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# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

# Introduction

The present document is part 1 of a multi-parts TS:

3GPP TS 36.521-1: Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification Radio transmission and reception; Part 1: Conformance Testing.

3GPP TS 36.521-2 [11]: Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification Radio transmission and reception; Part 2: Implementation Conformance Statement (ICS).

3GPP TS 36.521-3 [12]: Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification Radio transmission and reception; Part 3: Radio Resource Management (RRM) conformance testing.

# 1 Scope

The present document specifies the measurement procedures for the conformance test of the user equipment (UE) that contain transmitting characteristics, receiving characteristics and performance requirements as part of the 3G Long Term Evolution (3G LTE). Conformance test for the support of RRM (Radio Resource Management) are specified in TS 36.521-3 [12].

The requirements are listed in different clauses only if the corresponding parameters deviate. More generally, tests are only applicable to those mobiles that are intended to support the appropriate functionality. To indicate the circumstances in which tests apply, this is noted in the "*definition and applicability*" part of the test.

For example only Release 8 and later UE declared to support LTE shall be tested for this functionality. In the event that for some tests different conditions apply for different releases, this is indicated within the text of the test itself.

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document unless the context in which the reference is made suggests a different Release is relevant (information on the applicable release in a particular context can be found in e.g. test case title, description or applicability, message description or content).

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 36.101: "E-UTRA UE radio transmission and reception".

[3] ITU-R Recommendation SM.329-10, "Unwanted emissions in the spurious domain"

[4] 3GPP TS 36.133: "E-UTRA requirements for support of radio resource management".

[5] 3GPP TS 36.331: "E-UTRA Radio Resource Control (RRC): protocol specification".

[6] 3GPP TS 36.304: "E-UTRA UE procedures in idle mode".

[7] 3GPP TS 36.508: "Common test environments for User Equipment (UE)".

[8] 3GPP TS 36.211: "Physical Channels and Modulation".

[9] 3GPP TS 36.212: "E-UTRA Multiplexing and channel coding".

[10] 3GPP TS 36.213: "E-UTRA Physical layer procedures".

[11] 3GPP TS 36.521-2: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 2: Implementation Conformance Statement (ICS)".

[12] 3GPP TS 36.521-3: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management (RRM) conformance testing".

[13] 3GPP TS 36.321: "Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification".

[14] 3GPP TS 36.423: "X2 application protocol (X2AP) ".

[15] 3GPP TS 36.306: "E-UTRA User Equipment (UE) radio access capabilities".

[16] 3GPP TS 36.307: “Requirements on User Equipments (UEs) Supporting a release-independent frequency band”.

[17] 3GPP TR 36.904: “Derivation of test tolerances for User Equipment (UE) radio reception conformance tests”.

[18] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

[19] 3GPP TR 36.905: "Derivation of test points for radio transmission and reception conformance test cases".

[20] 3GPP TR 36.860: "3rd Generation Partnership Project;Technical Specification Group Radio Access Networks;LTE Advanced Dual Uplink Inter-band Carrier Aggregation "

[21] 3GPP TR 36.833-4: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE-Advanced intra-band non-contiguous Carrier Aggregation (CA) for 2 uplinks (2UL); Framework".

[22] 3GPP TS 23.303: "Technical Specification Group Services and System Aspects; Proximity-based services (ProSe); Stage 2".

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**Active time slot:** The time period where Uplink signal is transmitted excluding any transient period.

**Aggregated Channel Bandwidth:** The RF bandwidth in which a UE transmits and receives multiple contiguously aggregated carriers.

**Aggregated Transmission Bandwidth Configuration:** The number of resource block allocated within the aggregated channel bandwidth.

**Carrier aggregation:** Aggregation of two or more component carriers in order to support wider transmission bandwidths.

**Carrier aggregation band:** A set of one or more operating bands across which multiple carriers are aggregated with a specific set of technical requirements.

**Carrier aggregation bandwidth class:** A class defined by the aggregated transmission bandwidth configuration and maximum number of component carriers supported by a UE.

**Carrier aggregation configuration**: A combination of CA operating band(s) and CA bandwidth class(es) supported by a UE.

**Channel edge:** The lowest and highest frequency of the carrier, separated by the channel bandwidth.

**Channel bandwidth:** The RF bandwidth supporting a single E-UTRA RF carrier with the transmission bandwidth configured in the uplink or downlink of a cell. The channel bandwidth is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

**Contiguous carriers:** A set of two or more carriers configured in a spectrum block where there are no RF requirements based on co-existence for un-coordinated operation within the spectrum block.

**Contiguous resource allocation:** A resource allocation of consecutive resource blocks within one carrier or across contiguously aggregated carriers. The gap between contiguously aggregated carriers due to the nominal channel spacing is allowed.

**Contiguous spectrum:** Spectrum consisting of a contiguous block of spectrum with no sub-block gaps.

**Enhanced downlink control channel performance requirements type A:** This defines performance requirements for downlink control channel assuming as baseline receiver reference symbol based linear minimum mean square error interference rejection combining plus CRS interference cancellation.

**Enhanced downlink control channel performance requirements type B:** This defines performance requirements for downlink control channel assuming as baseline receiver reference symbol based enhanced linear minimum mean square error interference rejection combining plus CRS interference cancellation.

**Enhanced performance requirements type A:** This defines performance requirements assuming as baseline receiver reference symbol based linear minimum mean square error interference rejection combining.

**Enhanced performance requirements type B:** This defines performance requirements assuming as baseline receiver using network assisted interference cancellation and suppression.

**Enhanced performance requirements type C:** This defines performance requirements assuming as baseline receiver inter-stream interference cancellation.

**Inter-band carrier aggregation:** Carrier aggregation of component carriers in different operating bands**.**

NOTE: Carriers aggregated in each band can be contiguous or non-contiguous.

**Intra-band contiguous carrier aggregation:** Contiguous carriers aggregated in the same operating band.

**Intra-band non-contiguous carrier aggregation:** Non-contiguous carriers aggregated in the same operating band.

**Lower sub-block edge:** The frequency at the lower edge of one sub-block. It is used as a frequency reference point for both transmitter and receiver requirements.

**Category NB1/NB2 stand-alone operation**: category NB1/NB2 is operating standalone when it utilizes its own spectrum, for example the spectrum used by GERAN systems as a replacement of one or more GSM carriers, as well as scattered spectrum for potential IoT deployment.

**Category NB1/NB2 guard band operation:** category NB1/NB2 is operating in guard band when it utilizes the unused resource block(s) within a E-UTRA carrier's guard-band

**Category NB1/NB2 in-band operation:** category NB1/NB2 is operating in-band when it utilizes the resource block(s) within a normal E-UTRA carrier

**Non-contiguous spectrum:** Spectrum consisting of two or more sub-blocks separated by sub-block gap(s).

**ProSe-enabled UE:** A UE that supports ProSe requirements and associated procedures.

NOTE: As defined in TS 23.303 [22].

**ProSe Direct Communication**: A communication between two or more UEs in proximity that are ProSe-enabled.

NOTE: As defined in TS 23.303 [22].

**ProSe Direct Discovery**: A procedure employed by a ProSe-enabled UE to discover other ProSe-enabled UEs in its vicinity.

NOTE: As defined in TS 23.303 [22].

**Maximum Output Power:** The mean power level per carrier of UE measured at the antenna connector in a specified reference condition.

**Maximum Wgap:** Largest achievable sub-block gap size for an intra-band non-contiguous CA configuration with two sub-blocks, where one sub-block is placed in the low range of the operating band and the other one in the high range.

**Mean power:** When applied to E-UTRA transmission this is the power measured in the operating system bandwidth of the carrier. The period of measurement shall be at least one subframe (1ms) unless otherwise stated.

**Narrowband:** A narrowband is defined as six non-overlapping consecutive physical resource blocks in the frequency domain.

**Narrowband index:** The narrowbands are numbered $n_{\mathrm{NB}} = 0,..., N_{\mathrm{NB}}^{\mathrm{UL}} - 1$ in order of increasing physical resource-block number.

**Low Wgap:** Sub-block gap size of 5MHz centered in the middle of the operating band, with one sub-block on each side of the gap, with lowest $N_{RB}$ for PCC and SCC(s).

**Occupied bandwidth:** The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage β/2 of the total mean power of a given emission.

**Output power:** The mean power of one carrier of the UE, delivered to a load with resistance equal to the nominal load impedance of the transmitter.

**PMI delay:** The rate in basic time unit at which PMI is updated.

**Reference bandwidth**: The bandwidth in which an emission level is specified.

**Sub-block:** This is one contiguous allocated block of spectrum for transmission and reception by the same UE. There may be multiple instances of sub-blocks within an RF bandwidth.

**Sub-block bandwidth:** The bandwidth of one sub-block.

**Sub-block gap:** A frequency gap between two consecutive sub-blocks within an RF bandwidth, where the RF requirements in the gap are based on co-existence for un-coordinated operation.

**Synchronized operation**: Operation of TDD in two different systems, where no simultaneous uplink and downlink occur.

**Transmission bandwidth:** Bandwidth of an instantaneous transmission from a UE or BS, measured in Resource Block units.

**Transmission bandwidth configuration:** The highest transmission bandwidth allowed for uplink or downlink in a given channel bandwidth, measured in Resource Block units.

**Transmit Diversity:** Transmit diversity is based on space-frequency block coding techniques complemented with frequency-shift time diversity when four transmit antennas is used.

**Unsynchronized operation**: Operation of TDD in two different systems, where the conditions for synchronized operation

**Upper sub-block edge:** The frequency at the upper edge of one sub-block. It is used as a frequency reference point for both transmitter and receiver requirements.

**V2X Communication**: V2X (Vehicle to Everything) service is operating in ITS spectrum and/or LTE licensed operating bands.

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

| | |
|---|---|
| $BW_{Channel}$ | Channel bandwidth |
| $BW_{Channel,block}$ | Sub-block bandwidth, expressed in MHz. $BW_{Channel,block} = F_{edge,block,high} - F_{edge,block,low}$. |
| $BW_{Channel_CA}$ | Aggregated channel bandwidth, expressed in MHz. |
| $BW_{GB}$ | Virtual guard band to facilitate transmitter (receiver) filtering above / below edge CCs. |
| $E_{RS}$ | Transmitted energy per RE for reference symbols during the useful part of the symbol, i.e. excluding the cyclic prefix, (average power normalized to the subcarrier spacing) at the eNode B transmit antenna connector |
| $\hat{E}_s$ | The averaged received energy per RE of the wanted signal during the useful part of the symbol, i.e. excluding the cyclic prefix, at the UE antenna connector; average power is computed within a set of REs used for the transmission of physical channels (including user specific RSs when present), divided by the number of REs within the set, and normalized to the subcarrier spacingF Frequency |
| F | Frequency |
| $F_{agg_alloc_low}$ | Aggregated Transmission Bandwidth Configuration. The lowest frequency of the simultaneously transmitted resource blocks. |
| $F_{agg_alloc_high}$ | Aggregated Transmission Bandwidth Configuration. The highest frequency of the simultaneously transmitted resource blocks. |
| $F_{Interferer}$ (offset) | Frequency offset of the interferer |
| $F_{Interferer}$ | Frequency of the interferer |
| $F_C$ | Frequency of the carrier centre frequency |
| $F_{C_agg}$ | Aggregated Transmission Bandwidth Configuration. Center frequency of the aggregated carriers.$F_{C,block,\ high}$ Center frequency of the highest transmitted/received carrier in a sub-block. |
| $F_{C,block,\ low}$ | Center frequency of the lowest transmitted/received carrier in a sub-block. |
| $F_{CA_low}$ | The centre frequency of the *lowest carrier*, expressed in MHz. |
| $F_{CA_high}$ | The centre frequency of the *highest carrier*, expressed in MHz. |
| $F_{DL_low}$ | The lowest frequency of the downlink operating band |
| $F_{DL_high}$ | The highest frequency of the downlink operating band |
| $F_{UL_low}$ | The lowest frequency of the uplink operating band |
| $F_{UL_high}$ | The highest frequency of the uplink operating band |
| $F_{edge,block,low}$ | The lower sub-block edge, where $F_{edge,block,low} = F_{C,block,low} - F_{offset}$. |
| $F_{edge,block,high}$ | The upper sub-block edge, where $F_{edge,block,high} = F_{C,block,high} + F_{offset}$. |
| $F_{edge_low}$ | The *lower edge* of aggregated channel bandwidth, expressed in MHz. |
| $F_{edge_high}$ | The *higher edge* of aggregated channel bandwidth, expressed in MHz. |
| $F_{offset}$ | Frequency offset from $F_{C_high}$ to the *higher edge* or $F_{C_low}$ to the *lower edge*. |
| $F_{offset,block,low}$ | Separation between lower edge of a sub-block and the center of the lowest component carrier within the sub-block |

| | |
|---|---|
| $F_{offset,block,high}$ | Separation between higher edge of a sub-block and the center of the highest component carrier within the sub-block |
| $I_o$ | The power spectral density of the total input signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the UE antenna connector, including the own-cell downlink signal |
| $I_{or}$ | The total transmitted power spectral density of the own-cell downlink signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the eNode B transmit antenna connector |
| $\hat{I}_{or}$ | The total received power spectral density of the own-cell downlink signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the UE antenna connector |
| $I_{ot}$ | The received power spectral density of the total noise and interference for a certain RE (average power obtained within the RE and normalized to the subcarrier spacing) as measured at the UE antenna connector |
| $L_{CRB}$ | Transmission bandwidth which represents the length of a contiguous resource block allocation expresse in units of resources blocks |
| $N_{cp}$ | Cyclic prefix length |
| $N_{DL}$ | Downlink EARFCN |
| $N_{oc}$ | The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing), simulating interference from cells that are not defined in a test procedure, as measured at the UE antenna connector. |
| $N_{oc1}$ | The power spectral density of a white noise source (average power per RE normalized to the subcarrier spacing), simulating interference in non-CRS symbols in ABS subframe from cells that are not defined in a test procedure, as measured at the UE antenna connector. |
| $N_{oc2}$ | The power spectral density of a white noise source (average power per RE normalized to the subcarrier spacing), simulating interference in CRS symbols in ABS subframe from all cells that are not defined in a test procedure, as measured at the UE antenna connector. |
| $N_{oc3}$ | The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing), simulating interference in non-ABS subframe from cells that are not defined in a test procedure, as measured at the UE antenna connector. |
| $N_{oc}'$ | The power spectral density (average power per RE normalised to the subcarrier spacing) of the summation of the received power spectral densities of the strongest interfering cells explicitly defined in a test procedure plus $N_{oc}$ , as measured at the UE antenna connector. The respective power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value, or the respective power spectral density of each interfering cell relative to $N_{oc}$ is defined by its associated Es/Noc value. |
| $N_{Offs-DL}$ | Offset used for calculating downlink EARFCN |
| $N_{Offs-UL}$ | Offset used for calculating uplink EARFCN |
| $N_{otx}$ | The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing) simulating eNode B transmitter impairments as at the eNode B transmit antenna connector |
| $N_{RB}$ | Transmission bandwidth configuration, expressed in units of resource blocks |
| Highest $N_{RB}$ | Highest $N_{RB}$ defined for the band |
| $N_{RB_agg}$ | The number of the aggregated RBs within the fully allocated Aggregated Channel bandwidth. |
| Highest $N_{RB_agg}$ | The highest $N_{RB_agg}$ across Bandwidth Combination Sets supported by the UE as part of the CA Configuration. |
| Lowest $N_{RB_agg}$ | The lowest $N_{RB_agg}$ across Bandwidth Combination Sets supported by the UE as part of the CA Configuration. |
| $L_{Ctone}$ | Transmission bandwidth which represents the length of a contiguous sub-carrier allocation expressed in units of tones |
| $N_{RB_alloc}$ | Total number of simultaneously transmitted resource blocks in Channel bandwidth or Aggregated Channel Bandwidth configuration. |

| | |
|---|---|
| $N_{RB,c}$ | The transmission bandwidth configuration of component carrier *c*, expressed in units of resource blocks |
| $N_{RB,largest\ BW}$ | The largest transmission bandwidth configuration of the component carriers in the bandwidth combination, expressed in units of resource blocks |
| $N_{RX}$ | Number of receiver antennas |
| $N_{tone}$ | Transmission bandwidth configuration for category NB1 and NB2, expressed in units of tones. |
| $N_{tone\ 3.75kHz}$ | Transmission bandwidth configuration for category NB1 and NB2 with 3.75 kHz sub-carrier spacing, expressed in units of tones. |
| $N_{tone\ 15kHz}$ | Transmission bandwidth configuration for category NB1 and NB2 with 15 kHz sub-carrier spacing, expressed in units of tones. |
| $N_{UL}$ | Uplink EARFCN |
| $P$ | Number of cell-specific antenna ports |
| $p$ | Antenna port number |
| $P_{CMAX}$ | The measured configured maximum UE output power. |
| $P_{CMAX,c}$ | The configured maximum UE output power for serving cell *c*. |
| $P_{EMAX}$ | Maximum allowed UE output power signalled by higher layers. Same as IE *P-Max*, defined in [5]. |
| $P_{EMAX,c}$ | Maximum allowed UE output power signalled by higher layers for serving cell *c*. Same as IE *P-Max*, defined in [7]. |
| $P_{Interferer}$ | Modulated mean power of the interferer |
| $P_{PowerClass}$ | $P_{PowerClass}$ is the nominal UE power (i.e., no tolerance). |
| $P_{UMAX}$ | The measured configured maximum UE output power. Maximum UE Power with possible power reduction due to modulation type, network signalling values and location near the edge of the band; it equals $P_{CMAX}$ when the IE *P-Max*, defined in [5], is not signalled. |
| Puw | Power of an unwanted DL signal |
| Pw | Power of a wanted DL signal |
| $P_L_{CRB}$ | Number of transmitted resource blocks on the Primary Component Carrier |
| Rav | Minimum average throughput per RB |
| RB # | Position of the RB in the channel bandwidth. |
| $RB_{start}$ | Indicates the lowest RB index of transmitted resource blocks. |
| $RB_{end}$ | Indicates the highest RB index of transmitted resource blocks. |
| $S_L_{CRB}$ | Number of transmitted resource blocks on the Secondary Component Carrier |
| $\Delta F_{OOB}$ | Δ Frequency of Out Of Band emission |
| $\Delta R_{IB,c}$ | Allowed reference sensitivity relaxation due to support for inter-band CA operation, for serving cell *c*. |
| $\Delta T_{IB,c}$ | Allowed maximum configured output power relaxation due to support for inter-band CA operation, for serving cell *c*. |
| $\Delta T_C$ | Allowed operating band edge transmission power relaxation. |
| $\Delta T_{C,c}$ | Allowed operating band edge transmission power relaxation for serving cell *c*. |
| $\Delta T_{ProSe}$ | Allowed operating band transmission power relaxation due to support of E-UTRA ProSe on an operating band. |
| σ | Test specific auxiliary variable used for the purpose of downlink power allocation, defined in Annex C.3.2. |
| $W_{gap}$ | Sub-block gap size |

# 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

| | |
|---|---|
| ABS | Almost Blank Subframe |
| ACLR | Adjacent Channel Leakage Ratio |
| ACS | Adjacent Channel Selectivity |
| A-MPR | Additional Maximum Power Reduction |
| AWGN | Additive White Gaussian Noise |
| BCCH | Broadcast Control Channel |
| BCH | Broadcast Channel |
| BS | Base Station |
| CA | Carrier Aggregation |

| | |
|---|---|
| CA_X | Intra-band contiguous CA of component carriers in one sub-block within Band X where X is the applicable E-UTRA operating band |
| CA_X-X | Intra-band non-contiguous intra band CA of component carriers in two sub-blocks within Band X is the applicable E-UTRA operating band |
| CA_X-Y | Inter-band CA of component carrier(s) in one sub-block within Band X and component carrier(s) in one sub-block within Band Y where X and Y are the applicable E-UTRA operating band |
| CA_X-X-Y | CA of component carriers in two sub-blocks within Band X and component carrier(s) in one sub-block within Band Y where X and Y are the applicable E-UTRA operating bands |
| CC | Component Carriers |
| CP | Cyclic Prefix |
| CoMP | Coordinated Multi-Point |
| CPE | Customer Premise Equipment |
| CPE_X | Customer Premise Equipment for E-UTRA operating band X |
| CQI | Channel Quality Indicator |
| CW | Continuous Wave |
| DC | Dual Connectivity |
| DC_X-Y | Inter-band DC of component carrier(s) in one sub-block within Band X and component carrier(s) in one sub-block within Band Y where X and Y are the applicable E-UTRA operating band |
| DCI | Downlink Control Information |
| DIP | Dominant Interferer Proportion |
| DPS | Dynamic Point Switch |
| eDL-MIMO | Down Link Multiple Antenna transmission |
| DL | Downlink |
| DTX | Discontinuous Transmission |
| DwPTS | Downlink Pilot Time-Slot |
| EARFCN | E-UTRA Absolute Radio Frequency Channel Number |
| EPRE | Energy Per Resource Element |
| E-UTRA | Evolved UMTS Terrestrial Radio Access |
| EUTRAN | Evolved UMTS Terrestrial Radio Access Network |
| EVM | Error Vector Magnitude |
| FDD | Frequency Division Duplex |
| FRC | Fixed Reference Channel |
| FSTD | Frequency-Shift Time Diversity |
| HARQ | Hybrid ARQ |
| HD-FDD | Half- Duplex FDD |
| HST | High Speed Train |
| MAC | Medium Access Control |
| MBMS | Multimedia Broadcast Multicast Service |
| MCS | Modulation and Coding Scheme |
| MCG | Main Carrier Group |
| MOP | Maximum Output Power |
| MPR | Maximum Power Reduction |
| MSR | Maximum Sensitivity Reduction |
| OCNG | OFDMA Channel Noise Generator |
| OFDMA | Orthogonal Frequency Division Multiple Access |
| OOB | Out-of-band |
| P-MPR | Power Management Maximum Power Reduction |
| PA | Power Amplifier |
| PBCH | Physical Broadcast Channel |
| PCC | Primary Component Carrier |
| PCCH | Paging Control Channel |
| PCFICH | Physical Control Format Indicator Channel |
| PDCCH | Physical Downlink Control Channel |
| PDSCH | Physical Downlink Shared Channel |
| PDU | Packet Data Unit |
| PHICH | Physical Hybrid ARQ Indicator Channel |
| Pm-dsg | Probability of miss-detection of the Downlink Scheduling Grant |
| PMI | Precoding Matrix Indicator |
| PRACH | Physical Random Access Channel |
| PRB | Physical Resource Block |
| ProSe | Proximity-based Services |
| PSBCH | Physical Sidelink Broadcast CHannel |

| | |
|---|---|
| PSCCH | Physical Sidelink Control CHannel |
| PSDCH | Physical Sidelink Discovery CHannel |
| PSS | Primary Synchronization Signal |
| PSS_RA | PSS-to-EPRE ratio for the channel PSS |
| PSSCH | Physical Sidelink Shared CHannel |
| PSSS | Primary Sidelink Synchronization Signal |
| PUCCH | Physical Uplink Control Channel |
| PUSCH | Physical Uplink Shared ChannelRE Resource Element |
| RE | Resource Element |
| REFSENS | Reference Sensitivity power level |
| RI | Rank Indicator |
| RLC | Radio Link Control |
| RMC | Reference Measurement Channel |
| r.m.s | Root Mean Square |
| RNTI | Radio Network Temporary Identifier |
| RRC | Radio Resource Control |
| RS | Reference Signal |
| RSRP | Reference Signal Received Power |
| SCC | Secondary Component Carrier |
| SCG | Secondary Carrier Group |
| SCH | Synchronization Channel |
| SDU | Service Data Unit |
| SFBC | Space-Frequency Block Coding |
| SFN | Single Frequency Network |
| SINR | Signal-to-Interference-and-Noise Ratio |
| SNR | Signal-to-Noise Ratio |
| SRS | Sounding Reference Signal |
| SSS | Secondary Synchronization Signal |
| SSSS | Secondary Sidelink Synchronization Signal |
| SSS_RA | SSS-to-RS EPRE ratio for the channel SSS |
| TDD | Time Division Duplex |
| TP | Transmission Point |
| TPC | Transmit Power Control |
| TPMI | Transmitted Precoding Matrix Indicator |
| TTI | Transmission Time Interval |
| UE | User Equipment |
| UL | Uplink |
| UL-MIMO | Up Link Multiple Antenna transmission |
| UMTS | Universal Mobile Telecommunications System |
| UpPTS | Uplink Pilot Time-Slot |
| UTRA | UMTS Terrestrial Radio Access |
| UTRAN | UMTS Terrestrial Radio Access Network |
| V2X | Vehicle to Everything |
| xCH_RA | xCH-to-RS EPRE ratio for the channel xCH in all transmitted OFDM symbols not containing RS |
| xCH_RB | xCH-to-RS EPRE ratio for the channel xCH in all transmitted OFDM symbols containing RS |

# 4 General

Unless otherwise stated, the following reference conditions used by all test cases in this document are specified in TS 36.508 [7]:

- Connection Diagrams,
- Test Frequencies,
- Cell Settings,
- Reference Environments,
- Environmental Conditions,
- Generic Connection Setup Procedures,
- System Information (SI),
- Message Contents.

Where a test requires one of the above reference conditions that are different, this will be specified within the test itself.

The Minimum Requirements defined in each test make no allowance for Measurement Uncertainty. Therefore, Test Tolerances are used to relax the Minimum Requirements. If the Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for that test is non-zero. For each test the Test Tolerances are individually calculated to create the Test Requirements. The Test Tolerance for each test and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex F.3.

Downlink and Uplink transmissions are organized into radio frames with $T_f = 307200 \times T_s = 10\,\text{ms}$ duration. Two radio frame structures are supported in this document:

- Type 1, applicable to FDD,
- Type 2, applicable to TDD.

In clauses 6 and 7 TX and RX test cases for FDD/TDD test cases are defined. FDD and TDD test scenarios/ requirements are included within the same test case. For test cases with any difference between the FDD and TDD branches the test description part of the test case has been separated in two sections to cover the two technologies. The applicability for the FDD and TDD branches are specified in TS 36.521-2. For some test cases requiring a complex test coverage analysis, TR 36.905 [19] is used for this purpose.

In clause 8 the performance requirement test cases are defined. FDD and TDD performance requirement test cases are defined in different clauses accordingly to the requirements specified in TS 36.101.

Unless otherwise stated, each test case is tested for every operating band supported by the UE and repeated with the applicable test configurations (i.e. test environment, test frequencies, test channel bandwidths, channel bandwidth parameters) indicated in each test case. For test cases in clauses 6, 7, 8 the initial conditions of the downlink physical channels signal levels and downlink physical channels required are specified in Annex C.0, Annex C.1 and Annex C.2.

For test cases in clauses 6 and 7 that require measurements with maximum output power, the UE shall transmit at its maximum output power state with output power level of $P_{UMAX}$ level. This range of maximum output power shall not be modified for any further additional relaxation.

For UL-MIMO cases, the UE output power is the sum of mean powers as measured at each antenna connector unless otherwise stated.

For test cases in clauses 6 and 7, the partial RB allocations refer to any RB allocation less than full RB allocation except 1 RB allocation.

# 4.1 Categorization of test requirements in CA, UL-MIMO, ProSe, Dual Connectivity, UE category 0, UE category M1, UE category M2, UE category 1bis, UE category NB1, UE category NB2, V2X Communication

The test requirements for Clauses 6 (Tx Characteristics) and 7 (Rx Characteristics), which are specific to CA, UL-MIMO, ProSe, Dual Connectivity, UE category 0, UE category M1, UE category, UE category 1bis, UE category NB1, UE category NB2, V2X Communication are specified as suffix A, B, C, D, E , F and G where;

a) Suffix A additional requirements need to support CA

b) Suffix B additional requirements need to support UL-MIMO

c) Suffix C additional requirements need to support Dual Connectivity

d) Suffix D additional requirements need to support ProSe

e) Suffix E additional requirements need to support UE category 0, category M1, category M2, and category 1bis

f) Suffix F additional requirements need to support UE category NB1, UE category NB2

g) Suffix G additional requirements need to support V2X Communication

A terminal which supports the above features needs to meet both the general requirements and the additional requirement applicable to the additional sub-clause (suffix A, B, C, D, E, F and G).

Where there is a difference in requirement between the general requirements and the additional subclause requirements (suffix A, B, C, D, E, F and G) in clauses 5, 6 and 7, the tighter requirements are applicable unless stated otherwise in the additional subclause.

A terminal which supports more than one feature (CA, UL-MIMO, ProSe, Dual Connectivity, UE category 0, UE category M1, UE category M2, UE category 1bis, UE category NB1, UE category NB2 and V2X Communication) in clauses 5, 6 and 7 shall meet all of the separate corresponding requirements.

For a terminal supporting CA, compliance with minimum requirements for non-contiguous intra-band carrier aggregation in any given operating band does not imply compliance with minimum requirements for contiguous intra-band carrier aggregation in the same operating band.

For a terminal supporting CA, compliance with minimum requirements for contiguous intra-band carrier aggregation in any given operating band does not imply compliance with minimum requirements for non- contiguous intra-band carrier aggregation in the same operating band.

A terminal which supports a DL CA configuration shall support all the lower order fallback DL CA combinations and it shall support at least one bandwidth combination set for each of the constituent lower order DL combinations containing all the bandwidths specified within each specific combination set of the upper order DL combination.

A terminal which supports CA, for each supported CA configuration, shall support Pcell transmissions in each of the aggregated Component Carriers unless indicated otherwise in clause 5.4.2A.1.

Terminal supporting Dual Connectivity configuration shall meet the minimum requirements for corresponding CA configuration (suffix A), unless otherwise specified.

NOTE 1: Test Case 6.5.2.1A, PUSCH-EVM with exclusion period, is a Release 8 non-CA test case and does not indicate a requirement to support CA.

NOTE 2: This categorization of test requirements reflects only the categorization of minimum requirements as done by RAN4 in 3GPP TS 36.101. For the categorization of the tests requirements done on behalf of RAN5 follow the information given in Annex I.

For a terminal that supports ProSe Direct Communication and/or ProSe Direct Discovery, the minimum requirements are applicable when

- the UE is associated with a serving cell on the ProSe carrier, or

- the UE is not associated with a serving cell on the ProSe carrier and is provisioned with the preconfigured radio parameters for ProSe Direct Communications and/or ProSe Direct Discovery that are associated with known Geographical Area, or

- the UE is associated with a serving cell on a carrier different than the ProSe carrier, and the radio parameters for ProSe Direct Discovery on the ProSe carrier are provided by the serving cell, or

- the UE is associated with a serving cell on a carrier different than the ProSe carrier, and has a non-serving cell selected on the ProSe carrier that supports ProSe Direct Discovery and/or ProSe Direct Communication.

When the ProSe UE is not associated with a serving cell on the ProSe carrier, and the UE does not have knowledge of its geographical area, or is provisioned with preconfigured radio parameters that are not associated with any Geographical Area, ProSe transmissions are not allowed, and the requirements in Section 6.3.3D apply.

A terminal that supports simultaneous E-UTRA ProSe sidelink transmissions and E-UTRA uplink transmissions for the inter-band E-UTRA ProSe/E-UTRA bands specified in Table 5.2D-2, shall meet the minimum requirements for the corresponding inter-band UL CA configuration (suffix A), unless otherwise specified. For transmitter characteristics specified in clause 6, the terminal is required to meet the conformance tests for the corresponding inter-band UL CA configuration and is not required to be retested with simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions.

A terminal that supports E-UTRA V2X intra-band multi-carrier operation for the band specified in Table 5.5G-3, shall meet the corresponding transmitter characteristics requirements (in subclauses with suffix G in Section 6) only when there are multiple active transmissions on all of the configured carrier components. When there is only one active transmission on one of the configured carrier components, the corresponding requirements for V2X single carrier operation apply for the corresponding active carrier component.

## 4.2 RF requirements in later releases

The standardisation of new frequency bands may be independent of a release. However, in order to implement a UE that conforms to a particular release but supports a band of operation that is specified in a later release, it is necessary to specify some extra requirements. TS 36.307 [16] specifies requirements on UEs supporting a frequency band that is independent of release.

NOTE: For UEs conforming to the 3GPP release of the present document, some RF requirements of later releases may be mandatory independent of whether the UE supports the bands specified in later releases or not. The set of RF requirements of later releases that is also mandatory for UEs conforming to the 3GPP release of the present document is determined by regional regulation.

# 5 Frequency bands and channel arrangement

## 5.1 General

The channel arrangements presented in this clause are based on the operating bands and channel bandwidths defined in the present release of specifications.

NOTE: Other operating bands and channel bandwidths may be considered in future releases.

## 5.2 Operating bands

E-UTRA is designed to operate in the operating bands defined in Table 5.2-1.

**Table 5.2-1: E-UTRA operating bands**

| E-UTRA Operating Band | Uplink (UL) operating band BS receive UE transmit | Downlink (DL) operating band BS transmit UE receive | Duplex Mode |
|---|---|---|---|
| | $F_{UL_low}$ – $F_{UL_high}$ | $F_{DL_low}$ – $F_{DL_high}$ | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 1920 MHz | – | 1980 MHz | 2110 MHz | – | 2170 MHz | FDD |
| 2 | 1850 MHz | – | 1910 MHz | 1930 MHz | – | 1990 MHz | FDD |
| 3 | 1710 MHz | – | 1785 MHz | 1805 MHz | – | 1880 MHz | FDD |
| 4 | 1710 MHz | – | 1755 MHz | 2110 MHz | – | 2155 MHz | FDD |
| 5 | 824 MHz | – | 849 MHz | 869 MHz | – | 894MHz | FDD |
| 6[1] | 830 MHz | – | 840 MHz | 875 MHz | – | 885 MHz | FDD |
| 7 | 2500 MHz | – | 2570 MHz | 2620 MHz | – | 2690 MHz | FDD |
| 8 | 880 MHz | – | 915 MHz | 925 MHz | – | 960 MHz | FDD |
| 9 | 1749.9 MHz | – | 1784.9 MHz | 1844.9 MHz | – | 1879.9 MHz | FDD |
| 10 | 1710 MHz | – | 1770 MHz | 2110 MHz | – | 2170 MHz | FDD |
| 11 | 1427.9 MHz | – | 1447.9 MHz | 1475.9 MHz | – | 1495.9 MHz | FDD |
| 12 | 699 MHz | – | 716 MHz | 729 MHz | – | 746 MHz | FDD |
| 13 | 777 MHz | – | 787 MHz | 746 MHz | – | 756 MHz | FDD |
| 14 | 788 MHz | – | 798 MHz | 758 MHz | – | 768 MHz | FDD |
| 15 | Reserved | | | Reserved | | | FDD |
| 16 | Reserved | | | Reserved | | | FDD |
| 17 | 704 MHz | – | 716 MHz | 734 MHz | – | 746 MHz | FDD |
| 18 | 815 MHz | – | 830 MHz | 860 MHz | – | 875 MHz | FDD |
| 19 | 830 MHz | – | 845 MHz | 875 MHz | – | 890 MHz | FDD |
| 20 | 832 MHz | – | 862 MHz | 791 MHz | – | 821 MHz | FDD |
| 21 | 1447.9 MHz | – | 1462.9 MHz | 1495.9 MHz | – | 1510.9 MHz | FDD |
| 22 | 3410 MHz | – | 3490 MHz | 3510 MHz | – | 3590 MHz | FDD |
| 23[1] | 2000 MHz | – | 2020 MHz | 2180 MHz | – | 2200 MHz | FDD |
| 24 | 1626.5 MHz | – | 1660.5 MHz | 1525 MHz | – | 1559 MHz | FDD |
| 25 | 1850 MHz | – | 1915 MHz | 1930 MHz | – | 1995 MHz | FDD |
| 26 | 814 MHz | – | 849 MHz | 859 MHz | – | 894 MHz | FDD |
| 27 | 807 MHz | – | 824 MHz | 852 MHz | – | 869 MHz | FDD |
| 28 | 703 MHz | – | 748 MHz | 758 MHz | – | 803 MHz | FDD |
| 29 | NA | | | 717 MHz | – | 728 MHz | FDD[2] |
| 30 | 2305 MHz | – | 2315 MHz | 2350 MHz | – | 2360 MHz | FDD[15] |
| 31 | 452.5 MHz | – | 457.5 MHz | 462.5 MHz | – | 467.5 MHz | FDD |
| 32 | N/A | | | 1452 MHz | – | 1496 MHz | FDD[2] |
| 33 | 1900 MHz | – | 1920 MHz | 1900 MHz | – | 1920 MHz | TDD |
| 34 | 2010 MHz | – | 2025 MHz | 2010 MHz | – | 2025 MHz | TDD |
| 35 | 1850 MHz | – | 1910 MHz | 1850 MHz | – | 1910 MHz | TDD |
| 36 | 1930 MHz | – | 1990 MHz | 1930 MHz | – | 1990 MHz | TDD |
| 37 | 1910 MHz | – | 1930 MHz | 1910 MHz | – | 1930 MHz | TDD |
| 38 | 2570 MHz | – | 2620 MHz | 2570 MHz | – | 2620 MHz | TDD |
| 39 | 1880 MHz | – | 1920 MHz | 1880 MHz | – | 1920 MHz | TDD |
| 40 | 2300 MHz | – | 2400 MHz | 2300 MHz | – | 2400 MHz | TDD |
| 41 | 2496 MHz | – | 2690 MHz | 2496 MHz | – | 2690 MHz | TDD |
| 42 | 3400 MHz | – | 3600 MHz | 3400 MHz | – | 3600 MHz | TDD |
| 43 | 3600 MHz | – | 3800 MHz | 3600 MHz | – | 3800 MHz | TDD |
| 44 | 703 MHz | – | 803 MHz | 703 MHz | – | 803 MHz | TDD |
| 45 | 1447 MHz | – | 1467 MHz | 1447 MHz | – | 1467 MHz | TDD |
| 46 | 5150 MHz | – | 5925 MHz | 5150 MHz | – | 5925 MHz | TDD[8,9] |
| 47 | 5855 MHz | – | 5925 MHz | 5855 MHz | – | 5925 MHz | TDD[11] |
| 48 | 3550 MHz | – | 3700 MHz | 3550 MHz | – | 3700 MHz | TDD |
| 50 | 1432 MHz | - | 1517 MHz | 1432 MHz | - | 1517 MHz | TDD[13] |
| 51 | 1427 MHz | - | 1432 MHz | 1427 MHz | - | 1432 MHz | TDD[13] |
| … | | | | | | | |
| 64 | Reserved | | | | | | |
| 65 | 1920 MHz | – | 2010 MHz | 2110 MHz | – | 2200 MHz | FDD |
| 66 | 1710 MHz | – | 1780 MHz | 2110 MHz | – | 2200 MHz | FDD[4] |
| 67 | N/A | | | 738 MHz | – | 758 MHz | FDD[2] |
| 68 | 698 MHz | – | 728 MHz | 753 MHz | – | 783 MHz | FDD |
| 69 | N/A | | | 2570 MHz | – | 2620 MHz | FDD[2] |
| 70 | 1695 MHz | – | 1710 MHz | 1995 MHz | – | 2020 MHz | FDD[10] |
| 71 | 663 MHz | – | 698 MHz | 617 MHz | – | 652 MHz | FDD |
| 72 | 451 MHz | – | 456 MHz | 461 MHz | – | 466 MHz | FDD |
| 73 | 450MHz | – | 455 MHz | 460MHz | – | 465 MHz | FDD |
| 74 | 1427 MHz | – | 1470 MHz | 1475 MHz | – | 1518 MHz | FDD |
| 75 | N/A | | | 1432 MHz | – | 1517 MHz | FDD[2] |
| 76 | N/A | | | 1427 MHz | – | 1432 MHz | FDD[2] |

NOTE 1: Band 6, 23 is not applicable.
NOTE 2: Restricted to E-UTRA operation when carrier aggregation is configured. The downlink operating band is paired with the uplink operating band (external) of the carrier aggregation configuration that is supporting the configured Pcell.
NOTE 3: A UE that complies with the E-UTRA Band 65 minimum requirements in this specification shall also comply with the E-UTRA Band 1 minimum requirements.
NOTE 4: The range 2180-2200 MHz of the DL operating band is restricted to E-UTRA operation when carrier aggregation is configured.
NOTE 5: A UE that supports E-UTRA Band 66 shall receive in the entire DL operating band
NOTE 6: A UE that supports E-UTRA Band 66 and CA operation in any CA band shall also comply with the minimum requirements specified for the DL CA configurations CA_66B, CA_66C and CA_66A-66A.
NOTE 7: A UE that complies with the E-UTRA Band 66 minimum requirements in this specification shall also comply with the E-UTRA Band 4 minimum requirements.
NOTE 8: This band is an unlicensed band restricted to licensed-assisted operation using Frame Structure Type 3.
NOTE 9: In this version of the specification, restricted to E-UTRA DL operation when carrier aggregation is configured.
NOTE 10: The range 2010-2020 MHz of the DL operating band is restricted to E-UTRA operation when carrier aggregation is configured and TX-RX separation is 300 MHz The range 2005-2020 MHz of the DL operating band is restricted to E-UTRA operation when carrier aggregation is configured and TX-RX separation is 295 MHz.
NOTE 11: This band is unlicensed band used for V2X communication. There is no expected network deployment in this band so both Frame Structure Type 1 and Frame Structure Type 2 can be used.
NOTE 12: A UE that complies with the E-UTRA Band 74 minimum requirements in this specification shall also comply with the E-UTRA Band 11 and Band 21 minimum requirements.
NOTE 13: UE that complies with the E-UTRA Band 50 minimum requirements in this specification shall also comply with the E-UTRA Band 51 minimum requirements.
NOTE 14: A UE that complies with the E-UTRA Band 75 minimum requirements in this specification shall also comply with the E-UTRA Band 76 minimum requirements.
NOTE 15: Uplink transmission is not allowed at this band for UE with external vehicle-mounted antennas.

# 5.2A Operating bands for CA

E-UTRA carrier aggregation is designed to operate in the operating bands defined in Tables 5.2A-1, 5.2A-2, 5.2A-2a, 5.2A-2b, 5.2A-2c, 5.2A-3, 5.2A-4 and 5.2A-5.

**Table 5.2A-1: Intra-band contiguous CA operating bands**

| E-UTRA CA Band | E-UTRA Band (Table 5.2-1) |
|---|---|
| CA_1 | 1 |
| CA_2 | 2 |
| CA_3 | 3 |
| CA_5 | 5 |
| CA_7 | 7 |
| CA_8 | 8 |
| CA_12 | 12 |
| CA_23 | 23 |
| CA_27 | 27 |
| CA_28 | 28 |
| CA_38 | 38 |
| CA_39 | 39 |
| CA_40 | 40 |
| CA_41 | 41 |
| CA_42 | 42 |
| CA_43 | 43 |
| CA_48 | 48 |
| CA_66 | 66 |
| CA_70 | 70 |

**Table 5.2A-2: Inter-band CA operating bands (two bands)**

| E-UTRA CA Band | E-UTRA Band (Table 5.2-1) |
|---|---|
| CA_1-3 | 1, 3 |
| CA_1-1-3 | 1, 3 |
| CA_1-1-5 | 1, 5 |
| CA_1-1-7 | 1, 7 |
| CA_1-1-28 | 1, 28 |
| CA_1-3-3 | 1, 3 |
| CA_1-5 | 1, 5 |
| CA_1-7 | 1, 7 |
| CA_1-7-7 | 1, 7 |
| CA_1-8 | 1, 8 |
| CA_1-11 | 1, 11 |
| CA_1-18 | 1, 18 |
| CA_1-19 | 1, 19 |
| CA_1-20 | 1, 20 |
| CA_1-21 | 1, 21 |
| CA_1-26 | 1, 26 |
| CA_1-28 | 1, 28 |
| CA_1-32 | 1, 32 |
| CA_1-38 | 1, 38 |
| CA_1-40 | 1, 40 |
| CA_1-41 | 1, 41 |
| CA_1-42 | 1, 42 |
| CA_1-42-42 | 1, 42 |
| CA_1-43 | 1, 43 |
| CA_1-46 | 1, 46 |
| CA_2-4 | 2, 4 |
| CA_2-2-4 | 2, 4 |
| CA_2-2-4-4 | 2, 4 |
| CA_2-4-4 | 2, 4 |
| CA_2-5 | 2, 5 |
| CA_2-2-5 | 2, 5 |
| CA_2-2-7 | 2, 7 |
| CA_2-7 | 2, 7 |
| CA_2-7-7 | 2, 7 |
| CA_2-12 | 2, 12 |
| CA_2-2-12 | 2, 12 |
| CA_2-2-12-12 | 2, 12 |
| CA_2-2-29 | 2, 29 |
| CA_2-7-46 | 2, 7, 46 |
| CA_2-12-12 | 2, 12 |
| CA_2-13 | 2, 13 |
| CA_2-2-13 | 2, 13 |
| CA_2-14 | 2, 14 |
| CA_2-2-14 | 2, 14 |
| CA_2-17 | 2, 17 |
| CA_2-28 | 2, 28 |
| CA_2-29 | 2, 29 |
| CA_2-30 | 2, 30 |
| CA_2-2-30 | 2, 30 |
| CA_2-46 | 2, 46 |
| CA_2-2-46 | 2, 46 |
| CA_2-46-46 | 2, 46 |
| CA_2-48-48 | 2, 48 |
| CA_2-48 | 2, 48 |
| CA_2-49 | 2, 49 |

| | |
|---|---|
| CA_2-66 | 2, 66 |
| CA_2-2-66 | 2, 66 |
| CA_2-2-66-66 | 2, 66 |
| CA_2-66-66 | 2, 66 |
| CA_2-66-66-66 | 2, 66 |
| CA_2-71 | 2, 71 |
| CA_2-2-71 | 2, 71 |
| CA_3-5 | 3, 5 |
| CA_3-7 | 3, 7 |
| CA_3-3-7 | 3, 7 |
| CA_3-3-7-7 | 3, 7 |
| CA_3-7-7 | 3, 7 |
| CA_3-8 | 3, 8 |
| CA_3-3-8 | 3, 8 |
| CA_3-11 | 3, 11 |
| CA_3-18 | 3, 18 |
| CA_3-19 | 3, 19 |
| CA_3-3-19 | 3, 19 |
| CA_3-20 | 3, 20 |
| CA_3-3-20 | 3, 20 |
| CA_3-3-21 | 3, 21 |
| CA_3-3-28 | 3, 28 |
| CA_3-3-41 | 3, 41 |
| CA_3-3-42 | 3, 42 |
| CA_3-21 | 3, 21 |
| CA_3-26 | 3, 26 |
| CA_3-27 | 3, 27 |
| CA_3-28 | 3, 28 |
| CA_3-31 | 3, 31 |
| CA_3-32 | 3, 32 |
| CA_3-38 | 3, 38 |
| CA_3-40 | 3, 40 |
| CA_3-40-40 | 3, 40 |
| CA_3-41 | 3, 41 |
| CA_3-42 | 3, 42 |
| CA_3-42-42 | 3, 42 |
| CA_3-43 | 3, 43 |
| CA_3-46 | 3, 46 |
| CA_3-3-46 | 3, 46 |
| CA_3-69 | 3, 69 |
| CA_4-5 | 4, 5 |
| CA_4-4-5 | 4, 5 |
| CA_4-7 | 4, 7 |
| CA_4-4-7 | 4, 7 |
| CA_4-7-7 | 4, 7 |
| CA_4-12 | 4, 12 |
| CA_4-4-12 | 4, 12 |
| CA_4-4-12-12 | 4, 12 |
| CA_4-12-12 | 4, 12 |
| CA_4-13 | 4, 13 |
| CA_4-4-13 | 4, 13 |
| CA_4-17 | 4, 17 |
| CA_4-27 | 4, 27 |
| CA_4-28 | 4, 28 |
| CA_4-29 | 4, 29 |
| CA_4-4-29 | 4, 29 |
| CA_4-30 | 4, 30 |

| | |
|---|---|
| CA_4-4-30 | 4, 30 |
| CA_4-46 | 4, 46 |
| CA_4-46-46 | 4, 46 |
| CA_4-48 | 4, 48 |
| CA_4-71 | 4,71 |
| CA_4-4-71 | 4, 71 |
| CA_5-5-40 | 5, 40 |
| CA_5-7 | 5, 7 |
| CA_5-7-7 | 5, 7 |
| CA_5-12 | 5, 12 |
| CA_5-12-12 | 5, 12 |
| CA_5-13 | 5 ,13 |
| CA_5-17 | 5, 17 |
| CA_5-25 | 5, 25 |
| CA_5-28 | 5, 28 |
| CA_5-29 | 5, 29 |
| CA_5-30 | 5, 30 |
| CA_5-38 | 5, 38 |
| CA_5-40 | 5, 40 |
| CA_5-40-40 | 5, 40 |
| CA_5-41 | 5, 41 |
| CA_5-46 | 5, 46 |
| CA_5-48 | 5, 48 |
| CA_5-66 | 5, 66 |
| CA_5-5-66 | 5, 66 |
| CA_5-66-66 | 5, 66 |
| CA_5-5-66-66 | 5, 66 |
| CA_7-8 | 7, 8 |
| CA_7-7-8 | 7, 8 |
| CA_7-12 | 7, 12 |
| CA_7-20 | 7, 20 |
| CA_7-22 | 7, 22 |
| CA_7-26 | 7, 26 |
| CA_7-7-26 | 7, 26 |
| CA_7-28 | 7, 28 |
| CA_7-30 | 7, 30 |
| CA_7-32 | 7, 32 |
| CA_7-40 | 7, 40 |
| CA_7-42 | 7, 42 |
| CA_7-42-42 | 7, 42 |
| CA_7-46 | 7, 46 |
| CA_7-7-46 | 7, 46 |
| CA_7-7-66 | 7, 66 |
| CA_7-66 | 7, 66 |
| CA_7-66-66 | 7, 66 |
| CA_7-7-66-66 | 7, 66 |
| CA_8-11 | 8, 11 |
| CA_8-20 | 8, 20 |
| CA_8-27 | 8, 27 |
| CA_8-28 | 8, 28 |
| CA_8-32 | 8, 32 |
| CA_8-38 | 8, 38 |
| CA_8-39 | 8, 39 |
| CA_8-40 | 8, 40 |
| CA_8-41 | 8, 41 |
| CA_8-42 | 8, 42 |
| CA_8-46 | 8, 46 |

| | |
|---|---|
| CA_11-18 | 11, 18 |
| CA_11-26 | 11, 26 |
| CA_11-28 | 11, 28 |
| CA_11-41 | 11, 41 |
| CA_11-42 | 11, 42 |
| CA_11-46 | 11, 46 |
| CA_12-25 | 12, 25 |
| CA_12-30 | 12, 30 |
| CA_12-46 | 12, 46 |
| CA_12-48 | 12, 48 |
| CA_12-66 | 12, 66 |
| CA_12-66-66 | 12, 66 |
| CA_13-46 | 13, 46 |
| CA_13-48 | 13, 48 |
| CA_13-48-48 | 13, 48 |
| CA_13-66 | 13, 66 |
| CA_13-66-66 | 13, 66 |
| CA_14-30 | 14, 30 |
| CA_14-66 | 14, 66 |
| CA_14-66-66 | 14, 66 |
| CA_14-66-66-66 | 14, 66 |
| CA_18-28[1] | 18, 28 |
| CA_19-21 | 19, 21 |
| CA_19-28[2] | 19, 28 |
| CA_19-42 | 19, 42 |
| CA_19-46 | 19, 46 |
| CA_20-28[1] | 20, 28 |
| CA_20-31 | 20, 31 |
| CA_20-32 | 20, 32 |
| CA_20-38 | 20, 38 |
| CA_20-40 | 20, 40 |
| CA_20-40-40 | 20, 40 |
| CA_20-42 | 20, 42 |
| CA_20-42-42 | 20, 42 |
| CA_20-43 | 20, 43 |
| CA_20-67 | 20, 67 |
| CA_20-75 | 20, 75 |
| CA_20-76 | 20, 76 |
| CA_21-28 | 21, 28 |
| CA_21-42 | 21, 42 |
| CA_21-46 | 21, 46 |
| CA_23-29 | 23, 29 |
| CA_25-26 | 25, 26 |
| CA_25-25-26 | 25, 26 |
| CA_25-41 | 25, 41 |
| CA_25-25-41 | 25, 41 |
| CA_25-46 | 25, 46 |
| CA_26-41 | 26, 41 |
| CA_26-46 | 26, 46 |
| CA_26-48 | 26,48 |
| CA_26-48-48 | 26,48 |
| CA_28-38 | 28,38 |
| CA_28-40 | 28, 40 |
| CA_28-41 | 28, 41 |
| CA_28-42 | 28, 42 |
| CA_28-46 | 28, 46 |
| CA_29-30 | 29, 30 |

| | |
|---|---|
| CA_29-66 | 29, 66 |
| CA_29-66-66 | 29, 66 |
| CA_29-70 | 29, 70 |
| CA_30-66 | 30, 66 |
| CA_30-66-66 | 30, 66 |
| CA_32-42 | 32, 42 |
| CA_32-43 | 32, 43 |
| CA_34-39 | 34, 39 |
| CA_34-41 | 34, 41 |
| CA_38-40 | 38, 40 |
| CA_38-40-40 | 38, 40 |
| CA_39-40 | 39, 40 |
| CA_39-41 | 39, 41 |
| CA_39-42 | 39, 42 |
| CA_39-46 | 39, 46 |
| CA_40-41 | 40, 41 |
| CA_40-42 | 40, 42 |
| CA_40-43 | 40, 43 |
| CA_40-46 | 40, 46 |
| CA_41-42 | 41, 42 |
| CA_41-46 | 41, 46 |
| CA_41-48 | 41, 48 |
| CA_42-43 | 42,43 |
| CA_42-46 | 42, 46 |
| CA_46-48 | 46, 48 |
| CA_46-48-48 | 46, 48 |
| CA_46-66 | 46, 66 |
| CA_46-46-66 | 46, 66 |
| CA_46-66-66 | 46, 66 |
| CA_46-70 | 46, 70 |
| CA_46-71 | 46, 71 |
| CA_48-66 | 48, 66 |
| CA_48-66-66 | 48, 66 |
| CA_48-66-66-66 | 48, 66 |
| CA_48-48-66 | 48, 66 |
| CA_48-71 | 48, 71 |
| CA_48-48-71 | 48, 71 |
| CA_66-70 | 66,70 |
| CA_66-66-70 | 66,70 |
| CA_66-71 | 66, 71 |
| CA_66-66-71 | 66, 71 |
| CA_70-71 | 70, 71 |
| NOTE 1: The frequency range in band 28 is restricted for this CA band combination to 703-733 MHz for the UL and 758-788 MHz for the DL<br>NOTE 2: The frequency range in band 28 is restricted for this CA band combination to 718-748 MHz for the UL and 773-803 MHz for the DL | |

**Table 5.2A-2a: Inter-band CA operating bands (three bands)**

| E-UTRA CA Band | E-UTRA Band (Table 5.2-1) |
|---|---|
| CA_1-3-5 | 1, 3, 5 |
| CA_1-1-3-5 | 1, 3, 5 |
| CA_1-1-3-7 | 1, 3, 7 |
| CA_1-1-3-28 | 1, 3, 28 |
| CA_1-3-7 | 1, 3, 7 |
| CA_1-3-3-7 | 1, 3, 7 |
| CA_1-3-3-7-7 | 1, 3, 7 |
| CA_1-3-7-7 | 1, 3, 7 |
| CA_1-3-8 | 1, 3, 8 |
| CA_1-3-3-8 | 1, 3, 8 |
| CA_1-3-3-43 | 1, 3, 43 |
| CA_1-3-11 | 1, 3, 11 |
| CA_1-3-18 | 1, 3, 18 |
| CA_1-3-19 | 1, 3, 19 |
| CA_1-3-3-19 | 1, 3, 19 |
| CA_1-3-20 | 1, 3, 20 |
| CA_1-3-3-20 | 1, 3, 20 |
| CA_1-3-21 | 1, 3, 21 |
| CA_1-3-3-21 | 1, 3, 21 |
| CA_1-3-26 | 1, 3, 26 |
| CA_1-3-28 | 1, 3, 28 |
| CA_1-3-3-28 | 1, 3, 28 |
| CA_1-3-32 | 1, 3, 32 |
| CA_1-3-38 | 1, 3, 38 |
| CA_1-3-40 | 1, 3, 40 |
| CA_1-3-41 | 1, 3, 41 |
| CA_1-3-42 | 1, 3, 42 |
| CA_1-3-3-42 | 1, 3, 42 |
| CA_1-3-43 | 1, 3, 43 |
| CA_1-5-7 | 1, 5, 7 |
| CA_1-5-7-7 | 1, 5, 7 |
| CA_1-5-40 | 1, 5, 40 |
| CA_1-5-41 | 1, 5, 41 |
| CA_1-5-46 | 1, 5, 46 |
| CA_1-7-8 | 1, 7, 8 |
| CA_1-7-7-8 | 1, 7, 8 |
| CA_1-7-20 | 1, 7, 20 |
| CA_1-7-26 | 1, 7, 26 |
| CA_1-7-7-26 | 1, 7, 26 |
| CA_1-7-28 | 1, 7, 28 |
| CA_1-7-32 | 1, 7, 32 |
| CA_1-7-40 | 1, 7, 40 |
| CA_1-7-42 | 1, 7, 42 |
| CA_1-7-46 | 1, 7, 46 |
| CA_1-8-11 | 1, 8, 11 |
| CA_1-8-20 | 1, 8, 20 |
| CA_1-8-28 | 1, 8, 28 |
| CA_1-8-38 | 1, 8, 38 |
| CA_1-8-40 | 1, 8, 40 |
| CA_1-11-18 | 1, 11, 18 |
| CA_1-11-28 | 1, 11, 28 |
| CA_1-18-28[1] | 1, 18, 28 |
| CA_1-19-21 | 1, 19, 21 |
| CA_1-19-28[2] | 1, 19, 28 |
| CA_1-19-42 | 1, 19, 42 |
| CA_1-20-28[1] | 1, 20, 28 |
| CA_1-20-32 | 1, 20, 32 |
| CA_1-20-42 | 1, 20, 42 |
| CA_1-20-43 | 1, 20, 43 |
| CA_1-21-28 | 1, 21, 28 |
| CA_1-21-42 | 1, 21, 42 |
| CA_1-28-42 | 1, 28, 42 |
| CA_1-32-42 | 1, 32, 42 |

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|---|---|
| CA_1-32-43 | 1, 32, 43 |
| CA_1-41-42 | 1, 41, 42 |
| CA_1-42-42 | 1, 42 |
| CA_1-42-43 | 1, 42, 43 |
| CA_2-4-5 | 2, 4, 5 |
| CA_2-2-4-5 | 2, 4, 5 |
| CA_2-4-4-5 | 2, 4, 5 |
| CA_2-4-12-12 | 2, 4, 12 |
| CA_2-5-12-12 | 2, 5, 12 |
| CA_2-2-5-30 | 2, 5, 30 |
| CA_2-5-46 | 2, 5, 46 |
| CA_2-2-5-66 | 2, 5, 66 |
| CA_2-2-7-12 | 2, 7, 12 |
| CA_2-2-7-66 | 2, 7, 66 |
| CA_2-7-66-66 | 2, 7, 66 |
| CA_2-2-12-30 | 2, 12, 30 |
| CA_2-2-12-66 | 2, 12, 66 |
| CA_2-2-12-66-66 | 2, 12, 66 |
| CA_2-2-13-66 | 2, 13, 66 |
| CA_2-2-14-66-66 | 2, 14, 66 |
| CA_2-2-30-66 | 2, 30, 66 |
| CA_2-4-7 | 2, 4, 7 |
| CA_2-4-7-7 | 2, 4, 7 |
| CA_2-4-12 | 2, 4, 12 |
| CA_2-2-4-12 | 2, 4, 12 |
| CA_2-2-5-66-66 | 2, 5, 66 |
| CA_2-4-4-12 | 2, 4, 12 |
| CA_2-4-13 | 2, 4, 13 |
| CA_2-4-28 | 2, 4, 28 |
| CA_2-4-29 | 2, 4, 29 |
| CA_2-4-30 | 2, 4, 30 |
| CA_2-4-71 | 2, 4, 71 |
| CA_2-2-4-71 | 2, 4, 71 |
| CA_2-5-7 | 2, 5, 7 |
| CA_2-5-12 | 2, 5, 12 |
| CA_2-2-5-12 | 2, 5, 12 |
| CA_2-5-13 | 2, 5, 13 |
| CA_2-5-28 | 2, 5, 28 |
| CA_2-5-29 | 2, 5, 29 |
| CA_2-5-30 | 2, 5, 30 |
| CA_2-5-46 | 2, 5, 46 |
| CA_2-5-66 | 2, 5, 66 |
| CA_2-5-66-66 | 2, 5, 66 |
| CA_2-7-12 | 2, 7, 12 |
| CA_2-7-28 | 2, 7, 28 |
| CA_2-7-30 | 2, 7, 30 |
| CA_2-7-66 | 2, 7, 66 |
| CA_2-7-7-66 | 2, 7, 66 |
| CA_2-12-30 | 2, 12, 30 |
| CA_2-12-66 | 2, 12, 66 |
| CA_2-12-66-66 | 2, 12, 66 |
| CA_2-13-46 | 2, 13, 46 |
| CA_2-13-48 | 2, 13, 48 |
| CA_2-13-48-48 | 2, 13, 48 |
| CA_2-13-66 | 2, 13, 66 |
| CA_2-13-66-66 | 2, 13, 66 |
| CA_2-14-30 | 2, 14, 30 |
| CA_2-2-14-30 | 2, 14, 30 |
| CA_2-14-66 | 2, 14, 66 |
| CA_2-2-14-66 | 2, 14, 66 |
| CA_2-14-66-66 | 2, 14, 66 |
| CA_2-14-66-66-66 | 2, 14, 66 |
| CA_2-2-29-30 | 2, 29, 30 |
| CA_2-29-30 | 2, 29, 30 |
| CA_2-29-66 | 2, 29, 66 |

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|---|---|
| CA_2-30-66 | 2, 30, 66 |
| CA_2-30-66-66 | 2, 30, 66 |
| CA_2-46-48 | 2, 46, 48 |
| CA_2-46-66 | 2, 46, 66 |
| CA_2-46-46-66 | 2, 46, 66 |
| CA_2-48-66 | 2, 48, 66 |
| CA_2-48-48-66 | 2, 48, 66 |
| CA_2-66-71 | 2, 66, 71 |
| CA_2-2-66-71 | 2, 66, 71 |
| CA_2-66-66-71 | 2, 66, 71 |
| CA_3-5-7 | 3, 5, 7 |
| CA_3-5-7-7 | 3, 5, 7 |
| CA_3-5-40 | 3, 5, 40 |
| CA_3-5-40-40 | 3, 5, 40 |
| CA_3-5-41 | 3, 5, 41 |
| CA_3-3-7-8 | 3, 7, 8 |
| CA_3-3-7-7-8 | 3, 7, 8 |
| CA_3-7-7-8 | 3, 7, 8 |
| CA_3-7-8 | 3, 7, 8 |
| CA_3-7-20 | 3, 7, 20 |
| CA_3-3-7-20 | 3, 7, 20 |
| CA_3-7-26 | 3, 7, 26 |
| CA_3-7-7-26 | 3, 7, 26 |
| CA_3-7-28 | 3, 7, 28 |
| CA_3-3-7-28 | 3, 7, 28 |
| CA_3-7-32 | 3, 7, 32 |
| CA_3-7-38 | 3, 7, 38 |
| CA_3-7-40 | 3, 7, 40 |
| CA_3-7-42 | 3, 7, 42 |
| CA_3-7-46 | 3, 7, 46 |
| CA_3-8-11 | 3, 8, 11 |
| CA_3-8-20 | 3, 8, 20 |
| CA_3-8-28 | 3, 8, 28 |
| CA_3-8-32 | 3, 8, 32 |
| CA_3-8-38 | 3, 8, 38 |
| CA_3-8-40 | 3, 8, 40 |
| CA_3-11-18 | 3, 11,18 |
| CA_3-11-26 | 3, 11, 26 |
| CA_3-11-28 | 3, 11, 28 |
| CA_3-19-21 | 3, 19, 21 |
| CA_3-3-19-21 | 3, 19, 21 |
| CA_3-19-42 | 3, 19, 42 |
| CA_3-20-28[1] | 3, 20, 28 |
| CA_3-3-20-28[1] | 3, 20, 28 |
| CA_3-20-32 | 3, 20, 32 |
| CA_3-20-42 | 3, 20, 42 |
| CA_3-20-43 | 3, 20, 43 |
| CA_3-21-28 | 3, 21, 28 |
| CA_3-21-42 | 3, 21, 42 |
| CA_3-28-38 | 3, 28, 38 |
| CA_3-28-40 | 3, 28, 40 |
| CA_3-28-41 | 3, 28, 41 |
| CA_3-28-42 | 3, 28, 42 |
| CA_3-32-42 | 3, 32, 42 |
| CA_3-32-43 | 3, 32, 43 |
| CA_3-41-42 | 3, 41, 42 |
| CA_3-42-43 | 3, 42, 43 |
| CA_4-5-12 | 4, 5, 12 |
| CA_4-4-5-12 | 4, 5, 12 |
| CA_4-5-12-12 | 4, 5, 12 |
| CA_4-5-13 | 4, 5, 13 |
| CA_4-5-29 | 4, 5, 29 |
| CA_4-5-30 | 4, 5, 30 |
| CA_4-4-5-30 | 4, 5, 30 |
| CA_4-7-12 | 4, 7, 12 |

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|---|---|
| CA_4-7-28 | 4, 7, 28 |
| CA_4-12-30 | 4, 12, 30 |
| CA_4-4-12-30 | 4, 12, 30 |
| CA_4-29-30 | 4, 29, 30 |
| CA_4-4-29-30 | 4, 29, 30 |
| CA_5-7-28 | 5, 7, 28 |
| CA_5-7-46 | 5, 7, 46 |
| CA_5-12-46 | 5, 12, 46 |
| CA_5-12-48 | 5, 12, 48 |
| CA_5-12-66 | 5, 12, 66 |
| CA_5-30-66 | 5, 30, 66 |
| CA_5-30-66-66 | 5, 30, 66 |
| CA_5-40-41 | 5, 40, 41 |
| CA_5-46-66 | 5, 46, 66 |
| CA_7-8-20 | 7, 8, 20 |
| CA_7-8-38 | 7, 8, 38 |
| CA_7-8-40 | 7, 8, 40 |
| CA_7-12-66 | 7, 12, 66 |
| CA_7-20-28[1] | 7, 20, 28 |
| CA_7-20-32 | 7, 20, 32 |
| CA_7-20-38 | 7, 20, 38 |
| CA_7-20-42 | 7, 20, 42 |
| CA_7-28-38 | 7, 28, 38 |
| CA_7-30-66 | 7, 30, 66 |
| CA_7-46-66 | 7, 46, 66 |
| CA_8-11-28 | 8, 11, 28 |
| CA_8-20-28[1] | 8, 20, 28 |
| CA_8-28-41 | 8, 28, 41 |
| CA_8-39-41 | 8, 39, 41 |
| CA_12-30-66 | 12, 30, 66 |
| CA_12-30-66-66 | 12, 30, 66 |
| CA_13-46-66 | 13, 46, 66 |
| CA_13-48-66 | 13, 48, 66 |
| CA_13-48-48-66 | 13, 48, 66 |
| CA_14-30-66 | 14, 30, 66 |
| CA_14-30-66-66 | 14, 30, 66 |
| CA_19-21-42 | 19, 21, 42 |
| CA_20-32-42 | 20, 32, 42 |
| CA_20-32-43 | 20, 32, 43 |
| CA_20-38-40 | 20, 38, 40 |
| CA_20-38-40-40 | 20, 38, 40 |
| CA_21-28-42 | 21, 28, 42 |
| CA_25-26-41 | 25, 26, 41 |
| CA_25-25-26-41 | 25, 26, 41 |
| CA_28-41-42 | 28, 41, 42 |
| CA_29-30-66 | 29, 30, 66 |
| CA_29-30-66-66 | 29, 30, 66 |
| CA_29-46-66 | 29, 46, 66 |
| CA_29-66-70 | 29, 66, 70 |
| CA_29-66-66-70 | 29, 66, 70 |
| CA_32-42-43 | 32, 42, 43 |
| CA_46-48-66 | 46, 48, 66 |
| CA_46-48-71 | 46, 48, 71 |
| CA_46-48-48-71 | 46, 48, 71 |
| CA_66-70-71 | 66, 70, 71 |
| NOTE 1: The frequency range in band 28 is restricted for this CA band combination to 703-733 MHz for the UL and 758-788 MHz for the DL<br>NOTE 2: The frequency range in band 28 is restricted for this CA band combination to 718-748 MHz for the UL and 773-803 MHz for the DL | |

**Table 5.2A-2b: Inter-band CA operating bands (four bands)**

| E-UTRA CA Band | E-UTRA Band (Table 5.2-1) |
|---|---|
| CA_1-3-5-7 | 1, 3, 5, 7 |
| CA_1-3-5-7-7 | 1, 3, 5, 7 |
| CA_1-3-5-40 | 1, 3, 5, 40 |
| CA_1-3-5-41 | 1, 3, 5, 41 |
| CA_1-3-7-7-26 | 1, 3, 7, 26 |
| CA_1-3-7-8 | 1, 3, 7, 8 |
| CA_1-3-7-20 | 1, 3, 7, 20 |
| CA_1-3-7-26 | 1, 3, 7, 26 |
| CA_1-3-7-28 | 1, 3, 7, 28 |
| CA_1-3-7-32 | 1, 3, 7, 32 |
| CA_1-3-7-40 | 1, 3, 7, 40 |
| CA_1-3-7-42 | 1, 3, 7, 42 |
| CA_1-3-8-11 | 1, 3, 8, 11 |
| CA_1-3-8-20 | 1, 3, 8, 20 |
| CA_1-3-8-28 | 1, 3, 8, 28 |
| CA_1-3-8-38 | 1, 3, 8, 38 |
| CA_1-3-11-28 | 1, 3, 11, 28 |
| CA_1-3-8-40 | 1, 3, 8, 40 |
| CA_1-3-19-21 | 1, 3,19, 21 |
| CA_1-3-19-42 | 1, 3,19, 42 |
| CA_1-3-20-28[1] | 1, 3, 20, 28 |
| CA_1-3-20-32 | 1, 3, 20, 32 |
| CA_1-3-20-42 | 1, 3, 20, 42 |
| CA_1-3-20-43 | 1, 3, 20, 43 |
| CA_1-3-21-28 | 1, 3, 21, 28 |
| CA_1-3-21-42 | 1, 3, 21, 42 |
| CA_1-3-28-42 | 1, 3, 28, 42 |
| CA_1-3-32-42 | 1, 3, 32, 42 |
| CA_1-3-32-43 | 1, 3, 32, 43 |
| CA_1-3-42-43 | 1, 3, 42, 43 |
| CA_1-5-7-46 | 1, 5, 7, 46 |
| CA_1-7-8-20 | 1, 7, 8, 20 |
| CA_1-7-8-40 | 1, 7, 8, 40 |
| CA_1-7-20-28[1] | 1, 7, 20, 28 |
| CA_1-7-20-32 | 1, 7, 20, 32 |
| CA_1-7-20-42 | 1, 7, 20, 42 |
| CA_1-8-11-28 | 1, 8, 11, 28 |
| CA_1-8-20-28 | 1, 8, 20, 28 |
| CA_1-19-21-42 | 1, 19, 21, 42 |
| CA_1-20-32-42 | 1, 20, 32, 42 |
| CA_1-20-32-43 | 1, 20, 32, 43 |
| CA_1-21-28-42 | 1, 21, 28, 42 |
| CA_1-32-42-43 | 1, 32, 42, 43 |
| CA_2-2-5-12-66 | 2, 5, 12, 66 |
| CA_2-2-5-30-66 | 2, 5, 30, 66 |
| CA_2-2-7-12-66 | 2. 7, 12, 66 |
| CA_2-2-12-30-66 | 2, 12, 30, 66 |
| CA_2-2-14-30-66 | 2, 14, 30, 66 |
| CA_2-4-5-12 | 2, 4, 5, 12 |
| CA_2-4-5-29 | 2, 4, 5, 29 |
| CA_2-4-5-30 | 2, 4, 5, 30 |
| CA_2-4-7-12 | 2, 4, 7, 12 |
| CA_2-4-12-30 | 2, 4, 12, 30 |
| CA_2-4-29-30 | 2, 4, 29, 30 |
| CA_2-5-7-28 | 2, 5, 7, 28 |
| CA_2-5-12-66 | 2, 5, 12, 66 |
| CA_2-5-30-66 | 2, 5, 30, 66 |
| CA_2-5-30-66-66 | 2, 5, 30, 66 |
| CA_2-7-12-66 | 2, 7, 12, 66 |

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|---|---|
| CA_2-7-46-66 | 2, 7, 46, 66 |
| CA_2-12-30-66 | 2, 12, 30, 66 |
| CA_2-12-30-66-66 | 2, 12, 30, 66 |
| CA_2-13-48-66 | 2, 13, 48, 66 |
| CA_2-14-30-66 | 2, 14, 30, 66 |
| CA_2-14-30-66-66 | 2, 14, 30, 66 |
| CA_2-29-30-66 | 2, 29, 30, 66 |
| CA_2-46-48-66 | 2, 46, 48, 66 |
| CA_3-7-8-20 | 3, 7, 8, 20 |
| CA_3-7-8-38 | 3, 7, 8, 38 |
| CA_3-7-8-40 | 3, 7, 8, 40 |
| CA_3-7-20-28[1] | 3, 7, 20, 28 |
| CA_3-7-20-32 | 3, 7, 20, 32 |
| CA_3-7-20-42 | 3, 7, 20, 42 |
| CA_3-7-28-38 | 3, 7, 28, 38 |
| CA_3-8-11-28 | 3, 8, 11, 28 |
| CA_3-8-20-28 | 3, 8, 20, 28 |
| CA_3-19-21-42 | 3, 19, 21, 42 |
| CA_3-20-32-42 | 3, 20, 32, 42 |
| CA_3-20-32-43 | 3, 20, 32. 43 |
| CA_3-21-28-42 | 3, 21, 28, 42 |
| CA_3-28-41-42 | 3, 28, 41, 42 |
| CA_3-32-42-43 | 3, 32, 42, 43 |
| NOTE 1: The frequency range in band 28 is restricted for this CA band combination to 703-733 MHz for the UL and 758-788 MHz for the DL | |

**Table 5.2A-2c: Inter-band CA operating bands (five bands)**

| E-UTRA CA Band | E-UTRA Band (Table 5.2-1) |
|---|---|
| CA_1-3-7-20-28[1] | 1, 3, 7, 20, 28 |
| CA_1-3-7-20-42 | 1, 3, 7, 20, 42 |
| CA_1-3-8-11-28 | 1, 3, 8, 11, 28 |
| NOTE 1: The frequency range in band 28 is restricted for this CA band combination to 703-733 MHz for the UL and 758-788 MHz for the DL | |

**Table 5.2A-3: Intra-band non-contiguous CA operating bands (with two sub-blocks)**

| E-UTRA CA Band | E-UTRA Band (Table 5.2-1) |
|---|---|
| CA_1-1 | 1 |
| CA_2-2 | 2 |
| CA_3-3 | 3 |
| CA_4-4 | 4 |
| CA_5-5 | 5 |
| CA_7-7 | 7 |
| CA_12-12 | 12 |
| CA_23-23 | 23 |
| CA_25-25 | 25 |
| CA_40-40 | 40 |
| CA_41-41 | 41 |
| CA_42-42 | 42 |
| CA_43-43 | 43 |
| CA_48-48 | 48 |
| CA_66-66 | 66 |

**Table 5.2A-4: Intra-band non-contiguous CA operating bands (with three sub-blocks)**

| E-UTRA CA Band | E-UTRA Band (Table 5.2-1) |
|---|---|
| CA_25-25-25 | 25 |
| CA_41-41-41 | 41 |
| CA_48-48-48 | 48 |
| CA_66-66-66 | 66 |

**Table 5.2A-5: Intra-band non-contiguous CA operating bands (with four sub-blocks)**

| E-UTRA CA Band | E-UTRA Band (Table 5.2-1) |
|---|---|
| CA_48-48-48-48 | 48 |

# 5.2B Operating bands for UL-MIMO

E-UTRA UL-MIMO in Rel-10 is designed to operate in the operating bands defined in Table 5.2-1.

# 5.2C Operating bands for Dual Connectivity

E-UTRA dual connectivity is designed to operate in the operating bands defined in Table 5.2C-1.

**Table 5.2C-1: Inter-band dual connectivity operating bands (two bands)**

| E-UTRA DC Band | E-UTRA Band (Table 5.5) |
|---|---|
| DC_1-3 | 1, 3 |
| DC_1-5 | 1, 5 |
| DC_1-7 | 1, 7 |
| DC_1-8 | 1, 8 |
| DC_1-19 | 1, 19 |
| DC_1-21 | 1, 21 |
| DC_1-42 | 1, 42 |
| DC_2-4 | 2, 4 |
| DC_2-5 | 2, 5 |
| DC_2-7 | 2, 7 |
| DC_2-12 | 2, 12 |
| DC_2-13 | 2, 13 |
| DC_3-5 | 3, 5 |
| DC_3-7 | 3, 7 |
| DC_3-8 | 3, 8 |
| DC_3-19 | 3, 19 |
| DC_3-20 | 3, 20 |
| DC_3-21 | 3, 21 |
| DC_3-26 | 3, 26 |
| DC_3-28 | 3, 28 |
| DC_3-42 | 3, 42 |
| DC_4-5 | 4, 5 |
| DC_4-7 | 4, 7 |
| DC_4-12 | 4, 12 |
| DC_4-13 | 4, 13 |
| DC_4-17 | 4, 17 |
| DC_5-7 | 5, 7 |
| DC_5-12 | 5,12 |
| DC_5-17 | 5,17 |
| DC_7-8 | 7, 8 |
| DC_7-20 | 7, 20 |
| DC_7-28 | 7, 28 |
| DC_8-39 | 8, 39 |
| DC_8-41 | 8, 41 |
| DC_19-21 | 19, 21 |
| DC_19-42 | 19, 42 |
| DC_21-42 | 21, 42 |
| DC_21-28 | 21, 28 |
| DC_28-42 | 28, 42 |
| DC_39-41 | 39, 41 |
| DC_41-42 | 41, 42 |

## 5.2D Operating bands for ProSe

E-UTRA ProSe is designed to operate in the operating bands defined in Table 5.2D-1.

**Table 5.2D-1: E-UTRA ProSe operating band**

| E-UTRA ProSe Band | E-UTRA Operating Band | ProSe UE transmit | ProSe UE receive | ProSe Duplex Mode | ProSe Direct | |
|---|---|---|---|---|---|---|
| | | $F_{UL_low} – F_{UL_high}$ | $F_{DL_low} – F_{DL_high}$ | | Disc. | Comm. |
| 2 | 2 | 1850 MHz – 1910 MHz | 1850 MHz – 1910 MHz | HD | Yes | |
| 3 | 3 | 1710 MHz – 1785 MHz | 1710 MHz – 1785 MHz | HD | Yes | Yes |
| 4 | 4 | 1710 MHz – 1755 MHz | 1710 MHz – 1755 MHz | HD | Yes | |
| 7 | 7 | 2500 MHz – 2570 MHz | 2500 MHz – 2570 MHz | HD | Yes | Yes |
| 14 | 14 | 788 MHz – 798 MHz | 788 MHz – 798 MHz | HD | Yes | Yes |
| 20 | 20 | 832 MHz – 862 MHz | 832 MHz – 862 MHz | HD | Yes | Yes |
| 26 | 26 | 814 MHz – 849 MHz | 814 MHz – 849 MHz | HD | Yes | Yes |
| 28 | 28 | 703 MHz – 748 MHz | 703 MHz – 748 MHz | HD | Yes | Yes |
| 31 | 31 | 452.5 MHz – 457.5 MHz | 452.5 MHz – 457.5 MHz | HD | Yes | Yes |
| 41 | 41 | 2496 MHz – 2690 MHz | 2496 MHz – 2690 MHz | HD | Yes | |
| 68 | 68 | 698 MHz – 728 MHz | 698 MHz – 728 MHz | HD | Yes | Yes |
| 72 | 72 | 451 MHz – 456 MHz | 451 MHz – 456 MHz | HD | Yes | Yes |

E-UTRA ProSe is designed to operate concurrent with E-UTRA uplink/downlink on the operating bands combinations listed in Table 5.2D-2.

**Table 5.2D-2 Inter-band E-UTRA ProSe / E-UTRA operating bands**

| E-UTRA ProSe Band [Note 1] | E-UTRA band / E-UTRA CA band [Note 2] |
|---|---|
| 2 | 4 |
| | CA_2-4[Note 3] |
| 28 | 1 |
| | CA_1-28[Note 3] |

NOTE 1: As specified in Table 5.2D-1
NOTE 2: As specified in Table 5.2-1 and Table 5.2A-2
NOTE 3: Applies when E-UTRA uplink is assigned to one E-UTRA band and ProSe operation is restricted to the uplink frequencies paired with either PCC or SCC.
NOTE 4: The concurrency for E-UTRA ProSe Direct Discovery with E-UTRA uplink/downlink applies after allowing for any transmission and/or reception gap requested by the UE.

# 5.2E Operating bands for UE category 0, UE category M1, M2 and UE category 1bis

UE category 0 is designed to operate in the E-UTRA operating bands 2, 3, 4, 5, 8, 13, and 20 in both half duplex FDD mode and full-duplex FDD mode and in bands 39 and 41 in TDD mode. The E-UTRA bands are defined in Table 5.2-1.

UE category M1 and M2 is designed to operate in the E-UTRA operating bands 1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 14, 18, 19, 20, 21, 25, 26, 27, 28, 31, 66, 71, 72, 73 and 74 in both half duplex FDD mode and full-duplex FDD mode, and in band 39, 40 and 41 in TDD mode. The E-UTRA bands are defined in Table 5.2-1.

UE category 1bis is designed to operate in the E-UTRA operating bands 1, 2, 3, 4, 5, 7, 8, 12, 13, 18, 20, 26, 28, and 66 in full duplex FDD mode and in bands 39 and 41 in TDD mode. The E-UTRA bands are defined in Table 5.2-1.

# 5.2F Operating bands for UE category NB1 and NB2

Category NB1 and NB2 are designed to operate in the E-UTRA operating bands 1, 2, 3, 4, 5, 8, 11, 12, 13, 14, 17, 18, 19, 20, 21, 25, 26, 28, 31, 66, 70, 71, 72, 73 and 74 which are defined in Table 5.2-1. Category NB1 and NB2 systems operate in HD-FDD duplex mode.

# 5.2G Operating bands for V2X Communication

E-UTRA V2X Communication is designed to operate in the the operating bands defined in Table 5.2G-1.

**Table 5.2G-1: V2X operating band**

| E-UTRA Operating Band | E-UTRA V2X Operating Band | V2X UE transmit | | V2X UE receive | | Duplex Mode | Interface |
|---|---|---|---|---|---|---|---|
| | | $F_{UL_low}$ – $F_{UL_high}$ | | $F_{DL_low}$ – $F_{DL_high}$ | | | |
| 47 | 47 | 5855 MHz | 5925 MHz | 5855 MHz | 5925 MHz | HD | PC5 |

E-UTRA V2X communication is designed to operate concurrent with E-UTRA uplink/downlink on the operating bands combinations listed in Table 5.2G-2.

**Table 5.2G-2: Inter-band con-current V2X operating bands**

| V2X con-current configuration | E-UTRA or V2X Operating Band | Interface | Uplink (UL) operating band BS receive UE transmit | Downlink (DL) operating band BS transmit UE receive | Duplex Mode |
|---|---|---|---|---|---|
| | | | $F_{UL_low}$ – $F_{UL_high}$ | $F_{DL_low}$ – $F_{DL_high}$ | |
| V2X_3-47 | 3 | Uu | 1710 MHz – 1785 MHz | 1805 MHz – 1880 MHz | FDD |
| | 47 | PC5 | 5855 MHz – 5925 MHz | 5855 MHz 5925 MHz | HD |
| V2X_7-47 | 7 | Uu | 2500 MHz – 2570 MHz | 2620 MHz – 2690 MHz | FDD |
| | 47 | PC5 | 5855 MHz – 5925 MHz | 5855 MHz 5925 MHz | HD |
| V2X_8-47 | 8 | Uu | 880 MHz – 915 MHz | 925 MHz – 960 MHz | FDD |
| | 47 | PC5 | 5855 MHz – 5925 MHz | 5855 MHz 5925 MHz | HD |
| V2X_39-47 | 39 | Uu | 1880 MHz – 1920 MHz | 1880 MHz – 1920 MHz | TDD |
| | 47 | PC5 | 5855 MHz – 5925 MHz | 5855 MHz 5925 MHz | HD |
| V2X_41-47 | 41 | Uu | 2496 MHz – 2690 MHz | 2496 MHz 2690 MHz | TDD |
| | 47 | PC5 | 5855 MHz – 5925 MHz | 5855 MHz 5925 MHz | HD |

E-UTRA V2X communication is also designed to operate for intra-band multi-carrier operation in the operating bands defined in Table 5.2G-3.

**Table 5.2G-3: V2X intra-band multi-carrier operation**

| V2X multi-carrier Band configuration | V2X operating Band | Interface |
|---|---|---|
| V2X_47 | 47 | PC5 |

# 5.3 TX–RX frequency separation

a) The default E-UTRA TX channel (carrier centre frequency) to RX channel (carrier centre frequency) separation is specified in Table 5.3-1 for the TX and RX channel bandwidths defined in Table 5.4.2.1-1

**Table 5.3-1: Default UE TX-RX frequency separation**

| E-UTRA Operating Band | TX - RX carrier centre frequency separation |
|---|---|
| 1 | 190 MHz |
| 2 | 80 MHz |
| 3 | 95 MHz |
| 4 | 400 MHz |
| 5 | 45 MHz |
| 6 | 45 MHz |
| 7 | 120 MHz |
| 8 | 45 MHz |
| 9 | 95 MHz |
| 10 | 400 MHz |
| 11 | 48 MHz |
| 12 | 30 MHz |
| 13 | -31 MHz |
| 14 | -30 MHz |
| 17 | 30 MHz |
| 18 | 45 MHz |
| 19 | 45 MHz |
| 20 | -41 MHz |
| 21 | 48 MHz |
| 22 | 100 MHz |
| 23 | 180 MHz |
| 24 | -101.5 MHz |
| 25 | 80 MHz |
| 26 | 45 MHz |
| 27 | 45 MHz |
| 28 | 55 MHz |
| 30 | 45 MHz |
| 31 | 10 MHz |
| 65 | 190 MHz |
| 66 | 400 MHz |
| 68 | 55 MHz |
| 70 | 295, 300MHz[1] |
| 71 | -46 MHz |
| 72 | 10 MHz |
| 73 | 10 MHz |
| 74 | 48 MHz |
| NOTE 1: Default TX-RX carrier centre frequency separation. | |

b) The use of other TX channel to RX channel carrier centre frequency separation is not precluded and is intended to form part of a later release.

# 5.3A TX–RX frequency separation for CA

For intra-band contiguous carrier aggregation, the same TX-RX frequency separation as specified in Table 5.3-1 is applied to PCC and SCC, respectively.

# 5.3F TX–RX frequency separation for category NB1 and NB2

For in-band and guard-band operation mode, the category NB1 and NB2 TX-RX frequency separation is flexible within the assigned channel bandwidth of E-UTRA carrier with the TX-RX frequency separation of the E-UTRA carriers as specified in Table 5.3-1. For stand-alone operation mode the default TX-RX frequency separation is the same as Table 5.3-1.

# 5.4 Channel arrangement

## 5.4.1 Channel spacing

The spacing between carriers will depend on the deployment scenario, the size of the frequency block available and the channel bandwidths. The nominal channel spacing between two adjacent E-UTRA carriers is defined as following:

$$\text{Nominal Channel spacing} = (BW_{Channel(1)} + BW_{Channel(2)})/2$$

where $BW_{Channel(1)}$ and $BW_{Channel(2)}$ are the channel bandwidths of the two respective E-UTRA carriers. The channel spacing can be adjusted to optimize performance in a particular deployment scenario.

## 5.4.1A Channel spacing for CA

For intra-band contiguous carrier aggregation with two or more component carriers, the nominal channel spacing between two adjacent E-UTRA component carriers is defined as the following unless stated otherwise:

$$\text{Nominal channel spacing} = \left\lfloor \frac{BW_{Channel(1)} + BW_{Channel(2)} - 0.1\left|BW_{Channel(1)} - BW_{Channel(2)}\right|}{0.6} \right\rfloor 0.3 \quad [\text{MHz}]$$

where $BW_{Channel(1)}$ and $BW_{Channel(2)}$ are the channel bandwidths of the two respective E-UTRA component carriers according to Table 5.4.2-1 with values in MHz. The channel spacing for intra-band contiguous carrier aggregation can be adjusted to any multiple of 300 kHz less than the nominal channel spacing to optimize performance in a particular deployment scenario.

For intra-band contiguous carrier aggregation with two or more component carriers in Band 46, the requirements apply for both 19.8 MHz and 20.1 MHz nominal carrier spacing between two 20 MHz component carriers, and for 15.0 MHz nominal carrier spacing between 10 MHz and 20 MHz component carriers.

For intra-band non-contiguous carrier aggregation the channel spacing between two or more E-UTRA component carriers in different sub-blocks shall be larger than the nominal channel spacing defined in this subclause.

## 5.4.1F Channel spacing for UE category NB1 and NB2

Nominal channel spacing for UE category NB1 and NB2 in stand-alone mode is 200 kHz. For in-band and guard-band cases the nominal channel spacing between two adjacent category NB1 and NB2 carriers is 180 kHz.

## 5.4.2 Channel bandwidth

Requirements in present document are specified for the channel bandwidths listed in Table 5.4.2-1

**Table 5.4.2-1: Transmission bandwidth configuration $N_{RB}$ in E-UTRA channel bandwidths**

| **Channel bandwidth $BW_{Channel}$ [MHz]** | **1.4** | **3** | **5** | **10** | **15** | **20** |
|---|---|---|---|---|---|---|
| Transmission bandwidth configuration $N_{RB}$ | 6 | 15 | 25 | 50 | 75 | 100 |

Figure 5.4.2-1 shows the relation between the Channel bandwidth ($BW_{Channel}$) and the Transmission bandwidth configuration ($N_{RB}$). The channel edges are defined as the lowest and highest frequencies of the carrier separated by the channel bandwidth, i.e. at $F_C$ +/- $BW_{Channel}$ /2.

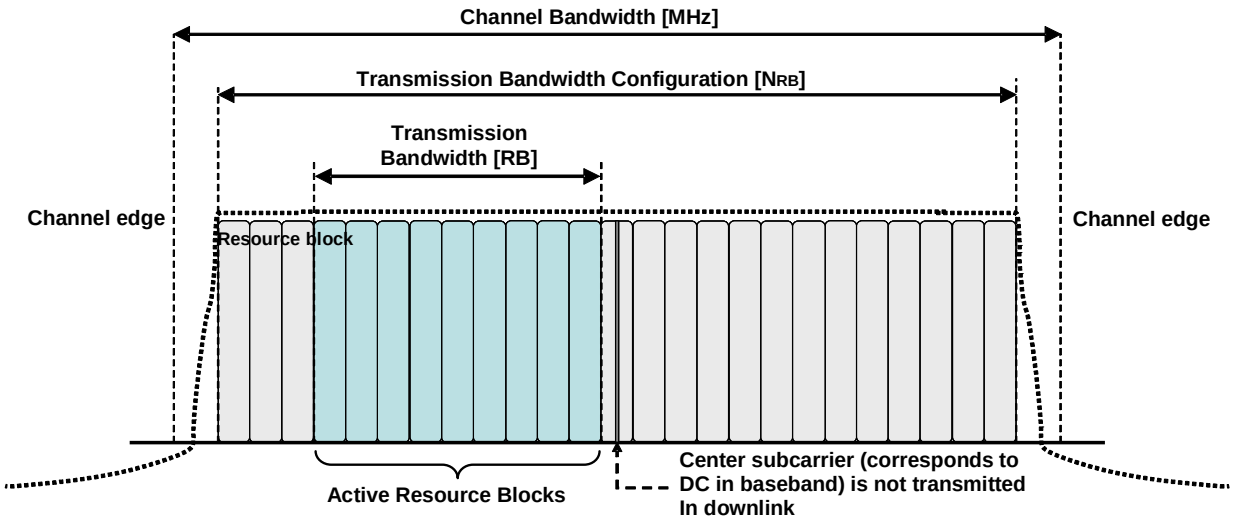



**Figure 5.4.2-1: Definition of channel bandwidth and transmission bandwidth configuration for one E-UTRA carrier**

### 5.4.2.1 Channel bandwidths per operating band

a) The requirements in this specification apply to the combination of channel bandwidths and operating bands shown in Table 5.4.2.1-1. The transmission bandwidth configuration in Table 5.4.2-1 shall be supported for each of the specified channel bandwidths. The same (symmetrical) channel bandwidth is specified for both the TX and RX path.

**Table 5.4.2.1-1: E-UTRA channel bandwidth**

| E-UTRA band / channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|
| **E-UTRA Band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| 1 | | | Yes | Yes | Yes | Yes |
| 2 | Yes | Yes | Yes | Yes | Yes[1] | Yes[1] |
| 3 | Yes | Yes | Yes | Yes | Yes[1] | Yes[1] |
| 4 | Yes | Yes | Yes | Yes | Yes | Yes |
| 5 | Yes | Yes | Yes | Yes[1] | | |
| 6 | | | Yes | Yes[1] | | |
| 7 | | | Yes | Yes | Yes**[3]** | Yes[1, 3] |
| 8 | Yes | Yes | Yes | Yes[1] | | |
| 9 | | | Yes | Yes | Yes[1] | Yes[1] |
| 10 | | | Yes | Yes | Yes | Yes |
| 11 | | | Yes | Yes[1] | | |
| 12 | Yes | Yes | Yes[1] | Yes[1] | | |
| 13 | | | Yes[1] | Yes[1] | | |
| 14 | | | Yes[1] | Yes[1] | | |
| ... | | | | | | |
| 17 | | | Yes[1] | Yes[1] | | |
| 18 | | | Yes | Yes[1] | Yes[1] | |
| 19 | | | Yes | Yes[1] | Yes[1] | |
| 20 | | | Yes | Yes[1] | Yes[1] | Yes[1] |
| 21 | | | Yes | Yes[1] | Yes[1] | |
| 22 | | | Yes | Yes | Yes[1] | Yes[1] |
| 23 | Yes | Yes | Yes | Yes | Yes[1] | Yes[1] |
| 24 | | | Yes | Yes | | |
| 25 | Yes | Yes | Yes | Yes | Yes[1] | Yes[1] |
| 26 | Yes | Yes | Yes | Yes[1] | Yes[1] | |
| 27 | Yes | Yes | Yes | Yes[1] | | |
| 28 | | Yes | Yes | Yes[1] | Yes[1] | Yes[1, 2] |
| 30 | | | Yes | Yes[1] | | |
| 31 | Yes | Yes[1] | Yes[1] | | | |
| ... | | | | | | |
| 33 | | | Yes | Yes | Yes | Yes |
| 34 | | | Yes | Yes | Yes | |
| 35 | Yes | Yes | Yes | Yes | Yes | Yes |
| 36 | Yes | Yes | Yes | Yes | Yes | Yes |
| 37 | | | Yes | Yes | Yes | Yes |
| 38 | | | Yes | Yes | Yes**[3]** | Yes**[3]** |
| 39 | | | Yes | Yes | Yes**[3]** | Yes**[3]** |
| 40 | | | Yes | Yes | Yes | Yes |
| 41 | | | Yes | Yes | Yes | Yes |
| 42 | | | Yes | Yes | Yes | Yes |
| 43 | | | Yes | Yes | Yes | Yes |
| 44 | | Yes | Yes | Yes | Yes | Yes |
| 45 | | | Yes | Yes | Yes | Yes |
| 46 | | | | Yes | | Yes |
| 47 | | | | Yes | | Yes |
| 48 | | | Yes | Yes | Yes | Yes |
| … | | | | | | |
| 64 | Reserved | | | | | |
| 65 | Yes | Yes | Yes | Yes | Yes | Yes |
| 66 | Yes | Yes | Yes | Yes | Yes | Yes |
| 68 | | | Yes | Yes | Yes[5] | |
| … | | | | | | |
| 70 | | | Yes | Yes | Yes | Yes[4] |
| 71 | | | Yes | Yes[1] | Yes[1] | Yes[1,6] |
| 72 | Yes | Yes[1] | Yes[1] | | | |
| 73 | Yes | Yes[1] | Yes[1] | | | |
| 74 | Yes | Yes | Yes | Yes[1] | Yes[1] | Yes[1] |

| | |
|---|---|
| NOTE 1: | refers to the bandwidth for which a relaxation of the specified UE receiver sensitivity requirement (subclause 7.3) is allowed. |
| NOTE 2: | For the 20 MHz bandwidth, the minimum requirements are specified for E-UTRA UL carrier frequencies confined to either 713-723 MHz or 728-738 MHz |
| NOTE 3: | refers to the bandwidth for which the uplink transmission bandwidth can be restricted by the network for some channel assignments in FDD/TDD co-existence scenarios in order to meet unwanted emissions requirements (subclause 6.6.3.2). |
| NOTE 4: | For the 20 MHz bandwidth, the minimum requirements are restricted to E-UTRA operation when carrier aggregation is configured. |
| NOTE 5: | For the 15 MHz bandwidth, the minimum requirements are specified for E-UTRA UL carrier frequencies confined to either 705.5 MHz or 710.5-720.5 MHz |
| NOTE 6: | For the 20MHz bandwidth, the minimum requirements are specified for E-UTRA UL carrier frequencies confined to either 673-678 MHz or 683-688MHz. |

b) The use of different (asymmetrical) channel bandwidth for the TX and RX is not precluded and is intended to form part of a later release.

## 5.4.2A Channel bandwidth for CA

For intra-band contiguous carrier aggregation *Aggregated Channel Bandwidth*, *Aggregated Transmission Bandwidth Configuration* and *Guard Bands* are defined as follows, see Figure 5.4.2A-1.

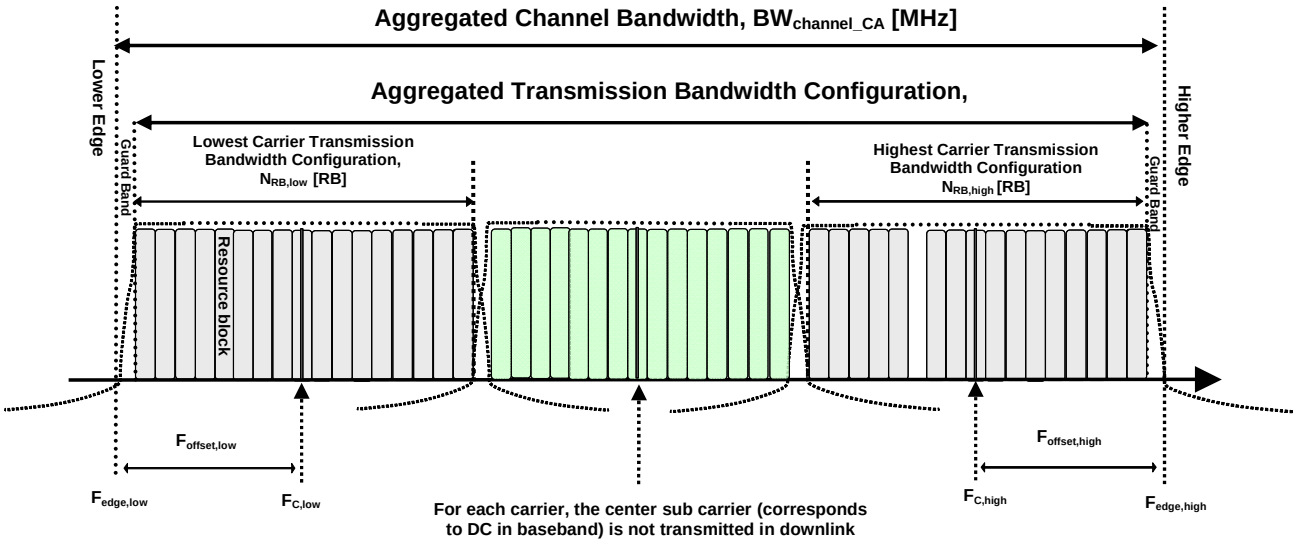



**Figure 5.4.2A-1: Definition of Aggregated channel bandwidth and aggregated channel bandwidth edges**

The *aggregated channel bandwidth*, $BW_{Channel_CA}$, is defined as

$$BW_{Channel_CA} = F_{edge,high} - F_{edge,low} \text{ [MHz]}.$$

The lower bandwidth edge $F_{edge,low}$ and the upper bandwidth edge $F_{edge,high}$ of the aggregated channel bandwidth are used as frequency reference points for transmitter and receiver requirements and are defined by

$$F_{edge,low} = F_{C,low} - F_{offset,low}$$

$$F_{edge,high} = F_{C,high} + F_{offset,high}$$

The lower and upper frequency offsets depend on the transmission bandwidth configurations of the lowest and highest assigned edge component carrier and are defined as

$$F_{offset,low} = (0.18N_{RB,low} + \Delta f_1)/2 + BW_{GB}\,[MHz]$$

$$F_{offset,high} = (0.18N_{RB,high} + \Delta f_1)/2 + BW_{GB}\,[MHz]$$

where $\Delta f_1 = \Delta f$ for the downlink with $\Delta f$ the subcarrier spacing and $\Delta f_1 = 0$ for the uplink, while $N_{RB,low}$ and $N_{RB,high}$ are the transmission bandwidth configurations according to Table 5.4.2-1 for the lowest and highest assigned component carrier, respectively. $BW_{GB}$ denotes the *Nominal Guard Band* and is defined in Table 5.4.2A-1, and the factor 0.18 is the PRB bandwidth in MHz.

NOTE: The values of $BW_{Channel_CA}$ for UE and BS are the same if the lowest and the highest component carriers are identical.

Aggregated Transmission Bandwidth Configuration is the number of the aggregated RBs within the fully allocated Aggregated Channel bandwidth and is defined per CA Bandwidth Class (Table 5.4.2A-1).

For intra-band non-contiguous carrier aggregation *Sub-block Bandwidth* and *Sub-block edges* are defined as follows, see Figure 5.4.2A-2.

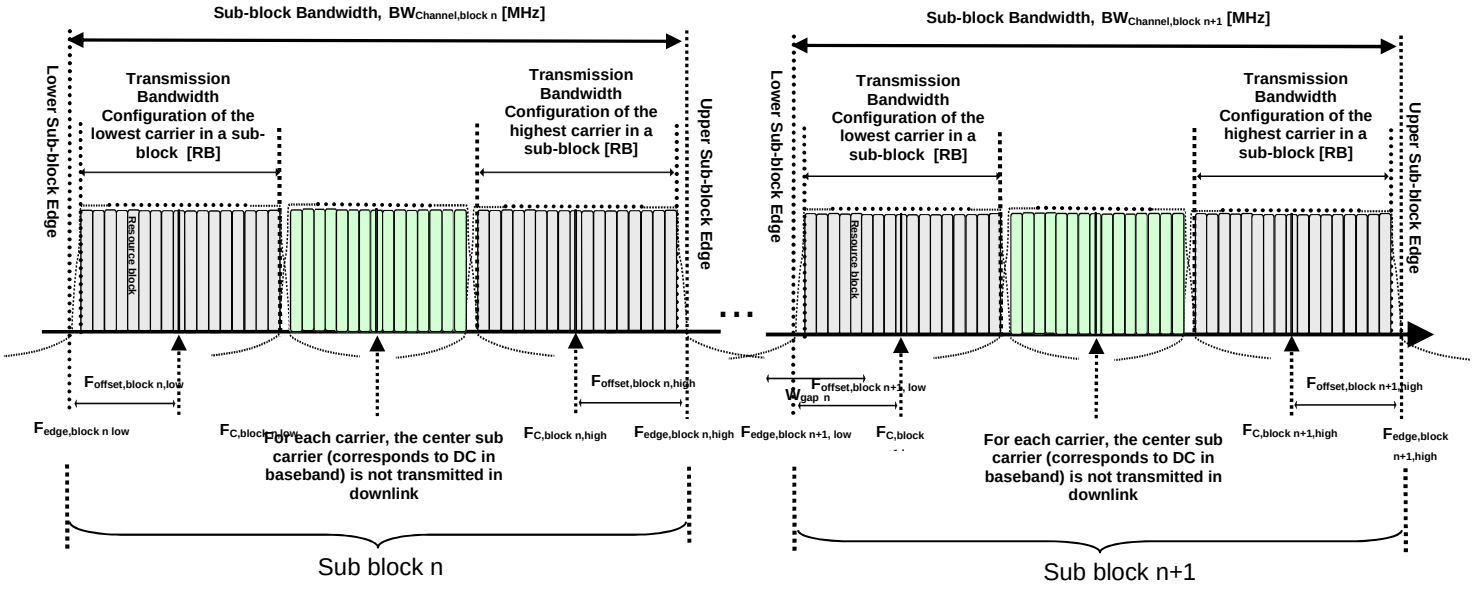



**Figure 5.4.2A-2: Non-contiguous intraband CA terms and definitions**

The lower sub-block edge of the Sub-block Bandwidth ($BW_{Channel,block}$) is defined as:

$$F_{edge,block,\,low} = F_{C,block,low} - F_{offset,block,\,low.}$$

The upper sub-block edge of the Sub-block Bandwidth is defined as:

$$F_{edge,block,high} = F_{C,block,high} + F_{offset,block,high}\,.$$

The Sub-block Bandwidth, $BW_{Channel,block}$, is defined as follows:

$$BWChannel,block = F_{edge,block,high} - F_{edge,block,low\,[MHz]}$$

The lower and upper frequency offsets $F_{offset,block,low}$ and $F_{offset,block,high}$ depend on the transmission bandwidth configurations of the lowest and highest assigned edge component carriers within a sub-block and are defined as:

$$F_{offset,block,low} = (0.18N_{RB,low} + \Delta f_1)/2 + BW_{GB}\,[MHz]$$

$$F_{offset,block,high} = (0.18N_{RB,high} + \Delta f_1)/2 + BW_{GB}\,[MHz]$$

where $\Delta f_1 = \Delta f$ for the downlink with $\Delta f$ the subcarrier spacing and $\Delta f_1 = 0$ for the uplink, while $N_{RB,low}$ and $N_{RB,high}$ are the transmission bandwidth configurations according to Table 5.4.2-1 for the lowest and highest assigned component carrier within a sub-block, respectively. $BW_{GB}$ denotes the *Nominal Guard Band* and is defined in Table 5.4.2A-1, and the factor 0.18 is the PRB bandwidth in MHz.

The sub-block gap size between two consecutive sub-blocks $W_{gap}$ is defined as:

$$W_{gap} = F_{edge,block\ n+1,low} - F_{edge,block\ n,high}\ [MHz]$$

**Table 5.4.2A-1: CA bandwidth classes and corresponding nominal guard bands**

| CA Bandwidth Class | Aggregated Transmission Bandwidth Configuration | Number of contiguous CC | Nominal Guard Band $BW_{GB}$ |
|---|---|---|---|
| A | $N_{RB,agg} \le 100$ | 1 | $a_1\ BW_{Channel(1)} - 0.5\Delta f_1$ (NOTE 2) |
| B | $25 < N_{RB,agg} \le 100$ | 2 | $0.05\ max(BW_{Channel(1)}, BW_{Channel(2)}) - 0.5\Delta f_1$ |
| C | $100 < N_{RB,agg} \le 200$ | 2 | $0.05\ max(BW_{Channel(1)}, BW_{Channel(2)}) - 0.5\Delta f_1$ |
| D | $200 < N_{RB,agg} \le 300$ | 3 | $0.05\ max(BW_{Channel(1)}, BW_{Channel(2)}, BW_{Channel(3)}) - 0.5\Delta f_1$ |
| E | $300 < N_{RB,agg} \le 400$ | 4 | $0.05\ max(BW_{Channel(1)}, BW_{Channel(2)}, BW_{Channel(3)}, BW_{Channel(4)}) - 0.5\Delta f_1$ |
| F | $400 < N_{RB,agg} \le 500$ | 5 | $0.05\ max(BW_{Channel(1)}, BW_{Channel(2)}, BW_{Channel(3)}, BW_{Channel(4)}, BW_{Channel(5)}) - 0.5\Delta f_1$ |
| I | $700 < N_{RB,agg} \le 800$ | 8 | NOTE 3 |

NOTE 1: $BW_{Channel(j)}$, j = 1, 2, 3, 4 is the channel bandwidth of an E-UTRA component carrier according to Table 5.4.2-1 and $\Delta f_1 = \Delta f$ for the downlink with $\Delta f$ the subcarrier spacing while $\Delta f_1 = 0$ for the uplink.
NOTE 2: $a_1 = 0.16/1.4$ for $BW_{Channel(1)} = 1.4$ MHz whereas $a_1 = 0.05$ for all other channel bandwidths.
NOTE 3: Applicable for later releases.

The channel spacing between centre frequencies of contiguously aggregated component carriers is defined in subclause 5.4.1A.

## 5.4.2A.1 Channel bandwidths per operating band for CA

The requirements for carrier aggregation in this specification are defined for carrier aggregation configurations with associated bandwidth combination sets. For inter-band carrier aggregation, a *carrier aggregation configuration* is a combination of operating bands, each supporting a carrier aggregation bandwidth class. For intra-band contiguous carrier aggregation, a carrier aggregation configuration is a single operating band supporting a carrier aggregation bandwidth class.

For each carrier aggregation configuration, requirements are specified for all bandwidth combinations contained in a *bandwidth combination set,* which is indicated per supported band combination in the UE radio access capability. A UE can indicate support of several bandwidth combination sets per band combination.

Requirements for intra-band contiguous carrier aggregation are defined for the carrier aggregation configurations and bandwidth combination sets specified in Table 5.4.2A.1-1. Requirements for inter-band carrier aggregation are defined for the carrier aggregation configurations and bandwidth combination sets specified in Table 5.4.2A.1-2, Table 5.4.2A.1-2a, Table 5.4.2A.1-2b and Table 5.4.2A.1-2c. Requirements for intra-band non-contiguous carrier aggregation are defined for the carrier aggregation configurations and bandwidth combination sets specified in Table 5.4.2A.1-3, Table 5.4.2A.1-4 and Table 5.4.2A.1-5.

The DL component carrier combinations for a given CA configuration shall be symmetrical in relation to channel centre unless stated otherwise in Table 5.4.2A.1-1, Table 5.4.2A.1-2, Table 5.4.2A.1-2a, Table 5.4.2A.1-2b and Table 5.4.2A.1-2c.

**Table 5.4.2A.1-1: E-UTRA CA configurations and bandwidth combination sets defined for intra-band contiguous CA**

| | | E-UTRA CA configuration / Bandwidth combination set | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Component carriers in order of increasing carrier frequency | | | | | | |
| E-UTRA CA configuration | Uplink CA configurations (NOTE 3) | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Maximum aggregated bandwidth [MHz] | Bandwidth combination set |
| CA_1C | CA_1C | 15 | 15 | | | | 40 | 0 |
| | | 20 | 20 | | | | | |
| | | 5, 10, 15 | 20 | | | | 40 | 1 |
| | | 20 | 5, 10, 15, 20 | | | | | |
| CA_2C | | 5 | 20 | | | | 40 | 0 |
| | | 10 | 15, 20 | | | | | |
| | | 15 | 10, 15, 20 | | | | | |
| | | 20 | 5, 10, 15, 20 | | | | | |
| CA_3B | | 5 | 3 | | | | 10 | 0 |
| | | 3, 5 | 5 | | | | | |
| CA_3C | CA_3C | 5, 10, 15 | 20 | | | | 40 | 0 |
| | | 20 | 5, 10, 15, 20 | | | | | |
| CA_5B | CA_5B | 5, 10 | 10 | | | | 20 | 0 |
| | | 10 | 5 | | | | | |
| | | 3 | 5 | | | | 8 | 1 |
| | | 5 | 3 | | | | | |
| CA_7B | | 15 | 5 | | | | 20 | 0 |
| CA_7C | CA_7C | 15 | 15 | | | | 40 | 0 |
| | | 20 | 20 | | | | | |
| | | 10 | 20 | | | | 40 | 1 |
| | | 15 | 15, 20 | | | | | |
| | | 20 | 10, 15, 20 | | | | | |
| | | 15 | 10, 15 | | | | 40 | 2 |
| | | 20 | 15, 20 | | | | | |
| CA_8B | CA_8B | 5,10 | 10 | | | | 20 | 0 |
| | | 10 | 5 | | | | | |
| CA_12B | - | 5 | 5, 10 | | | | 15 | 0 |
| CA_23B | - | 10 | 10 | | | | 20 | 0 |
| | | 5 | 15 | | | | | |
| CA_27B | - | 1.4, 3, 5 | 5 | | | | 13 | 0 |
| | | 1.4, 3 | 10 | | | | | |
| CA_28C | - | 5 | 20 | | | | 30 | 0 |
| | | 10 | 15, 20 | | | | | |
| | | 15 | 10, 15 | | | | | |
| | | 20 | 5, 10 | | | | | |
| CA_38C | CA_38C | 15 | 15 | | | | 40 | 0 |
| | | 20 | 20 | | | | | |
| CA_39C | CA_39C | 5,10,15 | 20 | | | | 35 | 0 |
| | | 20 | 5, 10, 15 | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_40C | CA_40C | 10 | 20 | | | | 40 | 0 |
| | | 15 | 15 | | | | | |
| | | 20 | 10, 20 | | | | | |
| | | 10, 15 | 20 | | | | 40 | 1 |
| | | 15 | 15 | | | | | |
| | | 20 | 10, 15, 20 | | | | | |
| CA_40D | CA_40C, 40D | 10, 15, 20 | 20 | 20 | | | 60 | 0 |
| | | 20 | 10, 15 | 20 | | | | |
| | | 20 | 20 | 10, 15 | | | | |
| | | 15, 20 | 15, 20 | 15, 20 | | | 60 | 1 |
| CA_40E | - | 15, 20 | 15, 20 | 15, 20 | 20 | | 80 | 0 |
| CA_40F | - | 15, 20 | 15, 20 | 15, 20 | 20 | 20 | 100 | 0 |
| CA_41F | CA_41C | 10, 15, 20 | 15, 20 | 20 | 20 | 20 | 100 | 0 |
| CA_41C | CA_41C | 10 | 20 | | | | 40 | 0 |
| | | 15 | 15, 20 | | | | | |
| | | 20 | 10, 15, 20 | | | | | |
| | | 5, 10 | 20 | | | | 40 | 1 |
| | | 15 | 15, 20 | | | | | |
| | | 20 | 5, 10, 15, 20 | | | | | |
| | | 10 | 15, 20 | | | | 40 | 2 |
| | | 15 | 10, 15, 20 | | | | | |
| | | 20 | 10, 15, 20 | | | | | |
| | | 10 | 20 | | | | 40 | 3 |
| | | 20 | 20 | | | | | |
| CA_41D | CA_41C | 10 | 20 | 15 | | | 60 | 0 |
| | | 10 | 15, 20 | 20 | | | | |
| | | 15 | 20 | 10, 15 | | | | |
| | | 15 | 10, 15, 20 | 20 | | | | |
| | | 20 | 15, 20 | 10 | | | | |
| | | 20 | 10, 15, 20 | 15, 20 | | | | |
| CA_41E | CA_41C | 15, 20 | 15, 20 | 15, 20 | 20 | | 80 | 0 |
| CA_42C | CA_42C | 5, 10, 15, 20 | 20 | | | | 40 | 0 |
| | | 20 | 5, 10, 15 | | | | | |
| | | 10, 15, 20 | 20 | | | | 40 | 1 |
| | | 20 | 10, 15 | | | | | |
| CA_42D | CA_42C | 5,10,15, 20 | 20 | 20 | | | 60 | 0 |
| | | 20 | 20 | 5,10,15 | | | | |
| | | 10, 15, 20 | 20 | 20 | | | 60 | 1 |
| | | 20 | 20 | 10, 15 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_42E | CA_42C | 5,10,15, 20 | 20 | 20 | 20 | | 80 | 0 |
| | | 20 | 20 | 20 | 5,10,15 | | | |
| CA_42F | CA_42C | 5, 10, 15, 20 | 20 | 20 | 20 | 20 | 100 | 0 |
| | | 20 | 20 | 20 | 20 | 5, 10, 15, 20 | | |
| CA_43C | - | 5 | 20 | | | | 40 | 0 |
| | | 10 | 15, 20 | | | | | |
| | | 15 | 10, 15, 20 | | | | | |
| | | 20 | 5, 10, 15, 20 | | | | | |
| CA_46C [4] | - | 20 | 20 | | | | 40 | 0 |
| | | 20 | 10, 20 | | | | 40 | 1 |
| | | 10, 20 | 20 | | | | | |
| CA_46D [4] | - | 20 | 20 | 20 | | | 60 | 0 |
| | | 20 | 20 | 10, 20 | | | 60 | 1 |
| | | 10, 20 | 20 | 20 | | | | |
| CA_46E [4] | - | 20 | 20 | 20 | 20 | | 80 | 0 |
| | | 20 | 20 | 20 | 10, 20 | | 80 | 1 |
| | | 10 | 20 | 20 | 20 | | | |
| CA_48C | - | 5, 10, 15, 20 | 20 | | | | 40 | 0 |
| | | 20 | 5, 10, 15 | | | | | |
| CA_48D | - | 5,10,15, 20 | 20 | 20 | | | 60 | 0 |
| | | 20 | 20 | 5,10,15 | | | | |
| CA_48E | - | 5,10,15, 20 | 20 | 20 | 20 | | 80 | 0 |
| | | 20 | 20 | 20 | 5,10,15 | | | |
| CA_48F | - | 5, 10, 15, 20 | 20 | 20 | 20 | 20 | 100 | 0 |
| | | 20 | 20 | 20 | 20 | 5, 10, 15, 20 | | |
| CA_66B | CA_66B | 5 | 5, 10, 15 | | | | 20 | 0 |
| | | 10 | 5, 10 | | | | | |
| | | 15 | 5 | | | | | |
| CA_66C | CA_66C | 5 | 20 | | | | 40 | 0 |
| | | 10 | 15, 20 | | | | | |
| | | 15 | 10, 15, 20 | | | | | |
| | | 20 | 5, 10, 15, 20 | | | | | |
| CA_66D | - | 5 | 20 | 20 | | | 60 | 0 |
| | | 20 | 5 | 20 | | | | |
| | | 20 | 20 | 5 | | | | |
| | | 10 | 20 | 15 | | | | |
| | | 15 | 20 | 10 | | | | |
| | | 10, 15, 20 | 15, 20 | 20 | | | | |
| | | 15, 20 | 10 | 20 | | | | |
| | | 15 | 15, 20 | 15 | | | | |
| | | 20 | 15, 20 | 10, 15 | | | | |
| | | 20 | 10 | 15 | | | | |
| CA_70C | - | 5 | 20 | | | | 25 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 10 | 15 | | | | | |
| | | 15 | 10 | | | | | |

NOTE 1: The CA configuration refers to an operating band and a CA bandwidth class specified in Table 5.4.2A-1 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.
NOTE 2: For the supported CC bandwidth combinations, the CC downlink and uplink bandwidths are equal.
NOTE 3: Uplink CA configurations are the configurations supported by the present release of specifications.
NOTE 4: Restricted to E-UTRA operation when inter-band carrier aggregation is configured. The downlink operating band is paired with the uplink operating band (external) of the carrier aggregation configuration that is supporting the configured Pcell.

**Table 5.4.2A.1-2: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA (two bands)**

| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **E-UTRA CA Configuration** | **Uplink CA configurations (NOTE 4)** | **E-UTRA Bands** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Maximum aggregated bandwidth [MHz]** | **Bandwidth combination set** |
| CA_1A-3A | CA_1A-3A | 1 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 40 | 1 |
| | | 3 | | Yes | Yes | Yes | Yes | Yes | | |
| CA_1A-1A-3A | - | 1 | See CA_1A-1A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-1A-7A | - | 1 | See CA_1A-1A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-3A | CA_1A-3A | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_1A-3C | CA_1A-3A, CA_3C | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-1A-3C | - | 1 | See CA_1A-1A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-5A | CA_1A-5A | 1 | | | | Yes | | | 20 | 0 |
| | | 5 | | | | Yes | | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 30 | 1 |
| | | 5 | | | Yes | Yes | | | | |
| CA_1A-1A-5A | - | 1 | See CA_1A-1A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| CA_1C-5A | - | 1 | See CA_1C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| CA_1A-7A | CA_1A-7A | 1 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 40 | 1 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-7A-7A | CA_1A-7A | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 3 in Table 5.4.2A.1-3 | | | | | | | |
| | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 1 |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | | |
| CA_1A-7C | CA_1A-7A, CA_7C | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | See CA_7C Bandwidth Combination Set 2 in Table 5.4.2A.1-1 | | | | | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 60 | 1 |
| | | 7 | See CA_7C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-8A | CA_1A-8A | 1 | | | Yes | Yes | Yes | Yes | 30 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 1 | | | Yes | Yes | | | 20 | 1 |
| | | 8 | | | Yes | Yes | | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 30 | 2 |
| | | 8 | | Yes | Yes | Yes | | | | |
| CA_1A-11A | CA_1A-11A | 1 | | | Yes | Yes | Yes | Yes | 30 | 0 |
| | | 11 | | | Yes | Yes | | | | |
| CA_1A-18A | CA_1A-18A | 1 | | | Yes | Yes | Yes | Yes | 35 | 0 |
| | | 18 | | | Yes | Yes | Yes | | | |
| | | 1 | | | Yes | Yes | | | 20 | 1 |
| | | 18 | | | Yes | Yes | | | | |
| CA_1A-19A | CA_1A-19A | 1 | | | Yes | Yes | Yes | Yes | 35 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 19 | | | Yes | Yes | Yes | | | |
| CA_1A-20A | CA_1A-20A | 1 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-21A | CA_1A-21A | 1 | | | Yes | Yes | Yes | Yes | 35 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| CA_1A-26A | CA_1A-26A | 1 | | | Yes | Yes | Yes | Yes | 35 | 0 |
| | | 26 | | | Yes | Yes | Yes | | | |
| | | 1 | | | Yes | Yes | | | 20 | 1 |
| | | 26 | | | Yes | Yes | | | | |
| CA_1A-28A | CA_1A-28A | 1 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| | | 1 | | | Yes | Yes | | | 20 | 1 |
| | | 28 | | | Yes | Yes | | | | |
| CA_1A-1A-28A | - | 1 | See CA_1A-1A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-32A | - | 1 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-38A | - | 1 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-40A | - | 1 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-40C | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 40 | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-41A | CA_1A-41A | 1 | | | Yes | Yes | Yes | Yes | 40 | 1 |
| | | 41 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-41A[8] | - | 1 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 41 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-41C[8] | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 41 | See CA_41C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-41D[8] | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 41 | See CA_41D Bandwidth Combination Set 0 at Table 5.4.2A.1-1 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_1A-42A | CA_1A-42A | 1 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-42A-42A | CA_1A-42A | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 42 | See CA_42A-42A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_1A-42C | CA_1A-42A, CA_1A-42C, CA_42C | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 42 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-42A-42C | CA_1A-42A | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 42 | See CA_42A-42C Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_1A-42C-42C | CA_1A-42A | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 42 | See CA_42C-42C Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_1A-42D | CA_1A-42A | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 42 | See CA_42D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-42E | CA_1A-42A | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 42 | See CA_42E Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_1A-43A | - | 1 | | | Yes | Yes | Yes | | 35 | 0 |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-46A | - | 1 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 46 | | | | | | Yes | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 40 | 1 |
| | | 46 | | | | Yes | | Yes | | |
| CA_1A-46C | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 1 |
| | | 46 | See CA_46C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-46D | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | See CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 80 | 1 |
| | | 46 | See CA_46D Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-46E | - | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 46 | See CA_46E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 100 | 1 |
| | | 46 | See CA_46E Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1C-3A | - | 1 | See CA_1C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-4A | CA_2A-4A | 2 | Yes | Yes | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 2 | | | Yes | Yes | | | 20 | 1 |
| | | 4 | | | Yes | Yes | | | | |
| | | 2 | | | Yes | Yes | Yes | Yes | 40 | 2 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-2A-4A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-4A-4A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-2A-4A-4A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-5A | CA_2A-5A | 2 | | | Yes | Yes | Yes | Yes | 30 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 5 | | | Yes | Yes | | | | |
| | | 2 | | | Yes | Yes | | | 20 | 1 |
| | | 5 | | | Yes | Yes | | | | |
| CA_2A-2A-5A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| CA_2A-2A-46D | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 100 | 0 |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2C-5A | - | 2 | See CA_2C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| CA_2A-5B | - | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2C-5B | - | 2 | See CA_2C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-2A-7A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-7A | CA_2A-7A | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-7A-7A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | See the CA_7A-7A Bandwidth combination set 1 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-7C | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | See the CA_7C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-12A | CA_2A-12A | 2 | | | Yes | Yes | Yes | Yes | 30 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 2 | | | Yes | Yes | Yes | Yes | 30 | 1 |
| | | 12 | | Yes | Yes | Yes | | | | |
| | | 2 | | | Yes | Yes | | | 20 | 2 |
| | | 12 | | | Yes | Yes | | | | |
| CA_2A-2A-12A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| CA_2A-12A-12A | - | 2 | | | Yes | Yes | Yes | Yes | 30 | 0 |
| | | 12 | See CA_12A-12A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-2A-12A-12A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 12 | See CA_12A-12A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-12B | CA_2A-12A | 2 | | | Yes | Yes | Yes | Yes | 35 | 0 |
| | | 12 | See CA_12B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-2A-12B | - | 2 | See CA_2A-2A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 55 | 0 |
| | | 12 | See CA_12B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2C-12A | - | 2 | See CA_2C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 50 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| CA_2A-13A | CA_2A-13A | 2 | | | Yes | Yes | Yes | Yes | 30 | 0 |
| | | 13 | | | | Yes | | | | |
| | | 2 | | | Yes | Yes | | | 20 | 1 |
| | | 13 | | | | Yes | | | | |
| CA_2A-2A-13A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 13 | | | | Yes | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_2A-14A | - | 2 | | | Yes | Yes | Yes | Yes | 30 | 0 |
| | | 14 | | | Yes | Yes | | | | |
| CA_2A-2A-14A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 14 | | | Yes | Yes | | | | |
| CA_2A-17A | - | 2 | | | Yes | Yes | | | 20 | 0 |
| | | 17 | | | Yes | Yes | | | | |
| CA_2A-28A | - | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-29A | - | 2 | | | Yes | Yes | | | 20 | 0 |
| | | 29 | | Yes | Yes | Yes | | | | |
| | | 2 | | | Yes | Yes | | | 20 | 1 |
| | | 29 | | | Yes | Yes | | | | |
| | | 2 | | | Yes | Yes | Yes | Yes | 30 | 2 |
| | | 29 | | | Yes | Yes | | | | |
| CA_2A-2A-29A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 29 | | | Yes | Yes | | | | |
| CA_2C-29A | - | 2 | See CA_2C Bandwidth Combination Set 0 in table 5.4.2A.1-1 | | | | | | 50 | 0 |
| | | 29 | | | Yes | Yes | | | | |
| CA_2A-30A | CA_2A-30A | 2 | | | Yes | Yes | Yes | Yes | 30 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| CA_2A-2A-30A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| CA_2C-30A | - | 2 | See CA_2C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 50 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| CA_2A-46A | CA_2A-46A | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_2A-2A-46A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_2A-46A-46C | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | See CA_46A-46C Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-46C | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-2A-46C | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-46D | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-46E | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 46 | See CA_46E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-46A-46A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 46 | See CA_46A-46A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-46A-46D | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 46 | See CA_46A-46D Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-48A | - | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-48A-48A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 48 | See CA_48A-48A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-48C | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_2A-48A-48C | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 48 | See the CA_48A-48C Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-48A-48D | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 48 | See CA_48A-48D Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-48C-48C | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 48 | See CA_48C-48C Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-48D | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 48 | See the CA_48D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-48E | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 48 | See CA_48E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-49A | CA_2A-49A | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 49 | | | | Yes | | Yes | | |
| CA_2A-66A | CA_2A-66A | 2 | Yes | Yes | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| | | 2 | | | Yes | Yes | | | 20 | 1 |
| | | 66 | | | Yes | Yes | | | | |
| | | 2 | | | Yes | Yes | Yes | Yes | 40 | 2 |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-66B | - | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 66 | See CA_66B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-66C | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 66 | See CA_66C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-66D | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 66 | See CA_66D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-2A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-2A-66A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-2A-66A-66B | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 66 | See CA_66A-66B Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-2A-66A-66C | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 100 | 0 |
| | | 66 | See CA_66A-66C Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-66A-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 66 | See CA_66A-66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-66A-66B | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 66 | See CA_66A-66B Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-66A-66C | | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 66 | See CA_66A-66C Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-2A-66B | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 66 | See CA_66B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-2A-66C | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | 80 | 0 |
| | | 66 | See CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-2A-66D | | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | 100 | 0 |
| | | 66 | See CA_66D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2C-66A | - | 2 | See CA_2C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2C-66A-66A | | 2 | See CA_2C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 80 | 0 |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_2A-71A | - | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| | | 2 | | | Yes | Yes | | | 20 | 1 |
| | | 71 | | | Yes | Yes | | | | |
| CA_2A-2A-71A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-5A | CA_3A-5A | 3 | | | | Yes | Yes | Yes | 30 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 3 | | | | Yes | | | 20 | 1 |
| | | 5 | | | Yes | Yes | | | | |
| | | 3 | | | Yes | Yes | Yes | Yes | 30 | 2 |
| | | 5 | | | Yes | Yes | | | | |
| | | 3 | | | Yes | Yes | Yes | Yes | 30 | 3 |
| | | 5 | | Yes | Yes | Yes | | | | |
| | | 3 | | Yes | Yes | Yes | | | 20 | 4 |
| | | 5 | | Yes | Yes | Yes | | | | |
| CA_3C-5A | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| CA_3A-7A | CA_3A-7A | 3 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 3 | | | Yes | Yes | Yes | Yes | 40 | 1 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-3A-7A | CA_3A-7A | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 3 | See CA_3A-3A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | 50 | 1 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-3A-7A-7A | CA_3A-7A | 3 | See CA_3A-3A Bandwidth Combination Set 0 in table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 1 in table 5.4.2A.1-3 | | | | | | | |
| | | 3 | See CA_3A-3A Bandwidth Combination Set 1 in table 5.4.2A.1-3 | | | | | | 60 | 1 |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 2 in table 5.4.2A.1-3 | | | | | | | |
| CA_3A-3A-42D | CA_3A-42A | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 100 | 0 |
| | | 42 | See CA_42D Bandwidth Combination Set 0 in Table 5.4.2A.1-1: | | | | | | | |
| CA_3A-7A-7A | CA_3A-7A | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | See CA_7A-7A Bandwidth combination set 1 in table 5.4.2A.1-3 | | | | | | | |
| | | 3 | | | Yes | Yes | Yes | Yes | 50 | 1 |
| | | 7 | See CA_7A-7A Bandwidth combination set 2 in table 5.4.2A.1-3 | | | | | | | |
| CA_3A-7B | - | 3 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 7 | See CA_7B bandwidth combination set 0 in table 5.4.2A.1-1 | | | | | | | |
| CA_3A-7C | CA_3A-7A CA_7C | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | See CA_7C Bandwidth combination set 1 in table 5.4.2A.1-1 | | | | | | | |
| | | 3 | | | Yes | Yes | Yes | Yes | 60 | 1 |
| | | 7 | See CA_7C Bandwidth combination set 2 in table 5.4.2A.1-1 | | | | | | | |
| CA_3C-7A | CA_3A-7A CA_3C | 3 | See CA_3C Bandwidth Combination Set 0 in table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_3C-7C | CA_3A-7A, CA_3C, CA_7C | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 7 | See CA_7C Bandwidth Combination Set 2 in Table 5.4.2A.1-1 | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 80 | 1 |
| | | 7 | See CA_7C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3A-8A | CA_3A-8A | 3 | | | | Yes | Yes | Yes | | 30 | 0 |
| | | 8 | | | Yes | Yes | | | | | |
| | | 3 | | | | Yes | | | | 20 | 1 |
| | | 8 | | | Yes | Yes | | | | | |
| | | 3 | | | Yes | Yes | Yes | Yes | | 30 | 2 |
| | | 8 | | Yes | Yes | Yes | | | | | |
| | | 3 | | | Yes | Yes | Yes | Yes | | 30 | 3 |
| | | 8 | | | Yes | Yes | | | | | |
| CA_3A-3A-8A | CA_3A-8A | 3 | See CA_3A-3A Bandwidth Combination Set 0 in table 5.4.2A.1-3 | | | | | | | 50 | 0 |
| | | 8 | | | Yes | Yes | | | | | |
| | | 3 | See CA_3A-3A Bandwidth Combination Set 1 in table 5.4.2A.1-3 | | | | | | | 40 | 1 |
| | | 8 | | | Yes | Yes | | | | | |
| CA_3C-8A | CA_3A-8A, CA_3C | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 50 | 0 |
| | | 8 | | Yes | Yes | Yes | | | | | |
| CA_3A-11A | - | 3 | | | Yes | Yes | Yes | Yes | | 30 | 0 |
| | | 11 | | | Yes | Yes | | | | | |
| CA_3A-18A | CA_3A-18A | 3 | | | Yes | Yes | Yes | Yes | | 35 | 0 |
| | | 18 | | | Yes | Yes | Yes | | | | |
| CA_3A-19A | CA_3A-19A | 3 | | | Yes | Yes | Yes | Yes | | 35 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | | |
| CA_3A-3A-19A | CA_3A-19A | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | 55 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | | |
| CA_3A-20A | CA_3A-20A | 3 | | | Yes | Yes | Yes | Yes | | 30 | 0 |
| | | 20 | | | Yes | Yes | | | | | |
| | | 3 | | | Yes | Yes | Yes | Yes | | 40 | 1 |
| | | 20 | | | Yes | Yes | Yes | Yes | | | |
| CA_3A-3A-20A | - | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | 60 | 0 |
| | | 20 | | | Yes | Yes | Yes | Yes | | | |
| CA_3C-20A | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 20 | | | Yes | Yes | Yes | Yes | | | |
| CA_3A-21A | CA_3A-21A | 3 | | | Yes | Yes | Yes | Yes | | 35 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | | |
| CA_3A-3A-21A | CA_3A-21A | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | 55 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | | |
| CA_3A-26A | CA_3A-26A | 3 | | | Yes | Yes | Yes | Yes | | 35 | 0 |
| | | 26 | | | Yes | Yes | Yes | | | | |
| | | 3 | | | Yes | Yes | | | | 20 | 1 |
| | | 26 | | | Yes | Yes | | | | | |
| CA_3A-27A | - | 3 | | | Yes | Yes | Yes | Yes | | 30 | 0 |
| | | 27 | | | Yes | Yes | | | | | |
| CA_3A-28A | CA_3A-28A | 3 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |
| | | 3 | | Yes | Yes | Yes | Yes | Yes | | 40 | 1 |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |
| CA_3A-3A-28A | - | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | 60 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_3C-28A | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |
| CA_3A-31A | - | 3 | | | Yes | Yes | Yes | Yes | | 25 | 0 |
| | | 31 | | Yes | Yes | | | | | | |
| CA_3A-32A | - | 3 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | | |
| CA_3C-32A | - | 3 | See the CA_3C Bandwidth combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | | |
| CA_3A-38A | - | 3 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 38 | | | Yes | Yes | Yes | Yes | | | |
| CA_3C-38A | - | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 38 | | | Yes | Yes | Yes | Yes | | | |
| CA_3A-40A | CA_3A-40A | 3 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 40 | | | Yes | Yes | Yes | Yes | | | |
| | | 3 | Yes | Yes | Yes | Yes | Yes | Yes | | 40 | 1 |
| | | 40 | | | Yes | Yes | Yes | Yes | | | |
| CA_3A-40A-40A | - | 3 | | | Yes | Yes | | | | 50 | 0 |
| | | 40 | See CA_40A-40A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_3A-40C | - | 3 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 40 | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3A-40D | - | 3 | | | Yes | Yes | Yes | Yes | | 80 | 0 |
| | | 40 | See CA_40D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3A-40E | - | 3 | | | Yes | Yes | Yes | Yes | | 100 | 0 |
| | | 40 | See CA_40E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3C-40A | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 40 | | | Yes | Yes | Yes | Yes | | | |
| CA_3C-40C | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 80 | 0 |
| | | 40 | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3A-41A | CA_3A-41A | 3 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 41 | | | Yes | Yes | Yes | Yes | | | |
| | | 3 | | Yes | Yes | Yes | Yes | Yes | | 40 | 1 |
| | | 41 | | | Yes | Yes | Yes | Yes | | | |
| CA_3A-3A-41A | - | 3 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 41 | | | Yes | Yes | Yes | Yes | | | |
| CA_3A-41C | CA_3A-41A, CA_3A-41C, CA_41C | 3 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 41 | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3A-41D | CA_3A-41A, CA_41C | 3 | | | Yes | Yes | Yes | Yes | | 80 | 0 |
| | | 41 | See CA_41D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3C-41A | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 41 | | | Yes | Yes | Yes | Yes | | | |
| CA_3C-41C | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 80 | 0 |
| | | 41 | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3C-41D | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 100 | 0 |
| | | 41 | See CA_41D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3A-42A | CA_3A-42A | 3 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_3A-3A-42A | CA_3A-42A | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | 60 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | | |
| CA_3A-42C | CA_3A-42A, CA_42C, CA_3A-42C | 3 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 42 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3A-42D | CA_3A-42A | 3 | | | Yes | Yes | Yes | Yes | | 80 | 0 |
| | | 42 | See CA_42D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3A-3A-42C | CA_3A-42A | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | 80 | 0 |
| | | 42 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3A-42A-42A | CA_3A-42A | 3 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 42 | See CA_42A-42A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_3A-42A-42C | CA_3A-42A | 3 | | | Yes | Yes | Yes | Yes | | 80 | 0 |
| | | 42 | See CA_42A-42C Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_3A-42C-42C | CA_3A-42A | 3 | | | Yes | Yes | Yes | Yes | | 100 | 0 |
| | | 42 | See CA_42C-42C Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_3A-42E | CA_3A-42A | 3 | | | Yes | Yes | Yes | Yes | | 100 | 0 |
| | | 42 | See CA_42E Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_3A-43A | - | 3 | | | Yes | Yes | Yes | | | 35 | 0 |
| | | 43 | | | Yes | Yes | Yes | Yes | | | |
| CA_3A-46A | - | 3 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 46 | | | | | | Yes | | | |
| | | 3 | | Yes | Yes | Yes | Yes | Yes | | 40 | 1 |
| | | 46 | | | | Yes | | Yes | | | |
| CA_3A-46C | - | 3 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | - | 3 | | Yes | Yes | Yes | Yes | Yes | | 60 | 1 |
| | | 46 | See CA_46C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3A-46D | - | 3 | | | Yes | Yes | Yes | Yes | | 80 | 0 |
| | | 46 | See CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 3 | | Yes | Yes | Yes | Yes | Yes | | 80 | 1 |
| | | 46 | See CA_46D Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3A-46E | - | 3 | | | Yes | Yes | Yes | Yes | | 100 | 0 |
| | | 46 | See CA_46E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 3 | | | Yes | Yes | Yes | Yes | | 100 | 1 |
| | | 46 | See CA_46E Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3A-3A-46A | - | 3 | See CA_3A-3A Bandwidth Combination Set 0 in table 5.4.2A.1-3 | | | | | | | 60 | 0 |
| | | 46 | | | | | | Yes | | | |
| CA_3C-46A | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 46 | | | | | | Yes | | | |
| CA_3C-46C | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 80 | 0 |
| | | 46 | See CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3C-46D | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 100 | 0 |
| | | 46 | See CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_3A-69A | - | 3 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 69 | | | Yes | Yes | Yes | Yes | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_4A-5A | CA_4A-5A | 4 | | | Yes | Yes | | | 20 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 4 | | | Yes | Yes | Yes | Yes | 30 | 1 |
| | | 5 | | | Yes | Yes | | | | |
| CA_4A-4A-5A | - | 4 | See CA_4A-4A Bandwidth Combination Set 0 in table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| CA_4A-5B | - | 4 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_4A-4A-5B | - | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_4A-7A | CA_4A-7A | 4 | | | Yes | Yes | | | 30 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 4 | | | Yes | Yes | Yes | Yes | 40 | 1 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_4A-4A-7A | - | 4 | | | Yes | Yes | | | 40 | 0 |
| | | 4 | | | Yes | Yes | | | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 4 | | | Yes | Yes | Yes | Yes | 60 | 1 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_4A-7A-7A | - | 4 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | See the CA_7A-7A Bandwidth combination set 1 in Table 5.4.2A.1-3 | | | | | | | |
| CA_4A-7C | - | 4 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | See CA_7C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_4A-12A | CA_4A-12A | 4 | Yes | Yes | Yes | Yes | | | 20 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 4 | Yes | Yes | Yes | Yes | Yes | Yes | 30 | 1 |
| | | 12 | | | Yes | Yes | | | | |
| | | 4 | | | Yes | Yes | Yes | Yes | 30 | 2 |
| | | 12 | | Yes | Yes | Yes | | | | |
| | | 4 | | | Yes | Yes | | | 20 | 3 |
| | | 12 | | | Yes | Yes | | | | |
| | | 4 | | | Yes | Yes | Yes | Yes | 30 | 4 |
| | | 12 | | | Yes | Yes | | | | |
| | | 4 | | | Yes | Yes | Yes | | 20 | 5 |
| | | 12 | | | Yes | | | | | |
| CA_4A-4A-12A | - | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| CA_4A-12A-12A | - | 4 | | | Yes | Yes | Yes | Yes | 30 | 0 |
| | | 12 | See CA_12A-12A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_4A-4A-12A-12A | - | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 12 | See CA_12A-12A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_4A-4A-12B | - | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 55 | 0 |
| | | 12 | See CA_12B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_4A-12B | CA_4A-12A | 4 | | | Yes | Yes | Yes | Yes | 35 | 0 |
| | | 12 | See CA_12B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_4A-13A | CA_4A-13A | 4 | | | Yes | Yes | Yes | Yes | 30 | 0 |
| | | 13 | | | | Yes | | | | |
| | | 4 | | | Yes | Yes | | | 20 | 1 |
| | | 13 | | | | Yes | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_4A-4A-13A | - | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 13 | | | | Yes | | | | |
| CA_4A-17A | CA_4A-17A | 4 | | | Yes | Yes | | | 20 | 0 |
| | | 17 | | | Yes | Yes | | | | |
| CA_4A-27A | - | 4 | | | Yes | Yes | Yes | Yes | 30 | 0 |
| | | 27 | | Yes | Yes | Yes | | | | |
| CA_4A-28A | - | 4 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_4A-29A | - | 4 | | | Yes | Yes | | | 20 | 0 |
| | | 29 | | Yes | Yes | Yes | | | | |
| | | 4 | | | Yes | Yes | | | 20 | 1 |
| | | 29 | | | Yes | Yes | | | | |
| | | 4 | | | Yes | Yes | Yes | Yes | 30 | 2 |
| | | 29 | | | Yes | Yes | | | | |
| CA_4A-4A-29A | - | 4 | See CA_4A-4A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 29 | | | Yes | Yes | | | | |
| CA_4A-30A | - | 4 | | | Yes | Yes | Yes | Yes | 30 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| CA_4A-4A-30A | - | 4 | See CA_4A-4A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 50 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| CA_4A-46A | - | 4 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_4A-46A-46A | - | 4 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 46 | See CA_46A-46A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_4A-46A-46C | - | 4 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | See CA_46A-46C Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_4A-46C | - | 4 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_4A-46D | - | 4 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | See CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_4A-46A-46D | - | 4 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 46 | See CA_46A-46D Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_4A-48A | - | 4 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| CA_4A-48C | - | 4 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_4A-48D | - | 4 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 48 | See CA_48D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_4A-48E | - | 4 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 48 | See CA_48E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_4A-71A | - | 4 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| CA_4A-4A-71A | - | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-7A | CA_5A-7A | 5 | Yes | Yes | Yes | Yes | | | 30 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | 30 | 1 |
| | | 7 | | | | Yes | Yes | Yes | | |
| CA_5A-7A-7A | CA_5A-7A | 5 | | | Yes | Yes | | | 50 | 0 |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 3 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5A-7C | - | 5 | | | Yes | Yes | | | 50 | 0 |
| | | 7 | See CA_7C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-12A | CA_5A-12A | 5 | | | Yes | Yes | | | 20 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| CA_5A-12A-12A | - | 5 | | | Yes | Yes | | | 20 | 0 |
| | | 12 | See CA_12A-12A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5A-12B | - | 5 | | | Yes | Yes | | | 25 | 0 |
| | | 12 | See CA_12B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-13A | - | 5 | | | Yes | Yes | | | 20 | 0 |
| | | 13 | | | | Yes | | | | |
| CA_5A-17A | CA_5A-17A | 5 | | | Yes | Yes | | | 20 | 0 |
| | | 17 | | | Yes | Yes | | | | |
| CA_5A-25A | - | 5 | | | Yes | Yes | | | 30 | 0 |
| | | 25 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-28A | - | 5 | | | Yes | Yes | | | 30 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-29A | - | 5 | | | Yes | Yes | | | 20 | 0 |
| | | 29 | | | Yes | Yes | | | | |
| CA_5A-30A | CA_5A-30A | 5 | | | Yes | Yes | | | 20 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| CA_5B-30A | - | 5 | See CA_5B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 30 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| CA_5A-38A | - | 5 | | | Yes | Yes | | | 30 | 0 |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-40A | CA_5A-40A | 5 | | | Yes | Yes | | | 30 | 0 |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | | Yes | Yes | Yes | | | 30 | 1 |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-5A-40A | - | 5 | See CA_5A-5A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 40 | 0 |
| | | 40 | | | | Yes | | Yes | | |
| CA_5A-40A-40A | - | 5 | | | Yes | Yes | | | 50 | 0 |
| | | 40 | See CA_40A-40A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5A-40C | - | 5 | | | Yes | Yes | | | 50 | 0 |
| | | 40 | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| | | 5 | | Yes | Yes | Yes | | | 50 | 1 |
| | | 40 | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-41A | - | 5 | | | Yes | Yes | | | 30 | 0 |
| | | 41 | | | | | | Yes | | |
| CA_5A-46A | - | 5 | | | Yes | Yes | | | 30 | 0 |
| | | 46 | | | | | | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 5 | | Yes | Yes | Yes | | | 30 | 1 |
| | | 46 | | | | Yes | | Yes | | |
| CA_5A-46C | - | 5 | | | Yes | Yes | | | 50 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | - | 5 | | | Yes | Yes | | | 50 | 1 |
| | | 46 | See CA_46C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-46D | - | 5 | | | Yes | Yes | | | 70 | 0 |
| | | 46 | See CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 5 | | | Yes | Yes | | | 70 | 1 |
| | | 46 | See CA_46D Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-46E | - | 5 | | | Yes | Yes | | | 90 | 0 |
| | | 46 | See CA_46E of Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 5 | | | Yes | Yes | | | 90 | 1 |
| | | 46 | See CA_46E of Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-48A | - | 5 | | | Yes | Yes | | | 30 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-48C | - | 5 | | | Yes | Yes | | | 50 | 0 |
| | | 48 | See CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-48D | - | 5 | | | Yes | Yes | | | 70 | 0 |
| | | 48 | See CA_48D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_5A-66A | CA_5A-66A | 5 | | | Yes | Yes | | | 30 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-5A-66A | - | 5 | See CA_5A-5A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 40 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-5A-66A-66A | - | 5 | See CA_5A-5A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 66 | See CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5A-5A-66A-66B | - | 5 | See CA_5A-5A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 66 | See CA_66A-66B Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5A-5A-66A-66C | - | 5 | See CA_5A-5A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 66 | See CA_66A-66C Bandwidth Combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5A-5A-66B | - | 5 | See CA_5A-5A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 40 | 0 |
| | | 66 | See CA_66B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-5A-66C | - | 5 | See CA_5A-5A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 66 | See CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-5A-66D | - | 5 | See CA_5A-5A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 66 | See CA_66D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-66A-66A | - | 5 | | | Yes | Yes | | | 50 | 0 |
| | | 66 | See CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5A-66A-66C | - | 5 | | | Yes | Yes | | | 70 | 0 |
| | | 66 | See CA_66A-66C Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5A-66B | - | 5 | | | Yes | Yes | | | 30 | 0 |
| | | 66 | See CA_66B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-66C | - | 5 | | | Yes | Yes | | | 50 | 0 |
| | | 66 | See CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-66D | | 5 | | | Yes | Yes | | | 70 | 0 |
| | | 66 | See CA_66D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5B-66A | - | 5 | See CA_5B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 40 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_5B-66A-66A | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5A-66A-66B | | 5 | | | Yes | Yes | | | 50 | 0 |
| | | 66 | See CA_66A-66B Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5B-66A-66B | - | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 66 | See CA_66A-66B Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5B-66A-66C | - | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 66 | See CA_66A-66C Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5B-66B | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 40 | 0 |
| | | 66 | See CA_66B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_5B-66C | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 66 | See CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_7A-8A | CA_7A-8A | 7 | | | | Yes | Yes | Yes | | 30 | 0 |
| | | 8 | | Yes | Yes | Yes | | | | | |
| | | 7 | | | | Yes | Yes | Yes | | 30 | 1 |
| | | 8 | | | Yes | Yes | | | | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | 30 | 2 |
| | | 8 | | | Yes | Yes | | | | | |
| CA_7A-7A-8A | CA_7A-8A | 7 | See CA_7A-7A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | | 50 | 0 |
| | | 8 | | | Yes | Yes | | | | | |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 2 in Table 5.4.2A.1-3 | | | | | | | 40 | 1 |
| | | 8 | | | Yes | Yes | | | | | |
| CA_7A-12A | - | 7 | | | Yes | Yes | Yes | Yes | | 30 | 0 |
| | | 12 | | | Yes | Yes | | | | | |
| CA_7A-12B | - | 7 | | | Yes | Yes | Yes | Yes | | 35 | 0 |
| | | 12 | See CA_12B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_7A-20A | CA_7A-20A | 7 | | | | Yes | Yes | Yes | | 30 | 0 |
| | | 20 | | | Yes | Yes | | | | | |
| | | 7 | | | | Yes | Yes | Yes | | 40 | 1 |
| | | 20 | | | Yes | Yes | Yes | Yes | | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | 40 | 2 |
| | | 20 | | | Yes | Yes | Yes | Yes | | | |
| CA_7C-20A | - | 7 | See CA_7C Bandwidth Combination Set 1 in table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 20 | | | Yes | Yes | Yes | Yes | | | |
| CA_7A-22A | - | 7 | | | | Yes | Yes | Yes | | 40 | 0 |
| | | 22 | | | Yes | Yes | Yes | Yes | | | |
| CA_7A-26A | CA_7A-26A | 7 | | | Yes | Yes | Yes | Yes | | 35 | 0 |
| | | 26 | | | Yes | Yes | Yes | | | | |
| CA_7A-7A-26A | CA_7A-26A | 7 | See CA_7A-7A bandwidth combination set 3 in table 5.4.2A.1-3 | | | | | | | 55 | 0 |
| | | 26 | | | Yes | Yes | Yes | | | | |
| CA_7A-28A | CA_7A-28A | 7 | | | Yes | Yes | Yes | Yes | | 35 | 0 |
| | | 28 | | | Yes | Yes | Yes | | | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | 40 | 1 |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |
| CA_7B-28A | - | 7 | See CA_7B bandwidth combination set 0 in table 5.4.2A.1-1 | | | | | | | 40 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |
| CA_7C-28A | CA_7A-28A CA_7C | 7 | See CA_7C bandwidth combination set 2 in table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |
| | | 7 | See CA_7C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | 60 | 1 |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |
| CA_7A-30A | - | 7 | | | Yes | Yes | Yes | Yes | | 30 | 0 |
| | | 30 | | | Yes | Yes | | | | | |
| CA_7A-32A | - | 7 | | | | Yes | Yes | Yes | | 40 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | | |
| CA_7A-40A | - | 7 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 40 | | | Yes | Yes | Yes | Yes | | | |
| CA_7A-40C | - | 7 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 40 | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_7A-40D | - | 7 | | | Yes | Yes | Yes | Yes | | 80 | 0 |
| | | 40 | See CA_40D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_7A-40E | - | 7 | | | Yes | Yes | Yes | Yes | | 100 | 0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 40 | See CA_40E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_7A-42A | - | 7 | | | Yes | Yes | Yes | Yes | 40 | 0 | |
| | | 42 | | | Yes | Yes | Yes | Yes | | | |
| CA_7A-42A-42A | - | 7 | | | Yes | Yes | Yes | Yes | 60 | 0 | |
| | | 42 | See CA_42A-42A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_7A-46A | - | 7 | | | Yes | Yes | Yes | Yes | 40 | 0 | |
| | | 46 | | | | | | Yes | | | |
| | | 7 | | | Yes | Yes | Yes | Yes | 40 | 1 | |
| | | 46 | | | | Yes | | Yes | | | |
| CA_7A-7A-46C | - | 7 | See CA_7A-7A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | 80 | 0 | |
| | | 46 | See CA_46C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_7A-46C | - | 7 | | | Yes | Yes | Yes | Yes | 60 | 0 | |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | - | 7 | | | Yes | Yes | Yes | Yes | 60 | 1 | |
| | | 46 | See CA_46C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_7A-46D | - | 7 | | | Yes | Yes | Yes | Yes | 80 | 0 | |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 7 | | | Yes | Yes | Yes | Yes | 80 | 1 | |
| | | 46 | See CA_46D Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_7A-46E | - | 7 | | | Yes | Yes | Yes | Yes | 100 | 0 | |
| | | 46 | See CA_46E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_7C-46C | - | 7 | See CA_7C Bandwidth Combination Set 2 in Table 5.4.2A.1-1 | | | | | | 80 | 0 | |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_7C-46D | - | 7 | See CA_7C Bandwidth Combination Set 2 in Table 5.4.2A.1-1 | | | | | | 100 | 0 | |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_7A-7A-46A | - | 7 | See CA_7A-7A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | 60 | 0 | |
| | | 46 | | | | | | Yes | | | |
| CA_7A-7A-46D | - | 7 | See CA_7A-7A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | 100 | 0 | |
| | | 46 | See CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_7A-66A | - | 7 | | | Yes | Yes | Yes | Yes | 40 | 0 | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_7A-7A-66A-66A | - | 7 | See CA_7A-7A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | 80 | 0 | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_7C-66A | - | 7 | See CA_7C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_7C-46A | - | 7 | See CA_7C Bandwidth Combination set 2 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 46 | | | | | | Yes | | | |
| CA_7A-7A-66A | - | 7 | See CA_7A-7A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | | 60 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_7A-66A-66A | - | 7 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_7C-66A-66A | - | 7 | See CA_7C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | 80 | 0 |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_8A-11A | - | 8 | | | Yes | Yes | | | | 20 | 0 |
| | | 11 | | | Yes | Yes | | | | | |
| CA_8A-20A | - | 8 | | | Yes | Yes | | | | 20 | 0 |
| | | 20 | | | Yes | Yes | | | | | |
| | | 8 | | Yes | Yes | Yes | | | | 20 | 1 |
| | | 20 | | | Yes | Yes | | | | | |
| | | 8 | | | Yes | Yes | | | | 30 | 2 |
| | | 20 | | | | Yes | Yes | Yes | | | |
| CA_8A-27A | - | 8 | | | Yes | Yes | | | | 20 | 0 |
| | | 27 | | | Yes | Yes | | | | | |
| CA_8A-28A | - | 8 | | Yes | Yes | Yes | | | | 30 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |
| CA_8A-32A | - | 8 | | Yes | Yes | Yes | | | | 30 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | | |
| CA_8A-38A | - | 8 | | | Yes | Yes | | | | 30 | 0 |
| | | 38 | | | Yes | Yes | Yes | Yes | | | |
| CA_8A-39A | CA_8A-39A | 8 | Yes | Yes | Yes | Yes | | | | 30 | 0 |
| | | 39 | | | Yes | Yes | Yes | Yes | | | |
| CA_8A-39C | - | 8 | Yes | Yes | Yes | Yes | | | | 45 | 0 |
| | | 39 | See CA_39C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_8B-39A | - | 8 | See CA_8B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 40 | 0 |
| | | 39 | | | Yes | Yes | Yes | Yes | | | |
| CA_8B-39C | - | 8 | See CA_8B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 55 | 0 |
| | | 39 | See CA_39C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_8A-40A | - | 8 | | | Yes | Yes | | | | 30 | 0 |
| | | 40 | | | Yes | Yes | Yes | Yes | | | |
| | - | 8 | | Yes | Yes | Yes | | | | 30 | 1 |
| | | 40 | | | Yes | Yes | Yes | Yes | | | |
| CA_8A-40C | - | 8 | | | Yes | Yes | | | | 50 | 0 |
| | | 40 | See CA_40C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_8A-41A | CA_8A-41A | 8 | Yes | Yes | Yes | Yes | | | | 30 | 0 |
| | | 41 | | | | Yes | | Yes | | | |
| | | 8 | | | Yes | Yes | | | | 30 | 1 |
| | | 41 | | | Yes | Yes | Yes | Yes | | | |
| CA_8A-41C | - | 8 | Yes | Yes | Yes | Yes | | | | 50 | 0 |
| | | 41 | See CA_41C bandwidth combination set 3 in table 5.4.2A.1-1 | | | | | | | | |
| CA_8A-41D | - | 8 | Yes | Yes | Yes | Yes | | | | 70 | 0 |
| | | 41 | See CA_41D bandwidth combination set 0 in table 5.4.2A.1-1 | | | | | | | | |
| CA_8B-41A | - | 8 | See CA_8B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 40 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 41 | | | | | | Yes | | |
| CA_8B-41C | - | 8 | See CA_8B bandwidth combination set 0 in table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 41 | See CA_41C bandwidth combination set 3 in table 5.4.2A.1-1 | | | | | | | |
| CA_8B-41D | - | 8 | See CA_8B bandwidth combination set 0 in table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 41 | See CA_41D bandwidth combination set 0 in table 5.4.2A.1-1 | | | | | | | |
| CA_8A-42A | - | 8 | Yes | Yes | Yes | Yes | | | 30 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_8A-42C | - | 8 | Yes | Yes | Yes | Yes | | | 50 | 0 |
| | | 42 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_8A-46A | - | 8 | Yes | Yes | Yes | Yes | | | 30 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_8A-46C | - | 8 | Yes | Yes | Yes | Yes | | | 50 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_8A-46D | - | 8 | Yes | Yes | Yes | Yes | | | 70 | 0 |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_8A-46E | - | 8 | Yes | Yes | Yes | Yes | | | 90 | 0 |
| | | 46 | See CA_46E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_8B-46A | - | 8 | See CA_8B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 40 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_8B-46C | - | 8 | See CA_8B bandwidth combination set 0 in table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_8B-46D | - | 8 | See CA_8B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_11A-18A | CA_11A-18A- | 11 | | | Yes | Yes | | | 25 | 0 |
| | | 18 | | | Yes | Yes | Yes | | | |
| CA_11A-26A | CA_11A-26A | 11 | | | Yes | Yes | | | 25 | 0 |
| | | 26 | | | Yes | Yes | Yes | | | |
| CA_11A-28A | - | 11 | | | Yes | Yes | | | 30 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_11A-41A | - | 11 | | | Yes | Yes | | | 30 | 0 |
| | | 41 | | | Yes | Yes | Yes | Yes | | |
| CA_11A-41C | - | 11 | | | Yes | Yes | | | 50 | 0 |
| | | 41 | See CA_41C bandwidth combination set 0 in table 5.4.2A.1-1 | | | | | | | |
| CA_11A-42A | - | 11 | | | Yes | Yes | | | 30 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_11A-42C | - | 11 | | | Yes | Yes | | | 50 | 0 |
| | | 42 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_11A-46A | - | 11 | | | Yes | Yes | | | 30 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_11A-46C | - | 11 | | | Yes | Yes | | | 50 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_11A-46D | - | 11 | | | Yes | Yes | | | 70 | 0 |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_11A-46E | - | 11 | | | Yes | Yes | | | 90 | 0 |
| | | 46 | See CA_46E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_12A-25A | - | 12 | | | Yes | Yes | | | 30 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 25 | | | Yes | Yes | Yes | Yes | | |
| CA_12A-30A | CA_12A-30A | 12 | | | Yes | Yes | | | 20 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| CA_12A-46A | - | 12 | | | Yes | Yes | | | 30 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_12A-48A | | 12 | | | Yes | Yes | | | 30 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| CA_12A-46C | - | 12 | | | Yes | Yes | | | 50 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_12A-46D | - | 12 | | | Yes | Yes | | | 70 | 0 |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_12A-46E | - | 12 | | | Yes | Yes | | | 90 | 0 |
| | | 46 | See CA_46E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_12A-48C | - | 12 | | | Yes | Yes | | | 50 | 0 |
| | | 48 | See CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_12A-48D | - | 12 | | | Yes | Yes | | | 70 | 0 |
| | | 48 | See CA_48D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_12A-48E | - | 12 | | | Yes | Yes | | | 90 | 0 |
| | | 48 | See CA_48E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_12A-66A | CA_12A-66A | 12 | | | Yes | Yes | | | 20 | 0 |
| | | 66 | Yes | Yes | Yes | Yes | | | | | |
| | | 12 | | | Yes | Yes | | | 30 | 1 |
| | | 66 | Yes | Yes | Yes | Yes | Yes | Yes | | | |
| | | 12 | | Yes | Yes | Yes | | | 30 | 2 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| | | 12 | | | Yes | Yes | | | 20 | 3 |
| | | 66 | | | Yes | Yes | | | | | |
| | | 12 | | | Yes | Yes | | | 30 | 4 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| | | 12 | | | Yes | | | | 20 | 5 |
| | | 66 | | | Yes | Yes | Yes | | | | |
| CA_12A-66A-66A | - | 12 | | | Yes | Yes | | | 50 | 0 |
| | | 66 | See CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_12A-66C | - | 12 | | | Yes | Yes | | | 50 | 0 |
| | | 66 | See CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_12B-66A | - | 12 | See CA_12B bandwidth combination set 0 in table 5.4.2A.1-1 | | | | | | 35 | 0 | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_12B-66A-66A | - | 12 | See CA_12B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 55 | 0 | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_13A-46A | - | 13 | | | Yes | Yes | | | 30 | 0 | |
| | | 46 | | | | | | Yes | | | |
| CA_13A-46C | - | 13 | | | Yes | Yes | | | 50 | 0 | |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_13A-46D | - | 13 | | | Yes | Yes | | | 70 | 0 | |
| | | 46 | See CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_13A-46E | - | 13 | | | Yes | Yes | | | 90 | 0 | |
| | | 46 | See CA_46E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_13A-48A | - | 13 | | | Yes | Yes | | | 30 | 0 | |
| | | 48 | | | Yes | Yes | Yes | Yes | | | |
| CA_13A-48A-48A | - | 13 | | | Yes | Yes | | | 50 | 0 | |
| | | 48 | See CA_48A-48A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_13A-48A-48C | - | 13 | | | Yes | Yes | | | 70 | 0 | |
| | | 48 | See the CA_48A-48C Bandwidth combination set 0 in the Table 5.4.2A.1-3 | | | | | | | | |
| CA_13A-48A-48D | - | 13 | | | Yes | Yes | | | 90 | 0 | |
| | | 48 | See CA_48A-48D Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_13A-48C-48C | - | 13 | | | Yes | Yes | | | 90 | 0 | |
| | | 48 | See CA_48C-48C Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_13A-48C | - | 13 | | | Yes | Yes | | | 50 | 0 | |
| | | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_13A-48D | - | 13 | | | Yes | Yes | | | 70 | 0 | |
| | | 48 | See the CA_48D Bandwidth combination set 0 in the Table 5.4.2A.1-1 | | | | | | | | |
| CA_13A-48E | - | 13 | | | Yes | Yes | | | 90 | 0 | |
| | | 48 | See CA_48E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_13A-66A | - | 13 | | | Yes | Yes | | | 30 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_13A-66A-66A | - | 13 | | | Yes | Yes | | | 50 | 0 |
| | | 66 | See CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_13A-66A-66B | - | 13 | | | Yes | Yes | | | 50 | 0 |
| | | 66 | See CA_66A-66B Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_13A-66A-66C | - | 13 | | | Yes | Yes | | | 70 | 0 |
| | | 66 | See CA_66A-66C Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_13A-66B | - | 13 | | | Yes | Yes | | | 30 | 0 |
| | | 66 | See CA_66B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_13A-66C | - | 13 | | | Yes | Yes | | | 50 | 0 |
| | | 66 | See CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_13A-66D | - | 13 | | | Yes | Yes | | | 70 | 0 |
| | | 66 | See CA_66D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_14A-30A | - | 14 | | | Yes | Yes | | | 20 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| CA_14A-66A | - | 14 | | | Yes | Yes | | | 30 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_14A-66A-66A | - | 14 | | | Yes | Yes | | | 50 | 0 |
| | | 66 | See CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_14A-66A-66A-66A | - | 14 | | | Yes | Yes | | | 70 | 0 |
| | | 66 | See CA_66A-66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-4 | | | | | | | |
| CA_18A-28A | CA_18A-28A | 18 | | | Yes | Yes | Yes | | 25 | 0 |
| | | 28 | | | Yes | Yes | | | | |
| CA_19A-21A | CA_19A-21A | 19 | | | Yes | Yes | Yes | | 30 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| CA_19A-28A | - | 19 | | | Yes | Yes | Yes | | 25 | 0 |
| | | 28 | | | Yes | Yes | | | | |
| CA_19A-42A | CA_19A-42A | 19 | | | Yes | Yes | Yes | | 35 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_19A-42C | CA_19A-42A | 19 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 42 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_19A-42D | - | 19 | | | Yes | Yes | Yes | | 75 | 0 |
| | | 42 | See CA_42D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|
| CA_19A-46A | - | 19 | | | Yes | Yes | Yes | | 35 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_19A-46C | - | 19 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_19A-46D | - | 19 | | | Yes | Yes | Yes | | 75 | 0 |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_19A-46E | - | 19 | | | Yes | Yes | Yes | | 95 | 0 |
| | | 46 | See CA_46E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_20A-28A[7] | - | 20 | | | | Yes | Yes | Yes | 40 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_20A-31A | - | 20 | | | Yes | Yes | Yes | Yes | 25 | 0 |
| | | 31 | | Yes | Yes | | | | | |
| CA_20A-32A | - | 20 | | | Yes | Yes | | | 30 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | 40 | 1 |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| CA_20A-38A | - | 20 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_20A-38C | - | 20 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 38 | See CA_38C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_20A-40A | - | 20 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | | 35 | 1 |
| | | 40 | | | | Yes | Yes | Yes | | |
| CA_20A-40A-40A | - | 20 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 40 | See CA_40A-40A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | | |
| CA_20A-40C | - | 20 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 40 | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_20A-40D | - | 20 | | | Yes | Yes | Yes | | 75 | 0 |
| | | 40 | See CA_40D Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_20A-42A | - | 20 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_20A-42A-42A | - | 20 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 42 | See CA_42A-42A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_20A-43A | - | 20 | | | Yes | | | | 25 | 0 |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_20A-67A | - | 20 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 67 | | | Yes | Yes | Yes | Yes | | |
| CA_20A-75A | - | 20 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 75 | | | Yes | Yes | Yes | Yes | | |
| CA_20A-76A | - | 20 | | | Yes | Yes | Yes | Yes | 25 | 0 |
| | | 76 | | | Yes | | | | | |
| CA_21A-28A | CA_21A-28A | 21 | | | Yes | Yes | Yes | | 25 | 0 |
| | | 28 | | | Yes | Yes | | | | |
| CA_21A-42A | CA_21A-42A | 21 | | | Yes | Yes | Yes | | 35 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_21A-42C | CA_21A-42A | 21 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 42 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_21A-42D | - | 21 | | | Yes | Yes | Yes | | 75 | 0 |
| | | 42 | See CA_42D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_21A-42E | - | 21 | | | Yes | Yes | Yes | | 95 | 0 |
| | | 42 | See CA_42E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_21A-46A | - | 21 | | | Yes | Yes | Yes | | 35 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_21A-46C | - | 21 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_21A-46D | - | 21 | | | Yes | Yes | Yes | | 75 | 0 |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_21A-46E | - | 21 | | | Yes | Yes | Yes | | 95 | 0 |
| | | 46 | See CA_46E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_23A-29A | - | 23 | | | Yes | Yes | Yes | Yes | 30 | 0 |
| | | 29 | | Yes | Yes | Yes | | | | |
| | | 23 | | | Yes | Yes | | | 20 | 1 |
| | | 29 | | Yes | Yes | Yes | | | | |
| CA_25A-26A | - | 25 | | Yes | Yes | Yes | Yes | Yes | 35 | 0 |
| | | 26 | Yes | Yes | Yes | Yes | Yes | | | |
| | | 25 | | Yes | Yes | Yes | | | 20 | 1 |
| | | 26 | | Yes | Yes | Yes | | | | |
| | | 25 | | | Yes | Yes | | | 20 | 2 |
| | | 26 | | | Yes | Yes | | | | |
| CA_25A-25A-26A | - | 25 | See CA_25A-25A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | 45 | 0 |
| | | 26 | | Yes | Yes | | | | | |
| CA_25A-41A[8] | - | 25 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 41 | | | Yes | Yes | Yes | Yes | | |
| CA_25A-25A-41A | - | 25 | See CA_25A-25A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 41 | | | Yes | Yes | Yes | Yes | | |
| CA_25A-41C[8] | - | 25 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 41 | See CA_41C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_25A-25A-41C | - | 25 | See CA_25A-25A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 41 | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_25A-41D[8] | - | 25 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 41 | See CA_41D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_25A-25A-41D | - | 25 | See CA_25A-25A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | 100 | 0 |
| | | 41 | See CA_41D bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_25A-46A | - | 25 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 46 | | | | Yes | | Yes | | |
| CA_25A-46C | - | 25 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 46 | See CA_46C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_25A-46D | - | 25 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | See CA_46D Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_26A-41A | - | 26 | | | Yes | Yes | Yes | | 35 | 0 |
| | | 41 | | | Yes | Yes | Yes | Yes | | |
| CA_26A-41C | - | 26 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 41 | See CA_41C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_26A-46A | CA_26A-46A | 26 | | Yes | Yes | Yes | | | 30 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_26A-48A | CA_26A-48A | 26 | | Yes | Yes | Yes | | | 30 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| CA_26A-48C | - | 26 | | Yes | Yes | Yes | | | 50 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_26A-48A-48A | - | 26 | | Yes | Yes | Yes | | | 50 | 0 | |
| | | 48 | See CA_48A-48A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_28A-38A | - | 28 | | | Yes | Yes | Yes | Yes | 40 | 0 | |
| | | 38 | | | Yes | Yes | Yes | Yes | | | |
| CA_28A-40A | - | 28 | | | Yes | Yes | Yes | Yes | 40 | 0 | |
| | | 40 | | | Yes | Yes | Yes | Yes | | | |
| CA_28A-40C | - | 28 | | | Yes | Yes | Yes | Yes | 60 | 0 | |
| | | 40 | See CA_40C Bandwidth Combination set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_28A-40D | - | 28 | | | Yes | Yes | Yes | Yes | 80 | 0 | |
| | | 40 | See CA_40D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_28A-41A | CA_28A-41A | 28 | | | Yes | Yes | | | 30 | 0 | |
| | | 41 | | | Yes | Yes | Yes | Yes | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | 40 | 1 | |
| | | 41 | | | Yes | Yes | Yes | Yes | | | |
| CA_28A-41C | | 28 | | | Yes | Yes | | | 50 | 0 | |
| | | 41 | See CA_41C Bandwidth Combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_28A-42A | CA_28A-42A | 28 | | | Yes | Yes | Yes | Yes | 40 | 0 | |
| | | 42 | | | Yes | Yes | Yes | Yes | | | |
| CA_28A-42C | CA_28A-42A, CA_42C | 28 | | | Yes | Yes | Yes | Yes | 60 | 0 | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_28A-42D | - | 28 | | | Yes | Yes | | | 70 | 0 | |
| | | 42 | See CA_42D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_28A-46A | - | 28 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 46 | | | | Yes | | Yes | | |
| CA_28A-46C | - | 28 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 46 | See CA_46C Bandwidth Combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_28A-46D | - | 28 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | See CA_46D Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_28A-46E | - | 28 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 46 | See CA_46E Bandwidth Combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_29A-30A | - | 29 | | | Yes | Yes | | | 20 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| CA_29A-66A | - | 29 | | | Yes | Yes | | | 30 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_29A-66C | | 29 | | | Yes | Yes | | | 50 | 0 |
| | | 66 | See CA_66C Bandwidth Combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_29A-66A-66A | | 29 | | | Yes | Yes | | | 50 | 0 |
| | | 66 | See CA_66A-66A Bandwidth Combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_29A-70A | - | 29 | | | Yes | Yes | | | 25 | 0 |
| | | 70 | | | Yes | Yes | Yes | | | |
| CA_29A-70C | - | 29 | | | Yes | Yes | | | 35 | 0 |
| | | 70 | See CA_70C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_30A-66A | CA_30A-66A | 30 | | | Yes | Yes | | | 30 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_30A-66A-66A | - | 30 | | | Yes | Yes | | | 50 | 0 |
| | | 66 | See CA_66A-66A Bandwidth Combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_32A-42A | - | 32 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_32A-43A | - | 32 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_34A-39A | - | 34 | | | Yes | Yes | Yes | | 35 | 0 |
| | | 39 | | | | Yes | Yes | Yes | | |
| CA_34A-41A | - | 34 | | | Yes | Yes | Yes | | 35 | 0 |
| | | 41 | | | | | | Yes | | |
| CA_38A-40A | - | 38 | | | | Yes | | Yes | 40 | 0 |
| | | 40 | | | | Yes | | Yes | | |
| | | 38 | | | | Yes | Yes | Yes | 40 | 1 |
| | | 40 | | | | Yes | Yes | Yes | | |
| CA_38A-40A-40A | - | 38 | | | | Yes | | Yes | 60 | 0 |
| | | 40 | See CA_40A-40A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 38 | | | | Yes | Yes | Yes | 60 | 1 |
| | | 40 | See CA_40A-40A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | | |
| CA_38A-40C | - | 38 | | | | Yes | | Yes | 60 | 0 |
| | | 40 | See CA_40C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 38 | | | | Yes | Yes | Yes | 60 | 1 |
| | | 40 | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_38A-40D | - | 38 | | | | Yes | Yes | Yes | 80 | 0 |
| | | 40 | See CA_40D Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39A-40A | - | 39 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_39A-40C | - | 39 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 40 | See CA_40C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_39A-40D | - | 39 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 40 | See CA_40D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39A-40E | - | 39 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 40 | See the CA_40E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39C-40A | - | 39 | See CA_39C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 55 | 0 |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_39C-40C | - | 39 | See CA_39C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 75 | 0 |
| | | 40 | See CA_40C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39C-40D | - | 39 | See the CA_39C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 95 | 0 |
| | | 40 | See the CA_40D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39A-41A | CA_39A-41A | 39 | | | | Yes | Yes | Yes | 40 | 0 |
| | | 41 | | | | | | Yes | | |
| CA_39A-41C | CA_41C<br>CA_39A-41A<br>CA_39A-41C | 39 | | | | Yes | Yes | Yes | 60 | 0 |
| | | 41 | | | | | | Yes | | |
| | | 41 | | | | | | Yes | | |
| CA_39A-41D | CA_41C<br>CA_39A-41A | 39 | | | | Yes | Yes | Yes | 80 | 0 |
| | | 41 | | | | | | Yes | | |
| | | 41 | | | | | | Yes | | |
| | | 41 | | | | | | Yes | | |
| CA_39C-41A | CA_39C<br>CA_39A-41A<br>CA_39C-41A | 39 | See CA_39C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 55 | 0 |
| | | 41 | | | | | | Yes | | |
| CA_39C-41C | CA_39C<br>CA_41C<br>CA_39A-41A | 39 | See CA_39C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 75 | 0 |
| | | 41 | | | | | | Yes | | |
| | | 41 | | | | | | Yes | | |
| CA_39C-41D | - | 39 | See CA_39C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 95 | 0 |
| | | 41 | See CA_41D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_39A-42A | - | 39 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_39A-42C | - | 39 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 42 | See CA_42C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39A-42D | - | 39 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 42 | See CA_42D Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39A-42E | - | 39 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 42 | See the CA_42E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39C-42A | - | 39 | See CA_39C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 55 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_39C-42C | - | 39 | See CA_39C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 75 | 0 |
| | | 42 | See CA_42C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39C-42D | - | 39 | See the CA_39C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 95 | 0 |
| | | 42 | See the CA_42D Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39A-46A | - | 39 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_39A-46C | - | 39 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39A-46D | - | 39 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | See the CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39A-46E | - | 39 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 46 | See CA_46E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39C-46A | - | 39 | See CA_39C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 55 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_39C-46C | - | 39 | See CA_39C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 75 | 0 |
| | | 46 | See the CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_39C-46D | - | 39 | See CA_39C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 95 | 0 |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_40A-41A | - | 40 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 41 | | | Yes | Yes | Yes | Yes | | |
| CA_40A-42A | CA_40A-42A | 40 | | | | Yes | Yes | Yes | 40 | 0 |
| | | 42 | | | | Yes | Yes | Yes | | |
| CA_40A-42C | - | 40 | | | | Yes | Yes | Yes | 60 | 0 |
| | | 42 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_40C-42C | - | 40 | See CA_40C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 42 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_40A-43A | - | 40 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_40A-46A | - | 40 | | | Yes | Yes | Yes | Yes | 40 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 46 | | | | | | Yes | | |
| | | 40 | | | Yes | Yes | Yes | Yes | 40 | 1 |
| | | 46 | | | | Yes | | Yes | | |
| CA_40A-46C | - | 40 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 40 | | | Yes | Yes | Yes | Yes | 60 | 1 |
| | | 46 | See CA_46C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_40A-46D | - | 40 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | See CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 40 | | | Yes | Yes | Yes | Yes | 80 | 1 |
| | | 46 | See CA_46D Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_40A-46E | - | 40 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 46 | See CA_46E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 40 | | | Yes | Yes | Yes | Yes | 100 | 1 |
| | | 46 | See CA_46E Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_40C-42A | - | 40 | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 42 | | | | Yes | Yes | Yes | | |
| CA_40C-46A | - | 40 | See CA_40C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_40C-46C | - | 40 | See CA_40C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_40C-46D | - | 40 | See CA_40C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 100 | 0 |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_40D-46A | - | 40 | See CA_40D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 46 | | | | | | Yes | | |
| CA_40D-46C | - | 40 | See CA_40D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 100 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_41A[9]-42A[9] | CA_41A-42A | 41 | | | | Yes | Yes | Yes | 40 | 0 |
| | | 42 | | | | Yes | Yes | Yes | | |
| CA_41A-42C | CA_41A-42A, CA_42C, CA_41A-42C | 41 | | | | Yes | Yes | Yes | 60 | 0 |
| | | 42 | See CA_42C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_41A-42D | - | 41 | | | | Yes | Yes | Yes | 80 | 0 |
| | | 42 | See CA_42D Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_41C-42A | CA_41A-42A, CA_41C, CA_41C-42A | 41 | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 42 | | | | Yes | Yes | Yes | | |
| CA_41C-42C | CA_41A-42A, CA_41C, CA_42C, CA_41C-42C | 41 | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 42 | See CA_42C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_41C-42D | - | 41 | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 100 | 0 |
| | | 42 | See CA_42D Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_41D-42A | - | 41 | See CA_41D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | | 80 | 0 |
| | | 42 | | | | Yes | Yes | Yes | | | | | |
| CA_41D-42C | - | 41 | See CA_41D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | | 100 | 0 |
| | | 42 | See CA_42C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | | | | |
| CA_41A-46A | - | 41 | | | Yes | Yes | Yes | Yes | | | | 40 | 0 |
| | | 46 | | | | | | Yes | | | | | |
| CA_41A-46C | - | 41 | | | Yes | Yes | Yes | Yes | | | | 60 | 0 |
| | | 46 | See CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | | | |
| CA_41A-46D | - | 41 | | | Yes | Yes | Yes | Yes | | | | 80 | 0 |
| | | 46 | See CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | | | |
| CA_41A-46E | - | 41 | | | Yes | Yes | Yes | Yes | | | | 100 | 0 |
| | | 46 | See the CA_46E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | | | |
| CA_41C-46A | - | 41 | See CA_41C Bandwidth Combination Set 2 in Table 5.4.2A.1-1 | | | | | | | | | 60 | 0 |
| | | 46 | | | | | | Yes | | | | | |
| CA_41C-46C | - | 41 | See CA_41C Bandwidth combination set 2 in Table 5.4.2A.1-1 | | | | | | | | | 80 | 0 |
| | | 46 | See CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | | | |
| CA_41C-46D | - | 41 | See the CA_41C Bandwidth combination set 2 in Table 5.4.2A.1-1 | | | | | | | | | 100 | 0 |
| | | 46 | See the CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | | | |
| CA_41D-46A | - | 41 | See CA_41D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | | 80 | 0 |
| | | 46 | | | | | | Yes | | | | | |
| CA_41D-46C | - | 41 | See the CA_41D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | | 100 | 0 |
| | | 46 | See the CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | | | |
| CA_41A-48A | - | 41 | | | | Yes | Yes | Yes | | | | 40 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | | | | |
| CA_41A-48C | - | 41 | | | | Yes | Yes | Yes | | | | 60 | 0 |
| | | 48 | See CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | | | |
| CA_41A-48D | - | 41 | | | | Yes | Yes | Yes | | | | 80 | 0 |
| | | 48 | See CA_48D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | | | |
| CA_41C-48A | CA_41C | 41 | See the CA_41C Bandwidth Combination Set 2 in Table 5.4.2A.1-1 | | | | | | | | | 60 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | | | | |
| CA_41C-48C | CA_41C | 41 | See the CA_41C Bandwidth Combination Set 2 in Table 5.4.2A.1-1 | | | | | | | | | 80 | 0 |
| | | 48 | See the CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | | | |
| CA_41C-48D | CA_41C | 41 | See the CA_41C Bandwidth Combination Set 2 in Table 5.4.2A.1-1 | | | | | | | | | 100 | 0 |
| | | 48 | See the CA_48D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | | | |
| CA_41D-48A | CA_41C | 41 | See the CA_41D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | | 80 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | | | | |
| CA_41D-48C | CA_41C | 41 | See the CA_41D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | | 100 | 0 |
| | | 48 | See the CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | | | |
| CA_42A-43A | - | 42 | | | Yes | Yes | Yes | Yes | | | | 40 | 0 |
| | | 43 | | | Yes | Yes | Yes | Yes | | | | | |
| CA_42A-46A | - | 42 | | | Yes | Yes | Yes | Yes | | | | 40 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 46 | | | | | | Yes | | |
| CA_46A-48A | - | 46 | | | | | | Yes | 40 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| CA_46A-48A-48A | - | 46 | | | | | | Yes | 60 | 0 |
| | | 48 | See CA_48A-48A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_46A-48C | - | 46 | | | | | | Yes | 60 | 0 |
| | | 48 | See CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_46C-48A | - | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| CA_46C-48A-48A | - | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 48 | See CA_48A-48A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_46C-48C | - | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 48 | See CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_46A-48D | - | 46 | | | | | | Yes | 80 | 0 |
| | | 48 | See CA_48D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_46D-48A | - | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_46A-46A-66A | - | 46 | See CA_46A-46A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | 60 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_46A-46C-66A | - | 46 | See CA_46A-46C Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | 80 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_46A-46D-66A | - | 46 | See CA_46A-46D Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | 100 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_46A-48E | - | 46 | | | | | | | Yes | 100 | 0 |
| | | 48 | See CA_48E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_46C-48D | - | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 100 | 0 |
| | | 48 | See CA_48D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_46D-48A-48A | - | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 100 | 0 |
| | | 48 | See CA_48A-48A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_46D-48C | - | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 100 | 0 |
| | | 48 | See CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_46E-48A | - | 46 | See CA_46E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 100 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | | |
| CA_46C-66A | - | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_46A-66A | - | 46 | | | | | | | Yes | 40 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_46A-66A-66A | - | 46 | | | | | | | Yes | 60 | 0 |
| | | 66 | See the CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_46C-66A-66A | - | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 80 | 0 |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_46A-66C | - | 46 | | | | | | | Yes | 60 | 0 |
| | | 66 | See the CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_46D-66A | - | 46 | See CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 80 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_46D-66A-66A | - | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 100 | 0 |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_46C-48E | - | 46 | See the CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 120 | 0 |
| | | 48 | See the CA_48E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_46E-48C | - | 46 | See the CA_46E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 120 | 0 |
| | | 48 | See the CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_46E-66A | - | 46 | See CA_46E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 100 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_46A-70A | - | 46 | | | | | | | Yes | 35 | 0 |
| | | 70 | | | Yes | Yes | Yes | | | | |
| CA_46A-71A | - | 46 | | | | | | | Yes | 40 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_46C-71A | - | 46 | See CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_46D-71A | - | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | 80 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_48A-66A | - | 48 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_48A-48A-66A | - | 48 | See CA_48A-48A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | 60 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_48A-48C-66A | - | 48 | See the CA_48A-48C Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | 80 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_48A-48C-66B | - | 48 | See CA_48A-48C Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | 80 | 0 |
| | | 66 | See CA_66B Bandwidth combination set 0 in the Table 5.4.2A.1-1 | | | | | | | | |
| CA_48A-48C-66C | - | 48 | See CA_48A-48C Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | 100 | 0 |
| | | 66 | See CA_66C Bandwidth combination set 0 in the Table 5.4.2A.1-1 | | | | | | | | |
| CA_48A-48D-66A | - | 48 | See CA_48A-48D Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | 100 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_48C-48C-66A | - | 48 | See CA_48C-48C Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | 100 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_48A-66A-66A | - | 48 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_48A-48A-66A-66A | - | 48 | See CA_48A-48A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | 80 | 0 |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_48A-48A-66B | - | 48 | See CA_48A-48A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | 60 | 0 |
| | | 66 | See CA_66B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_48A-48A-66C | - | 48 | See CA_48A-48A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | 80 | 0 |
| | | 66 | See CA_66C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_48A-66B | - | 48 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 66 | See CA_66B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_48A-66C | - | 48 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 66 | See CA_66C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_48A-71A | - | 48 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_48C-66A | - | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_48C-66A-66A | - | 48 | See CA_48C Bandwidth Combination Cet 0 in Table 5.4.2A.1-1 | | | | | | | 80 | 0 |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_48C-66B | - | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 60 | 0 |
| | | 66 | See CA_66B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_48C-66C | - | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 80 | 0 |
| | | 66 | See CA_66C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_48D-66A | - | 48 | See the CA_48D Bandwidth combination set 0 in the Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_48E-66A | - | 48 | See CA_48E Bandwidth combination set 0 in the Table 5.4.2A.1-1 | | | | | | 100 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_48C-71A | - | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| CA_48A-48A-71A | - | 48 | See CA_48A-48A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| CA_66A-70A | - | 66 | | | Yes | Yes | Yes | Yes | 35 | 0 |
| | | 70 | | | Yes | Yes | Yes | | | |
| CA_66A-66A-70A | - | 66 | See CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 55 | 0 |
| | | 70 | | | Yes | Yes | Yes | | | |
| CA_66A-70C | - | 66 | | | Yes | Yes | Yes | Yes | 45 | 0 |
| | | 70 | See CA_70C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_66A-66A-70C | - | 66 | See the CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 65 | 0 |
| | | 70 | See the CA_70C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_66C-70A | - | 66 | See CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 55 | 0 |
| | | 70 | | | Yes | Yes | Yes | | | |
| CA_66C-70C | - | 66 | See the CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 65 | 0 |
| | | 70 | See the CA_70C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_66A-71A | - | 66 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| CA_66C-71A | - | 66 | See CA_66C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| CA_66A-66A-71A | - | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| CA_70A-71A | - | 70 | | | Yes | Yes | Yes | | 35 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| CA_70C-71A | - | 70 | See the CA_70C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 45 | 0 |
| | | 71 | | | Yes | Yes | Yes | Yes | | |

NOTE 1: The CA Configuration refers to a combination of an operating band and a CA bandwidth class specified in Table 5.4.2A-1 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.
NOTE 2: For each band combination, all combinations of indicated bandwidths belong to the set.
NOTE 3: For the supported CC bandwidth combinations, the CC downlink and uplink bandwidths are equal.
NOTE 4: Uplink CA configurations are the configurations supported by the present release of specifications.
NOTE 5: For TDD inter-band Carrier Aggregtion only non-simultaneous Rx/Tx uplink CA configurations can be supported by UE supporting corresponding DL CA configuration without simultaneous Rx/Tx.
NOTE 6: Void
NOTE 7: Power imbalance between downlink carriers on Band 20 and Band 28 is assumed to be within [6dB].
NOTE 8: For the corresponding CA configuration, UE may not support Pcell transmissions in this E-UTRA band.
NOTE 9: Requirements for this band configuration are applicable for 8Rx.

**Table 5.4.2A.1-2a: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA (three bands)**

| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **E-UTRA CA Configuration** | **Uplink CA configurations (NOTE 5)** | **E-UTRA Bands** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Maximum aggregated bandwidth [MHz]** | **Bandwidth combination set** |
| CA_1A-3A-5A | CA_1A-3A<br>CA_1A-5A[6]<br>CA_3A-5A | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | | |
| | | 1 | | | Yes | Yes | | | 40 | 1 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | | |
| CA_1A-1A-3A-5A | - | 1 | See CA_1A-1A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | | |
| CA_1C-3A-5A | - | 1 | See CA_1C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | | |
| CA_1A-3A-3A-7A-7A | - | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 3 | See the CA_3A-3A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 7 | See the CA_7A-7A Bandwidth combination set 1 in Table 5.4.2A.1-3 | | | | | | | |
| CA_1A-3C-5A | - | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 5 | | | Yes | Yes | | | | |
| CA_1A-3A-7A | CA_1A-3A<br>CA_1A-7A<br>CA_3A-7A | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 60 | 1 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-1A-3A-7A | - | 1 | See CA_1A-1A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-1A-3C-7A | - | 1 | See the CA_1A-1A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 100 | 0 |
| | | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-3A-7A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | See the CA_3A-3A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-7A-7A | CA_1A-3A<br>CA_1A-7A<br>CA_3A-7A | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 3 in Table 5.4.2A.1-3 | | | | | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 80 | 1 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | | |
| CA_1A-3A-7C | CA_1A-3A,<br>CA_1A-7A,<br>CA_3A-7A,<br>CA_7C | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | | | | Yes | Yes | Yes | | |
| | | 7 | See CA_7C Bandwidth Combination Set 2 in Table 5.4.2A.1-1 | | | | | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 80 | 1 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | See CA_7C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-3C-7A | | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CA_1A-3A, CA_1A-7A, CA_3A-7A, CA_3C | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 80 | 1 |
| | | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3C-7C | CA_1A-3A, CA_1A-7A, CA_3A-7A, CA_3C, CA_7C | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 7 | See CA_7C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-3A-8A | CA_1A-3A, CA_1A-8A, CA_3A-8A | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 8 | | Yes | Yes | Yes | | | | |
| | | 1 | | | Yes | Yes | | | 40 | 1 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 8 | | Yes | Yes | Yes | | | | |
| | | 1 | | | Yes | Yes | Yes | | 40 | 2 |
| | | 3 | | | Yes | Yes | Yes | | | |
| | | 8 | | Yes | Yes | Yes | | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 50 | 3 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| CA_1A-3A-3A-8A | - | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 8 | | | Yes | Yes | | | | |
| CA_1A-3C-8A | CA_1A-3A, CA_1A-8A, CA_3A-8A, CA_3C | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 8 | | Yes | Yes | Yes | | | | |
| CA_1A-3A-3A-42C | CA_1A-3A, CA_1A-42A, CA_3A-42A | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 42 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-3A-11A | - | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 11 | | | Yes | Yes | | | | |
| CA_1A-3A-18A | CA_1A-3A, CA_1A-18A[6], CA_3A-18A | 1 | | | Yes | Yes | Yes | Yes | 55 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 18 | | | Yes | Yes | Yes | | | |
| CA_1A-3A-19A | CA_1A-3A CA_1A-19A[6] CA_3A-19A | 1 | | | Yes | Yes | Yes | Yes | 55 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 19 | | | Yes | Yes | Yes | | | |
| CA_1A-3A-3A-19A | CA_1A-3A CA_1A-19A[6] CA_3A-19A | 1 | | | Yes | Yes | Yes | Yes | 75 | 0 |
| | | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 19 | | | Yes | Yes | Yes | | | |
| CA_1A-3A-26A | CA_1A-3A, CA_1A-26A, CA_3A-26A | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 26 | | | Yes | Yes | | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 55 | 1 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 26 | | | Yes | Yes | Yes | | | |
| CA_1A-3A-20A | CA_1A-3A, CA_3A-20A, CA_1A-20A | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-3A-20A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | See CA_3A-3A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_1A-3C-20A | | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | | |
| CA_1A-3A-21A | CA_1A-3A, CA_1A-21A, CA_3A-21A | 1 | | | Yes | Yes | Yes | Yes | 55 | 0 | |
| | | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 21 | | | Yes | Yes | Yes | | | | |
| CA_1A-3A-3A-21A | CA_1A-3A, CA_1A-21A, CA_3A-21A | 1 | | | Yes | Yes | Yes | Yes | 75 | 0 | |
| | | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 21 | | | Yes | Yes | Yes | | | | |
| CA_1A-3A-28A | CA_1A-3A, CA_1A-28A, CA_3A-28A[6] | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 | |
| | | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |
| CA_1A-1A-3A-28A | - | 1 | See CA_1A-1A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 | |
| | | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |
| CA_1A-3A-3A-28A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 | |
| | | 3 | See CA_3A-3A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |
| CA_1A-3C-28A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 | |
| | | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |
| CA_1A-3A-32A | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 | |
| | | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | | |
| CA_1A-3A-38A | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 | |
| | | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | | |
| CA_1A-3A-40A | CA_1A-3A | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 | |
| | | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 40 | | | Yes | Yes | Yes | Yes | | | |
| CA_1A-3A-40C | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 | |
| | | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 40 | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_1A-3C-40A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 | |
| | | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 40 | | | Yes | Yes | Yes | Yes | | | |
| CA_1A-3C-40C | - | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 | |
| | | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 40 | See CA_40C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_1A-3A-41A[9] | CA_1A-3A | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 | |
| | | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 41 | | | Yes | Yes | Yes | Yes | | | |
| CA_1A-3A-41C[9] | CA_1A-3A | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 | |
| | | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 41 | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_1A-3A-41D[9] | CA_1A-3A | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 | |
| | | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 41 | See CA_41D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_1A-3A-42A | CA_1A-3A, CA_1A-42A, CA_3A-42A | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 | |
| | | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | | |
| CA_1A-3A-3A-42A | CA_1A-3A, CA_1A-42A, CA_3A-42A | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 | |
| | | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_1A-3A-42C | CA_1A-3A, CA_1A-42A, CA_3A-42A | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-3A-43A | - | 1 | | | Yes | Yes | Yes | | 50 | 0 |
| | | 3 | | | Yes | Yes | Yes | | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-5A-40A | CA_1A-5A[6] | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 40 | | | | Yes | Yes | Yes | | |
| CA_1A-5A-41A[11] | - | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 41 | | | | | | Yes | | |
| CA_1A-5A-46A | CA_1A-5A[6] | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 46 | | | | | | Yes | | |
| CA_1A-5A-7A | CA_1A-5A[6] CA_1A-7A CA_5A-7A | 1 | | | Yes | Yes | | | 40 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 50 | 1 |
| | | 5 | | | Yes | Yes | | | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| CA_1A-5A-7A-7A | CA_1A-5A[6] CA_1A-7A CA_5A-7A | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 3 in Table 5.4.2A.1-3 | | | | | | | |
| CA_1A-5A-46C | CA_1A-5A[6] | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 46 | See CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-5A-46D | - | 1 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 46 | See CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-7A-8A | CA_1A-7A, CA_1A-8A | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 50 | 1 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| CA_1A-7A-7A-8A | - | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | | |
| | | 8 | | | Yes | Yes | | | | |
| CA_1A-7A-20A | - | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 60 | 1 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 60 | 2 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-7C-20A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | See CA_7C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-7A-26A | CA_1A-7A CA_1A-26A, CA_7A-26A | 1 | | | Yes | Yes | Yes | Yes | 55 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 26 | | | Yes | Yes | Yes | | | |
| CA_1A-7A-7A-26A | CA_1A-7A CA_1A-26A, CA_7A-26A | 1 | | | Yes | Yes | Yes | Yes | 75 | 0 |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 3 in Table 5.4.2A.1-3 | | | | | | | |
| | | 26 | | | Yes | Yes | Yes | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_1A-7A-28A | CA_1A-7A, CA_1A-28A, CA_7A-28A | 1 | | | Yes | Yes | Yes | Yes | 55 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 60 | 1 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 28 | | | | Yes | Yes | Yes | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 60 | 2 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-7C-28A | CA_1A-7A, CA_1A-28A, CA_7A-28A, CA_7C | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | See CA_7C Bandwidth Combination Set 2 in Table 5.4.2A.1-1 | | | | | | | |
| | | 28 | | | | Yes | Yes | Yes | | |
| CA_1A-7A-32A | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-7A-40A | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-7A-40C | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 40 | See CA_40C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-7A-42A | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-7A-46A | CA_1A-7A | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 46 | | | | | | Yes | | |
| CA_1A-7A-46C | CA_1A-7A | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 46 | See CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-7A-46D | - | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-8A-11A | - | 1 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 11 | | | Yes | Yes | | | | |
| CA_1A-8A-20A | - | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-8A-28A | - | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 8 | | Yes | Yes | Yes | | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-8A-38A | - | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-8A-40A | CA_1A-8A | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 8 | | Yes | Yes | Yes | | | | |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-8A-40C | - | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 40 | See CA_40C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-11A-18A | - | 1 | | | Yes | Yes | Yes | Yes | 45 | 0 |
| | | 11 | | | Yes | Yes | | | | |
| | | 18 | | | Yes | Yes | Yes | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 40 | 1 |
| | | 11 | | | Yes | Yes | | | | |
| | | 18 | | | Yes | Yes | | | | |
| | - | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_1A-11A-28A | | 11 | | | Yes | Yes | | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-18A-28A | CA_1A-18A[6], CA_1A-28A, CA_18A-28A | 1 | | | Yes | Yes | Yes | Yes | 45 | 0 |
| | | 18 | | | Yes | Yes | Yes | | | |
| | | 28 | | | Yes | Yes | | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 40 | 1 |
| | | 18 | | | Yes | Yes | | | | |
| | | 28 | | | Yes | Yes | | | | |
| CA_1A-19A-21A | CA_1A-19A[6], CA_1A-21A, CA_19A-21A | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 21 | | | Yes | Yes | Yes | | | |
| CA_1A-19A-28A | - | 1 | | | Yes | Yes | Yes | Yes | 45 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 28 | | | Yes | Yes | | | | |
| CA_1A-19A-42A | CA_1A-19A[6], CA_1A-42A, CA_19A-42A[6] | 1 | | | Yes | Yes | Yes | Yes | 55 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-19A-42C | CA_1A-19A[6], CA_1A-42A, CA_19A-42A[6] | 1 | | | Yes | Yes | Yes | Yes | 75 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-20A-28A[12] | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-20A-32A | - | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 20 | | | Yes | Yes | | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-20A-42A | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-20A-43A | - | 1 | | | Yes | Yes | Yes | | 40 | 0 |
| | | 20 | | | Yes | | | | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-21A-28A | CA_1A-21A, CA_1A-28A, CA_21A-28A | 1 | | | Yes | Yes | Yes | Yes | 45 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 28 | | | Yes | Yes | | | | |
| CA_1A-21A-42A | CA_1A-21A, CA_1A-42A, CA_21A-42A | 1 | | | Yes | Yes | Yes | Yes | 55 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-21A-42C | CA_1A-21A CA_1A-42A CA_21A-42A | 1 | | | Yes | Yes | Yes | Yes | 75 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-21A-42D | - | 1 | | | Yes | Yes | Yes | Yes | 95 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | See CA_42D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-28A-42A | CA_1A-28A, CA_1A-42A, CA_28A-42A | 1 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 28 | | | Yes | Yes | | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-28A-42C | CA_1A-28A, CA_1A-42A, CA_28A-42A | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 28 | | | Yes | Yes | | | | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-32A-42A | - | 1 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-32A-43A | - | 1 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-41A-42A[10] | CA_1A-42A | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 41 | | | | Yes | Yes | Yes | | |
| | | 42 | | | | Yes | Yes | Yes | | |
| CA_1A-41A-42C[10] | CA_1A-42A, CA_42C, CA_1A-42C | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 41 | | | | Yes | Yes | Yes | | |
| | | 42 | See CA_42C Bandwidth combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-41C-42A[10] | CA_1A-42A | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 41 | See CA_41C Bandwidth combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 42 | | | | Yes | Yes | Yes | | |
| CA_1A-41C-42C[10] | CA_1A-42A, CA_42C, CA_1A-42C | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 41 | See CA_41C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 42 | See CA_42C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-42A-43A | - | 1 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-4A-5A | CA_2A-4A | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | | |
| CA_2A-2A-4A-5A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 70 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | | |
| CA_2A-2A-12A-66A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 90 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-2A-14A-66A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 90 | 0 |
| | | 14 | | | Yes | Yes | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-4A-5B | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-4A-7A | CA_2A-4A | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-4A-7A-7A | CA_2A-4A | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | See the CA_7A-7A Bandwidth combination set 1 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-4A-7C | . | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | See CA_7C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-4A-4A-5A | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 5 | | | Yes | Yes | | | | |
| CA_2A-4A-12A | CA_2A-4A CA_4A-12A | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 12 | | | Yes | Yes | | | | |
| CA_2A-4A-12A-12A | - | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 12 | See CA_12A-12A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_2A-4A-12B | - | 2 | | | Yes | Yes | Yes | Yes | 55 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 12 | See CA_12B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-2A-4A-12A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 70 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 12 | | | Yes | Yes | | | | |
| CA_2A-4A-4A-12A | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 12 | | | Yes | Yes | | | | |
| CA_2A-4A-13A | - | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 13 | | | | Yes | | | | |
| CA_2A-4A-28A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-4A-29A | CA_2A-4A | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 29 | | | Yes | Yes | | | | |
| CA_2A-4A-30A | - | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_2A-4A-71A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-5A-7A | - | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| CA_2A-5A-12A | - | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 12 | | | Yes | Yes | | | | |
| CA_2A-2A-5A-12A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 12 | | | Yes | Yes | | | | |
| CA_2A-5A-12A-12A | - | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 12 | See CA_12A-12A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-5A-46C | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-2A-5A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 70 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-2A-5A-66A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 90 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-2A-5A-66B | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 70 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 66 | See CA_66B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-2A-5A-66C | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 90 | 0 |
| | | 5 | | | Yes | Yes | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 66 | See CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-2A-7A-12A | - | 2 | See CA_2A-2A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 70 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 12 | | | Yes | Yes | | | | |
| CA_2A-2A-7A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-2A-12B-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 75 | 0 |
| | | 12 | See CA_12B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-2A-13A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 70 | 0 |
| | | 13 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-5A-12B | - | 2 | | | Yes | Yes | Yes | Yes | 45 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 12 | See CA_12B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-5A-13A | CA_2A-13A[6] | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 13 | | | | Yes | | | | |
| CA_2A-5A-28A | - | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-5A-29A | - | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 29 | | | Yes | Yes | | | | |
| CA_2A-5A-30A | - | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_2A-2A-5A-30A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_2C-5A-30A | - | 2 | See CA_2C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_2A-5B-30A | - | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_2C-5B-30A | - | 2 | See CA_2C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 70 | 0 |
| | | 5 | See CA_5B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_2A-5A-46A | - | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 46 | | | | | | Yes | | |
| CA_2A-5A-46D | - | 2 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-5A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-5A-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 5 | | | Yes | Yes | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_2A-5B-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | | 80 | 0 |
| | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_2A-5A-66B | | 2 | | | Yes | Yes | Yes | Yes | | 50 | 0 |
| | | 5 | | | Yes | Yes | | | | | |
| | | 66 | See CA_66B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-5A-66C | | 2 | | | Yes | Yes | Yes | Yes | | 70 | 0 |
| | | 5 | | | Yes | Yes | | | | | |
| | | 66 | See CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-5A-66D | - | 2 | | | Yes | Yes | Yes | Yes | | 90 | 0 |
| | | 5 | | | Yes | Yes | | | | | |
| | | 66 | See CA_66D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-5B-66A | | 2 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-5B-66B | - | 2 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 66 | See CA_66B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-5B-66C | - | 2 | | | Yes | Yes | Yes | Yes | | 80 | 0 |
| | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 66 | See CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-7A-12A | - | 2 | | | Yes | Yes | Yes | Yes | | 50 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | | |
| | | 12 | | | Yes | Yes | | | | | |
| CA_2A-7A-12B | - | 2 | | | Yes | Yes | Yes | Yes | | 55 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | | |
| | | 12 | See CA_12B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-7A-28A | - | 2 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-7A-30A | - | 2 | | | Yes | Yes | Yes | Yes | | 50 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | | |
| | | 30 | | | Yes | Yes | | | | | |
| CA_2A-7A-46A | - | 2 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | | |
| | | 46 | | | | Yes | | Yes | | | |
| CA_2A-7A-66A | - | 2 | | | Yes | Yes | Yes | Yes | | 60 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-7A-7A-66A | - | 2 | | | Yes | Yes | Yes | Yes | | 80 | 0 |
| | | 7 | See CA_7A-7A Bandwidth combination set 1 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-7C-66A | - | 2 | | | Yes | Yes | Yes | Yes | | 80 | 0 |
| | | 7 | See CA_7C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-7A-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | | 80 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 66 | See CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-12A-30A | CA_2A-12A[6] | 2 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_2A-2A-12A-30A | - | 2 | See CA_2A-2A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_2C-12A-30A | - | 2 | See CA_2C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 60 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_2A-12A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| | | 2 | | | Yes | Yes | | | 40 | 1 |
| | | 12 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-2A-12A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 70 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-12A-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-12A-66C | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 66 | See CA_66C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-12B-66A | - | 2 | | | Yes | Yes | Yes | Yes | 55 | 0 |
| | | 12 | See CA_12B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-12B-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 75 | 0 |
| | | 12 | See CA_12B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-13A-46A | - | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 13 | | | Yes | Yes | | | | |
| | | 46 | | | | | | Yes | | |
| CA_2A-13A-46C | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 13 | | | Yes | Yes | | | | |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-13A-46D | - | 2 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 13 | | | Yes | Yes | | | | |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-13A-48A | - | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 13 | | | Yes | Yes | | | | |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-13A-48A-48A | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 13 | | | Yes | Yes | | | | |
| | | 48 | See CA_48A-48A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-13A-48C | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 13 | | | Yes | Yes | | | | |
| | | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-13A-48D | - | 2 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 13 | | | Yes | Yes | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 48 | See CA_48D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-13A-48A-48C | - | 2 | | | Yes | Yes | Yes | Yes | | 90 | 0 |
| | | 13 | | | Yes | Yes | | | | | |
| | | 48 | See CA_48A-48C Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_2A-13A-66A | - | 2 | | | Yes | Yes | Yes | Yes | | 50 | 0 |
| | | 13 | | | Yes | Yes | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-13A-66D | - | 2 | | | Yes | Yes | Yes | Yes | | 90 | 0 |
| | | 13 | | | Yes | Yes | | | | | |
| | | 66 | See CA_66D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-13A-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | | 70 | 0 |
| | | 13 | | | Yes | Yes | | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_2A-13A-66A-66B | - | 2 | | | Yes | Yes | Yes | Yes | | 70 | 0 |
| | | 13 | | | Yes | Yes | | | | | |
| | | 66 | See CA_66A-66B Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_2A-13A-66A-66C | - | 2 | | | Yes | Yes | Yes | Yes | | 90 | 0 |
| | | 13 | | | Yes | Yes | | | | | |
| | | 66 | See CA_66A-66C Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_2A-13A-66B | - | 2 | | | Yes | Yes | Yes | Yes | | 50 | 0 |
| | | 13 | | | Yes | Yes | | | | | |
| | | 66 | See CA_66B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-13A-66C | - | 2 | | | Yes | Yes | Yes | Yes | | 70 | 0 |
| | | 13 | | | Yes | Yes | | | | | |
| | | 66 | See CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-14A-30A | - | 2 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 14 | | | Yes | Yes | | | | | |
| | | 30 | | | Yes | Yes | | | | | |
| CA_2A-2A-14A-30A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 14 | | | Yes | Yes | | | | 60 | 0 |
| | | 30 | | | Yes | Yes | | | | | |
| CA_2A-14A-66A | - | 2 | | | Yes | Yes | Yes | Yes | | 50 | 0 |
| | | 14 | | | Yes | Yes | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-2A-14A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 14 | | | Yes | Yes | | | | 70 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-14A-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | | 70 | 0 |
| | | 14 | | | Yes | Yes | | | | | |
| | | 66 | See CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_2A-14A-66A-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | | 90 | 0 |
| | | 14 | | | Yes | Yes | | | | | |
| | | 66 | See CA_66A-66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_2A-29A-30A | - | 2 | | | Yes | Yes | Yes | Yes | | 40 | 0 |
| | | 29 | | | Yes | Yes | | | | | |
| | | 30 | | | Yes | Yes | | | | | |
| CA_2A-2A-29A-30A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 29 | | | Yes | Yes | | | | 60 | 0 |
| | | 30 | | | Yes | Yes | | | | | |
| CA_2C-29A-30A | - | 2 | See CA_2C Bandwidth Combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 29 | | | Yes | Yes | | | | 60 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 30 | | | Yes | Yes | | | | |
| CA_2A-29A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 29 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-2A-30A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 70 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-30A-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-30A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-46A-48A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 46 | | | | | | Yes | | |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-46A-48C | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | | | | | | Yes | | |
| | | 48 | See the CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-46A-48D | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 46 | | | | | | Yes | | |
| | | 48 | See CA_48D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-46A-48E | - | 2 | | | Yes | Yes | Yes | Yes | 120 | 0 |
| | | 46 | | | | | | Yes | | |
| | | 48 | See the CA_48E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-46C-48A | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | See the CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-46C-48C | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 46 | See CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-46D-48A | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 46 | See CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-46A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 46 | | | | | | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-46A-46A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | See CA_46A-46A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-46C-48D | - | 2 | | | Yes | Yes | Yes | Yes | 120 | 0 |
| | | 46 | See the CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 48 | See the CA_48D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-46C-48E | - | 2 | | | Yes | Yes | Yes | Yes | 140 | 0 |
| | | 46 | See the CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 48 | See the CA_48E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_2A-46C-66A | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | See CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_2A-46A-46C-66A | | 46 | See CA_46A-46C Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-46D-66A | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 | |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-46D-48C | - | 2 | | | Yes | Yes | Yes | Yes | 120 | 0 | |
| | | 46 | See the CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 48 | See the CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-46E-48A | - | 2 | | | Yes | Yes | Yes | Yes | 120 | 0 | |
| | | 46 | See the CA_46E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 48 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-46E-66A | - | 2 | | | Yes | Yes | Yes | Yes | 120 | 0 | |
| | | 46 | See CA_46E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-46E-48C | | 2 | | | Yes | Yes | Yes | Yes | 140 | 0 | |
| | | 46 | See the CA_46E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 48 | See the CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| CA_2A-48A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 | |
| | | 48 | | | Yes | Yes | Yes | Yes | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-48C-66A | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 | |
| | | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-48D-66A | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 | |
| | | 48 | See CA_48D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-48A-48A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 | |
| | | 48 | See CA_48A-48A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-48A-48C-66A | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 | |
| | | 48 | See CA_48A-48C Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-66A-71A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-2A-66A-71A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-66A-66A-71A | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_2A-66C-71A | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 | |
| | | 66 | See CA_66C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_3A-5A-7A | CA_3A-5A, CA_3A-7A, CA_5A-7A | 3 | | | | Yes | Yes | Yes | 50 | 0 | |
| | | 5 | | | Yes | Yes | | | | | |
| | | 7 | | | | Yes | Yes | Yes | | | |
| CA_3A-5A-7A-7A | | 3 | | | | Yes | Yes | Yes | 70 | 0 | |
| | | 5 | | | Yes | Yes | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CA_3A-5A, CA_3A-7A, CA_5A-7A | 7 | See CA_7A-7A Bandwidth Combination Set 3 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_3A-5A-40A | CA_3A-5A | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 5 | | | Yes | Yes | | | 50 | 0 | |
| | | 40 | | | | Yes | Yes | Yes | | | |
| | | 3 | | Yes | Yes | Yes | | | | | |
| | | 5 | | Yes | Yes | Yes | | | 40 | 1 | |
| | | 40 | | | | | | Yes | | | |
| CA_3A-5A-40A-40A | - | 3 | | | Yes | Yes | | | | | |
| | | 5 | | | Yes | Yes | | | 60 | 0 | |
| | | 40 | See CA_40A-40A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| CA_3A-5A-41A | - | 3 | | | Yes | Yes | Yes | Yes | | | |
| | | 5 | | | Yes | Yes | | | 50 | 0 | |
| | | 41 | | | | | | Yes | | | |
| CA_3C-7A-8A | - | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 70 | 0 | |
| | | 7 | | | Yes | Yes | Yes | Yes | | | |
| | | 8 | | | Yes | Yes | | | | | |
| CA_3A-3A-7A-8A | CA_3A-7A, CA_3A-8A, CA_7A-8A | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 70 | 0 | |
| | | 7 | | | Yes | Yes | Yes | Yes | | | |
| | | 8 | | | Yes | Yes | | | | | |
| | | 3 | See CA_3A-3A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | 60 | 1 | |
| | | 7 | | | Yes | Yes | Yes | Yes | | | |
| | | 8 | | | Yes | Yes | | | | | |
| CA_3A-3A-7A-7A-8A | CA_3A-7A, CA_3A-8A, CA_7A-8A | 3 | See CA_3A-3A Bandwidth Combination Set 0 in table 5.4.2A.1-3 | | | | | | 90 | 0 | |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 1 in table 5.4.2A.1-3 | | | | | | | | |
| | | 8 | | | Yes | Yes | | | | | |
| | | 3 | See CA_3A-3A Bandwidth Combination Set 1 in table 5.4.2A.1-3 | | | | | | 70 | 1 | |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 2 in table 5.4.2A.1-3 | | | | | | | | |
| | | 8 | | | Yes | Yes | | | | | |
| CA_3A-7A-7A-8A | CA_3A-7A, CA_3A-8A, CA_7A-8A | 3 | | | Yes | Yes | Yes | Yes | 70 | 0 | |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 8 | | | Yes | Yes | | | | | |
| | | 3 | | | Yes | Yes | Yes | Yes | 60 | 1 | |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 2 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 8 | | | Yes | Yes | | | | | |
| CA_3A-7A-8A | CA_3A-7A, CA_3A-8A, CA_7A-8A | 3 | | | Yes | Yes | Yes | | 40 | 0 | |
| | | 7 | | | | Yes | Yes | | | | |
| | | 8 | | | Yes | Yes | | | | | |
| | | 3 | | | Yes | Yes | Yes | Yes | 50 | 1 | |
| | | 7 | | | | Yes | Yes | Yes | | | |
| | | 8 | | | Yes | Yes | | | | | |
| | | 3 | | | Yes | Yes | Yes | Yes | 50 | 2 | |
| | | 7 | | | Yes | Yes | Yes | Yes | | | |
| | | 8 | | | Yes | Yes | | | | | |
| CA_3A-7A-20A | CA_3A-7A, CA_3A-20A, CA_7A-20A | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 | |
| | | 7 | | | | Yes | Yes | Yes | | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | | |
| | | 3 | | | Yes | Yes | Yes | Yes | 60 | 1 | |
| | | 7 | | | Yes | Yes | Yes | Yes | | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | | |
| CA_3A-3A-7A-20A | - | 3 | See CA_3A-3A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 | |
| | | 7 | | | Yes | Yes | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 20 | | | | Yes | Yes | Yes | | |
| CA_3C-7A-20A | - | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 1 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| CA_3C-7C-20A | - | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 100 | 0 |
| | | 7 | See CA_7C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-7C-20A | - | 3 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | See CA_7C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-7A-26A | CA_3A-7A, CA_3A-26A, CA_7A-26A | 3 | | | Yes | Yes | Yes | Yes | 55 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 26 | | | Yes | Yes | Yes | | | |
| CA_3A-7A-7A-26A | CA_3A-7A, CA_3A-26A, CA_7A-26A | 3 | | | Yes | Yes | Yes | Yes | 75 | 0 |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 3 in Table 5.4.2A.1-3 | | | | | | | |
| | | 26 | | | Yes | Yes | Yes | | | |
| CA_3A-7A-28A | CA_3A-7A, CA_3A-28A[6], CA_7A-28A | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-3A-7A-28A | - | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-7C-28A | CA_3A-7A, CA_7C, CA_7A-28A | 3 | | | | Yes | Yes | Yes | 80 | 0 |
| | | 7 | See CA_7C Bandwidth Combination Set 2 in Table 5.4.2A.1-1 | | | | | | | |
| | | 28 | | | | Yes | Yes | Yes | | |
| | | 3 | | | | Yes | Yes | Yes | 80 | 1 |
| | | 7 | See CA_7C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| | | 28 | | | | Yes | Yes | Yes | | |
| CA_3C-7A-28A | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 28 | | | | Yes | Yes | Yes | | |
| CA_3C-7C-28A | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 100 | 0 |
| | | 7 | See CA_7C Bandwidth Combination Set 2 in Table 5.4.2A.1-1 | | | | | | | |
| | | 28 | | | | Yes | Yes | Yes | | |
| CA_3A-7A-32A | CA_3A-7A | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| CA_3C-7A-32A | - | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-7A-38A[7] | - | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_3C-7A-38A[7] | - | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_3A-7A-40A | - | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-7A-40C | - | 3 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 40 | See CA_40C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-7A-42A | - | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-7A-46A | - | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 46 | | | | | | Yes | | |
| CA_3A-7A-46C | - | 3 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-7A-46D | - | 3 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-8A-11A | - | 3 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 11 | | | Yes | Yes | | | | |
| CA_3A-8A-20A | - | 3 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 20 | | | Yes | Yes | | | | |
| CA_3A-8A-28A | - | 3 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 8 | | Yes | Yes | Yes | | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-8A-32A | - | 3 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 8 | | Yes | Yes | Yes | | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-8A-38A | - | 3 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_3C-8A-38A | - | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 70 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-8A-40A | CA_3A-8A | 3 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 8 | | Yes | Yes | Yes | | | | |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-8A-40C | - | 3 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 40 | See CA_40C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-11A-18A | CA_3A-11A, CA_3A-18A, CA_11A-18A | 3 | | | Yes | Yes | Yes | Yes | 45 | 0 |
| | | 11 | | | Yes | Yes | | | | |
| | | 18 | | | Yes | Yes | Yes | | | |
| CA_3A-11A-26A | CA_3A-11A, CA_3A-26A, CA_11A-26A | 3 | | | Yes | Yes | Yes | Yes | 45 | 0 |
| | | 11 | | | Yes | Yes | | | | |
| | | 26 | | | Yes | Yes | Yes | | | |
| CA_3A-11A-28A | - | 3 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 11 | | | Yes | Yes | | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_3A-19A-21A | CA_3A-19A, CA_3A-21A, CA_19A-21A | 3 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 21 | | | Yes | Yes | Yes | | | |
| CA_3A-3A-19A-21A | CA_3A-19A, CA_3A-21A, CA_19A-21A | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 70 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 21 | | | Yes | Yes | Yes | | | |
| CA_3A-19A-42A | CA_3A-19A, CA_3A-42A, CA_19A-42A[6] | 3 | | | Yes | Yes | Yes | Yes | 55 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-19A-42C | CA_3A-19A, CA_3A-42A, CA_19A-42A[6] | 3 | | | Yes | Yes | Yes | Yes | 75 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-19A-42D | - | 3 | | | Yes | Yes | Yes | Yes | 95 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 42 | See CA_42D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-20A-28A[12] | - | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-3A-20A-28A[12] | - | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_3C-20A-28A[12] | - | 3 | See CA_3C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-20A-32A | CA_3A-20A | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-20A-42A | - | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-20A-43A | - | 3 | | | Yes | Yes | Yes | | 40 | 0 |
| | | 20 | | | Yes | | | | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-21A-28A | CA_3A-21A, CA_3A-28A[6], CA_21A-28A | 3 | | | Yes | Yes | Yes | Yes | 45 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 28 | | | Yes | Yes | | | | |
| CA_3A-21A-42A | CA_3A-21A, CA_3A-42A, CA_21A-42A | 3 | | | Yes | Yes | Yes | Yes | 55 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-21A-42C | CA_3A-21A, CA_3A-42A, CA_21A-42A | 3 | | | Yes | Yes | Yes | Yes | 75 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-21A-42D | - | 3 | | | Yes | Yes | Yes | Yes | 95 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | See CA_42D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-28A-38A | - | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_3C-28A-38A | - | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-28A-40A | CA_3A-28A[6] | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-28A-40C | CA_3A-28A[6] | 3 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| | | 40 | See CA_40C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-28A-40D | - | 3 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| | | 40 | See CA_40D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-28A-41A | CA_3A-41A | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| | | 41 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-28A-41C | CA_3A-41A | 3 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| | | 41 | See CA_41C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-28A-42A | CA_3A-28A[6], CA_3A-42A, CA_28A-42A | 3 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 28 | | | Yes | Yes | | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-28A-42C | CA_3A-28A[6], CA_3A-42A, CA_28A-42A, CA_42C | 3 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 28 | | | Yes | Yes | | | | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-28A-42D | - | 3 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 28 | | | Yes | Yes | | | | |
| | | 42 | See CA_42D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-32A-42A | - | 3 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-32A-43A | - | 3 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-41A-42A | CA_3A-41A, CA_41A-42A, CA_3A-42A | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 41 | | | | Yes | Yes | Yes | | |
| | | 42 | | | | Yes | Yes | Yes | | |
| CA_3A-41A-42C | CA_3A-41A, CA_3A-41C, CA_3A-42A, CA_41A-42A, CA_41A-42C, CA_42C | 3 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 41 | | | | Yes | Yes | Yes | | |
| | | 42 | See CA_42C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-41C-42A | CA_3A-41A, CA_3A-41C, CA_3A-42A, CA_41A-42A, CA_41C, CA_41C-42A | 3 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 41 | See CA_41C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 42 | | | | Yes | Yes | Yes | | |
| CA_3A-41C-42C | CA_3A-41A, CA_3A-41C, CA_3A-42A, CA_3A-42C, CA_41A-42A, CA_41A-42C CA_41C, CA_41C-41A, CA_42C | 3 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 41 | See CA_41C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 42 | See CA_42C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-42A-43A | - | 3 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_4A-5A-12A | - | 4 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 12 | | | Yes | Yes | | | | |
| | - | 4 | | | Yes | Yes | Yes | Yes | 40 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_4A-5A-12A-12A | | 5 | | | Yes | Yes | | | | |
| | | 12 | See CA_12A-12A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_4A-5A-12B | - | 4 | | | Yes | Yes | Yes | Yes | 45 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 12 | See CA_12B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_4A-4A-5A-12A | - | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 12 | | | Yes | Yes | | | | |
| CA_4A-5A-13A | CA_4A-13A[6] | 4 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 13 | | | | Yes | | | | |
| CA_4A-5A-29A | - | 4 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 29 | | | Yes | Yes | | | | |
| CA_4A-5A-30A | - | 4 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_4A-4A-5A-30A | - | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_4A-4A-5B-30A | - | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 70 | 0 |
| | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_4A-5B-30A | - | 4 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_4A-7A-12A | - | 4 | | | Yes | Yes | | | 40 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 12 | | | Yes | Yes | | | | |
| | | 4 | | | Yes | Yes | Yes | Yes | 50 | 1 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 12 | | | Yes | Yes | | | | |
| CA_4A-7A-28A | - | 4 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_4A-12A-30A | CA_4A-12A | 4 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_4A-4A-12A-30A | - | 4 | See CA_4A-4A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_4A-29A-30A | - | 4 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | | 29 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_4A-4A-29A-30A | - | 4 | See CA_4A-4A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | 60 | 0 |
| | | 29 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_5A-7A-28A | - | 5 | | | Yes | Yes | | | 50 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-7A-46A | CA_5A-7A | 5 | | | Yes | Yes | | | 50 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 46 | | | | | | Yes | | |
| | CA_5A-7A | 5 | | | Yes | Yes | | | 70 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_5A-7A-46C | | 7 | | | | Yes | Yes | Yes | | |
| | | 46 | See CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-7A-46D | - | 5 | | | Yes | Yes | | | 90 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 46 | See CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-12A-46A | - | 5 | | | Yes | Yes | | | 40 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 46 | | | | | | Yes | | |
| CA_5A-12A-46C | - | 5 | | | Yes | Yes | | | 60 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-12A-46D | - | 5 | | | Yes | Yes | | | 80 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-12A-48A | - | 5 | | | Yes | Yes | | | 40 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-12A-48C | - | 5 | | | Yes | Yes | | | 60 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-12A-48D | - | 5 | | | Yes | Yes | | | 80 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 48 | See the CA_48D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_5A-30A-66A | - | 5 | | | Yes | Yes | | | 40 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-30A-66A-66A | - | 5 | | | Yes | Yes | | | 60 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5B-30A-66A | - | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 50 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_5B-30A-66A-66A | - | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | 70 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_5A-46A-66A | - | 5 | | | Yes | Yes | | | 50 | 0 |
| | | 46 | | | | | | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_7A-8A-20A | - | 7 | | | | Yes | Yes | Yes | 40 | 0 |
| | | 8 | | Yes | Yes | Yes | | | | |
| | | 20 | | | Yes | Yes | | | | |
| CA_7A-8A-38A[13] | - | 7 | | | | Yes | Yes | Yes | 50 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_7A-8A-40A | - | 7 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 8 | | | Yes | Yes | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-12A-66A | - | 5 | | | Yes | Yes | | | 40 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-40A-41A | - | 5 | | | Yes | Yes | | | 50 | 0 |
| | | 40 | | | | Yes | | Yes | | |
| | | 41 | | | | | | Yes | | |
| CA_5A-46C-66A | - | 5 | | | Yes | Yes | | | 70 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_5A-46D-66A | - | 5 | | | Yes | Yes | | | 90 | 0 |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_7A-8A-40C | - | 7 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 40 | See CA_40C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_7A-12A-66A | - | 7 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_7A-12B-66A | - | 7 | | | Yes | Yes | Yes | Yes | 55 | 0 |
| | | 12 | See CA_12B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_7A-20A-28A[12] | - | 7 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_7A-20A-32A | CA_7A-20A | 7 | | | | Yes | Yes | Yes | 60 | 0 |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| CA_7A-20A-38A[8] | - | 7 | | | | Yes | Yes | Yes | 60 | 0 |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_7A-20A-42A | - | 7 | | | | Yes | Yes | Yes | 60 | 0 |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_7A-28A-38A[14] | - | 7 | | | | Yes | Yes | Yes | 60 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_7A-30A-66A | - | 7 | | | Yes | Yes | Yes | Yes | 50 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_7A-46A-66A | - | 7 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 46 | | | | Yes | | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_8A-11A-28A | - | 8 | | | Yes | Yes | | | 40 | 0 |
| | | 11 | | | Yes | Yes | | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_8A-20A-28A[15] | - | 8 | | | Yes | Yes | | | 50 | 0 |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_8A-28A-41A | - | 8 | | | Yes | Yes | | | 50 | 0 |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| | | 41 | | | Yes | Yes | Yes | Yes | | |
| | - | 8 | | | Yes | Yes | | | 50 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_8A-39A-41A | | 39 | | | | Yes | Yes | Yes | | |
| | | 41 | | | | | | Yes | | |
| CA_12A-30A-66A | - | 12 | | | Yes | Yes | | | 40 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_12A-30A-66A-66A | - | 12 | | | Yes | Yes | | | 60 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_13A-46A-66A | - | 13 | | | Yes | Yes | | | 50 | 0 |
| | | 46 | | | | | | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_13A-46C-66A | - | 13 | | | Yes | Yes | | | 70 | 0 |
| | | 46 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_13A-46D-66A | - | 13 | | | Yes | Yes | | | 90 | 0 |
| | | 46 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_13A-48A-66A | - | 13 | | | Yes | Yes | | | 50 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_13A-48A-48A-66A | - | 13 | | | Yes | Yes | | | 70 | 0 |
| | | 48 | See CA_48A-48A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_13A-48C-66A | - | 13 | | | Yes | Yes | | | 70 | 0 |
| | | 48 | See CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_13A-48A-66B | - | 13 | | | Yes | Yes | | | 50 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| | | 66 | See CA_66B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_13A-48A-66C | - | 13 | | | Yes | Yes | | | 70 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| | | 66 | See CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_14A-30A-66A | - | 14 | | | Yes | Yes | | | 40 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_14A-30A-66A-66A | - | 14 | | | Yes | Yes | | | 60 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | See CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_19A-21A-42A | CA_19A-21A, CA_19A-42A[6], CA_21A-42A | 19 | | | Yes | Yes | Yes | | 50 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_19A-21A-42C | CA_19A-21A, CA_19A-42A[6], CA_21A-42A | 19 | | | Yes | Yes | Yes | | 70 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_20A-32A-42A | - | 20 | | | Yes | | | | 45 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_20A-32A-43A | - | 20 | | | Yes | | | | 45 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_20A-38A-40A | - | 20 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 38 | | | | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 40 | | | | Yes | Yes | Yes | | |
| CA_20A-38A-40A-40A | - | 20 | | | Yes | Yes | Yes | | 75 | 0 |
| | | 38 | | | | Yes | Yes | Yes | | |
| | | 40 | See CA_40A-40A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | | |
| CA_20A-38A-40C | - | 20 | | | Yes | Yes | Yes | | 75 | 0 |
| | | 38 | | | | Yes | Yes | Yes | | |
| | | 40 | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_20A-38A-40D | - | 20 | | | Yes | Yes | Yes | | 95 | 0 |
| | | 38 | | | | Yes | Yes | Yes | | |
| | | 40 | See CA_40D Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_21A-28A-42A | CA_21A-28A, CA_21A-42A, CA_28A-42A | 21 | | | Yes | Yes | Yes | | 45 | 0 |
| | | 28 | | | Yes | Yes | | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_21A-28A-42C | CA_21A-28A, CA_21A-42A, CA_28A-42A | 21 | | | Yes | Yes | Yes | | 65 | 0 |
| | | 28 | | | Yes | Yes | | | | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_25A-26A-41A | - | 25 | | Yes | Yes | Yes | Yes | Yes | 55 | 0 |
| | | 26 | Yes | Yes | Yes | Yes | Yes | | | |
| | | 41 | | | Yes | Yes | Yes | Yes | | |
| CA_25A-25A-26A-41A | - | 25 | See CA_25A-25A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | 65 | 0 |
| | | 26 | | Yes | Yes | | | | | |
| | | 41 | | | Yes | Yes | Yes | Yes | | |
| CA_25A-25A-26A-41C | - | 25 | See CA_25A-25A Bandwidth Combination Set 1 in Table 5.4.2A.1-3 | | | | | | 85 | 0 |
| | | 26 | | Yes | Yes | | | | | |
| | | 41 | See CA_41C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_25A-26A-41C | - | 25 | | Yes | Yes | Yes | Yes | Yes | 75 | 0 |
| | | 26 | Yes | Yes | Yes | Yes | Yes | | | |
| | | 41 | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_28A-41A-42A | CA_41A-42A | 28 | | | Yes | Yes | | | 50 | 0 |
| | | 41 | | | | Yes | Yes | Yes | | |
| | | 42 | | | | Yes | Yes | Yes | | |
| CA_28A-41A-42C | CA_41A-42A, CA_42C | 28 | | | Yes | Yes | | | 70 | 0 |
| | | 41 | | | | Yes | Yes | Yes | | |
| | | 42 | See CA_42C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_28A-41C-42A | CA_41A-42A | 28 | | | Yes | Yes | | | 70 | 0 |
| | | 41 | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 42 | | | | Yes | Yes | Yes | | |
| CA_28A-41C-42C | CA_42C | 28 | | | Yes | Yes | | | 90 | 0 |
| | | 41 | See CA_41C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 42 | See CA_42C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_29A-30A-66A | - | 29 | | | Yes | Yes | | | 40 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_29A-30A-66A-66A | - | 29 | | | Yes | Yes | | | 60 | 0 |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | See CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_29A-46A-66A | - | 29 | | | Yes | Yes | | | 50 | 0 |
| | | 46 | | | | | | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| | - | 29 | | | Yes | Yes | | | 45 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_29A-66A-70A | | 66 | | | Yes | Yes | Yes | Yes | | |
| | | 70 | | | Yes | Yes | Yes | | | |
| CA_29A-66A-66A-70A | - | 29 | | | Yes | Yes | | | 65 | 0 |
| | | 66 | See CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 70 | | | Yes | Yes | Yes | | | |
| CA_29A-66A-70C | - | 29 | | | Yes | Yes | | | 55 | 0 |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| | | 70 | See CA_70C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_29A-66A-66A-70C | - | 29 | | | Yes | Yes | | | 75 | 0 |
| | | 66 | See the CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 70 | See the CA_70C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_29A-66C-70A | - | 29 | | | Yes | Yes | | | 65 | 0 |
| | | 66 | See CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 70 | | | Yes | Yes | Yes | | | |
| CA_29A-66C-70C | - | 29 | | | Yes | Yes | | | 75 | 0 |
| | | 66 | See the CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 70 | See the CA_70C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_32A-42A-43A | - | 32 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_46A-48A-66A | - | 46 | | | | | | Yes | 60 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_46A-48A-71A | - | 46 | | | | | | Yes | 60 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| CA_46C-48A-48A-71A | - | 46 | See CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 100 | 0 |
| | | 48 | See CA_48A-48A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| CA_46A-48C-66A | - | 46 | | | | | | Yes | 80 | 0 |
| | | 48 | See the CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_46A-48D-66A | - | 46 | | | | | | Yes | 100 | 0 |
| | | 48 | See the CA_48D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_46A-48E-66A | - | 46 | | | | | | Yes | 120 | 0 |
| | | 48 | See the CA_48E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_46C-48A-66A | - | 46 | See the CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 80 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_46C-48C-66A | - | 46 | See the CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 100 | 0 |
| | | 48 | See the CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_46C-48D-66A | - | 46 | See the CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 120 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 48 | See the CA_48D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_46C-48E-66A | - | 46 | See the CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 140 | 0 |
| | | 48 | See the CA_48E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_46D-48A-66A | - | 46 | See the CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 100 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_46D-48C-66A | - | 46 | See the CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 120 | 0 |
| | | 48 | See the CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_46E-48A-66A | - | 46 | See the CA_46E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 120 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_46E-48C-66A | - | 46 | See the CA_46E Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 140 | 0 |
| | | 48 | See the CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | | |
| CA_46A-48A-48A-71A | - | 46 | | | | | | Yes | | 80 | 0 |
| | | 48 | See CA_48A-48A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_46A-48C-71A | - | 46 | | | | | | Yes | | 80 | 0 |
| | | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_46C-48A-71A | - | 46 | See CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 80 | 0 |
| | | 48 | | | Yes | Yes | Yes | Yes | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_46C-48C-71A | - | 46 | See CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 100 | 0 |
| | | 48 | See CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_66A-70A-71A | - | 66 | | | Yes | Yes | Yes | Yes | | 55 | 0 |
| | | 70 | | | Yes | Yes | Yes | | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_66C-70A-71A | - | 66 | See the CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | 75 | 0 |
| | | 70 | | | Yes | Yes | Yes | | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_66A-70C-71A | - | 66 | | | Yes | Yes | Yes | Yes | | 65 | 0 |
| | | 70 | See the CA_70C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_66A-66A-70A-71A | - | 66 | See the CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | 75 | 0 |
| | | 70 | | | Yes | Yes | Yes | | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | | |
| CA_66A-66A-70C-71A | - | 66 | See the CA_66A-66A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | 85 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 70 | See the CA_70C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 71 | | | Yes | Yes | Yes | Yes | | |
| CA_66C-70C-71A | - | 66 | See the CA_66C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 85 | 0 |
| | | 70 | See the CA_70C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 71 | | | | Yes | Yes | Yes | | |

NOTE 1: The CA Configuration refers to a combination of an operating band and a CA bandwidth class specified in Table 5.4.2A-1 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.
NOTE 2: For each band combination, all combinations of indicated bandwidths belong to the set.
NOTE 3: For the supported CC bandwidth combinations, the CC downlink and uplink bandwidths are equal.
NOTE 4: A terminal which supports a DL CA configuration shall support all the lower order fallback DL CA combinations and it shall support at least one bandwidth combination set for each of the constituent lower order DL combinations containing all the bandwidths specified within each specific combination set of the upper order DL combination.
NOTE 5: Uplink CA configurations are the configurations supported by the present release of specifications.
NOTE 6: If the UE supports any uplink CA configuration for corresponding downlink CA configuration it shall support this uplink CA configuration.
NOTE 7: UL carrier shall be supported in Band 3 only. Power imbalance between downlink carriers on Band 7 and Band 38 is assumed to be within [6dB].
NOTE 8: UL carrier shall be supported in Band 20 only. Power imbalance between downlink carriers on Band 7 and Band 38 is assumed to be within [6dB]
NOTE 9: UL carrier is only supported on Band 1 or Band 3 not Band 41 because the fall back mode 1UL/2DL CA_1A-41A has the limitation that UL carrier is only supported on Band 1.
NOTE 10: UL carrier is only supported on Band 1 or Band 42 not Band 41 because the fall back mode 1UL/2DL CA_1A-41A has the limitation that UL carrier is only supported on Band 1.
NOTE 11: UL carrier is only supported on Band 1 or Band 5 not Band 41 because the fall back mode 1UL/2DL CA_1A-41A has the limitation that UL carrier is only supported on Band 1.
NOTE 12: Power imbalance between downlink carriers on Band 20 and Band 28 is assumed to be within [6dB].
NOTE 13: UL carrier shall be supported in Band 8 only. Power imbalance between downlink carriers on Band 7 and Band 38 is assumed to be within [6dB].
NOTE 14: UL carrier shall be supported in Band 28 only. Power imbalance between downlink carriers on Band 7 and Band 38 is assumed to be within [6dB].
NOTE 15: Power imbalance between downlink carriers on Band 20 and Band 28 is assumed to be within [6dB].

**Table 5.4.2A.1-2b: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA (four bands)**

| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **E-UTRA CA Configuration** | **Uplink CA configurations (NOTE 5)** | **E-UTRA Bands** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Maximum aggregated bandwidth [MHz]** | **Bandwidth combination set** |
| CA_1A-3A-5A-7A | CA_1A-3A, CA_1A-5A[6], CA_1A-7A, CA_3A-5A, CA_3A-7A, CA_5A-7A | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | | | | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| CA_1A-3A-5A-7A-7A | CA_1A-3A, CA_1A-5A[6], CA_1A-7A, CA_3A-5A, CA_3A-7A, CA_5A-7A | 1 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 3 | | | | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | | |
| | | 7 | See CA_7A-7A Bandwidth Combination Set 3 in Table 5.4.2A.1-3 | | | | | | | |
| CA_1A-3A-5A-40A | CA_1A-3A, CA_1A-5A[6], CA_3A-5A | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | | |
| | | 40 | | | | Yes | Yes | Yes | | |
| CA_1A-3A-5A-41A[8] | - | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | | |
| | | 41 | | | | | | Yes | | |
| CA_1A-3A-7A-7A-26A | CA_1A-3A, CA_1A-7A, CA_1A-26A, CA_3A-7A, CA_3A-26A, CA_7A-26A | 1 | | | Yes | Yes | Yes | Yes | 95 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | See the CA_7A-7A Bandwidth combination set 3 in Table 5.4.2A.1-3 | | | | | | | |
| | | 26 | | | Yes | Yes | Yes | | | |
| CA_1A-3A-7A-8A | CA_1A-3A, CA_1A-7A, CA_3A-7A, CA_3A-8A | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 70 | 1 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| CA_1A-3C-7A-8A | - | 1 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 3 | See the CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| CA_1A-3A-7A-20A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 80 | 1 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-7C-20A | - | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | See CA_7C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3C-7A-20A | - | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-3A-7A-20A | - | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 3 | See CA_3A-3A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-7A-26A | CA_1A-3A, CA_1A-7A, CA_1A-26A, CA_3A-7A, CA_3A-26A, CA_7A-26A | 1 | | | Yes | Yes | Yes | Yes | 75 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 26 | | | Yes | Yes | Yes | | | |
| CA_1A-3A-7A-28A | CA_1A-3A, CA_1A-7A, CA_1A-28A, CA_3A-7A, CA_3A-28A[6], CA_7A-28A | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | | | | Yes | Yes | Yes | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 28 | | | | Yes | Yes | Yes | | |
| | | 1 | | | Yes | Yes | Yes | Yes | 80 | 1 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-7C-28A | CA_1A-3A, CA_1A-7A, CA_1A-28A, CA_3A-7A, CA_3A-28A[6], CA_7A-28A, CA_7C | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 3 | | | | Yes | Yes | Yes | | |
| | | 7 | See CA_7C Bandwidth Combination Set 2 in Table 5.4.2A.1-1 | | | | | | | |
| | | 28 | | | | Yes | Yes | Yes | | |
| CA_1A-3A-3A-7A-28A | - | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 3 | See CA_3A-3A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-7A-32A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-7A-40A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-7A-40C | - | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 40 | See CA_40C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-3A-7A-42A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-8A-40A | CA_1A-3A, CA_1A-8A, CA_3A-8A | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 8 | | Yes | Yes | Yes | | | | |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-8A-11A | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 11 | | | Yes | Yes | | | | |
| CA_1A-3A-8A-20A | - | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_1A-3A-8A-28A | - | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-8A-38A | - | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-11A-28A | - | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 11 | | | Yes | Yes | | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-19A-21A | CA_1A-3A, CA_1A-19A[6], CA_1A-21A, CA_3A-19A, CA_3A-21A, CA_19A-21A | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 21 | | | Yes | Yes | Yes | | | |
| CA_1A-3A-19A-42A | CA_1A-3A, CA_1A-19A[6], CA_1A-42A, CA_3A-19A, CA_3A-42A, CA_19A-42A[6] | 1 | | | Yes | Yes | Yes | Yes | 75 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-3A-19A-21A | CA_1A-3A, CA_1A-19A[6], CA_1A-21A, CA_3A-19A, CA_3A-21A, CA_19A-21A | 1 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 3 | See CA_3A-3A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 21 | | | Yes | Yes | Yes | | | |
| CA_1A-3A-19A-42C | CA_1A-3A, CA_1A-19A[6], CA_1A-42A, CA_3A-19A, CA_3A-42A, CA_19A-42A[6] | 1 | | | Yes | Yes | Yes | Yes | 95 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-3A-20A-28A[7] | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-3A-20A-28A[7] | - | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 3 | See CA_3A-3A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-20A-32A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 1 | | | Yes | Yes | Yes | | 55 | 1 |
| | | 3 | | | Yes | Yes | Yes | | | |
| | | 20 | | | Yes | | | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-20A-42A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-20A-43A | - | 1 | | | Yes | Yes | Yes | | 55 | 0 |
| | | 3 | | | Yes | Yes | Yes | | | |
| | | 20 | | | Yes | | | | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_1A-3A-21A-28A | CA_1A-3A, CA_1A-21A, CA_1A-28A, CA_3A-21A, CA_3A-28A[6], CA_21A-28A | 1 | | | Yes | Yes | Yes | Yes | 65 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 28 | | | Yes | Yes | | | | |
| CA_1A-3A-21A-42A | CA_1A-3A, CA_1A-21A, CA_1A-42A, CA_3A-21A, CA_3A-42A, CA_21A-42A | 1 | | | Yes | Yes | Yes | Yes | 75 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-21A-42C | CA_1A-3A, CA_1A-21A, CA_1A-42A, CA_3A-21A, CA_3A-42A, CA_21A-42A | 1 | | | Yes | Yes | Yes | Yes | 95 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-3A-28A-42A | CA_1A-3A, CA_1A-28A, CA_1A-42A, CA_3A-28A[6], CA_3A-42A, CA_28A-42A | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-28A-42C | CA_1A-3A, CA_1A-28A, CA_1A-42A, CA_3A-28A[6], CA_3A-42A, CA_28A-42A | 1 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | | | | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-3A-32A-42A | - | 1 | | | Yes | Yes | Yes | | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-32A-43A | - | 1 | | | Yes | Yes | Yes | | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-42A-43A | - | 1 | | | Yes | Yes | Yes | | 70 | 0 |
| | | 3 | | | Yes | Yes | Yes | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-20A-32A-42A | - | 1 | | | Yes | Yes | Yes | | 60 | 0 |
| | | 20 | | | Yes | | | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-20A-32A-43A | - | 1 | | | Yes | Yes | Yes | | 60 | 0 |
| | | 20 | | | Yes | | | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_1A-5A-7A-46A | CA_1A-5A[6], CA_1A-7A, CA_5A-7A | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 46 | | | | | | Yes | | |
| CA_1A-5A-7A-46C | - | 1 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 46 | See CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-7A-8A-20A | - | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 20 | | | | Yes | Yes | Yes | | |
| CA_1A-7A-8A-40A | - | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-7A-8A-40C | - | 1 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 40 | See CA_40C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-7A-20A-28A[7] | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-7A-20A-32A | - | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-7A-20A-42A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-8A-11A-28A | - | 1 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 11 | | | Yes | Yes | | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-8A-20A-28A | - | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-19A-21A-42A | CA_1A-19A[6], CA_1A-21A, CA_1A-42A, CA_19A-21A, CA_19A-42A[6], CA_21A-42A | 1 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-19A-21A-42C | CA_1A-19A[6], CA_1A-21A, CA_1A-42A, CA_19A-21A, CA_19A-42A[6], CA_21A-42A | 1 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | See CA_42C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_1A-21A-28A-42A | CA_1A-21A, CA_1A-28A, CA_1A-42A, CA_21A-28A, CA_21A-42A, CA_28A-42A | 1 | | | Yes | Yes | Yes | Yes | 65 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 28 | | | Yes | Yes | | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-21A-28A-42C | CA_1A-21A, CA_1A-28A, CA_1A-42A, CA_21A-28A, CA_21A-42A, CA_28A-42A | 1 | | | Yes | Yes | Yes | Yes | 85 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 28 | | | Yes | Yes | | | | |
| | | 42 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_1A-32A-42A-43A | - | 1 | | | Yes | Yes | Yes | | 75 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-2A-5A-12A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 12 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-2A-5A-30A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-2A-7A-12A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 90 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 12 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-2A-12A-30A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-2A-14A-30A-66A | - | 2 | See CA_2A-2A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | 80 | 0 |
| | | 14 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-4A-5A-12A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | | |
| | | 12 | | | Yes | Yes | | | | |
| CA_2A-4A-5A-29A | CA_2A-4A | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | | |
| | | 29 | | | Yes | Yes | | | | |
| CA_2A-4A-5A-30A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_2A-4A-5B-30A | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 5 | See CA_5B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_2A-4A-7A-12A | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 12 | | | Yes | Yes | | | | |
| CA_2A-4A-12A-30A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 12 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_2A-4A-29A-30A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 4 | | | Yes | Yes | Yes | Yes | | |
| | | 29 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| CA_2A-5A-7A-28A | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_2A-5A-12A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 12 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-5A-30A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-5A-30A-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 5 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-5B-30A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 5 | See CA_5B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-7A-12A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 12 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-7A-12B-66A | - | 2 | | | Yes | Yes | Yes | Yes | 75 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 12 | See CA_12B Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-7A-46A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | | | Yes | Yes | Yes | Yes | | |
| | | 46 | | | | Yes | | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-12A-30A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-12A-30A-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 12 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-13A-48A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 13 | | | Yes | Yes | | | | |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_2A-13A-48C-66A | - | 2 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 13 | | | Yes | Yes | | | | |
| | | 48 | See CA_48C Bandwidth combination set 0 in the Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-13A-48A-48A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 13 | | | Yes | Yes | | | | |
| | | 48 | See CA_48A-48A Bandwidth combination set 0 in Table 5.4.2A.1-3 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-14A-30A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 14 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-14A-30A-66A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 14 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | See CA_66A-66A Bandwidth Combination Set 0 in Table 5.4.2A.1-3 | | | | | | | |
| CA_2A-29A-30A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 29 | | | Yes | Yes | | | | |
| | | 30 | | | Yes | Yes | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-46A-48A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 46 | | | | | | Yes | | |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_2A-46A-48C-66A | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 46 | See the CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-46A-48D-66A | - | 2 | | | Yes | Yes | Yes | Yes | 120 | 0 |
| | | 46 | | | | | | Yes | | |
| | | 48 | See the CA_48D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-46C-48A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 46 | See the CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-46C-48C-66A | - | 2 | | | Yes | Yes | Yes | Yes | 120 | 0 |
| | | 46 | See the CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 48 | See the CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-46C-48D-66A | - | 2 | | | Yes | Yes | Yes | Yes | 140 | 0 |
| | | 46 | See the CA_46C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 48 | See the CA_48D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-46D-48A-66A | - | 2 | | | Yes | Yes | Yes | Yes | 120 | 0 |
| | | 46 | See the CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 48 | | | Yes | Yes | Yes | Yes | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_2A-46D-48C-66A | - | 2 | | | Yes | Yes | Yes | Yes | 140 | 0 |
| | | 46 | See the CA_46D Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 48 | See the CA_48C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 66 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-7A-8A-20A | - | 3 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-7A-8A-38A[9] | - | 3 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_3C-7A-8A-38A[1] | - | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 90 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-7A-8A-40A | - | 3 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 40 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-7A-8A-40C | - | 3 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 40 | See CA_40C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-7A-20A-28A[7] | - | 3 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 20 | | | | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_3C-7A-20A-28A[7] | - | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 100 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 28 | | | | Yes | Yes | Yes | | |
| CA_3A-7A-20A-32A | CA_3A-7A, CA_3A-20A, CA_7A-20A | 3 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-7A-20A-42A | - | 3 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-7A-28A-38A[9] | - | 3 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_3C-7A-28A-38A[9] | - | 3 | See CA_3C Bandwidth combination set 0 in Table 5.4.2A.1-1 | | | | | | 100 | 0 |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| | | 38 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-8A-11A-28A | - | 3 | | | Yes | Yes | Yes | Yes | 60 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 11 | | | Yes | Yes | | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-8A-20A-28A | - | 3 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 8 | | | Yes | Yes | | | | |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-19A-21A-42A | - | 3 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-19A-21A-42C | - | 3 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 19 | | | Yes | Yes | Yes | | | |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 42 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-20A-32A-42A | - | 3 | | | Yes | Yes | Yes | | 60 | 0 |
| | | 20 | | | Yes | | | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-20A-32A-43A | - | 3 | | | Yes | Yes | Yes | | 60 | 0 |
| | | 20 | | | Yes | | | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_3A-21A-28A-42A | - | 3 | | | Yes | Yes | Yes | Yes | 65 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 28 | | | Yes | Yes | | | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_3A-21A-28A-42C | - | 3 | | | Yes | Yes | Yes | Yes | 85 | 0 |
| | | 21 | | | Yes | Yes | Yes | | | |
| | | 28 | | | Yes | Yes | | | | |
| | | 42 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-28A-41A-42A | CA_3A-41A, CA_41A-42A | 3 | | | Yes | Yes | Yes | Yes | 70 | 0 |
| | | 28 | | | Yes | Yes | | | | |
| | | 41 | | | | Yes | Yes | Yes | | |
| | | 42 | | | | Yes | Yes | Yes | | |
| CA_3A-28A-41A-42C | CA_42C | 3 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 28 | | | Yes | Yes | | | | |
| | | 41 | | | | Yes | Yes | Yes | | |
| | | 42 | See CA_42C Bandwidth combination set 1 in Table 5.4.2A.1-1 | | | | | | | |
| CA_3A-28A-41C-42A | - | 3 | | | Yes | Yes | Yes | Yes | 90 | 0 |
| | | 28 | | | Yes | Yes | | | | |
| | | 41 | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | | | | |
| | | 42 | | | | Yes | Yes | Yes | | |
| CA_3A-32A-42A-43A | - | 3 | | | Yes | Yes | Yes | | 75 | 0 |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |

NOTE 1: The CA Configuration refers to a combination of an operating band and a CA bandwidth class specified in Table 5.4.2A-1 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.
NOTE 2: For each band combination, all combinations of indicated bandwidths belong to the set.
NOTE 3: For the supported CC bandwidth combinations, the CC downlink and uplink bandwidths are equal.
NOTE 4: A terminal which supports a DL CA configuration shall support all the lower order fallback DL CA combinations and it shall support at least one bandwidth combination set for each of the constituent lower order DL combinations containing all the bandwidths specified within each specific combination set of the upper order DL combination.
NOTE 5: Uplink CA configurations are the configurations supported by the present release of specifications.
NOTE 6: If the UE supports any uplink CA configuration for corresponding downlink CA configuration it shall support this uplink CA configuration.
NOTE 7: Power imbalance between downlink carriers on Band 20 and Band 28 is assumed to be within [6dB].
NOTE 8: UL carrier is only supported on Band 1, Band 3 or Band 5 not Band 41 because the fall back mode 2DL/1UL CA_1A-41A has the limitation that UL carrier is only supported on Band 1.
NOTE 9: UL carrier shall be supported in Band 3, 8 or 28 only. Power imbalance between downlink carriers on Band 7 and Band 38 is assumed to be within [6dB].

**Table 5.4.2A.1-2c: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA (five bands)**

| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **E-UTRA CA Configuration** | **Uplink CA configurations (NOTE 5)** | **E-UTRA Bands** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Maximum aggregated bandwidth [MHz]** | **Bandwidth combination set** |
| CA_1A-3A-7A-20A-28A[7] | - | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 20 | | | | Yes | Yes | Yes | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-7A-20A-42A | - | 1 | | | Yes | Yes | Yes | Yes | 100 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 7 | | | | Yes | Yes | Yes | | |
| | | 20 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-8A-11A-28A | - | 1 | | | Yes | Yes | Yes | Yes | 80 | 0 |
| | | 3 | | | Yes | Yes | Yes | Yes | | |
| | | 8 | | | Yes | Yes | | | | |
| | | 11 | | | Yes | Yes | | | | |
| | | 28 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-20A-32A-42A | - | 1 | | | Yes | Yes | Yes | | 75 | 0 |
| | | 3 | | | Yes | Yes | Yes | | | |
| | | 20 | | | Yes | | | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-20A-32A-43A | - | 1 | | | Yes | Yes | Yes | | 75 | 0 |
| | | 3 | | | Yes | Yes | Yes | | | |
| | | 20 | | | Yes | | | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |
| CA_1A-3A-32A-42A-43A | - | 1 | | | Yes | Yes | Yes | | 90 | 0 |
| | | 3 | | | Yes | Yes | Yes | | | |
| | | 32 | | | Yes | Yes | Yes | Yes | | |
| | | 42 | | | Yes | Yes | Yes | Yes | | |
| | | 43 | | | Yes | Yes | Yes | Yes | | |

NOTE 1: The CA Configuration refers to a combination of an operating band and a CA bandwidth class specified in Table 5.4.2A-1 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.
NOTE 2: For each band combination, all combinations of indicated bandwidths belong to the set.
NOTE 3: For the supported CC bandwidth combinations, the CC downlink and uplink bandwidths are equal.
NOTE 4: A terminal which supports a DL CA configuration shall support all the lower order fallback DL CA combinations and it shall support at least one bandwidth combination set for each of the constituent lower order DL combinations containing all the bandwidths specified within each specific combination set of the upper order DL combination.
NOTE 5: Uplink CA configurations are the configurations supported by the present release of specifications.
NOTE 6: If the UE supports uplink CA for corresponding downlink CA it shall support this uplink CA configuration.
NOTE 7: Power imbalance between downlink carriers on Band 20 and Band 28 is assumed to be within [6dB].

**Table 5.4.2A.1-3: E-UTRA CA configurations and bandwidth combination sets defined for non-contiguous intra-band CA (with two sub-blocks)**

| | | E-UTRA CA configuration / Bandwidth combination set | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Component carriers in order of increasing carrier frequency | | | | | | |
| E-UTRACA configuration | Uplink CA configurations (NOTE 1) | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Maximum aggregated bandwidth [MHz] | Bandwidth combination set |
| CA_1A-1A | - | 5, 10, 15, 20 | 5, 10, 15, 20 | | | | 40 | 0 |
| CA_2A-2A | - | 5, 10, 15, 20 | 5, 10, 15, 20 | | | | 40 | 0 |
| CA_3A-3A | - | 5, 10, 15, 20 | 5, 10, 15, 20 | | | | 40 | 0 |
| | | 5, 10 | 5, 10, 15, 20 | | | | 30 | 1 |
| | | 5 | 3 | | | | 10 | 2 |
| | | 3, 5 | 5 | | | | | |
| CA_4A-4A | CA_4A-4A | 5, 10, 15, 20 | 5, 10, 15, 20 | | | | 40 | 0 |
| | | 5, 10 | 5, 10 | | | | 20 | 1 |
| CA_5A-5A | - | 5,10 | 5,10 | | | | 20 | 0 |
| | | 3 | 5 | | | | 8 | 1 |
| CA_7A-7A | - | 5 | 15 | | | | 40 | 0 |
| | | 10 | 10, 15 | | | | | |
| | | 15 | 15, 20 | | | | | |
| | | 20 | 20 | | | | | |
| | | 5, 10, 15, 20 | 5, 10, 15, 20 | | | | 40 | 1 |
| | | 5, 10, 15, 20 | 5, 10 | | | | 30 | 2 |
| | | 10, 15, 20 | 10, 15, 20 | | | | 40 | 3 |
| CA_12A-12A | - | 5 | 5 | | | | 10 | 0 |
| CA_23A-23A | - | 5 | 10 | | | | 15 | 0 |
| CA_25A-25A | - | 5, 10 | 5, 10 | | | | 20 | 0 |
| | | 5, 10, 15, 20 | 5, 10, 15, 20 | | | | 40 | 1 |
| CA_40A-40A | - | 10, 20 | 10, 20 | | | | 40 | 0 |
| | | 10,15,20 | 10,15,20 | | | | 40 | 1 |
| CA_40A-40C | CA_40C | 20 | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | 60 | 0 |
| | | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | 20 | | | | |
| CA_40C-40C | CA_40C | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | See CA_40C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | 80 | 0 |
| CA_41A-41A | - | 10, 15, 20 | 10, 15, 20 | | | | 40 | 0 |
| | | 5, 10, 15, 20 | 5, 10, 15, 20 | | | | 40 | 1 |
| CA_41A-41C | CA_41C | 5, 10, 15, 20 | See CA_41C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | | 60 | 0 |
| | | See CA_41C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | 5, 10, 15, 20 | | | | |
| CA_41A-41D | CA_41C | 5, 10, 15, 20 | See CA_41D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | 80 | 0 |
| | | See CA_41D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | 5, 10, 15, 20 | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_41C-41C | CA_41C | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | 80 | 0 |
| CA_41C-41D | CA_41C | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | See CA_41D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | 100 | 0 |
| | | See CA_41D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | See CA_41C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | |
| CA_42A-42A | - | 5, 10, 15, 20 | 5, 10, 15, 20 | | | | 40 | 0 |
| CA_42A-42C | CA_42C | 5, 10, 15, 20 | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | 60 | 0 |
| | | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | 5, 10, 15, 20 | | | | |
| CA_42A-42D | - | 5, 10, 15, 20 | See CA_42D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | 80 | 0 |
| | | See CA_42D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | 5, 10, 15, 20 | | | |
| CA_42C-42C | CA_42C | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | See CA_42C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | 80 | 0 |
| CA_43A-43A | - | 5, 10, 15, 20 | 5, 10, 15, 20 | | | | 40 | 0 |
| CA_46A-46A[2] | - | 20 | 20 | | | | 40 | 0 |
| CA_46A-46C[2] | - | 20 | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | 60 | 0 |
| | | See CA_46C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | 20 | | | | |
| CA_46A-46D[2] | - | 20 | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | 80 | 0 |
| | | See CA_46D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | 20 | | | |
| CA_48A-48A | - | 5, 10, 15, 20 | 5, 10, 15, 20 | | | | 40 | 0 |
| CA_48A-48C | - | 5, 10, 15, 20 | See CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | 60 | 0 |
| | | See CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | 5, 10, 15, 20 | | | | |
| CA_48A-48D | - | 5, 10, 15, 20 | See CA_48D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | 80 | 0 |
| | | See CA_48D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | 5, 10, 15, 20 | | | |
| CA_48C-48C | - | See CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | See CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | 80 | 0 |
| CA_48C-48D | - | See CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | See CA_48D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | 100 | 0 |
| | | See CA_48D Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | See CA_48C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | |
| CA_48A-48E | - | 5, 10, 15, 20 | See CA_48E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | 100 | 0 |
| | | See CA_48E Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | 5, 10, 15, 20 | | |
| CA_66A-66A | - | 5, 10, 15, 20 | 5, 10, 15, 20 | | | | 40 | 0 |
| CA_66A-66B | - | 5, 10, 15, 20 | See CA_66B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | 40 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | See CA_66B Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | 5, 10, 15, 20 | | | | |
| CA_66A-66C | - | 5, 10, 15, 20 | See CA_66C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | | | 60 | 0 |
| | | See CA_66C Bandwidth Combination Set 0 in Table 5.4.2A.1-1 | | 5, 10, 15, 20 | | | | |

NOTE 1: Uplink CA configurations are the configurations supported by the present release of specifications.
NOTE 2: Restricted to E-UTRA operation when inter-band carrier aggregation is configured. The downlink operating band is paired with the uplink operating band (external) of the carrier aggregation configuration that is supporting the configured Pcell.

**Table 5.4.2A.1-4: E-UTRA CA configurations and bandwidth combination sets defined for non-contiguous intra-band CA (with three sub-blocks)**

| | | E-UTRA CA configuration / Bandwidth combination set | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Component carriers in order of increasing carrier frequency | | | | | | |
| E-UTRACA configuration | Uplink CA configurations (NOTE 1) | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Maximum aggregated bandwidth [MHz] | Bandwidth combination set |
| CA_25A-25A-25A | - | 5, 10, 15, 20 | 5, 10, 15, 20 | 5, 10, 15, 20 | | | 60 | 0 |
| CA_41A-41A-41A | - | 5, 10, 15, 20 | 5, 10, 15, 20 | 5, 10, 15, 20 | | | 60 | 0 |
| CA_41A-41A-41C | CA_41C | 5, 10, 15, 20 | 5, 10, 15, 20 | See CA_41C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | | 80 | 0 |
| | | 5, 10, 15, 20 | See CA_41C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | 5, 10, 15, 20 | | | |
| | | See CA_41C Bandwidth Combination Set 1 in Table 5.4.2A.1-1 | | 5, 10, 15, 20 | 5, 10, 15, 20 | | | |
| CA_48A-48A-48A | - | 5, 10, 15, 20 | 5, 10, 15, 20 | 5, 10, 15, 20 | | | 60 | 0 |
| CA_66A-66A-66A | - | 5, 10, 15, 20 | 5, 10, 15, 20 | 5, 10, 15, 20 | | | 60 | 0 |

**Table 5.4.2A.1-5: E-UTRA CA configurations and bandwidth combination sets defined for non-contiguous intra-band CA (with four sub-blocks)**

| | | E-UTRA CA configuration / Bandwidth combination set | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Component carriers in order of increasing carrier frequency | | | | | | |
| E-UTRACA configuration | Uplink CA configurations (NOTE 1) | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Maximum aggregated bandwidth [MHz] | Bandwidth combination set |
| CA_48A-48A-48A-48A | - | 5, 10, 15, 20 | 5, 10, 15, 20 | 5, 10, 15, 20 | 5, 10, 15, 20 | | 80 | 0 |

## 5.4.2B Channel bandwidth for UL-MIMO

### 5.4.2B.1 Channel bandwidths per operating band for UL- MIMO

For UL-MIMO, the channel bandwidths specified in Table 5.4.2.1-1 in present document apply for the UL-MIMO operating bands.

## 5.4.2C Channel bandwidth for Dual Connectivity

For E-UTRA DC bands specified in 5.2C, the corresponding E-UTRA CA configurations in 5.4.A2.1, i.e., dual uplink inter-band carrier aggregation with uplink assigned to two E-UTRA bands, are applicable to Dual Connectivity.

NOTE 1: Requirements for the dual connectivity configurations are defined in the section corresponding E-UTRA uplink CA configurations, unless otherwise specified.

NOTE 2: For TDD inter-band dual connectivity configurations, requirements are applicable only for synchronous operation.

## 5.4.2D Channel bandwidth for ProSe

### 5.4.2D.1 Channel bandwidths per operating band for ProSe

The ProSe combination of channel bandwidths and operating bands is shown in Table 5.4.2D.1-1 and Table 5.4.2D.1-2. The transmission bandwidth configuration in Table 5.4.2D.1-1 and Table 5.4.2D.1-2 shall be supported for each of the specified channel bandwidths. The same (symmetrical) channel bandwidth is specified for both the TX and RX path.

**Table 5.4.2D.1-1: ProSe Direct Discovery channel bandwidth**

| E-UTRA ProSe band / ProSe channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|
| **E-UTRA ProSe Band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| 2 | | | Yes | Yes | Yes | Yes |
| 3 | | | Yes | Yes | Yes | Yes |
| 4 | | | Yes | Yes | Yes | Yes |
| 7 | | | Yes | Yes | Yes | Yes |
| 14 | | | Yes | Yes | | |
| 20 | | | Yes | Yes | Yes | Yes |
| 26 | | | Yes | Yes | Yes | |
| 28 | | | Yes | Yes | Yes | Yes |
| 31 | | | Yes | | | |
| 41 | | | Yes | Yes | Yes | Yes |
| 68 | | | Yes | Yes | Yes | |
| 72 | | | Yes | | | |

**Table 5.4.2D.1-2: ProSe Direct Communication channel bandwidth**

| E-UTRA ProSe band / ProSe channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|
| **E-UTRA ProSe Band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| 3 | | | | Yes | | |
| 7 | | | | Yes | | |
| 14 | | | | Yes | | |
| 20 | | | | Yes | | |
| 26 | | | | Yes | | |
| 28 | | | | Yes | | |
| 31 | | | Yes | | | |
| 68 | | | Yes | Yes | | |
| 72 | | | Yes | | | |

## 5.4.2F Channel bandwidth for category NB1 and category NB2

Channel bandwidth for category NB1/NB2 is 200 kHz.

For category NB1/NB2, requirements in present document are specified for the channel bandwidth listed in Table 5.4.2F-1.

**Table 5.4.2F-1: Transmission bandwidth configuration $N_{RB}$, $N_{tone\ 15kHz}$ and $N_{tone\ 3.75kHz}$ in NB1/NB2 channel bandwidth**

| Channel bandwidth ``$BW_{Channel}$ [kHz] | 200 |
|---|---|
| Transmission bandwidth configuration $N_{RB}$ | 1 |
| Transmission bandwidth configuration $N_{tone\ 15kHz}$ | 12 |
| Transmission bandwidth configuration $N_{tone\ 3.75kHz}$ | 48 |

Figure 5.4.2F-1 shows the relation between the category NB1/NB2 channel bandwidth ($BW_{Channel}$) and the category NB1/NB2 transmission bandwidth configuration ($N_{tone}$). The channel edges are defined as the lowest and highest frequencies of the carrier separated by the channel bandwidth, i.e. at $F_C$ +/- $BW_{Channel}$ /2.

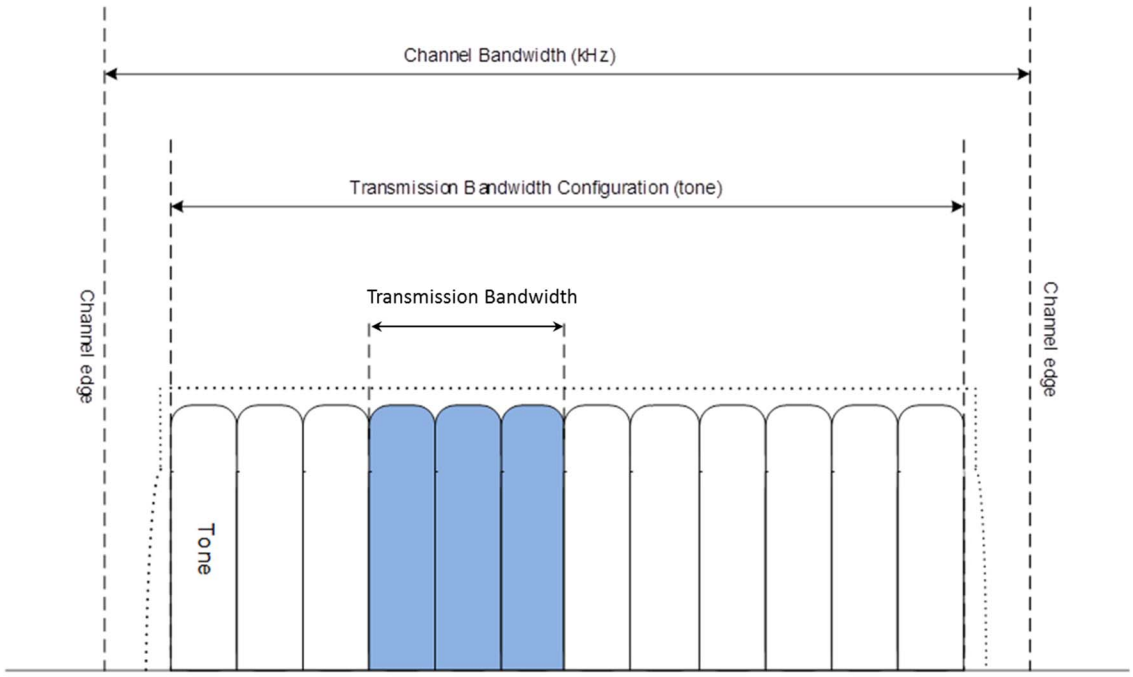



**Figure 5.4.2F-1: Definition of Channel Bandwidth and Transmission Bandwidth configuration**

## 5.4.2G Channel bandwidth for V2X Communication

### 5.4.2G.1 Channel bandwidths per operating band for V2X Communication

E-UTRA V2X Communication channel bandwidths and operating band is shown in Table 5.4.2G.1-1. The same (symmetrical) channel bandwidth is specified for both the TX and RX path.

**Table 5.4.2G.1-1: V2X Communication channel bandwidth**

| E-UTRA V2X band / V2X channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|
| **E-UTRA V2X Operating Band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| 47 | | | | Yes | | Yes |

For V2X inter-band con-current operation, the V2X Communication channel bandwidths for each operating band is specified in Table 5.4.2G.1-2.

**Table 5.4.2G.1-2: Inter-band con-current V2X configurations and bandwidth combination sets**

| V2X con-current band Configuration | E-UTRA or V2X operating Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum bandwidth [MHz] | Bandwidth combination set |
|---|---|---|---|---|---|---|---|---|---|
| V2X_3A-47A | 3 | Yes | Yes | Yes | Yes | Yes | Yes | 40 | 0 |
| | 47 | | | | Yes | | Yes | | |
| V2X_7A_47A | 7 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | 47 | | | | Yes | | Yes | | |
| V2X_8A-47A | 8 | Yes | Yes | Yes | Yes | | | 30 | 0 |
| | 47 | | | | Yes | | Yes | | |
| V2X_39A-47A | 39 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | 47 | | | | Yes | | Yes | | |
| V2X_41A-47A | 41 | | | Yes | Yes | Yes | Yes | 40 | 0 |
| | 47 | | | | Yes | | Yes | | |

V2X Bandwidth Class is specified in Table 5.4.2G.1-3 for V2X intra-band contiguous multi-carrier operation.

**Table 5.4.2G.1-3: V2X bandwidth classes and corresponding nominal guard bands**

| V2X Bandwidth Class | Aggregated Transmission Bandwidth Configuration | Number of contiguous CC | Nominal Guard Band $BW_{GB}$ |
|---|---|---|---|
| A | $N_{RB,agg} \le 100$ | 1 | $0.05\ BW_{Channel(1)} - 0.5\Delta f_1$ |
| B | $25 < N_{RB,agg} \le 100$ | 2 | $[0.05\ max(BW_{Channel(1)}, BW_{Channel(2)}) - 0.5\Delta f_1]$ |
| C | $100 < N_{RB,agg} \le 200$ | 2 | NOTE 3 |
| D | $200 < N_{RB,agg} \le 300$ | 3 | NOTE 3 |
| E | $300 < N_{RB,agg} \le 400$ | 4 | NOTE 3 |
| F | $400 < N_{RB,agg} \le 500$ | 5 | NOTE 3 |
| I | $700 < N_{RB,agg} \le 800$ | 8 | NOTE 3 |
| NOTE 1: $BW_{Channel(j)}$, j = 1, 2, 3, 4 is the channel bandwidth of an E-UTRA component carrier according to Table 5.4.2.1-1 and $\Delta f_1 = \Delta f$ for the downlink with $\Delta f$ the subcarrier spacing while $\Delta f_1 = 0$ for the uplink.<br>NOTE 2: Void<br>NOTE 3: Applicable for later releases. | | | |

For V2X intra-band multi-carrier operation, the V2X communication channel bandwidths for each operating band is specified in Table 5.4.2G.1-4.

**Table 5.4.2G.1-4: V2X intra-band multi-carrier configurations**

| V2X multi-carrier band Configuration | V2X multi-carrier configuration / Bandwidth combination set | | | | | | |
|---|---|---|---|---|---|---|---|
| | Component carriers in order of increasing carrier frequency | | | | | Maximum aggregated bandwidth [MHz] | Bandwidth combination set |
| | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | Channel bandwidths for carrier [MHz] | | |
| V2X_47B | 10 | 10 | | | | 20 | 0 |

## 5.4.3 Channel raster

The channel raster is 100 kHz for all bands, which means that the carrier centre frequency must be an integer multiple of 100 kHz.

## 5.4.3A Channel raster for CA

For carrier aggregation the channel raster is 100 kHz for all bands, which means that the carrier centre frequency must be an integer multiple of 100 kHz.

## 5.4.3F Channel raster for UE category NB1 and NB2

Channel raster for category NB1 and NB2 in-band, guard-band and standalone operation is 100 kHz.

## 5.4.4 Carrier frequency and EARFCN

The carrier frequency in the uplink and downlink is designated by the E-UTRA Absolute Radio Frequency Channel Number (EARFCN) in the range 0 - 65535. The relation between EARFCN and the carrier frequency in MHz for the downlink is given by the following equation, where $F_{DL_low}$ and $N_{Offs-DL}$ are given in Table 5.4.4-1 and $N_{DL}$ is the downlink EARFCN.

$$F_{DL} = F_{DL_low} + 0.1(N_{DL} - N_{Offs-DL})$$

The relation between EARFCN and the carrier frequency in MHz for the uplink is given by the following equation where $F_{UL_low}$ and $N_{Offs-UL}$ are given in Table 5.4.4-1 and $N_{UL}$ is the uplink EARFCN.

$$F_{UL} = F_{UL_low} + 0.1(N_{UL} - N_{Offs-UL})$$

**Table 5.4.4-1: E-UTRA channel numbers**

| Band | Downlink | | | Uplink | | |
|---|---|---|---|---|---|---|
| | $F_{DL_low}$ (MHz) | $N_{Offs-DL}$ | Range of $N_{DL}$ | $F_{UL_low}$ (MHz) | $N_{Offs-UL}$ | Range of $N_{UL}$ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2110 | 0 | 0 – 599 | 1920 | 18000 | 18000 – 18599 |
| 2 | 1930 | 600 | 600 – 1199 | 1850 | 18600 | 18600 – 19199 |
| 3 | 1805 | 1200 | 1200 – 1949 | 1710 | 19200 | 19200 – 19949 |
| 4 | 2110 | 1950 | 1950 – 2399 | 1710 | 19950 | 19950 – 20399 |
| 5 | 869 | 2400 | 2400 – 2649 | 824 | 20400 | 20400 – 20649 |
| 6 | 875 | 2650 | 2650 – 2749 | 830 | 20650 | 20650 – 20749 |
| 7 | 2620 | 2750 | 2750 – 3449 | 2500 | 20750 | 20750 – 21449 |
| 8 | 925 | 3450 | 3450 – 3799 | 880 | 21450 | 21450 – 21799 |
| 9 | 1844.9 | 3800 | 3800 – 4149 | 1749.9 | 21800 | 21800 – 22149 |
| 10 | 2110 | 4150 | 4150 – 4749 | 1710 | 22150 | 22150 – 22749 |
| 11 | 1475.9 | 4750 | 4750 – 4949 | 1427.9 | 22750 | 22750 – 22949 |
| 12 | 729 | 5010 | 5010 – 5179 | 699 | 23010 | 23010 – 23179 |
| 13 | 746 | 5180 | 5180 – 5279 | 777 | 23180 | 23180 – 23279 |
| 14 | 758 | 5280 | 5280 – 5379 | 788 | 23280 | 23280 – 23379 |
| … | | | | | | |
| 17 | 734 | 5730 | 5730 – 5849 | 704 | 23730 | 23730 – 23849 |
| 18 | 860 | 5850 | 5850 – 5999 | 815 | 23850 | 23850 – 23999 |
| 19 | 875 | 6000 | 6000 – 6149 | 830 | 24000 | 24000 – 24149 |
| 20 | 791 | 6150 | 6150 – 6449 | 832 | 24150 | 24150 – 24449 |
| 21 | 1495.9 | 6450 | 6450 – 6599 | 1447.9 | 24450 | 24450 – 24599 |
| 22 | 3510 | 6600 | 6600 – 7399 | 3410 | 24600 | 24600 – 25399 |
| 23 | 2180 | 7500 | 7500 – 7699 | 2000 | 25500 | 25500 – 25699 |
| 24 | 1525 | 7700 | 7700 - 8039 | 1626.5 | 25700 | 25700 – 26039 |
| 25 | 1930 | 8040 | 8040 - 8689 | 1850 | 26040 | 26040 - 26689 |
| 26 | 859 | 8690 | 8690 - 9039 | 814 | 26690 | 26690 - 27039 |
| 27 | 852 | 9040 | 9040 – 9209 | 807 | 27040 | 27040 – 27209 |
| 28 | 758 | 9210 | 9210 – 9659 | 703 | 27210 | 27210 – 27659 |
| 29[2] | 717 | 9660 | 9660 – 9769 | N/A | | |
| 30 | 2350 | 9770 | 9770 – 9869 | 2305 | 27660 | 27660 – 27759 |
| 31 | 462.5 | 9870 | 9870 – 9919 | 452.5 | 27760 | 27760 – 27809 |
| 32[2] | 1452 | 9920 | 9920 – 10359 | N/A | | |
| 33 | 1900 | 36000 | 36000 –36199 | 1900 | 36000 | 36000 – 36199 |
| 34 | 2010 | 36200 | 36200 –36349 | 2010 | 36200 | 36200 – 36349 |
| 35 | 1850 | 36350 | 36350 –36949 | 1850 | 36350 | 36350 – 36949 |
| 36 | 1930 | 36950 | 36950 –37549 | 1930 | 36950 | 36950 – 37549 |
| 37 | 1910 | 37550 | 37550 –37749 | 1910 | 37550 | 37550 – 37749 |
| 38 | 2570 | 37750 | 37750 –38249 | 2570 | 37750 | 37750 – 38249 |
| 39 | 1880 | 38250 | 38250 –38649 | 1880 | 38250 | 38250 – 38649 |
| 40 | 2300 | 38650 | 38650 –39649 | 2300 | 38650 | 38650 – 39649 |
| 41 | 2496 | 39650 | 39650 - 41589 | 2496 | 39650 | 39650 - 41589 |
| 42 | 3400 | 41590 | 41590 – 43589 | 3400 | 41590 | 41590 – 43589 |
| 43 | 3600 | 43590 | 43590 – 45589 | 3600 | 43590 | 43590 – 45589 |
| 44 | 703 | 45590 | 45590 – 46589 | 703 | 45590 | 45590 – 46589 |
| 45 | 1447 | 46590 | 46590 – 46789 | 1447 | 46590 | 46590 – 46789 |
| 46[4] | 5150 | 46790 | 46790 – 54539 | 5150 | 46790 | 46790 – 54539 |
| 47 | 5855 | 54540 | 54540 - 55239 | 5855 | 54540 | 54540 – 55239 |
| 48 | 3550 | 55240 | 55240 – 56739 | 3550 | 55240 | 55240 – 56739 |
| … | | | | | | |
| 65 | 2110 | 65536 | 65536 – 66435 | 1920 | 131072 | 131072 – 131971 |
| 66[5] | 2110 | 66436 | 66436 – 67335 | 1710 | 131972 | 131972 – 132671 |
| 67[2] | 738 | 67336 | 67336 – 67535 | N/A | | |
| 68 | 753 | 67536 | 67536 – 67835 | 698 | 132672 | 132672 – 132971 |
| 69[2] | 2570 | 67836 | 67836 - 68335 | N/A | | |
| 70[6] | 1995 | 68336 | 68336-68585 | 1695 | 132972 | 132972-133121 |
| 71 | 617 | 68586 | 68586 - 68935 | 663 | 133122 | 133122 - 133471 |
| 72 | 461 | 68936 | 68936-68985 | 451 | 133472 | 133472-133521 |
| 73 | 460 | 68986 | 68986 - 69035 | 450 | 133522 | 133522 - 133571 |
| 74 | 1475 | 69036 | 69036 - 69465 | 1427 | 133572 | 133572 - 134001 |

| | | | | |
|---|---|---|---|---|
| 75[2] | 1432 | 69466 | 69466 - 70315 | N/A |
| 76[2] | 1427 | 70316 | 70316 - 70365 | N/A |

Note 1: The channel numbers that designate carrier frequencies so close to the operating band edges that the carrier extends beyond the operating band edge shall not be used. This implies that the first 7, 15, 25, 50, 75 and 100 channel numbers at the lower operating band edge and the last 6, 14, 24, 49, 74 and 99 channel numbers at the upper operating band edge shall not be used for channel bandwidths of 1.4, 3, 5, 10, 15 and 20 MHz respectively.

Note 2: Restricted to E-UTRA operation when carrier aggregation is configured.

Note 3: For ProSe and V2X the corresponding UL channel number are also specified for the DL for the associated ProSe/V2X operating bands i.e. ProSe_$F_{UL}$ = $F_{UL}$ and ProSe_$F_{DL}$ = $F_{UL}$; V2X_$F_{UL}$ = $F_{DL}$ and V2X_$F_{DL}$ = $F_{UL}$.

Note 4: Requirements for uplink operations are not specified in this version of the specification.

Note 5: The range 2180-2200 MHz of the DL operating band is restricted to E-UTRA operation when carrier aggregation is configured.

Note 6: The range 2010-2020 MHz of the DL operating band is restricted to E-UTRA operation when carrier aggregation is configured and TX-RX separation is 300 MHz The range 2005-2020 MHz of the DL operating band is restricted to E-UTRA operation when carrier aggregation is configured and TX-RX separation is 295 MHz.

## 5.4.4F Carrier frequency and EARFCN for category NB1 and NB2

The carrier frequency of category NB1/NB2 in the downlink is designated by the E-UTRA Absolute Radio Frequency Channel Number (EARFCN) in the range 0 – 262143 and the Offset of category NB1/NB2 Channel Number to EARFCN in the range {-10,-9,-8,-7,-6,-5,-4,-3,-2,-1,-0.5,0,1,2,3,4,5,6,7,8,9}. The relation between EARFCN, Offset of category NB1/NB2 Channel Number to EARFCN and the carrier frequency in MHz for the downlink is given by the following equation, where $F_{DL}$ is the downlink carrier frequency of category NB1/NB2, $F_{DL_low}$ and $N_{Offs\text{-}DL}$ are given in table 5.2-1, $N_{DL}$ is the downlink EARFCN, $M_{DL}$ is the Offset of category NB1/NB2 Channel Number to downlink EARFCN.

$$F_{DL} = F_{DL_low} + 0.1(N_{DL} – N_{Offs\text{-}DL}) + 0.0025*(2M_{DL}+1)$$

The carrier frequency of category NB1/NB2 in the uplink is designated by the E-UTRA Absolute Radio Frequency Channel Number (EARFCN) in the range 0 –262143 and the Offset of category NB1/NB2 Channel Number to EARFCN in the range {-10,-9,-8,-7,-6,-5,-4,-3,-2,-1,0,1,2,3,4,5,6,7,8,9}. The relation between EARFCN, Offset of category NB1/NB2 Channel Number to EARFCN and the carrier frequency in MHz for the uplink is given by the following equation, where $F_{UL}$ is the uplink carrier frequency of category NB1/NB2, $F_{UL_low}$ and $N_{Offs\text{-}UL}$ are given in table 5.2-1, $N_{UL}$ is the uplink EARFCN, $M_{UL}$ is the Offset of category NB1/NB2 Channel Number to uplink EARFCN.

$$F_{UL} = F_{UL_low} + 0.1(N_{UL} – N_{Offs\text{-}UL}) + 0.0025*(2M_{UL})$$

NOTE 1: For category NB1/NB2, $N_{DL}$ or $N_{UL}$ is different than the value of EARFCN that corresponds to E-UTRA downlink or uplink carrier frequency for in-band and guard band operation.

NOTE 2: For stand-alone operation, only $M_{DL}$ = -0.5 and $M_{UL}$= 0 are applicable. $M_{DL}$ = -0.5 is not applicable for in-band and guard band operation.

NOTE 3: For the carrier including NPSS/NSSS for in-band and guard band operation, MDL is selected from {-2,-1,0,1}.

NOTE 4: For the carrier including NPSS/NSSS for stand-alone operation, $M_{DL}$ = -0.5.

# 6 Transmitter Characteristics

## 6.1 General

Editor's note: For a transition period until RAN#83 meeting (September 2019), active time slot measurement including transient period in out-of-band/spurious emission tests is allowed for TE implementation.

Unless otherwise stated, the transmitter characteristics are specified at the antenna connector of the UE with a single transmit antenna. For UE with integral antenna only, a reference antenna with a gain of 0 dBi is assumed.

The transient periods due to power steps, OFF/ON and ON/OFF transitions could occur at slot or symbol boundary with transients, on one or both sides of the boundary. The measurement period and whether to exclude the transient periods are specified in the respective sections below.

Unless otherwise stated, the Test Equipment shall be synchronised to the Uplink signal for measurement of TDD transmitter characteristics.

For CA tests, Cell ID = 0 applies to P-Cell, and Cell ID = 1 is used for S-Cell.

Parameters given in table 6.1-1 are used throughout this section for CA, unless otherwise stated by the test case.

**Table 6.1-1: Common Test Parameters**

| Parameter | Value | Comments |
|---|---|---|
| Cross carrier scheduling | Not configured | |

For CA testing, unless otherwise stated, the logical carriers PCC / SCCs are mapped to physical frequencies as defined in Table 6.1-2.

**Table 6.1-2: PCC/SCCs frequency mapping**

| CA Configuration | PCC-SCC mapping | Notes |
|---|---|---|
| Intra-band contiguous CA | CC1-CC2 (Note 4) or CC2-CC1 (Note 5) | 1 |
| Inter-band CA (CA_x-y) | Bx-By and By-Bx | 2, 3 |
| Intra-band non-contiguous CA | CC2-CC1 (Note 4) or CC1-CC2 (Note 5) | 1 |

Note 1: Notation CCi-CCj means PCC on component carrier CCi and SCC on component carrier CCj, with CCi/j frequencies defined in the corresponding intra-band contiguous CA band in TS36.508 [7].
Note 2: Notation Bi–Bj means PCC on component Band i and SCC on component Band j, with single Band i/j frequencies defined in TS36.508 [7].
Note 3: Applicable for UE declared capability of UL support (within CA operation) in the individual bands. If UE does not support both PCC-SCC mappings, only the supported mapping is applicable.
Note 4: Applicable for TDD CA and FDD CA bands with UL frequency < DL frequency.
Note 5: Applicable for FDD CA bands with UL frequency > DL frequency.

For testing of category 0 HD-FDD UE in FDD operating bands, the SS shall ensure downlink transmission is only configured in downlink subframes and that UL grants are given to ensure UE is transmitting only in uplink subframes throughout the test. The subframes reserved for uplink and downlink respectively are specified in the RMC definition in Annex A.2 for uplink and Annex A.3 for downlink.

For testing of category NB1 in all operation bands, standalone is used as default operation mode unless otherwise stated by the test case.

# 6.2 Transmit power

## 6.2.1 Void

Editor's note: This "void" section was introduced because TS 36.101 v8.1.0 also contains a "void" sub-clause within the transmit power clause 6.2, and there is a strong desire in RAN5 to keep the test cases clauses numbering matching their specific core requirements as much as possible.

## 6.2.2 UE Maximum Output Power

Editor's notes: The test applicability of Maximum Output Power for Band 47 is needed to be checked.

### 6.2.2.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified nominal maximum output power and tolerance.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

### 6.2.2.2 Test applicability

This test case applies to all types of E-UTRA Power Class 3 UE release 8 and forward.

### 6.2.2.3 Minimum conformance requirements

The following UE Power Classes defines the maximum output power for any transmission bandwidth within the channel bandwidth. The period of measurement shall be at least one sub frame (1ms).

**Table 6.2.2.3-1: UE Power Class**

| EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 23 | ±2 | | |
| 2 | | | | | 23 | ±2[2] | | |
| 3 | | | | | 23 | ±2[2] | | |
| 4 | | | | | 23 | ±2 | | |
| 5 | | | | | 23 | ±2 | | |
| 6 | | | | | 23 | ±2 | | |
| 7 | | | | | 23 | ±2[2] | | |
| 8 | | | | | 23 | ±2[2] | | |
| 9 | | | | | 23 | ±2 | | |
| 10 | | | | | 23 | ±2 | | |
| 11 | | | | | 23 | ±2 | | |
| 12 | | | | | 23 | ±2[2] | | |
| 13 | | | | | 23 | ±2 | | |
| 14 | | | | | 23 | ±2 | | |
| … | | | | | | | | |
| 17 | | | | | 23 | ±2 | | |
| 18 | | | | | 23 | ±2[6] | | |
| 19 | | | | | 23 | ±2 | | |
| 20 | | | | | 23 | ±2[2] | | |
| 21 | | | | | 23 | ±2 | | |
| 22 | | | | | 23 | +2/-3.5[2] | | |
| 23 | | | | | 23[5] | ±2[5] | | |
| 24 | | | | | 23 | ±2 | | |
| 25 | | | | | 23 | ±2[2] | | |
| 26 | | | | | 23 | ±2[2] | | |
| 27 | | | | | 23 | ±2 | | |
| 28 | | | | | 23 | +2/-2.5 | | |
| 30 | | | | | 23 | ±2 | | |
| 31 | | | | | 23 | ±2 | | |
| ... | | | | | | | | |
| 33 | | | | | 23 | ±2 | | |
| 34 | | | | | 23 | ±2 | | |
| 35 | | | | | 23 | ±2 | | |
| 36 | | | | | 23 | ±2 | | |
| 37 | | | | | 23 | ±2 | | |
| 38 | | | | | 23 | ±2 | | |
| 39 | | | | | 23 | ±2 | | |
| 40 | | | | | 23 | ±2 | | |
| 41 | | | | | 23 | ±2[2] | | |
| 42 | | | | | 23 | +2/-3 | | |
| 43 | | | | | 23 | +2/-3 | | |
| 44 | | | | | 23 | +2/[-3] | | |
| 45 | | | | | 23 | ±2 | | |
| 47 | | | 26 | ±2 | 23 | ±2 | | |
| 48 | | | | | 23 | +2/-3 | | |
| … | | | | | | | | |
| 65 | | | | | 23 | ±2 | | |
| 66 | | | | | 23 | ±2 | | |
| … | | | | | | | | |
| 68 | | | | | 23 | ±2 | | |
| … | | | | | | | | |
| 70 | | | | | 23 | ±2 | | |
| 71 | | | | | 23 | +2/-2.5 | | |
| 72 | | | | | 23 | ±2 | | |
| 73 | | | | | 23 | ±2 | | |
| 74 | | | | | 23 | ±2 | | |

Note 1: Void
Note 2: For transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB
Note 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance
Note 4: For the UE which supports both Band 11 and Band 21 operating frequencies, the tolerance is FFS.

| | |
|---|---|
| Note 5: | When NS_20 is signalled, the total output power within 2000-2005 MHz shall be limited to 7 dBm. |
| Note 6: | For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5dB for transmission bandwidths confined within 815 MHz and 818 MHz |

The normative reference for this requirement is TS 36.101 clause 6.2.2.

## 6.2.2.4 Test description

### 6.2.2.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Max UE output power testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 1 | 1 |
| 1.4MHz | | QPSK | 5 | 5 |
| 3MHz | | QPSK | 1 | 1 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 1 | 1 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 1 | 1 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 1 | 1 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 1 | 1 |
| 20MHz | | QPSK | 18 | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: For E-UTRA bands not applied with Note 2 in Table 6.2.2.3-1:

- The 1 RB allocation shall be tested at RB#0 for low and mid range, RB #max for high range test frequency.
- The RBstart of non-1RB allocation shall be RB #0 for low and mid range, RB# (max +1 - RB allocation) for high range test frequency.

Note 3: For E-UTRA bands applied with Note 2 in Table 6.2.2.3-1:

- If the test channel bandwidth is larger than 4MHz, then the 1 RB allocation shall be tested at both RB #0 and RB #max.
- If the test channel bandwidth is smaller or equal to 4MHz, then the 1 RB allocation shall be tested at RB #0.
- If the test channel bandwidth = (FUL_high - FUL_low) specified by the operating band, then only one frequency range shall be tested and the 1 RB allocation shall be tested at RB #0, RB #$\left\lceil N_{\mathrm{RB}}^{\mathrm{UL}} / 2 \right\rceil$ and RB #max.
- For non-1RB allocation, test frequency is middle range, and the RBstart shall be RB #0.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RFaccording to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.2.4.3.

#### 6.2.2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach $P_{UMAX}$ level.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.2.2.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.2.5-1.

**Table 6.2.2.5-1: UE Power Class test requirements**

| EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 23 | ±2.7 | | |
| 2 | | | | | 23 | ±2.7[2] | | |
| 3 | | | | | 23 | ±2.7[2] | | |
| 4 | | | | | 23 | ±2.7 | | |
| 5 | | | | | 23 | ±2.7 | | |
| 6 | | | | | 23 | ±2.7 | | |
| 7 | | | | | 23 | ±2.7[2] | | |
| 8 | | | | | 23 | ±2.7[2] | | |
| 9 | | | | | 23 | ±2.7 | | |
| 10 | | | | | 23 | ±2.7 | | |
| 11 | | | | | 23 | ±2.7 | | |
| 12 | | | | | 23 | ±2.7[2] | | |
| 13 | | | | | 23 | ±2.7 | | |
| 14 | | | | | 23 | ±2.7 | | |
| … | | | | | | | | |
| 17 | | | | | 23 | ±2.7 | | |
| 18 | | | | | 23 | ±2.7[6] | | |
| 19 | | | | | 23 | ±2.7 | | |
| 20 | | | | | 23 | ±2.7[2] | | |
| 21 | | | | | 23 | ±2.7 | | |
| 22 | | | | | 23 | +3.0/-4.5[2] | | |
| 23 | | | | | 23[5] | ±2.7[5] | | |
| 24 | | | | | 23 | ±2.7 | | |
| 25 | | | | | 23 | ±2.7[2] | | |
| 26 | | | | | 23 | ±2.7[2] | | |
| 27 | | | | | 23 | ±2.7 | | |
| 28 | | | | | 23 | +2.7/-3.2 | | |
| 30 | | | | | 23 | ±2.7 | | |
| 31 | | | | | 23 | ±2.7 | | |
| ... | | | | | | | | |
| 33 | | | | | 23 | ±2.7 | | |
| 34 | | | | | 23 | ±2.7 | | |
| 35 | | | | | 23 | ±2.7 | | |
| 36 | | | | | 23 | ±2.7 | | |
| 37 | | | | | 23 | ±2.7 | | |
| 38 | | | | | 23 | ±2.7 | | |
| 39 | | | | | 23 | ±2.7 | | |
| 40 | | | | | 23 | ±2.7 | | |
| 41 | | | | | 23 | ±2.7[2] | | |
| 42 | | | | | 23 | +3.0/-4.0 | | |
| 43 | | | | | 23 | +3.0/-4.0 | | |
| 44 | | | | | 23 | +2.7/[-3.7] | | |
| 45 | | | | | 23 | ±2.7 | | |
| 47 | | | 26 | ±3.3 | 23 | ±3.3 | | |
| … | | | | | | | | |
| 65 | | | | | 23 | +2.7/-2.7 | | |
| 66 | | | | | 23 | +2.7/-2.7 | | |
| … | | | | | | | | |
| 68 | | | | | 23 | +2.7/-2.7 | | |
| … | | | | | | | | |
| 70 | | | | | 23 | +2.7/-2.7 | | |
| 71 | | | | | 23 | +2.7/-3.2 | | |
| 72 | | | | | 23 | ±2.7 | | |
| 73 | | | | | 23 | ±2.7 | | |
| 74 | | | | | 23 | ±2.7 | | |

Note 1: Void
Note 2: For transmission bandwidths (Figure 5.4.2-1, Table 5.4.4-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB
Note 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance.
Note 4: For the UE which supports both Band 11 and Band 21 operating frequencies, the tolerance is FFS.
Note 5: When NS_20 is signalled, the total output power within 2000-2005 MHz shall be limited to 7 dBm.

| | |
|---|---|
| Note 6: | For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5dB for transmission bandwidths confined within 815 MHz and 818 MHz. |

For the UE which supports inter-band carrier aggregation configurations with uplink assigned to one E-UTRA band the $\Delta T_{IB,c}$ in Tables 6.2.5.3-2, 6.2.5.3-3 and 6.2.5.3-4 shall be applied for applicable bands.

In case the UE supports more than one of the above inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 6.2.5.3-2, truncated to one decimal place for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied
- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 6.2.5.3-2 that applies for that operating band among the supported CA configurations.

## 6.2.2_1 Maximum Output Power for HPUE

Editor's note: For a transition period until RAN5#81, this test case in version 15.2.0 of 36.521-1 is allowed to be used.

### 6.2.2_1.1 Test purpose

Same test purpose as in clause 6.2.2.1.

### 6.2.2_1.2 Test applicability

This test case applies to all types of E-UTRA UE Power Class 1 or Power Class 2 release 10 and forward.

### 6.2.2_1.3 Minimum conformance requirements

The following defines the maximum output power for any transmission bandwidth within the channel bandwidth for Power Class 1 and Power Class 2 UE. The period of measurement shall be at least one sub frame (1ms).

**Table 6.2.2_1.3-1: HPUE Power Class**

| EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| 14 | 31 | +2/-3[1] | N/A | N/A | N/A | N/A | N/A | N/A |
| 31 | 31 | +2/-3[1] | N/A | N/A | N/A | N/A | N/A | N/A |
| 41 | N/A | N/A | 26 | ±2[2] | N/A | N/A | N/A | N/A |
| 72 | 31 | +2/-3[1] | N/A | N/A | N/A | N/A | N/A | N/A |

Note 1: The above tolerances are applicable for UE(s) that support up to 4 E-UTRA operating bands. For UE(s) that support 5 or more E-UTRA bands the maximum output power is expected to decrease with each additional band and is FFS

Note 2: For transmission bandwidths (Figure 5.4.2-1, Table 5.4.4-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB

Note 3: N/A

Note 4: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance

Note 5-6: N/A

For a power class 2 capable UE operating on Band 41, when an IE *P-max* as defined in [5] of 23 dBm or lower is indicated in the cell or if the TDD frame configuration is 0 or 6, the requirements for power class 2 are not applicable, and the corresponding requirements for a power class 3 UE shall apply.

The normative reference for this requirement is TS 36.101 clause 6.2.2.

## 6.2.2_1.4 Test description

Same test description as in clause 6.2.2.4 with the following exceptions:

- Instead of Table 6.2.2.4.1-1→ use Table 6.2.2_1.4-1

**Table 6.2.2_1.4-1: Test Configuration Table**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Max UE output power testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 1 | 1 |
| 1.4MHz | | QPSK | 5 | 5 |
| 3MHz | | QPSK | 1 | 1 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 1 | 1 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 1 | 1 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 1 | 1 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 1 | 1 |
| 20MHz | | QPSK | 18 | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: For E-UTRA bands not applied with Note 2 in Table 6.2.2_1.3-1:
The 1 RB allocation shall be tested at RB#0 for low and mid range, RB #max for high range test frequency.
The RBstart of non-1RB allocation shall be RB #0 for low and mid range, RB# (max +1 - RB allocation) for high range test frequency.

Note 3: For E-UTRA bands applied with Note 2 in Table 6.2.2_1.3-1:
- If the test channel bandwidth is larger than 4MHz, then the 1 RB allocation shall be tested at both RB #0 and RB #max.
- If the test channel bandwidth is smaller or equal to 4MHz, then the 1 RB allocation shall be tested at RB #0.
- If the test channel bandwidth = (FUL_high - FUL_low) specified by the operating band, then only one frequency range shall be tested and the 1 RB allocation shall be tested at RB #0, RB #$\lceil N_{\mathrm{RB}}^{\mathrm{UL}} / 2 \rceil$ and RB #max.
- For non-1RB allocation, test frequency is middle range, and the RBstart shall be RB #0.

- Message contents are according to TS 36.508 [7] subclause 4.4.3.2 with the following exceptions:

**Table 6.2.2_1.4-2: SystemInformationBlockType1: Test point 1**

| Derivation Path: 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-1 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 31 dBm<br>26 dBm<br>Not present | for Power Class 1<br>for Power Class 2 other than Band 41<br>for Power Class 2 Band 41<br>See Table 6.2.2_1.3-1 | |

### 6.2.2_1.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.2_1.5-1

**Table 6.2.2_1.5-1: HPUE Power Class test requirements**

| EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| 14 | 31 | +2.7/-3.7[1] | N/A | N/A | N/A | N/A | N/A | N/A |
| 31 | 31 | +2.7/-3.7[1] | N/A | N/A | N/A | N/A | N/A | N/A |
| 41 | N/A | N/A | 26 | ±2.7[2] | N/A | N/A | N/A | N/A |
| 72 | 31 | +2.7/-3.7[1] | N/A | N/A | N/A | N/A | N/A | N/A |
| Note 1: The above tolerances are applicable for UE(s) that support up to 4 E-UTRA operating bands. For UE(s) that support 5 or more E-UTRA bands the maximum output power is expected to decrease with each additional band and is FFS<br>Note 2: For transmission bandwidths (Figure 5.4.2-1, Table 5.4.4-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB. | | | | | | | | |

## 6.2.2A UE Maximum Output Power for CA

### 6.2.2A.0 Minimum conformance requirements

The following UE Power Classes define the maximum output power for any transmission bandwidth within the aggregated channel bandwidth.

The maximum output power is measured as the sum of the maximum output power at each UE antenna connector. The period of measurement shall be at least one sub frame (1ms).

For inter-band carrier aggregation with uplink assigned to one E-UTRA band the requirements in subclause 6.2.2 apply.

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, UE maximum output power shall be measured over all component carriers from different bands. If each band has separate antenna connectors, maximum output power is measured as the sum of maximum output power at each UE antenna connector. The maximum output power is specified in Table 6.2.2A.0-1.

**Table 6.2.2A.0-1: UE Power Class for uplink interband CA (two bands)**

| E-UTRA CA Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| CA_1A-3A | | | | | 23 | +2/-3[2] | | |
| CA_1A-5A | | | | | 23 | +2/-3 | | |
| CA_1A-7A | | | | | 23 | +2/-3[2] | | |
| CA_1A-8A | | | | | 23 | +2/-3[2] | | |
| CA_1A-18A | | | | | 23 | +2/-3[5] | | |
| CA_1A-19A | | | | | 23 | +2/-3 | | |
| CA_1A-21A | | | | | 23 | +2/-3 | | |
| CA_1A-26A | | | | | 23 | +2/-3[2] | | |
| CA_1A-28A | | | | | 23 | +2/-3 | | |
| CA_1A-42A | | | | | 23 | +2/-3 | | |
| CA_2A-4A | | | | | 23 | +2/-3[2] | | |
| CA_2A-5A | | | | | 23 | +2/-3[2] | | |
| CA_2A-7A | | | | | 23 | +2/-3[2] | | |
| CA_2A-12A | | | | | 23 | +2/-3[2] | | |
| CA_2A-13A | | | | | 23 | +2/-3[2] | | |
| CA_2A-46A | | | | | 23 | +2/-3 | | |
| CA_2A-30A | | | | | 23 | +2/-3[2] | | |
| CA_2A-66A | | | | | 23 | +2/-3[2] | | |
| CA_3A-5A | | | | | 23 | +2/-3[2] | | |
| CA_3A-7A | | | | | 23 | +2/-3[2] | | |
| CA_3A-8A | | | | | 23 | +2/-3[2] | | |
| CA_3A-18A | | | | | 23 | +2/-3[2] | | |
| CA_3A-19A | | | | | 23 | +2/-3[2] | | |
| CA_3A-20A | | | | | 23 | +2/-3[2] | | |
| CA_3A-26A | | | | | 23 | +2/-3[2] | | |
| CA_3A-28A | | | | | 23 | +2/-3[2] | | |
| CA_4A-5A | | | | | 23 | +2/-3 | | |
| CA_4A-7A | | | | | 23 | +2/-3[2] | | |
| CA_4A-12A | | | | | 23 | +2/-3[2] | | |
| CA_4A-13A | | | | | 23 | +2/-3 | | |
| CA_4A-17A | | | | | 23 | +2/-3 | | |
| CA_5A-7A | | | | | 23 | +2/-3[2] | | |
| CA_5A-12A | | | | | 23 | +2/-3[2] | | |
| CA_5A-17A | | | | | 23 | +2/-3 | | |
| CA_5A-30A | | | | | 23 | +2/-3[2] | | |
| CA_5A-66A | | | | | 23 | +2/-3[2] | | |
| CA_7A-20A | | | | | 23 | +2/-3[2] | | |
| CA_7A-28A | | | | | 23 | +2/-3[2] | | |
| CA_11A-18A | | | | | 23 | +2/-3 | | |
| CA_12A-30A | | | | | 23 | +2/-3 | | |
| CA_12A-66A | | | | | 23 | +2/-3 | | |
| CA_18A-28A | | | | | 23 | +2/-3 | | |
| CA_19A-21A | | | | | 23 | +2/-3 | | |
| CA 39A-41A | | | | | 23 | +2/-3[2] | | |
| CA_39A-41C | | | | | 23 | +2/-3[2] | | |
| CA_39C-41A | | | | | 23 | +2/-3[2] | | |
| CA_41A-42A | | | | | 23 | +2/-3[2] | | |
| CA_41A-42C | | | | | 23 | +2/-3[2] | | |
| CA_41C-42A | | | | | 23 | +2/-3[2] | | |

NOTE 1: Void.
NOTE 2: [2] refers to the transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.
NOTE 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance.
NOTE 4: For inter-band carrier aggregation the maximum power requirement should apply to the total transmitted power over all component carriers (per UE).
NOTE 5: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB for transmission bandwidths confined within 815 MHz and 818 MHz.

For intra-band contiguous carrier aggregation the maximum output power is specified in Table 6.2.2A.0-2.

**Table 6.2.2A.0-2: CA UE Power Class for intraband contiguous CA**

| E-UTRA CA Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| CA_1C | | | | | 23 | +2/-2 | | |
| CA_3C | | | | | 23 | +2/-2[2] | | |
| CA_7C | | | | | 23 | +2/-2[2] | | |
| CA_8B | | | | | 23 | +2/-2[2] | | |
| CA_38C | | | | | 23 | +2/-2 | | |
| CA_39C | | | | | 23 | +2/-2 | | |
| CA_40C | | | | | 23 | +2/-2 | | |
| CA_40D | | | | | 23 | +2/-2 | | |
| CA_41C | | | 26 | +2/-2[2] | 23 | +2/-2[2] | | |
| CA_42C | | | | | 23 | +2/-3 | | |

Note 1: Void
Note 2: For transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB
Note 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance
Note 4: For intra-band contiguous carrier aggregation the maximum power requirement should apply to the total transmitted power over all component carriers (per UE).

For intra-band non-contiguous carrier aggregation with one uplink carrier on the PCC, the requirements in subclause 6.2.2 apply.

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.2A.

NOTE 1: Non-contiguous Uplink CA has no test coverage as the UE power class requirements (MPR=0dB) cannot be verified for the intra-band non-contiguous UL CA case due to the MPR is always bigger than 0 dB in current non-contiguous Uplink CA configurations according to Table 5.4.2A.1-3.

NOTE 2: Uplink LAA has no test coverage as the UE power class requirements (MPR=0dB) cannot be verified due to the MPR is always bigger than 0 dB according to clause 6.2.3A.2.3.

## 6.2.2A.1 UE Maximum Output Power for CA (intra-band contiguous DL CA and UL CA)

### 6.2.2A.1.1 Test purpose

To verify that the error of UE maximum output power in intra-band contiguous carrier aggregation does not exceed the range prescribed by the specified CA Power Class and tolerance.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

### 6.2.2A.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 6.2.2A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.2.2A.0.

### 6.2.2A.1.4 Test description

#### 6.2.2A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test

parameters for each CA Configuration, and are shown in table 6.2.2A.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.2A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | Low and High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 50 | N/Afor this test | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 50 | 50 | | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 100 | 25 | | QPSK | 1 | P_1@0 | S_0@0 | | |
| 100 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | | |
| 75 | 75 | | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 100 | 50 | | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 100 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 100 | 75 | | QPSK | 1 | P_1@0 | S_0@0 | | |
| 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | | |
| 100 | 100 | | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.2A.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.2A.1.4.3.

#### 6.2.2A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.2.2A.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.2A.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach $P_{UMAX}$ level.
6. Measure the mean transmitted power over all component carriers in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.2.2A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.2.2A.1.5 Test Requirements

The maximum output power for the CA configuration, derived in step 6 shall be within the range prescribed by the CA UE Power Class and tolerance in Table 6.2.2A.1.5-1.

**Table 6.2.2A.1.5-1: CA UE Power Class test requirements**

| CA Conf | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| CA_1C | | | | | 23 | ±2.7 | | |
| CA_3C | | | | | 23 | ±2.7[2] | | |
| CA_7C | | | | | 23 | ±2.7[2] | | |
| CA_8B | | | | | 23 | ±2.7[2] | | |
| CA_38C | | | | | 23 | ±2.7 | | |
| CA_39C | | | | | 23 | ±2.7 | | |
| CA_40C | | | | | 23 | ±2.7 | | |
| CA_41C | | | | | 23 | ±2.7[2] | | |
| CA_42C | | | | | 23 | +3.0/-4.0 | | |

Note 1: Void
Note 2: For transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB
Note 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance
Note 4: For intra-band contiguous carrier aggregation the maximum power requirement should apply to the total transmitted power over all component carriers (per UE).
Note 5: Lower limit is assuming $\Delta T_{C,c}$ and $\Delta T_{IB,c}$ are zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1.

For the UE which supports inter-band carrier aggregation configurations with uplink assigned to one E-UTRA band the $\Delta T_{IB,c}$ in Tables 6.2.5.3-2, 6.2.5.3-3 and 6.2.5.3-4 shall be applied for applicable bands.

In case the UE supports more than one of the above inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is $\leq$ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 6.2.5.3-2, truncated to one decimal place for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL, then

the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 6.2.5.3-2 that applies for that operating band among the supported CA configurations.

## 6.2.2A.1_3 UE Maximum Output Power for CA and HPUE (intra-band contiguous DL CA and UL CA)

*Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:*

- *TS36.521-2 applicability table is missing*

### 6.2.2A.1_3.1 Test purpose

Same test purpose as in clause 6.2.2A.1.1

### 6.2.2A.1_3.2 Test applicability

This test case applies to all types of E-UTRA UE Power Class 2 release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 6.2.2A.1_3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.2.2A.0.

### 6.2.2A.1_3.4 Test description

Same test description as in clause 6.2.2A.1.4.

### 6.2.2A.1_3.5 Test Requirements

The maximum output power for the CA configuration, derived in step 6 shall be within the range prescribed by the CA UE Power Class and tolerance in Table 6.2.2A.1_3.5-1.

**Table 6.2.2A.1_3.5-1: CA UE Power Class test requirements**

| CA Conf | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| CA_41C | | | 26 | ±2.7[2] | | | | |
| Note 1: Void<br>Note 2: For transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB<br>Note 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance<br>Note 4: For intra-band contiguous carrier aggregation the maximum power requirement should apply to the total transmitted power over all component carriers (per UE).<br>Note 5: Lower limit is assuming $\Delta T_{C,c}$ and $\Delta T_{IB,c}$ are zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | | | |

For the UE which supports inter-band carrier aggregation configurations with uplink assigned to one E-UTRA band the $\Delta T_{IB,c}$ in Tables 6.2.5.3-2, 6.2.5.3-3 and 6.2.5.3-4 shall be applied for applicable bands.

In case the UE supports more than one of the above inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 6.2.5.3-2, truncated to one decimal place for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 6.2.5.3-2 that applies for that operating band among the supported CA configurations.

## 6.2.2A.2 UE Maximum Output Power for CA (inter-band DL CA and UL CA)

### 6.2.2A.2.1 Test purpose

Same as in clause 6.2.2A.1.1, but for the inter-band carrier aggregation case.

### 6.2.2A.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA.

### 6.2.2A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.2.2A.0.

### 6.2.2A.2.4 Test description

#### 6.2.2A.2.4.1 Initial conditions

Same as in clause 6.2.2A.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands.
- Instead of Table 6.2.2A.1.4.1-1→ use Table 6.2.2A.2.4.1-1.
- Instead of clause 6.2.2A.1.4.3 use clause 6.2.2A.2.4.3.

**Table 6.2.2A.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | Low range for PCC and SCC<br>High range for PCC and SCC<br>(Note 3) | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/Afor this test | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 6 | 25 | | QPSK | 2 | P_1@5 | S_1@24 | - | - |
| 6 | 25 | | QPSK | 13 | P_5@0 | S_8@0 | - | - |
| 6 | 25 | | QPSK | 13 | P_5@1 | S_8@17 | - | - |
| 6 | 50 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 6 | 50 | | QPSK | 2 | P_1@5 | S_1@49 | - | - |
| 6 | 50 | | QPSK | 17 | P_5@0 | S_12@0 | - | - |
| 6 | 50 | | QPSK | 17 | P_5@1 | S_12@38 | - | - |
| 15 | 25 | | QPSK | 2 | S_1@0 | P_1@0 | | |
| 15 | 25 | | QPSK | 2 | S_1@14 | P_1@24 | | |
| 15 | 25 | | QPSK | 13 | S_5@0 | P_8@0 | | |
| 15 | 25 | | QPSK | 13 | S_5@10 | P_8@17 | | |
| 25 | 6 | | QPSK | 2 | P_1@0 | P_1@0 | | |
| 25 | 6 | | QPSK | 2 | P_1@24 | P_1@5 | | |
| 25 | 6 | | QPSK | 13 | P_8@0 | P_5@0 | | |
| 25 | 6 | | QPSK | 13 | P_8@17 | P_5@1 | | |
| 25 | 15 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 25 | 15 | | QPSK | 2 | P_1@24 | S_1@14 | - | - |
| 25 | 15 | | QPSK | 12 | P_8@0 | S_5@0 | - | - |
| 25 | 15 | | QPSK | 12 | P_8@17 | S_5@10 | - | - |
| 25 | 25 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 25 | 25 | | QPSK | 2 | P_1@24 | S_1@24 | - | - |
| 25 | 25 | | QPSK | 16 | P_8@0 | S_8@0 | - | - |
| 25 | 25 | | QPSK | 16 | P_8@17 | S_8@17 | - | - |
| 25 | 50 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 25 | 50 | | QPSK | 2 | P_1@24 | S_1@49 | - | - |
| 25 | 50 | | QPSK | 20 | P_8@0 | S_12@0 | - | - |
| 25 | 50 | | QPSK | 20 | P_8@17 | S_12@38 | - | - |
| 50 | 25 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 50 | 25 | | QPSK | 2 | P_1@49 | S_1@24 | - | - |
| 50 | 25 | | QPSK | 8 | P_12@0 | S_8@0 | - | - |
| 50 | 25 | | QPSK | 8 | P_12@38 | S_8@17 | - | - |
| 50 | 50 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 50 | 50 | | QPSK | 2 | P_1@49 | S_1@49 | - | - |
| 50 | 50 | | QPSK | 24 | P_12@0 | S_12@0 | - | - |
| 50 | 50 | | QPSK | 24 | P_12@38 | S_12@38 | - | - |
| 25 | 75 | | QPSK | 2 | P_1@0 | P_1@0 | | |
| 25 | 75 | | QPSK | 2 | P_1@24 | P_1@74 | | |
| 25 | 75 | | QPSK | 24 | P_8@0 | P_16@0 | | |
| 25 | 75 | | QPSK | 24 | P_8@17 | P_16@59 | | |
| 50 | 100 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 50 | 100 | | QPSK | 2 | P_1@49 | S_1@99 | - | - |
| 50 | 100 | | QPSK | 30 | P_12@0 | S_18@0 | - | - |
| 50 | 100 | | QPSK | 30 | P_12@38 | S_18@82 | - | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 75 | 25 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 75 | 25 | | QPSK | 2 | P_1@74 | S_1@24 | - | - |
| 75 | 25 | | QPSK | 24 | P_16@0 | S_8@0 | - | - |
| 75 | 25 | | QPSK | 24 | P_16@59 | S_8@17 | - | - |
| 75 | 75 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 75 | 75 | | QPSK | 2 | P_1@74 | S_1@74 | - | - |
| 75 | 75 | | QPSK | 32 | P_16@0 | S_16@0 | - | - |
| 75 | 75 | | QPSK | 32 | P_16@59 | S_16@59 | - | - |
| 100 | 50 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 100 | 50 | | QPSK | 2 | P_1@99 | S_1@49 | - | - |
| 100 | 50 | | QPSK | 30 | P_18@0 | S_12@0 | - | - |
| 100 | 50 | | QPSK | 30 | P_18@82 | S_12@38 | - | - |
| 100 | 75 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 100 | 75 | | QPSK | 2 | P_1@99 | S_1@74 | - | - |
| 100 | 75 | | QPSK | 34 | P_18@0 | S_16@0 | - | - |
| 100 | 75 | | QPSK | 34 | P_18@82 | S_16@59 | - | - |
| 100 | 100 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 100 | 100 | | QPSK | 2 | P_1@99 | S_1@99 | - | - |
| 100 | 100 | | QPSK | 36 | P_18@0 | S_18@0 | - | - |
| 100 | 100 | | QPSK | 36 | P_18@82 | S_18@82 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested. | | | | | | | | |
| Note 3: For Low range use only test points with RBstart=0. For High range use only test points with RBstart=RBmax-LCRB+1. | | | | | | | | |

#### 6.2.2A.2.4.2 Test procedure

Same as in clause 6.2.2A.1.4.2 with the following exceptions:

- Instead of Table 6.2.2A.1.4.1-1→ use Table 6.2.2A.2.4.1-1.
- Instead of clause 6.2.2A.1.4.3 use clause 6.2.2A.2.4.3.

#### 6.2.2A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.2.2A.2.5 Test Requirements

The maximum output power for the CA configuration, derived in step 6 shall be within the range prescribed by the CA UE Power Class and tolerance in Table 6.2.2A.2.5-1.

**Table 6.2.2A.2.5-1: UE Power Class for dual uplink interband CA test requirements**

| E-UTRA CA Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| CA_1A-3A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_1A-5A | | | | | 23 | +2.7/-3.7 | | |
| CA_1A-7A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_1A-8A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_1A-18A | | | | | 23 | +2.7/-3.7[5] | | |
| CA_1A-19A | | | | | 23 | +2.7/-3.7 | | |
| CA_1A-21A | | | | | 23 | +2.7/-3.7 | | |
| CA_1A-26A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_1A-28A | | | | | 23 | +2.7/-3.7 | | |
| CA_1A-42A | | | | | 23 | +3.0/-4.0 | | |
| CA_2A-4A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_2A-5A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_2A-7A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_2A-12A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_2A-13A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_2A-30A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_2A-66A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_3A-5A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_3A-7A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_3A-8A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_3A-18A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_3A-19A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_3A-20A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_3A-26A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_3A-28A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_4A-5A | | | | | 23 | +2.7/-3.7 | | |
| CA_4A-7A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_4A-12A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_4A-13A | | | | | 23 | +2.7/-3.7 | | |
| CA_4A-17A | | | | | 23 | +2/.7-3.7 | | |
| CA_5A-7A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_5A-12A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_5A-17A | | | | | 23 | +2.7/-3.7 | | |
| CA_5A-30A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_5A-66A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_7A-20A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_7A-28A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_11A-18A | | | | | 23 | +2.7/-3.7 | | |
| CA_12A-30A | | | | | 23 | +2.7/-3.7 | | |
| CA_12A-66A | | | | | 23 | +2.7/-3.7 | | |
| CA_18A-28A | | | | | 23 | +2.7/-3.7 | | |
| CA_19A-21A | | | | | 23 | +2.7/-3.7 | | |
| CA 39A-41A | | | | | 23 | +2.7/-3.7[2] | | |
| CA_41A-42A | | | | | 23 | +3.0/-4.0[2] | | |

NOTE 1: Void.
NOTE 2: [2] refers to the transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.
NOTE 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance.
NOTE 4: For inter-band carrier aggregation the maximum power requirement should apply to the total transmitted power over all component carriers (per UE).
NOTE 5: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB for transmission bandwidths confined within 815 MHz and 818 MHz.

For the UE which supports inter-band carrier aggregation configurations with uplink assigned to one E-UTRA band the $\Delta T_{IB,c}$ in Table 6.2.5.3-2 shall be applied for applicable bands. For the UE which supports an inter-band carrier aggregation configuration from Table 6.2.5.3-3 the $\Delta T_{IB,c}$ in Table 6.2.5.3-3 shall be applied for applicable bands.

In case the UE supports more than one of the above inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 6.2.5.3-2, truncated to one decimal place for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 6.2.5.3-2 that applies for that operating band among the supported CA configurations.

In case the UE supports more than one of the inter-band carrier aggregation configurations from Table 6.2.5.3-3 and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz and the tolerances are the same, the value applies to the band. If the tolerances are different, the applicable additional 3DL tolerance is FFS. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 3DL carrier aggregation configurations involving such band shall be applied.

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional 3DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 3DL CA configurations.

## 6.2.2A.3 UE Maximum Output Power for CA (intra-band non-contiguous DL CA and UL CA)

NOTE: No test case details specified as the UE power class requirements (MPR=0dB) cannot be verified for the intra-band non-contiguous UL CA case due to the MPR is always bigger than 0 dB in current non-contiguous Uplink CA configurations according to Table 5.4.2A.1-3.

## 6.2.2A.4 UE Maximum Output Power for CA (3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

There is no intra-band non-contiguous combination for CA (3UL CA)

### 6.2.2A.4.1 Test purpose

To verify that the error of UE maximum output power in three uplink carrier aggregation does not exceed the range prescribed by the specified CA Power Class and tolerance.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

### 6.2.2A.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band contiguous or inter-band and 3UL CA.

### 6.2.2A.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.2.2A.0.

### 6.2.2A.4.4 Test description

#### 6.2.2A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be set up and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.2.2A.4.4.1-1 to 6.2.2A.4.4.1-2. The details of the

uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.2A.4.4.1-1: Intra Band contiguous CA Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low and High range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 50 | N/Afor this test | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 50 | 50 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 100 | 25 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | |
| 100 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | |
| 75 | 75 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 100 | 50 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 100 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 100 | 75 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | |
| 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | |
| 100 | 100 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

**Table 6.2.2A.4.4.1-2: inter-band CA Test Configuration Table**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | Inner Band : Low range for PCC and SCCs<br>High range for PCC and SCCs (Note 3) |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) |
| Test Parameters for CA Configurations | | | |
| **CA Configuration / $N_{RB_agg}$** | **DL Allocation** | **CC MOD** | **UL Allocation** |

| PCC $N_{RB}$ | SCCs $N_{RB}$ | PCC & SCC RB allocation | | $N_{RB_alloc}$ | PCC & SCCs RB allocations ($L_{CRB}$ @ $RB_{start}$) | | | |
|---|---|---|---|---|---|---|---|---|
| 6 | 25 | N/Afor this test | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 6 | 25 | | QPSK | 3 | P_1@5 | S_1@24 | S_1@24 | - |
| 6 | 25 | | QPSK | 21 | P_5@0 | S_8@0 | S_8@0 | - |
| 6 | 25 | | QPSK | 21 | P_5@1 | S_8@17 | S_8@17 | - |
| 6 | 50 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 6 | 50 | | QPSK | 3 | P_1@5 | S_1@49 | S_1@49 | - |
| 6 | 50 | | QPSK | 29 | P_5@0 | S_12@0 | S_12@0 | - |
| 6 | 50 | | QPSK | 29 | P_5@1 | S_12@38 | S_12@38 | - |
| 15 | 25 | | QPSK | 3 | S_1@0 | P_1@0 | P_1@0 | |
| 15 | 25 | | QPSK | 3 | S_1@14 | P_1@24 | P_1@24 | |
| 15 | 25 | | QPSK | 21 | S_5@0 | P_8@0 | P_8@0 | |
| 15 | 25 | | QPSK | 21 | S_5@10 | P_8@17 | P_8@17 | |
| 25 | 6 | | QPSK | 3 | P_1@0 | P_1@0 | P_1@0 | |
| 25 | 6 | | QPSK | 3 | P_1@24 | P_1@5 | P_1@5 | |
| 25 | 6 | | QPSK | 18 | P_8@0 | P_5@0 | P_5@0 | |
| 25 | 6 | | QPSK | 18 | P_8@17 | P_5@1 | P_5@1 | |
| 25 | 15 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 25 | 15 | | QPSK | 3 | P_1@24 | S_1@14 | S_1@14 | - |
| 25 | 15 | | QPSK | 18 | P_8@0 | S_5@0 | S_5@0 | - |
| 25 | 15 | | QPSK | 18 | P_8@17 | S_5@10 | S_5@10 | - |
| 25 | 25 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 25 | 25 | | QPSK | 3 | P_1@24 | S_1@24 | S_1@24 | - |
| 25 | 25 | | QPSK | 24 | P_8@0 | S_8@0 | S_8@0 | - |
| 25 | 25 | | QPSK | 24 | P_8@17 | S_8@17 | S_8@17 | - |
| 25 | 50 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 25 | 50 | | QPSK | 3 | P_1@24 | S_1@49 | S_1@49 | - |
| 25 | 50 | | QPSK | 32 | P_8@0 | S_12@0 | S_12@0 | - |
| 25 | 50 | | QPSK | 32 | P_8@17 | S_12@38 | S_12@38 | - |
| 50 | 25 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 50 | 25 | | QPSK | 3 | P_1@49 | S_1@24 | S_1@24 | - |
| 50 | 25 | | QPSK | 28 | P_12@0 | S_8@0 | S_8@0 | - |
| 50 | 25 | | QPSK | 28 | P_12@38 | S_8@17 | S_8@17 | - |
| 50 | 50 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 50 | 50 | | QPSK | 3 | P_1@49 | S_1@49 | S_1@49 | - |
| 50 | 50 | | QPSK | 36 | P_12@0 | S_12@0 | S_12@0 | - |
| 50 | 50 | | QPSK | 36 | P_12@38 | S_12@38 | S_12@38 | - |
| 25 | 75 | | QPSK | 3 | P_1@0 | P_1@0 | P_1@0 | |
| 25 | 75 | | QPSK | 3 | P_1@24 | P_1@74 | P_1@74 | |
| 25 | 75 | | QPSK | 40 | P_8@0 | P_16@0 | P_16@0 | |
| 25 | 75 | | QPSK | 40 | P_8@17 | P_16@59 | P_16@59 | |
| 50 | 100 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 50 | 100 | | QPSK | 3 | P_1@49 | S_1@99 | S_1@99 | - |
| 50 | 100 | | QPSK | 48 | P_12@0 | S_18@0 | S_18@0 | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 50 | 100 | | QPSK | 48 | P_12@38 | S_18@82 | S_18@82 | - |
| 75 | 75 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 75 | 75 | | QPSK | 3 | P_1@74 | S_1@74 | S_1@74 | - |
| 75 | 75 | | QPSK | 48 | P_16@0 | S_16@0 | S_16@0 | - |
| 75 | 75 | | QPSK | 48 | P_16@59 | S_16@59 | S_16@59 | - |
| 100 | 50 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 100 | 50 | | QPSK | 3 | P_1@99 | S_1@49 | S_1@49 | - |
| 100 | 50 | | QPSK | 42 | P_18@0 | S_12@0 | S_12@0 | - |
| 100 | 50 | | QPSK | 42 | P_18@82 | S_12@38 | S_12@38 | - |
| 100 | 75 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 100 | 75 | | QPSK | 3 | P_1@99 | S_1@74 | S_1@74 | - |
| 100 | 75 | | QPSK | 50 | P_18@0 | S_16@0 | S_16@0 | - |
| 100 | 75 | | QPSK | 50 | P_18@82 | S_16@59 | S_16@59 | - |
| 100 | 100 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 100 | 100 | | QPSK | 3 | P_1@99 | S_1@99 | S_1@99 | - |
| 100 | 100 | | QPSK | 54 | P_18@0 | S_18@0 | S_18@0 | - |
| 100 | 100 | | QPSK | 54 | P_18@82 | S_18@82 | S_18@82 | - |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.
Note 3: For Low range use only test points with RBstart=0. For High range use only test points with RBstart=RBmax-LCRB+1.
Note 4: No additional test points need to be tested for LAA Scell configured in Band 46 since all the test configurations require MPR.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.55 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.2A.4.4.1-1 to 6.2.2A.4.4.1-2.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.2A.4.4.3.

### 6.2.2A.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.2.2A.4.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.2A.4.4.1-1 to 6.2.2A.4.4.1-2 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach $P_{UMAX}$ level.

6. Measure the mean transmitted power over all component carriers in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.2.2A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

### 6.2.2A.4.5 Test Requirements

The maximum output power for the CA configuration, derived in step 6 shall be within the range prescribed by the CA UE Power Class and tolerance in Table 6.2.2A.4.5-1 for Intra band 3UL CA configuration and Table 6.2.2A.4.5-2 for inter band 3 UL CA configuration.

**Table 6.2.2A.4.5-1: CA UE Power Class test for intra band 3UL CA test requirements**

| E-UTRA CA Conf | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| CA_40D | | | | | 23 | ±2.7 | | |
| Note 1: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance<br>Note 2: For intra-band contiguous carrier aggregation the maximum power requirement should apply to the total transmitted power over all component carriers (per UE).<br>Note 3: Lower limit is assuming $\Delta T_{C,c}$ and $\Delta T_{IB,c}$ are zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | | | |

**Table 6.2.2A.4.5-2: UE Power Class for inter band 3UL CA test requirements**

| E-UTRA CA Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| CA_39A-41C | | | | | 23 | +2.7/-3.7[1] | | |
| CA_39C-41A | | | | | 23 | +2.7/-3.7[1] | | |
| CA_41A-42C | | | | | 23 | +2/-3[2] | | |
| CA_41C-42A | | | | | 23 | +2/-3[2] | | |
| NOTE 1: Refers to the transmission bandwidths ( Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.<br>NOTE 2: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance.<br>NOTE 3: For inter-band carrier aggregation the maximum power requirement should apply to the total transmitted power over all component carriers (per UE). | | | | | | | | |

For the UE which supports intra-band carrier aggregation configurations with uplink assigned to one E-UTRA band the $\Delta T_{IB,c}$ in Tables 6.2.5.3-2, 6.2.5.3-3 and 6.2.5.3-4 shall be applied for applicable bands.

In case the UE supports more than one of the above intra band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 6.2.5.3-2, truncated to one decimal place for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 6.2.5.3-2 that applies for that operating band among the supported CA configurations.

For the UE which supports inter-band carrier aggregation configurations with uplink assigned to one E-UTRA band the $\Delta T_{IB,c}$ in Table 6.2.5.3-2 shall be applied for applicable bands. For the UE which supports an inter-band carrier aggregation configuration from Table 6.2.5.3-3 the $\Delta T_{IB,c}$ in Table 6.2.5.3-3 shall be applied for applicable bands.

In case the UE supports more than one of the above inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 6.2.5.3-2, truncated to one decimal place for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 6.2.5.3-2 that applies for that operating band among the supported CA configurations.

In case the UE supports more than one of the inter-band carrier aggregation configurations from Table 6.2.5.3-3 and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz and the tolerances are the same, the value applies to the band. If the tolerances are different, the applicable additional 3DL tolerance is FFS. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 3DL carrier aggregation configurations involving such band shall be applied.

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional 3DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 3DL CA configurations.

#### 6.2.2A.4.1 Void

#### 6.2.2A.4.2 Void

## 6.2.2B UE Maximum Output Power for UL-MIMO

### 6.2.2B.1 Test purpose

To verify that the error of UE maximum output power in UL MIMO does not exceed the range prescribed by the specified UL MIMO Power Class and tolerance.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

### 6.2.2B.2 Test applicability

This test case applies to all types of E-UTRA Power Class 3 UE release 10 and forward that support UL MIMO.

### 6.2.2B.3 Minimum conformance requirements

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the maximum output power for any transmission bandwidth within the channel bandwidth is specified in Table 6.2.2B.3-1 with the UL-MIMO configurations specified in Table 6.2.2B.3-2. The maximum output power is measured as the sum of the maximum output power at each UE antenna connector. The period of measurement shall be at least one sub frame (1ms).

**Table 6.2.2B.3-1: UE Power Class for UL-MIMO in closed loop spatial multiplexing scheme**

| EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2/-3 | | |
| 2 | | | | | 23 | +2/-3[2] | | |
| 3 | | | | | 23 | +2/-3[2] | | |
| 4 | | | | | 23 | +2/-3 | | |
| 5 | | | | | 23 | +2/-3 | | |
| 6 | | | | | 23 | +2/-3 | | |
| 7 | | | | | 23 | +2/-3[2] | | |
| 8 | | | | | 23 | +2/-3[2] | | |
| 9 | | | | | 23 | +2/-3 | | |
| 10 | | | | | 23 | +2/-3 | | |
| 11 | | | | | 23 | +2/-3 | | |
| 12 | | | | | 23 | +2/-3[2] | | |
| 13 | | | | | 23 | +2/-3 | | |
| 14 | | | | | 23 | +2/-3 | | |
| … | | | | | | | | |
| 17 | | | | | 23 | +2/-3 | | |
| 18 | | | | | 23 | +2/-3 | | |
| 19 | | | | | 23 | +2/-3 | | |
| 20 | | | | | 23 | +2/-3[2] | | |
| 21 | | | | | 23 | +2/-3 | | |
| 22 | | | | | 23 | +2/-4.5[2] | | |
| 23 | | | | | 23 | +2/-3 | | |
| 24 | | | | | 23 | +2/-3 | | |
| 25 | | | | | 23 | +2/-3[2] | | |
| 26 | | | | | 23 | +2/-3[2] | | |
| 27 | | | | | 23 | +2/-3 | | |
| 28 | | | | | 23 | +2/[-3] | | |
| 30 | | | | | 23 | +2/-3 | | |
| 31 | | | | | 23 | +2/-3 | | |
| … | | | | | | | | |
| 33 | | | | | 23 | +2/-3 | | |
| 34 | | | | | 23 | +2/-3 | | |
| 35 | | | | | 23 | +2/-3 | | |
| 36 | | | | | 23 | +2/-3 | | |
| 37 | | | | | 23 | +2/-3 | | |
| 38 | | | | | 23 | +2/-3 | | |
| 39 | | | | | 23 | +2/-3 | | |
| 40 | | | | | 23 | +2/-3 | | |
| 41 | | | | | 23 | +2/-3[2] | | |
| 42 | | | | | 23 | +2/-4 | | |
| 43 | | | | | 23 | +2/-4 | | |
| 44 | | | | | 23 | +2/[-3] | | |
| 45 | | | | | 23 | +2/-3 | | |
| … | | | | | | | | |
| 48 | | | | | 23 | +2/-3 | | |
| … | | | | | | | | |
| 65 | | | | | 23 | +2/-3 | | |
| 66 | | | | | 23 | +2/-3 | | |
| … | | | | | | | | |
| 68 | | | | | 23 | +2/-3 | | |
| … | | | | | | | | |
| 70 | | | | | 23 | +2/-3 | | |
| 72 | | | | | 23 | +2/-3 | | |
| 73 | | | | | 23 | +2/-3 | | |
| 74 | | | | | 23 | +2/-3 | | |

Note 1: Void
Note 2: For transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB
Note 3: For the UE which supports both Band 11 and Band 21 operating frequencies, the tolerance is FFS.
Note 4: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance

**Table 6.2.2B.3-2: UL-MIMO configuration in closed-loop spatial multiplexing scheme**

| Transmission mode | DCI format | Codebook Index |
|---|---|---|
| Mode 2 | DCI format 4 | Codebook index 0 |

The normative reference for this requirement is TS 36.101 clause 6.2.2B.

## 6.2.2B.4 Test description

### 6.2.2B.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.2B.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.2B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Max UE output power testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 1 | 1 |
| 1.4MHz | | QPSK | 5 | 5 |
| 3MHz | | QPSK | 1 | 1 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 1 | 1 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 1 | 1 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 1 | 1 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 1 | 1 |
| 20MHz | | QPSK | 18 | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: For E-UTRA bands not applied with Note 2 in Table 6.2.2B.3-1:
- The 1 RB allocation shall be tested at RB#0 for low and mid range, RB #max for high range test frequency.
- The starting resource block of non-1RB allocation shall be RB #0 for low and mid range, RB# (max +1 - RB allocation) for high range test frequency.

Note 3: For E-UTRA bands applied with Note 2 in Table 6.2.2B.3-1:
- If the test channel bandwidth is larger than 4MHz, then the 1 RB allocation shall be tested at both RB #0 and RB #max.
- If the test channel bandwidth is smaller or equal to 4MHz, then the 1 RB allocation shall be tested at RB #0.
- If the test channel bandwidth = ($F_{UL_high}$ - $F_{UL_low}$) specified by the operating band, then only one frequency range shall be tested and the 1 RB allocation shall be tested at RB #0, RB #$\left\lceil N_{RB}^{UL}/2 \right\rceil$ and RB #max.
- For non-1RB allocation, test frequency is middle range, and the starting resource block shall be RB #0.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.2B.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RFaccording to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.2B.4.3.

### 6.2.2B.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.2.2B.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach $P_{UMAX}$ level.
3. Measure the mean sum power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

### 6.2.2B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

## 6.2.2B.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.2B.5-1.

**Table 6.2.2B.5-1: UE Power Class for UL-MIMO in closed loop spatial multiplexing scheme**

| EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7/-3.7 | | |
| 2 | | | | | 23 | +2.7/-3.7[2] | | |
| 3 | | | | | 23 | +2.7/-3.7[2] | | |
| 4 | | | | | 23 | +2.7/-3.7 | | |
| 5 | | | | | 23 | +2.7/-3.7 | | |
| 6 | | | | | 23 | +2.7/-3.7 | | |
| 7 | | | | | 23 | +2.7/-3.7[2] | | |
| 8 | | | | | 23 | +2.7/-3.7[2] | | |
| 9 | | | | | 23 | +2.7/-3.7 | | |
| 10 | | | | | 23 | +2.7/-3.7 | | |
| 11 | | | | | 23 | +2.7/-3.7 | | |
| 12 | | | | | 23 | +2.7/-3.7[2] | | |
| 13 | | | | | 23 | +2.7/-3.7 | | |
| 14 | | | | | 23 | +2.7/-3.7 | | |
| … | | | | | | | | |
| 17 | | | | | 23 | +2.7/-3.7 | | |
| 18 | | | | | 23 | +2.7/-3.7 | | |
| 19 | | | | | 23 | +2.7/-3.7 | | |
| 20 | | | | | 23 | +2.7/-3.7[2] | | |
| 21 | | | | | 23 | +2.7/-3.7 | | |
| 22 | | | | | 23 | +3/-5.5[2] | | |
| 23 | | | | | 23 | +2.7/-3.7 | | |
| 24 | | | | | 23 | +2.7/-3.7 | | |
| 25 | | | | | 23 | +2.7/-3.7[2] | | |
| 26 | | | | | 23 | +2.7/-3.7 | | |
| 27 | | | | | 23 | +2.7/-3.7 | | |
| 28 | | | | | 23 | +2.7/[-3.7] | | |
| 30 | | | | | 23 | +2.7/-3.7 | | |
| 31 | | | | | 23 | +2.7/-3.7 | | |
| … | | | | | | | | |
| 33 | | | | | 23 | +2.7/-3.7 | | |
| 34 | | | | | 23 | +2.7/-3.7 | | |
| 35 | | | | | 23 | +2.7/-3.7 | | |
| 36 | | | | | 23 | +2.7/-3.7 | | |
| 37 | | | | | 23 | +2.7/-3.7 | | |
| 38 | | | | | 23 | +2.7/-3.7 | | |
| 39 | | | | | 23 | +2.7/-3.7 | | |
| 40 | | | | | 23 | +2.7/-3.7 | | |
| 41 | | | | | 23 | +2.7/-3.7[2] | | |
| 42 | | | | | 23 | +3/-5 | | |
| 43 | | | | | 23 | +3/-5 | | |
| 44 | | | | | 23 | +2.7/[-3.7] | | |
| 45 | | | | | 23 | +2.7/-3.7 | | |
| … | | | | | | | | |
| 65 | | | | | 23 | +2.7/-3.7 | | |
| 66 | | | | | 23 | +2/-3 | | |
| … | | | | | | | | |
| 68 | | | | | 23 | +2.7/-3.7 | | |
| … | | | | | | | | |
| 70 | | | | | 23 | +2.7/-3.7 | | |
| 72 | | | | | 23 | +2.7/-3.7 | | |
| 73 | | | | | 23 | +2.7/-3.7 | | |
| 74 | | | | | 23 | +2.7/-3.7 | | |

Note 1: Void
Note 2: For transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB
Note 3: For the UE which supports both Band 11 and Band 21 operating frequencies, the tolerance is FFS.
Note 4: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance

For the UE which supports inter-band carrier aggregation configurations with uplink assigned to one E-UTRA band the $\Delta T_{IB,c}$ in Tables 6.2.5.3-2, 6.2.5.3-3 and 6.2.5.3-4 shall be applied for applicable bands.

In case the UE supports more than one of the above inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 6.2.5.3-2, truncated to one decimal place for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied
- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 6.2.5.3-2 that applies for that operating band among the supported CA configurations.

# 6.2.2B_1HPUE Maximum Output Power for UL-MIMO

## 6.2.2B_1.1 Test purpose

Same test purpose as in clause 6.2.2B.1.

## 6.2.2B_1.2 Test applicability

This test case applies to all types of E-UTRA Power Class 2 UE release 10 and forward that support UL MIMO.

## 6.2.2B_1.3 Minimum conformance requirements

For Power Class 2 UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the maximum output power for any transmission bandwidth within the channel bandwidth is specified in Table 6.2.2B_1.3-1 with the UL-MIMO configurations specified in Table 6.2.2B.3-2. The maximum output power is measured as the sum of the maximum output power at each UE antenna connector. The period of measurement shall be at least one sub frame (1ms).

**Table 6.2.2B_1.3-1: Power Class for UL-MIMO in closed loop spatial multiplexing scheme for Power Class 2**

| EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| 31 | 31 | +2/-3[1] | | | | | | |
| 41 | | | 26 | +2/-3[2] | | | | |
| 72 | 31 | +2/-3[1] | | | | | | |
| Note 1: The above tolerances are applicable for UE(s) that support up to 4 E-UTRA operating bands. For UE(s) that support 5 or more E-UTRA bands the maximum output power is expected to decrease with each additional band and is FFS | | | | | | | | |
| Note 2: For transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB | | | | | | | | |
| Note 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance | | | | | | | | |

For a power class 2 capable UE operating on Band 41, when an IE *P-max* as defined in [5] of 23 dBm or lower is indicated in the cell or if the TDD frame configuration is 0 or 6, the requirements for power class 2 are not applicable and the corresponding requirements for a power class 3 UE shall apply.

The normative reference for this requirement is TS 36.101 clause 6.2.2B.

## 6.2.2B_1.4 Test description

Same test description as in clause 6.2.2B.4 with the following exception:

- Instead of Table 6.2.2B.4.1-1→ use Table 6.2.2B_1.4.1-1

**Table 6.2.2B_1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Max UE output power testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 1 | 1 |
| 1.4MHz | | QPSK | 5 | 5 |
| 3MHz | | QPSK | 1 | 1 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 1 | 1 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 1 | 1 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 1 | 1 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 1 | 1 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: If the test channel bandwidth is larger than 4MHz, then the 1 RB allocation shall be tested at both RB #0 and RB #max.<br>- If the test channel bandwidth is smaller or equal to 4MHz, then the 1 RB allocation shall be tested at RB #0.<br>- If the test channel bandwidth = (FUL_high - FUL_low) specified by the operating band, then only one frequency range shall be tested and the 1 RB allocation shall be tested at RB #0, RB # $\lceil N_{\mathrm{RB}}^{\mathrm{UL}} / 2 \rceil$ and RB #max.<br>- For non-1RB allocation, test frequency is middle range, and the RBstart shall be RB #0. | | | | |

## 6.2.2B_1.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.2B_1.5-1.

**Table 6.2.2B_1.5-1: Power Class for UL-MIMO in closed loop spatial multiplexing scheme for Power Class 2**

| **EUTRA band** | **Class 1 (dBm)** | **Tolerance (dB)** | **Class 2 (dBm)** | **Tolerance (dB)** | **Class 3 (dBm)** | **Tolerance (dB)** | **Class 4 (dBm)** | **Tolerance (dB)** |
|---|---|---|---|---|---|---|---|---|
| 31 | 31 | +2.7/-3.7[1] | | | | | | |
| 41 | | | 26 | +2.7/-3.7[2] | | | | |
| 72 | 31 | +2.7/-3.7[1] | | | | | | |
| Note 1: The above tolerances are applicable for UE(s) that support up to 4 E-UTRA operating bands. For UE(s) that support 5 or more E-UTRA bands the maximum output power is expected to decrease with each additional band and is FFS<br>Note 2: For transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB<br>Note 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance | | | | | | | | |

# 6.2.2C

# 6.2.2D UE Maximum Output Power for ProSe

## 6.2.2D.0 Minimum conformance requirements

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, the UE maximum output power shall be as specified in Table 6.2.2A-0 in subclause 6.2.2A for the corresponding inter-band aggregation with uplink assigned to two bands.

The normative reference for this requirement is TS 36.101 [2] clause 6.2.2D.

## 6.2.2D.1 UE Maximum Output Power for ProSe Discovery

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Message exceptions content needs further investigation (some values still TBD).
- Test system uncertainties and test tolerances.
- Test procedure for concurrent operation with E-UTRA uplink transmissions is not defined.

### 6.2.2D.1.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specific maximum output power and tolerance when operating in ProSe Discovery mode non-concurrent with E-UTRA uplink transmissions.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

### 6.2.2D.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward which supports ProSe Direct Discovery.

### 6.2.2D.1.3 Minimum Conformance requirements

The minimum conformance requirements are defined in clause 6.2.2D.0.

### 6.2.2D.1.4 Test description

#### 6.2.2D.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.2D.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.2D.1.4.1-1: Test Configuration Table**

| Initial Conditions | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, Highest | | |
| | | | |
| | **Downlink Configuration** | **Uplink Configuration** | **Sidelink Configuration (PSDCH transmission)** |
| Ch BW | RB allocation | RB allocation | RB allocation |
| 5MHz | 8 | 8 | 2 |
| 10MHz | 16 | 16 | 2 |
| 15MHz | 25 | 25 | 2 |
| 20MHz | 30 | 30 | 2 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.67.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.2.2D.1.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 6.2.2D.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message content exceptions are defined in clause 6.2.2D.1.4.3.
7. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is closed and UE is set to announce discovery.

### 6.2.2D.1.4.2 Test procedure

1. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions (only those marked with "…Step 1…" ) are defined in clause 6.2.2D.1.4.3.
2. The UE shall transmit RRCConnectionReconfigurationComplete message.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms).

### 6.2.2D.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

- Table A.7.1.1-1 for FDD
- Table A.7.1.2-1 for TDD

**Table 6.2.2D.1.4.3-1: ACTIVATE TEST MODE: Maximum Output Power for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 6.2.2D.1.4.3-2: CLOSE UE TEST LOOP: Maximum Output Power for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 6.2.2D.1.4.3-3: *MAC-MainConfig-RBC*: Maximum Output Power for ProSe Direct Discovery (applicable only for Step 1 of Test procedure)**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | TBD | | |
| periodicBSR-Timer | TBD | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | TBD | | |
| } | | | |

### 6.2.2D.1.5 Test requirements

FFS

## 6.2.2D.2 UE Maximum Output Power for ProSe Direct Communication

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Many clauses are TBD

### 6.2.2D.2.1 Test purpose

TBD

### 6.2.2D.2.2 Test applicability

TBD

### 6.2.2D.2.3 Minimum conformance requirements

TBD

### 6.2.2D.2.4 Test description

TBD

#### 6.2.2DD.2.4.1 Initial conditions

TBD

#### 6.2.2D.2.4.2 Test procedure

TBD

#### 6.2.2D.2.4.3 Message contents

TBD

### 6.2.2D.2.5 Test requirements

TBD

## 6.2.2E UE Maximum Output Power for UE category 0

### 6.2.2E.1 Test purpose

Same test purpose as in clause 6.2.2.1.

### 6.2.2E.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.2.2E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.2.3

### 6.2.2E.4 Test description

#### 6.2.2E.4.1 Initial condition

Same initial conditions as in clause 6.2.2.4.1 with the following exceptions:

- Instead of Table 6.2.2.4.1-1 → use Table 6.2.2E.4.1-1.
- Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.2.2E.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Max UE output power testing | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 1.4MHz | | QPSK | 1 | 1 |
| 1.4MHz | | QPSK | 5 | 5 |
| 3MHz | | QPSK | 1 | 1 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 1 | 1 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 1 | 1 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 1 | 1 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 1 | 1 |
| 20MHz | | QPSK | 18 | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: For E-UTRA bands not applied with Note 2 in Table 6.2.2.3-1:
- The 1 RB allocation shall be tested at RB#0 for low and mid range, RB #max for high range test frequency.
- The RBstart of non-1RB allocation shall be RB #0 for low and mid range, RB# (max +1 - RB allocation) for high range test frequency.

Note 3: For E-UTRA bands applied with Note 2 in Table 6.2.2.3-1:
- If the test channel bandwidth is larger than 4MHz, then the 1 RB allocation shall be tested at both RB #0 and RB #max.
- If the test channel bandwidth is smaller or equal to 4MHz, then the 1 RB allocation shall be tested at RB #0.
- If the test channel bandwidth = (FUL_high - FUL_low) specified by the operating band, then only one frequency range shall be tested and the 1 RB allocation shall be tested at RB #0, RB #$\lceil N_{\mathrm{RB}}^{\mathrm{UL}} / 2 \rceil$ and RB #max.
- For non-1RB allocation, test frequency is middle range, and the RBstart shall be RB #0.

6.2.2E.4.2 Test procedure

Same test procedure as in clause 6.2.2.4.2 with the following exception for HD-FDD:

- In step 3, slots with transient periods are not under test. Half-duplex guard subframes are not under test.

### 6.2.2E.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.2.2E.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.2E.5-1.

**Table 6.2.2E.5-1: UE Power Class test requirements**

| EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 23 | ±2.7 | | |
| 2 | | | | | 23 | ±2.7[2] | | |
| 3 | | | | | 23 | ±2.7[2] | | |
| 4 | | | | | 23 | ±2.7 | | |
| 5 | | | | | 23 | ±2.7 | | |
| 6 | | | | | 23 | ±2.7 | | |
| 7 | | | | | 23 | ±2.7[2] | | |
| 8 | | | | | 23 | ±2.7[2] | | |
| 9 | | | | | 23 | ±2.7 | | |
| 10 | | | | | 23 | ±2.7 | | |
| 11 | | | | | 23 | ±2.7 | | |
| 12 | | | | | 23 | ±2.7[2] | | |
| 13 | | | | | 23 | ±2.7 | | |
| 14 | | | | | 23 | ±2.7 | | |
| … | | | | | | | | |
| 17 | | | | | 23 | ±2.7 | | |
| 18 | | | | | 23 | ±2.7[6] | | |
| 19 | | | | | 23 | ±2.7 | | |
| 20 | | | | | 23 | ±2.7[2] | | |
| 21 | | | | | 23 | ±2.7 | | |
| 22 | | | | | 23 | +3.0/-4.5 | | |
| 23 | | | | | 23[5] | ±2.7[5] | | |
| 24 | | | | | 23 | ±2.7 | | |
| 25 | | | | | 23 | ±2.7[2] | | |
| 26 | | | | | 23 | ±2.7[2] | | |
| 27 | | | | | 23 | ±2.7 | | |
| 28 | | | | | 23 | +2.7/-3.2 | | |
| 30 | | | | | 23 | ±2.7 | | |
| 31 | | | | | 23 | ±2.7 | | |
| ... | | | | | | | | |
| 33 | | | | | 23 | ±2.7 | | |
| 34 | | | | | 23 | ±2.7 | | |
| 35 | | | | | 23 | ±2.7 | | |
| 36 | | | | | 23 | ±2.7 | | |
| 37 | | | | | 23 | ±2.7 | | |
| 38 | | | | | 23 | ±2.7 | | |
| 39 | | | | | 23 | ±2.7 | | |
| 40 | | | | | 23 | ±2.7 | | |
| 41 | | | | | 23 | ±2.7[2] | | |
| 42 | | | | | 23 | +3.0/-4.0 | | |
| 43 | | | | | 23 | +3.0/-4.0 | | |
| 44 | | | | | 23 | +2.7/[-3.7] | | |
| 45 | | | | | 23 | ±2.7 | | |
| … | | | | | | | | |

Note 1: The above tolerances are applicable for UE(s) that support up to 4 E-UTRA operating bands. For UE(s) that support 5 or more E-UTRA bands the maximum output power is expected to decrease with each additional band and is FFS

Note 2: For transmission bandwidths (Figure 5.4.2-1, Table 5.4.4-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB

Note 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance.

Note 4: For the UE which supports both Band 11 and Band 21 operating frequencies, the tolerance is FFS.

Note 5: When NS_20 is signalled, the total output power within 2000-2005 MHz shall be limited to 7 dBm.

Note 6: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5dB for transmission bandwidths confined within 815 MHz and 818 MHz.

# 6.2.2EA UE Maximum Output Power for UE category M1

## 6.2.2EA.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified nominal maximum output power and tolerance.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

## 6.2.2EA.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

## 6.2.2EA.3 Minimum conformance requirements

The following UE Power Classes define the maximum output power for any transmission bandwidth within the channel bandwidth for non CA configuration and UL-MIMO unless otherwise stated. The period of measurement shall be at least one sub frame (1ms).

**Table 6.2.2EA-1: UE Power Class**

| EUTRA band | Class 3 (dBm) | Tolerance (dB) | Class 5 (dBm) | Tolerance (dB) |
|---|---|---|---|---|
| 1 | 23 | ±2 | 20 | ±2 |
| 2 | 23 | ±2[2] | 20 | ±2[2] |
| 3 | 23 | ±2[2] | 20 | ±2[2] |
| 4 | 23 | ±2 | 20 | ±2 |
| 5 | 23 | ±2 | 20 | ±2 |
| 7 | 23 | ±2[2] | 20 | ±2[2] |
| 8 | 23 | ±2[2] | 20 | ±2[2] |
| 11 | 23 | ±2 | 20 | ±2 |
| 12 | 23 | ±2[2] | 20 | ±2[2] |
| 13 | 23 | ±2 | 20 | ±2 |
| 14 | 23 | ±2 | 20 | ±2 |
| 18 | 23 | ±2[5] | 20 | ±2[5] |
| 19 | 23 | ±2 | 20 | ±2 |
| 20 | 23 | ±2[2] | 20 | ±2[2] |
| 21 | 23 | ±2 | 20 | ±2 |
| 26 | 23 | ±2[2] | 20 | ±2[2] |
| 27 | 23 | ±2 | 20 | ±2 |
| 28 | 23 | +2/-2.5 | 20 | +2/-2.5 |
| 31 | 23 | ±2 | 20 | ±2 |
| … | | | | |
| 39 | 23 | ±2 | 20 | ±2 |
| 41 | 23 | ±2[2] | 20 | ±2[2] |
| … | | | | |
| 71 | 23 | ±2 | 20 | ±2 |
| 72 | 23 | ±2 | 20 | ±2 |
| 73 | 23 | ±2 | 20 | ±2 |
| 74 | 23 | ±2 | 20 | ±2 |

NOTE 1: Void
NOTE 2: [2] refers to the transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.
NOTE 3: For the UE which supports both Band 11 and Band 21 operating frequencies, the tolerance is FFS.
NOTE 4: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance.
NOTE 5: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB for transmission bandwidths confined within 815 MHz and 818 MHz.
NOTE 6: Void

The normative reference for this requirement is TS 36.101 [2] clause 6.2.2E.

## 6.2.2EA.4 Test description

### 6.2.2EA.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in sub-clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.2EA.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.2.2EA.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Max UE output power testing | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 5MHz | | QPSK | 1 | 1 |
| 5MHz | | QPSK | 3(Note 5) | 3(Note 5) |
| 10MHz | | QPSK | 1 | 1 |
| 10MHz | | QPSK | 4(Note 4), 5 (Note 5) | 4(Note 4), 5(Note 5) |
| 15MHz | | QPSK | 1 | 1 |
| 15MHz | | QPSK | 6 | 6 |
| 20MHz | | QPSK | 1 | 1 |
| 20MHz | | QPSK | 6 | 6 |
| Note 1: Test Channel Bandwidth is checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |
| Note 2: The 1 RB allocation shall be tested at RB#0 with narrowband index 0 for low and mid range, RB #5 with max narrowband index for high range test frequency. For E-UTRA bands applied with Note 2 in Table 6.2.2 EA -1 and when channel bandwidth is larger than 4 MHz, for 5 MHz channel bandwidth the 1 RB allocation shall additionally be tested at RB#2 with narrowband index [3] for low range, RB #3 with narrowband index 0 for high range test frequency, for 10 MHz channel bandwidth the 1 RB allocation shall additionally be tested at RB#1 with narrowband index 3 for low range, RB #4 with narrowband index 4 for high range test frequency, for 15 MHz channel bandwidth the 1 RB allocation shall additionally be tested at RB#0 with narrowband index 3 for low range, RB #5 with narrowband index 8 for high range test frequency, for 20 MHz channel bandwidth the 1 RB allocation shall additionally be tested at RB#3 with narrowband index 2 for low range, RB #2 with narrowband index 13 for high range test frequency. | | | | |
| Note 3: The RBstart of non-1RB allocation shall be RB #0 with narrowband index 0 for low and mid range, RB# (6 - RB allocation) with max narrowband index for high range test frequency. | | | | |
| Note 4: Only applicable for Power class 3 | | | | |
| Note 5: Only applicable for Power class 5 | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.2EA.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.2.2EA.4.3.

#### 6.2.2EA.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.2.2EA.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach $P_{UMAX}$ level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods and Half-duplex guard subframe are not under test.

### 6.2.2EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.2.2EA.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.2EA.5-1.

**Table 6.2.2EA.5-1: UE Power Class test requirements**

| EUTRA band | Class 3 (dBm) | Tolerance (dB) | Class 5 (dBm) | Tolerance (dB) |
|---|---|---|---|---|
| 1 | 23 | ±2.7 | 20 | ±2.7 |
| 2 | 23 | ±2.7[2] | 20 | ±2.7[2] |
| 3 | 23 | ±2.7[2] | 20 | ±2.7[2] |
| 4 | 23 | ±2.7 | 20 | ±2.7 |
| 5 | 23 | ±2.7 | 20 | ±2.7 |
| 7 | 23 | ±2.7[2] | 20 | ±2.7[2] |
| 8 | 23 | ±2.7[2] | 20 | ±2.7[2] |
| 11 | 23 | ±2.7 | 20 | ±2.7 |
| 12 | 23 | ±2.7 | 20 | ±2.7[2] |
| 13 | 23 | ±2.7 | 20 | ±2.7 |
| 14 | 23 | ±2.7 | 20 | ±2.7 |
| 18 | 23 | ±2.7[5] | 20 | ±2.7[5] |
| 19 | 23 | ±2.7 | 20 | ±2.7 |
| 20 | 23 | ±2.7[2] | 20 | ±2.7[2] |
| 21 | 23 | ±2.7 | 20 | ±2.7 |
| 26 | 23 | ±2.7[2] | 20 | ±2.7[2] |
| 27 | 23 | ±2.7 | 20 | ±2.7 |
| 28 | 23 | +2.7/-3.2 | 20 | +2.7/-3.2 |
| 31 | 23 | ±2.7 | 20 | ±2.7 |
| … | | | | |
| 39 | 23 | ±2.7 | 20 | ±2.7 |
| 41 | 23 | ±2.7[2] | 20 | ±2.7[2] |
| … | | | | |
| 71 | 23 | ±2.7 | 20 | ±2.7 |
| 72 | 23 | ±2.7 | 20 | ±2.7 |
| 73 | 23 | ±2.7 | 20 | ±2.7 |
| 74 | 23 | ±2.7 | 20 | ±2.7 |

NOTE 1: Void
NOTE 2: [2] refers to the transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.
NOTE 3: For the UE which supports both Band 11 and Band 21 operating frequencies, the tolerance is FFS.
NOTE 4: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance.
NOTE 5: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB for transmission bandwidths confined within 815 MHz and 818 MHz.
NOTE 6: Void

# 6.2.2EB UE Maximum Output Power for UE category 1bis

## 6.2.2EB.1 Test purpose

Same test purpose as in clause 6.2.2.

## 6.2.2EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of category 1bis.

## 6.2.2EB.3 Minimum conformance requirements

The following UE Power Classes defines the maximum output power for any transmission bandwidth within the channel bandwidth. The period of measurement shall be at least one sub frame (1ms).

**Table 6.2.2EB.3-1: UE Power Class**

| EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 23 | ±2 | | |
| 2 | | | | | 23 | $\pm 2^2$ | | |
| 3 | | | | | 23 | $\pm 2^2$ | | |
| 4 | | | | | 23 | ±2 | | |
| 5 | | | | | 23 | ±2 | | |
| 7 | | | | | 23 | $\pm 2^2$ | | |
| 8 | | | | | 23 | $\pm 2^2$ | | |
| 12 | | | | | 23 | $\pm 2^2$ | | |
| 13 | | | | | 23 | ±2 | | |
| 18 | | | | | 23 | $\pm 2^6$ | | |
| 20 | | | | | 23 | $\pm 2^2$ | | |
| 26 | | | | | 23 | $\pm 2^2$ | | |
| 28 | | | | | 23 | +2/-2.5 | | |
| 31 | | | | | 23 | ±2 | | |
| 39 | | | | | 23 | ±2 | | |
| 41 | | | | | 23 | $\pm 2^2$ | | |
| 66 | | | | | 23 | ±2 | | |
| 72 | | | | | 23 | ±2 | | |

Note 1: Void
Note 2: For transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB
Note 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance
Note 4: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5dB for transmission bandwidths confined within 815 MHz and 818 MHz

The normative reference for this requirement is TS 36.101 clause 6.2.2.

## 6.2.2EB.4 Test description

### 6.2.2EB.4.1 Initial conditions

Same initial conditions as in clause 6.2.2.4.1 with the following exceptions:

- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

### 6.2.2EB.4.2 Test procedure

Same test procedure as in clause 6.2.2.4.2.

### 6.2.2EB.4.3 Message contents

Same message contents as in clause 6.2.2.4.3.

## 6.2.2EB.5 Test requirement

The maximum output power, derived in step 3 of clause 6.2.2.4.2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.2EB.5-1.

**Table 6.2.2EB.5-1: UE Power Class test requirements**

| EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 23 | ±2.7 | | |
| 2 | | | | | 23 | ±2.7[2] | | |
| 3 | | | | | 23 | ±2.7[2] | | |
| 4 | | | | | 23 | ±2.7 | | |
| 5 | | | | | 23 | ±2.7 | | |
| 7 | | | | | 23 | ±2.7[2] | | |
| 8 | | | | | 23 | ±2.7[2] | | |
| 12 | | | | | 23 | ±2.7[2] | | |
| 13 | | | | | 23 | ±2.7 | | |
| 18 | | | | | 23 | ±2.7[6] | | |
| 20 | | | | | 23 | ±2.7[2] | | |
| 26 | | | | | 23 | ±2.7[2] | | |
| 28 | | | | | 23 | +2.7/-3.2 | | |
| 31 | | | | | 23 | ±2.7 | | |
| 39 | | | | | 23 | ±2.7 | | |
| 41 | | | | | 23 | ±2.7[2] | | |
| 66 | | | | | 23 | +2.7/-2.7 | | |
| 72 | | | | | 23 | ±2.7 | | |

Note 1: Void
Note 2: For transmission bandwidths (Figure 5.4.2-1, Table 5.4.4-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB
Note 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance.
Note 4: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5dB for transmission bandwidths confined within 815 MHz and 818 MHz.

# 6.2.2EC UE Maximum Output Power for UE category M2

## 6.2.2EC.1 Test purpose

Same as in clause 6.2.2EA.1

## 6.2.2EC.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward of UE category M2.

## 6.2.2EC.3 Minimum conformance requirements

Same as in clause 6.2.2EA.3

## 6.2.2EC.4 Test description

### 6.2.2EC.4.1 Initial condition

Same as in clause 6.2.2EA.4.1 with the following exceptions:

- Instead of Table 6.2.2EA.4.1-1 → use Table 6.2.2EC.4.1-1

**Table 6.2.2EC.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Highest | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | | |
| Configuration ID | Ch BW | N/A for Max UE output power testing | Mod'n | RB allocation | | |
| | | | | FDD and HD-FDD | TDD | Narrowband index (Note 1) |
| **Low range, Mid range** | | | | | | |
| 1 | 5MHz | | QPSK | 1 | 1 | 0 |
| 2 | 5MHz | | QPSK | 3(Note 6) | 3(Note 6) | 0 |
| 3 | 10MHz | | QPSK | 1 | 1 | 0 |
| 4 | 10MHz | | QPSK | 4(Note 5), 5 (Note 6) | 4(Note 5), 5 (Note 6) | 0 |
| 5 | 15MHz | | QPSK | 1 | 1 | 0 |
| 6 | 15MHz | | QPSK | 24 | 24 | 0 |
| 7 | 20MHz | | QPSK | 1 | 1 | 0 |
| 8 | 20MHz | | QPSK | 24 | 24 | 0 |
| **High range** | | | | | | |
| 1 | 5MHz | | QPSK | 1 | 1 | 3 |
| 2 | 5MHz | | QPSK | 3(Note 6) | 3(Note 6) | 3 |
| 3 | 10MHz | | QPSK | 1 | 1 | 7 |
| 4 | 10MHz | | QPSK | 4(Note 5), 5 (Note 6) | 4(Note 5), 5 (Note 6) | 7 |
| 5 | 15MHz | | QPSK | 1 | 1 | 11 |
| 6 | 15MHz | | QPSK | 24 | 24 | 8 |
| 7 | 20MHz | | QPSK | 1 | 1 | 15 |
| 8 | 20MHz | | QPSK | 24 | 24 | 12 |

Note 1: Denotes where in the channel Bandwidth the wideband shall be placed. Narrowband, Narrowband index and Wideband are defined in TS 36.211, 5.2.4.

Note 2: Test Channel Bandwidth is checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 3: The 1 RB allocation shall be tested at RB#0 for low and mid range, RB #5 for high range test frequency. For E-UTRA bands applied with Note 2 in Table 6.2.2 EA -1 and when channel bandwidth is larger than 4 MHz, for 5 MHz channel bandwidth the 1 RB allocation shall additionally be tested at RB#2 with narrowband index 3 for low range, RB #3 withnarrowband index 0 for high range test frequency, for 10 MHz channel bandwidth the 1 RB allocation shall additionally be tested at RB#1 with narrowband index 3 for low range, RB #4 with narrowband index 4 for high range test frequency, for 15 MHz channel bandwidth the 1 RB allocation shall additionally be tested at RB#0 with narrowband index 3 for low range, RB #5 with narrowband index 8 for high range test frequency, for 20 MHz channel bandwidth the 1 RB allocation shall additionally be tested at RB#3 with narrowband index 2 for low range, RB #2 with narrowband index 13 for high range test frequency.

Note 4: The RBstart of non-1RB allocation shall be RB #0 for low and mid range, RB# (6 – (RB allocation mod 6)) for high range test frequency.

Note 5: Only applicable for Power class 3

Note 6: Only applicable for Power class 5

## 6.2.2EC.4.2 Test procedure

Same as in clause 6.2.2EA.4.1 with the following exceptions:

- Instead of Table 6.2.2EA.4.1-1→ use Table 6.2.2EC.4.1-1

## 6.2.2EC.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.2.2EC.5 Test requirements

Same as in clause 6.2.2EA.5.

## 6.2.2F UE Maximum Output Power for category NB1 and NB2

### 6.2.2F.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified nominal maximum output power and tolerance.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

### 6.2.2F.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

### 6.2.2F.3 Minimum conformance requirements

Category NB1 and NB2 UE Power Classes are specified in Table 6.2.2F.3-1 and define the maximum output power for any transmission bandwidth within the category NB1 and NB2 channel bandwidth. For 3.75kHz sub-carrier spacing the maximum output power is defined as mean power of measurement which period is at least one slot (2ms) excluding the 2304Ts gap when UE is not transmitting. For 15kHz sub-carrier spacing the maximum output power is defined as mean power of measurement which period is at least one sub-frame (1ms).

**Table 6.2.2F.3-1: UE Power Class**

| EUTRA band | Class 3 (dBm) | Tolerance (dB) | Class 5 (dBm) | Tolerance (dB) |
|---|---|---|---|---|
| 1 | 23 | ±2 | 20 | ±2 |
| 2 | 23 | ±2 | 20 | ±2 |
| 3 | 23 | ±2 | 20 | ±2 |
| 4 | 23 | ±2 | 20 | ±2 |
| 5 | 23 | ±2 | 20 | ±2 |
| 8 | 23 | ±2 | 20 | ±2 |
| 11 | 23 | ±2 | 20 | ±2 |
| 12 | 23 | ±2 | 20 | ±2 |
| 13 | 23 | ±2 | 20 | ±2 |
| 14 | 23 | ±2 | 20 | ±2 |
| 17 | 23 | ±2 | 20 | ±2 |
| 18 | 23 | ±2 | 20 | ±2 |
| 19 | 23 | ±2 | 20 | ±2 |
| 20 | 23 | ±2 | 20 | ±2 |
| 21 | 23 | ±2 | 20 | ±2 |
| 25 | 23 | ±2 | 20 | ±2 |
| 26 | 23 | ±2 | 20 | ±2 |
| 28 | 23 | ±2 | 20 | ±2 |
| 31 | 23 | ±2 | 20 | ±2 |
| 66 | 23 | ±2 | 20 | ±2 |
| 70 | 23 | ±2 | 20 | ±2 |
| 71 | 23 | ±2 | 20 | ±2 |
| 72 | 23 | ±2 | 20 | ±2 |
| 73 | 23 | ±2 | 20 | ±2 |
| 74 | 23 | ±2 | 20 | ±2 |

The normative reference for this requirement is TS 36.101 clause 6.2.2F.

## 6.2.2F.4 Test description

### 6.2.2F.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters, and are shown in table 6.2.2F.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 6.2.2F.4.1-1: Test Configuration Initial Conditions**

| | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 8.1.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.2 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A | Modulation | $N_{tones}$ | Sub-carrier spacing (kHz) |
| 1 (Note 2) | | BPSK | 1@0 | 3.75 |
| 2 (Note 3) | | BPSK | 1@47 | 3.75 |
| 3 (Note 2) | | QPSK | 1@0 | 15 |
| 4 (Note 3) | | QPSK | 1@11 | 15 |
| 5 (Note 1) | | QPSK | 3@3 | 15 |
| Note 1: Applicable to UE supporting UL multi-tone transmissions<br>Note 2: only applicable for low range<br>Note 3: only applicable for high range | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only the main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1.1 and H.4.0.
4. The UL Reference Measurement channel is set according to Table 6.2.2F.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.2.2F.4.3.

### 6.2.2F.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via NPDCCH with DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.2.2F.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC (UE should be already transmitting $P_{UMAX}$ after Initial Conditions setting).
2. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms) for sub-carrier spacing of 15 kHz or one slot (2ms) excluding the 2304Ts gap when UE is not transmitting for sub-carrier spacing of 3.75 kHz. Half-Duplex guard subframes are not under test.

NOTE 1: For configuration IDs applicable to UE depending on UE capability in Test Configuration Table with different UL sub-carrier spacing, the SS shall release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the appropriate UL subcarrier spacing in Random Access Response message.

#### 6.2.2F.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6.

### 6.2.2F.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.2F.5-1.

**Table 6.2.2F.5-1: UE Power Class test requirement**

| EUTRA band | Class 3 (dBm) | Tolerance (dB) | Class 5 (dBm) | Tolerance (dB) |
|---|---|---|---|---|
| 1 | 23 | ±2.7 | 20 | ±2.7 |
| 2 | 23 | ±2.7 | 20 | ±2.7 |
| 3 | 23 | ±2.7 | 20 | ±2.7 |
| 4 | 23 | ±2.7 | 20 | ±2.7 |
| 5 | 23 | ±2.7 | 20 | ±2.7 |
| 8 | 23 | ±2.7 | 20 | ±2.7 |
| 11 | 23 | ±2.7 | 20 | ±2.7 |
| 12 | 23 | ±2.7 | 20 | ±2.7 |
| 13 | 23 | ±2.7 | 20 | ±2.7 |
| 14 | 23 | ±2.7 | 20 | ±2.7 |
| 17 | 23 | ±2.7 | 20 | ±2.7 |
| 18 | 23 | ±2.7 | 20 | ±2.7 |
| 19 | 23 | ±2.7 | 20 | ±2.7 |
| 20 | 23 | ±2.7 | 20 | ±2.7 |
| 21 | 23 | ±2.7 | 20 | ±2.7 |
| 25 | 23 | ±2.7 | 20 | ±2.7 |
| 26 | 23 | ±2.7 | 20 | ±2.7 |
| 28 | 23 | ±2.7 | 20 | ±2.7 |
| 31 | 23 | ±2.7 | 20 | ±2.7 |
| 66 | 23 | ±2.7 | 20 | ±2.7 |
| 70 | 23 | ±2.7 | 20 | ±2.7 |
| 71 | 23 | ±2.7 | 20 | ±2.7 |
| 72 | 23 | ±2.7 | 20 | ±2.7 |
| 73 | 23 | ±2.7 | 20 | ±2.7 |
| 74 | 23 | ±2.7 | 20 | ±2.7 |

## 6.2.2FA UE Maximum Output Power for category NB1 and NB2/Power Class 6

### 6.2.2FA.1 Test purpose

Same test purpose as in clause 6.2.2F.1.

### 6.2.2FA.2 Test applicability

This test case applies to all types of UE release 14 and forward of category NB1 and NB2.

### 6.2.2FA.3 Minimum conformance requirements

Category NB1 and NB2 UE Power Classes are specified in Table 6.2.2FA.3-1 and define the maximum output power for any transmission bandwidth within the category NB1 and NB2 channel bandwidth. For 3.75kHz sub-carrier spacing the maximum output power is defined as mean power of measurement which period is at least one slot (2ms) excluding the 2304Ts gap when UE is not transmitting. For 15kHz sub-carrier spacing the maximum output power is defined as mean power of measurement which period is at least one sub-frame (1ms).

**Table 6.2.2FA.3-1: UE Power Class 6**

| EUTRA band | Class 3 (dBm) | Tolerance (dB) | Class 5 (dBm) | Tolerance (dB) | Class 6 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|
| 1 | NA | NA | NA | NA | 14 | ±2.5 |
| 2 | NA | NA | NA | NA | 14 | ±2.5 |
| 3 | NA | NA | NA | NA | 14 | ±2.5 |
| 5 | NA | NA | NA | NA | 14 | ±2.5 |
| 8 | NA | NA | NA | NA | 14 | ±2.5 |
| 11 | NA | NA | NA | NA | 14 | ±2.5 |
| 12 | NA | NA | NA | NA | 14 | ±2.5 |
| 13 | NA | NA | NA | NA | 14 | ±2.5 |
| 17 | NA | NA | NA | NA | 14 | ±2.5 |
| 18 | NA | NA | NA | NA | 14 | ±2.5 |
| 19 | NA | NA | NA | NA | 14 | ±2.5 |
| 20 | NA | NA | NA | NA | 14 | ±2.5 |
| 21 | NA | NA | NA | NA | 14 | ±2.5 |
| 25 | NA | NA | NA | NA | 14 | ±2.5 |
| 26 | NA | NA | NA | NA | 14 | ±2.5 |
| 28 | NA | NA | NA | NA | 14 | ±2.5 |
| 31 | NA | NA | NA | NA | 14 | ±2.5 |
| 66 | NA | NA | NA | NA | 14 | ±2.5 |
| 70 | NA | NA | NA | NA | 14 | ±2.5 |
| 72 | NA | NA | NA | NA | 14 | ±2.5 |
| 73 | NA | NA | NA | NA | 14 | ±2.5 |
| 74 | NA | NA | NA | NA | 14 | ±2.5 |

The normative reference for this requirement is TS 36.101 clause 6.2.2F.

## 6.2.2FA.4 Test description

Same test description as in clause 6.2.2F.4.

## 6.2.2FA.5 Test requirements

Same test requirements as in clause 6.2.2F.5 with the following exceptions:

- Instead of Table 6.2.2F.5-1 → use Table 6.2.2FA.5-1.

**Table 6.2.2FA.5-1: UE Power Class test requirement for Power Class 6**

| EUTRA band | Class 6 (dBm) | Tolerance (dB) |
|---|---|---|
| 1 | 14 | ±3.2 |
| 2 | 14 | ±3.2 |
| 3 | 14 | ±3.2 |
| 5 | 14 | ±3.2 |
| 8 | 14 | ±3.2 |
| 11 | 14 | ±3.2 |
| 12 | 14 | ±3.2 |
| 13 | 14 | ±3.2 |
| 17 | 14 | ±3.2 |
| 18 | 14 | ±3.2 |
| 19 | 14 | ±3.2 |
| 20 | 14 | ±3.2 |
| 21 | 14 | ±3.2 |
| 25 | 14 | ±3.2 |
| 26 | 14 | ±3.2 |
| 28 | 14 | ±3.2 |
| 31 | 14 | ±3.2 |
| 66 | 14 | ±3.2 |
| 70 | 14 | ±3.2 |
| 72 | 14 | ±3.2 |
| 73 | 14 | ±3.2 |
| 74 | 14 | ±3.2 |

## 6.2.2G UE Maximum Output Power for V2X Communication

### 6.2.2G.1 UE Maximum Output Power for V2X Communication / Non-concurrent with E-UTRA uplink transmission

NOTE: This test need not be performed because the Maximum Power Reduction (MPR) can be applied regardless of the number of RBs.

#### 6.2.2G.1.1 Test purpose

Same test purpose as in clause 6.2.2.1.

#### 6.2.2G.1.2 Test applicability

This test case applies to all types of UE that support V2X Sidelink communication and Band 47.

#### 6.2.2G.1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.2G-1, the allowed V2X UE maximum output power for shall be as applied in Table 6.2.2.3-1 in subclause 6.2.2.

The normative reference for this requirement is TS 36.101 [2] clause 6.2.2G.

#### 6.2.2G.1.4 Test description

##### 6.2.2G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-1. All of these configurations shall be tested with applicable test

parameters for each channel bandwidth, and are shown in table 6.2.2G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.2.2G.1.4.1-1: Test Configuration Table**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 96 |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.2.2G.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.2.2G.1.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.2.2G.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Measure the mean power of the UE in the channel bandwidth for each test point in table 6.2.2G.1.5-1 according to the test configuration from Table 6.2.2G.1.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

### 6.2.2G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7I and 4.10:

## 6.2.2G.1.5 Test requirements

**Table 6.2.2G.1.5-1: UE Power Class test requirements**

| EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| 47 | | | | | 23 | ±3.3 | | |
| Note 1: Void<br>Note 2: For transmission bandwidths (Figure 5.4.2-1, Table 5.4.4-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB<br>Note 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance. | | | | | | | | |

## 6.2.2G.2 UE Maximum Output Power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission

### 6.2.2G.2.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified nominal maximum output power and tolerance.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

### 6.2.2G.2.2 Test applicability

This test applies to all types of E-UTRA UE release 14 and forward that support V2X Communication.

### 6.2.2G.2.3 Minimum conformance requirements

For V2X UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-2, the UE maximum output power shall be as specified in Table 6.2.2G.2.3-1 for the corresponding inter-band con-current operation with uplink assigned to two bands.

**Table 6.2.2G.2.3-1: Inter-band con-current V2X UE Power Class (two bands)**

| V2X con-current band Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| V2X_3A-47A | | | | | 23 | +2/-3[4] | | |
| V2X_5A-47A | | | | | 23 | +2/-3[4] | | |
| V2X_7A-47A | | | | | 23 | +2/-3[4] | | |
| V2X_8A-47A | | | | | 23 | +2/-3[4] | | |
| V2X_20A-47A | | | | | 23 | +2/-3[4] | | |
| V2X_34A-47A | | | | | 23 | +2/-3[4] | | |
| V2X_39A-47A | | | | | 23 | +2/-3[4] | | |
| V2X_41A-47A | | | | | 23 | +2/-3[4] | | |

NOTE 1: The con-current band combinations are used for V2X Service.
NOTE 2: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance
NOTE 3: For inter-band con-current aggregation the maximum power requirement applies to the total transmitted power over all component carriers (per UE).
NOTE 4: [4] refers to the transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB

The normative reference for this requirement is TS 36.101 [2] clause 6.2.2G.

### 6.2.2G.2.4 Test description

#### 6.2.2G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.2G.2.4.1-1. The details of the uplink and V2X reference measurement channels (RMCs) are specified in Annexes A.2 and A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.2G.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range for uplink and Low range for V2X, High range for uplink and High range for V2X | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink** | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | N/A for UE Maximum Output Power test case | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | | QPSK | 1 | 10 MHz | QPSK | 48@2 |
| 1.4 MHz | | QPSK | 5 | 20 MHz | QPSK | 96@2 |
| 3 MHz | | QPSK | 1 | | | |
| 3 MHz | | QPSK | 4 | | | |
| 5 MHz | | QPSK | 1 | | | |
| 5 MHz | | QPSK | 8 | | | |
| 10 MHz | | QPSK | 1 | | | |
| 10 MHz | | QPSK | 12 | | | |
| 15 MHz | | QPSK | 1 | | | |
| 15 MHz | | QPSK | 16 | | | |
| 20 MHz | | QPSK | 1 | | | |
| 20 MHz | | QPSK | 18 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | |
| Note 2: For Low range the E-UTRA carrier uses only test points with RBstart=0. For High range the E-UTRA carrier uses only test points with RBstart=RBmax-LCRB+1. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.2.2G.2.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to Table 6.2.2G.2.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 6.2.2G.2.4.3.

### 6.2.2G.2.4.2 Test procedure

1. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.2.2G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX}$ level. Configure the UE to transmit PSCCH and PSSCH with the $P_{UMAX}$ level of each test points.
3. Measure the mean power over all component carriers in the V2X con-current band configuration. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

### 6.2.2G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.2.2G.2.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.2G.2.5-1.

**Table 6.2.2G.2.5-1: Inter-band con-current V2X UE Power Class (two bands)**

| V2X con-current band Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| V2X_3A-47A | | | | | 23 | +3.3/-4.3[4] | | |
| V2X_5A-47A | | | | | 23 | +3.3/-4.3[4] | | |
| V2X_7A-47A | | | | | 23 | +3.3/-4.3[4] | | |
| V2X_8A-47A | | | | | 23 | +3.3/-4.3[4] | | |
| V2X_20A-47A | | | | | 23 | +3.3/-4.3[4] | | |
| V2X_34A-47A | | | | | 23 | +3.3/-4.3[4] | | |
| V2X_39A-47A | | | | | 23 | +3.3/-4.3[4] | | |
| V2X_41A-47A | | | | | 23 | +3.3/-4.3[4] | | |

NOTE 1: The con-current band combinations are used for V2X Service.
NOTE 2: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance
NOTE 3: For inter-band con-current aggregation the maximum power requirement applies to the total transmitted power over all component carriers (per UE).
NOTE 4: [4] refers to the transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB

## 6.2.2G.3 UE Maximum Output Power for V2X Communication / Intra-band contiguous multi-carrier operation

NOTE: This test need not be performed because the Maximum Power Reduction (MPR) can be applied regardless of the number of RBs.

### 6.2.2G.3.1 Test purpose

Same test purpose as in clause 6.2.2.1.

### 6.2.2G.3.2 Test applicability

This test case applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink communication and Band 47.

### 6.2.2G.3.3 Minimum conformance requirements

For intra-band contiguous multi-carrier operation, the maximum output power is defined in Table 6.2.2G.3.3-1.

**Table 6.2.2G.3.3-1: V2X UE Power Class for intra-band contiguous multi-carrier operation**

| V2X multi-carrier Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| V2X_47B | | | | | 23 | ±2 | | |

NOTE 1: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance.
NOTE 2: For intra-band multi-carrier operation, the maximum power requirement should apply to the total transmitted power over all component carriers (per UE).

The normative reference for this requirement is TS 36.101 [2] clause 6.2.2G.

## 6.2.2G.3.4 Test description

### 6.2.2G.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-4. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.2.2G.3.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.2.2G.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for Channel Bandwidths** | | | |
| **V2X MCC Configuration** | | **V2X PSSCH Allocation** | |
| **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **CC1 and CC2 RB Allocation** |
| 50 | 50 | QPSK | 48+48 |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.89a.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.2.2G.3.4.3.
3. The V2X reference measurement channel is set according to Table 6.2.2G.3.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UEs.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.2.2G.3.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Measure the mean power of the UE in the channel bandwidth for each test point in Table 6.2.2G.3.5-1 according to the test configuration from Table 6.2.2G.3.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

### 6.2.2G.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7I and 4.10 with the following exceptions:

**Table 6.2.2G.3.4.3-0: +CCUTLE (Initial condition)**

| Derivation Path: 36.508 Table 4.7I-2: +CCUTLE, condition Close and Transmit |
|---|

#### 6.2.2G.3.5 Test requirements

**Table 6.2.2G.3.5-1: V2X UE Power Class test requirements for intra-band contiguous multi-carrier operation**

| V2X multi-carrier Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| V2X_47B | | | | | 23 | ±3.3 | | |
| NOTE 1: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance<br>NOTE 2: For intra-band multi-carrier operation, the maximum power requirement should apply to the total transmitted power over all component carriers (per UE). | | | | | | | | |

### 6.2.2G.4 UE Maximum Output Power for V2X Communication / Power class 2

#### 6.2.2G.4.1 UE Maximum Output Power for V2X Communication / Power class 2 / Non-concurrent with E-UTRA uplink transmissions

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- Message contents

- Applicability spec

NOTE: This test need not be performed because the Maximum Power Reduction (MPR) can be applied regardless of the number of RBs.

##### 6.2.2G.4.1.1 Test purpose

Same test purpose as in clause 6.2.2.1.

##### 6.2.2G.4.1.2 Test applicability

This test case applies to all types of UE Power Class 2 that support V2X Sidelink communication and Band 47.

##### 6.2.2G.4.1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.2G-1, the allowed V2X UE maximum output power for shall be as applied in Table 6.2.2.3-1 in subclause 6.2.2.

The normative reference for this requirement is TS 36.101 [2] clause 6.2.2G.

##### 6.2.2G.4.1.4 Test description

###### 6.2.2G.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.2G.4.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.2.2G.4.1.4.1-1: Test Configuration Table**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 96 |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.2.2G.4.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.2.2G.4.1.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 6.2.2G.4.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Measure the mean power of the UE in the channel bandwidth for each test point in Table 6.2.2G.4.1.5-1 according to the test configuration from Table 6.2.2G.4.1.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

#### 6.2.2G.4.1.4.3 Message contents

FFS

#### 6.2.2G.4.1.5 Test requirements

**Table 6.2.2G.4.1.5-1: UE Power Class test requirements**

| EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| 47 | | | 26 | ±3.3 | | | | |
| Note 1: Void | | | | | | | | |

## 6.2.3 Maximum Power Reduction (MPR)

Editor's note:

- Requirement for Band 44 is not yet finalised due to square brackets in core specification TS 36.101 Table 6.2.2-1.

- Test requirements values in this section need to be reviewed in order to take into account notes in Table 6.2.5.3-2: $\Delta T_{IB,c}$ regarding $\Delta T_{IB,c}$ and asymmetric lower tolerances in table 6.2.2.3-1.

### 6.2.3.1 Test purpose

The number of RB identified in Table 6.2.3.3-1 is based on meeting the requirements for adjacent channel leakage ratio and the maximum power reduction (MPR) due to Cubic Metric (CM).

Simple scaling can be used to derive the requirement for other bandwidth based on the previously agreed value for 5MHz channel bandwidth.

### 6.2.3.2 Test applicability

The requirements of this test apply in test cases 6.6.2.3 Adjacent Channel Leakage power Ratio to all types of E-UTRA Power Class 3 UE release 8 and forward

NOTE: As a result TC 6.2.3 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3.3 Minimum conformance requirements

For UE Power Class 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2.3-1 due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3.3-1.

**Table 6.2.3.3-1: Maximum Power Reduction (MPR) for Power Class 3**

| Modulation | Channel bandwidth / Transmission bandwidth configuration [RB] | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| QPSK | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 1 |
| 16 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 1 |
| 16 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 2 |

For PRACH, PUCCH and SRS transmission, the allowed MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For each subframe, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) within the slot, the maximum MPR over the two slots is then applied for the entire subframe.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5.3 apply.

The normative reference for this requirement is TS 36.101 clause 6.2.3.

### 6.2.3.4 Test description

#### 6.2.3.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, 10MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 5 | 5 |
| 1.4MHz | | QPSK | 6 | 6 |
| 1.4MHz | | 16QAM | 5 | 5 |
| 1.4MHz | | 16QAM | 6 | 6 |
| 3.0MHz | | QPSK | 4 | 4 |
| 3.0MHz | | QPSK | 15 | 15 |
| 3.0MHz | | 16QAM | 4 | 4 |
| 3.0MHz | | 16QAM | 15 | 15 |
| 5MHz | | QPSK | 8 | 8 |
| 5MHz | | QPSK | 25 | 25 |
| 5MHz | | 16QAM | 8 | 8 |
| 5MHz | | 16QAM | 25 | 25 |
| 10MHz | | QPSK | 12 | 12 |
| 10MHz | | QPSK | 50 | 50 |
| 10MHz | | 16QAM | 12 | 12 |
| 10MHz | | 16QAM | 50 (Note 3) | 50 (Note 3) |
| 15MHz | | QPSK | 16 | 16 |
| 15MHz | | QPSK | 75 | 75 |
| 15MHz | | 16QAM | 16 | 16 |
| 15MHz | | 16QAM | 75 (Note 3) | 75 (Note 3) |
| 20MHz | | QPSK | 18 | 18 |
| 20MHz | | QPSK | 100 | 100 |
| 20MHz | | 16QAM | 18 | 18 |
| 20MHz | | 16QAM | 100 (Note 3) | 100 (Note 3) |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max + 1 - RB allocation) of the channel bandwidth. | | | | |
| Note 3: Applies only for UE-Categories ≥2. | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.2.3.4.1-1.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.2.4.3.

#### 6.2.3.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.3.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX\ level}$.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.2.3.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3.5-1.

**Table 6.2.3.5-1: UE Power Class test requirements**

| E-UTRA Band | Class 1 (dBm) | Tol. (Db) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | QPSK partial RB allocation Tol. (dB)) | QPSK full RB allocation Tol. (dB)) | 16QAM partial RB allocation Tol. (dB) | 16QAM full RB allocation Tol. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 2 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 3 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 4 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 5 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 6 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 7 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 8 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 9 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 10 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 11 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 12 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 13 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 14 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| … | | | | | | | | | |
| 17 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 18 | | | | | 23 | ±2.7[3] | +2.7 / [3] -3.7 | +2.7 / [3] -3.7 | +2.7 / [3] -4.7 |
| 19 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 20 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 21 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 22 | | | | | 23 | +3.0/-4.5 | +3.0/-5.5 | +3.0/-5.5 | +3.0/-6.5 |
| 23 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 24 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 25 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 26 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 27 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 28 | | | | | 23 | +2.7/-3.2 | +2.7/-4.2 | +2.7/-4.2 | +2.7/-5.2 |
| 30 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 31 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| ... | | | | | | | | | |
| 33 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 34 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 35 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 36 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 37 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 38 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 39 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 40 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 41 | | | | | 23 | ±2.7[1] | +2.7 / -3.7 [1,2] | +2.7 / -3.7 [1,2] | +2.7 / -4.7 [1,2] |
| 42 | | | | | 23 | +3.0 / -4.0 | +3.0 / -5.0 | +3.0 / -5.0 | +3.0 / -6.0 |
| 43 | | | | | 23 | +3.0 / -4.0 | +3.0 / -5.0 | +3.0 / -5.0 | +3.0 / -6.0 |
| 44 | | | | | 23 | +2.7/ [-3.7] | +2.7 / [-4.7] | +2.7 / [-4.7] | +2.7 / [-5.7] |
| 45 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| … | | | | | | | | | |
| 65 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 66 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| … | | | | | | | | | |
| 68 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| … | | | | | | | | | |
| 70 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 72 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| … | | | | | | | | | |
| 74 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |

Note 1: For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.

Note 2: For the UE maximum output power modified by MPR, the power limits specified in Table 6.2.5.3-1 apply

Note 3: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5dB for transmission bandwidths confined within 815 MHz and 818 MHz

## 6.2.3_1 Maximum Power Reduction (MPR) for HPUE

### 6.2.3_1.1 Test purpose

Same test purpose as in clause 6.2.3.1 with the following exception:

- Instead of Table 6.2.3.3-1 → use Table 6.2.3_1.3-1

### 6.2.3_1.2 Test applicability

The requirements of this test apply in test cases 6.6.2.3_1 Adjacent Channel Leakage power Ratio for HPUE to all types of E-UTRA Power Class 1 or Power Class 2 UE release 10 and forward.

NOTE: As a result TC 6.2.3_1 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3_1.3 Minimum conformance requirements

For UE Power Class 1 and 2, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2_1.3-1 due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3_1.3-1.

**Table 6.2.3_1.3-1: Maximum Power Reduction (MPR) for Power Class 1 and 2**

| Modulation | Channel bandwidth / Transmission bandwidth configuration [RB] | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| QPSK | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 1 |
| 16 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 1 |
| 16 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 2 |

For a power class 2 capable UE operating on Band 41, when an IE *P-max* as defined in [5] of 23 dBm or lower is indicated in the cell or if the TDD frame configuration is 0 or 6, the requirements for power class 2 are not applicable, and the corresponding requirements for a power class 3 UE shall apply.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5_1.3 apply.

The normative reference for this requirement is TS 36.101 clause 6.2.3.

### 6.2.3_1.4 Test description

Same test description as in clause 6.2.3.4.

### 6.2.3_1.5 Test requirements

Same test requirements as in clause 6.2.3.5 with the following exceptions:

- Instead of Table 6.2.3.5-1 → use Table 6.2.3_1.5-1

**Table 6.2.3_1.5-1: UE Power Class 1 and 2 test requirements**

| E-UTRA Band | Class 1 (dBm) | Tol. (Db) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | QPSK partial RB allocation Tol. (dB)) | QPSK full RB allocation Tol. (dB)) | 16QAM partial RB allocation Tol. (dB) | 16QAM full RB allocation Tol. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 14 | 31 | | | | | +2.7/ -3.7 | +2.7 / -4.7 | +2.7 / -4.7 | +2.7 / -5.7 |
| 31 | 31 | | | | | +2.7/ -3.7 | +2.7 / -4.7 | +2.7 / -4.7 | +2.7 / -5.7 |
| 41 | | | 26 | | | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 72 | 31 | | | | | +2.7/ -3.7 | +2.7 / -4.7 | +2.7 / -4.7 | +2.7 / -5.7 |
| Note 1: For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.<br>Note 2: For the UE maximum output power modified by MPR, the power limits specified in Table 6.2.5.3-1 apply | | | | | | | | | |

## 6.2.3_2 Maximum Power Reduction (MPR) for Multi-Cluster PUSCH

### 6.2.3_2.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified maximum output power with MPR and tolerance when operating in multi-cluster PUSCH scenarios.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

## 6.2.3_2.2 Test applicability

The requirements of this test apply in test cases 6.6.2.3_2 Adjacent Channel Leakage power Ratio to all types of E-UTRA UE release 10 and forward that support multi cluster PUSCH within a component carrier for the tested band but do not support UL 64QAM or UL 256QAM.

NOTE: As a result TC 6.2.3_2 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.3_2.3 Minimum conformance requirements

For UE Power Class 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in table 6.2.2-1 due to multi-cluster PUSCH, is specified as follows:

$$MPR = CEIL \{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$M_A = 8.00\text{-}10.12A; \quad 0.00 < A \leq 0.33$$

$$5.67 - 3.07A; \quad 0.33 < A \leq 0.77$$

$$3.31; \quad 0.77 < A \leq 1.00$$

Where

$$A = N_{RB_alloc} / N_{RB.}$$

CEIL$\{M_{A,}\ 0.5\}$ means rounding upwards to closest 0.5dB, i.e. MPR $\in$ [3.0, 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0]

For the UE maximum output power modified by MPR, the power limits specified in clause 6.2.5.3 apply.

The normative reference for this requirement is TS 36.101 clause 6.2.3.

## 6.2.3_2.4 Test description

### 6.2.3_2.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in clause 5.4.2.1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3_2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3_2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** |

| | Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | Cluster1 RB allocations ($L_{CRB}$ @ $RB_{start}$) | Cluster2 RB allocations ($L_{CRB}$ @ $RB_{start}$) |
|---|---|---|---|---|---|
| 1 | 5MHz | | 16QAM | 2@0 | 1@24 |
| 2 | 5MHz | | 16QAM | 18@0 | 2@22 |
| 3 | 5MHz | | 16QAM | 2@0 | 18@6 |
| 4 | 10MHz | | 16QAM | 3@0 | 2@48 |
| 5 | 10MHz | | 16QAM | 42@0 | 3@45 |
| 6 | 10MHz | | 16QAM | 3@0 | 42@6 |
| 7 | 15MHz | | 16QAM | 8@0 | 7@68 |
| 8 | 15MHz | | 16QAM | 60@0 | 4@68 |
| 9 | 15MHz | | 16QAM | 4@0 | 60@12 |
| 10 | 20MHz | | 16QAM | 4@0 | 4@96 |
| 11 | 20MHz | | 16QAM | 92@0 | 4@96 |
| 12 | 20MHz | | 16QAM | 4@0 | 92@8 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.2.3_2.4.1-1.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.3_2.4.3.

### 6.2.3_2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.3_2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX\ level}$.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test.

### 6.2.3_2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.2.3_2.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3_2.5-1.

**Table 6.2.3_2.5-1: UE Power Class test requirements for Multi-Cluster PUSCH**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 31, 51, 72 | | | | | 23 | +2.7 / -12.7 |
| 2 | 31, 51, 72 | | | | | 23 | +2.7 / -7.7 |
| 3 | 31, 51, 72 | | | | | 23 | +2.7 / -7.7 |
| 4 | 5, 6, 8, 11, 12, 13, 14, 17, 24, 27, 30 | | | | | 23 | +2.7 / -12.7 |
| 5 | 5, 6, 8, 11, 12, 13, 14, 17, 24, 27, 30 | | | | | 23 | +2.7 / -7.7 |
| 6 | 5, 6, 8, 11, 12, 13, 14, 17, 24, 27, 30 | | | | | 23 | +2.7 / -7.7 |
| 7 | 18, 19, 21, 26, 34, 68 | | | | | 23 | +2.7 / -11.7 |
| 8 | 18, 19, 21, 26, 34, 68 | | | | | 23 | +2.7 / -7.7 |
| 9 | 18, 19, 21, 26, 34, 68 | | | | | 23 | +2.7 / -7.7 |
| 10 | 1, 2, 3, 4, 7, 9, 10, 20, 23, 25, 28, 33, 35, 36, 37, 38, 39, 40, 41,44, 45, 50, 65, 66, 70, 71 | | | | | 23 | +2.7 / -13.2 |
| | 22, 42, 43, 48 | | | | | 23 | +3.0 / -13.5 |
| 11 | 1, 2, 3, 4, 7, 9, 10, 20, 23, 25, 28, 33, 35, 36, 37, 38, 39, 40, 41, 44, 45, 50, 65, 66, 70, 71 | | | | | 23 | +2.7 / -7.7 |
| | 22, 42, 43 | | | | | 23 | +3.0 / -8.0 |
| 12 | 1, 2, 3, 4, 7, 9, 10, 20, 23, 25, 28,33, 35, 36, 37, 38, 39, 40, 41, 44, 45, 50, 65, 66, 70, 71 | | | | | 23 | +2.7 / -7.7 |
| | 22, 42, 43, 48 | | | | | 23 | +3.0 / -8.0 |

## 6.2.3_3 Maximum Power Reduction (MPR) for UL 64QAM

Editor's note:

- Requirement for Band 44 is not yet finalised due to square brackets in core specification TS 36.101 Table 6.2.2-1.

- Test requirements values in this section need to be reviewed in order to take into account notes in Table 6.2.5.3-2: $\Delta T_{IB,c}$ regarding $\Delta T_{IB,c}$ and asymmetric lower tolerances in table 6.2.2.3-1.

## 6.2.3_3.1 Test purpose

The number of RB identified in Table 6.2.3_3.3-1 is based on meeting the requirements for adjacent channel leakage ratio and the maximum power reduction (MPR) due to Cubic Metric (CM).

Simple scaling can be used to derive the requirement for other bandwidth based on the previously agreed value for 5MHz channel bandwidth.

## 6.2.3_3.2 Test applicability

The requirements of this test apply in test cases 6.6.2.3_3 Adjacent Channel Leakage power Ratio to E-UTRA UE from release 13 and forward that support UL 64QAM.

NOTE: As a result TC 6.2.3_3 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.3_3.3 Minimum conformance requirements

For UE Power Class 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2.3-1 due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3_3.3-1.

**Table 6.2.3_3.3-1: Maximum Power Reduction (MPR) for Power Class 3**

| Modulation | Channel bandwidth / Transmission bandwidth configuration [RB] | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| 64 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 2 |
| 64 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 3 |

For each subframe, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) within the slot, the maximum MPR over the two slots is then applied for the entire subframe.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5.3 apply.

The normative reference for this requirement is TS 36.101 clause 6.2.3.

## 6.2.3_3.4 Test description

### 6.2.3_3.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3_3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3_3.4.1-1: Test Configuration Table**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, 10MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | 64QAM | 5 | 5 |
| 1.4MHz | | 64QAM | 6 | 6 |
| 3.0MHz | | 64QAM | 4 | 4 |
| 3.0MHz | | 64QAM | 15 | 15 |
| 5MHz | | 64QAM | 8 | 8 |
| 5MHz | | 64QAM | 25 | 25 |
| 10MHz | | 64QAM | 12 | 12 |
| 10MHz | | 64QAM | 50 | 50 |
| 15MHz | | 64QAM | 16 | 16 |
| 15MHz | | 64QAM | 75 | 75 |
| 20MHz | | 64QAM | 18 | 18 |
| 20MHz | | 64QAM | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max + 1 - RB allocation) of the channel bandwidth. | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.2.3_3.4.1-1.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.2.4.3.

### 6.2.3_3.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.3_3.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX\ level}$.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test.

### 6.2.3_3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.2.3_3.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3_3.5-1.

**Table 6.2.3_3.5-1: UE Power Class test requirements**

| E-UTRA Band | Class 1 (dBm) | Tol. (Db) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | 64QAM partial RB allocation Tol. (dB) | 64QAM full RB allocation Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 2 | | | | | 23 | +2.7 / [1,2] -4.7 | +2.7 / [1,2] -6.2 |
| 3 | | | | | 23 | +2.7 / [1,2] -4.7 | +2.7 / [1,2] -6.2 |
| 4 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 5 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 6 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 7 | | | | | 23 | +2.7 / [1,2] -4.7 | +2.7 / [1,2] -6.2 |
| 8 | | | | | 23 | +2.7 / [1,2] -4.7 | +2.7 / [1,2] -6.2 |
| 9 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 10 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 11 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 12 | | | | | 23 | +2.7 / [1,2] -4.7 | +2.7 / [1,2] -6.2 |
| 13 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 14 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| … | | | | | | | |
| 17 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 18 | | | | | 23 | +2.7 / [3] -4.7 | +2.7 / [3] -6.2 |
| 19 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 20 | | | | | 23 | +2.7 / [1,2] -4.7 | +2.7 / [1,2] -6.2 |
| 21 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 22 | | | | | 23 | +3.0/-6.5 | +3.0/-8 |
| 23 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 24 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 25 | | | | | 23 | +2.7 / [1,2] -4.7 | +2.7 / [1,2] -6.2 |
| 26 | | | | | 23 | +2.7 / [1,2] -4.7 | +2.7 / [1,2] -6.2 |
| 27 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 28 | | | | | 23 | +2.7/-5.2 | +2.7/-6.7 |
| 31 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| ... | | | | | | | |
| 33 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 34 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 35 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 36 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 37 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 38 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 39 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 40 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 41 | | | | | 23 | +2.7 / [1,2] -4.7 | +2.7 / [1,2] -6.2 |
| 42 | | | | | 23 | +3.0 / -6.0 | +3.0 / -7.5 |
| 43 | | | | | 23 | +3.0 / -6.0 | +3.0 / -7.5 |
| 44 | | | | | 23 | +2.7 / [-5.7] | +2.7 / [-7.2] |
| 45 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| … | | | | | | | |
| 65 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 66 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| … | | | | | | | |
| 68 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| … | | | | | | | |
| 70 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| 72 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |
| … | | | | | | | |
| 74 | | | | | 23 | +2.7 / -4.7 | +2.7 / -6.2 |

Note 1: For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.

Note 2: For the UE maximum output power modified by MPR, the power limits specified in Table 6.2.5.3-1 apply

Note 3: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5dB for transmission bandwidths confined within 815 MHz and 818 MHz

## 6.2.3_4 Maximum Power Reduction (MPR) for Multi-Cluster PUSCH with UL 64QAM

Editor's note: For a transition period until RAN5#83, this test case in version 15.3.1 of 36.521-1 shall be used. This is to ensure no test coverage is lost before the UL 256QAM test case becomes available.

### 6.2.3_4.1 Test purpose

Same test purpose as in clause 6.2.3_2.

### 6.2.3_4.2 Test applicability

The requirements of this test apply in test cases 6.6.2.3_4 Adjacent Channel Leakage power Ratio to E-UTRA UE from release 13 and forward that support UL 64QAM and multi cluster PUSCH within a component carrier for the tested band but do not support UL 256QAM.

NOTE: As a result TC 6.2.3_4 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.3_4.3 Minimum conformance requirements

For UE Power Class 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in table 6.2.2-1 due to multi-cluster PUSCH, is specified as follows:

$$MPR = CEIL \{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$M_A = 8.00\text{-}10.12A; \quad 0.00 < A \leq 0.33$$

$$5.67 - 3.07A; \quad 0.33 < A \leq 0.77$$

$$3.31; \quad 0.77 < A \leq 1.00$$

Where

$$A = N_{RB_alloc} / N_{RB.}$$

CEIL{$M_A$, 0.5} means rounding upwards to closest 0.5dB, i.e. MPR ∈ [3.0, 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0]

For the UE maximum output power modified by MPR, the power limits specified in clause 6.2.5.3 apply.

The normative reference for this requirement is TS 36.101 clause 6.2.3.

## 6.2.3_4.4 Test description

### 6.2.3_4.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in clause 5.4.2.1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3_4.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3_4.4.1-1: Test Configuration Table**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | | Low range, Mid range, High range |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Highest |
| **Test Parameters for Channel Bandwidths** | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** |

| | Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | Cluster1 RB allocations ($L_{CRB}$ @ $RB_{start}$) | Cluster2 RB allocations ($L_{CRB}$ @ $RB_{start}$) |
|---|---|---|---|---|---|
| 1 | 5MHz | | 64QAM | 2@0 | 1@24 |
| 2 | 5MHz | | 64QAM | 18@0 | 2@22 |
| 3 | 5MHz | | 64QAM | 2@0 | 18@6 |
| 4 | 10MHz | | 64QAM | 3@0 | 2@48 |
| 5 | 10MHz | | 64QAM | 42@0 | 3@45 |
| 6 | 10MHz | | 64QAM | 3@0 | 42@6 |
| 7 | 15MHz | | 64QAM | 8@0 | 7@68 |
| 8 | 15MHz | | 64QAM | 60@0 | 4@68 |
| 9 | 15MHz | | 64QAM | 4@0 | 60@12 |
| 10 | 20MHz | | 64QAM | 4@0 | 4@96 |
| 11 | 20MHz | | 64QAM | 92@0 | 4@96 |
| 12 | 20MHz | | 64QAM | 4@0 | 92@8 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.2.3_4.4.1-1.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.3_4.4.3.

### 6.2.3_4.4.2 Test procedure

Same test procedure as in clause 6.2.3_2.4.2

- Instead of Table 6.2.3_2.4.1-1 → use Table 6.2.3_4.4.1-1

### 6.2.3_4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.2.3_4.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3_4.5-1.

**Table 6.2.3_4.5-1: UE Power Class test requirements for Multi-Cluster PUSCH with UL 64QAM**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 31, 51,72 | | | | | 23 | +2.7 / -12.7 |
| 2 | 31, 51, 72 | | | | | 23 | +2.7 / -7.7 |
| 3 | 31, 51, 72 | | | | | 23 | +2.7 / -7.7 |
| 4 | 5, 6, 8, 11, 12, 13, 14, 17, 24, 27, 30 | | | | | 23 | +2.7 / -12.7 |
| 5 | 5, 6, 8, 11, 12, 13, 14, 17, 24, 27, 30 | | | | | 23 | +2.7 / -7.7 |
| 6 | 11, 12, 13, 14, 17, 24, 27, 30 | | | | | 23 | +2.7 / -7.7 |
| 7 | 18, 19, 21, 26, 34, 68 | | | | | 23 | +2.7 / -11.7 |
| 8 | 18, 19, 21, 26, 34, 68 | | | | | 23 | +2.7 / -7.7 |
| 9 | 18, 19, 21, 26, 34, 68 | | | | | 23 | +2.7 / -7.7 |
| 10 | 1, 2, 3, 4, 7, 9, 10, 20, 23, 25, 28, 33, 35, 36, 37, 38, 39, 40, 41, 44, 45, 50, 65, 66, 70, 71 | | | | | 23 | +2.7 / -13.2 |
| 10 | 22, 42, 43, 48 | | | | | 23 | +2.7 / -13.5 |
| 11 | 1, 2, 3, 4, 7, 9, 10, 20, 23, 25, 28,33, 35, 36, 37, 38, 39, 40, 41, 44, 45, 50, 65, 66, 70, 71 | | | | | 23 | +2.7 / -7.7 |
| 11 | 22, 42, 43, 48 | | | | | 23 | +2.7 / -8.0 |
| 12 | 1, 2, 3, 4, 7, 9, 10, 20, 23, 25, 28,33, 35, 36, 37, 38, 39, 40, 41, 44, 45, 50, 65, 66, 70, 71 | | | | | 23 | +2.7 / -7.7 |
| 12 | 22, 42, 43, 48 | | | | | 23 | +2.7 / -8.0 |

## 6.2.3_5 Maximum Power Reduction (MPR) for UL 256QAM

Editor's note:

- Requirement for Band 44 is not yet finalised due to square brackets in core specification TS 36.101 Table 6.2.2-1.

- Test requirements values in this section need to be reviewed in order to take into account notes in Table 6.2.5.3-2: $\Delta T_{IB,c}$ regarding $\Delta T_{IB,c}$ and asymmetric lower tolerances in table 6.2.2.3-1.

### 6.2.3_5.1 Test purpose

The number of RB identified in Table 6.2.3_5.3-1 is based on meeting the requirements for adjacent channel leakage ratio and the maximum power reduction (MPR) due to Cubic Metric (CM).

Simple scaling can be used to derive the requirement for other bandwidth based on the previously agreed value for 5MHz channel bandwidth.

## 6.2.3_5.2 Test applicability

The requirements of this test apply in test cases 6.6.2.3_5 Adjacent Channel Leakage power Ratio to E-UTRA UE from release 14 and forward that support UL 256QAM.

NOTE: As a result TC 6.2.3_5 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.3_5.3 Minimum conformance requirements

For UE Power Class 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2.3-1 due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3_5.3-1.

**Table 6.2.3_5.3-1: Maximum Power Reduction (MPR) for Power Class 3**

| Modulation | Channel bandwidth / Transmission bandwidth configuration [RB] | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| 256 QAM | ≥ 1 | | | | | | ≤ 5 |

For each subframe, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) within the slot, the maximum MPR over the two slots is then applied for the entire subframe.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5.3 apply.

The normative reference for this requirement is TS 36.101 clause 6.2.3.

## 6.2.3_5.4 Test description

### 6.2.3_5.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3_5.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3_5.4.1-1: Test Configuration Table**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, 10MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | 256QAM | 6 | 6 |
| 3.0MHz | | 256QAM | 15 | 15 |
| 5MHz | | 256QAM | 25 | 25 |
| 10MHz | | 256QAM | 50 | 50 |
| 15MHz | | 256QAM | 75 | 75 |
| 20MHz | | 256QAM | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.2.3_5.4.1-1.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.2.4.3.

### 6.2.3_5.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.3_5.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX\ level}$.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test.

### 6.2.3_5.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.2.3_5.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3_5.5-1.

**Table 6.2.3_5.5-1: UE Power Class test requirements**

| E-UTRA Band | Class 1 (dBm) | Tol. (Db) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | 256QAM partial RB allocation Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -7.7 |
| 2 | | | | | 23 | +2.7 / [1,2] -7.7 |
| 3 | | | | | 23 | +2.7 / [1,2] -7.7 |
| 4 | | | | | 23 | +2.7 / -7.7 |
| 5 | | | | | 23 | +2.7 / -7.7 |
| 6 | | | | | 23 | +2.7 / -7.7 |
| 7 | | | | | 23 | +2.7 / [1,2] -7.7 |
| 8 | | | | | 23 | +2.7 / [1,2] -7.7 |
| 9 | | | | | 23 | +2.7 / -7.7 |
| 10 | | | | | 23 | +2.7 / -7.7 |
| 11 | | | | | 23 | +2.7 / -7.7 |
| 12 | | | | | 23 | +2.7 / [1,2] -7.7 |
| 13 | | | | | 23 | +2.7 / -7.7 |
| 14 | | | | | 23 | +2.7 / -7.7 |
| … | | | | | | |
| 17 | | | | | 23 | +2.7 / -7.7 |
| 18 | | | | | 23 | +2.7 / [3] -7.7 |
| 19 | | | | | 23 | +2.7 / -7.7 |
| 20 | | | | | 23 | +2.7 / [1,2] -7.7 |
| 21 | | | | | 23 | +2.7 / -7.7 |
| 22 | | | | | 23 | +3.0/-6.5 |
| 23 | | | | | 23 | +2.7 / -7.7 |
| 24 | | | | | 23 | +2.7 / -7.7 |
| 25 | | | | | 23 | +2.7 / [1,2] -7.7 |
| 26 | | | | | 23 | +2.7 / [1,2] -7.7 |
| 27 | | | | | 23 | +2.7 / -7.7 |
| 28 | | | | | 23 | +2.7/-5.2 |
| 31 | | | | | 23 | +2.7 / -7.7 |
| ... | | | | | | |
| 33 | | | | | 23 | +2.7 / -7.7 |
| 34 | | | | | 23 | +2.7 / -7.7 |
| 35 | | | | | 23 | +2.7 / -7.7 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 36 | | | | | 23 | +2.7 / -7.7 |
| 37 | | | | | 23 | +2.7 / -7.7 |
| 38 | | | | | 23 | +2.7 / -7.7 |
| 39 | | | | | 23 | +2.7 / -7.7 |
| 40 | | | | | 23 | +2.7 / -7.7 |
| 41 | | | | | 23 | +2.7 / [1,2] -7.7 |
| 42 | | | | | 23 | +3.0 / -9.0 |
| 43 | | | | | 23 | +3.0 / -9.0 |
| 44 | | | | | 23 | +2.7 / [-8.7] |
| 45 | | | | | 23 | +2.7 / -7.7 |
| … | | | | | | |
| 65 | | | | | 23 | +2.7 / -7.7 |
| 66 | | | | | 23 | +2.7 / -7.7 |
| … | | | | | | |
| 70 | | | | | 23 | +2.7 / -7.7 |
| 72 | | | | | 23 | +2.7 / -7.7 |
| … | | | | | | |
| 74 | | | | | 23 | +2.7 / -7.7 |

Note 1: For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.

Note 2: For the UE maximum output power modified by MPR, the power limits specified in Table 6.2.5.3-1 apply

Note 3: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5dB for transmission bandwidths confined within 815 MHz and 818 MHz

## 6.2.3_6 Maximum Power Reduction (MPR) for Multi-Cluster PUSCH with UL 256QAM

### 6.2.3_6.1 Test purpose

Same test purpose as in clause 6.2.3_2.

### 6.2.3_6.2 Test applicability

The requirements of this test apply in test cases 6.6.2.3_6 Adjacent Channel Leakage power Ratio for Multi-Cluster PUSCH to E-UTRA UE from release 14 and forward that support UL 256QAM and multi cluster PUSCH within a component carrier for the tested band.

NOTE: As a result TC 6.2.3_6 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.3_6.3 Minimum conformance requirements

For UE Power Class 1 and 3 transmissions with non-contiguous resource allocation in single component carrier, the allowed Maximum Power Reduction (MPR) for the maximum output power in table 6.2.2.3-1, is specified as follows

$$MPR = CEIL \{M_A, 0.5\}$$

Where $M_A$ is defined as follows for QPSK, 16 QAM and 64 QAM

$$M_A = \begin{cases} 8.00\text{-}10.12A & ; 0.00 < A \leq 0.33 \\ 5.67 - 3.07A & ; 0.33 < A \leq 0.77 \\ 3.31 & ; 0.77 < A \leq 1.00 \end{cases}$$

Where $M_A$ is defined as follows for 256 QAM

$$MA = \begin{cases} 8.00\text{-}10.12A & ; 0.00 < A \leq 0.25 \\ 5.50 & ; 0.25 < A < 1.00 \end{cases}$$

Where

$A = N_{RB_alloc} / N_{RB.}$

CEIL$\{M_{A,} 0.5\}$ means rounding upwards to closest 0.5dB, i.e. MPR ∈ [3.0, 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0]

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5 apply.

The normative reference for this requirement is TS 36.101 clause 6.2.3.

## 6.2.3_6.4 Test description

### 6.2.3_6.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in clause 5.4.2.1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3_6.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3_6.4.1-1: Test Configuration Table**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** |

| | Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | Cluster1 RB allocations ($L_{CRB}$ @ $RB_{start}$) | Cluster2 RB allocations ($L_{CRB}$ @ $RB_{start}$) |
|---|---|---|---|---|---|
| 1 | 5MHz | | 256QAM | 2@0 | 1@24 |
| 2 | 5MHz | | 256QAM | 18@0 | 2@22 |
| 3 | 5MHz | | 256QAM | 2@0 | 18@6 |
| 4 | 10MHz | | 256QAM | 3@0 | 2@48 |
| 5 | 10MHz | | 256QAM | 42@0 | 3@45 |
| 6 | 10MHz | | 256QAM | 3@0 | 42@6 |
| 7 | 15MHz | | 256QAM | 8@0 | 7@68 |
| 8 | 15MHz | | 256QAM | 60@0 | 4@68 |
| 9 | 15MHz | | 256QAM | 4@0 | 60@12 |
| 10 | 20MHz | | 256QAM | 4@0 | 4@96 |
| 11 | 20MHz | | 256QAM | 92@0 | 4@96 |
| 12 | 20MHz | | 256QAM | 4@0 | 92@8 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.2.3_6.4.1-1.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.3_6.4.3.

### 6.2.3_6.4.2 Test procedure

Same test procedure as in clause 6.2.3_2.4.2

- Instead of Table 6.2.3_2.4.1-1 → use Table 6.2.3_6.4.1-1

### 6.2.3_6.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.2.3_6.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3_6.5-1.

**Table 6.2.3_6.5-1: UE Power Class test requirements for Multi-Cluster PUSCH with UL 256QAM**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 31, 51, 72, 73 | | | | | 23 | +2,7 / -12,7 |
| 2 | 31, 51, 72, 73 | | | | | 23 | +2,7 / -11,2 |
| 3 | 31, 51, 72, 73 | | | | | 23 | +2,7 / -11,2 |
| 4 | 5, 6, 8, 11, 12, 13, 14, 17, 24, 27, 30 | | | | | 23 | +2,7 / -12,7 |
| 5 | 5, 6, 8, 11, 12, 13, 14, 17, 24, 27, 30 | | | | | 23 | +2,7 / -11,2 |
| 6 | 5, 6, 8, 11, 12, 13, 14, 17, 24, 27, 30 | | | | | 23 | +2,7 / -11,2 |
| 7 | 18, 19, 21, 26, 34, 68 | | | | | 23 | +2,7 / -11,7 |
| 8 | 18, 19, 21, 26, 34, 68 | | | | | 23 | +2,7 / -11,2 |
| 9 | 18, 19, 21, 26, 34, 68 | | | | | 23 | +2,7 / -11,2 |
| 10 | 1, 2, 3, 4, 7, 9, 10, 20, 23, 25, 28, 33, 35, 36, 37, 38, 39, 40, 41, 44, 45, 50, 65, 66, 70, 71, 74 | | | | | 23 | +2,7 / -13,2 |
| | 22, 42, 43, 48 | | | | | 23 | +3,0 / -13,5 |
| 11 | 1, 2, 3, 4, 7, 9, 10, 20, 23, 25, 28, 33, 35, 36, 37, 38, 39, 40, 41, 44, 45, 50, 65, 66, 70, 71, 74 | | | | | 23 | +2,7 / -11,2 |
| | 22, 42, 43, 48 | | | | | 23 | +3,0 / -11,5 |
| 12 | 1, 2, 3, 4, 7, 9, 10, 20, 23, 25, 28, 33, 35, 36, 37, 38, 39, 40, 41, 44, 45, 50, 65, 66, 70, 71, 74 | | | | | 23 | +2,7 / -11,2 |
| | 22, 42, 43, 48 | | | | | 23 | +3,0 / -11,5 |

## 6.2.3A Maximum Power Reduction (MPR) for CA

### 6.2.3A.1 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA)

#### 6.2.3A.1.1 Test purpose

The number of RB identified in Table 6.2.3A.1.3-1 is based on meeting the requirements for Adjacent Channel Leakage power Ratio (ACLR) for CA and the maximum power reduction (MPR) for intra-band contiguous CA Bandwidth Class C due to Cubic Metric (CM).

### 6.2.3A.1.2 Test applicability

The requirements of this test apply in test case 6.6.2.3A.1 Adjacent Channel Leakage power Ratio (ACLR) for CA to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

NOTE: As a result TC 6.2.3A.1 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3A.1.3 Minimum conformance requirements

For intra-band contiguous carrier aggregation the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A.0-2 due to higher order modulation and contiguously allocated transmissions (resource blocks) is specified in Table 6.2.3A.1.3-1. In case the modulation format is different on different component carriers then the MPR is determined by the rules applied to higher order of those modulations.

**Table 6.2.3A.1.3-1: Maximum Power Reduction (MPR) for Power Class 3**

| Modulation | CA bandwidth Class B and C | | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| | 25 RB + 50 RB | 50 RB + 50 RB | 25 RB + 100 RB | 50 RB + 100 RB | 75 RB + 75 RB | 75 RB + 100 RB | 100 RB + 100 RB | |
| QPSK | > 8 and ≤ 25 | > 12 and ≤ 50 | > 8 and ≤ 25 | > 12 and ≤ 50 | > 16 and ≤ 75 | > 16 and ≤ 75 | > 18 and ≤ 100 | ≤ 1 |
| QPSK | > 25 | > 50 | > 25 | > 50 | > 75 | > 75 | > 100 | ≤ 2 |
| 16 QAM | ≤ 8 | ≤ 12 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 16 | ≤ 18 | ≤ 1 |
| 16 QAM | > 8 and ≤ 25 | > 12 and ≤ 50 | > 8 and ≤ 25 | > 12 and ≤ 50 | > 16 and ≤ 75 | > 16 and ≤ 75 | > 18 and ≤ 100 | ≤ 2 |
| 16 QAM | > 25 | > 50 | > 25 | > 50 | > 75 | > 75 | > 100 | ≤ 3 |

For PUCCH and SRS transmission, the allowed MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For intra-band contiguous CA Bandwidth Class C with non-contiguous resource allocation the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A.0-2 is specified as follows:

$$MPR = CEIL \{ \min(M_A, M_{IM5}), 0.5\}$$

Where $M_A$ is defined as follows:

$M_A =$ 8.2; $0 \le A < 0.025$

9.2 - 40A; $0.025 \le A < 0.05$

8 - 16A; $0.05 \le A < 0.25$

4.83 - 3.33A; $0.25 \le A \le 0.4$

3.83 - 0.83A; $0.4 \le A \le 1$

and $M_{IM5}$ is defined as follows

$M_{IM5} =$ 4.5 ; $\Delta_{IM5} < 1.5 * BW_{Channel_CA}$

6.0 ; $1.5 * BW_{Channel_CA} \le \Delta_{IM5} < BW_{Channel_CA}/2 + F_{OOB}$

$M_A$ ; $\Delta_{IM5} \ge BW_{Channel_CA}/2 + F_{OOB}$For intra-band contiguous carrier aggregation bandwidth class B with non-contiguous resource allocation, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A.0-2 is specified as follows

$$MPR = CEIL \{ M_A, 0.5\}$$

Where $M_A$ is defined as follows:

$M_A =$ $10.5 – 17.5A$ ; $0 \le A < 0.2$

$8.5 – 7.5A$ ; $0.2 \le A < 0.6$

$5.5 – 2.5A$ ; $0.6 \leq A \leq 1$

Where

$A = N_{RB_alloc} / N_{RB_agg.}$

$\Delta_{IM5} = \max( | F_{C_agg} – (3*F_{agg_alloc_low} – 2*F_{agg_alloc_high}) |, \quad | F_{C_agg} \quad – (3*F_{agg_alloc_high} – 2*F_{agg_alloc_low}) | )$

$F_{C_agg} = (F_{edge_high} + F_{edge_low})/2$

CEIL{$M_{A,}$ 0.5} means rounding upwards to closest 0.5dB, i.e. MPR $\in$ [3.0, 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5, 8.0, 8.5]

For intra-band carrier aggregation, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) on all component carriers within the slot, the maximum MPR over the two slots is then applied for the entire subframe.

For the UE maximum output power modified by MPR, the power limits specified in sub-clause 6.2.5A.1 apply.

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.3A.

## 6.2.3A.1.4 Test description

### 6.2.3A.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3A.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low and High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| ID | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 100 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | | |
| 2 | 100 | 25 | | QPSK | 25 | P_25@0 | S_0@0 | | |
| 3 | 100 | 25 | | QPSK | 125 | P_100@0 | S_25@0 | | |
| 4 | 100 | 25 | | 16QAM | 8 | P_8@0 | S_0@0 | | |
| 5 | 100 | 25 | | 16QAM | 25 | P_25@0 | S_0@0 | | |
| 6 | 100 | 25 | | 16QAM | 125 | P_100@0 | S_25@0 | | |
| 7 | 100 | 25 | | QPSK | 2 | P_1@0 | S_1@24 | | |
| 8 | 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | | |
| 9 | 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | | |
| 10 | 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | | |
| 11 | 75 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | | |
| 12 | 75 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | | |
| 13 | 75 | 75 | | 16QAM | 150 | P_75@0 | S_75@0 | | |
| 14 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 15 | 100 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | | |
| 16 | 100 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | | |
| 17 | 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | | |
| 18 | 100 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | | |
| 19 | 100 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | | |
| 20 | 100 | 50 | | 16QAM | 150 | P_100@0 | S_50@0 | | |
| 21 | 100 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |
| 22 | 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | | |
| 23 | 100 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | | |
| 24 | 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | | |
| 25 | 100 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | | |
| 26 | 100 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | | |
| 27 | 100 | 75 | | 16QAM | 175 | P_100@0 | S_75@0 | | |
| 28 | 100 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 29 | 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | | |
| 30 | 100 | 100 | | QPSK | 100 | P_100@0 | S_0@0 | | |
| 31 | 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 32 | 100 | 100 | | 16QAM | 18 | P_18@0 | S_0@0 | | |
| 33 | 100 | 100 | | 16QAM | 100 | P_100@0 | S_0@0 | | |
| 34 | 100 | 100 | | 16QAM | 200 | P_100@0 | S_100@0 | | |
| 35 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| 36 | 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | | |
| 37 | 25 | 50 | | QPSK | 25 | P_25@0 | S_0@0 | | |
| 38 | 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | | |
| 39 | 25 | 50 | | 16QAM | 8 | P_8@0 | S_0@0 | | |
| 40 | 25 | 50 | | 16QAM | 25 | P_25@0 | S_0@0 | | |
| 41 | 25 | 50 | | 16QAM | 75 | P_25@0 | S_50@0 | | |
| 42 | 25 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |
| 43 | 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | | |
| 44 | 50 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | | |
| 45 | 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | | |
| 46 | 50 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | | |
| 47 | 50 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | | |
| 48 | 50 | 50 | | 16QAM | 100 | P_50@0 | S_50@0 | | |
| 49 | 50 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |

NOTE 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.
NOTE 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.3A.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.3A.1.4.3.

### 6.2.3A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.2.3A.1.4.3.
3. SS activates SCC by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.3A.1.4.1-1on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control “up” commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX}$ level.

6. Measure the mean power over all component carriers in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.2.3A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.2.3A.1.5 Test Requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3A.1.5-1 or Table.6.2.3A.1.5-2, as applicable.

.

**Table 6.2.3A.1.5-1: CA UE Power Class test requirements, E UTRA bands ≤ 3GHz**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7/-2.7 |
| 2 | | | | | 23 | +2.7/-3.7 |
| 3 | | | | | 23 | +2.7/-4.7 |
| 4 | | | | | 23 | +2.7/-3.7 |
| 5 | | | | | 23 | +2.7/-4.7 |
| 6 | | | | | 23 | +2.7/-6.2 |
| 7 | | | | | 23 | +2.7/-14.2 |
| 8 | | | | | 23 | +2.7/-2.7 |
| 9 | | | | | 23 | +2.7/-3.7 |
| 10 | | | | | 23 | +2.7/-4.7 |
| 11 | | | | | 23 | +2.7/-3.7 |
| 12 | | | | | 23 | +2.7/-4.7 |
| 13 | | | | | 23 | +2.7/-6.2 |
| 14 | | | | | 23 | +2.7/-14.2 |
| 15 | | | | | 23 | +2.7/-2.7 |
| 16 | | | | | 23 | +2.7/-3.7 |
| 17 | | | | | 23 | +2.7/-4.7 |
| 18 | | | | | 23 | +2.7/-3.7 |
| 19 | | | | | 23 | +2.7/-4.7 |
| 20 | | | | | 23 | +2.7/-6.2 |
| 21 | | | | | 23 | +2.7/-14.2 |
| 22 | | | | | 23 | +2.7/-2.7 |
| 23 | | | | | 23 | +2.7/-3.7 |
| 24 | | | | | 23 | +2.7/-4.7 |
| 25 | | | | | 23 | +2.7/-3.7 |
| 26 | | | | | 23 | +2.7/-4.7 |
| 27 | | | | | 23 | +2.7/-6.2 |
| 28 | | | | | 23 | +2.7/-14.2 |
| 29 | | | | | 23 | +2.7/-2.7 |
| 30 | | | | | 23 | +2.7/-3.7 |
| 31 | | | | | 23 | +2.7/-4.7 |
| 32 | | | | | 23 | +2.7/-3.7 |
| 33 | | | | | 23 | +2.7/-4.7 |
| 34 | | | | | 23 | +2.7/-6.2 |
| 35 | | | | | 23 | +2.7/-14.2 |
| 36 | | | | | 23 | +2.7/-2.7 |
| 37 | | | | | 23 | +2.7/-3.7 |
| 38 | | | | | 23 | +2.7/-4.7 |
| 39 | | | | | 23 | +2.7/-3.7 |
| 40 | | | | | 23 | +2.7/-4.7 |
| 41 | | | | | 23 | +2.7/-6.2 |
| 42 | | | | | 23 | +2.7/-17.2 |
| 43 | | | | | 23 | +2.7/-2.7 |
| 44 | | | | | 23 | +2.7/-3.7 |
| 45 | | | | | 23 | +2.7/-4.7 |
| 46 | | | | | 23 | +2.7/-3.7 |
| 47 | | | | | 23 | +2.7/-4.7 |
| 48 | | | | | 23 | +2.7/-6.2 |
| 49 | | | | | 23 | +2.7/-17.2 |

NOTE 1: Lower limit is assuming $\Delta T_{C,c}$ and $\Delta T_{IB,c}$ are zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1.

**Table 6.2.3A.1.5-2: CA UE Power Class test requirements, 3GHz < E UTRA bands ≤ 4.2GHz**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +3.0/-4.0 |
| 2 | | | | | 23 | +3.0/-4.0 |
| 3 | | | | | 23 | +3.0/-5.0 |
| 4 | | | | | 23 | +3.0/-4.0 |
| 5 | | | | | 23 | +3.0/-5.0 |
| 6 | | | | | 23 | +3.0/-6.5 |
| 7 | | | | | 23 | +3.0/-14.5 |
| 8 | | | | | 23 | +3.0/-4.0 |
| 9 | | | | | 23 | +3.0/-4.0 |
| 10 | | | | | 23 | +3.0/-5.0 |
| 11 | | | | | 23 | +3.0/-4.0 |
| 12 | | | | | 23 | +3.0/-5.0 |
| 13 | | | | | 23 | +3.0/-6.5 |
| 14 | | | | | 23 | +3.0/-14.5 |
| 15 | | | | | 23 | +3.0/-4.0 |
| 16 | | | | | 23 | +3.0/-4.0 |
| 17 | | | | | 23 | +3.0/-5.0 |
| 18 | | | | | 23 | +3.0/-4.0 |
| 19 | | | | | 23 | +3.0/-5.0 |
| 20 | | | | | 23 | +3.0/-6.5 |
| 21 | | | | | 23 | +3.0/-14.5 |
| 22 | | | | | 23 | +3.0/-4.0 |
| 23 | | | | | 23 | +3.0/-4.0 |
| 24 | | | | | 23 | +3.0/-5.0 |
| 25 | | | | | 23 | +3.0/-4.0 |
| 26 | | | | | 23 | +3.0/-5.0 |
| 27 | | | | | 23 | +3.0/-6.5 |
| 28 | | | | | 23 | +3.0/-14.5 |
| 29 | | | | | 23 | +3.0/-4.0 |
| 30 | | | | | 23 | +3.0/-4.0 |
| 31 | | | | | 23 | +3.0/-5.0 |
| 32 | | | | | 23 | +3.0/-4.0 |
| 33 | | | | | 23 | +3.0/-5.0 |
| 34 | | | | | 23 | +3.0/-6.5 |
| 35 | | | | | 23 | +3.0/-14.5 |
| 36 | | | | | 23 | +3.0/-4.0 |
| 37 | | | | | 23 | +3.0/-4.0 |
| 38 | | | | | 23 | +3.0/-5.0 |
| 39 | | | | | 23 | +3.0/-4.0 |
| 40 | | | | | 23 | +3.0/-5.0 |
| 41 | | | | | 23 | +3.0/-6.5 |
| 42 | | | | | 23 | +3.0/-17.5 |
| 43 | | | | | 23 | +3.0/-4.0 |
| 44 | | | | | 23 | +3.0/-4.0 |
| 45 | | | | | 23 | +3.0/-5.0 |
| 46 | | | | | 23 | +3.0/-4.0 |
| 47 | | | | | 23 | +3.0/-5.0 |
| 48 | | | | | 23 | +3.0/-6.5 |
| 49 | | | | | 23 | +3.0/-17.5 |
| NOTE 1: Lower limit is assuming $\Delta T_{C,c}$ and $\Delta T_{IB,c}$ are zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

## 6.2.3A.1_1 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Minimum conformance requirements are missing for aggregated BW 15+10 MHz.

### 6.2.3A.1_1.1 Test purpose

The number of RB identified in Table 6.2.3A.1_1.3-1 is based on meeting the requirements for Adjacent Channel Leakage power Ratio (ACLR) for CA for UL 64QAM and the maximum power reduction (MPR) for intra-band contiguous CA Bandwidth Class C due to Cubic Metric (CM).

### 6.2.3A.1_1.2 Test applicability

The requirements of this test apply in test case 6.6.2.3A.1_1 Adjacent Channel Leakage power Ratio (ACLR) for CA to all types of E-UTRA UE from release 13 and forward that support intra-band contiguous DL CA, UL CA and UL 64QAM.

NOTE: As a result TC 6.2.3A.1_1 has not been included in the test case applicability Table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3A.1_1.3 Minimum conformance requirements

For intra-band contiguous carrier aggregation the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A.0-2due to higher order modulation and contiguously aggregated transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3A.1_1.3-1. In case the modulation format is different on different component carriers then the MPR is determined by the rules applied to higher order of those modulations.

**Table 6.2.3A.1_1.3-1: Maximum Power Reduction (MPR) for Power Class 3**

| Modulation | CA bandwidth Class B and C | | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| | 25 RB + 50 RB | 50 RB + 50 RB | 25 RB + 100 RB | 50 RB + 100 RB | 75 RB + 75 RB | 75 RB + 100 RB | 100 RB + 100 RB | |
| 64 QAM | ≤ 8 and allocation wholly contained within a single CC | ≤ 12 and allocation wholly contained within a single CC | ≤ 8 and allocation wholly contained within a single CC | ≤ 12 and allocation wholly contained within a single CC | ≤ 16 and allocation wholly contained within a single CC | ≤ 16 and allocation wholly contained within a single CC | ≤ 18 and allocation wholly contained within a single CC | ≤ 2 |
| 64 QAM | > 8 or allocation extends across two CC's | > 12 or allocation extends across two CC's | > 8 or allocation extends across two CC's | > 12 or allocation extends across two CC's | > 16 or allocation extends across two CC's | > 16 or allocation extends across two CC's | > 18 or allocation extends across two CC's | ≤ 3 |

For PUCCH and SRS transmissions, the allowed MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For intra-band contiguous carrier aggregation bandwidth class C with non-contiguous resource allocation, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A-1 is specified as follows:

$$MPR = CEIL\ \{\ \min(M_A, M_{IM5}),\ 0.5\}$$

Where $M_A$ is defined as follows:

$M_A = 8.2$ ; $0 \le A < 0.025$

$9.2 - 40A$ ; $0.025 \le A < 0.05$

$8 - 16A$ ; $0.05 \le A < 0.25$

$4.83 - 3.33A$ ; $0.25 \le A \le 0.4$,

$3.83 - 0.83A$ ; $0.4 \le A \le 1$,

and $M_{IM5}$ is defined as follows:

$M_{IM5} = 4.5$ ; $\Delta_{IM5} < 1.5 * BW_{Channel_CA}$

$6.0$ ; $1.5 * BW_{Channel_CA} \le \Delta_{IM5} < BW_{Channel_CA}/2 + F_{OOB}$

$M_A$; $\Delta_{IM5} \geq BW_{Channel_CA}/2 + F_{OOB}$

For intra-band contiguous carrier aggregation bandwidth class B with non-contiguous resource allocation, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A-1 is specified as follows:

$$MPR = CEIL \{ M_A, 0.5\}$$

Where $M_A$ is defined as follows:

$$M_A = \begin{cases} 10.5 - 17.5A & ; 0 \leq A < 0.2 \\ 8.5 - 7.5A & ; 0.2 \leq A < 0.6 \\ 5.5 - 2.5A & ; 0.6 \leq A \leq 1 \end{cases}$$

Where

$A = N_{RB_alloc} / N_{RB_agg.}$

$\Delta_{IM5} = \max( | F_{C_agg} - (3*F_{agg_alloc_low} - 2*F_{agg_alloc_high}) |, | F_{C_agg} - (3*F_{agg_alloc_high} - 2*F_{agg_alloc_low}) | )$

$F_{C_agg} = (F_{edge_high} + F_{edge_low})/2$

CEIL{$M_A$, 0.5} means rounding upwards to closest 0.5dB, i.e. MPR∈ [3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5].

## 6.2.3A.1_1.4 Test description

### 6.2.3A.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in Table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.2.3A.1_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3A.1_1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low and High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | | **DL Allocation** | | **CC MOD** | **UL Allocation** | | | |
| **ID** | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 100 | 25 | N/A | 64QAM | 8 | P_8@0 | S_0@0 | | |
| 2 | 100 | 25 | | 64QAM | 100 | P_100@0 | S_0@0 | | |
| 3 | 100 | 25 | | 64QAM | 125 | P_100@0 | S_25@0 | | |
| 4 | 100 | 50 | | 64QAM | 12 | P_12@0 | S_0@0 | | |
| 5 | 100 | 50 | | 64QAM | 100 | P_100@0 | S_0@0 | | |
| 6 | 100 | 50 | | 64QAM | 150 | P_100@0 | S_50@0 | | |
| 7 | 75 | 75 | | 64QAM | 16 | P_16@0 | S_0@0 | | |
| 8 | 75 | 75 | | 64QAM | 75 | P_75@0 | S_0@0 | | |
| 9 | 75 | 75 | | 64QAM | 150 | P_75@0 | S_75@0 | | |
| 10 | 100 | 75 | | 64QAM | 16 | P_16@0 | S_0@0 | | |
| 11 | 100 | 75 | | 64QAM | 100 | P_100@0 | S_0@0 | | |
| 12 | 100 | 75 | | 64QAM | 175 | P_100@0 | S_75@0 | | |
| 13 | 100 | 100 | | 64QAM | 18 | P_18@0 | S_0@0 | | |
| 14 | 100 | 100 | | 64QAM | 100 | P_100@0 | S_0@0 | | |
| 15 | 100 | 100 | | 64QAM | 200 | P_100@0 | S_100@0 | | |
| 16 | 25 | 50 | | 64QAM | 8 | P_8@0 | S_0@0 | | |
| 17 | 25 | 50 | | 64QAM | 25 | P_25@0 | S_0@0 | | |
| 18 | 25 | 50 | | 64QAM | 75 | P_25@0 | S_50@0 | | |
| 19 | 50 | 50 | | 64QAM | 12 | P_12@0 | S_0@0 | | |
| 20 | 50 | 50 | | 64QAM | 50 | P_50@0 | S_0@0 | | |
| 21 | 50 | 50 | | 64QAM | 100 | P_50@0 | S_50@0 | | |
| 22 | 50 | 100 | | 64QAM | 12 | P_12@0 | S_0@0 | | |
| 23 | 50 | 100 | | 64QAM | 50 | P_50@0 | S_0@0 | | |
| 24 | 50 | 100 | | 64QAM | 150 | P_50@0 | S_100@0 | | |
| NOTE 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>NOTE 2: If the CA Configuration UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | | |

### 6.2.3A.1_1.4.2 Test procedure

Same test procedure as defined in clause 6.2.3A.1.4.2 with the following exception:

- In Step 4, instead of Table 6.2.3A.1.4.1-1 → use Table 6.2.3A.1_1.4.1-1

### 6.2.3A.1_1.4.3 Message contents

Same message contents as defined in clause 6.2.3A.1.4.3.

## 6.2.3A.1_1.5 Test requirement

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3A.1_1.5-1 or Table.6.2.3A.1_1.5-2, as applicable.

**Table 6.2.3A.1_1.5-1: CA UE Power Class test requirements, E UTRA bands ≤ 3GHz**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7/-4.7 |
| 2 | | | | | 23 | +2.7/-6.2 |
| 3 | | | | | 23 | +2.7/-6.2 |
| 4 | | | | | 23 | +2.7/-4.7 |
| 5 | | | | | 23 | +2.7/-6.2 |
| 6 | | | | | 23 | +2.7/-6.2 |
| 7 | | | | | 23 | +2.7/-4.7 |
| 8 | | | | | 23 | +2.7/-6.2 |
| 9 | | | | | 23 | +2.7/-6.2 |
| 10 | | | | | 23 | +2.7/-4.7 |
| 11 | | | | | 23 | +2.7/-6.2 |
| 12 | | | | | 23 | +2.7/-6.2 |
| 13 | | | | | 23 | +2.7/-4.7 |
| 14 | | | | | 23 | +2.7/-6.2 |
| 15 | | | | | 23 | +2.7/-6.2 |
| 16 | | | | | 23 | +2.7/-4.7 |
| 17 | | | | | 23 | +2.7/-6.2 |
| 18 | | | | | 23 | +2.7/-6.2 |
| 19 | | | | | 23 | +2.7/-4.7 |
| 20 | | | | | 23 | +2.7/-6.2 |
| 21 | | | | | 23 | +2.7/-6.2 |
| 22 | | | | | 23 | +2.7/-4.7 |
| 23 | | | | | 23 | +2.7/-6.2 |
| 24 | | | | | 23 | +2.7/-6.2 |
| NOTE 1: Lower limit is assuming ΔTC,c and ΔTIB,c are zero. If non-zero, PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

**Table 6.2.3A.1_1.5-2: CA UE Power Class test requirements, 3GHz < E UTRA bands ≤ 4.2GHz**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +3.0/-5.0 |
| 2 | | | | | 23 | +3.0/-6.5 |
| 3 | | | | | 23 | +3.0/-6.5 |
| 4 | | | | | 23 | +3.0/-5.0 |
| 5 | | | | | 23 | +3.0/-6.5 |
| 6 | | | | | 23 | +3.0/-6.5 |
| 7 | | | | | 23 | +3.0/-5.0 |
| 8 | | | | | 23 | +3.0/-6.5 |
| 9 | | | | | 23 | +3.0/-6.5 |
| 10 | | | | | 23 | +3.0/-5.0 |
| 11 | | | | | 23 | +3.0/-6.5 |
| 12 | | | | | 23 | +3.0/-6.5 |
| 13 | | | | | 23 | +3.0/-5.0 |
| 14 | | | | | 23 | +3.0/-6.5 |
| 15 | | | | | 23 | +3.0/-6.5 |
| 16 | | | | | 23 | +3.0/-5.0 |
| 17 | | | | | 23 | +3.0/-6.5 |
| 18 | | | | | 23 | +3.0/-6.5 |
| 19 | | | | | 23 | +3.0/-5.0 |
| 20 | | | | | 23 | +3.0/-6.5 |
| 21 | | | | | 23 | +3.0/-6.5 |
| 22 | | | | | 23 | +3.0/-5.0 |
| 23 | | | | | 23 | +3.0/-6.5 |
| 24 | | | | | 23 | +3.0/-6.5 |
| NOTE 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

## 6.2.3A.1_2 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM

### 6.2.3A.1_2.1 Test purpose

The number of RB identified in Table 6.2.3A.1_2.3-1 is based on meeting the requirements for Adjacent Channel Leakage power Ratio (ACLR) for CA for UL 256QAM and the maximum power reduction (MPR) for intra-band contiguous CA Bandwidth Class C due to Cubic Metric (CM).

### 6.2.3A.1_2.2 Test applicability

The requirements of this test apply in test case 6.6.2.3A.1_2 Adjacent Channel Leakage power Ratio (ACLR) for CA to all types of E-UTRA UE from release 14 and forward that support intra-band contiguous DL CA, UL CA and UL 256QAM.

NOTE: As a result TC 6.2.3A.1_2 has not been included in the test case applicability Table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3A.1_2.3 Minimum conformance requirements

For intra-band contiguous carrier aggregation the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A.0-2 due to higher order modulation and contiguously aggregated transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3A.1_2.3-1 for UE power class 3 CA bandwidth classes B and C.

In case the modulation format is different on different component carriers then the MPR is determined by the rules applied to higher order of those modulations.

**Table 6.2.3A.1_2.3-1: Maximum Power Reduction (MPR) for Power Class 3**

| Modulation | CA bandwidth Class B and C / Smallest Component Carrier Transmission Bandwidth Configuration | | | | MPR (dB) |
|---|---|---|---|---|---|
| | 25 RB | 50 RB | 75 RB | 100 RB | |
| QPSK | > 8 and ≤ 25 | > 12 and ≤ 50 | > 16 and ≤ 75 | > 18 and ≤ 100 | ≤ 1 |
| QPSK | > 25 | > 50 | > 75 | > 100 | ≤ 2 |
| 16 QAM | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 1 |
| 16 QAM | > 8 and ≤ 25 | > 12 and ≤ 50 | > 16 and ≤ 75 | > 18 and ≤ 100 | ≤ 2 |
| 16 QAM | > 25 | > 50 | > 75 | > 100 | ≤ 3 |
| 64 QAM | ≤ 8 and allocation wholly contained within a single CC | ≤ 12 and allocation wholly contained within a single CC | ≤ 16 and allocation wholly contained within a single CC | ≤ 18 and allocation wholly contained within a single CC | ≤ 2 |
| 64 QAM | > 8 or allocation extends across two CC's | > 12 or allocation extends across two CC's | > 16 or allocation extends across two CC's | > 18 or allocation extends across two CC's | ≤ 3 |
| 256 QAM | ≥ 1 | | | | ≤ 5 |

## 6.2.3A.1_2.4 Test description

### 6.2.3A.1_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in Table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.2.3A.1_2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3A.1_2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | Low and High range | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | |
| Test Parameters for CA Configurations | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | | **DL Allocation** | **CC MOD** | **UL Allocation** | | |
| **ID** | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 1 | 25 | 50 | N/A | 256QAM | 25 | P_25@0 | S_0@0 |
| 2 | 25 | 50 | | 256QAM | 75 | P_25@0 | S_50@0 |
| 3 | 50 | 50 | | 256QAM | 50 | P_50@0 | S_0@0 |
| 4 | 50 | 50 | | 256QAM | 100 | P_50@0 | S_50@0 |
| 5 | 50 | 100 | | 256QAM | 50 | P_50@0 | S_0@0 |
| 6 | 50 | 100 | | 256QAM | 150 | P_50@0 | S_100@0 |
| 7 | 75 | 50 | | 256QAM | 75 | P_75@0 | S_0@0 |
| 8 | 75 | 50 | | 256QAM | 125 | P_75@0 | S_50@0 |
| 9 | 75 | 75 | | 256QAM | 75 | P_75@0 | S_0@0 |
| 10 | 75 | 75 | | 256QAM | 150 | P_75@0 | S_75@0 |
| 11 | 100 | 25 | | 256QAM | 100 | P_100@0 | S_0@0 |
| 12 | 100 | 25 | | 256QAM | 125 | P_100@0 | S_25@0 |
| 13 | 100 | 50 | | 256QAM | 100 | P_100@0 | S_0@0 |
| 14 | 100 | 50 | | 256QAM | 150 | P_100@0 | S_50@0 |
| 15 | 100 | 75 | | 256QAM | 100 | P_100@0 | S_0@0 |
| 16 | 100 | 75 | | 256QAM | 175 | P_100@0 | S_75@0 |
| 17 | 100 | 100 | | 256QAM | 100 | P_100@0 | S_0@0 |
| 18 | 100 | 100 | | 256QAM | 200 | P_100@0 | S_100@0 |
| NOTE 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>NOTE 2: If the CA Configuration UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest $N_{RB_PCC}$ is tested. | | | | | | | |

### 6.2.3A.1_2.4.2 Test procedure

Same test procedure as defined in clause 6.2.3A.1.4.2 with the following exception:

- In Step 2, instead of clause 6.2.3A.1.4.3 → use clause 6.2.3A.1_2.4.3
- In Step 4, instead of Table 6.2.3A.1.4.1-1 → use Table 6.2.3A.1_2.4.1-1

### 6.2.3A.1_2.4.3 Message contents

Same message contents as defined in clause 6.2.3A.1.4.3.

## 6.2.3A.1_2.5 Test requirement

The maximum output power, derived in step 6 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3A.1_2.5-1 or Table.6.2.3A.1_2.5-2, as applicable.

**Table 6.2.3A.1_2.5-1: CA UE Power Class test requirements, E UTRA bands ≤ 3GHz**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7/-9.7 |
| 2 | | | | | 23 | +2.7/-9.7 |
| 3 | | | | | 23 | +2.7/-9.7 |
| 4 | | | | | 23 | +2.7/-9.7 |
| 5 | | | | | 23 | +2.7/-9.7 |
| 6 | | | | | 23 | +2.7/-9.7 |
| 7 | | | | | 23 | +2.7/-9.7 |
| 8 | | | | | 23 | +2.7/-9.7 |
| 9 | | | | | 23 | +2.7/-9.7 |
| 10 | | | | | 23 | +2.7/-9.7 |
| 11 | | | | | 23 | +2.7/-9.7 |
| 12 | | | | | 23 | +2.7/-9.7 |
| 13 | | | | | 23 | +2.7/-9.7 |
| 14 | | | | | 23 | +2.7/-9.7 |
| 15 | | | | | 23 | +2.7/-9.7 |
| 16 | | | | | 23 | +2.7/-9.7 |
| 17 | | | | | 23 | +2.7/-9.7 |
| 18 | | | | | 23 | +2.7/-9.7 |
| NOTE 1: Lower limit is assuming ΔTIB,c is zero. If non-zero, PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

**Table 6.2.3A.1_2.5-2: CA UE Power Class test requirements, 3GHz < E UTRA bands ≤ 4.2GHz**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +3.0/-10.0 |
| 2 | | | | | 23 | +3.0/-10.0 |
| 3 | | | | | 23 | +3.0/-10.0 |
| 4 | | | | | 23 | +3.0/-10.0 |
| 5 | | | | | 23 | +3.0/-10.0 |
| 6 | | | | | 23 | +3.0/-10.0 |
| 7 | | | | | 23 | +3.0/-10.0 |
| 8 | | | | | 23 | +3.0/-10.0 |
| 9 | | | | | 23 | +3.0/-10.0 |
| 10 | | | | | 23 | +3.0/-10.0 |
| 11 | | | | | 23 | +3.0/-10.0 |
| 12 | | | | | 23 | +3.0/-10.0 |
| 13 | | | | | 23 | +3.0/-10.0 |
| 14 | | | | | 23 | +3.0/-10.0 |
| 15 | | | | | 23 | +3.0/-10.0 |
| 16 | | | | | 23 | +3.0/-10.0 |
| 17 | | | | | 23 | +3.0/-10.0 |
| 18 | | | | | 23 | +3.0/-10.0 |
| NOTE 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and T($P_{CMAX_L,c}$) may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

## 6.2.3A.1_3 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA) for HPUE

*Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:*

- *Test requirement still remaining bracket.*

### 6.2.3A.1_3.1 Test purpose

The number of RB identified in Table 6.2.3A.1_3.3-1 is based on meeting the requirements for Adjacent Channel Leakage power Ratio (ACLR) for CA and the maximum power reduction (MPR) for intra-band contiguous CA Bandwidth Class C due to Cubic Metric (CM).

### 6.2.3A.1_3.2 Test applicability

The requirements of this test apply in test case TBD Adjacent Channel Leakage power Ratio (ACLR) for CA to all types of E-UTRA Power Class 2 UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

NOTE: As a result TC 6.2.3A.1_3 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3A.1_3.3 Minimum conformance requirements

For intra-band contiguous carrier aggregation the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A.5.3-1 due to higher order modulation and contiguously allocated transmissions (resource blocks) is specified in Table 6.2.3A.1_3.3-1. In case the modulation format is different on different component carriers then the MPR is determined by the rules applied to higher order of those modulations.

**Table 6.2.3A.1_3.3-1: Maximum Power Reduction (MPR) for Power Class 2**

| Modulation | CA bandwidth Class C | | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| | 25 RB + 50 RB | 50 RB + 50 RB | 25 RB + 100 RB | 50 RB + 100 RB | 75 RB + 75 RB | 75 RB + 100 RB | 100 RB + 100 RB | |
| QPSK | > 6 and ≤ 25 | > 6 and ≤ 50 | > 6 and ≤ 25 | > 6 and ≤ 50 | > 6 and ≤ 75 | > 6 and ≤ 75 | > 6 and ≤ 100 | ≤ 1 |
| QPSK | > 25 | > 50 | > 25 | > 50 | > 75 | > 75 | > 100 | ≤ 2 |
| 16 QAM | ≤ 6 | ≤ 8 | ≤ 6 | ≤ 8 | ≤ 16 | ≤ 16 | ≤ 18 | ≤ 1.5 |
| 16 QAM | > 6 and ≤ 25 | > 8 and ≤ 50 | > 6 and ≤ 25 | > 8 and ≤ 50 | > 16 and ≤ 75 | > 16 and ≤ 75 | > 18 and ≤ 100 | ≤ 2 |
| 16 QAM | > 25 | > 50 | > 25 | > 50 | > 75 | > 75 | > 100 | ≤ 3 |

For PUCCH and SRS transmission, the allowed MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For UE power class 2 intra-band contiguous carrier aggregation bandwidth class C with non-contiguous resource allocation, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A.5.3-1 is specified as follows

$$MPR = CEIL \{ \min(M_A, M_{IM5}), 0.5\}$$

Where $M_A$ is defined as follows for QPSK and 16 QAM

$$M_A = \begin{cases} 8.2 & ; 0 \le A < 0.04 \\ 9.2 - 40A & ; 0.04 \le A < 0.075 \\ 8 - 16A & ; 0.075 \le A < 0.25 \\ 4.83 - 3.33A & ; 0.25 \le A \le 0.4, \\ 3.83 - 0.83A & ; 0.4 \le A \le 1, \end{cases}$$

and $M_{IM5}$ is defined as follows

$$M_{IM5} = \begin{cases} 5.0 & ; \Delta_{IM5} < 1.5 * BW_{Channel_CA} \\ 6.0 & ; 1.5 * BW_{Channel_CA} \le \Delta_{IM5} < BW_{Channel_CA}/2 + F_{OOB} \\ M_A & ; \Delta_{IM5} \ge BW_{Channel_CA}/2 + F_{OOB} \end{cases}$$

For intra-band carrier aggregation, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) on all component carriers within the slot, the maximum MPR over the two slots is then applied for the entire subframe.

For the UE maximum output power modified by MPR, the power limits specified in sub-clause TBD apply.

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.3A.

### 6.2.3A.1_3.4 Test description

Use 6.2.3A.1.4.1 except replace Table 6.2.3A.1.4.1-1 with Table 6.2.3A.1_3.4.1-1.

**Table 6.2.3A.1_3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low and High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| ID | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 100 | 25 | | QPSK | 6 | P_6@0 | S_0@0 | | |
| 2 | 100 | 25 | | QPSK | 25 | P_25@0 | S_0@0 | | |
| 3 | 100 | 25 | | QPSK | 125 | P_100@0 | S_25@0 | | |
| 4 | 100 | 25 | | 16QAM | 6 | P_6@0 | S_0@0 | | |
| 5 | 100 | 25 | | 16QAM | 25 | P_25@0 | S_0@0 | | |
| 6 | 100 | 25 | | 16QAM | 125 | P_100@0 | S_25@0 | | |
| 7 | 100 | 25 | | QPSK | 2 | P_1@0 | S_1@24 | | |
| 8 | 75 | 75 | | QPSK | 6 | P_6@0 | S_0@0 | | |
| 9 | 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | | |
| 10 | 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | | |
| 11 | 75 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | | |
| 12 | 75 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | | |
| 13 | 75 | 75 | | 16QAM | 150 | P_75@0 | S_75@0 | | |
| 14 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 15 | 100 | 50 | | QPSK | 6 | P_6@0 | S_0@0 | | |
| 16 | 100 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | | |
| 17 | 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | | |
| 18 | 100 | 50 | | 16QAM | 6 | P_6@0 | S_0@0 | | |
| 19 | 100 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | | |
| 20 | 100 | 50 | | 16QAM | 150 | P_100@0 | S_50@0 | | |
| 21 | 100 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |
| 22 | 100 | 75 | | QPSK | 6 | P_6@0 | S_0@0 | | |
| 23 | 100 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | | |
| 24 | 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | | |
| 25 | 100 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | | |
| 26 | 100 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | | |
| 27 | 100 | 75 | | 16QAM | 175 | P_100@0 | S_75@0 | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 28 | 100 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 29 | 100 | 100 | | QPSK | 6 | P_6@0 | S_0@0 | | |
| 30 | 100 | 100 | | QPSK | 100 | P_100@0 | S_0@0 | | |
| 31 | 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | | |
| 32 | 100 | 100 | | 16QAM | 18 | P_18@0 | S_0@0 | | |
| 33 | 100 | 100 | | 16QAM | 100 | P_100@0 | S_0@0 | | |
| 34 | 100 | 100 | | 16QAM | 200 | P_100@0 | S_100@0 | | |
| 35 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| 36 | 25 | 50 | | QPSK | 6 | P_6@0 | S_0@0 | | |
| 37 | 25 | 50 | | QPSK | 25 | P_25@0 | S_0@0 | | |
| 38 | 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | | |
| 39 | 25 | 50 | | 16QAM | 6 | P_6@0 | S_0@0 | | |
| 40 | 25 | 50 | | 16QAM | 25 | P_25@0 | S_0@0 | | |
| 41 | 25 | 50 | | 16QAM | 75 | P_25@0 | S_50@0 | | |
| 42 | 25 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |
| 43 | 50 | 50 | | QPSK | 6 | P_6@0 | S_0@0 | | |
| 44 | 50 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | | |
| 45 | 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | | |
| 46 | 50 | 50 | | 16QAM | 8 | P_8@0 | S_0@0 | | |
| 47 | 50 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | | |
| 48 | 50 | 50 | | 16QAM | 100 | P_50@0 | S_50@0 | | |
| 49 | 50 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |

NOTE 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.
NOTE 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.

### 6.2.3A.1_3.5 Test Requirements

The maximum output power, derived in step 6 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3A.1_3.5-1.

**Table 6.2.3A.1_3.5-1: CA UE Power Class test requirements, E UTRA bands**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | 26 | [+2.7/-2.7] | | |
| 2 | | | 26 | [+2.7/-3.7] | | |
| 3 | | | 26 | [+2.7/-4.7] | | |
| 4 | | | 26 | [+2.7/-3.7] | | |
| 5 | | | 26 | [+2.7/-4.7] | | |
| 6 | | | 26 | [+2.7/-6.2] | | |
| 7 | | | 26 | [+2.7/-14.2] | | |
| 8 | | | 26 | [+2.7/-2.7] | | |
| 9 | | | 26 | [+2.7/-3.7] | | |
| 10 | | | 26 | [+2.7/-4.7] | | |
| 11 | | | 26 | [+2.7/-3.7] | | |
| 12 | | | 26 | [+2.7/-4.7] | | |
| 13 | | | 26 | [+2.7/-6.2] | | |
| 14 | | | 26 | [+2.7/-14.2] | | |
| 15 | | | 26 | [+2.7/-2.7] | | |
| 16 | | | 26 | [+2.7/-3.7] | | |
| 17 | | | 26 | [+2.7/-4.7] | | |
| 18 | | | 26 | [+2.7/-3.7] | | |
| 19 | | | 26 | [+2.7/-4.7] | | |
| 20 | | | 26 | [+2.7/-6.2] | | |
| 21 | | | 26 | [+2.7/-14.2] | | |
| 22 | | | 26 | [+2.7/-2.7] | | |
| 23 | | | 26 | [+2.7/-3.7] | | |
| 24 | | | 26 | [+2.7/-4.7] | | |
| 25 | | | 26 | [+2.7/-3.7] | | |
| 26 | | | 26 | [+2.7/-4.7] | | |
| 27 | | | 26 | [+2.7/-6.2] | | |
| 28 | | | 26 | [+2.7/-14.2] | | |
| 29 | | | 26 | [+2.7/-2.7] | | |
| 30 | | | 26 | [+2.7/-3.7] | | |
| 31 | | | 26 | [+2.7/-4.7] | | |
| 32 | | | 26 | [+2.7/-3.7] | | |
| 33 | | | 26 | [+2.7/-4.7] | | |
| 34 | | | 26 | [+2.7/-6.2] | | |
| 35 | | | 26 | [+2.7/-14.2] | | |
| 36 | | | 26 | [+2.7/-2.7] | | |
| 37 | | | 26 | [+2.7/-3.7] | | |
| 38 | | | 26 | [+2.7/-4.7] | | |
| 39 | | | 26 | [+2.7/-3.7] | | |
| 40 | | | 26 | [+2.7/-4.7] | | |
| 41 | | | 26 | [+2.7/-6.2] | | |
| 42 | | | 26 | [+2.7/-17.2] | | |
| 43 | | | 26 | [+2.7/-2.7] | | |
| 44 | | | 26 | [+2.7/-3.7] | | |
| 45 | | | 26 | [+2.7/-4.7] | | |
| 46 | | | 26 | [+2.7/-3.7] | | |
| 47 | | | 26 | [+2.7/-4.7] | | |
| 48 | | | 26 | [+2.7/-6.2] | | |
| 49 | | | 26 | [+2.7/-17.2] | | |

NOTE 1: Lower limit is assuming $\Delta T_{C,c}$ and $\Delta T_{IB,c}$ are zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1.

## 6.2.3A.2 Maximum Power Reduction (MPR) for CA (inter-band DL CA and UL CA)

Editor's note: 36.905 Test point analysis doc for eLAA is pending.

### 6.2.3A.2.1 Test purpose

The number of RB identified in Table 6.2.3A.2.3-1 is based on meeting the requirements for Adjacent Channel Leakage power Ratio (ACLR) for CA and Spectrum emission mask (SEM) for CA and the maximum power reduction (MPR) for inter-band CA Bandwidth Class A due to Cubic Metric (CM).

### 6.2.3A.2.2 Test applicability

The requirements of this test apply in test case 6.6.2.3A.2 Adjacent Channel Leakage power Ratio (ACLR) for CA and 6.6.2.1A.2 Spectrum emission mask (SEM) for CA to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA. The requirements also apply to all types of E-UTRA UE release 14 and forward that support uplink LAA.

NOTE: As a result TC 6.2.3A.2 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3A.2.3 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to one E-UTRA band (Table 5.4.2A-1), the requirements in subclause 6.2.3 apply.

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the requirements in subclause 6.2.3 apply [for each uplink carrier].

For UE Power Class 1 and 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A.0-1due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3A.2.3-1.

**Table 6.2.3A.2.3-1: Maximum Power Reduction (MPR) for Power Class 1 and 3**

| Modulation | Channel bandwidth / Transmission bandwidth ($N_{RB}$) | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| QPSK | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 1 |
| 16 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 1 |
| 16 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 2 |

For PRACH, PUCCH and SRS transmissions, the allowed MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For each subframe, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) within the slot; the maximum MPR over the two slots is then applied for the entire subframe.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5 apply.

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.3A and 6.2.3.

The allowed MPR for transmission on an Scell in Band 46 within a component carrier of a nominal channel bandwidth of 10 MHz or 20 MHz is in accordance with 6.2.3.3-1 for $L$ = 5 (10 MHz) and $L$ = 10 (20 MHz) with $L$ defined in Clause 8.1.4 of [6]. For all other possible values of the *RIV* defined in Clause 8.1.4 of [6] the allowed MPR is 2.5 dB for QPSK modulation, 3 dB for 16QAM modulation and 4 dB for 64QAM modulation (256QAM is FFS).

### 6.2.3A.2.4 Test description

#### 6.2.3A.2.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth and are shown in table 6.2.3A.2.4.1-1. The details of the uplink reference

measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3A.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest $N_{RB_agg}$ Highest $N_{RB_agg}$ (Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | | |
| | **PCC** | **SCC** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **NRB_alloc** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | | |
| 1 (NOTE4) | 6 | 25 | N/A for this test | QPSK | QPSK | 2 | 1 | 1 |
| 2 | 6 | 25 | | QPSK | QPSK | 13 | 5 | 8 |
| 3 | 6 | 25 | | QPSK | QPSK | 31 | 6 | 25 |
| 4 (NOTE4) | 6 | 25 | | 16QAM | 16QAM | 2 | 1 | 1 |
| 5 | 6 | 25 | | 16QAM | 16QAM | 13 | 5 | 8 |
| 6 | 6 | 25 | | 16QAM | 16QAM | 31 | 6 | 25 |
| 7 | 6 | 25 | | QPSK | 16QAM | 30 | 5 | 25 |
| 8 (NOTE4) | 6 | 50 | | QPSK | QPSK | 2 | 1 | 1 |
| 9 | 6 | 50 | | QPSK | QPSK | 17 | 5 | 12 |
| 10 | 6 | 50 | | QPSK | QPSK | 56 | 6 | 50 |
| 11 (NOTE4) | 6 | 50 | | 16QAM | 16QAM | 2 | 1 | 1 |
| 12 | 6 | 50 | | 16QAM | 16QAM | 17 | 5 | 12 |
| 13 | 6 | 50 | | 16QAM | 16QAM | 56 | 6 | 50 |
| 14 | 6 | 50 | | QPSK | 16QAM | 55 | 5 | 50 |
| 15 (NOTE4) | 25 | 15 | | QPSK | QPSK | 2 | 1 | 1 |
| 16 | 25 | 15 | | QPSK | QPSK | 12 | 8 | 4 |
| 17 | 25 | 15 | | QPSK | QPSK | 40 | 25 | 15 |
| 18 (NOTE4) | 25 | 15 | | 16QAM | 16QAM | 2 | 1 | 1 |
| 19 | 25 | 15 | | 16QAM | 16QAM | 12 | 8 | 4 |
| 20 | 25 | 15 | | 16QAM | 16QAM | 40 | 25 | 15 |
| 21 | 25 | 15 | | QPSK | 16QAM | 23 | 8 | 15 |
| 22 (NOTE4) | 25 | 25 | | QPSK | QPSK | 2 | 1 | 1 |
| 23 | 25 | 25 | | QPSK | QPSK | 16 | 8 | 8 |
| 24 | 25 | 25 | | QPSK | QPSK | 50 | 25 | 25 |
| 25 (NOTE4) | 25 | 25 | | 16QAM | 16QAM | 2 | 1 | 1 |
| 26 | 25 | 25 | | 16QAM | 16QAM | 16 | 8 | 8 |
| 27 | 25 | 25 | | 16QAM | 16QAM | 50 | 25 | 25 |
| 28 | 25 | 25 | | QPSK | 16QAM | 33 | 8 | 25 |
| 29 (NOTE4) | 25 | 50 | | QPSK | QPSK | 2 | 1 | 1 |
| 30 | 25 | 50 | | QPSK | QPSK | 16 | 4 | 12 |
| 31 (NOTE4) | 25 | 50 | | QPSK | QPSK | 20 | 8 | 12 |
| 32 | 25 | 50 | | QPSK | QPSK | 65 | 15 | 50 |
| 33 (NOTE4) | 25 | 50 | | 16QAM | 16QAM | 2 | 1 | 1 |
| 34 | 25 | 50 | | 16QAM | 16QAM | 16 | 4 | 12 |
| 35 | 25 | 50 | | 16QAM | 16QAM | 20 | 8 | 12 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (NOTE4) | | | | | | | | |
| 36 | 25 | 50 | | 16QAM | 16QAM | 65 | 15 | 50 |
| 37 | 25 | 50 | | QPSK | 16QAM | 54 | 4 | 50 |
| 38 (NOTE4) | 50 | 25 | | QPSK | QPSK | 2 | 1 | 1 |
| 39 | 50 | 25 | | QPSK | QPSK | 20 | 12 | 8 |
| 40 | 50 | 25 | | QPSK | QPSK | 75 | 50 | 25 |
| 41 (NOTE4) | 50 | 25 | | 16QAM | 16QAM | 2 | 1 | 1 |
| 42 | 50 | 25 | | 16QAM | 16QAM | 20 | 12 | 8 |
| 43 | 50 | 25 | | 16QAM | 16QAM | 75 | 50 | 25 |
| 44 | 50 | 25 | | QPSK | 16QAM | 37 | 12 | 25 |
| 45 (NOTE4) | 50 | 50 | | QPSK | QPSK | 2 | 1 | 1 |
| 46 | 50 | 50 | | QPSK | QPSK | 24 | 12 | 12 |
| 47 | 50 | 50 | | QPSK | QPSK | 100 | 50 | 50 |
| 48 (NOTE4) | 50 | 50 | | 16QAM | 16QAM | 2 | 1 | 1 |
| 49 | 50 | 50 | | 16QAM | 16QAM | 24 | 12 | 12 |
| 50 | 50 | 50 | | 16QAM | 16QAM | 100 | 50 | 50 |
| 51 | 50 | 50 | | QPSK | 16QAM | 62 | 12 | 50 |
| 52 (NOTE4) | 50 | 100 | | QPSK | QPSK | 2 | 1 | 1 |
| 53 | 50 | 100 | | QPSK | QPSK | 30 | 12 | 18 |
| 54 | 50 | 100 | | QPSK | QPSK | 150 | 50 | 100 |
| 55 (NOTE4) | 50 | 100 | | 16QAM | 16QAM | 2 | 1 | 1 |
| 56 | 50 | 100 | | 16QAM | 16QAM | 30 | 12 | 18 |
| 57 | 50 | 100 | | 16QAM | 16QAM | 150 | 50 | 100 |
| 58 | 50 | 100 | | QPSK | 16QAM | 112 | 12 | 100 |
| 59 (NOTE4) | 75 | 75 | | QPSK | QPSK | 2 | 1 | 1 |
| 60 | 75 | 75 | | QPSK | QPSK | 32 | 16 | 16 |
| 61 | 75 | 75 | | QPSK | QPSK | 150 | 75 | 75 |
| 62 (NOTE4) | 75 | 75 | | 16QAM | 16QAM | 2 | 1 | 1 |
| 63 | 75 | 75 | | 16QAM | 16QAM | 32 | 16 | 16 |
| 64 | 75 | 75 | | 16QAM | 16QAM | 150 | 75 | 75 |
| 65 | 75 | 75 | | QPSK | 16QAM | 91 | 16 | 75 |
| 66 (NOTE4) | 100 | 50 | | QPSK | QPSK | 2 | 1 | 1 |
| 67 | 100 | 50 | | QPSK | QPSK | 30 | 18 | 12 |
| 68 | 100 | 50 | | QPSK | QPSK | 150 | 100 | 50 |
| 69 (NOTE4) | 100 | 50 | | 16QAM | 16QAM | 2 | 1 | 1 |
| 70 | 100 | 50 | | 16QAM | 16QAM | 30 | 18 | 12 |
| 71 | 100 | 50 | | 16QAM | 16QAM | 150 | 100 | 50 |
| 72 | 100 | 50 | | QPSK | 16QAM | 68 | 18 | 50 |
| 73 (NOTE4) | 100 | 75 | | QPSK | QPSK | 2 | 1 | 1 |
| 74 | 100 | 75 | | QPSK | QPSK | 34 | 18 | 16 |
| 75 | 100 | 75 | | QPSK | QPSK | 175 | 100 | 75 |
| 76 (NOTE4) | 100 | 75 | | 16QAM | 16QAM | 2 | 1 | 1 |
| 77 | 100 | 75 | | 16QAM | 16QAM | 34 | 18 | 16 |
| 78 | 100 | 75 | | 16QAM | 16QAM | 175 | 100 | 75 |
| 79 | 100 | 75 | | QPSK | 16QAM | 93 | 18 | 75 |
| 80 (NOTE4) | 100 | 100 | | QPSK | QPSK | 2 | 1 | 1 |
| 81 | 100 | 100 | | QPSK | QPSK | 36 | 18 | 18 |
| 82 | 100 | 100 | | QPSK | QPSK | 200 | 100 | 100 |
| 83 (NOTE4) | 100 | 100 | | 16QAM | 16QAM | 2 | 1 | 1 |
| 84 | 100 | 100 | | 16QAM | 16QAM | 36 | 18 | 18 |
| 85 | 100 | 100 | | 16QAM | 16QAM | 200 | 100 | 100 |
| 86 | 100 | 100 | | QPSK | 16QAM | 118 | 18 | 100 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 87 (NOTE5) | 100 | 100 | | QPSK | QPSK | 11 | 1 | L=1 |
| 88 (NOTE5) | 100 | 100 | | QPSK | QPSK | 108 | 18 | L=9 |
| 89 (NOTE5) | 100 | 100 | | 16QAM | 16QAM | 11 | 1 | L=1 |
| 90 (NOTE5) | 100 | 100 | | 16QAM | 16QAM | 108 | 18 | L=9 |
| X+1 (NOTE4) | 15 | 25 | | QPSK | QPSK | 2 | 1 | 1 |
| X+2 | 15 | 25 | | QPSK | QPSK | 12 | 4 | 8 |
| X+3 | 15 | 25 | | QPSK | QPSK | 40 | 15 | 25 |
| X+4 (NOTE4) | 15 | 25 | | 16QAM | 16QAM | 2 | 1 | 1 |
| X+5 | 15 | 25 | | 16QAM | 16QAM | 12 | 4 | 8 |
| X+6 | 15 | 25 | | 16QAM | 16QAM | 40 | 15 | 25 |
| X+7 | 15 | 25 | | QPSK | 16QAM | 29 | 4 | 25 |
| X+8 (NOTE4) | 25 | 6 | | QPSK | QPSK | 2 | 1 | 1 |
| X+9 | 25 | 6 | | QPSK | QPSK | 13 | 8 | 5 |
| X+10 | 25 | 6 | | QPSK | QPSK | 31 | 25 | 6 |
| X+11 (NOTE4) | 25 | 6 | | 16QAM | 16QAM | 2 | 1 | 1 |
| X+12 | 25 | 6 | | 16QAM | 16QAM | 13 | 8 | 5 |
| X+13 | 25 | 6 | | 16QAM | 16QAM | 31 | 25 | 6 |
| X+14 | 25 | 6 | | QPSK | 16QAM | 14 | 8 | 6 |
| X+15 (NOTE4) | 25 | 75 | | QPSK | QPSK | 2 | 1 | 1 |
| X+16 | 25 | 75 | | QPSK | QPSK | 24 | 8 | 16 |
| X+17 | 25 | 75 | | QPSK | QPSK | 100 | 25 | 75 |
| X+18 (NOTE4) | 25 | 75 | | 16QAM | 16QAM | 2 | 1 | 1 |
| X+19 | 25 | 75 | | 16QAM | 16QAM | 24 | 8 | 16 |
| X+20 | 25 | 75 | | 16QAM | 16QAM | 100 | 25 | 75 |
| X+21 | 25 | 75 | | QPSK | 16QAM | 83 | 8 | 75 |
| X+22 | 75 | 25 | | QPSK | QPSK | 2 | 1 | 1 |
| X+23 | 75 | 25 | | QPSK | QPSK | 24 | 16 | 8 |
| X+24 | 75 | 25 | | QPSK | QPSK | 100 | 75 | 25 |
| X+25 | 75 | 25 | | 16QAM | 16QAM | 2 | 1 | 1 |
| X+26 | 75 | 25 | | 16QAM | 16QAM | 24 | 16 | 8 |
| X+27 | 75 | 25 | | 16QAM | 16QAM | 100 | 75 | 25 |
| X+28 | 75 | 25 | | QPSK | 16QAM | 41 | 16 | 25 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.
Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same NRB_agg. only the first of those is tested according to the order on the Test Configuration Table list.
Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.
Note 4: Applicable only for 6.6.2.1A.2 Spectrum emission mask for CA (inter-band DL CA and UL CA)
Note 5: Void

**Table 6.2.3A.2.4.1-2: Test Configuration Table for UL LAA**

| Initial Conditions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest $N_{RB_agg}$ Highest $N_{RB_agg}$ (Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | | |
| | **PCC** | **SCC** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **NRB_alloc** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | | |
| 1 | 100 | 100 | | QPSK | QPSK | 11 | 1 | L=1 |
| 2 | 100 | 100 | | QPSK | QPSK | 108 | 18 | L=9 |
| 3 | 100 | 100 | | 16QAM | 16QAM | 11 | 1 | L=1 |
| 4 | 100 | 100 | | 16QAM | 16QAM | 108 | 18 | L=9 |
| 5 | 100 | 100 | | QPSK | QPSK | 200 | 100 | L=10 |
| 6 | 100 | 100 | | 16QAM | 16QAM | 200 | 100 | L=10 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same NRB_agg. only the first of those is tested. according to the order on the Test Configuration Table list.<br>Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}$=N-1, with *N* defined in Clause 8.1.4 of [6]. | | | | | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.3A.2.4.1-1 or 6.2.3A.2.4.1-2.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.3A.2.4.3.

### 6.2.3A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.2.3A.2.4.3.
3. SS activates SCC by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 (or DCI format 0A for SCC in the case of uplink LAA) for C_RNTI to schedule the UL RMC according to Table 6.2.3A.2.4.1-1 or Table 6.2.3A.2.4.1-2 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control “up” commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX}$ level.

6. Measure the mean power over all component carriers in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.2.3A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.2.3A.2.5 Test Requirements

The maximum output power, derived in step 6 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3A.2.5-1 or Table 6.2.3A.2.5-2, as applicable.

**Table 6.2.3A.2.5-1: CA UE Output Power test requirements**

| Config ID | MPR (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 2 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 3 | 1 | 1 | 1.5 | 0 | 20.5 | 22 | 23 | 3 | 25.7 | 19.3 |
| 4 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 5 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 6 | 2 | 2 | 1.5 | 0 | 19.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| 7 | 0 | 2 | 1.5 | 0 | 21.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| 8 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 9 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 10 | 1 | 1 | 1.5 | 0 | 20.5 | 22 | 23 | 3 | 25.7 | 19.3 |
| 11 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 12 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 13 | 2 | 2 | 1.5 | 0 | 19.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| 14 | 0 | 2 | 1.5 | 0 | 21.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| 15 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 16 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 17 | 1 | 1 | 0 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 18 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 19 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 20 | 2 | 2 | 0 | 1.5 | 19.5 | 19.5 | 22.5 | 5 | 25.7 | 17.3 |
| 21 | 0 | 2 | 1.5 | 1.5 | 21.5 | 19.5 | 23 | 3 | 25.7 | 19.3 |
| 22 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 23 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 24 | 1 | 1 | 0 | 0 | 20.5 | 22 | 23 | 3 | 25.7 | 19.3 |
| 25 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 26 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 27 | 2 | 2 | 0 | 0 | 19.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| 28 | 0 | 2 | 1.5 | 0 | 21.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| 29 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 30 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 31 | 0 | 0 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 32 | 1 | 1 | 1.5 | 0 | 20.5 | 22 | 23 | 3 | 25.7 | 19.3 |
| 33 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 34 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 35 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 36 | 2 | 2 | 1.5 | 0 | 19.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| 37 | 0 | 2 | 1.5 | 0 | 21.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| 38 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 39 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 40 | 1 | 1 | 0 | 0 | 22 | 22 | 23 | 3 | 25.7 | 19.3 |
| 41 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 42 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 43 | 2 | 2 | 0 | 0 | 21 | 21 | 23 | 3 | 25.7 | 19.3 |
| 44 | 0 | 2 | 1.5 | 0 | 21.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| 45 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 46 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 47 | 1 | 1 | 0 | 0 | 22 | 22 | 23 | 3 | 25.7 | 19.3 |
| 48 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 49 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 50 | 2 | 2 | 0 | 0 | 21 | 21 | 23 | 3 | 25.7 | 19.3 |
| 51 | 0 | 2 | 1.5 | 0 | 21.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| 52 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 53 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23 | 3 | 25.7 | 19.3 |
| 54 | 1 | 1 | 0 | 0 | 22 | 22 | 23 | 3 | 25.7 | 19.3 |
| 55 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 56 | 1 | 1 | 1.5 | 0 | 20.5 | 22 | 23 | 3 | 25.7 | 19.3 |
| 57 | 2 | 2 | 0 | 0 | 21 | 21 | 23 | 3 | 25.7 | 19.3 |
| 58 | 0 | 2 | 1.5 | 0 | 21.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| 59 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 60 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 61 | 1 | 1 | 0 | 0 | 22 | 22 | 23 | 3 | 25.7 | 19.3 |
| 62 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 63 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 64 | 2 | 2 | 0 | 0 | 21 | 21 | 23 | 3 | 25.7 | 19.3 |
| 65 | 0 | 2 | 1.5 | 0 | 21.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| 66 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 67 | 0 | 0 | 0 | 1.5 | 23 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 68 | 1 | 1 | 0 | 0 | 22 | 22 | 23 | 3 | 25.7 | 19.3 |
| 69 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 70 | 1 | 1 | 0 | 1.5 | 22 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 71 | 2 | 2 | 0 | 0 | 21 | 21 | 23 | 3 | 25.7 | 19.3 |
| 72 | 0 | 2 | 0 | 0 | 23 | 21 | 23 | 3 | 25.7 | 19.3 |
| 73 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 74 | 0 | 0 | 0 | 1.5 | 23 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 75 | 1 | 1 | 0 | 0 | 22 | 22 | 23 | 3 | 25.7 | 19.3 |
| 76 | 1 | 1 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 77 | 1 | 1 | 0 | 1.5 | 22 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| 78 | 2 | 2 | 0 | 0 | 21 | 21 | 23 | 3 | 25.7 | 19.3 |
| 79 | 0 | 2 | 0 | 0 | 23 | 21 | 23 | 3 | 25.7 | 19.3 |
| 80 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 81 | 0 | 0 | 0 | 0 | 23 | 23 | 23 | 3 | 25.7 | 19.3 |
| 82 | 1 | 1 | 0 | 0 | 22 | 22 | 23 | 3 | 25.7 | 19.3 |
| 83 | 1 | 1 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| 84 | 1 | 1 | 0 | 0 | 22 | 22 | 23 | 3 | 25.7 | 19.3 |
| 85 | 2 | 2 | 0 | 0 | 21 | 21 | 23 | 3 | 25.7 | 19.3 |
| 86 | 0 | 2 | 0 | 0 | 23 | 21 | 23 | 3 | 25.7 | 19.3 |
| X+1 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| X+2 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| X+3 | 1 | 1 | 1.5 | 0 | 20.5 | 22 | 23 | 3 | 25.7 | 19.3 |
| X+4 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| X+5 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| X+6 | 2 | 2 | 1.5 | 0 | 19.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| X+7 | 2 | 2 | 1.5 | 0 | 19.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| X+8 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| X+9 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| X+10 | 1 | 1 | 0 | 1.5 | 20.5 | 22 | 23 | 3 | 25.7 | 19.3 |
| X+11 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| X+12 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| X+13 | 2 | 2 | 0 | 1.5 | 19.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| X+14 | 2 | 0 | 0 | 1.5 | 21.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| X+15 | 0 | 0 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| X+16 | 1 | 1 | 1.5 | 0 | 20.5 | 22 | 23 | 3 | 25.7 | 19.3 |
| X+17 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| X+18 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| X+19 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| X+20 | 2 | 2 | 1.5 | 0 | 19.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| X+21 | 0 | 2 | 1.5 | 0 | 21.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| X+22 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| X+23 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23 | 3 | 25.7 | 19.3 |
| X+24 | 1 | 1 | 0 | 0 | 22 | 22 | 23 | 3 | 25.7 | 19.3 |
| X+25 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| X+26 | 1 | 1 | 1.5 | 1.5 | 20.5 | 20.5 | 23 | 3 | 25.7 | 19.3 |
| X+27 | 2 | 2 | 0 | 0 | 21 | 21 | 23 | 3 | 25.7 | 19.3 |
| X+28 | 0 | 2 | 1.5 | 0 | 21.5 | 21 | 23 | 3 | 25.7 | 19.3 |

Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero. $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

Note 2: $\Delta_{TC,c}$ does not apply in all bands. For bands without this lower limit is 19.3 dBm in all test points

**Table 6.2.3A.2.5-2: UL LAA UE Output Power test requirements**

| Config ID | MPR (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 2.5 | 1.5 | 1.5 | 21.5 | 19 | 23 | 3 | 26.5 | 18.5 |
| 2 | 0 | 2.5 | 0 | 0 | 23 | 20.5 | 23 | 3 | 26.5 | 18.5 |
| 3 | 1 | 3 | 1.5 | 1.5 | 20.5 | 18.5 | 22.6 | 5 | 26.5 | 16.1 |
| 4 | 1 | 3 | 0 | 0 | 22 | 20 | 23 | 3 | 26.5 | 18.5 |
| 5 | 1 | 1 | 0 | 0 | 22 | 22 | 23 | 3 | 26.5 | 18.5 |
| 6 | 2 | 2 | 0 | 0 | 21 | 21 | 23 | 3 | 26.5 | 18.5 |

Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero. $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.
Note 2: $\Delta_{TC,c}$ does not apply in all bands. For bands without this lower limit is 18.5 dBm in all test points

## 6.2.3A.2_1 Maximum Power Reduction (MPR) for CA (inter-band DL CA and UL CA) for UL 64QAM

### 6.2.3A.2_1.1 Test purpose

The number of RB identified in Table 6.2.3A.2_1.3-1 is based on meeting the requirements for Adjacent Channel Leakage power Ratio (ACLR) for CA and the maximum power reduction (MPR) for inter-band CA Bandwidth Class A due to Cubic Metric (CM).

### 6.2.3A.2_1.2 Test applicability

The requirements of this test apply in test case 6.6.2.3A.2_1 Adjacent Channel Leakage power Ratio (ACLR) for CA to all types of E-UTRA UE release 13 and forward that support inter-band DL CA, UL CA and UL 64QAM.

NOTE: As a result TC 6.2.3A.2_1 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3A.2_1.3 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to one E-UTRA band (Table 5.4.2A-1), the requirements in subclause 6.2.3 apply.

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the requirements in subclause 6.2.3 apply [for each uplink carrier].

For UE Power Class 1 and 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A.0-1due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3A.2_1.3-1.

**Table 6.2.3A.2_1.3-1: Maximum Power Reduction (MPR) for Power Class 1 and 3**

| Modulation | Channel bandwidth / Transmission bandwidth ($N_{RB}$) | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| 64 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 2 |
| 64 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 3 |

For PRACH, PUCCH and SRS transmissions, the allowed MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For each subframe, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) within the slot; the maximum MPR over the two slots is then applied for the entire subframe.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5 apply.

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.3A and 6.2.3.

## 6.2.3A.2_1.4 Test description

### 6.2.3A.2_1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3A.2_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3A.2_1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest $N_{RB_agg}$ Highest $N_{RB_agg}$ (Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | | |
| | **PCC** | **SCC** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **NRB_alloc** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | | |
| 1 | 6 | 25 | N/A for this test | 64QAM | 64QAM | 13 | 5 | 8 |
| 2 | 6 | 25 | | 64QAM | 64QAM | 31 | 6 | 25 |
| 3 | 6 | 50 | | 64QAM | 64QAM | 17 | 5 | 12 |
| 4 | 6 | 50 | | 64QAM | 64QAM | 56 | 6 | 50 |
| 5 | 25 | 15 | | 64QAM | 64QAM | 12 | 8 | 4 |
| 6 | 25 | 15 | | 64QAM | 64QAM | 40 | 25 | 15 |
| 7 | 25 | 25 | | 64QAM | 64QAM | 16 | 8 | 8 |
| 8 | 25 | 25 | | 64QAM | 64QAM | 50 | 25 | 25 |
| 9 | 25 | 50 | | 64QAM | 64QAM | 16 | 4 | 12 |
| 10 | 25 | 50 | | 64QAM | 64QAM | 65 | 15 | 50 |
| 11 | 50 | 25 | | 64QAM | 64QAM | 20 | 12 | 8 |
| 12 | 50 | 25 | | 64QAM | 64QAM | 75 | 50 | 25 |
| 13 | 50 | 50 | | 64QAM | 64QAM | 24 | 12 | 12 |
| 14 | 50 | 50 | | 64QAM | 64QAM | 100 | 50 | 50 |
| 15 | 50 | 100 | | 64QAM | 64QAM | 30 | 12 | 18 |
| 16 | 50 | 100 | | 64QAM | 64QAM | 150 | 50 | 100 |
| 17 | 75 | 75 | | 64QAM | 64QAM | 32 | 16 | 16 |
| 18 | 75 | 75 | | 64QAM | 64QAM | 150 | 75 | 75 |
| 19 | 100 | 50 | | 64QAM | 64QAM | 30 | 18 | 12 |
| 20 | 100 | 50 | | 64QAM | 64QAM | 150 | 100 | 50 |
| 21 | 100 | 75 | | 64QAM | 64QAM | 34 | 18 | 16 |
| 22 | 100 | 75 | | 64QAM | 64QAM | 175 | 100 | 75 |
| 23 | 100 | 100 | | 64QAM | 64QAM | 36 | 18 | 18 |
| 24 | 100 | 100 | | 64QAM | 64QAM | 200 | 100 | 100 |
| 25 | 15 | 25 | | 64QAM | 64QAM | 12 | 4 | 8 |
| 26 | 15 | 25 | | 64QAM | 64QAM | 40 | 15 | 25 |
| 27 | 25 | 6 | | 64QAM | 64QAM | 13 | 8 | 5 |
| 28 | 25 | 6 | | 64QAM | 64QAM | 31 | 25 | 6 |
| 29 | 25 | 75 | | 64QAM | 64QAM | 24 | 8 | 16 |
| 30 | 25 | 75 | | 64QAM | 64QAM | 100 | 25 | 75 |
| X+1 | 75 | 25 | | 64QAM | 64QAM | 32 | 16 | 8 |
| X+2 | 75 | 25 | | 64QAM | 64QAM | 150 | 75 | 25 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested. | | | | | | | | |
| Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.3A.2_1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.3A.2_1.4.3.

#### 6.2.3A.2_1.4.2 Test procedure

Same test procedure as defined in clause 6.2.3A.2.4.2 with the following exception:

- In Step 4, instead of Table 6.2.3A.2.4.1-1 □ use Table 6.2.3A.2_1.4.1-1

#### 6.2.3A.2_1.4.3 Message contents

Same message contents as defined in clause 6.2.3A.2.4.3.

### 6.2.3A.2_1.5 Test Requirements

The maximum output power, derived in step 6 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3A.2_1.5-1, as applicable.

**Table 6.2.3A.2_1.5-1: CA UE Output Power test requirements**

| Config ID | MPR (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 2 | 2 | 1.5 | 1.5 | 19.5 | 19.5 | 22.5 | 5 | 25.7 | 16.8 |
| 2 | 3 | 3 | 1.5 | 0 | 18.5 | 20 | 22.3 | 5 | 25.7 | 16.6 |
| 3 | 2 | 2 | 1.5 | 1.5 | 19.5 | 19.5 | 22.5 | 5 | 25.7 | 16.8 |
| 4 | 3 | 3 | 1.5 | 0 | 18.5 | 20 | 22.3 | 5 | 25.7 | 16.6 |
| 5 | 2 | 2 | 1.5 | 1.5 | 19.5 | 19.5 | 22.5 | 5 | 25.7 | 16.8 |
| 6 | 3 | 3 | 0 | 1.5 | 20 | 18.5 | 22.3 | 5 | 25.7 | 16.6 |
| 7 | 2 | 2 | 1.5 | 1.5 | 19.5 | 19.5 | 22.5 | 5 | 25.7 | 16.8 |
| 8 | 3 | 3 | 0 | 0 | 20 | 20 | 23 | 3 | 25.7 | 19.3 |
| 9 | 2 | 2 | 1.5 | 1.5 | 19.5 | 19.5 | 22.5 | 5 | 25.7 | 16.8 |
| 10 | 3 | 3 | 1.5 | 0 | 18.5 | 20 | 22.3 | 5 | 25.7 | 16.6 |
| 11 | 2 | 2 | 1.5 | 1.5 | 19.5 | 19.5 | 22.5 | 5 | 25.7 | 16.8 |
| 12 | 3 | 3 | 0 | 0 | 20 | 20 | 23 | 3 | 25.7 | 19.3 |
| 13 | 2 | 2 | 1.5 | 1.5 | 19.5 | 19.5 | 22.5 | 5 | 25.7 | 16.8 |
| 14 | 3 | 3 | 0 | 0 | 20 | 20 | 23 | 3 | 25.7 | 19.3 |
| 15 | 2 | 2 | 1.5 | 0 | 19.5 | 21 | 23 | 3 | 25.7 | 19.3 |
| 16 | 3 | 3 | 0 | 0 | 20 | 20 | 23 | 3 | 25.7 | 19.3 |
| 17 | 2 | 2 | 1.5 | 1.5 | 19.5 | 19.5 | 22.5 | 5 | 25.7 | 16.8 |
| 18 | 3 | 3 | 0 | 0 | 20 | 20 | 19.5 | 3 | 25.7 | 19.3 |
| 19 | 2 | 2 | 0 | 1.5 | 21 | 19.5 | 23 | 3 | 25.7 | 19.3 |
| 20 | 3 | 3 | 0 | 0 | 20 | 20 | 23 | 3 | 25.7 | 19.3 |
| 21 | 2 | 2 | 0 | 1.5 | 21 | 19.5 | 23 | 3 | 25.7 | 19.3 |
| 22 | 3 | 3 | 0 | 0 | 20 | 20 | 23 | 3 | 25.7 | 19.3 |
| 23 | 2 | 2 | 0 | 0 | 21 | 21 | 23 | 3 | 25.7 | 19.3 |
| 24 | 3 | 3 | 0 | 0 | 20 | 20 | 23 | 3 | 25.7 | 19.3 |
| 25 | 2 | 2 | 1.5 | 1.5 | 19.5 | 19.5 | 22.5 | 5 | 25.7 | 16.8 |
| 26 | 3 | 3 | 1.5 | 0 | 18.5 | 20 | 22.3 | 5 | 25.7 | 16.6 |
| 27 | 2 | 2 | 1.5 | 1.5 | 19.5 | 19.5 | 22.5 | 5 | 25.7 | 16.8 |
| 28 | 3 | 3 | 0 | 1.5 | 20 | 18.5 | 22.3 | 5 | 25.7 | 16.6 |
| 29 | 2 | 2 | 1.5 | 1.5 | 19.5 | 19.5 | 22.5 | 5 | 25.7 | 16.8 |
| 30 | 3 | 3 | 0 | 0 | 20 | 20 | 23 | 3 | 25.7 | 19.3 |
| X+1 | 2 | 2 | 1.5 | 1.5 | 19.5 | 19.5 | 22.5 | 5 | 25.7 | 16.8 |
| X+2 | 3 | 3 | 0 | 0 | 20 | 20 | 23 | 3 | 25.7 | 19.3 |

Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero. $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

Note 2: $\Delta_{TC,c}$ does not apply in all bands. For bands without this lower limit is 19.3 dBm in all test points

## 6.2.3A.2_2 Maximum Power Reduction (MPR) for CA (inter-band DL CA and UL CA) for UL 256QAM

### 6.2.3A.2_2.1 Test purpose

The number of RB identified in Table 6.2.3A.2_2.3-1 is based on meeting the requirements for Adjacent Channel Leakage power Ratio (ACLR) for CA and the maximum power reduction (MPR) for inter-band CA Bandwidth Class A due to Cubic Metric (CM).

### 6.2.3A.2_2.2 Test applicability

The requirements of this test apply in test case 6.6.2.3A.2_2 Adjacent Channel Leakage power Ratio (ACLR) for CA to all types of E-UTRA UE release 14 and forward that support inter-band DL CA, UL CA and UL 256QAM.

NOTE: As a result TC 6.2.3A.2_2 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3A.2_2.3 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to one E-UTRA band (Table 5.4.2A-1), the requirements in subclause 6.2.3 apply.

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the requirements in subclause 6.2.3 apply for each uplink component carrier.

For UE Power Class 1 and 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A.0-1due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3A.2_2.3-1.

**Table 6.2.3A.2_2.3-1: Maximum Power Reduction (MPR) for Power Class 1 and 3**

| Modulation | Channel bandwidth / Transmission bandwidth ($N_{RB}$) | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| 256 QAM | ≥ 1 | | | | | | ≤ 5 |

For PRACH, PUCCH and SRS transmissions, the allowed MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For each TTI pattern, the MPR shall be evaluated per $T_{eval}$ period as specified in table 6.2.3A.2_2.3-2 and given by the maximum value taken over the transmission(s) within that period; the maximum MPR over $T_{REF}$ is then applied for $T_{REF}$.

**Table 6.2.3A.2_2.3-2: MPR evaluation period**

| TTI pattern | $T_{REF}$ | $T_{eval}$ |
|---|---|---|
| Subframe | 1 subframe | 1 slot |
| Slot | 7 OS | Min($T_{no_hopping}$, 7OS) |
| Sublot | 2 OS, 3OS | Min($T_{no_hopping}$, 2OS/3OS) |

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5 apply.

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.3A and 6.2.3.

### 6.2.3A.2_2.4 Test description

#### 6.2.3A.2_2.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3A.2_2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3A.2_2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | | |
| | **PCC** | **SCC** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **NRB_alloc** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | | |
| 1 | 6 | 25 | N/A for this Test | 256QAM | 256QAM | 31 | 6 | 25 |
| 2 | 6 | 50 | | 256QAM | 256QAM | 56 | 6 | 50 |
| 3 | 25 | 15 | | 256QAM | 256QAM | 40 | 25 | 15 |
| 4 | 25 | 25 | | 256QAM | 256QAM | 50 | 25 | 25 |
| 5 | 25 | 50 | | 256QAM | 256QAM | 75 | 25 | 50 |
| 6 | 50 | 25 | | 256QAM | 256QAM | 75 | 50 | 25 |
| 7 | 50 | 50 | | 256QAM | 256QAM | 100 | 50 | 50 |
| 8 | 50 | 100 | | 256QAM | 256QAM | 150 | 50 | 100 |
| 9 | 75 | 75 | | 256QAM | 256QAM | 150 | 75 | 75 |
| 10 | 100 | 50 | | 256QAM | 256QAM | 150 | 100 | 50 |
| 11 | 100 | 75 | | 256QAM | 256QAM | 175 | 100 | 75 |
| 12 | 100 | 100 | | 256QAM | 256QAM | 200 | 100 | 100 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested. | | | | | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channel is set according to Table 6.2.3A.2_2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.3A.2_2.4.3.

#### 6.2.3A.2_2.4.2 Test procedure

Same test procedure as defined in clause 6.2.3A.2.4.2 with the following exception:

- In Step 2, instead of clause 6.2.3A.2.4.3 → use clause 6.2.3A.2_2.4.3
- In Step 4, instead of Table 6.2.3A.2.4.1-1 or 6.2.3A.2.4.1-2 → use Table 6.2.3A.2_2.4.1-1

#### 6.2.3A.2_2.4.3 Message contents

Same message contents as defined in clause 6.2.3A.2.4.3.

### 6.2.3A.2_2.5 Test Requirement

The maximum output power, derived in step 6 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3A.2_2.5-1 or Table 6.2.3A.2_2.5-2, as applicable. Selection of the applied test requirement table is based on the E-UTRA operating band with the higher frequency range.

**Table 6.2.3A.2_2.5-1: CA UE Output Power test requirements, E UTRA bands ≤ 3GHz**

| Config ID | MPR (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 5 | 5 | 1.5 | 0 | 16.5 | 18.0 | 20.3 | 6.0 | 25.7 | 13.6 |
| 2 | 5 | 5 | 1.5 | 0 | 16.5 | 18.0 | 20.3 | 6.0 | 25.7 | 13.6 |
| 3 | 5 | 5 | 0 | 1.5 | 16.5 | 18.0 | 20.3 | 6.0 | 25.7 | 13.6 |
| 4 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 25.7 | 15.3 |
| 5 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 25.7 | 15.3 |
| 6 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 25.7 | 15.3 |
| 7 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 25.7 | 15.3 |
| 8 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 25.7 | 15.3 |
| 9 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 25.7 | 15.3 |
| 10 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 25.7 | 15.3 |
| 11 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 25.7 | 15.3 |
| 12 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 25.7 | 15.3 |

Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero. $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

Note 2: $\Delta_{TC,c}$ does not apply in all bands. For bands without this lower limit is 15.3 dBm in all test points

**Table 6.2.3A.2_2.5-2: CA UE Output Power test requirements, 3GHz < E UTRA bands ≤ 4.2GHz**

| Config ID | MPR (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 5 | 5 | 1.5 | 0 | 16.5 | 18.0 | 20.3 | 6.0 | 26.0 | 13.3 |
| 2 | 5 | 5 | 1.5 | 0 | 16.5 | 18.0 | 20.3 | 6.0 | 26.0 | 13.3 |
| 3 | 5 | 5 | 0 | 1.5 | 16.5 | 18.0 | 20.3 | 6.0 | 26.0 | 13.3 |
| 4 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 26.0 | 15.0 |
| 5 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 26.0 | 15.0 |
| 6 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 26.0 | 15.0 |
| 7 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 26.0 | 15.0 |
| 8 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 26.0 | 15.0 |
| 9 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 26.0 | 15.0 |
| 10 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 26.0 | 15.0 |
| 11 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 26.0 | 15.0 |
| 12 | 5 | 5 | 0 | 0 | 16.5 | 18.0 | 21.0 | 5.0 | 26.0 | 15.0 |

Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero. $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.
Note 2: $\Delta_{TC,c}$ does not apply in all bands. For bands without this lower limit is 15.0 dBm in all test points

## 6.2.3A.3 Maximum Power Reduction (MPR) for CA (intra-band non-contiguous DL CA and UL CA)

Editor's note: For a transition period until RAN5#73, this test case in version 13.1.0 of 36.521-1 shall be used. This is to ensure no test coverage is lost before the UL 64QAM test case becomes available.

### 6.2.3A.3.1 Test purpose

The number of RB identified in Table 6.2.3A.2.3-1 is based on meeting the requirements for Adjacent Channel Leakage power Ratio (ACLR) for CA and the maximum power reduction (MPR) for inter-band CA Bandwidth Class A due to Cubic Metric (CM).

### 6.2.3A.3.2 Test applicability

The requirements of this test apply in test case 6.6.2.3A.3 Adjacent Channel Leakage power Ratio (ACLR) for CA to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA but do not support UL 64QAM or UL 256QAM.

NOTE: As a result TC 6.2.3A.3 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3A.3.3 Minimum conformance requirements

For intra-band non-contiguous carrier aggregation with one uplink carrier, the requirements in subclause 6.2.3 apply.

For intra-band non-contiguous carrier aggregation with two uplink carriers MPR is specified for E-UTRA CA configurations with a maximum possible $W_{GAP} \leq 35$ MHz; the allowed MPR is

$$MPR = CEIL \{M_N, 0.5\}$$

where $M_N$ is defined as follows

$$M_N = -0.125\ N + 18.25;\ 2 \leq N \leq 50$$

$$-0.0333\ N + 13.67;\ 50 < N \leq 200$$

where N= $N_{RB_alloc}$ is the number of allocated resource blocks. E-UTRA CA configurations with a maximum possible $W_{gap}$ > 35 MHz and their corresponding MPR are intended to form part of a later release.

For intra-band carrier aggregation, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) on all component carriers within the slot; the maximum MPR over the two slots is then applied for the entire subframe.

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.3A.

## 6.2.3A.3.4 Test description

### 6.2.3A.3.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3A.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3A.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | Refer to test points<br>A: Low Wgap, Maximum Wgap | | | | | |
| Test CC Combination setting ($N_{RB}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@24 |
| 2 | 25 | 25 | 35 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@0 |
| 3 | 25 | 25 | 5 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@24 |
| 4 | 25 | 25 | 5 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@0 |
| 5 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@99 |
| 6 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@75 |
| 7 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_100@0 | 16QAM | S_100@0 |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.3A.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.3A.3.4.3.

#### 6.2.3A.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, and Annex C.3.0 for all downlink physical channels
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.2.3A.2.4.3.
3. SS activates SCC by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.3A.3.4.1-1on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control “up” commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX}$ level.
6. Measure the mean power over all component carriers in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.2.3A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.2.3A.3.5 Test Requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3A.3.5-1, as applicable.

**Table 6.2.3A.3.5-1: CA UE Output Power test requirements**

| Configuration ID | MPR (dB) | $\Delta T_C$ (dB) | $P_{CMAX}$ (dBm) | $T(P_{CMAX_L})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|
| Test Requirements for CA_4A-4A Configurations | | | | | | |
| 1 | 18 | 0 | 5 | 7 | 25.7 | -2,7 |
| 2 | 12 | 0 | 11 | 6 | 25.7 | 4.3 |
| 3 | 18 | 0 | 5 | 7 | 25.7 | -2,7 |
| 4 | 12 | 0 | 11 | 6 | 25.7 | 4.3 |
| 5 | 18 | 0 | 5 | 7 | 25.7 | -2.7 |
| 6 | 12 | 0 | 11 | 6 | 25.7 | 4.3 |
| 7 | 7 | 0 | 16 | 5 | 25.7 | 10.3 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | |

## 6.2.3A.3_1 Maximum Power Reduction (MPR) for CA (intra-band non-contiguous DL CA and UL CA) for UL 64QAM

### 6.2.3A.3_1.1 Test purpose

The number of RB identified in Table 6.2.3A.2.3-1 is based on meeting the requirements for Adjacent Channel Leakage power Ratio (ACLR) for CA and the maximum power reduction (MPR) for inter-band CA Bandwidth Class A due to Cubic Metric (CM).

### 6.2.3A.3_1.2 Test applicability

The requirements of this test apply in test case 6.6.2.3A.3_1 Adjacent Channel Leakage power Ratio (ACLR) for CA to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

NOTE: As a result TC 6.2.3A.3_1 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3A.3_1.3 Minimum conformance requirements

For intra-band non-contiguous carrier aggregation with one uplink carrier, the requirements in subclause 6.2.3 apply.

For intra-band non-contiguous carrier aggregation with two uplink carriers MPR is specified for E-UTRA CA configurations with a maximum possible $W_{GAP} \leq 35$ MHz; the allowed MPR is

$$MPR = CEIL \{M_N, 0.5\}$$

where $M_N$ is defined as follows

$$M_N = -0.125\ N + 18.25;\ 2 \leq N \leq 50$$

$$-0.0333\ N + 13.67;\ 50 < N \leq 200$$

where $N = N_{RB_alloc}$ is the number of allocated resource blocks. E-UTRA CA configurations with a maximum possible $W_{gap} > 35$ MHz and their corresponding MPR are intended to form part of a later release.

For intra-band carrier aggregation, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) on all component carriers within the slot; the maximum MPR over the two slots is then applied for the entire subframe.

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.3A.

### 6.2.3A.3_1.4 Test description

#### 6.2.3A.3_1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3A.3_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3A.3_1.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: Mid frequency, Maximum Wgap(low + high frequency) |
| Test CC Combination setting ($N_{RB}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ [MHz] | DL Allocation | | UL Allocation | | | |
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | | CC MOD | PCC & SCC RB allocation | CC MOD | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | 64QAM | P_1@0 | 16QAM | S_1@24 |
| 2 | 25 | 25 | 35 | N/A | N/A | 64QAM | P_25@0 | 16QAM | S_25@0 |
| 3 | 25 | 25 | 5 | N/A | N/A | 64QAM | P_1@0 | 16QAM | S_1@24 |
| 4 | 25 | 25 | 5 | N/A | N/A | 64QAM | P_25@0 | 16QAM | S_25@0 |
| 5 | 100 | 100 | 5 | N/A | N/A | 64QAM | P_1@0 | 16QAM | S_1@99 |
| 6 | 100 | 100 | 5 | N/A | N/A | 64QAM | P_25@0 | 16QAM | S_25@75 |
| 7 | 100 | 100 | 5 | N/A | N/A | 64QAM | P_100@0 | 16QAM | S_100@0 |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.3A.3_1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.3A.3_1.4.3.

### 6.2.3A.3_1.4.2 Test procedure

Same test procedure as defined in clause 6.2.3A.3.4.2 with the following exception:

- In Step 4, instead of Table 6.2.3A.3.4.1-1 □ use Table 6.2.3A.3_1.4.1-1

### 6.2.3A.3_1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.2.3A.3_1.5 Test Requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3A.3_1.5-1, as applicable.

**Table 6.2.3A.3_1.5-1: CA UE Output Power test requirements**

| Configuration ID | MPR (dB) | $\Delta T_C$ (dB) | $P_{CMAX}$ (dBm) | $T(P_{CMAX_L})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|
| Test Requirements for CA_4A-4A Configurations | | | | | | |
| 1 | 18 | 0 | 5 | 7 | 25.7 | -2,7 |
| 2 | 12 | 0 | 11 | 6 | 25.7 | 4.3 |
| 3 | 18 | 0 | 5 | 7 | 25.7 | -2,7 |
| 4 | 12 | 0 | 11 | 6 | 25.7 | 4.3 |
| 5 | 18 | 0 | 5 | 7 | 25.7 | -2.7 |
| 6 | 12 | 0 | 11 | 6 | 25.7 | 4.3 |
| 7 | 7 | 0 | 16 | 5 | 25.7 | 10.3 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | |

## 6.2.3A.3_2 Maximum Power Reduction (MPR) for CA (intra-band non-contiguous DL CA and UL CA) for UL 256QAM

### 6.2.3A.3_2.1 Test purpose

Same as in clause 6.2.3A.3_1.1.

### 6.2.3A.3_2.2 Test applicability

The requirements of this test apply in test case 6.6.2.3A.3_2 Adjacent Channel Leakage Power Ratio (ACLR) for CA to all types of E-UTRA UE release 14 and forward that support intra-band non-contiguous DL CA and UL CA and UL 256QAM.

NOTE: As a result, TC 6.2.3A.3_2 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3A.3_2.3 Minimum conformance requirements

Same as in clause 6.2.3A.3_1.3.

### 6.2.3A.3_2.4 Test description

#### 6.2.3A.3_2.4.1 Initial condition

Same as in clause 6.2.3A.3_1.4.1 with the following exceptions:

- Instead of Table 6.2.3A.3_1.4.1-1 → use Table 6.2.3A.3_2.4.1-1.

**Table 6.2.3A.3_2.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: Mid frequency, Maximum Wgap(low + high frequency) |
| Test CC Combination setting ($N_{RB}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ [MHz] | DL Allocation | | UL Allocation | | | |
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | | CC MOD | PCC & SCC RB allocation | CC MOD | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | 256QAM | P_1@0 | 256QAM | S_1@24 |
| 2 | 25 | 25 | 35 | N/A | N/A | 256QAM | P_25@0 | 256QAM | S_25@0 |
| 3 | 25 | 25 | 5 | N/A | N/A | 256QAM | P_1@0 | 256QAM | S_1@24 |
| 4 | 25 | 25 | 5 | N/A | N/A | 256QAM | P_25@0 | 256QAM | S_25@0 |
| 5 | 100 | 100 | 5 | N/A | N/A | 256QAM | P_1@0 | 256QAM | S_1@99 |
| 6 | 100 | 100 | 5 | N/A | N/A | 256QAM | P_25@0 | 256QAM | S_25@75 |
| 7 | 100 | 100 | 5 | N/A | N/A | 256QAM | P_100@0 | 256QAM | S_100@0 |

### 6.2.3A.3_2.4.2 Test procedure

Same test procedure as defined in clause 6.2.3A.3.4.2 with the following exception:

- In Step 4, instead of Table 6.2.3A.3.4.2-1 → use Table 6.2.3A.3_2.4.1-1

### 6.2.3A.3_2.4.3 Message contents

Same as in clause 6.2.3A.3_1.4.3.

### 6.2.3A.3_2.5 Test Requirements

Same as in clause 6.2.3A.3_1.5.

## 6.2.3B Maximum Power Reduction (MPR) for UL-MIMO

### 6.2.3B.1 Test purpose

The number of RB identified in Table 6.2.3B.3-1 is based on meeting the requirements for adjacent channel leakage ratio for UL-MIMO and the maximum power reduction (MPR) for UL-MIMO due to Cubic Metric (CM).

### 6.2.3B.2 Test applicability

The requirements of this test apply in test cases 6.6.2.3B Adjacent Channel Leakage power Ratio to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

NOTE: As a result TC 6.2.3B has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.3B.3 Minimum conformance requirements

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the maximum output power is measured as the sum of the maximum output power at each UE antenna connector. For UE Power Class 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2B.3-1 due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3B.3-1 with UL-MIMO configurations defined in Table 6.2.2B.3-2.

**Table 6.2.3B.3-1: Maximum Power Reduction (MPR) for Power Class 3**

| Modulation | Channel bandwidth / Transmission bandwidth configuration [RB] | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| QPSK | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 1 |
| 16 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 1 |
| 16 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 2 |

For the UE maximum output power modified by MPR, the power limits specified in clause 6.2.5B.3 apply.

The normative reference for this requirement is TS 36.101 clause 6.2.3B.

## 6.2.3B.4 Test description

### 6.2.3B.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in clause 5.4.2B.1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3B.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] clause 4.3.1 | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3.1 | Lowest, 5MHz, 10MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 5 | 5 |
| 1.4MHz | | QPSK | 6 | 6 |
| 1.4MHz | | 16QAM | 5 | 5 |
| 1.4MHz | | 16QAM | 6 | 6 |
| 3.0MHz | | QPSK | 4 | 4 |
| 3.0MHz | | QPSK | 15 | 15 |
| 3.0MHz | | 16QAM | 4 | 4 |
| 3.0MHz | | 16QAM | 15 | 15 |
| 5MHz | | QPSK | 8 | 8 |
| 5MHz | | QPSK | 25 | 25 |
| 5MHz | | 16QAM | 8 | 8 |
| 5MHz | | 16QAM | 25 | 25 |
| 10MHz | | QPSK | 12 | 12 |
| 10MHz | | QPSK | 50 | 50 |
| 10MHz | | 16QAM | 12 | 12 |
| 10MHz | | 16QAM | 50 (Note 3) | 50 (Note 3) |
| 15MHz | | QPSK | 16 | 16 |
| 15MHz | | QPSK | 75 | 75 |
| 15MHz | | 16QAM | 16 | 16 |
| 15MHz | | 16QAM | 75 (Note 3) | 75 (Note 3) |
| 20MHz | | QPSK | 18 | 18 |
| 20MHz | | QPSK | 100 | 100 |
| 20MHz | | 16QAM | 18 | 18 |
| 20MHz | | 16QAM | 100 (Note 3) | 100 (Note 3) |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max + 1 - RB allocation) of the channel bandwidth. | | | | |
| Note 3: Applies only for UE-Categories ≥2. | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.28.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Table 6.2.3B.4.1-1.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.3B.4.3.

### 6.2.3B.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.2.3B.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at PUMAX level.

3. Measure the sum of mean power of the UE at each transmit antenna connector in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.2.3B.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.2.3B.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3B.5-1.

**Table 6.2.3B.5-1: UE Power Class test requirements**

| E-UTRA Band | Class 1 (dBm) | Tol. (Db) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | QPSK partial RB allocation Tol. (dB)) | QPSK full RB allocation Tol. (dB)) | 16QAM partial RB allocation Tol. (dB) | 16QAM full RB allocation Tol. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 2 | | | | | 23 | +2.7/-3.7[1] | +2.7/-4.7[1,2] | +2.7/-4.7[1,2] | +2.7/-5.7[1,2] |
| 3 | | | | | 23 | +2.7/-3.7[1] | +2.7/-4.7[1,2] | +2.7/-4.7[1,2] | +2.7/-5.7[1,2] |
| 4 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 5 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 6 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 7 | | | | | 23 | +2.7/-3.7[1] | +2.7/-4.7[1,2] | +2.7/-4.7[1,2] | +2.7/-5.7[1,2] |
| 8 | | | | | 23 | +2.7/-3.7[1] | +2.7/-4.7[1,2] | +2.7/-4.7[1,2] | +2.7/-5.7[1,2] |
| 9 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 10 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 11 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 12 | | | | | 23 | +2.7/-3.7[1] | +2.7/-4.7[1,2] | +2.7/-4.7[1,2] | +2.7/-5.7[1,2] |
| 13 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 14 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| … | | | | | | | | | |
| 17 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 18 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 19 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 20 | | | | | 23 | +2.7/-3.7[1] | +2.7/-4.7[1,2] | +2.7/-4.7[1,2] | +2.7/-5.7[1,2] |
| 21 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 22 | | | | | 23 | +3.0/-5.5 | +3.0/-6.5 | +3.0/-6.5 | +3.0/-7.5 |
| … | | | | | | | | | |
| 23 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 24 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 25 | | | | | 23 | +2.7/-3.7[1] | +2.7/-[4.7][1,2] | +2.7/-[4.7][1,2] | +2.7/-[5.7][1,2] |
| 26 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 27 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 28 | | | | | 23 | +2.7/[-3.7] | +2.7/[-4.7] | +2.7/[-4.7] | +2.7/[-5.7] |
| 30 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 31 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| ... | | | | | | | | | |
| 33 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 34 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 35 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 36 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 37 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 38 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 39 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 40 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 41 | | | | | 23 | +2.7/-3.7[1] | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 42 | | | | | 23 | +3.0/-5.0 | +3.0/-6.0[1,2] | +3.0/-6.0[1,2] | +3.0/-7.0[1,2] |
| 43 | | | | | 23 | +3.0/-5.0 | +3.0/-6.0 | +3.0/-6.0 | +3.0/-7.0[1,2] |
| 44 | | | | | 23 | +2.7/[-3.7] | +2.7/[-4.7] | +2.7/[-4.7] | +2.7/[-5.7] |
| 45 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| … | | | | | | | | | |
| 65 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 66 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| … | | | | | | | | | |
| 68 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| … | | | | | | | | | |
| 70 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| 72 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |
| … | | | | | | | | | |
| 74 | | | | | 23 | +2.7/-3.7 | +2.7/-4.7 | +2.7/-4.7 | +2.7/-5.7 |

Note 1: For transmission configurations (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.

Note 2: For the UE maximum output power modified by MPR, the power limits specified in Table 6.2.5B.3-1 apply

# 6.2.3D UE Maximum Output Power for ProSe

## 6.2.3D.0 Minimum conformance requirements

For UE Power Class 1, 2 and 3, this subclause specifies the allowed Maximum Power Reduction (MPR) power for ProSe physical signals due to higher order modulation and transmit bandwidth configuration (resource blocks).

The allowed MPR for the maximum output power for ProSe physical signal PSSS shall be as be as specified in subclause 6.2.3 for PUSCH QPSK modulation for the corresponding transmission bandwidth.

The allowed MPR for the maximum output power for ProSe physical signal SSSS is specified in Table 6.2.3D.0-1.

For a power class 2 capable UE operating on Band 41, the corresponding requirements for a power class 3 UE apply when an IE *P-max* as defined in [5] of 23 dBm or lower is indicated in the cell or if the TDD frame configuration is 0 or 6.

**Table 6.2.3D.0-1: Maximum Power Reduction (MPR) for SSSS for Power Class 1, 2 and 3**

| Channel bandwidth | MPR for SSSS (dB) |
|---|---|
| 1.4 MHz | |
| 3.0 MHz | |
| 5.0 MHz | ≤ 4 |
| 10 MHz | ≤ 4 |
| 15 MHz | ≤ 4 |
| 20 MHz | ≤ 4 |

The normative reference for this requirement is TS 36.101 [2] clause 6.2.3D.

## 6.2.3D.1 Maximum Power Reduction (MPR) for ProSe Discovery

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Message exceptions content needs further investigation (some values still TBD).
- Test system uncertainties and test tolerances.

### 6.2.3D.1.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specific maximum output power with MPR and tolerance when operating in ProSe Discovery mode.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

### 6.2.3D.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward which supports ProSe Direct Discovery and SLSS transmission and reception.

### 6.2.3D.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.2.3D.0.

### 6.2.3D.1.4 Test description

#### 6.2.3D.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3D.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3D.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, Highest | | |
| | | | |
| | **Downlink Configuration** | **Uplink Configuration** | **Sidelink Configuration (PSSS/SSSS transmission)** |
| Ch BW | RB allocation | RB allocation | RB allocation |
| 5MHz | 8 | 8 | 6 |
| 10MHz | 16 | 16 | 6 |
| 15MHz | 25 | 25 | 6 |
| 20MHz | 30 | 30 | 6 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.67.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exception are defined in clause 6.2.3D.1.4.3
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 6.2.3D.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message content exception are defined in clause 6.2.3D.1.4.3
7. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is closed and UE is set to announce discovery.

### 6.2.3D.1.4.2 Test procedure

1. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions (only those marked with "…Step 1…" ) are defined in clause 6.2.3D.1.4.3.
2. The UE shall transmit RRCConnectionReconfigurationComplete message.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration of the two PSSS symbols, excluding transient period within one sub-frame.
4. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration of the two SSSS symbols, excluding transient period within one sub-frame.

### 6.2.3D.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

- Table A.7.1.1-1 for FDD
- Table A.7.1.2-1 for TDD

**Table 6.2.3D.1.4.3-1: ACTIVATE TEST MODE: Maximum Power Reduction for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 6.2.3D.1.4.3-2: CLOSE UE TEST LOOP: Maximum Power Reduction for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 6.2.3D.1.4.3-3: *MAC-MainConfig-RBC*: Maximum Power Reduction for ProSe Direct Discovery (applicable only for Step 1 of Test procedure)**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | TBD | | |
| periodicBSR-Timer | TBD | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | TBD | | |
| } | | | |

**Table 6.2.3D.1.4.3-4: *RRC-RRCConnectionReconfiguration*: Maximum Output Power for ProSe Direct Discovery (applicable only for Step 2 of Test procedure)**

| Information Element | Value | Comment | Condition |
|---|---|---|---|
| networkControlledSyncTx | ON | Configured | |

## 6.2.3D.1.5 Test requirements

The maximum output power for PSSS, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.2.5-1. The maximum output power for SSSS, derived in step 4 shall be within the range prescribed by the maximum output power and tolerance in Table 6.2.3D.5-1

**Table 6.2.3D.5-1: UE Power Class test requirements for SSSS**

| EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 19 | ±2.7 | | |
| 2 | | | | | 19 | ±2.7[2] | | |
| 3 | | | | | 19 | ±2.7[2] | | |
| 4 | | | | | 19 | ±2.7 | | |
| 5 | | | | | 19 | ±2.7 | | |
| 6 | | | | | 19 | ±2.7 | | |
| 7 | | | | | 19 | ±2.7[2] | | |
| 8 | | | | | 19 | ±2.7[2] | | |
| 9 | | | | | 19 | ±2.7 | | |
| 10 | | | | | 19 | ±2.7 | | |
| 11 | | | | | 19 | ±2.7 | | |
| 12 | | | | | 19 | ±2.7[2] | | |
| 13 | | | | | 19 | ±2.7 | | |
| 14 | | | | | 19 | ±2.7 | | |
| … | | | | | | | | |
| 17 | | | | | 19 | ±2.7 | | |
| 18 | | | | | 19 | ±2.7[6] | | |
| 19 | | | | | 19 | ±2.7 | | |
| 20 | | | | | 19 | ±2.7[2] | | |
| 21 | | | | | 19 | ±2.7 | | |
| 22 | | | | | 19 | +3.0/-4.5 | | |
| 23 | | | | | 19 | ±2.7[5] | | |
| 24 | | | | | 19 | ±2.7 | | |
| 25 | | | | | 19 | ±2.7[2] | | |
| 26 | | | | | 19 | ±2.7[2] | | |
| 27 | | | | | 19 | ±2.7 | | |
| 28 | | | | | 19 | +2.7/-3.2 | | |
| 30 | | | | | 19 | ±2.7 | | |
| 31 | | | | | 19 | ±2.7 | | |
| ... | | | | | | | | |
| 33 | | | | | 19 | ±2.7 | | |
| 34 | | | | | 19 | ±2.7 | | |
| 35 | | | | | 19 | ±2.7 | | |
| 36 | | | | | 19 | ±2.7 | | |
| 37 | | | | | 19 | ±2.7 | | |
| 38 | | | | | 19 | ±2.7 | | |
| 39 | | | | | 19 | ±2.7 | | |
| 40 | | | | | 19 | ±2.7 | | |
| 41 | | | | | 19 | ±2.7[2] | | |
| 42 | | | | | 19 | +3.0/-4.0 | | |
| 43 | | | | | 19 | +3.0/-4.0 | | |
| 44 | | | | | 19 | +2.7/[-3.7] | | |
| … | | | | | | | | |
| 68 | | | | | 19 | ±2.7 | | |
| … | | | | | | | | |
| 72 | | | | | 19 | ±2.7 | | |

Note 1: The above tolerances are applicable for UE(s) that support up to 4 E-UTRA operating bands. For UE(s) that support 5 or more E-UTRA bands the maximum output power is expected to decrease with each additional band and is FFS

Note 2: For transmission bandwidths (Figure 5.4.2-1, Table 5.4.4-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB

Note 3: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance.

Note 4: For the UE which supports both Band 11 and Band 21 operating frequencies, the tolerance is FFS.

Note 5: When NS_20 is signalled, the total output power within 2000-2005 MHz shall be limited to 7 dBm.

Note 6: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5dB for transmission bandwidths confined within 815 MHz and 818 MHz.

### 6.2.3D.2 Maximum Power Reduction (MPR) ProSe Direct Communication

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Many clauses are TBD

#### 6.2.3D.2.1 Test purpose

TBD

#### 6.2.3D.2.2 Test applicability

TBD

#### 6.2.3D.2.3 Minimum conformance requirements

TBD

#### 6.2.3D.2.4 Test description

TBD

##### 6.2.3D.2.4.1 Initial conditions

TBD

##### 6.2.3D.2.4.2 Test procedure

TBD

##### 6.2.3D.2.4.3 Message contents

TBD

#### 6.2.3D.2.5 Test requirements

TBD

## 6.2.3E Maximum Power Reduction (MPR) for UE category 0

### 6.2.3E.1 Test purpose

Same test purpose as in clause 6.2.3.1.

### 6.2.3E.2 Test applicability

The requirements of this test apply in test case 6.6.2.3E Adjacent Channel Leakage power Ratio for UE category 0 to all types of E-UTRA UE release 12 and forward of UE category 0.

NOTE: As a result TC 6.2.3E has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.3.3.

## 6.2.3E.4 Test description

### 6.2.3E.4.1 Initial condition

Same initial conditions as in clause 6.2.3.4.1 with following exceptions for HD-FDD:

- Instead of Table 6.2.3.4.1-1 → use Table 6.2.3E.4.1-1.
- Connect SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.2.3E.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, 10MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 1.4MHz | | QPSK | 5 | 5 |
| 1.4MHz | | QPSK | 6 | 6 |
| 1.4MHz | | 16QAM | 5 | 5 |
| 3.0MHz | | QPSK | 4 | 4 |
| 3.0MHz | | QPSK | 15 | 15 |
| 3.0MHz | | 16QAM | 4 | 4 |
| 3.0MHz | | 16QAM | 5 | 5 |
| 5MHz | | QPSK | 8 | 8 |
| 5MHz | | QPSK | 25 | 25 |
| 5MHz | | 16QAM | 5 | 5 |
| 10MHz | | QPSK | 12 | 12 |
| 10MHz | | QPSK | 36 | 36 |
| 10MHz | | 16QAM | 5 | 5 |
| 15MHz | | QPSK | 16 | 16 |
| 15MHz | | QPSK | 36 | 36 |
| 15MHz | | 16QAM | 5 | 5 |
| 20MHz | | QPSK | 18 | 18 |
| 20MHz | | QPSK | 36 | 36 |
| 20MHz | | 16QAM | 5 | 5 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max + 1 - RB allocation) of the channel bandwidth. | | | | |

### 6.2.3E.4.2 Test procedure

Same test procedure as in clause 6.2.3.4.2 with following exception for HD-FDD:

- In step 3, slots with transient periods are not under test. Half-duplex guard subframe are not under test.

### 6.2.3E.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.2.3E.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3E.5-1.

**Table 6.2.3E.5-1: UE Power Class test requirements**

| E-UTRA Band | Class 1 (dBm) | Tol. (Db) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | QPSK partial RB allocation Tol. (dB)) | QPSK full RB allocation Tol. (dB)) | 16QAM partial RB allocation Tol. (dB) | 16QAM full RB allocation Tol. (dB)[3,4] |
|---|---|---|---|---|---|---|---|---|---|
| 2 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 3 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 4 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 5 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 8 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 13 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 20 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 39 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 41 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |

Note 1: For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.
Note 2: For the UE maximum output power modified by MPR, the power limits specified in Table 6.2.5.3-1 apply
Note 3: Full allocation for 16QAM cat0
Note 4: Only applicable in 3MHz

# 6.2.3EA Maximum Power Reduction (MPR) for UE category M1

## 6.2.3EA.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified nominal maximum output power and tolerance covering configurations where a maximum power reduction is allowed in the UE.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

## 6.2.3EA.2 Test applicability

The requirements of this test apply in test case 6.6.2.3EA Adjacent Channel Leakage power Ratio for UE category M1 to all types of E-UTRA UE release 13 and forward of UE category M1.

NOTE: As a result TC 6.2.3EA has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.3EA.3 Minimum conformance requirements

For UE Power Class 3 and 5, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2EA-1 due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3EA-1 and 6.2.3EA-2.

**Table 6.2.3EA-1: Maximum Power Reduction (MPR) for Power Class 3**

| Modulation | Channel bandwidth / Transmission bandwidth ($N_{RB}$) | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| QPSK | >2 | >2 | >1 | >4 | - | - | ≤ 1 |
| QPSK | >5 | >5 | - | - | - | - | ≤ 2 |
| 16 QAM | ≤ 2 | ≤ 2 | >1 | >3 | - | - | ≤ 1 |
| 16QAM | >2 | >2 | >3 | >5 | - | - | ≤ 2 |

**Table 6.2.3EA-2: Maximum Power Reduction (MPR) for Power Class 5**

| Modulation | Channel bandwidth / Transmission bandwidth ($N_{RB}$) | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| QPSK | >2 | >2 | >3 | >5 | - | - | ≤ 1 |
| QPSK | >5 | >5 | - | - | - | - | ≤ 2 |
| 16 QAM | ≤ 2 | ≤ 2 | >3 | >5 | - | - | ≤ 1 |
| 16QAM | >2 | >2 | >5 | - | - | - | ≤ 2 |

For PRACH, PUCCH and SRS transmissions, the allowed MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For each subframe, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) within the slot; the maximum MPR over the two slots is then applied for the entire subframe.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5 EA.3 apply.

No other MPR requirement than those specified in Table 6.2.3EA-1 and Table 6.2.3EA-2 applies to category M1 UE.

## 6.2.3EA.4 Test description

### 6.2.3EA.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3EA.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.2.3EA.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest, 5MHz, 10MHz, 15 MHz | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| **Low range, Mid range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 5 | 0 |
| 6 | 3MHz | | QPSK | 2 | 0 |
| 7 | 3MHz | | QPSK | 5 | 0 |
| 8 | 3MHz | | QPSK | 6 | 0 |
| 9 | 3MHz | | 16QAM | 2 | 0 |
| 10 | 3MHz | | 16QAM | 5 | 0 |
| 11 | 5MHz | | QPSK | 6 | 0 |
| 12 (Note 4) | 5MHz | | 16QAM | 1 | 0 |
| 13 | 5MHz | | 16QAM | 3 | 0 |
| 14 | 5MHz | | 16QAM | 5 | 0 |
| 15 (Note 4) | 10MHz | | QPSK | 4 | 0 |
| 16 | 10MHz | | QPSK | 6 | 0 |
| 17 (Note 4) | 10MHz | | 16QAM | 3 | 0 |
| 18 | 10MHz | | 16QAM | 5 | 0 |
| 19 | 15MHz | | QPSK | 6 | 0 |
| 20 | 15MHz | | 16QAM | 5 | 0 |
| **High range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 5 | 0 |
| 6 | 3MHz | | QPSK | 2 | 1 |
| 7 | 3MHz | | QPSK | 5 | 1 |
| 8 | 3MHz | | QPSK | 6 | 1 |
| 9 | 3MHz | | 16QAM | 2 | 1 |
| 10 | 3MHz | | 16QAM | 5 | 1 |
| 11 | 5MHz | | QPSK | 6 | 3 |
| 12 (Note 4) | 5MHz | | 16QAM | 1 | 3 |
| 13 | 5MHz | | 16QAM | 3 | 3 |
| 14 | 5MHz | | 16QAM | 5 | 3 |
| 15 (Note 4) | 10MHz | | QPSK | 4 | 7 |
| 16 | 10MHz | | QPSK | 6 | 7 |
| 17 (Note 4) | 10MHz | | 16QAM | 3 | 7 |
| 18 | 10MHz | | 16QAM | 5 | 7 |
| 19 | 15MHz | | QPSK | 6 | 11 |
| 20 | 15MHz | | 16QAM | 5 | 11 |

Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4

Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband.

Note 4: Only for power class 3 UE

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.3EA.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.2.3EA.4.3.

### 6.2.3EA.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.2.3EA.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX\ level}$.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods and Half-duplex guard subframe are not under test.

### 6.2.3EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA.

## 6.2.3EA.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3EA.5-1, 6.2.3EA.5-2 and6.2.3EA.5-3.

**Table 6.2.3EA.5-1: UE Power Class test requirements for bands without $\Delta T_{C,c}$ (Low/Mid/High range) and bands with $\Delta T_{C,c}$ (Mid range) except band 28**

| Configuration ID | Power class 3 | | | | | Power class 5 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2.0 | 25.7 | 20.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 2 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 3 | 2 | 21 | 2.0 | 25.7 | 18.3 | 2 | 18 | 4.0 | 22.7 | 13.3 |
| 4 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 5 | 2 | 21 | 2.0 | 25.7 | 18.3 | 2 | 18 | 4.0 | 22.7 | 13.3 |
| 6 | 0 | 23 | 2.0 | 25.7 | 20.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 7 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 8 | 2 | 21 | 2.0 | 25.7 | 18.3 | 2 | 18 | 4.0 | 22.7 | 13.3 |
| 9 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 10 | 2 | 21 | 2.0 | 25.7 | 18.3 | 2 | 18 | 4.0 | 22.7 | 13.3 |
| 11 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 12 | 0 | 23 | 2.0 | 25.7 | 20.3 | N/A | | | | |
| 13 | 1 | 22 | 2.0 | 25.7 | 19.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 14 | 2 | 21 | 2.0 | 25.7 | 18.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 15 | 0 | 23 | 2.0 | 25.7 | 20.3 | N/A | | | | |
| 16 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 17 | 0 | 23 | 2.0 | 25.7 | 20.3 | N/A | | | | |
| 18 | 1 | 22 | 2.0 | 25.7 | 19.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 19 | 0 | 23 | 2.0 | 25.7 | 20.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 20 | 0 | 23 | 2.0 | 25.7 | 20.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |

Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5
Note 2: $\Delta T_{C,c}$ applicability per band is indicated by note 2 in Table 6.2.2EA-1

**Table 6.2.3EA.5-2: UE Power Class test requirements for bands with $\Delta T_{C,c}$ (Low/High range)**

| Configuration ID | Power class 3 | | | | | Power class 5 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 21.5 | 2.0 | 25.7 | 18.8 | 0 | 18.5 | 4.0 | 22.7 | 13.8 |
| 2 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 3 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5.0 | 22.7 | 10.8 |
| 4 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 5 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5.0 | 22.7 | 10.8 |
| 6 | 0 | 21.5 | 2.0 | 25.7 | 18.8 | 0 | 18.5 | 4.0 | 22.7 | 13.8 |
| 7 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 8 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5.0 | 22.7 | 10.8 |
| 9 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 10 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5.0 | 22.7 | 10.8 |
| 11 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 12 | 0 | 21.5 | 2.0 | 25.7 | 18.8 | N/A | | | | |
| 13 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 0 | 18.5 | 4.0 | 22.7 | 13.8 |
| 14 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 15 | 0 | 21.5 | 2.0 | 25.7 | 18.8 | N/A | | | | |
| 16 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 17 | 0 | 21.5 | 2.0 | 25.7 | 18.8 | N/A | | | | |
| 18 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 0 | 18.5 | 4 | 22.7 | 13.8 |
| 19 | 0 | 21.5 | 2.0 | 25.7 | 18.8 | 0 | 18.5 | 4.0 | 22.7 | 13.8 |
| 20 | 0 | 21.5 | 2.0 | 25.7 | 18.8 | 0 | 18.5 | 4.0 | 22.7 | 13.8 |

Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5
Note 2: $\Delta T_{C,c}$ applicability per band is indicated by note 2 in Table 6.2.2EA-1

**Table 6.2.3EA.5-3: UE Power Class test requirements for band 28**

| Configuration ID | Power class 3 | | | | | Power class 5 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | N/A | | | | | | | | | |
| 2 | N/A | | | | | | | | | |
| 3 | N/A | | | | | | | | | |
| 4 | N/A | | | | | | | | | |
| 5 | N/A | | | | | | | | | |
| 6 | 0 | 23 | 2.0 | 25.7 | 19.8 | 0 | 20 | 2.0 | 22.7 | 16.8 |
| 7 | 1 | 22 | 2.0 | 25.7 | 18.8 | 1 | 19 | 3.5 | 22.7 | 14.3 |
| 8 | 2 | 21 | 2.0 | 25.7 | 17.8 | 2 | 18 | 4.0 | 22.7 | 12.8 |
| 9 | 1 | 22 | 2.0 | 25.7 | 18.8 | 1 | 19 | 3.5 | 22.7 | 14.3 |
| 10 | 2 | 21 | 2.0 | 25.7 | 17.8 | 2 | 18 | 4.0 | 22.7 | 12.8 |
| 11 | 1 | 22 | 2.0 | 25.7 | 18.8 | 1 | 19 | 3.5 | 22.7 | 14.3 |
| 12 | 0 | 23 | 2.0 | 25.7 | 19.8 | N/A | | | | |
| 13 | 1 | 22 | 2.0 | 25.7 | 18.8 | 0 | 20 | 2.0 | 22.7 | 16.8 |
| 14 | 2 | 21 | 2.0 | 25.7 | 17.8 | 1 | 19 | 3.5 | 22.7 | 14.3 |
| 15 | 0 | 23 | 2.0 | 25.7 | 19.8 | N/A | | | | |
| 16 | 1 | 22 | 2.0 | 25.7 | 18.8 | 1 | 19 | 3.5 | 22.7 | 14.3 |
| 17 | 0 | 23 | 2.0 | 25.7 | 19.8 | N/A | | | | |
| 18 | 1 | 22 | 2.0 | 25.7 | 18.8 | 0 | 20 | 2.0 | 22.7 | 16.8 |
| 19 | 0 | 23 | 2.0 | 25.7 | 19.8 | 0 | 20 | 2.0 | 22.7 | 16.8 |
| 20 | 0 | 23 | 2.0 | 25.7 | 19.8 | 0 | 20 | 2.0 | 22.7 | 16.8 |

Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5
Note 2: $\Delta T_{C,c}$ applicability per band is indicated by note 2 in Table 6.2.2EA-1

# 6.2.3EB Maximum Power Reduction (MPR) for UE category 1bis

## 6.2.3EB.1 Test purpose

Same test purpose as in clause 6.2.2.

## 6.2.3EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of category 1bis.

## 6.2.3EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.3.3.

## 6.2.3EB.4 Test description

### 6.2.3EB.4.1 Initial conditions

Same initial conditions as in clause 6.2.3.4.1 with the following exceptions:

- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

### 6.2.3EB.4.2 Test procedure

Same test procedure as in clause 6.2.2.4.2.

### 6.2.3EB.4.3 Message contents

Same message contents as in clause 6.2.2.4.3.

### 6.2.3EB.5 Test requirement

The maximum output power, derived in step 2 of clause 6.2.3EB.4.2, shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3EB.5-1.

**Table 6.2.3EB.5-1: UE Power Class test requirements**

| E-UTRA Band | Class 1 (dBm) | Tol. (Db) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | QPSK partial RB allocation Tol. (dB)) | QPSK full RB allocation Tol. (dB)) | 16QAM partial RB allocation Tol. (dB) | 16QAM full RB allocation Tol. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 2 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 3 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 4 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 5 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 7 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 8 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 12 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 13 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 18 | | | | | 23 | ±2.7[3] | +2.7 / [3] -3.7 | +2.7 / [3] -3.7 | +2.7 / [3] -4.7 |
| 20 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 26 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 28 | | | | | 23 | +2.7/-3.2 | +2.7/-4.2 | +2.7/-4.2 | +2.7/-5.2 |
| 31 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 39 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 41 | | | | | 23 | ±2.7[1] | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -3.7 | +2.7 / [1,2] -4.7 |
| 66 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 72 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |

Note 1: For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.
Note 2: For the UE maximum output power modified by MPR, the power limits specified in Table 6.2.5.3-1 apply
Note 3: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5dB for transmission bandwidths confined within 815 MHz and 818 MHz

# 6.2.3EC Maximum Power Reduction (MPR) for UE category M2

## 6.2.3EC.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified nominal maximum output power and tolerance covering configurations where a maximum power reduction is allowed in the UE.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

## 6.2.3EC.2 Test applicability

The requirements of this test apply in test case 6.6.2.3EC Adjacent Channel Leakage power Ratio for UE category M2 to all types of E-UTRA UE release 14 and forward of UE category M2.

NOTE: As a result TC 6.2.3EC has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.3EC.3 Minimum conformance requirements

For category M2 UE Power Class 1 and 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2EC-1 due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3EC.3-1 and Table 6.2.3EC.3-2.

**Table 6.2.3EC.3-1: Maximum Power Reduction (MPR) for category M2 UE for Power Class 3**

| Modulation | Channel bandwidth / Transmission bandwidth ($N_{RB}$) | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| QPSK | >2 | >2 | >1 | >4 | > 16 | > 18 | ≤ 1 |
| QPSK | >5 | >5 | - | - | - | - | ≤ 2 |
| 16 QAM | ≤ 2 | ≤ 2 | >1 | >3 | ≤ 16 | ≤ 18 | ≤ 1 |
| 16QAM | >2 | >2 | >3 | >5 | > 16 | > 18 | ≤ 2 |

**Table 6.2.3EC.3-2: Maximum Power Reduction (MPR) for category M2 UE for Power Class 5**

| Modulation | Channel bandwidth / Transmission bandwidth ($N_{RB}$) | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| QPSK | >2 | >2 | >3 | >5 | > 16 | > 18 | ≤ 1 |
| QPSK | >5 | >5 | - | - | - | - | ≤ 2 |
| 16 QAM | ≤ 2 | ≤ 2 | >3 | >5 | ≤ 16 | ≤ 18 | ≤ 1 |
| 16QAM | >2 | >2 | >5 | - | > 16 | > 18 | ≤ 2 |

For PRACH, PUCCH and SRS transmissions, the allowed MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For each subframe, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) within the slot; the maximum MPR over the two slots is then applied for the entire subframe.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5EC apply.

No other MPR requirement than those specified in Table 6.2.3EC.3-1 and Table 6.2.3EC.3-2 applies to category M1 UE.

The normative reference for this requirement is TS 36.101 clause 6.2.3E.

## 6.2.3EC.4 Test description

### 6.2.3EC.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3EC.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.2.3EC.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest, 5MHz, 10MHz, 15 MHz | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| **Low range, Mid range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 6 | 0 |
| 6 | 3MHz | | QPSK | 2 | 0 |
| 7 | 3MHz | | QPSK | 5 | 0 |
| 8 | 3MHz | | QPSK | 12 | 0 |
| 9 | 3MHz | | 16QAM | 2 | 0 |
| 10 | 3MHz | | 16QAM | 12 | 0 |
| 11 (Note 4) | 5MHz | | QPSK | 1 | 0 |
| 12 (Note 5) | 5MHz | | QPSK | 3 | 0 |
| 13 | 5MHz | | QPSK | 24 | 0 |
| 14 (Note 4) | 5MHz | | 16QAM | 1 | 0 |
| 15 | 5MHz | | 16QAM | 3 | 0 |
| 16 (Note 5) | 5MHz | | 16QAM | 5 | 0 |
| 17 | 5MHz | | 16QAM | 24 | 0 |
| 18 (Note 3) | 10MHz | | QPSK | 4 | 0 |
| 19 (Note 5) | 10MHz | | QPSK | 5 | 0 |
| 20 | 10MHz | | QPSK | 24 | 0 |
| 21 (Note 4) | 10MHz | | 16QAM | 3 | 0 |
| 22 | 10MHz | | 16QAM | 5 | 0 |
| 23 | 10MHz | | 16QAM | 24 | 0 |
| 24 | 15MHz | | QPSK | 16 | 0 |
| 25 | 15MHz | | QPSK | 24 | 0 |
| 26 | 15MHz | | 16QAM | 16 | 0 |
| 27 | 15MHz | | 16QAM | 24 | 0 |
| 28 | 20MHz | | QPSK | 18 | 0 |
| 29 | 20MHz | | QPSK | 24 | 0 |
| 30 | 20MHz | | 16QAM | 18 | 0 |
| 31 | 20MHz | | 16QAM | 24 | 0 |
| **High range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 6 | 0 |
| 6 | 3MHz | | QPSK | 2 | 1 |
| 7 | 3MHz | | QPSK | 5 | 1 |
| 8 | 3MHz | | QPSK | 12 | 0 |
| 9 | 3MHz | | 16QAM | 2 | 1 |
| 10 | 3MHz | | 16QAM | 12 | 0 |
| 11 (Note 4) | 5MHz | | QPSK | 1 | 3 |
| 12 (Note 5) | 5MHz | | QPSK | 3 | 3 |
| 13 | 5MHz | | QPSK | 24 | 0 |
| 14 (Note 4) | 5MHz | | 16QAM | 1 | 3 |
| 15 | 5MHz | | 16QAM | 3 | 3 |
| 16 (Note 5) | 5MHz | | 16QAM | 5 | 3 |
| 17 | 5MHz | | 16QAM | 24 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| 18 (Note 3) | 10MHz | | QPSK | 4 | 7 |
| 19 (Note 5) | 10MHz | | QPSK | 5 | 7 |
| 20 | 10MHz | | QPSK | 24 | 4 |
| 21 (Note 4) | 10MHz | | 16QAM | 3 | 7 |
| 22 | 10MHz | | 16QAM | 5 | 7 |
| 23 | 10MHz | | 16QAM | 24 | 4 |
| 24 | 15MHz | | QPSK | 15 | 9 |
| 25 | 15MHz | | QPSK | 24 | 8 |
| 26 | 15MHz | | 16QAM | 15 | 9 |
| 27 | 15MHz | | 16QAM | 24 | 8 |
| 28 | 20MHz | | QPSK | 18 | 13 |
| 29 | 20MHz | | QPSK | 24 | 12 |
| 30 | 20MHz | | 16QAM | 18 | 13 |
| 31 | 20MHz | | 16QAM | 24 | 12 |
| Note 1: Denotes where in the channel Bandwidth the wideband shall be placed. Narrowband, Narrowband index and Wideband are defined in TS36.211, 5.2.4.<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 – (RB allocation mod 6)) of the narrowband.<br>Note 4: Only for power class 3 UE<br>Note 5: Only for power class 5 UE | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.3EC.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.2.3EC.4.3.

### 6.2.3EC.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.2.3EC.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX\ level}$.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods and Half-duplex guard subframe are not under test.

### 6.2.3EC.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA.

## 6.2.3EC.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3EC.5-1, 6.2.3EC.5-2 and6.2.3EC.5-3.

**Table 6.2.3EC.5-1: UE Power Class test requirements for bands without $\Delta T_{C,c}$ (Low/Mid/High range) and bands with $\Delta T_{C,c}$ (Mid range) except band 28 and band 71**

| Configuration ID | Power class 3 | | | | | Power class 5 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2 | 25.7 | 20.3 | 0 | 20 | 2 | 22.7 | 17.3 |
| 2 | 1 | 22 | 2 | 25.7 | 19.3 | 1 | 19 | 3.5 | 21.7 | 14.8 |
| 3 | 2 | 21 | 2 | 25.7 | 18.3 | 2 | 18 | 4 | 20.7 | 13.3 |
| 4 | 1 | 22 | 2 | 25.7 | 19.3 | 1 | 19 | 3.5 | 21.7 | 14.8 |
| 5 | 2 | 21 | 2 | 25.7 | 18.3 | 2 | 18 | 4 | 20.7 | 13.3 |
| 6 | 0 | 23 | 2 | 25.7 | 20.3 | 0 | 20 | 2 | 22.7 | 17.3 |
| 7 | 1 | 22 | 2 | 25.7 | 19.3 | 1 | 19 | 3.5 | 21.7 | 14.8 |
| 8 | 2 | 21 | 2 | 25.7 | 18.3 | 2 | 18 | 4 | 20.7 | 13.3 |
| 9 | 1 | 22 | 2 | 25.7 | 19.3 | 1 | 19 | 3.5 | 21.7 | 14.8 |
| 10 | 2 | 21 | 2 | 25.7 | 18.3 | 2 | 18 | 4 | 20.7 | 13.3 |
| 11 | 0 | 23 | 2 | 25.7 | 20.3 | N/A | | | | |
| 12 | N/A | | | | | 0 | 20 | 2 | 22,7 | 17,3 |
| 13 | 1 | 22 | 2 | 25.7 | 19.3 | 1 | 19 | 3.5 | 21.7 | 14.8 |
| 14 | 0 | 23 | 2 | 25.7 | 20.3 | N/A | | | | |
| 15 | 1 | 22 | 2 | 25.7 | 19.3 | 0 | 20 | 2 | 22.7 | 17.3 |
| 16 | NA | | | | | 1 | 19 | 3.5 | 21.7 | 14.8 |
| 17 | 2 | 21 | 2 | 25.7 | 18.3 | 2 | 18 | 4 | 20,7 | 13,3 |
| 18 | 0 | 23 | 2 | 25,7 | 20,3 | N/A | | | | |
| 19 | N/A | | | | | 0 | 20 | 2 | 22,7 | 17,3 |
| 20 | 1 | 22 | 2 | 25,7 | 19,3 | 1 | 19 | 3,5 | 21,7 | 14,8 |
| 21 | 0 | 23 | 2 | 25,7 | 20,3 | N/A | | | | |
| 22 | 1 | 22 | 2 | 25,7 | 19,3 | 0 | 20 | 2 | 22,7 | 17,3 |
| 23 | 2 | 21 | 2 | 25,7 | 18,3 | 2 | 18 | 4 | 20,7 | 13,3 |
| 24 | 0 | 23 | 2 | 25,7 | 20,3 | 0 | 20 | 2 | 22,7 | 17,3 |
| 25 | 1 | 22 | 2 | 25,7 | 19,3 | 1 | 19 | 3,5 | 21,7 | 14.8 |
| 26 | 1 | 22 | 2 | 25.7 | 19.3 | 1 | 19 | 3.5 | 21.7 | 14.8 |
| 27 | 2 | 21 | 2 | 25.7 | 18.3 | 2 | 18 | 4 | 20.7 | 13.3 |
| 28 | 0 | 23 | 2 | 25.7 | 20.3 | 0 | 20 | 2 | 22.7 | 17.3 |
| 29 | 1 | 22 | 2 | 25.7 | 19.3 | 1 | 19 | 3.5 | 21.7 | 14.8 |
| 30 | 1 | 22 | 2 | 25.7 | 19.3 | 1 | 19 | 3.5 | 21.7 | 14.8 |
| 31 | 2 | 21 | 2 | 25.7 | 18.3 | 2 | 18 | 4.0 | 20.7 | 13.3 |

Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5
Note 2: $\Delta T_{C,c}$ applicability per band is indicated by note 2 in Table 6.2.2EA-1

**Table 6.2.3EC.5-2: UE Power Class test requirements for bands with $\Delta T_{C,c}$ (Low/High range)**

| Configuration ID | Power class 3 | | | | | Power class 5 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 21.5 | 2 | 25.7 | 18.8 | 0 | 18.5 | 4 | 23.2 | 13.8 |
| 2 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 23.2 | 11.8 |
| 3 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5 | 22.2 | 10.8 |
| 4 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 23.2 | 11.8 |
| 5 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5 | 22.2 | 10.8 |
| 6 | 0 | 21.5 | 2 | 25.7 | 18.8 | 0 | 18.5 | 4 | 23.2 | 13.8 |
| 7 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 23.2 | 11.8 |
| 8 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5 | 22.2 | 10.8 |
| 9 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 23.2 | 11.8 |
| 10 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5 | 22.2 | 10.8 |
| 11 | 0 | 21.5 | 2 | 25.7 | 18.8 | N/A | | | | |
| 12 | N/A | | | | | 0 | 18.5 | 4 | 23.2 | 13.8 |
| 13 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 23.2 | 11.8 |
| 14 | 0 | 21.5 | 2 | 25.7 | 18.8 | N/A | | | | |
| 15 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 0 | 18.5 | 4 | 23.2 | 13.8 |
| 16 | NA | | | | | 1 | 17.5 | 5 | 23.2 | 11.8 |
| 17 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5 | 22.2 | 10.8 |
| 18 | 0 | 21.5 | 2 | 25.7 | 18.8 | N/A | | | | |
| 19 | N/A | | | | | | | | | 0 |
| 20 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 23.2 | 11.8 |
| 21 | 0 | 21.5 | 2 | 25.7 | 18.8 | N/A | | | | |
| 22 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 0 | 18.5 | 5 | 24.2 | 12.8 |
| 23 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5 | 22.2 | 10.8 |
| 24 | 0 | 21.5 | 2 | 25.7 | 18.8 | 0 | 18.5 | 4 | 23.2 | 13.8 |
| 25 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 23.2 | 11.8 |
| 26 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 23.2 | 11.8 |
| 27 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5 | 22.2 | 10.8 |
| 28 | 0 | 21.5 | 2 | 25.7 | 18.8 | 0 | 18.5 | 4 | 23.2 | 13.8 |
| 29 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 23.2 | 11.8 |
| 30 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 23.2 | 11.8 |
| 31 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5 | 22.2 | 10.8 |

Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5
Note 2: $\Delta T_{C,c}$ applicability per band is indicated by note 2 in Table 6.2.2EA-1

**Table 6.2.3EC.5-3: UE Power Class test requirements for band 28 and band 71**

| Configuration ID | Power class 3 | | | | | Power class 5 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2.5 | 26.2 | 19.8 | 0 | 20 | 2.5 | 23.2 | 16.8 |
| 2 | 1 | 22 | 2.5 | 26.2 | 18.8 | 1 | 19 | 3.5 | 23.2 | 14.8 |
| 3 | 2 | 21 | 2.5 | 26.2 | 17.8 | 2 | 18 | 4 | 22.7 | 13.3 |
| 4 | 1 | 22 | 2.5 | 26.2 | 18.8 | 1 | 19 | 3.5 | 23.2 | 14.8 |
| 5 | 2 | 21 | 2.5 | 26.2 | 17.8 | 2 | 18 | 4 | 22.7 | 13.3 |
| 6 | 0 | 23 | 2.5 | 26.2 | 19.8 | 0 | 20 | 2.5 | 23.2 | 16.8 |
| 7 | 1 | 22 | 2.5 | 26.2 | 18.8 | 1 | 19 | 3.5 | 23.2 | 14.8 |
| 8 | 2 | 21 | 2.5 | 26.2 | 17.8 | 2 | 18 | 4 | 22.7 | 13.3 |
| 9 | 1 | 22 | 2.5 | 26.2 | 18.8 | 1 | 19 | 3.5 | 23.2 | 14.8 |
| 10 | 2 | 21 | 2.5 | 26.2 | 17.8 | 2 | 18 | 4 | 22.7 | 13.3 |
| 11 | 0 | 23 | 2.5 | 26.2 | 19.8 | N/A | | | | |
| 12 | N/A | | | | | 0 | 20 | 2.5 | 23.2 | 16.8 |
| 13 | 1 | 1 | 19 | 3.5 | 23.2 | 1 | 19 | 3.5 | 23.2 | 14,8 |
| 14 | 0 | 23 | 2.5 | 26.2 | 19.8 | N/A | | | | |
| 15 | 1 | 22 | 2.5 | 26.2 | 18.8 | 0 | 20 | 2.5 | 23.2 | 16.8 |
| 16 | N/A | | | | | 1 | 19 | 3.5 | 23.2 | 14.8 |
| 17 | 2 | 21 | 2.5 | 25.7 | 17.8 | 2 | 18 | 4 | 22.7 | 13.3 |
| 18 | 0 | 23 | 2.5 | 25.7 | 19.8 | N/A | | | | |
| 19 | N/A | | | | | 0 | 20 | 2.5 | 23.2 | 16.8 |
| 20 | 1 | 22 | 2.5 | 25.7 | 18.8 | 1 | 19 | 3.5 | 23.2 | 14.8 |
| 21 | 0 | 23 | 2.5 | 25.7 | 19.8 | N/A | | | | |
| 22 | 1 | 22 | 2.5 | 25.7 | 18.8 | 0 | 20 | 2.5 | 23.2 | 16.8 |
| 23 | 2 | 21 | 2.5 | 25.7 | 17.8 | 2 | 18 | 4 | 22.7 | 13.3 |
| 24 | 0 | 23 | 2.5 | 25.7 | 19.8 | 0 | 20 | 2.5 | 23.2 | 16.8 |
| 25 | 1 | 22 | 2.5 | 25.7 | 18.8 | 1 | 19 | 3.5 | 23.2 | 14.8 |
| 26 | 1 | 22 | 2.5 | 25.7 | 18.8 | 1 | 19 | 3.5 | 23.2 | 14.8 |
| 27 | 2 | 21 | 2.5 | 25.7 | 17.8 | 2 | 18 | 4 | 22.7 | 13.3 |
| 28 | 0 | 23 | 2.5 | 25.7 | 19.8 | 0 | 20 | 2.5 | 23.2 | 16.8 |
| 29 | 1 | 22 | 2.5 | 25.7 | 18.8 | 1 | 19 | 3.5 | 23.2 | 14.8 |
| 30 | 1 | 22 | 2.5 | 25.7 | 18.8 | 1 | 19 | 3.5 | 23.2 | 14.8 |
| 31 | 2 | 21 | 2.5 | 25.7 | 17.8 | 2 | 18 | 4 | 22.7 | 13.3 |

Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5
Note 2: $\Delta T_{C,c}$ applicability per band is indicated by note 2 in Table 6.2.2EA-1

# 6.2.3F Maximum Power Reduction (MPR) for category NB1 and NB2

## 6.2.3F.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified nominal maximum output power and tolerance covering configurations where a maximum power reduction is allowed in the UE.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

## 6.2.3F.2 Test applicability

The requirements of this test apply in test case 6.6.2.3F Adjacent Channel Leakage power Ratio for category NB1 to all types of release 13 and forward of UE category NB1.

The requirements of this test apply in test case 6.6.2.3F Adjacent Channel Leakage power Ratio for category NB2 to all types of release 14 and forward of UE category NB2.

NOTE: As a result TC 6.2.3F has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.3F.3 Minimum conformance requirements

For UE category NB1 power class 3 and 5 the allowed Maximum Power Reduction (MPR) for the maximum output power given in Table 6.2.2F.3-1 is specified in Table 6.2.3F.3-1.

**Table 6.2.3F.3-1: Maximum Power Reduction (MPR) for UE category NB1 and NB2 Power Class 3 and 5**

| **Modulation** | **QPSK** | | |
|---|---|---|---|
| **Tone positions for 3 Tones allocation** | 0-2 | 3-5 and 6-8 | 9-11 |
| **MPR** | ≤ 0.5 dB | 0 dB | ≤ 0.5 dB |
| **Tone positions for 6 Tones allocation** | 0-5 and 6-11 | | |
| **MPR** | ≤ 1 dB | ≤ 1 dB | |
| **Tone positions for 12 Tones allocation** | 0-11 | | |
| **MPR** | ≤ 2 dB | | |

For the UE maximum output power modified by MPR, the power limits specified in sub-clause 6.2.5F.3 apply.

The normative reference for this requirement is TS 36.101 clause 6.2.3F.

## 6.2.3F.4 Test description

### 6.2.3F.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters, and are shown in table 6.2.3F.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2.4. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 6.2.3F.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 8.1.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.2 | | |
| **Test Parameters** | | | | |
| Configuration ID | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A for Maximum Power Reduction (MPR) test case | Modulation | $N_{tones}$ | Sub-carrier spacing (kHz) |
| 1 | | QPSK | 1@0 | 3.75 |
| 2 | | QPSK | 1@47 | 3.75 |
| 3 | | BPSK | 1@0 | 15 |
| 4 | | BPSK | 1@11 | 15 |
| 5 (Note 1) | | QPSK | 3@0 | 15 |
| 6 (Note 1) | | QPSK | 3@3 | 15 |
| | | | | |
| 7 (Note 1) | | QPSK | 3@9 | 15 |
| 8 (Note 1) | | QPSK | 6@0 | 15 |
| 9 (Note 1) | | QPSK | 6@6 | 15 |
| 10 (Note 1) | | QPSK | 12@0 | 15 |
| Note 1: Applicable to UE supporting UL multi-tone transmissions | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.2.3F.4.1-1.
5. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.2.3F.4.3.

### 6.2.3F.4.2 Test procedure

1. SS sends uplink scheduling information via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.2.3F.4.1-1 and with scheduling pattern and repetitions according to Annex A.2. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms) for 15 kHz sub-carrier spacing, or for 3.75 kHz sub-carrier spacing at least one slot (2 ms) excluding the 2304Ts gap when UE is not transmitting.

NOTE 1: For configuration IDs applicable to UE depending on UE capability in Test Configuration Table with different UL sub-carrier spacing, the SS shall release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the appropriate UL subcarrier spacing in Random Access Response message.

### 6.2.3F.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6.

## 6.2.3F.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3F.5-1.

**Table 6.2.3F.5-1: Maximum Power Reduction test requirements Power Class 3 and 5**

| Test ID | MPR (dB) | Power class 3 | | | | Power class 5 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2.0 | 25.7 | 20.3 | 20 | 2.0 | 22.7 | 17.3 |
| 2 | 0 | 23 | 2.0 | 25.7 | 20.3 | 20 | 2.0 | 22.7 | 17.3 |
| 3 | 0 | 23 | 2.0 | 25.7 | 20.3 | 20 | 2.0 | 22.7 | 17.3 |
| 4 | 0 | 23 | 2.0 | 25.7 | 20.3 | 20 | 2.0 | 22.7 | 17.3 |
| 5 | 0.5 | 22.5 | 2.0 | 25.7 | 19.8 | 19.5 | 2.0 | 22.7 | 16.8 |
| 6 | 0 | 23 | 2.0 | 25.7 | 20.3 | 20 | 2.0 | 22.7 | 17.3 |
| 7 | 0.5 | 22.5 | 2.0 | 25.7 | 19.8 | 19.5 | 2.0 | 22.7 | 16.8 |
| 8 | 1 | 22 | 2.0 | 25.7 | 19.3 | 19 | 2.0 | 22.7 | 16.3 |
| 9 | 1 | 22 | 2.0 | 25.7 | 19.3 | 19 | 2.0 | 22.7 | 16.3 |
| 10 | 2 | 21 | 2.0 | 25.7 | 18.3 | 18 | 2.0 | 22.7 | 15.3 |
| Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5F | | | | | | | | | |

# 6.2.3FA Maximum Power Reduction (MPR) for category NB1 and NB2/Power Class 6

## 6.2.3FA.1 Test purpose

Same test purpose as in clause 6.2.3F.1.

## 6.2.3FA.2 Test applicability

The requirements of this test apply in test case 6.6.2.3F Adjacent Channel Leakage power Ratio for category NB1 and NB2 to all types of release 14 and forward of UE category NB1 and NB2.

NOTE: As a result TC 6.2.3FA has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.3FA.3 Minimum conformance requirements

For UE category NB1 and NB2 power class 6 the allowed Maximum Power Reduction (MPR) for the maximum output power is 0 dB.

For the UE maximum output power modified by MPR, the power limits specified in sub-clause 6.2.5FA.3 apply.

The normative reference for this requirement is TS 36.101 clause 6.2.3F.

## 6.2.3FA.4 Test description

Same test description as in clause 6.2.3F.4 the following exceptions:

- Instead of Table 6.2.3F.4.1-1 → use Table 6.2.3FA.4-1

**Table 6.2.3FA.4-1: Test Configuration Table**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 8.1.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.2 | | |
| **Test Parameters** | | | | |
| Configuration ID | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A for Maximum Power Reduction (MPR) test case | Modulation | $N_{tones}$ | Sub-carrier spacing (kHz) |
| 1 | | QPSK | 1@0 | 3.75 |
| 2 | | QPSK | 1@47 | 3.75 |
| 3 | | BPSK | 1@0 | 15 |
| 4 | | BPSK | 1@11 | 15 |
| 5 (Note 1) | | QPSK | 12@0 | 15 |
| Note 1: Applicable to UE supporting UL multi-tone transmissions | | | | |

### 6.2.3FA.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3FA.5-1.

**Table 6.2.3FA.5-1: Maximum Power Reduction test requirements for Power class 6**

| Test ID | MPR (dB) | Power class 6 | | | |
|---|---|---|---|---|---|
| | | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 14 | 2.5 | 17.2 | 10.8 |
| 2 | 0 | 14 | 2.5 | 17.2 | 10.8 |
| 3 | 0 | 14 | 2.5 | 17.2 | 10.8 |
| 4 | 0 | 14 | 2.5 | 17.2 | 10.8 |
| 5 | 0 | 14 | 2.5 | 17.2 | 10.8 |
| Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5F | | | | | |

## 6.2.3G Maximum Power Reduction (MPR) for V2X communication

### 6.2.3G.1 Maximum Power Reduction (MPR) for V2X Communication / Power class 3

#### 6.2.3G.1.1 Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions

##### 6.2.3G.1.1.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified nominal maximum output power and tolerance covering configurations where a maximum power reduction is allowed in the UE.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

##### 6.2.3G.1.1.2 Test applicability

The requirements of this test apply in the test case 6.6.2.3G Adjacent Channel Leakage power Ratio for V2X Communication to all types of UE that support V2X Sidelink communication and Band 47.

NOTE: As a result TC 6.2.3G.1.1 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3G.1.1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.2G-1, this subclause specifies the allowed Maximum Power Reduction (MPR) power for V2X physical channels and signals due to PSCCH and PSSCH simultaneous transmission.

For contiguous allocation of PSCCH and PSSCH simultaneous transmission, the allowed MPR for the maximum output power for V2X physical channels PSCCH and PSSCH shall be as specified in Table 6.2.3G.1.1.3-1 for power class 3.

**Table 6.2.3G.1.1.3-1: Maximum Power Reduction (MPR) for power class 3 V2X Communication (Contiguous PSCCH and PSSCH transmission)**

| Modulation | Channel bandwidth / Transmission bandwidth ($N_{RB}$) | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| QPSK | | | | | | | ≤ 1.5 |
| 16 QAM | | | | | | | ≤ 2 |

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.3G.

### 6.2.3G.1.1.4 Test description

#### 6.2.3G.1.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3G.1.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.2.3G.1.1.4.1-1: Test Configuration Table**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10 MHz | QPSK | 48 |
| 10 MHz | 16QAM | 48 |
| 20 MHz | QPSK | 96 |
| 20 MHz | 16QAM | 96 |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.2.3G.1.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.2.3G.1.1.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9..

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 6.2.3G.1.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.

2. Measure the mean power of the UE in the channel bandwidth for each test point in Table 6.2.3G.1.1.5-1 according to the test configuration from Table 6.2.3G.1.1.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

#### 6.2.3G.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7.I and 4.10.

### 6.2.3G.1.1.5 Test Requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3G.1.1.5-1.

**Table 6.2.3G.1.1.5-1: UE Power Class 3 test requirements**

| E-UTRA Band | Class 3 (dBm) | QPSK Tol. (dB)) | 16QAM Tol. (dB) |
|---|---|---|---|
| 47 | 23 | +3.3 / - 4.8 | +3.3 / - 5.3 |
| Note 1: For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.<br>Note 2: For the UE maximum output power modified by MPR, the power limits specified in Table 6.2.5.3-1 apply. | | | |

## 6.2.3G.1.2 Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Non-contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions

### 6.2.3G.1.2.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified nominal maximum output power and tolerance covering configurations where a maximum power reduction is allowed in the UE.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

### 6.2.3G.1.2.2 Test applicability

The requirements of this test apply in the test case 6.6.2.3G Adjacent Channel Leakage power Ratio for V2X Communication to all types of UE that support V2X Sidelink communication and Band 47.NOTE: As a result TC 6.2.3G.1.2 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.3G.1.2.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.2G-1, this subclause specifies the allowed Maximum Power Reduction (MPR) power for V2X physical channels and signals due to PSCCH and PSSCH simultaneous transmission

For non-contiguous allocation of PSCCH and PSSCH simultaneous transmission, the allowed MPR for the maximum output power for V2X physical channels PSCCH and PSSCH shall be as specified as follows

$$MPR = CEIL \{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$M_A = \begin{cases} 4.5 & ; 0.00 < A \leq 0.2 \\ 5.5 - 5.833A & ; 0.2 < A \leq 0.6 \\ 2.0 & ; 0.6 < A \leq 1.00 \end{cases}$$

Where

$A = N_{RB_alloc} / N_{RB.}$

CEIL{$M_{A,}$ 0.5} means rounding upwards to closest 0.5dB.

The normative reference for this requirement is TS 36.101 [2] clause 6.2.3G.

### 6.2.3G.1.2.4 Test description

#### 6.2.3G.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3G.1.2.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.2.3G.1.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | |
| **Configuration ID** | **V2X Configuration to Transmit** | | |
| | Ch BW | Modulation | PSSCH RB allocation (PRB @ RBstart) |
| 1 | 10 MHz | 16QAM | 5 @ 45 |
| 2 | 10 MHz | 16QAM | 25 @ 25 |
| 3 | 10 MHz | 16QAM | 40 @ 10 |
| 4 | 20 MHz | 16QAM | 10 @ 90 |
| 5 | 20 MHz | 16QAM | 50 @ 50 |
| 6 | 20 MHz | 16QAM | 80 @ 20 |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.2.3G.1.2.4.3.
3. The V2X reference measurement channel is set according to Table 6.2.3G.1.2.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 6.2.3G.1.2.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Measure the mean power of the UE in the channel bandwidth for each test point in Table 6.2.3G.1.2.5-1 according to the test configuration from Table 6.2.3G.1.2.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

#### 6.2.3G.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.2.3G.1.2.4.3-1: SL-CommResourcePoolV2X-r14**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20C SL-CommResourcePoolV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResourcePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| adjacencyPSCCH-PSSCH-r14 | FALSE | BOOLEAN | |
| numSubchannel-r14 | n8 | | |
| startRB-Subchannel-r14 | 10 | | 10 MHz |
| | 20 | | 20 MHz |
| startRB-PSCCH-Pool-r14 | 0 | | |

#### 6.2.3G.1.2.5 Test requirement

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3G.1.2.5-1.

**Table 6.2.3G.1.2.5-1: UE Power Class 3 test requirements**

| Configuration ID | MPR (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX,c})$ (dB) | Tol. (dB) |
|---|---|---|---|---|
| 1 | 4.5 | 18.5 | 4.0 | +3.3 / -9.8 |
| 2 | 3.0 | 20.0 | 2.5 | +3.3 / -6.8 |
| 3 | 2.0 | 21.0 | 2.0 | +3.3 / -5.3 |
| 4 | 4.5 | 18.5 | 4.0 | +3.3 / -9.8 |
| 5 | 3.0 | 20.0 | 2.5 | +3.3 / -6.8 |
| 6 | 2.0 | 21.0 | 2.0 | +3.3 / -5.3 |
| Note 1: For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.<br>Note 2: For the UE maximum output power modified by MPR, the power limits specified in Table 6.2.5.3-1 apply. | | | | |

### 6.2.3G.1.3 Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission

#### 6.2.3G.1.3.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified nominal maximum output power and tolerance covering configurations where a maximum power reduction is allowed in the UE.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

#### 6.2.3G.1.3.2 Test applicability

This test applies in test cases 6.6.2.3 and 6.6.2.3G Adjacent Channel Leakage power Ratio to all types of E-UTRA UE release 14 and forward that support V2X Communication.

NOTE: As a result TC 6.2.3G.1.3 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

#### 6.2.3G.1.3.3 Minimum conformance requirements

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-2, the allowed MPR requirements in subclause 6.2.3G apply for V2X PSSCH and PSCCH transmission. The allowed MPR requirements in subclause 6.2. 3D apply for other V2X sidelink transmission (PSBCH/PSSS/SSSS). The MPR requirements in subclause 6.2.3 apply for uplink transmission.

The normative reference for this requirement is TS 36.101 [2] clause 6.2.3G.

#### 6.2.3G.1.3.4 Test description

##### 6.2.3G.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3G.1.3.4.1-1. The details of the uplink and V2X reference measurement channels (RMCs) are specified in A.2 and A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.3G.1.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low range for uplink and Low range for V2X, High range for uplink and High range for V2X | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink** | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4MHz | | QPSK | 5 | 10 MHz | QPSK | 48@2 |
| 1.4MHz | | QPSK | 6 | 10 MHz | 16QAM | 48@2 |
| 1.4MHz | | 16QAM | 5 | 20 MHz | QPSK | 96@2 |
| 1.4MHz | | 16QAM | 6 | 20 MHz | 16QAM | 96@2 |
| 3MHz | | QPSK | 4 | | | |
| 3MHz | | QPSK | 15 | | | |
| 3MHz | | 16QAM | 4 | | | |
| 3MHz | | 16QAM | 15 | | | |
| 5MHz | | QPSK | 8 | | | |
| 5MHz | | QPSK | 25 | | | |
| 5MHz | | 16QAM | 8 | | | |
| 5MHz | | 16QAM | 25 | | | |
| 10MHz | | QPSK | 12 | | | |
| 10MHz | | QPSK | 50 | | | |
| 10MHz | | 16QAM | 12 | | | |
| 10MHz | | 16QAM | 50 (Note 3) | | | |
| 15MHz | | QPSK | 16 | | | |
| 15MHz | | QPSK | 75 | | | |
| 15MHz | | 16QAM | 16 | | | |
| 15MHz | | 16QAM | 75 (Note 3) | | | |
| 20MHz | | QPSK | 18 | | | |
| 20MHz | | QPSK | 100 | | | |
| 20MHz | | 16QAM | 18 | | | |
| 20MHz | | 16QAM | 100 (Note 3) | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | |
| Note 2: For Low range the E-UTRA carrier uses only test points with RBstart=0. For High range the E-UTRA carrier uses only test points with RBstart=RBmax-LCRB+1. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.2.3G.1.3.4.3
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to Table 6.2.3G.1.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 6.2.3G.1.3.4.3.

### 6.2.3G.1.3.4.2 Test procedure

1. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for

SL_V_RNTI to schedule the V2X RMC according to Table 6.2.3G.1.3.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX}$ level. Configure the UE to transmit PSCCH and PSSCH with the $P_{UMAX}$ level of each test points.

3. Measure the mean power over all component carriers in the V2X con-current band configuration. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

#### 6.2.3G.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

### 6.2.3G.1.3.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3G.13.5-1.

**Table 6.2.3G.1.3.5-1: Inter-band con-current V2X UE Power Class test requirements**

| V2X con-current band Configuration | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | QPSK full RB allocation Tol. (dB)) | 16QAM full RB allocation Tol. (dB) |
|---|---|---|---|---|---|---|---|
| V2X_3A-47A | | | | | 23 | +3.3 / -5.3 | +3.3 / -6.3 |
| V2X_5A-47A | | | | | 23 | +3.3 / -5.5 | +3.3 / -6.5 |
| V2X_7A-47A | | | | | 23 | +3.3 / -5.3 | +3.3 / - 6.3 |
| V2X_8A-47A | | | | | 23 | +3.3 / -5.3 | +3.3 / -6.3 |
| V2X_20A-47A | | | | | 23 | +3.3 / -5.5 | +3.3 / -6.5 |
| V2X_34A-47A | | | | | 23 | +3.3 / -5.3 | +3.3 / -6.3 |
| V2X_39A-47A | | | | | 23 | +3.3 / -5.3 | +3.3 / -6.3 |
| V2X_41A-47A | | | | | 23 | +3.3 / -5.3 | +3.3 / -6.3 |

NOTE 1: The con-current band combinations are used for V2X Service.
NOTE 2: $P_{PowerClass}$ is the maximum UE power specified without taking into account the tolerance
NOTE 3: For inter-band con-current aggregation the maximum power requirement applies to the total transmitted power over all component carriers (per UE).
NOTE 4: [4] refers to the transmission bandwidths (Figure 5.4.2-1) confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB

## 6.2.3G.1.4 Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Intra-band contiguous multi-carrier operation

Editor's note: This test case is incomplete. The following items are missing or incomplete:

- Test requirement including the test tolerance in Annex F.3.2

- Applicability spec

### 6.2.3G.1.4.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified nominal maximum output power and tolerance covering configurations where a maximum power reduction is allowed in the UE.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

### 6.2.3G.1.4.2 Test applicability

This test applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 6.2.3G.1.4.3 Minimum conformance requirements

For intra-band contiguous multi-carrier operation the allowed Maximum Power Reduction (MPR) for the maximum output power in Table [6.2.2G.1.4.3-1] due to higher order modulation is specified in Table 6.2.3G.1.4.3-1. In case the modulation format is different on different component carriers then the MPR is determined by the rules applied to higher order of those modulations.

**Table 6.2.3G.1.4.3-1: Maximum Power Reduction (MPR) for Power Class 3**

| Modulation | 50 RB + 50 RB | 50 RB + 100 RB | 100 RB + 100 RB | MPR (dB) |
|---|---|---|---|---|
| QPSK | - | N/A | N/A | ≤ [3] |
| 16 QAM | - | N/A | N/A | ≤ [3] |

The normative reference for this requirement is TS 36.101 [2] clause 6.2.3G.

### 6.2.3G.1.4.4 Test description

#### 6.2.3G.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-4. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3G.1.4.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.2.3G.1.4.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Mid range | |
| Test Channel Bandwidths as specified in subclause 5.4.2G | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for Channel Bandwidths** | | | |
| **V2X multi-carrier Configuration** | | **V2X PSSCH Allocation** | |
| **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **CC1 and CC2 RB Allocation** |
| 10MHz | 10MHz | QPSK | 48+48 |
| 10MHz | 10MHz | 16QAM | 48+48 |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.89a.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.2.3G.1.4.4.3.
3. The V2X reference measurement channel is set according to Table 6.2.3G.1.4.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 6.2.3G.1.4.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Measure the mean power of the UE in the channel bandwidth for each test point in Table 6.2.3G.1.4.5-1 according to the test configuration from Table 6.2.3G.1.4.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

#### 6.2.3G.1.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.2.3G.1.4.4.3-0: +CCUTLE (Initial condition)**

| Derivation Path: 36.508 Table 4.7I-2: +CCUTLE, condition Close and Transmit |
|---|

### 6.2.3G.1.4.5 Test requirement

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3G.1.4.5-1.

**Table 6.2.3G.1.4.5-1: UE Power Class 3 test requirements**

| E-UTRA Band | Bandwidth combination set | Class 3 (dBm) | QPSK Tol. (dB) | 16QAM Tol. (dB) |
|---|---|---|---|---|
| V2X_47B | 0 | 23 | +2.7 / [-4.7] | +2.7 / [-4.7] |

## 6.2.3G.2 Maximum Power Reduction (MPR) for V2X Communication / Power class 2

### 6.2.3G.2.1 Maximum Power Reduction (MPR) for V2X Communication / Power class 2 / Contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions

#### 6.2.3G.2.1.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified nominal maximum output power and tolerance covering configurations where a maximum power reduction is allowed in the UE.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

#### 6.2.3G.2.1.2 Test applicability

The requirements of this test apply in the test case 6.6.2.3G Adjacent Channel Leakage power Ratio for V2X Communication to all types of UE that support V2X Sidelink communication and Band 47.

NOTE: As a result TC 6.2.3G.2.1 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

#### 6.2.3G.2.1.3 Minimum conformance requirements

For contiguous allocation of PSCCH and PSSCH simultaneous transmission, the allowed MPR for the maximum output power for V2X physical channels PSCCH and PSSCH shall be as specified in Table 6.2.3G.2.1.3-1 for power class 2.

**Table 6.2.3G.2.1.3-1: Maximum Power Reduction (MPR) for power class 2 V2X Communication (Contiguous PSCCH and PSSCH transmission)**

| Modulation | Channel bandwidth / Transmission bandwidth ($N_{RB}$) | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| QPSK | | | | | | | ≤ 2 |
| 16 QAM | | | | | | | ≤ 2.5 |

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.3G.

### 6.2.3G.2.1.4 Test description

#### 6.2.3G.2.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3G.2.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.2.3G.2.1.4.1-1: Test Configuration Table**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10 MHz | QPSK | 48 |
| 10 MHz | 16QAM | 48 |
| 20 MHz | QPSK | 96 |
| 20 MHz | 16QAM | 96 |

1. Connect the SS and the GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure 92.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 6.8.2. Message content exceptions are defined in clause 6.2.3G.2.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.2.3G.2.1.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 6.2.3G.2.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.

2. Measure the mean power of the UE in the channel bandwidth for each test point in Table 6.2.3G.2.1.5-1 according to the test configuration from Table 6.2.3G.2.1.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

#### 6.2.3G.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.2.3G.2.1.4.3-1: SL-V2X-PreconfigFreqInfo-r14**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20E SL-V2X-PreconfigFreqInfo-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | | |
| maxTxPower-r12 | 26 | | |
| } | | | |

#### 6.2.3G.2.1.5 Test Requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3G.2.1.5-1.

**Table 6.2.3G.2.1.5-1: UE Power Class 2 test requirements**

| E-UTRA Band | Class 2 (dBm) | QPSK Tol. (dB)) | 16QAM Tol. (dB) |
|---|---|---|---|
| 47 | 26 | +3.3/-5.3 | +3.3/-5.8 |
| Note 1: For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.<br>Note 2: For the UE maximum output power modified by MPR, the power limits specified in Table 6.2.5.3-1 apply. | | | |

### 6.2.3G.2.2 Maximum Power Reduction (MPR) for V2X Communication / Power class 2 / Non-contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions

#### 6.2.3G.2.2.1 Test purpose

To verify that the error of the UE maximum output power does not exceed the range prescribed by the specified nominal maximum output power and tolerance covering configurations where a maximum power reduction is allowed in the UE.

An excess maximum output power has the possibility to interfere to other channels or other systems. A small maximum output power decreases the coverage area.

#### 6.2.3G.2.2.2 Test applicability

The requirements of this test apply in the test case 6.6.2.3G Adjacent Channel Leakage power Ratio for V2X Communication to all types of UE Power Class 2 release 14 and forward that support V2X Sidelink communication.

NOTE: As a result TC 6.2.3G.2.2 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

#### 6.2.3G.2.2.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.2G-1, this subclause specifies the allowed Maximum Power Reduction (MPR) power for V2X physical channels and signals due to PSCCH and PSSCH simultaneous transmission

For non-contiguous allocation of PSCCH and PSSCH simultaneous transmission, the allowed MPR for the maximum output power for V2X physical channels PSCCH and PSSCH shall be as specified as follows:

$$MPR = CEIL \{M_A, 0.5\}$$

Where $M_A$ is defined as follows

For 10MHz channel bandwidth $M_A =$ 4.5 ; $0.0 < A \leq 0.2$

8.5 – 20.0A ; $0.2 < A \leq 0.3$

2.5 ; $0.3 < A \leq 1.00$

For 20MHz channel bandwidth $M_A =$ 9.0 ; $0.0 < A \leq 0.1$

12.0 – 30.0A ; $0.1 < A \leq 0.3$

3.0 ; $0.3 < A \leq 1.00$

Where

$A = N_{RB_alloc} / N_{RB.}$

$CEIL\{M_{A,} 0.5\}$ means rounding upwards to closest 0.5dB.

The normative reference for this requirement is TS 36.101 [2] clause 6.2.3G.

### 6.2.3G.2.2.4 Test description

#### 6.2.3G.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.2G-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3G.2.2.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.2.3G.2.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | |
| **Configuration ID** | **V2X Configuration to Transmit** | | |
| | Ch BW | Modulation | PSSCH RB allocation (PRB @ RBstart) |
| 1 | 10 MHz | 16QAM | 8 @ 40 |
| 2 | 10 MHz | 16QAM | 10 @ 35 |
| 3 | 10 MHz | 16QAM | 40 @ 10 |
| 4 | 20 MHz | 16QAM | 8 @ 90 |
| 5 | 20 MHz | 16QAM | 20 @ 70 |
| 6 | 20 MHz | 16QAM | 80 @ 20 |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.92.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.2.3G.2.2.4.3.

3. The V2X reference measurement channel is set according to Table 6.2.3G.2.2.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 6.2.3G.2.2.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Measure the mean power of the UE in the channel bandwidth for each test point in Table 6.2.3G.2.2.5-1 according to the test configuration from Table 6.2.3G.2.2.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

#### 6.2.3G.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.2.3G.2.2.4.3-1: SL-V2X-PreconfigFreqInfo-r14**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20E SL-V2X-PreconfigFreqInfo-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | | |
| maxTxPower-r12 | 26 | | |
| } | | | |

**Table 6.2.3G.2.2.4.3-2: SL-CommResourcePoolV2X-r14**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20C SL-CommResourcePoolV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResourcePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| adjacencyPSCCH-PSSCH-r14 | FALSE | BOOLEAN | |
| numSubchannel-r14 | n8 | | |
| startRB-Subchannel-r14 | 10 | | 10 MHz |
| | 20 | | 20 MHz |
| startRB-PSCCH-Pool-r14 | 0 | | |

#### 6.2.3G.2.2.5 Test requirement

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3G.2.2.5-1.

**Table 6.2.3G.2.2.5-1: UE Power Class 2 test requirements**

| Configuration ID | E-UTRA Band | Class 2 (dBm) | Tol. (dB) |
|---|---|---|---|
| 1 | 47 | 26 | +3.3 / -7.8 |
| 2 | 47 | 26 | +3.3 / -7.3 |
| 3 | 47 | 26 | +3.3 / -5.8 |
| 4 | 47 | 26 | +3.3 / -12.3 |
| 5 | 47 | 26 | +3.3 / -8.8 |
| 6 | 47 | 26 | +3.3 / -6.3 |
| Note 1: For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.<br>Note 2: For the UE maximum output power modified by MPR, the power limits specified in Table 6.2.5.3-1 apply. | | | |

## 6.2.4 Additional Maximum Power Reduction (A-MPR)

Editor's note: The following aspects are either missing or not yet determined:

- TT and test points are TBD.

### 6.2.4.1 Test purpose

Additional ACLR and spectrum emission requirements can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction A-MPR is allowed for the output power as specified in Table 6.2.2.3-1. Unless stated otherwise, an A-MPR of 0 dB shall be used.

### 6.2.4.2 Test applicability

The requirements of this test apply in test case 6.6.2.2 Additional Spectrum Emission Mask for network signalled values NS_03, NS_04, NS_06, NS_07, NS_11, NS_20, NS_21, NS_27 and NS_35 to all types of E-UTRA Power Class 3 UE release 8 and forward.

The requirements of this test apply in test case 6.6.3.3 Additional Spurious Emissions for network signalled values NS_05, NS_07, NS_08, NS_09, NS_11, NS_12, NS_13, NS_14, NS_15, NS_16, NS_17, NS_18, NS_19, NS_20, NS_21, NS_22, NS_23, NS_24, NS_25, NS_27, NS_28, NS_29, NS_30, NS 31, NS_36, NS_38. NS_39 to all types of E-UTRA Power Class 3 UE release 8 and forward.

NOTE: As a result TC 6.2.4 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.4.3 Minimum conformance requirements

For UE Power Class 3 the specific requirements and identified sub-clauses are specified in Table 6.2.4.3-1 along with the allowed A-MPR values that may be used to meet these requirements. The allowed A-MPR values specified below in Table 6.2.4.3-1 to 6.2.4.3-25 are in addition to the allowed MPR requirements specified in clause 6.2.3. For the UE maximum output power modified by A-MPR, the power limits specified in clause 6.2.5 apply.

**Table 6.2.4.3-1: Additional Maximum Power Reduction (A-MPR) / Spectrum Emission requirements**

| Network Signalling value | Requirements (sub-clause) | E-UTRA Band | Channel bandwidth (MHz) | Resources Blocks ($N_{RB}$) | A-MPR (dB) |
|---|---|---|---|---|---|
| NS_01 | 6.6.2.1.1 | Table 5.2-1 | 1.4,3,5,10,15,20 | Table 5.4.2-1 | N/A |
| NS_03 | 6.6.2.2.3.1 | 2,4,10, 23, 25,35,36, 66, 70 | 3 | >5 | ≤ 1 |
| | | | 5 | >6 | ≤ 1 |
| | | | 10 | >6 | ≤ 1 |
| | | | 15 | >8 | ≤ 1 |
| | | | 20 | >10 | ≤ 1 |
| NS_04 | 6.6.2.2.3.2 | 41 | 5 | >6 | ≤1 |
| | | | 10, 15, 20 | Table 6.2.4.3-2 | |
| NS_04 | 6.6.2.2.3.2, 6.6.3.3.3.1 | 41 | 5,10, 15, 20 | Table 6.2.4.3-3, Table 6.2.4.3-4 | |
| NS_05 | 6.6.3.3.3.2 | 1 | 10,15,20 | ≥ 50 [1] | ≤ 1 [1] |
| | | | 15, 20 | Table 6.2.4.3-5 [2] | |
| | | 65 [3] | 10,15,20 | ≥ 50 | ≤ 1 [1] |
| | | | 15,20 | Table 6.2.4.3-5 [2] | |
| NS_06 | 6.6.2.2.3.3 | 12, 13, 14, 17 | 1.4, 3, 5, 10 | Table 5.4.2-1 | N/A |
| NS_07 | 6.6.2.2.3.3 6.6.3.3.3.3 | 13 | 10 | Table 6.2.4.3-6 | Table 6.2.4.3-6 |
| NS_08 | 6.6.3.3.3.4 | 19 | 10, 15 | > 44 | ≤ 3 |
| NS_09 | 6.6.3.3.3.5 | 21 | 10, 15 | > 40 | ≤ 1 |
| | | | | > 55 | ≤ 2 |
| | | 74 [6] | 10, 15 | > 40 | ≤ 1 |
| | | | | > 55 | ≤ 2 |
| NS_10 | | 20 | 15, 20 | Table 6.2.4.3-7 | Table 6.2.4.3-7 |
| NS_11 | 6.6.2.2.1 6.6.3.3.3.6 | 23[1] | 1.4, 3, 5, 10,15,20 | Table 6.2.4.3-8 | Table 6.2.4.3-8 |
| NS_12 | 6.6.3.3.3.7 | 26 | 1.4, 3, 5, 10, 15 | Table 6.2.4.3-9, Table 6.2.4.3-10 | Table 6.2.4.3-9, Table 6.2.4.3-10 |
| NS_13 | 6.6.3.3.3.8 | 26 | 5 | Table 6.2.4.3-11 | Table 6.2.4.3-11 |
| NS_14 | 6.6.3.3.3.9 | 26 | 10, 15 | Table 6.2.4.3-12 | Table 6.2.4.3-12 |
| NS_15 | 6.6.3.3.3.10 | 26 | 1.4, 3, 5, 10, 15 | Table 6.2.4.3-13 Table 6.2.4.3-14 | Table 6.2.4.3-13, Table 6.2.4.3-14 |
| NS_16 | 6.6.3.3.3.11 | 27 | 3, 5, 10 | Table 6.2.4.3-15, Table 6.2.4.3-16, Table 6.2.4.3-17 | |
| NS_17 | 6.6.3.3.3.12 | 28 | 5, 10 | Table 5.4.2-1 | N/A |
| NS_18 | 6.6.3.3.3.13 | 28 | 5 | ≥ 2 | ≤ 1 |
| | | | 10, 15, 20 | ≥ 1 | ≤ 4 |
| NS_19 | 6.6.3.3.3.14 | 44 | 10, 15, 20 | Table 6.2.4.3-18 | Table 6.2.4.3-18 |
| NS_20 | 6.2.2 6.6.2.2.1 6.6.3.3.3.15 | 23 | 5, 10, 15, 20 | Table 6.2.4.3-19 | Table 6.2.4.3-19 |
| NS_21 | 6.6.2.2.3.1 6.6.3.3.3.16 | 30 | 5, 10 | Table 6.2.4.3-20 | Table 6.2.4.3-20 |
| NS_22 | 6.6.3.3.3.17 | 42, 43 | 5, 10, 15, 20 | Table 6.2.4.3-21 | |
| NS_23 | 6.6.3.3.3.18 | 42, 43 | 5, 10, 15, 20 | N/A | |
| NS_24 | 6.6.3.3.3.19 | 65 [4] | 5, 10, 15, 20 | Table 6.2.4.3-22 | |
| NS_25 | 6.6.3.3.3.20 | 65 [4] | 5, 10, 15, 20 | Table 6.2.4.3-23 | |
| … | | | | | |
| NS_27 | 6.6.2.2.3.4, 6.6.3.3.3.21 | 48 | 5, 10, 15, 20 | Table 6.2.4.3-24 | |
| NS_28 | 6.2.2A, 6.6.3.3.22 | 46 (NOTE 5) | 20 | Table 6.2.4-25 | NS_28 |
| NS_29 | 6.2.2A, 6.6.2.3.1a, 6.6.3.3.23 | 46 (NOTE 5) | 20 | Table 6.2.4-26 | NS_29 |

| | | | | | |
|---|---|---|---|---|---|
| NS_30 | 6.2.2A, 6.6.3.3.24 | 46 (NOTE 5) | 20 | Table 6.2.4-27 | NS_30 |
| NS_31 | 6.2.2A, 6.6.3.3.25 | 46 (NOTE 5) | 20 | Table 6.2.4-28 | NS_31 |
| NS_32 | - | - | - | - | - |
| NS_35 | 6.6.2.2.3.5 | 71 | 5, 10, 15, 20 | N/A | |
| NS_36 | | 68 | 5, 10, 15 | Table 6.2.4.3-29 | |
| … | | | | | |
| NS_38 | 6.6.3.3.3.27 | 74 | 3, 5, 10, 15, 20 | Table 6.2.4.3-30 | |
| NS_39 | 6.6.3.3.3.28 | 74 | 10, 15, 20 | Table 6.2.4.3-31 | |

Note 1 Applicable when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to the upper edge of PHS band (1915.7 MHz) + 4 MHz + the channel BW assigned, where channel BW is as defined in subclause 5.6. A-MPR for operations below this frequency is not covered in this version of specifications except for the channel assignments in Note2 as the emissions requirement in 6.6.3.3.3.2 may not be met. For 10MHz channel bandwidth whose carrier frequency is larger than or equal to 1945 MHz or 15 MHz channel bandwidth whose carrier frequency is larger than or equal to 1947.5 MHz, no A-MPR applies.
Note 2 Applicable when carrier frequency is 1932.5 MHz for 15MHz channel bandwidth or 1930 MHz for 20MHz channel bandwidth case.
Note 3: Applicable when the E-UTRA carrier is within 1920-1980 MHz.
Note 4: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980MHz.
Note 5: Applicable only for an LAA Scell configured in Band 46.

**Table 6.2.4.3-2: A-MPR for NS_04 for bandwidths > 5MHz (Rel-11 and earlier)**

| Channel bandwidth [MHz] | Parameters | Region A | Region B | | Region C |
|---|---|---|---|---|---|
| 10 | $RB_{start}$ [1] | 0 – 12 | 13 – 36 | | 37 – 49 |
| | $RB_{start}$ [1] + $L_{CRB}$ [2] [RBs] | N/A (Note 3) | 14 - 37 | >37 | N/A (Note 3) |
| | A-MPR [dB] | ≤3dB | 0 | ≤2dB | ≤3dB |
| 15 | $RB_{start}$ [1] | 0 – 18 | 19 – 55 | | 56 – 74 |
| | $RB_{start}$ [1] + $L_{CRB}$ [2] [RBs] | N/A (Note 3) | 20 - 56 | >56 | N/A (Note 3) |
| | A-MPR [dB] | ≤3dB | 0 | ≤2dB | ≤3dB |
| 20 | $RB_{start}$ [1] | 0 – 24 | 25 – 74 | | 75 – 99 |
| | $RB_{start}$ [1] + $L_{CRB}$ [2] [RBs] | N/A (Note 3) | 26 - 75 | >75 | N/A (Note 3) |
| | A-MPR [dB] | ≤3dB | 0 | ≤2dB | ≤3dB |

Note 1: $RB_{start}$ indicates the lowest RB index of transmitted resource blocks.
Note 2: $L_{CRB}$ is the length of a contiguous resource block allocation.
Note 3: Any RB allocation that starts in Region A or C is allowed the specified A-MPR.
Note 4: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis.
Note 5: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe.

**Table 6.2.4-3: A-MPR requirements for "NS_04" with bandwidth >5MHz (Rel-12 to Rel-13 and bit 2 of modifiedMPRbehavior = 0)**

| Channel bandwidth [MHz] | Parameters | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | Fc [MHz] | ≤ 2499.5 | | | | | > 2499.5 |
| | $RB_{start}$ | 0 - 8 | | | 9 – 24 | | 0 - 24 |
| | $L_{CRB}$ [RBs] | > 0 | | | > 0 | | > 0 |
| | A-MPR [dB] | ≤ 2 | | | 0 | | 0 |
| 10 | Fc [MHz] | ≤ 2504 | | | | | > 2504 |
| | $RB_{start}$ | 0 - 8 | | | 9 - 35 | 36 - 49 | 0 - 49 |
| | $L_{CRB}$ [RBs] | ≤ 15 | > 15 and < 25 | ≥ 25 | N/A | > 0 | > 0 |
| | $RB_{start} + L_{CRB}$ [RBs] | N/A | N/A | N/A | ≥ 45 | N/A | N/A |
| | A-MPR [dB] | ≤ 3 | ≤ 1 | ≤ 2 | ≤ 1 | 0 | 0 |
| 15 | Fc [MHz] | ≤ 2510.8 | | | | | > 2510.8 |
| | $RB_{start}$ | 0 - 13 | | | 14 – 59 | 60 – 74 | 0 - 74 |
| | $L_{CRB}$ [RBs] | ≤ 18 or ≥ 36 | > 18 and < 36 | | N/A | > 0 | > 0 |
| | $RB_{start} + L_{CRB}$ [RBs] | N/A | N/A | | ≥ 62 | N/A | N/A |
| | A-MPR [dB] | ≤ 3 | ≤ 1 | | ≤ 1 | 0 | 0 |
| 20 | Fc [MHz] | ≤ 2517.5 | | | | | > 2517.5 |
| | $RB_{start}$ | 0 – 22 | | | 23 – 76 | 77 – 99 | 0 - 99 |
| | $L_{CRB}$ [RBs] | ≤ 18 or ≥ 40 | > 18 and < 40 | | N/A | > 0 | > 0 |
| | $RB_{start} + L_{CRB}$ [RBs] | N/A | N/A | | ≥ 86 | N/A | N/A |
| | A-MPR [dB] | ≤ 3 | ≤ 1 | | ≤ 1 | 0 | 0 |

NOTE 1: $RB_{start}$ indicates the lowest RB index of transmitted resource blocks
NOTE 2: $L_{CRB}$ is the length of a contiguous resource block allocation
NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis
NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe

**Table 6.2.4.3-4: A-MPR requirements for "NS_04" for Power Class 3 UE (Rel-12 and later and bit 2 of modifiedMPRbehavior = 1)**

| Channel bandwidth [MHz] | Parameters | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | Fc [MHz] | ≤ 2500.5 | | | | | > 2500.5 |
| | $RB_{start}$ | 0 - 8 | | | 9 – 24 | | 0 - 24 |
| | $L_{CRB}$ [RBs] | > 0 | | | > 0 | | > 0 |
| | A-MPR [dB] | ≤ 2 | | | 0 | | 0 |
| 10 | Fc [MHz] | ≤ 2504 | | | | | > 2504 |
| | $RB_{start}$ | 0 - 8 | | | 9 - 35 | 36 - 49 | 0 - 49 |
| | $L_{CRB}$ [RBs] | ≤ 15 | > 15 and < 25 | ≥ 25 | N/A | > 0 | > 0 |
| | $RB_{start} + L_{CRB}$ [RBs] | N/A | N/A | N/A | ≥ 45 | N/A | N/A |
| | A-MPR [dB] | ≤ 3 | ≤ 1 | ≤ 2 | ≤ 1 | 0 | 0 |
| 15 | Fc [MHz] | ≤ 2510.8 | | | | | > 2510.8 |
| | $RB_{start}$ | 0 - 13 | | | 14 – 59 | 60 – 74 | 0 - 74 |
| | $L_{CRB}$ [RBs] | ≤ 18 or ≥ 36 | > 18 and < 36 | | N/A | > 0 | > 0 |
| | $RB_{start} + L_{CRB}$ [RBs] | N/A | N/A | | ≥ 62 | N/A | N/A |
| | A-MPR [dB] | ≤ 3 | ≤ 1 | | ≤ 1 | 0 | 0 |
| 20 | Fc [MHz] | ≤ 2517.5 | | | | | > 2517.5 |
| | $RB_{start}$ | 0 – 22 | | | 23 – 76 | 77 – 99 | 0 - 99 |
| | $L_{CRB}$ [RBs] | ≤ 18 or ≥ 40 | > 18 and < 40 | | N/A | > 0 | > 0 |
| | $RB_{start} + L_{CRB}$ [RBs] | N/A | N/A | | ≥ 86 | N/A | N/A |
| | A-MPR [dB] | ≤ 3 | ≤ 1 | | ≤ 1 | 0 | 0 |

NOTE 1: $RB_{start}$ indicates the lowest RB index of transmitted resource blocks
NOTE 2: $L_{CRB}$ is the length of a contiguous resource block allocation
NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis
NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe

**Table 6.2.4.3-5: A-MPR for "NS_05"**

| Channel Bandwidth [MHz] | Parameters | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 15 | Fc [MHz] | 1932.5 | | | | | | |
| | $RB_{start}$ | 0-7 | 8 – 66 | | | 67-74 | | |
| | $L_{CRB}$ [RBs] | ≥1 | ≤30 | 31 – 54 | >54 | ≤6 | >6 | |
| | A-MPR [dB] | ≤11 | 0 | ≤3 | ≤5 | ≤5 | ≤1 | |
| 20 | Fc [MHz] | 1930 | | | | | | |
| | $RB_{start}$ | 0-23 | 24-75 | | | 76-99 | | |
| | $L_{CRB}$ [RBs] | ≥1 | ≤24 | 25 – 40 | 41 – 50 | > 50 | ≤6 | >6 |
| | A-MPR [dB] | ≤11 | 0 | ≤3 | ≤5 | ≤10 | ≤5 | ≤1 |

**Table 6.2.4.3-6: A-MPR for "NS_07"**

| Parameters | Region A | | Region B | | | | Region C | |
|---|---|---|---|---|---|---|---|---|
| $RB_{start}$ [1] | 0 – 12 | | 13 –18 | | 19 – 42 | | 43 – 49 | |
| $L_{CRB}$ [2] [RBs] | 6 – 8 | 1 to 5 and 9-50 | <8 | ≥8 | <18 | ≥18 | ≤2 | >2 |
| A-MPR [dB] | ≤8 | ≤12 | 0 | ≤12 | 0 | ≤6 | ≤3 | 0 |

Note 1: $RB_{start}$ indicates the lowest RB index of transmitted resource blocks
Note 2: $L_{CRB}$ is the length of a contiguous resource block allocation
Note 3: For intra-subframe frequency hopping between two regions, notes 1 and 2 apply on a per slot basis.
Note 4: For intra-subframe frequency hopping between two regions, the larger A-MPR value of the two regions may be applied for both slots in the subframe.

**Table 6.2.4.3-7: A-MPR for "NS_10"**

| Channel bandwidth [MHz] | Parameters | Region A |
|---|---|---|
| 15 | $RB_{start}$ [1] | 0 – 10 |
| | $L_{CRB}$ [RBs] | 1 -20 |
| | A-MPR [dB] | ≤ 2 |
| 20 | $RB_{start}$ [1] | 0 – 15 |
| | $L_{CRB}$ [RBs] | 1 -20 |
| | A-MPR [dB] | ≤ 5 |

Note 1: $RB_{start}$ indicates the lowest RB index of transmitted resource blocks.
Note 2: $L_{CRB}$ is the length of a contiguous resource block allocation.
Note 3: For intra-subframe frequency hopping which intersects Region A, notes 1 and 2 apply on a per slot basis.
Note 4: For intra-subframe frequency hopping which intersect Region A, the larger A-MPR value may be applied for both slots in the subframe.

**Table 6.2.4.3-8: A-MPR for NS_11**

| Channel Bandwidth [MHz] | Parameters | | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | Fc [MHz] | <2004 | ≥2004 | | | | |
| | $L_{CRB}$ [RBs] | 1-15 | >5 | | | | |
| | A-MPR [dB] | ≤5 | ≤ 1 | | | | |
| 5 | Fc [MHz] | <2004 | 2004 ≤ Fc <2007 | | ≥2007 | | |
| | $L_{CRB}$ [RBs] | 1-25 | 1-6 & 15-25 | 8-12 | >6 | | |
| | A-MPR [dB] | ≤7 | ≤ 4 | 0 | ≤ 1 | | |
| 10 | Fc [MHz] | 2005 ≤ Fc <2015 | | 2015 | | | |
| | $RB_{start}$ | 0-49 | | 0-49 | | | |
| | $L_{CRB}$ [RBs] | 1-50 | | 1-50 | | | |
| | A-MPR [dB] | ≤ 12 | | 0 | | | |
| 15 | Fc [MHz] | <2012.5 | | | | | |
| | $RB_{start}$ | 0-4 | 5-21 | | 22-56 | | 57-74 |
| | $L_{CRB}$ [RBs] | ≥1 | 7-50 | 0-6 & ≥50 | ≤25 | >25 | >0 |
| | A-MPR [dB] | ≤15 | ≤7 | ≤10 | 0 | ≤6 | ≤15 |
| | Fc [MHz] | 2012.5 | | | | | |
| | $RB_{start}$ | 0-12 | 13-39 | | 40-65 | | 66-74 |
| | $L_{CRB}$ [RBs] | ≥1 | ≥30 | <30 | ≥ (69 – $RB_{start}$) | | ≥1 |
| | A-MPR [dB] | ≤10 | ≤6 | 0 | ≤2 | | ≤6.5 |
| 20 | Fc [MHz] | 2010 | | | | | |
| | $RB_{start}$ | 0-12 | 13-29 | | 30-68 | | 69-99 |
| | $L_{CRB}$ [RBs] | ≥1 | 10-60 | 1-9 & >60 | 1-24 | ≥25 | ≥1 |
| | A-MPR [dB] | ≤15 | ≤7 | ≤10 | 0 | ≤7 | ≤15 |

**Table 6.2.4.3-9: A-MPR for "NS_12" (Rel-11 and earlier)**

| Channel bandwidth [MHz] | Parameters | Region A | | Region B |
|---|---|---|---|---|
| 1.4 | $RB_{start}$ | 0 | | 1-2 |
| | $L_{CRB}$ [RBs] | ≤3 | ≥4 | ≥4 |
| | A-MPR [dB] | ≤3 | ≤6 | ≤3 |
| 3 | $RB_{start}$ | 0-3 | | 4-5 |
| | $L_{CRB}$ [RBs] | 4-9 | 1-3 and 10-15 | ≥9 |
| | A-MPR [dB] | ≤4 | ≤3 | ≤3 |
| 5 | $RB_{start}$ | 0-6 | | 7-9 |
| | $L_{CRB}$ [RBs] | ≤8 | ≥9 | ≥15 |
| | A-MPR [dB] | ≤5 | ≤3 | ≤3 |

**Table 6.2.4.3-10: A-MPR for "NS_12" (Rel-12 and later)**

| Channel bandwidth [MHz] | Parameters | Region A | | Region B |
|---|---|---|---|---|
| 1.4 | $RB_{start}$ | 0 | | 1-2 |
| | $L_{CRB}$ [RBs] | ≤3 | ≥4 | ≥4 |
| | A-MPR [dB] | ≤3 | ≤6 | ≤3 |
| 3 | $RB_{start}$ | 0-3 | | 4-5 |
| | $L_{CRB}$ [RBs] | 1-15 | | ≥9 |
| | A-MPR [dB] | ≤4 | | ≤3 |
| 5 | $RB_{start}$ | 0-6 | | 0-9 |
| | $L_{CRB}$ [RBs] | ≤8 | | ≥9 |
| | A-MPR [dB] | ≤5 | | ≤3 |
| 10 | $RB_{start}$ | 0-15 | | 0-22 |
| | $L_{CRB}$ [RBs] | ≤18 | | ≥20 |
| | A-MPR [dB] | ≤4 | | ≤2 |
| 15 | $RB_{start}$ | 0-30 | | 0-30 |
| | $L_{CRB}$ [RBs] | ≤30 | | ≥32 |
| | A-MPR [dB] | ≤4 | | ≤3 |

**Table 6.2.4.3-11: A-MPR for "NS_13"**

| Channel bandwidth [MHz] | Parameters | Region A | |
|---|---|---|---|
| 5 | $RB_{start}$ | 0-2 | |
| | $L_{CRB}$ [RBs] | ≤5 | ≥18 |
| | A-MPR [dB] | ≤3 | ≤2 |

**Table 6.2.4.3-12: A-MPR for "NS_14"**

| Channel bandwidth [MHz] | Parameters | Region A | |
|---|---|---|---|
| 10 | $RB_{start}$ | 0 | |
| | $L_{CRB}$ [RBs] | ≤5 | ≥50 |
| | A-MPR [dB] | ≤3 | ≤1 |
| 15 | $RB_{start}$ | ≤8 | |
| | $L_{CRB}$ [RBs] | ≤16 | ≥50 |
| | A-MPR [dB] | ≤3 | ≤1 |

**Table 6.2.4.3-13: A-MPR for "NS_15" for E-UTRA highest channel edge ≤ 845 MHz**

| Channel bandwidth [MHz] | Parameters | Region A | Region B | Region C |
|---|---|---|---|---|
| 5 | $RB_{end}$ [RB] | | | 19-24 |
| | $L_{CRB}$ [RB] | | | ≥18 |
| | A-MPR [dB] | | | ≤2 |
| 10 | $RB_{end}$ [RB] | 0-4 | 29-44 | 45-49 |
| | $L_{CRB}$ [RB] | ≤2 | ≥24 | >0 |
| | A-MPR [dB] | ≤4 | ≤4 | ≤9 |
| 15 | $RB_{end}$ [RB] | 0-12 | 44-61 | 62-74 |
| | $L_{CRB}$ [RB] | ≤2 | ≥20 | >0 |
| | A-MPR [dB] | ≤4 | ≤5 | ≤9 |

**Table 6.2.4.3-14: A-MPR for "NS_15" for E-UTRA highest channel edge > 845 MHz and ≤ 849 MHz**

| Channel bandwidth [MHz] | Parameters | Region A | Region B | Region C |
|---|---|---|---|---|
| 1.4 | $RB_{end}$ [RB] | | | 4-5 |
| | A-MPR [dB] | | | ≤3 |
| 3 | $RB_{end}$ [RB] | 0-1 | 8-12 | 13-14 |
| | $L_{CRB}$ [RB] | ≤2 | ≥8 | >0 |
| | A-MPR [dB] | ≤4 | ≤4 | ≤9 |
| 5 | $RB_{end}$ [RB] | 0-4 | 12-19 | 20-24 |
| | $L_{CRB}$ [RB] | ≤2 | ≥8 | >0 |
| | A-MPR [dB] | ≤4 | ≤5 | ≤9 |
| 10 | $RB_{end}$ [RB] | 0-12 | 23-36 | 37-49 |
| | $L_{CRB}$ [RB] | ≤2 | ≥15 | >0 |
| | A-MPR [dB] | ≤4 | ≤6 | ≤9 |
| 15 | $RB_{end}$ [RB] | 0-20 | 26-53 | 54-74 |
| | $L_{CRB}$ [RB] | ≤2 | ≥20 | >0 |
| | A-MPR [dB] | ≤4 | ≤5 | ≤9 |

**Table 6.2.4.3-15: A-MPR for “NS_16” with channel lower edge at ≥807 MHz and <808.5 MHz**

| Channel band-width [MHz] | Parameter | Region A | Region B | Region C | Region D | Region E |
|---|---|---|---|---|---|---|
| 3 MHz | $RB_{start}$ | 0 | 1-2 | | | |
| | $L_{CRB}$ [RBs] | ≥12 | 12 | | | |
| | A-MPR [dB] | ≤2 | ≤1 | | | |
| 5 MHz | $RB_{start}$ | 0-1 | 2 | 2-9 | 2-5 | |
| | $L_{CRB}$ [RBs] | 1 - 25 | 12 | 15-18 | 20 | |
| | A-MPR [dB] | ≤5 | ≤1 | ≤2 | ≤3 | |
| 10 MHz | $RB_{start}$ | 0 - 8 | 0-14 | | 15-20 | 15-24 |
| | $L_{CRB}$ [RBs] | 1 - 12 | 15-20 | ≥24 | ≥30 | 24-27 |
| | A-MPR [dB] | ≤5 | ≤3 | ≤7 | ≤3 | ≤1 |

**Table 6.2.4.3-16: A-MPR for “NS_16” with channel lower edge at ≥808.5 MHz and <812 MHz**

| Channel band-width [MHz] | Parameter | Region A | Region B | Region C | Region D | Region E |
|---|---|---|---|---|---|---|
| 5 MHz | $RB_{start}$ | 0 | 0-1 | 1-5 | | |
| | $L_{CRB}$ [RBs] | 16-20 | ≥24 | 16-20 | | |
| | A-MPR [dB] | ≤2 | ≤3 | ≤1 | | |
| 10 MHz | $RB_{start}$ | 0-6 | | 0-10 | 0-14 | 11-20 |
| | $L_{CRB}$ [RBs] | 1-12 | 15-20 | 24-32 | ≥36 | 24-32 |
| | A-MPR [dB] | ≤5 | ≤2 | ≤4 | ≤5 | ≤1 |

**Table 6.2.4.3-17: A-MPR for "NS_16" with channel lower edge at ≥812 MHz**

| Channel band-width [MHz] | Parameter | Region A | Region B | Region C | Region D |
|---|---|---|---|---|---|
| 10 MHz | $RB_{start}$ | 0 - 9 | 0 | 1-14 | 0-5 |
| | $L_{CRB}$ [RBs] | 27-32 | 36-40 | 36-40 | ≥45 |
| | A-MPR [dB] | ≤1 | ≤2 | ≤1 | ≤3 |

**Table 6.2.4.3-18: A-MPR for "NS_19"**

| Channel bandwidth [MHz] | Parameters | Region A | | Region B |
|---|---|---|---|---|
| 10 | $RB_{start}$ | | | 0-6 |
| | $L_{CRB}$ [RBs] | | | ≥40 |
| | A-MPR [dB] | | | ≤1 |
| 15 | $RB_{start}$ | 0-6 | | 7-20 |
| | $L_{CRB}$ [RBs] | ≤18 | ≥36 | ≥42 |
| | A-MPR [dB] | ≤2 | ≤3 | ≤2 |
| 20 | $RB_{start}$ | 0-14 | | 15-30 |
| | $L_{CRB}$ [RBs] | ≤40 | ≥45 | ≥50 |
| | A-MPR [dB] | ≤2 | ≤3 | ≤2 |

**Table 6.2.4.3-19: A-MPR for "NS_20"**

| Channel bandwidth [MHz] | Parameters | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | Fc (MHz) | < 2007.5 | | | 2007.5 ≤ Fc < 2012.5 | | | | 2012.5 ≤ Fc ≤ 2017.5 | | | |
| | $RB_{start}$ | ≤24 | | | 0-3 | | | 4-6 | ≤24 | | | |
| | $L_{CRB}$ (RBs) | >0 | | | 15-19 | | ≥20 | ≥18 | 1-25 | | | |
| | A-MPR [dB] | ≤17 | | | ≤1 | | ≤4 | ≤2 | ≤ 0 | | | |
| 10 | Fc (MHz) | 2005 | | | | | | | | | | |
| | $RB_{start}$ | 0-25 | | | 26-34 | | | | 35-49 | | | |
| | $L_{CRB}$ (RBs) | >0 | | | 8-15 | | | >15 | >0 | | | |
| | A-MPR [dB] | ≤16 | | | ≤2 | | | ≤5 | ≤ 6 | | | |
| | Fc (MHz) | 2015 | | | | | | | | | | |
| | $RB_{start}$ | 0-5 | | | | | | 6-10 | | | | |
| | $L_{CRB}$ (RBs) | ≥32 | | | | | | ≥40 | | | | |
| | A-MPR [dB] | ≤4 | | | | | | ≤2 | | | | |
| 15 | Fc (MHz) | 2012.5 | | | | | | | | | | |
| | $RB_{start}$ | 0-14 | | | | 15-24 | | | | 25-39 | | 61-74 |
| | $L_{CRB}$ (RBs) | 1-9 & 40-75 | | 10-39 | | 24-29 | | ≥30 | | ≥36 | | ≤6 |
| | A-MPR [dB] | ≤11 | | ≤6 | | ≤1 | | ≤7 | | ≤5 | | ≤6 |
| 20 | Fc (MHz) | 2010 | | | | | | | | | | |
| | $RB_{start}$ | 0-21 | 22-31 | | | 32-38 | | 39-49 | | 50-69 | | 70-99 |
| | $L_{CRB}$ (RBs) | >0 | 1-9 & 31-75 | | 10-30 | ≥15 | | ≥24 | | ≥25 | | >0 |
| | A-MPR [dB] | ≤17 | ≤12 | | ≤6 | ≤9 | | ≤7 | | ≤5 | | ≤16 |

NOTE 1: When NS_20 is signalled the minimum requirements for the 10 MHz bandwidth are specified for E-UTRA UL carrier centre frequencies of 2005 MHz or 2015 MHz.
NOTE 2: When NS_20 is signalled the minimum requirements for the 15 MHz channel bandwidth are specified for E-UTRA UL carrier centre frequency of 2012.5 MHz.

**Table 6.2.4.3-20: A-MPR for "NS_21"**

| Channel Bandwidth [MHz] | Parameters | Region A | | Region B | |
|---|---|---|---|---|---|
| 10 | $RB_{start}$ | 0 – 6 | 0 – 6 | N/A | N/A |
| | $RB_{end}$ | N/A | N/A | 43 – 49 | 43 – 49 |
| | $L_{CRB}$ [RBs] | 1 – 2 | 3 – 12, 32 - 50 | 1 – 2 | 3 – 12, 32 - 50 |
| | A-MPR [dB] | ≤ 4 | ≤ 3 | ≤ 4 | ≤ 3 |

**Table 6.2.4.3-21: A-MPR for "NS_22"**

| Channel bandwidth [MHz] | Parameters | Region A | Region B | Region C | Region D |
|---|---|---|---|---|---|
| 5 | No A-MPR is needed for 5 MHz channel bandwidth | | | | |
| 10 | $RB_{start}$ | 0-13 | 0-17 | ≤ 6 | ≥12 |
| | $L_{CRB}$ [RBs] | > 36 | 33-36 | ≤ 32 | ≤ 32 |
| | RBstart + LCRB [RBs] | N/A | N/A | N/A | ≥44 |
| | A-MPR [dB] | ≤ 4 | ≤ 3 | ≤ 3 | ≤ 3 |
| 15 | $RB_{start}$ | 0-24 | 0-38 | ≤ 14 | ≥ 23 |
| | $L_{CRB}$ [RBs] | > 50 | 37-50 | ≤ 36 | ≤ 36 |
| | RBstart + LCRB [RBs] | N/A | N/A | N/A | ≥59 |
| | A-MPR [dB] | ≤ 5 | ≤ 4 | ≤ 3 | ≤ 3 |
| 20 | $RB_{start}$ | 0-35 | 0-51 | ≤ 21 | ≥ 31 |
| | $L_{CRB}$ [RBs] | > 64 | 49-64 | ≤ 48 | ≤ 48 |
| | RBstart + LCRB [RBs] | N/A | N/A | N/A | ≥79 |
| | A-MPR [dB] | ≤ 5 | ≤ 4 | ≤ 3 | ≤ 3 |

NOTE 1: $RB_{start}$ indicates the lowest RB index of transmitted resource blocks
NOTE 2: $L_{CRB}$ is the length of a contiguous resource block allocation
NOTE 3: For intra-subframe frequency hopping between two regions, notes 1 and 2 apply on a per slot basis.
NOTE 4: For intra-subframe frequency hopping between two regions, the larger A-MPR value of the two regions may be applied for both slots in the subframe.

**Table 6.2.4.3-22: A-MPR for "NS_24"**

| Channel Bandwidth [MHz] | Parameters | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | Fc [MHz] | Fc > [1987.5] | | | | | | |
| | $RB_{start}$ | 0 – 24 | | | | | | |
| | $L_{CRB}$ [RBs] | 0 – 24 | | | | | | |
| | A-MPR [dB] | ≤ 10 | | | | | | |
| 10 | Fc [MHz] | 1975 < Fc ≤ 1985 | | | | | 1985<Fc≤1995 | Fc>1995 |
| | $RB_{start}$ | 0 - 1 | 2 - 14 | 15 - 26 | 36 - 49 | | 0 - 49 | 0 - 49 |
| | $L_{CRB}$ [RBs] | > 10 | ≥ 35 | N/A | ≤ 2 | > 11 | 0 - 49 | 0 - 49 |
| | $RB_{end}$ | N/A | N/A | > 48 | N/A | N/A | N/A | N/A |
| | A-MPR [dB] | ≤ 2 | ≤ 2 | 1 | ≤ 3 | ≤ 1 | ≤ 9 | ≤ 17 |
| 15 | Fc [MHz] | 1972.5 < Fc ≤ 1987.5 | | | | | Fc > 1987.5 | |
| | $RB_{start}$ | 0 - 11 | | | 12 - 74 | | 0 - 74 | |
| | $L_{CRB}$ [RBs] | ≤ 45 | | > 45 | > 3 | | 0 - 74 | |
| | $RB_{end}$ | N/A | | N/A | ≥ 45 | | N/A | |
| | A-MPR [dB] | ≤ 2 | | ≤ 8 | ≤ 7 | | ≤ 17 | |
| 20 | Fc [MHz] | Fc > 1970 | | | | | | |
| | $RB_{start}$ | 0 – 99 | | | | | | |
| | $L_{CRB}$ [RBs] | 0 – 99 | | | | | | |
| | A-MPR [dB] | ≤ 17 | | | | | | |

**Table 6.2.4.3-23: A-MPR for "NS_25"**

| Channel Bandwidth [MHz] | Parameters | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | Fc [MHz] | Fc > [1997.5] | | | | | | | |
| | $RB_{start}$ | 0 - 9 | | | | 10 – 24 | | | |
| | $L_{CRB}$ [RBs] | > 12 | | | | N/A | | | |
| | $RB_{end}$ | N/A | | | | ≥ 22 | | | |
| | A-MPR [dB] | ≤ 5 | | | | ≤ 2 | | | |
| 10 | Fc [MHz] | 1975 < Fc ≤ 1985 | | 1985 < Fc ≤ 1995 | | | Fc > 1995 | | |
| | $RB_{start}$ | 0-1 | 2-49 | 0 | | 1 - 18 | 19-49 | 0-6 | 7-15 | 16-49 |
| | $L_{CRB}$ [RBs] | > 10 | N/A | ≤ 25 | > 25 | > 25 | N/A | N/A | > 20 | N/A |
| | $RB_{end}$ | N/A | > 48 | N/A | N/A | N/A | > 42 | N/A | N/A | > 35 |
| | A-MPR [dB] | ≤ 1 | ≤ 1 | ≤ 1 | ≤ 5 | ≤ 5 | ≤ 1 | ≤ 10 | ≤ 7 | ≤ 11 |
| 15 | Fc [MHz] | 1972.5 < Fc ≤ 1987.5 | | | | | | Fc > 1987.5 | | |
| | $RB_{start}$ | 0 - 4 | | 5 - 30 | | 31 - 62 | 63 - 74 | 0 - 74 | | |
| | $L_{CRB}$ [RBs] | ≥ 15 | | ≥ 45 | | N/A | N/A | 0 - 74 | | |
| | $RB_{end}$ | N/A | | N/A | | > 71 | N/A | N/A | | |
| | A-MPR [dB] | ≤ 4 | | ≤ 3 | | ≤ 1 | ≤ 1 | ≤ 13 | | |
| 20 | Fc [MHz] | 1970 < Fc ≤ 1990 | | | | | | Fc > 1990 | | |
| | $RB_{start}$ | 0 - 13 | | 14 - 40 | | 41 - 99 | | 0 - 99 | | |
| | $L_{CRB}$ [RBs] | N/A | | ≥ 32 | | N/A | | 0 - 99 | | |
| | $RB_{end}$ | N/A | | N/A | | > 72 | | N/A | | |
| | A-MPR [dB] | ≤ 11 | | ≤ 11 | | ≤13 | | ≤ 13 | | |

**Table 6.2.4.3-24: A-MPR for "NS_27“**

| Parameters | | | | |
|---|---|---|---|---|
| **Channel bandwidth [MHz]** | **$RB_{start}$** | **$RB_{end}$** | **$L_{CRB}$** | **A-MPR** |
| 15 | 0 – 6 | | ≤ 15 | ≤ 4 dB |
| | | 68 – 74 | | |
| | ≥ 0 | | ≥ 60 | ≤ 2 dB |
| 20 | 0 – 12 | | ≤ 20 | ≤ 4 dB |
| | | 87 – 99 | | |
| | 13 – 15 | | ≤ 3 | ≤ 1 dB |
| | | 84 – 86 | | |
| | ≥ 0 | | ≥ 60 | ≤ 3 dB |

**Table 6.2.4-25: A-MPR for "NS_28"**

| Parameters | | | |
|---|---|---|---|
| **Channel Bandwidth [MHz]** | **Carrier centre frequency ($F_C$) [MHz]** | **Uplink resource allocation** | **A-MPR [dB]** |
| 20 | 5160[1], 5340[2], 5480[1] | L = 10 (RIV = 19) | 9 |
| | | Any other RIV | 8 |
| | 5700[3] | L = 10 (RIV = 19) | [9] |
| | | Any other RIV | [8] |
| | 5180[3], 5200[3], 5220[3], 5240[3], 5260[3], 5280[3], 5300[3], 5320[3], 5500[3], 5520[3], 5540[3], 5560[3], 5580[3], 5600[3], 5620[3], 5640[3], 5660[3], 5680[3] | L = 10 (RIV = 19) | 2 |
| | | Any other RIV | 2 |

NOTE 1: Applies also for carrier centre frequencies at a frequency offset of +100 kHz or +200 kHz from the carrier centre frequency stated.
NOTE 2: Applies also for carrier centre frequencies at a frequency offset of-200 kHz or -100 kHz from the carrier centre frequency stated.
NOTE 3: Applies also for carrier centre frequencies at a frequency offset of -200 kHz, -100 kHz, 100 kHz or +200 kHz from the carrier centre frequency stated.
NOTE 4: The carrier centre frequencies and corresponding EARFCN allowed for operation in Band 46 are specified in [12]. The uplink resource allocation is defined in Clause 8.1.4 of [10].

**Table 6.2.4-26: A-MPR for "NS_29"**

| Parameters | | | |
|---|---|---|---|
| **Channel Bandwidth [MHz]** | **Carrier centre frequency ($F_C$) [MHz]** | **Uplink resource allocation** | **A-MPR [dB]** |
| 20 | 5180[1], 5200[1], 5220[1], 5240[1], 5260[1], 5280[1], 5300[1], 5320[1], 5500[1], 5520[1], 5540[1], 5560[1], 5580[1], 5600[1], 5620[1], 5640[1], 5660[1], 5680[1], 5700[1] | L = 10 (RIV = 19) | 2 |
| | | Any other RIV | 1 |

NOTE 1: Applies also for carrier centre frequencies at a frequency offset of -200 kHz, -100 kHz, 100 kHz or +200 kHz from the carrier centre frequency stated
NOTE 2: The carrier centre frequencies and corresponding EARFCN allowed for operation in Band 46 are specified in [12]. The uplink resource allocation is defined in Clause 8.1.4 of [10].

**Table 6.2.4-27: A-MPR for "NS_30"**

| Parameters | | | |
|---|---|---|---|
| **Channel Bandwidth [MHz]** | **Carrier centre frequency ($F_C$) [MHz]** | **Uplink resource allocation** | **A-MPR [dB]** |
| 20 | 5160[1], 5240[2] | L = 10 (RIV = 19) | 15 |
| | | Any other RIV | 16 |
| | 5180[3], 5320[3] | L = 10 (RIV = 19) | 3 |
| | | Any other RIV | 3 |
| | 5480[1] | L = 10 (RIV = 19) | 11 |
| | | Any other RIV | 11 |
| | 5700[3] | L = 10 (RIV = 19) | [6] |
| | | Any other RIV | [6] |
| | 5180[3], 5200[3], 5220[3], 5240[3], 5260[3], 5280[3], 5300[3], 5500[3], 5520[3], 5540[3], 5560[3], 5580[3], 5600[3], 5620[3], 5640[3], 5660[3], 5680[3] | L = 10 (RIV = 19) | 1 |
| | | Any other RIV | N/A |

NOTE 1: Applies also for carrier centre frequencies at a frequency offset of +100 kHz or +200 kHz from the carrier centre frequency stated.
NOTE 2: Applies also for carrier centre frequencies at a frequency offset of-200 kHz or -100 kHz from the carrier centre frequency stated.
NOTE 3: Applies also for carrier centre frequencies at a frequency offset of -200 kHz, -100 kHz, 100 kHz or +200 kHz from the carrier centre frequency stated.
NOTE 4: The carrier centre frequencies and corresponding EARFCN allowed for operation in Band 46 are specified in [12]. The uplink resource allocation is defined in Clause 8.1.4 of [10]. The uplink resource allocation is defined in Clause 8.1.4 of [10].

**Table 6.2.4-28: A-MPR for "NS_31"**

| Parameters | | | |
|---|---|---|---|
| **Channel Bandwidth [MHz]** | **Carrier centre frequency ($F_C$) [MHz]** | **Uplink resource allocation** | **A-MPR [dB]** |
| 20 | 5160[1], 5180[3], 5200[3], 5220[3], 5240[2] | L = 10 (RIV = 19) | 7 |
| | | Any other RIV | 7 |
| | 5260[1], 5340[2], 5480[1] | L = 10 (RIV = 19) | 6 |
| | | Any other RIV | 6 |
| | 5700[3], 5825[3] | L = 10 (RIV = 19) | [6] |
| | | Any other RIV | [6] |
| | 5745[3] | L = 10 (RIV = 19) | [6] |
| | | Any other RIV | [6] |
| | 5280[3], 5300[3], 5320[3], 5500[3], 5520[3], 5540[3], 5560[3], 5580[3], 5600[3], 5620[3], 5640[3], 5660[3], 5680[3], 5765[3], 5785[3], 5805[3], 5825[3] | L = 10 (RIV = 19) | 2 |
| | | Any other RIV | 1 |

NOTE 1: Applies also for carrier centre frequencies at a frequency offset of +100 kHz or +200 kHz from the carrier centre frequency stated.
NOTE 2: Applies also for carrier centre frequencies at a frequency offset of-200 kHz or -100 kHz from the carrier centre frequency stated.
NOTE 3: Applies also for carrier centre frequencies at a frequency offset of -200 kHz, -100 kHz, 100 kHz or +200 kHz from the carrier centre frequency stated.
NOTE 4: The carrier centre frequencies and corresponding EARFCN allowed for operation in Band 46 are specified in [12]. The uplink resource allocation is defined in Clause 8.1.4 of [10].

**Table 6.2.4.3-29: A-MPR for "NS_36"**

| Channel Bandwidth [MHz] | Parameters | | | | |
|---|---|---|---|---|---|
| 5 MHz | Fc [MHz] | 700.5 ≤ Fc < 705.5 | | | |
| | $RB_{start}$ | 0 | | 1-4 | |
| | $L_{CRB}$ [RBs] | 1 | ≥ 15 | ≥ 15 | 24 |
| | A-MPR [dB] | ≤ 2 | ≤ 4 | ≤ 1 | ≤ 3 |
| 10 MHz | Fc [MHz] | 703 ≤ Fc < 708 | | | |
| | $RB_{start}$ | 0 - 8 | 9 - 12 | 13 - 39 | 40 - 43 |
| | $L_{CRB}$ [RBs] | > 0 | > 12 | > 16 | > 0 |
| | A-MPR [dB] | ≤ 10 | ≤ 8 | ≤ 6 | ≤ 6 |
| 15 MHz | Fc [MHz] | Fc = 705.5 | | | |
| | $RB_{start}$ | 0 - 16 | 17 - 23 | 24 - 56 | 57 - 60 |
| | $L_{CRB}$ [RBs] | > 0 | > 12 | > 20 | < 6 |
| | A-MPR [dB] | ≤ 10 | ≤ 9 | ≤ 7 | ≤ 6 |

NOTE 1: RBstart indicates the lowest RB index of transmitted resource blocks
NOTE 2: LCRB is the length of a contiguous resource block allocation
NOTE 3: For intra-subframe frequency hopping between two regions, notes 1 and 2 apply on a per slot basis. For intra-slot or intra-subslot frequency hopping between two regions, notes 1 and 2 apply on a per $T_{no_hopping}$ basis.
NOTE 4: For intra-subframe frequency hopping between two regions, the larger A-MPR value of the two regions may be applied for both slots in the subframe. For intra-slot frequency hopping between two regions, the larger A-MPR value may be applied for the slot. For intra-subslot frequency hopping between two regions, the larger A-MPR value may be applied for the subslot.

**Table 6.2.4.3-30: A-MPR for "NS_38"**

| Channel Bandwidth [MHz] | Carrier centre frequency ($F_C$) [MHz] | Parameters | Region A | | Region B | | Region C | | Region D | | Region E | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 1428.5 ≤ $F_C$ < 1431.5 | $RB_{start}$ | 0 | | 1– 2 | | 3 – 6 | | | | | |
| | | $L_{CRB}$ [RBs] | 1 | ≥2 | 2 | ≥ 3 | 5-7 | ≥8 | | | | |
| | | A-MPR [dB] | ≤ 11 | ≤ 16 | ≤ 9 | ≤ 15 | ≤ 12 | ≤ 14 | | | | |
| 5 | 1429.5 ≤ $F_C$ < 1434.5 | $RB_{start}$ | 0 - 1 | | 2 – 4 | | 5 – 7 | | 8 – 10 | | | |
| | | $L_{CRB}$ [RBs] | 2 | ≥3 | 4-6 | ≥ 7 | 8-10 | ≥11 | 12-14 | ≥15 | | |
| | | A-MPR [dB] | ≤ 12 | ≤ 16 | ≤ 13 | ≤ 16 | ≤ 12 | ≤ 15 | ≤ 10 | ≤ 12 | | |
| 10 | 1432 ≤ $F_C$ < 1442 | $RB_{start}$ | 0 | | 1 – 4 | | 5 – 9 | | 10 – 14 | | 15 – 21 | |
| | | $L_{CRB}$ [RBs] | 3-4 | ≥5 | 5-8 | ≥ 9 | 9-16 | ≥17 | 15-23 | ≥24 | 24-29 | ≥30 |
| | | A-MPR [dB] | ≤ 13 | ≤ 16 | ≤ 13 | ≤ 16 | ≤ 13 | ≤ 16 | ≤ 11 | ≤ 14 | ≤ 11 | ≤ 13 |
| 15 | 1434.5 ≤ $F_C$ < 1447.5 | $RB_{start}$ | 0 -1 | | 2 – 7 | | 8 – 17 | | 18 – 23 | | 24 – 30 | |
| | | $L_{CRB}$ [RBs] | 5-10 | ≥11 | 8-12 | ≥ 13 | 15-25 | ≥26 | 26-40 | ≥41 | ≥ 36 | |
| | | A-MPR [dB] | ≤ 14 | ≤ 16 | ≤ 13 | ≤ 16 | ≤ 13 | ≤ 16 | ≤ 12 | ≤ 14 | ≤ 12 | |
| 20 | 1437 ≤ $F_C$ < 1450 | $RB_{start}$ | 0 -4 | | 5 – 9 | | 10 – 19 | | 20 – 29 | | 30 – 40 | |
| | | $L_{CRB}$ [RBs] | 6-10 | ≥11 | 11-20 | ≥ 21 | 17-32 | ≥33 | 28-45 | ≥46 | 41-54 | ≥55 |
| | | A-MPR [dB] | ≤ 13 | ≤ 16 | ≤ 13 | ≤ 16 | ≤ 13 | ≤ 16 | ≤ 12 | ≤ 14 | ≤ 11 | ≤ 13 |

**Table 6.2.4.3-31: A-MPR for "NS_39"**

| Channel Bandwidth [MHz] | Carrier centre frequency ($F_C$) [MHz] | Parameters | Region A | | | Region B | | Region C | |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 1462 < $F_C$ ≤1465 | $RB_{start}$ | 43-50 | | | | | | |
| | | $L_{CRB}$ [RBs] | ≤ 3 | > 3 and ≤ 25 | ≥ 32 | | | | |
| | | A-MPR [dB] | ≤ 4 | ≤ 3 | ≤ 3 | | | | |
| 15 | 1456.3 < $F_C$ ≤ 1462.5 | $RB_{start}$ | 56-75 | | | 64-75 | | 60-75 | |
| | | $L_{CRB}$ [RBs] | ≥ 36 | | | ≥ 13 and ≤ 35 | | ≥ 5 and ≤ 12 | < 5 |
| | | A-MPR [dB] | ≤ 3 | | | ≤ 2 | | ≤ 3 | ≤ 4 |
| 20 | 1450.8 < $F_C$ ≤ 1460 | $RB_{start}$ | 71-100 | | | >76 | | | |
| | | $L_{CRB}$ [RBs] | ≥ 36 | | | ≥ 7 and ≤ 35 | < 7 | | |
| | | A-MPR [dB] | ≤ 3 | | | ≤ 3 | ≤ 4 | | |

For PRACH, PUCCH and SRS transmissions, the allowed A-MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For each subframe, the A-MPR is evaluated per slot and given by the maximum value taken over the transmission(s) within the slot; the maximum A-MPR over the two slots is then applied for the entire subframe.

The normative reference for this requirement is TS 36.101 clause 6.2.4.

## 6.2.4.4 Test description

### 6.2.4.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.4.4.1-1 through table 6.2.4.4.1-26. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4.4.1-1: Test Configuration Table (network signalled value "NS_03")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for NS_03 A-MPR** | | | | | | | |
| | | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1 | 1.4MHz | N/A for A-MPR testing. | | | QPSK | 6 | 6 |
| 2 | 1.4MHz | | | | QPSK | 5 | 5 |
| 3 | 1.4MHz | | | | 16QAM (Note 6) | 5 | 5 |
| 4 | 3MHz | | | | QPSK | 15 | 15 |
| 5 | 3MHz | | | | QPSK | 4 | 4 |
| 6 | 3MHz | | | | 16QAM (Note 6) | 15 | 15 |
| 7 | 3MHz | | | | 16QAM (Note 6) | 4 | 4 |
| 8 | 5MHz | | | | QPSK | 25 | 25 |
| 9 | 5MHz | | | | QPSK | 8 | 8 |
| 10 | 5MHz | | | | QPSK | 6 | 6 |
| 11 | 5MHz | | | | 16QAM (Note 6) | 25 | 25 |
| 12 | 5MHz | | | | 16QAM (Note 6) | 8 | 8 |
| 13 | 10MHz | | | | QPSK | 50 | 50 |
| 14 | 10MHz | | | | QPSK | 12 | 12 |
| 15 | 10MHz | | | | QPSK | 6 | 6 |
| 16 | 10MHz | | | | 16QAM (Note 6) | 50 (Note 4) | 50 (Note 4) |
| 17 | 10MHz | | | | 16QAM (Note 6) | 12 | 12 |
| 18 | 15MHz | | | | QPSK | 75 | 75 |
| 19 | 15MHz | | | | QPSK | 16 | 16 |
| 20 | 15MHz | | | | QPSK | 8 | 8 |
| 21 | 15MHz | | | | 16QAM (Note 6) | 75 (Note 4) | 75 (Note 4) |
| 22 | 15MHz | | | | 16QAM (Note 6) | 16 | 16 |
| 23 | 20MHz | | | | QPSK | 100 | 100 |
| 24 | 20MHz | | | | QPSK | 18 | 18 |
| 25 | 20MHz | | | | QPSK | 10 | 10 |
| 26 | 20MHz | | | | 16QAM (Note 6) | 100 (Note 4) | 100 (Note 4) |
| 27 | 20MHz | | | | 16QAM (Note 6) | 18 | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

Note 4: Applies only for UE-Categories ≥2.

Note 5: For band 23, above table only applies to mid and high range test frequencies. Low range test frequencies will be covered by NS_11 test configuration table.

Note 6: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-2: Test Configuration Table (network signalled value "NS_04")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range<br><br>Additional test frequencies for Rel-12 to Rel-13 and bit 2 of modifiedMPRbehavior = 0:<br><br>For 5 MHz bandwidth:<br>2499.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866<br><br>Additional test frequencies for Rel-12 and later and bit 2 of modifiedMPRbehavior = 1:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39686<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866 | | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10 MHz, 15 MHz, 20MHz | | |
| **Test Parameters for NS_04 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation TDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 (Note 6) | 5MHz | N/A for A-MPR testing | | QPSK | 25 | 0 |
| 2 (Note 6) | 5MHz | | | QPSK | 8 | Note 3 |
| 3(Note 6) | 5MHz | | | QPSK | 6 | Note 3 |
| 4 (Note 6) | 5MHz | | | 16QAM (Note 5) | 25 | 0 |
| 5 (Note 6) | 5MHz | | | 16QAM (Note 5) | 8 | Note 3 |
| 6 (Note 6) | 10MHz | | | QPSK | 1 | 0 |
| 7 (Note 6) | 10MHz | | | QPSK | 12 | 0 |
| 8 (Note 6) | 10MHz | | | QPSK | 50 | 0 |
| 9 Note 6) | 10MHz | | | 16QAM (Note 5) | 50 (Note 4) | 0 |
| 10 (Note 6) | 10MHz | | | QPSK | 24 | 13 |
| 11 (Note 6) | 10MHz | | | 16QAM (Note 5) | 24 | 13 |
| 12 (Note 6) | 10MHz | | | QPSK | 36 | 13 |
| 13 (Note 6) | 10MHz | | | QPSK | 12 | 37 |
| 14 (Note 6) | 10MHz | | | QPSK | 1 | 49 |
| 15 (Note 6) | 15MHz | | | QPSK | 1 | 0 |
| 16 (Note 6) | 15MHz | | | QPSK | 16 | 0 |
| 17 (Note 6) | 15MHz | | | QPSK | 75 | 0 |
| 18 (Note 6) | 15MHz | | | 16QAM | 75 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| | | | (Note 5) | (Note 4) | |
| 19 (Note 6) | 15MHz | | QPSK | 36 | 19 |
| 20 (Note 6) | 15MHz | | 16QAM (Note 5) | 36 (Note 4) | 19 |
| 21 (Note 6) | 15MHz | | QPSK | 50 | 19 |
| 22 (Note 6) | 15MHz | | QPSK | 18 | 56 |
| 23 (Note 6) | 15MHz | | QPSK | 1 | 74 |
| 24 (Note 6) | 20MHz | | QPSK | 1 | 0 |
| 25 (Note 6) | 20MHz | | QPSK | 18 | 0 |
| 26 (Note 6) | 20MHz | | QPSK | 100 | 0 |
| 27 (Note 6) | 20MHz | | 16QAM (Note 5) | 100 (Note 4) | 0 |
| 28 (Note 6) | 20MHz | | QPSK | 50 | 25 |
| 29 (Note 6) | 20MHz | | 16QAM (Note 5) | 50 (Note 4) | 25 |
| 30 (Note 6) | 20MHz | | QPSK | 75 | 25 |
| 31 (Note 6) | 20MHz | | QPSK | 25 | 75 |
| 32 (Note 6) | 20MHz | | QPSK | 1 | 99 |
| 33 (Note 8) | 5MHz | | QPSK | 1 | 0 |
| 34 (Note 8) | 5MHz | | QPSK | 16 | 9 |
| 35 (Note 9) | 5MHz | | QPSK | 25 | 0 |
| 36 (Note 8) | 5MHz | | 16QAM (Note 5) | 16 | 9 |
| 37 (Note 9) | 5MHz | | 16QAM (Note 5) | 25 | 0 |
| 38 (Note 8) | 10MHz | | QPSK | 1 | 0 |
| 39 (Note 8) | 10MHz | | QPSK | 1 | 49 |
| 40 (Note 8) | 10MHz | | QPSK | 24 | 0 |
| 41 (Note 8) | 10MHz | | QPSK | 40 | 10 |
| 42 (Note 7) | 10MHz | | QPSK | 50 | 0 |
| 43 (Note 7) | 10MHz | | 16QAM (Note 5) | 50 | 0 |
| 44 (Note 8) | 15MHz | | QPSK | 1 | 0 |
| 45 (Note 8) | 15MHz | | QPSK | 1 | 74 |
| 46 (Note 8) | 15MHz | | QPSK | 32 | 0 |
| 47 (Note 8) | 15MHz | | QPSK | 60 | 15 |
| 48 (Note 7) | 15MHz | | QPSK | 75 | 0 |
| 49 (Note 7) | 15MHz | | 16QAM (Note 5) | 75 | 0 |
| 50 (Note 8) | 20MHz | | QPSK | 1 | 0 |
| 51 (Note 8) | 20MHz | | QPSK | 1 | 99 |
| 52 (Note 8) | 20MHz | | QPSK | 36 | 0 |
| 53 (Note 8) | 20MHz | | QPSK | 75 | 25 |
| 54 (Note 7) | 20MHz | | QPSK | 100 | 0 |
| 55 (Note 7) | 20MHz | | 16QAM (Note 5) | 100 | 0 |

Note 1: Test Channel Bandwidths are checked separately for E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: The configuration ID will be used to map the applicable Test Configuration to be corresponding Test Requirement in subclause 6.2.4 as not all combinations are necessarily required based on the applicability of the UE.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 4: Applies only for UE-Categories ≥2.
Note 5: The 16QAM configurations shall not apply to UEs which support UL 64QAM.
Note 6: Applies only for Rel-11 and earlier.
Note 7: Applies only for Rel-12 and later.
Note 8: Applies only for Rel-12 and later and Low Range.
Note 9: Applies only for Rel-12 and later and Mid, High Range and additional test frequencies.

**Table 6.2.4.4.1-3: Test Configuration Table (network signalled value "NS_05")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range<br><br>In case of Low range:<br>- For 5MHz Channel Bandwidth: 1927.2MHz (NUL = 18072)<br>- For 10 MHz Channel Bandwidth: 1934.7 MHz (NUL = 18147)<br>- For 15 MHz Channel Bandwidth: 1932.5 MHz (NUL = 18125)<br>- For 20 MHz Channel Bandwidth: 1930 MHz (NUL = 18100) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_05 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 5MHz | | | QPSK | 1 | 24 |
| 3 | 5MHz | | | QPSK | 25 | 0 |
| 4 | 10MHz | | | QPSK | 1 | 0 |
| 5 | 10MHz | | | QPSK | 1 | 49 |
| 6 | 10MHz | | | QPSK | 12 | 0 |
| 7 | 10MHz | | | QPSK | 12 | 38 |
| 8 | 10MHz | | | QPSK | 48 | 0 |
| 9 | 10MHz | | | QPSK | 48 | 2 |
| 10 (Note 8) | 10MHz | | | QPSK | 50 | 0 |
| 11 (Note 8) | 10MHz | | | 16QAM (Note 7) | 50 (Note 4) | 0 |
| 12 (Note 9) | 15MHz | | | QPSK | 1 | 8 |
| 13 (Note 9) | 15MHz | | | QPSK | 1 | 66 |
| 14 (Note 9) | 15MHz | | | QPSK | 16 | 8 |
| 15 (Note 9) | 15MHz | | | QPSK | 16 | 51 |
| 16 (Note 9) | 15MHz | | | QPSK | 30 | 8 |
| 17 (Note 9) | 15MHz | | | QPSK | 30 | 37 |
| 18 (Note 9) | 20MHz | | | QPSK | 1 | 24 |
| 19 (Note 9) | 20MHz | | | QPSK | 1 | 75 |
| 20 (Note 9) | 20MHz | | | QPSK | 18 | 24 |
| 21 (Note 9) | 20MHz | | | QPSK | 18 | 58 |
| 22 (Note 9) | 20MHz | | | QPSK | 24 | 24 |
| 23 (Note 9) | 20MHz | | | QPSK | 24 | 52 |
| 24 (Note 10) | 15MHz | | | QPSK | 1 | 0 |
| 25 (Note 10) | 15MHz | | | QPSK | 1 | 74 |
| 26 (Note 10) | 15MHz | | | QPSK | 16 | 0 |
| 27 (Note 10) | 15MHz | | | QPSK | 16 | 59 |

| | | | | | |
|---|---|---|---|---|---|
| 28 (Note 10) | 15MHz | | QPSK | 48 | 0 |
| 29 (Note 10) | 15MHz | | QPSK | 48 | 27 |
| 30 (Note 10) | 15MHz | | QPSK | 75 | 0 |
| 31 (Note 10) | 15MHz | | 16QAM (Note 7) | 75 (Note 4) | 0 |
| 32 (Note 10) | 20MHz | | QPSK | 1 | 0 |
| 33 (Note 10) | 20MHz | | QPSK | 1 | 99 |
| 34 (Note 10) | 20MHz | | QPSK | 18 | 0 |
| 35 (Note 10) | 20MHz | | QPSK | 18 | 82 |
| 36 (Note 10) | 20MHz | | QPSK | 48 | 0 |
| 37 (Note 10) | 20MHz | | QPSK | 48 | 52 |
| 38 (Note 10) | 20MHz | | QPSK | 100 | 0 |
| 39 (Note 10) | 20MHz | | 16QAM (Note 7) | 100 (Note 4) | 0 |
| 40 (Note 11) | 10MHz | | QPSK | 50 | 0 |
| 41 (Note 11) | 10MHz | | 16QAM (Note 7) | 50 (Note 4) | 0 |
| 42 (Note 11) | 15MHz | | QPSK | 1 | 0 |
| 43 (Note 11) | 15MHz | | QPSK | 75 | 0 |
| 44 (Note 11) | 15MHz | | QPSK | 16 | 8 |
| 45 (Note 11) | 15MHz | | QPSK | 30 | 8 |
| 46 (Note 11) | 15MHz | | QPSK | 54 | 8 |
| 47 (Note 11) | 15MHz | | QPSK | 64 | 8 |
| 48 (Note 11) | 15MHz | | QPSK | 1 | 74 |
| 49 (Note 11) | 15MHz | | QPSK | 6 | 69 |
| 50 (Note 11) | 15MHz | | QPSK | 8 | 67 |
| 51 (Note 11) | 20MHz | | QPSK | 1 | 0 |
| 52 (Note 11) | 20MHz | | QPSK | 100 | 0 |
| 53 (Note 11) | 20MHz | | QPSK | 18 | 24 |
| 54 (Note 11) | 20MHz | | QPSK | 24 | 24 |
| 55 (Note 11) | 20MHz | | QPSK | 40 | 24 |
| 56 (Note 11) | 20MHz | | QPSK | 50 | 24 |
| 57 (Note 11) | 20MHz | | QPSK | 72 | 24 |
| 58 (Note 11) | 20MHz | | QPSK | 1 | 99 |
| 59 (Note 11) | 20MHz | | QPSK | 6 | 94 |
| 60 (Note 11) | 20MHz | | QPSK | 24 | 76 |
| 61 | 10MHz | | QPSK | 50 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| (Note 12) | | | | | |
| 62 (Note 12) | 10MHz | | 16QAM (Note 7) | 50 (Note 4) | 0 |
| 63 (Note 12) | 15MHz | | QPSK | 1 | 0 |
| 64 (Note 12) | 15MHz | | QPSK | 1 | 74 |
| 65 (Note 12) | 15MHz | | QPSK | 16 | 0 |
| 66 (Note 12) | 15MHz | | QPSK | 16 | 59 |
| 67 (Note 12) | 15MHz | | QPSK | 48 | 0 |
| 68 (Note 12) | 15MHz | | QPSK | 48 | 27 |
| 69 (Note 12) | 15MHz | | QPSK | 75 | 0 |
| 70 (Note 12) | 15MHz | | 16QAM (Note 7) | 75 (Note 4) | 0 |
| 71 (Note 12) | 20MHz | | QPSK | 1 | 0 |
| 72 (Note 12) | 20MHz | | QPSK | 1 | 99 |
| 73 (Note 12) | 20MHz | | QPSK | 18 | 0 |
| 74 (Note 12) | 20MHz | | QPSK | 18 | 82 |
| 75 (Note 12) | 20MHz | | QPSK | 48 | 0 |
| 76 (Note 12) | 20MHz | | QPSK | 48 | 52 |
| 77 (Note 12) | 20MHz | | QPSK | 100 | 0 |
| 78 (Note 12) | 20MHz | | 16QAM (Note 7) | 100 (Note 4) | 0 |

Note 1: Void
Note 2: Void
Note 3: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 4: Applies only for UE-Categories ≥2.
Note 5: Void.
Note 6: Void.
Note 7: The 16QAM configurations shall not apply to UEs which support UL 64QAM.
Note 8: Applies when bit number 1 in modifiedMPRbehavior = 0 (Rel-11 minimum requirements apply) for Band1 and not available for Band65.
Note 9: Applies for low range and when bit number 1 in modifiedMPRbehavior = 0 (Rel-11 minimum requirements apply) for Band1 and not available for Band65.
Note 10: Applies for mid range and when bit number 1 in modifiedMPRbehavior = 0 (Rel-11 minimum requirements apply) for Band1 and not available for Band65.
Note 11: Applies only for low range and when bit number 1 in modifiedMPRbehavior = 1 (Rel-12 minimum requirements apply) for Band1 and low range for Band65.
Note 12: Applies only for mid range and when bit number 1 in modifiedMPRbehavior = 1 (Rel-12 minimum requirements apply) for Band1 and mid range for Band65.
Note 13: ModifiedMPRbehavior is defined in annex J.1.

**Table 6.2.4.4.1-4: Test Configuration Table (network signalled value "NS_06")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz | |
| **Test Parameters for NS_06 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 1.4MHz | N/A for A-MPR testing | | QPSK | 6 |
| 2 | 1.4MHz | | | QPSK | 5 |
| 3 | 1.4MHz | | | 16QAM (Note 4) | 5 |
| 4 | 5MHz | | | QPSK | 25 |
| 5 | 5MHz | | | QPSK | 8 |
| 6 | 5MHz | | | 16QAM (Note 4) | 8 |
| 7 | 10MHz | | | QPSK | 50 |
| 8 | 10MHz | | | QPSK | 12 |
| 9 | 10MHz | | | 16QAM (Note 4) | 12 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-5: Test Configuration Table (network signalled value "NS_07")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Mid range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10MHz | | |
| **Test Parameters for NS_07 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 10MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 10MHz | | | QPSK | 8 | 0 |
| 3 | 10MHz | | | QPSK | 6 | 13 |
| 4 | 10MHz | | | QPSK | 20 | 13 |
| 5 | 10MHz | | | QPSK | 12 | 13 |
| 6 | 10MHz | | | 16QAM (Note 3) | 36 (Note 2) | 13 |
| 7 | 10MHz | | | QPSK | 16 | 19 |
| 8 | 10MHz | | | QPSK | 12 | 19 |
| 9 | 10MHz | | | 16QAM (Note 3) | 16 | 19 |
| 10 | 10MHz | | | QPSK | 30 | 19 |
| 11 | 10MHz | | | 16QAM (Note 3) | 30 (Note 2) | 19 |
| 12 | 10MHz | | | QPSK | 6 | 43 |
| 13 | 10MHz | | | QPSK | 2 | 48 |
| 14 | 10MHz | | | QPSK | 50 | 0 |
| 15 | 10MHz | | | QPSK | 12 | 0 |
| 16 | 10MHz | | | 16QAM (Note 3) | 50 (Note 2) | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: Applies only for UE-Categories ≥2.
Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-6: Test Configuration Table (network signalled value "NS_08")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz | |
| **Test Parameters for NS_08 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | QPSK | 25 |
| 4 | 10MHz | | | QPSK | 1 |
| 5 | 10MHz | | | QPSK | 12 |
| 6 | 10MHz | | | QPSK | 40 |
| 7 | 10MHz | | | QPSK | 50 |
| 8 | 10MHz | | | 16QAM (Note 5) | 50 (Note 4) |
| 9 | 15MHz | | | QPSK | 1 |
| 10 | 15MHz | | | QPSK | 16 |
| 11 | 15MHz | | | QPSK | 40 |
| 12 | 15MHz | | | QPSK | 75 |
| 13 | 15MHz | | | 16QAM (Note 5) | 75 (Note 4) |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: The 1 RB allocation shall be tested at both RB #0 and RB #max.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max + 1 - RB allocation) of the channel bandwidth
Note 4: Applies only for UE-Categories ≥2.
Note 5: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-7: Test Configuration Table (network signalled value "NS_09")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | QPSK | 25 |
| 4 | 10MHz | | | QPSK | 1 |
| 5 | 10MHz | | | QPSK | 12 |
| 6 | 10MHz | | | QPSK | 40 |
| 7 | 10MHz | | | QPSK | 50 |
| 8 | 10MHz | | | 16QAM (Note 5) | 50 (Note 4) |
| 9 | 15MHz | | | QPSK | 1 |
| 10 | 15MHz | | | QPSK | 16 |
| 11 | 15MHz | | | QPSK | 40 |
| 12 | 15MHz | | | QPSK | 54 |
| 13 | 15MHz | | | QPSK | 75 |
| 14 | 15MHz | | | 16QAM (Note 5) | 75 (Note 4) |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: The 1 RB allocation shall be tested at both RB #0 and RB #max.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max + 1 - RB allocation) of the channel bandwidth
Note 4: Applies only for UE-Categories ≥2.
Note 5: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-8: Test Configuration Table (network signalled value "NS_10")**

| Void, not tested |
|---|

**Table 6.2.4.4.1-9: Test Configuration Table (network signalled value "NS_11")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 3 MHz Channel Bandwidth:<br>a. 2001.5 MHz ($N_{UL}$ = 25515)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br><br>For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br>c. 2007.5 MHz ($N_{UL}$ = 25575)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2005.5 MHz ($N_{UL}$ = 25555)<br>c. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2007.5 MHz ($N_{UL}$ = 25575)<br>b. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 3MHz, 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_11 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 3MHz | N/A for A-MPR testing | | QPSK | 6 |
| 2 | 3MHz | | | QPSK | 15 |
| 3 | 3MHz | | | 16QAM (Note 4) | 6 |
| 4 | 3MHz | | | 16QAM (Note 4) | 15 |
| 5 | 5MHz | | | QPSK | 1 |
| 6 | 5MHz | | | QPSK | 8 |
| 7 | 5MHz | | | QPSK | 25 |
| 8 | 5MHz | | | 16QAM (Note 4) | 8 |
| 9 | 5MHz | | | 16QAM (Note 4) | 25 |
| 10 | 10MHz | | | QPSK | 1 |
| 11 | 10MHz | | | QPSK | 12 |
| 12 | 10MHz | | | QPSK | 50 |
| 13 | 10MHz | | | 16QAM (Note 4) | 12 |
| 14 | 10MHz | | | 16QAM (Note 4) | 50 (Note 3) |
| 15 | 15MHz | | | QPSK | 1 |
| 16 | 15MHz | | | QPSK | 8 |

| | | | | |
|---|---|---|---|---|
| 17 | 15MHz | | QPSK | 25 |
| 18 | 15MHz | | QPSK | 30 |
| 19 | 15MHz | | QPSK | 75 |
| 20 | 15MHz | | 16QAM (Note 4) | 8 |
| 21 | 15MHz | | 16QAM (Note 4) | 25 |
| 22 | 15MHz | | 16QAM (Note 4) | 30 |
| 23 | 15MHz | | 16QAM (Note 4) | 75 |
| 24 | 20MHz | | QPSK | 1 |
| 25 | 20MHz | | QPSK | 10 |
| 26 | 20MHz | | QPSK | 25 |
| 27 | 20MHz | | QPSK | 100 |
| 28 | 20MHz | | 16QAM (Note 4) | 10 |
| 29 | 20MHz | | 16QAM (Note 4) | 25 |
| 30 | 20MHz | | 16QAM (Note 4) | 100 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories ≥2.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-10: Test Configuration Table (network signalled value "NS_12")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: UL 814.9 MHz ($N_{UL}$ = 26699)<br><br>For 3 MHz Channel Bandwidth: UL 815.7 MHz ($N_{UL}$ = 26707)<br><br>For 5 MHz Channel Bandwidth: UL 816.7 MHz ($N_{UL}$ = 26717)<br><br>For 10 MHz Channel Bandwidth: UL 819.2 MHz ($N_{UL}$ = 26742)<br><br>For 15 MHz Channel Bandwidth: UL 821.7 MHz ($N_{UL}$ = 26767) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz and 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for A-MPR testing. | | QPSK | 1 | 0 |
| 2 | 1.4 MHz | | | QPSK | 6 | 0 |
| 3 | 1.4 MHz | | | QPSK | 1 | 1 |
| 4 | 1.4 MHz | | | QPSK | 5 | 1 |
| 5 | 1.4 MHz | | | 16QAM (Note 3) | 6 | 0 |
| 6 (Note 1) | 3 MHz | | | QPSK | 4 | 0 |
| 7 (Note 1) | 3 MHz | | | QPSK | 10 | 0 |
| 8 | 3 MHz | | | QPSK | 4 | 4 |
| 9 | 3 MHz | | | QPSK | 10 | 4 |
| 10 (Note 1) | 3 MHz | | | 16QAM (Note 3) | 15 | 0 |
| 11 | 5 MHz | | | QPSK | 8 | 0 |
| 12 | 5 MHz | | | QPSK | 15 | 0 |
| 13 | 5 MHz | | | QPSK | 8 | 7 |
| 14 (Note 1) | 5 MHz | | | QPSK | 15 | 7 |
| 15 | 5 MHz | | | 16QAM (Note 3) | 25 | 0 |
| 16 (Note 2) | 10 MHz | | | QPSK | 18 | 0 |
| 17 (Note 2) | 10 MHz | | | QPSK | 18 | 16 |
| 18 (Note 2) | 10 MHz | | | 16QAM (Note 4, 3) | 50 | 0 |
| 19 (Note 2) | 15 MHz | | | QPSK | 30 | 0 |
| 20 (Note 2) | 15 MHz | | | QPSK | 30 | 31 |
| 21 (Note 2) | 15 MHz | | | 16QAM (Note 4, 3) | 75 | 0 |
| Note 1: Only for UEs of Rel-11 and earlier<br>Note 2: Only for UEs of Rel-12 and later<br>Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.<br>Note 4 : Applies only for UE-Categories ≥2. | | | | | | |

**Table 6.2.4.4.1-11: Test Configuration Table (network signalled value "NS_13")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: UL 819.7 MHz ($N_{UL}$ = 26747)<br><br>For 3 MHz Channel Bandwidth: UL 820.5 MHz ($N_{UL}$ = 26755)<br><br>For 5 MHz Channel Bandwidth: UL 821.5 MHz ($N_{UL}$ = 26765) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3MHz and 5 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 (Note 1) | 1.4 MHz | N/A for A-MPR testing. | | QPSK | 6 | 0 |
| 2 (Note 1) | 3 MHz | | | QPSK | 15 | 0 |
| 3 | 5 MHz | | | QPSK | 1 | 0 |
| 4 | 5 MHz | | | QPSK | 25 | 0 |
| 5 | 5 MHz | | | QPSK | 15 | 0 |
| 6 | 5 MHz | | | QPSK | 15 | 7 |
| 7 | 5 MHz | | | 16QAM (Note 2) | 25 | 0 |
| Note 1: Only for UEs of Rel-12 and later<br>Note 2: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | |

**Table 6.2.4.4.1-12: Test Configuration Table (network signalled value "NS_14")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 10 MHz Channel Bandwidth: UL 829 MHz ($N_{UL}$ = 26840)<br><br>For 15 MHz Channel Bandwidth: Mid range | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10 MHz, 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 10 MHz | N/A for A-MPR testing. | | QPSK | 1 | 0 |
| 2 | 10 MHz | | | QPSK | 25 | 0 |
| 3 | 10 MHz | | | QPSK | 50 | 0 |
| 4 | 10 MHz | | | QPSK | 25 | 1 |
| 5<br>(Note 1) | 10 MHz | | | 16QAM<br>(Note 2) | 50 | 0 |
| 6 | 15 MHz | | | QPSK | 8 | 0 |
| 7 | 15 MHz | | | QPSK | 25 | 0 |
| 8 | 15 MHz | | | QPSK | 75 | 0 |
| 9 | 15 MHz | | | QPSK | 50 | 15 |
| 10<br>(Note 1) | 15 MHz | | | 16QAM<br>(Note 2) | 75 | 0 |
| Note 1: Applies only for UE-Categories ≥2.<br>Note 2: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | |

**Table 6.2.4.4.1-13: Test Configuration Table (network signalled value "NS_15")**

| Initial Conditions | |
|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | NC |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | For 1.4 MHz Channel Bandwidth: High range<br><br>For 3 MHz Channel Bandwidth: UL 843.5 MHz ($N_{UL}$ = 26985) or High range<br><br>For 5 MHz Channel Bandwidth: UL 842.5 MHz ($N_{UL}$ = 26975) or High range<br><br>For 10 MHz Channel Bandwidth: UL 840 MHz ($N_{UL}$ = 26950) or High range<br><br>For 15 MHz Channel Bandwidth: UL 837.5 MHz ($N_{UL}$ = 26925) or High range |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz |

| Test Parameters for Channel Bandwidths | | | | | | |
|---|---|---|---|---|---|---|
| | | Downlink Configuration | | Uplink Configuration | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 (note 3) | 1.4 MHz | N/A for A-MPR testing. | | QPSK | 4 | 0 |
| 2 (note 3) | 1.4 MHz | | | 16QAM (Note 4) | 6 | 0 |
| 3 (note 3) | 3 MHz | | | QPSK | 6 | 7 |
| 4 (note 3) | 3 MHz | | | QPSK | 12 | 1 |
| 5 (note 3) | 3 MHz | | | 16QAM (Note 4) | 15 | 0 |
| 6 (note 2) | 3 MHz | | | QPSK | 15 | 0 |
| 7 (note 3) | 5 MHz | | | QPSK | 6 | 14 |
| 8 (note 3) | 5 MHz | | | QPSK | 20 | 0 |
| 9 (note 3) | 5 MHz | | | 16QAM (Note 4) | 25 | 0 |
| 10 (note 2) | 5 MHz | | | QPSK | 16 | 9 |
| 11 (note 2) | 5 MHz | | | QPSK | 25 | 0 |
| 12 (note 3) | 10 MHz | | | QPSK | 1 | 39 |
| 13 (note 3) | 10 MHz | | | QPSK | 1 | 10 |
| 14 (note 3) | 10 MHz | | | QPSK | 3 | 0 |
| 15 (note 3) | 10 MHz | | | QPSK | 20 | 3 |
| 16 (note 3) | 10 MHz | | | QPSK | 36 | 1 |
| 17 (note 3) | 10 MHz | | | QPSK | 50 | 0 |
| 18 (note 1, 3) | 10 MHz | | | 16QAM (Note 4) | 50 | 0 |
| 19 (note 2) | 10 MHz | | | QPSK | 20 | 25 |
| 20 (note 2) | 10 MHz | | | QPSK | 45 | 0 |
| 21 (note 3) | 15 MHz | | | QPSK | 18 | 36 |
| 22 (note 3) | 15 MHz | | | QPSK | 25 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| 23 (note 3) | 15 MHz | | QPSK | 54 | 0 |
| 24 (note 1, 3) | 15 MHz | | 16QAM (Note 4) | 75 | 0 |
| 25 (note 2) | 15 MHz | | QPSK | 18 | 44 |
| 26 (note 2) | 15 MHz | | QPSK | 60 | 2 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: Applicable only test frequency < high range.
Note 3: Applicable only to high range frequency testing.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-14: Test Configuration Table (network signalled value "NS_16")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: Low range<br><br>For 3 MHz Channel Bandwidth: Low range, 810 MHz ($N_{UL}$= 27070)<br><br>For 5 MHz Channel Bandwidth: Low range, 811 MHz ($N_{UL}$= 27080), 814.5 MHz ($N_{UL}$= 27115)<br><br>For 10 MHz Channel Bandwidth: Low range, 813.5 MHz ($N_{UL}$= 27105), 817 MHz ($N_{UL}$= 27140) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for A-MPR testing. | | QPSK | 1 | 0 |
| 2 | 1.4 MHz | | | QPSK | 6 | 0 |
| 3 | 1.4 MHz | | | 16QAM (Note 4) | 6 | 0 |
| 4 | 3 MHz | | | QPSK | 1 | 0 |
| 5 | 3 MHz | | | QPSK | 12 | 1 |
| 6 | 3 MHz | | | QPSK | 15 | 0 |
| 7 | 3 MHz | | | 16QAM (Note 4) | 15 | 0 |
| 8 | 5 MHz | | | QPSK | 1 | 0 |
| 9 | 5 MHz | | | QPSK | 12 | 2 |
| 10 | 5 MHz | | | QPSK | 18 | 2 |
| 11 | 5 MHz | | | QPSK | 20 | 0 |
| 12 | 5 MHz | | | QPSK | 20 | 2 |
| 13 | 5 MHz | | | QPSK | 25 | 0 |
| 14 | 5 MHz | | | 16QAM (Note 4) | 25 | 0 |
| 15 | 10 MHz | | | QPSK | 1 | 0 |
| 16 (Note 2) | 10 MHz | | | QPSK | 1 | 10 |

| | | | | | |
|---|---|---|---|---|---|
| 17 (Note 2) | 10 MHz | | QPSK | 20 | 0 |
| 18 (Note 2) | 10 MHz | | QPSK | 27 | 15 |
| 19 (Note 2) | 10 MHz | | QPSK | 32 | 15 |
| 20 | 10 MHz | | QPSK | 32 | 0 |
| 21 | 10 MHz | | QPSK | 50 | 0 |
| 22 (Note 1) | 10 MHz | | 16QAM (Note 4) | 50 | 0 |
| 23 (Note 3) | 10 MHz | | QPSK | 40 | 0 |
| 24 (Note 3) | 10 MHz | | QPSK | 40 | 1 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: Applies only for 10 MHz channel for Low Range, and 813.5 MHz
Note 3: Applies only for 10 MHz channel for 817 MHz range
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-15: Test Configuration Table (network signalled value "NS_17")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | Mid range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | 5MHz, 10MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | QPSK | 25 |
| 4 | 5MHz | | | 16QAM (Note 4) | 25 (Note 3) |
| 5 | 10MHz | | | QPSK | 1 |
| 6 | 10MHz | | | QPSK | 12 |
| 7 | 10MHz | | | QPSK | 50 |
| 8 | 10MHz | | | 16QAM (Note 4) | 50 (Note 3) |

Note 1: The 1 RB allocation shall be tested at both RB #0 and RB #max.
Note 2: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories ≥2.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-16: Test Configuration Table (network signalled value "NS_18")**

| **Initial Conditions** |
|---|

| | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | QPSK | 25 |
| 4 | 5MHz | | | 16QAM (Note 4) | 25 (Note 3) |
| 5 | 10MHz | | | QPSK | 1 |
| 6 | 10MHz | | | QPSK | 12 |
| 7 | 10MHz | | | QPSK | 50 |
| 8 | 10MHz | | | 16QAM (Note 4) | 50 (Note 3) |
| 9 | 15MHz | | | QPSK | 1 |
| 10 | 15MHz | | | QPSK | 16 |
| 11 | 15MHz | | | QPSK | 75 |
| 12 | 15MHz | | | 16QAM (Note 4) | 75 (Note 3) |
| 13 | 20MHz | | | QPSK | 1 |
| 14 | 20MHz | | | QPSK | 18 |
| 15 | 20MHz | | | QPSK | 100 |
| 16 | 20MHz | | | 16QAM (Note 4) | 100 (Note 3) |

Note 1: The 1 RB allocation shall be tested at both RB #0 and RB #max.
Note 2: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories ≥2.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-17: Test Configuration Table (network signalled value "NS_19")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 3MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 3MHz | N/A | | QPSK | 15 |
| 2 | 3MHz | | | 16QAM<br>(Note 4) | 15<br>(Note 3) |
| 3 | 10MHz | | | QPSK | 40 |
| 4 | 10MHz | | | 16QAM<br>(Note 4) | 40<br>(Note 3) |
| 5 | 15MHz | | | QPSK | 1 |
| 6 | 15MHz | | | QPSK | 18 |
| 7 | 15MHz | | | QPSK | 36 |
| 8 | 15MHz | | | QPSK | 45 |
| 9 | 15MHz | | | 16QAM<br>(Note 4) | 45<br>(Note 3) |
| 10 | 20MHz | | | QPSK | 1 |
| 11 | 20MHz | | | QPSK | 40 |
| 12 | 20MHz | | | QPSK | 45 |
| 13 | 20MHz | | | QPSK | 50 |
| 14 | 20MHz | | | 16QAM<br>(Note 4) | 50<br>(Note 3) |

Note 1: The 1 RB allocation shall be tested at both RB #0 and RB #max.
Note 2: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories ≥2.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-18: Test Configuration Table (network signalled value "NS_20")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2007.5 MHz ($N_{UL}$ = 25575)<br>c. 2012.5 MHz ($N_{UL}$ = 25625)<br>d. 2017.5 MHz ($N_{UL}$ = 25675)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_20 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 8 |
| 2 | 5MHz | | | QPSK | 15 |
| 3 | 5MHz | | | QPSK | 25 |
| 4 | 5MHz | | | 16QAM (Note 4) | 15 |
| 5 | 5MHz | | | 16QAM (Note 4) | 25 |
| 6 | 10MHz | | | QPSK | 8 |
| 7 | 10MHz | | | QPSK | 12 |
| 8 | 10MHz | | | QPSK | 50 |
| 9 | 10MHz | | | 16QAM (Note 4) | 12 |
| 10 | 10MHz | | | 16QAM (Note 4) | 50 (Note 3) |
| 11 | 15MHz | | | QPSK | 6 |
| 12 | 15MHz | | | QPSK | 25 |
| 13 | 15MHz | | | QPSK | 36 |
| 14 | 15MHz | | | QPSK | 75 |
| 15 | 15MHz | | | 16QAM (Note 4) | 25 |
| 16 | 15MHz | | | 16QAM (Note 4) | 36 |
| 17 | 15MHz | | | 16QAM (Note 4) | 75 |
| 18 | 20MHz | | | QPSK | 8 |
| 19 | 20MHz | | | QPSK | 18 |

| | | | | |
|---|---|---|---|---|
| 20 | 20MHz | | QPSK | 25 |
| 21 | 20MHz | | QPSK | 75 |
| 22 | 20MHz | | QPSK | 100 |
| 23 | 20MHz | | 16QAM (Note 4) | 18 |
| 24 | 20MHz | | 16QAM (Note 4) | 25 |
| 25 | 20MHz | | 16QAM (Note 4) | 75 |
| 26 | 20MHz | | 16QAM (Note 4) | 100 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories ≥2.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-19: Test Configuration Table (network signalled value "NS_21")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range or High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5 MHz, 10 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 (note 2) | 5 MHz | | | QPSK | 1 | 0 |
| 2 (note 2) | 5 MHz | | | QPSK | 25 | 0 |
| 3 (note 2) | 10 MHz | | | QPSK | 1 | 0 |
| 4 (note 3) | 10 MHz | | | QPSK | 1 | 49 |
| 5 (note 2) | 10 MHz | | | QPSK | 15 | 0 |
| 6 (note 3) | 10 MHz | | | QPSK | 3 | 47 |
| 7 (note 3) | 10 MHz | | | QPSK | 50 | 0 |
| 8 (note 1, 3) | 10 MHz | | | 16QAM (Note 4) | 50 | 0 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: Applicable only to low range frequency testing.
Note 3: Applicable only to high range frequency testing.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-20: Test Configuration Table (network signalled value "NS_22")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_22 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 5MHz | | | QPSK | 25 | 0 |
| 3 | 5MHz | | | QPSK | 1 | 24 |
| 4 | 5MHz | | | 16QAM | 1 | 0 |
| 5 | 5MHz | | | 16QAM | 1 | 24 |
| 6 | 10MHz | | | QPSK | 50 | 0 |
| 7 | 10MHz | | | QPSK | 36 | 0 |
| 8 | 10MHz | | | QPSK | 1 | 0 |
| 9 | 10MHz | | | QPSK | 1 | 49 |
| 10 | 10MHz | | | 16QAM | 1 | 0 |
| 11 | 10MHz | | | 16QAM | 1 | 49 |
| 12 | 15MHz | | | QPSK | 75 | 0 |
| 13 | 15MHz | | | QPSK | 50 | 0 |
| 14 | 15MHz | | | QPSK | 1 | 0 |
| 15 | 15MHz | | | QPSK | 1 | 74 |
| 16 | 15MHz | | | 16QAM | 1 | 0 |
| 17 | 15MHz | | | 16QAM | 1 | 74 |
| 18 | 20MHz | | | QPSK | 100 | 0 |
| 19 | 20MHz | | | QPSK | 64 | 0 |
| 20 | 20MHz | | | QPSK | 1 | 0 |
| 21 | 20MHz | | | QPSK | 1 | 99 |
| 22 | 20MHz | | | 16QAM | 1 | 0 |
| 23 | 20MHz | | | 16QAM | 1 | 99 |
| Note 1: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | |

**Table 6.2.4.4.1-21: Test Configuration Table (network signalled value "NS_23")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_23 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 5MHz | | | QPSK | 1 | 24 |
| 3 | 5MHz | | | QPSK | 25 | 0 |
| 4 | 5MHz | | | 16QAM | 1 | 0 |
| 5 | 5MHz | | | 16QAM | 1 | 24 |
| 6 | 10MHz | | | QPSK | 50 | 0 |
| 7 | 15MHz | | | QPSK | 75 | 0 |
| 8 | 20MHz | | | QPSK | 100 | 0 |
| Note 1: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | |

**Table 6.2.4.4.1-22: Test Configuration Table (network signalled value "NS_24")**

| Initial Conditions | |
|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | Normal |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | Refer to $F_{UL}$ in test parameters with following:<br><br>5 MHz CH BW:<br>- 1985 MHz ($N_{UL}$ = 131722)<br>- 2007.5 MHz ($N_{UL}$ = high range)<br>10 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772)<br>- 2005 MHz ($N_{UL}$ = high range)<br>15 MHZ CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772)<br>- 2002.5 MHz ($N_{UL}$ = high range)<br>20 MHz CH BW:<br>- 2000 MHz ($N_{UL}$ = high range) |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | 5MHz, 10MHz, 15MHz, 20MHz |

**Test Parameters for NS_24 A-MPR**

| | | | Downlink Configuration | | Uplink Configuration | | |
|---|---|---|---|---|---|---|---|
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 2007.5 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 2007.5 | 5MHz | | | QPSK | 8 | 17 |
| 3 | 2007.5 | 5MHz | | | QPSK | 25 | 0 |
| 4 (Notes 2,3) | 2007.5 | 5MHz | | | 16QAM | 25 | 0 |
| 5 | 1985 | 5MHz | | | QPSK | 8 | 17 |
| 6 | 1980 | 10MHz | | | QPSK | 12 | 1 |
| 7 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 50 | 0 |
| 8 | 1980 | 10MHz | | | QPSK | 48 | 2 |
| 9 | 1980 | 10MHz | | | QPSK | 25 | 25 |
| 10 | 1980 | 10MHz | | | QPSK | 1 | 49 |
| 11 | 1980 | 10MHz | | | QPSK | 12 | 38 |
| 12 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 12 | 38 |
| 13 | 1980 | 10MHz | | | QPSK | 3 | 47 |
| 14 | 1980 | 10MHz | | | QPSK | 8 | 1 |
| 15 | 1990 | 10MHz | | | QPSK | 1 | 0 |
| 16 | 1990 | 10MHz | | | QPSK | 12 | 38 |
| 17 (Notes 2,3) | 1990 | 10MHz | | | 16QAM | 50 | 0 |
| 18 | 2005 | 10MHz | | | QPSK | 12 | 38 |
| 19 | 2005 | 10MHz | | | QPSK | 50 | 0 |
| 20 (Notes 2,3) | 2005 | 10MHz | | | 16QAM | 50 | 0 |
| 21 | 1980 | 15MHz | | | QPSK | 1 | 11 |
| 22 | 1980 | 15MHz | | | QPSK | 16 | 11 |
| 23 | 1980 | 15MHz | | | QPSK | 45 | 11 |
| 24 (Notes 2,3) | 1980 | 15MHz | | | 16QAM | 50 | 0 |
| 25 | 1980 | 15MHz | | | QPSK | 16 | 28 |
| 26 | 1980 | 15MHz | | | QPSK | 16 | 59 |
| 27 | 1980 | 15MHz | | | QPSK | 60 | 15 |
| 28 | 1980 | 15MHz | | | QPSK | 30 | 12 |
| 29 | 2002.5 | 15MHz | | | QPSK | 1 | 0 |
| 30 | 2002.5 | 15MHz | | | QPSK | 16 | 59 |
| 31 (Notes 2,3) | 2002.5 | 15MHz | | | 16QAM | 16 | 59 |
| 32 (Notes 2,3) | 2002.5 | 15MHz | | | 16QAM | 75 | 0 |
| 33 | 2000 | 20MHz | | | QPSK | 1 | 0 |
| 34 | 2000 | 20MHz | | | QPSK | 18 | 82 |
| 35 (Notes 2,3) | 2000 | 20MHz | | | 16QAM | 18 | 82 |
| 36 (Notes 2,3) | 2000 | 20MHz | | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.

| | |
|---|---|
| Note 2: | Applies only for UE-Categories ≥2. |
| Note 3: | The 16QAM configurations shall not apply to UEs which support UL 64QAM. |

**Table 6.2.4.4.1-23: Test Configuration Table (network signalled value "NS_25")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br>5 MHz CH BW:<br>- 2007.5 MHz ($N_{UL}$ = high range)<br>10 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772)<br>- 2005 MHz ($N_{UL}$ = high range)<br>15 MHZ CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772)<br>- 2002.5 MHz ($N_{UL}$ = high range)<br>20 MHz CH BW:<br>- 2000 MHz ($N_{UL}$ = high range) | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_25 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 2007.5 | 5MHz | N/A for A-MPR testing | | QPSK | 25 | 0 |
| 2 (Notes 2,3) | 2007.5 | 5MHz | | | 16QAM | 25 | 0 |
| 3 | 2007.5 | 5MHz | | | QPSK | 8 | 9 |
| 4 | 2007.5 | 5MHz | | | QPSK | 1 | 24 |
| 5 | 2007.5 | 5MHz | | | QPSK | 8 | 17 |
| 6 (Notes 2,3) | 2007.5 | 5MHz | | | 16QAM | 8 | 17 |
| 7 | 1980 | 10MHz | | | QPSK | 12 | 1 |
| 8 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 50 | 0 |
| 9 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 48 | 2 |
| 10 | 1980 | 10MHz | | | QPSK | 25 | 25 |
| 11 | 1980 | 10MHz | | | QPSK | 1 | 49 |
| 12 | 1980 | 10MHz | | | QPSK | 12 | 38 |
| 13 | 1990 | 10MHz | | | QPSK | 12 | 0 |
| 14 | 1990 | 10MHz | | | QPSK | 25 | 0 |
| 15 | 1990 | 10MHz | | | QPSK | 50 | 0 |
| 16 (Notes 2,3) | 1990 | 10MHz | | | 16QAM | 25 | 0 |
| 17 | 1990 | 10MHz | | | QPSK | 48 | 2 |
| 18 | 1990 | 10MHz | | | QPSK | 30 | 19 |
| 19 (Notes 2,3) | 1990 | 10MHz | | | 16QAM | 30 | 19 |
| 20 | 1990 | 10MHz | | | QPSK | 12 | 31 |
| 21 | 2005 | 10MHz | | | QPSK | 1 | 0 |
| 22 | 2005 | 10MHz | | | QPSK | 12 | 6 |
| 23 | 2005 | 10MHz | | | QPSK | 50 | 0 |
| 24 (Notes 2,3) | 2005 | 10MHz | | | 16QAM | 50 | 0 |
| 25 | 2005 | 10MHz | | | QPSK | 40 | 10 |
| 26 (Notes 2,3) | 2005 | 10MHz | | | 16QAM | 40 | 10 |
| 27 | 2005 | 10MHz | | | QPSK | 32 | 18 |
| 28 (Notes 2,3) | 2005 | 10MHz | | | 16QAM | 32 | 18 |
| 29 | 2005 | 10MHz | | | QPSK | 12 | 23 |
| 30 | 1980 | 15MHz | | | QPSK | 16 | 4 |
| 31 | 1980 | 15MHz | | | QPSK | 75 | 0 |
| 32 | 1980 | 15MHz | | | QPSK | 60 | 15 |
| 33 (Notes 2,3) | 1980 | 15MHz | | | 16QAM | 40 | 35 |
| 34 | 1980 | 15MHz | | | QPSK | 1 | 74 |
| 35 | 1980 | 15MHz | | | QPSK | 12 | 63 |
| 36 | 1980 | 15MHz | | | QPSK | 16 | 55 |
| 37 | 2002.5 | 15MHz | | | QPSK | 1 | 0 |
| 38 | 2002.5 | 15MHz | | | QPSK | 16 | 0 |
| 39 (Notes 2,3) | 2002.5 | 15MHz | | | 16QAM | 16 | 0 |
| 40 (Notes 2,3) | 2002.5 | 15MHz | | | 16QAM | 1 | 0 |
| 41 | 1980 | 20MHz | | | QPSK | 1 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 42 | 1980 | 20MHz | | QPSK | 18 | 0 |
| 43 (Notes 2,3) | 1980 | 20MHz | | 16QAM | 100 | 0 |
| 44 | 1980 | 20MHz | | QPSK | 64 | 36 |
| 45 | 1980 | 20MHz | | QPSK | 18 | 72 |
| 46 (Notes 2,3) | 1980 | 20MHz | | 16QAM | 54 | 46 |
| 47 | 1980 | 20MHz | | QPSK | 18 | 55 |
| 48 | 2000 | 20MHz | | QPSK | 1 | 0 |
| 49 | 2000 | 20MHz | | QPSK | 18 | 72 |
| 50 (Notes 2,3) | 2000 | 20MHz | | 16QAM | 18 | 72 |
| 51 (Notes 2,3) | 2000 | 20MHz | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: Applies only for UE-Categories ≥2.
Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-24: Test Configuration Table (network signalled value "NS_27")**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to Frequency column in test parameters | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_27 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Frequency** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | Low/Mid | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | High | 5MHz | | | QPSK | 1 | 24 |
| 3 | Low/Mid/High | 5MHz | | | QPSK | 25 | 0 |
| 4 | Low/Mid/High | 5MHz | | | 16QAM | 25 | 0 |
| 5 | Low/Mid | 10MHz | | | QPSK | 1 | 0 |
| 6 | High | 10MHz | | | QPSK | 1 | 49 |
| 7 | Low/Mid/High | 10MHz | | | QPSK | 50 | 0 |
| 8 (Note 2) | Low/Mid/High | 10MHz | | | 16QAM | 50 | 0 |
| 9 | Low/Mid | 15MHz | | | QPSK | 1 | 0 |
| 10 | Low | 15MHz | | | QPSK | 1 | 7 |
| 11 | Low/Mid | 15MHz | | | QPSK | 16 | 0 |
| 12 | High | 15MHz | | | QPSK | 1 | 74 |
| 13 | High | 15MHz | | | QPSK | 1 | 67 |
| 14 | High | 15MHz | | | QPSK | 16 | 0 |
| 15 | Low/Mid/High | 15MHz | | | QPSK | 75 | 0 |
| 16 (Note 2) | Low/Mid/High | 15MHz | | | 16QAM | 75 | 0 |
| 17 | Low/Mid | 20MHz | | | QPSK | 1 | 0 |
| 18 | Low | 20MHz | | | QPSK | 1 | 13 |
| 19 | Low | 20MHz | | | QPSK | 1 | 16 |
| 20 | Low/Mid | 20MHz | | | QPSK | 21 | 0 |
| 21 | High | 20MHz | | | QPSK | 1 | 99 |
| 22 | High | 20MHz | | | QPSK | 1 | 86 |
| 23 | High | 20MHz | | | QPSK | 1 | 83 |
| 24 | High | 20MHz | | | QPSK | 21 | 0 |
| 25 | Low/Mid/High | 20MHz | | | QPSK | 100 | 0 |
| 26 (Note 2) | Low/Mid/High | 20MHz | | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: Applies only for UE-Categories ≥2.
Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-25: Test Configuration Table (network signalled value "NS_35")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_35 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 25 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | 16QAM (Note 4) | 8 |
| 4 | 10MHz | | | QPSK | 50 |
| 5 | 10MHz | | | QPSK | 12 |
| 6 | 10MHz | | | 16QAM (Note 4) | 12 |
| 7 | 15MHz | | | QPSK | 75 |
| 8 | 15MHz | | | QPSK | 16 |
| 9 | 15MHz | | | 16QAM (Note 4) | 16 |
| 10 | 20MHz | | | QPSK | 100 |
| 11 | 20MHz | | | QPSK | 18 |
| 12 | 20MHz | | | 16QAM (Note 4) | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4.4.1-26: Test Configuration Table (network signalled value "NS_36")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>5 MHz CH BW:<br>- 700.5 MHz ($N_{UL}$ = low range)<br>- 705.5 MHz ($N_{UL}$ =132747)<br>10 MHz CH BW:<br>- 703 MHz ($N_{UL}$ = low range)<br>- 708 MHz ($N_{UL}$ = 132772)<br>15 MHz CH BW:<br>- 705.5 MHz ($N_{UL}$ = low range)<br>- 710.5 MHz ($N_{UL}$ =132797 ) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz | | |
| **Test Parameters for NS_36 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 700.5 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 700.5 | 5MHz | | | QPSK | 25 | 0 |
| 3 | 700.5 | 5MHz | | | QPSK | 20 | 1 |
| 4 | 700.5 | 5MHz | | | QPSK | 24 | 1 |
| 5 | 700.5 | 5MHz | | | QPSK | 12 | 0 |
| 6 (Notes 2,3) | 700.5 | 5MHz | | | 16QAM | 12 | 0 |
| 7 | 705.5 | 5MHz | | | QPSK | 25 | 0 |
| 8 (Notes 2,3) | 705.5 | 5MHz | | | 16QAM | 25 | 0 |
| 9 | 703 | 10MHz | | | QPSK | 50 | 0 |
| 10 | 703 | 10MHz | | | QPSK | 1 | 0 |
| 11 | 703 | 10MHz | | | QPSK | 40 | 9 |
| 12 | 703 | 10MHz | | | QPSK | 36 | 13 |
| 13 | 703 | 10MHz | | | QPSK | 10 | 40 |
| 14 | 703 | 10MHz | | | QPSK | 6 | 44 |
| 15 | 708 | 10MHz | | | QPSK | 50 | 0 |
| 16 (Notes 2,3) | 708 | 10MHz | | | 16QAM | 50 | 0 |
| 17 | 705.5 | 15MHz | | | QPSK | 75 | 0 |
| 18 | 705.5 | 15MHz | | | QPSK | 50 | 17 |
| 19 | 705.5 | 15MHz | | | QPSK | 50 | 24 |
| 20 | 705.5 | 15MHz | | | QPSK | 1 | 57 |
| 21 | 705.5 | 15MHz | | | QPSK | 10 | 17 |
| 22 | 705.5 | 15MHz | | | QPSK | 18 | 24 |
| 23 (Notes 2,3) | 705.5 | 15MHz | | | 16QAM | 18 | 24 |
| 24 | 710.5 | 15MHz | | | QPSK | 75 | 0 |
| 25 | 710.5 | 15MHz | | | 16QAM | 75 | 0 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 2: Applies only for UE-Categories ≥2.<br>Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | | |

Editor's note: The following lines belong at the end of section 6.2.4.4.1. As new tables are added to this section, these lines should always follow the tables.

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to the applicable table from Table 6.2.4.4.1-1 to Table 6.2.4.4.1-26.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.4.4.3.

### 6.2.4.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to the applicable table from Table 6.2.4.4.1-1 to Table 6.2.4.4.1-26. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test.

### 6.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exceptions for each network signalled value.

#### 6.2.4.4.3.1 Message contents exceptions (network signalled value "NS_03")

1. Information element additionalSpectrumEmission is set to NS_03. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.1-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_03"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 3 (NS_03) | | |

#### 6.2.4.4.3.2 Message contents exceptions (network signalled value "NS_04")

1. Information element additionalSpectrumEmission is set to NS_04. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.2-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_04"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 4 (NS_04) | | |

#### 6.2.4.4.3.3 Message contents exceptions (network signalled value "NS_05")

1. Information element additionalSpectrumEmission is set to NS_05. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.3-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_05"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 5 (NS_05) | | |

6.2.4.4.3.4 Message contents exceptions (network signalled value "NS_06")

1. Information element additionalSpectrumEmission is set to NS_06. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.4-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_06"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 6 (NS_06) | | |

6.2.4.4.3.5 Message contents exceptions (network signalled value "NS_07")

1. Information element additionalSpectrumEmission is set to NS_07. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.5-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_07"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 7 (NS_07) | | |

6.2.4.4.3.6 Message contents exceptions (network signalled value "NS_08")

1. Information element additionalSpectrumEmission is set to NS_08. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.6-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_08"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 8 (NS_08) | | |

6.2.4.4.3.7 Message contents exceptions (network signalled value "NS_09")

1. Information element additionalSpectrumEmission is set to NS_09. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.7-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_09"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 9 (NS_09) | | |

6.2.4.4.3.8 Message contents exceptions (network signalled value "NS_10")

Void

6.2.4.4.3.9 Message contents exceptions (network signalled value "NS_11")

1. Information element additionalSpectrumEmission is set to NS_11. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.9-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_11"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 11 (NS_11) | | |

6.2.4.4.3.10 Message contents exceptions (network signalled value "NS_12")

1. Information element additionalSpectrumEmission is set to NS_12. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.10-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_12"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 12 (NS_12) | | |

6.2.4.4.3.11 Message contents exceptions (network signalled value "NS_13")

1. Information element additionalSpectrumEmission is set to NS_13. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.11-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_13"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 13 (NS_13) | | |

6.2.4.4.3.12 Message contents exceptions (network signalled value "NS_14")

1. Information element additionalSpectrumEmission is set to NS_14. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.12-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_14"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 14 (NS_14) | | |

6.2.4.4.3.13 Message contents exceptions (network signalled value "NS_15")

1. Information element additionalSpectrumEmission is set to NS_15. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.13-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_15"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 15 (NS_15) | | |

6.2.4.4.3.14 Message contents exceptions (network signalled value "NS_16")

1. Information element additionalSpectrumEmission is set to NS_16. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.14-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_16"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 16 (NS_16) | | |

6.2.4.4.3.15 Message contents exceptions (network signalled value "NS_17")

1. Information element additionalSpectrumEmission is set to NS_17. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.15-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_17"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 17 (NS_17) | | |

6.2.4.4.3.16 Message contents exceptions (network signalled value "NS_18")

1. Information element additionalSpectrumEmission is set to NS_18. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.16-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_18"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 18 (NS_18) | | |

6.2.4.4.3.17 Message contents exceptions (network signalled value "NS_19")

1. Information element additionalSpectrumEmission is set to NS_19. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.17-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_19"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 19 (NS_19) | | |

6.2.4.4.3.18 Message contents exceptions (network signalled value "NS_20")

1. Information element additionalSpectrumEmission is set to NS_20. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.18-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_20"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 20 (NS_20) | | |

6.2.4.4.3.19 Message contents exceptions (network signalled value "NS_21")

1. Information element additionalSpectrumEmission is set to NS_21. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.19-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_21"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 21 (NS_21) | | |

6.2.4.4.3.20 Message contents exceptions (network signalled value "NS_22")

1. Information element additionalSpectrumEmission is set to NS_21. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.20-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_22"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 22 (NS_22) | | |

6.2.4.4.3.21 Message contents exceptions (network signalled value "NS_23")

1. Information element additionalSpectrumEmission is set to NS_21. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.21-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_23"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 23 (NS_23) | | |

6.2.4.4.3.22 Message contents exceptions (network signalled value "NS_24")

1. Information element additionalSpectrumEmission is set to NS_24. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.22-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_24"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 24 (NS_24) | | |

6.2.4.4.3.23 Message contents exceptions (network signalled value "NS_25")

1. Information element additionalSpectrumEmission is set to NS_25. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.23-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_25"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 25 (NS_25) | | |

6.2.4.4.3.24 Reserved

6.2.4.4.3.25 Message contents exceptions (network signalled value "NS_27")

1. Information element additionalSpectrumEmission is set to NS_27. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.1-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_27"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 27 (NS_27) | | |

6.2.4.4.3.26 Message contents exceptions (network signalled value "NS_35")

1. Information element additionalSpectrumEmission is set to NS_35. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.26-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_35"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 32 | | |
| additionalSpectrumEmission-v10l0 | 35 (NS_35) | | |

6.2.4.4.3.27 Message contents exceptions (network signalled value "NS_36")

1. Information element additionalSpectrumEmission is set to NS_36. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.27-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_36"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 32 | | |
| additionalSpectrumEmission-v10l0 | 36 (NS_36) | | |

6.2.4.4.3.28 Message contents exceptions (network signalled value "NS_38")

1. Information element additionalSpectrumEmission is set to NS_38. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.28-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_38"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 32 | | |
| additionalSpectrumEmission-v10l0 | 38 (NS_38) | | |

6.2.4.4.3.29 Message contents exceptions (network signalled value "NS_39")

1. Information element additionalSpectrumEmission is set to NS_39. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4.4.3.29-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_39"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 32 | | |
| additionalSpectrumEmission-v10l0 | 39 (NS_39) | | |

### 6.2.4.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable table from Table 6.2.4.5-1 to Table 6.2.4.5-29. The allowed A-MPR values specified in Table 6.2.4.3-1 are in addition to the allowed MPR requirements specified in clause 6.2.3. For the UE maximum output power modified by MPR and/or A-MPR, the power limits specified in Table 6.2.5.3-1 apply.

**Table 6.2.4.5-1: UE Power Class test requirements (network signalled value "NS_03") (for Bands 4, 10, 23, 35, 36, 66, and 70)**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 2 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 3 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 4 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 5 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 6 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 7 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 8 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 9 | 0 | 1 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 10 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 11 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 12 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 13 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 14 | 0 | 1 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 15 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 16 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 17 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 18 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 19 | 0 | 1 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 20 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 21 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 22 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 23 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 24 | 0 | 1 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 25 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 26 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 27 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4.5-2: UE Power Class test requirements (network signalled value "NS_03") (for Bands 2 and 25)**

| Configuration ID | EUTRA band | Test Freq. | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | 2, 25 | Mid | | | | | 23 | +2.7 / -3.7 |
| 1 | 2, 25 | Low, High | | | | | 23 | +2.7 / -5.7 |
| 2 | 2, 25 | Mid | | | | | 23 | +2.7 / -2.7 |
| 2 | 2, 25 | Low, High | | | | | 23 | +2.7 / -4.2 |
| 3 | 2, 25 | Mid | | | | | 23 | +2.7 / -3.7 |
| 3 | 2, 25 | Low, High | | | | | 23 | +2.7 / -5.7 |
| 4 | 2, 25 | Mid | | | | | 23 | +2.7 / -4.7 |
| 4 | 2, 25 | Low, High | | | | | 23 | +2.7 / -7.7 |
| 5 | 2, 25 | Mid | | | | | 23 | +2.7 / -2.7 |
| 5 | 2, 25 | Low, High | | | | | 23 | +2.7 / -4.2 |
| 6 | 2, 25 | Mid | | | | | 23 | +2.7 / -6.2 |
| 6 | 2, 25 | Low, High | | | | | 23 | +2.7 / -9.2 |
| 7 | 2, 25 | Mid | | | | | 23 | +2.7 / -3.7 |
| 7 | 2, 25 | Low, High | | | | | 23 | +2.7 / -5.7 |
| 8 | 2, 25 | All | | | | | 23 | +2.7 / -4.7 |
| 9 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -3.7 |
| 9 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -5.7 |
| 10 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 10 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 11 | 2, 25 | All | | | | | 23 | +2.7 / -6.2 |
| 12 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -4.7 |
| 12 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -7.7 |
| 13 | 2, 25 | All | | | | | 23 | +2.7 / -4.7 |
| 14 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -3.7 |
| 14 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB | | | | | 23 | +2.7 / -5.7 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | allocation) | | | | | | |
| 15 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 15 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 16 | 2, 25 | All | | | | | 23 | +2.7 / -6.2 |
| 17 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -4.7 |
| 17 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -7.7 |
| 18 | 2, 25 | All | | | | | 23 | +2.7 / -4.7 |
| 19 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -3.7 |
| 19 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -5.7 |
| 20 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 20 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 21 | 2, 25 | All | | | | | 23 | +2.7 / -6.2 |
| 22 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -4.7 |
| 22 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -7.7 |
| 23 | 2, 25 | All | | | | | 23 | +2.7 / -4.7 |
| 24 | 2, 25 | All | | | | | 23 | +2.7 / -3.7 |
| 25 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 25 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 26 | 2, 25 | All | | | | | 23 | +2.7 / -6.2 |
| 27 | 2, 25 | All | | | | | 23 | +2.7 / -4.7 |

**Table 6.2.4.5-3: UE Power Class test requirements (network signalled value "NS_04")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 2 (RBstart=0; Low Range) | 0 | 1 | 1.5 | 20.5 | 2.5 | 25.7 | 17.3 |
| 2 (RBstart=0; Mid, High Range) | 0 | 1 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 2 (RBstart=17; Low, Mid Range) | 0 | 1 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 2 (RBstart=17; High Range) | 0 | 1 | 1.5 | 20.5 | 2.5 | 25.7 | 17.3 |
| 3 (RBstart=0; Low Range) | 0 | 0 | 1.5 | 21.5 | 2.0 | 25.7 | 18.8 |
| 3 (RBstart=0; Mid, High Range) | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 3 (RBstart=19; Low, Mid Range) | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 3 (RBstart=19; High Range) | 0 | 0 | 1.5 | 21.5 | 2.0 | 25.7 | 18.8 |
| 4 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 5 (RBstart=0; Low Range) | 1 | 1 | 1.5 | 19.5 | 3.5 | 25.7 | 15.3 |
| 5 (RBstart=0; Mid, High Range) | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 5 (RBstart=17; Low, Mid Range) | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 5 (RBstart=17; High Range) | 1 | 1 | 1.5 | 19.5 | 3.5 | 25.7 | 15.3 |
| 6 (Low Range) | 0 | 3 | 1.5 | 18.5 | 4.0 | 25.7 | 13.8 |
| 6 (Mid, High Range) | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 7 (Low Range) | 0 | 3 | 1.5 | 18.5 | 4.0 | 25.7 | 13.8 |
| 7 (Mid, High Range) | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 8 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 9 | 2 | 3 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 10 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 11 | 2 | 0 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 12 | 1 | 2 | 0 | 20 | 2.5 | 25.7 | 16.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 (Low, Mid Range) | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 13 (High Range) | 0 | 3 | 1.5 | 18.5 | 4.0 | 25.7 | 13.8 |
| 14 (Low, Mid Range) | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 14 (High Range) | 0 | 3 | 1.5 | 18.5 | 4.0 | 25.7 | 13.8 |
| 15 (Low Range) | 0 | 3 | 1.5 | 18.5 | 4.0 | 25.7 | 13.8 |
| 15 (Mid, High Range) | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 16 (Low, Mid Range) | 0 | 3 | 1.5 | 18.5 | 4.0 | 25.7 | 13.8 |
| 16 (High Range) | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 17 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 18 | 2 | 3 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 19 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 20 | 2 | 0 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 21 | 1 | 2 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 22 | 1 | 3 | 0 | 19 | 2.0 | 25.7 | 16.3 |
| 23 (Low, Mid Range) | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 23 (High Range) | 0 | 3 | 1.5 | 18.5 | 4.0 | 25.7 | 13.8 |
| 24 (Low Range) | 0 | 3 | 1.5 | 18.5 | 4.0 | 25.7 | 13.8 |
| 24 (Mid, High Range) | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 25 (Low Range) | 0 | 3 | 1.5 | 18.5 | 4.0 | 25.7 | 13.8 |
| 25 (Mid, High Range) | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 26 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 27 | 2 | 3 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 28 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 29 | 2 | 0 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 30 | 1 | 2 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 31 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 32 (Low, Mid Range) | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 32 (High Range) | 0 | 3 | 1.5 | 18.5 | 4.0 | 25.7 | 13.8 |
| 33 | 0 | 2 | 1.5 | 19.5 | 3.5 | 25.7 | 15.3 |
| 34 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 35 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 36 | 2 | 0 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 37 | 2 | 0 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 38 | 0 | 3 | 1.5 | 18.5 | 4.0 | 25.7 | 13.8 |
| 39 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 40 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 41 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 42 (Low Range) | 1 | 2 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 42 (Mid, High | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Range, 2504.1 MHz) | | | | | | | |
| 43 (Low Range) | 2 | 2 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 43 (Mid, High Range, 2504.1 MHz ) | 2 | 0 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 44 | 0 | 3 | 1.5 | 18.5 | 4.0 | 25.7 | 13.8 |
| 45 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 46 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 47 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 48 (Low Range) | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 48 (Mid, High Range, 2510.9 MHz) | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 49 (Low Range) | 2 | 3 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 49 (Mid, High Range, 2510.9 MHz) | 2 | 0 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 50 | 0 | 3 | 1.5 | 18.5 | 4.0 | 25.7 | 13.8 |
| 51 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 52 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 53 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 54 (Low Range) | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 54 (Mid, High Range, 2517.6 MHz) | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 55 (Low Range) | 2 | 3 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 55 (Mid, High Range, 2517.6 MHz) | 2 | 0 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4.5-4: UE Power Class test requirements (network signalled value "NS_05")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 2 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 3 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 5 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 6 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 7 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 8 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 9 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 10 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 11 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 12 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 13 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 14 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 15 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 16 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 17 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 18 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 19 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 20 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 21 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 22 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 23 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 24 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 25 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 26 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 27 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 28 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 29 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 30 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 31 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 32 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 33 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 34 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 35 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 36 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 37 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 38 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 39 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 40 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 41 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 42 | 0 | 11 | 0 | 12 | 6.0 | 25.7 | 5.3 |
| 43 | 1 | 11 | 0 | 11 | 6.0 | 25.7 | 4.3 |
| 44 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 45 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 46 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 47 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 48 | 0 | 5 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 49 | 0 | 5 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 50 | 0 | 1 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 51 | 0 | 11 | 0 | 12 | 6.0 | 25.7 | 5.3 |
| 52 | 1 | 11 | 0 | 11 | 6.0 | 25.7 | 4.3 |
| 53 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 54 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 55 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 56 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 57 | 1 | 10 | 0 | 12 | 6.0 | 25.7 | 5.3 |
| 58 | 0 | 5 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 59 | 0 | 5 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 60 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 61 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 62 | 2 | 0 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 63 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 64 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 65 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 66 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 67 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 68 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 69 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 70 | 2 | 0 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 71 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 72 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 73 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 74 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 75 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 76 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 77 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 78 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |

**Table 6.2.4.5-5: UE Power Class test requirements (network signalled value "NS_06") (for Bands 13, 14, and 17)**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 2 | 13,14,17 | | | | | 23 | +2.7 / -2.7 |
| 3 | 13,14,17 | | | | | 23 | +2.7 / -2.7 |
| 4 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 5 | 13,14,17 | | | | | 23 | +2.7 / -2.7 |
| 6 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 7 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 8 | 13,14,17 | | | | | 23 | +2.7 / -2.7 |
| 9 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |

**Table 6.2.4.5-6: UE Power Class test requirements (network signalled value "NS_06") (for Band 12)**

| Configuration ID | EUTRA band | Test Freq. | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | 12 | Mid | | | | | 23 | +2.7 / -3.7 |
| 1 | 12 | Low, High | | | | | 23 | +2.7 / -5.7 |
| 2 | 12 | Mid | | | | | 23 | +2.7 / -2.7 |
| 2 | 12 | Low, High | | | | | 23 | +2.7 / -4.2 |
| 3 | 12 | Mid | | | | | 23 | +2.7 / -2.7 |
| 3 | 12 | Low, High | | | | | 23 | +2.7 / -4.2 |
| 4 | 12 | All | | | | | 23 | +2.7 / -3.7 |
| 5 | 12 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 5 | 12 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 6 | 12 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -3.7 |
| 6 | 12 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -5.7 |
| 7 | 12 | All | | | | | 23 | +2.7 / -3.7 |
| 8 | 12 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 8 | 12 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 9 | 12 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -3.7 |
| 9 | 12 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -5.7 |

**Table 6.2.4.5-7: UE Power Class test requirements (network signalled value "NS_07")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 13 | | | | | 23 | +2.7 / -18.7 |
| 2 | 13 | | | | | 23 | +2.7 / -13.7 |
| 3 | 13 | | | | | 23 | +2.7 / -2.7 |
| 4 | 13 | | | | | 23 | +2.7 / -19.7 |
| 5 | 13 | | | | | 23 | +2.7 / -18.7 |
| 6 | 13 | | | | | 23 | +2.7 / -20.7 |
| 7 | 13 | | | | | 23 | +2.7 / -3.7 |
| 8 | 13 | | | | | 23 | +2.7 / -2.7 |
| 9 | 13 | | | | | 23 | +2.7 / -4.7 |
| 10 | 13 | | | | | 23 | +2.7 / -12.7 |
| 11 | 13 | | | | | 23 | +2.7 / -13.7 |
| 12 | 13 | | | | | 23 | +2.7 / -2.7 |
| 13 | 13 | | | | | 23 | +2.7 / -6.2 |
| 14 | 13 | | | | | 23 | +2.7 / -19.7 |
| 15 | 13 | | | | | 23 | +2.7 / -18.7 |
| 16 | 13 | | | | | 23 | +2.7 / -20.7 |

**Table 6.2.4.5-8: UE Power Class test requirements (network signalled value "NS_08")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 19 | | | | | 23 | +2.7 / -2.7 |
| 2 | 19 | | | | | 23 | +2.7 / -2.7 |
| 3 | 19 | | | | | 23 | +2.7 / -3.7 |
| 4 | 19 | | | | | 23 | +2.7 / -2.7 |
| 5 | 19 | | | | | 23 | +2.7 / -2.7 |
| 6 | 19 | | | | | 23 | +2.7 / -3.7 |
| 7 | 19 | | | | | 23 | +2.7 / -8.2 |
| 8 | 19 | | | | | 23 | +2.7 / -9.7 |
| 9 | 19 | | | | | 23 | +2.7 / -2.7 |
| 10 | 19 | | | | | 23 | +2.7 / -2.7 |
| 11 | 19 | | | | | 23 | +2.7 / -3.7 |
| 12 | 19 | | | | | 23 | +2.7 / -8.2 |
| 13 | 19 | | | | | 23 | +2.7 / -9.7 |

**Table 6.2.4.5-9: UE Power Class test requirements (network signalled value "NS_09")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 21 | | | | | 23 | +2.7 / -2.7 |
| 2 | 21 | | | | | 23 | +2.7 / -2.7 |
| 3 | 21 | | | | | 23 | +2.7 / -3.7 |
| 4 | 21 | | | | | 23 | +2.7 / -2.7 |
| 5 | 21 | | | | | 23 | +2.7 / -2.7 |
| 6 | 21 | | | | | 23 | +2.7 / -3.7 |
| 7 | 21 | | | | | 23 | +2.7 / -4.7 |
| 8 | 21 | | | | | 23 | +2.7 / -6.2 |
| 9 | 21 | | | | | 23 | +2.7 / -2.7 |
| 19 | 21 | | | | | 23 | +2.7 / -2.7 |
| 11 | 21 | | | | | 23 | +2.7 / -3.7 |
| 12 | 21 | | | | | 23 | +2.7 / -4.7 |
| 13 | 21 | | | | | 23 | +2.7 / -6.2 |
| 14 | 21 | | | | | 23 | +2.7 / -8.2 |

**Table 6.2.4.5-10: UE Power Class test requirements (network signalled value "NS_10")**

| |
|---|
| Void, not tested |

**Table 6.2.4.5-11: UE Power Class test requirements (network signalled value "NS_11 for Band 23")**

| Configuration ID | EUTRA Band | Centre Frequency | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1a | 23 | 2001.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 1b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -4.7 |
| 2a | 23 | 2001.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 2b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -4.7 |
| 3a | 23 | 2001.5 MHz | | | | | 23 | + 2.7 / -12.7 |
| 3b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -6.2 |
| 4a | 23 | 2001.5 MHz | | | | | 23 | + 2.7 / -12.7 |
| 4b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -6.2 |
| 5a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -12.7 |
| 5b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -8.2 |
| 5c | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -2.7 |
| 6a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -12.7 |
| 6b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -2.7 |
| 6c | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -3.7 |
| 7a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -13.7 |
| 7b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -9.7 |
| 7c | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -4.7 |
| 8a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -13.7 |
| 8b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -3.7 |
| 8c | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -4.7 |
| 9a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -14.7 |
| 9b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 9c | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -6.2 |
| 10a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -17.7 |
| 10b | 23 | 2005.5 MHz | | | | | 23 | + 2.7 / |

| Configuration ID | EUTRA Band | Centre Frequency | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | -17.7 |
| 10c | 23 | 2015 MHz | | | | | 23 | + 2.7 / -2.7 |
| 11a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -17.7 |
| 11b | 23 | 2005.5 MHz | | | | | 23 | + 2.7 / -17.7 |
| 11c | 23 | 2015 MHz | | | | | 23 | + 2.7 / -2.7 |
| 12a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -18.7 |
| 12b | 23 | 2005.5 MHz | | | | | 23 | + 2.7 / -18.7 |
| 12c | 23 | 2015 MHz | | | | | 23 | + 2.7 / -3.7 |
| 13a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -18.7 |
| 13b | 23 | 2005.5 MHz | | | | | 23 | + 2.7 / -18.7 |
| 13c | 23 | 2015 MHz | | | | | 23 | + 2.7 / -3.7 |
| 14a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -20.7 |
| 14b | 23 | 2005.5 MHz | | | | | 23 | + 2.7 / -20.7 |
| 14c | 23 | 2015 MHz | | | | | 23 | + 2.7 / -4.7 |
| 15a | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -21.7 |
| 15b | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -16.7 |
| 16a | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -13.7 |
| 16b (Note 1) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -13.2 |
| 16b (Note 2) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -12.2 |
| 17a | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -3.7 |
| 17b | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -3.7 |
| 18a | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -12.7 |
| 18b | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -12.7 |
| 19a | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -16.7 |
| 19b | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -8.7 |
| 20a | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -13.7 |
| 20b (Note 1) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -13.2 |
| 20b (Note 2) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -13.2 |
| 21a | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -4.7 |
| 21b | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -3.7 |
| 22a | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -13.7 |

| Configuration ID | EUTRA Band | Centre Frequency | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 22b | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -13.7 |
| 23a | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -17.7 |
| 23b | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -9.7 |
| 24 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -20.7 |
| 25 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -2.7 |
| 26 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -13.7 |
| 27 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -16.7 |
| 28 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -3.7 |
| 29 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -14.7 |
| 30 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -17.7 |
| Note 1: $RB_{start}$ = RB# 0<br>Note 2: $RB_{start}$ = RB# (max +1 - RB allocation) | | | | | | | | |

**Table 6.2.4.5-12: UE Power Class 3 test requirements (network signalled value "NS_12")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 3 | 1.5 | 18.5 | 4 | 25.7 | 13.8 |
| 2 | 1 | 4 | 1.5 | 16.5 | 5 | 25.7 | 10.8 |
| 3 | 0 | 0 | 1.5 | 21.5 | 2 | 25.7 | 18.8 |
| 4 | 0 | 3 | 1.5 | 18.5 | 4 | 25.7 | 13.8 |
| 5 | 2 | 4 | 1.5 | 15.5 | 5 | 25.7 | 9.8 |
| 6 | 0 | 4 | 1.5 | 17.5 | 5 | 25.7 | 11.8 |
| 7 | 1 | 3 | 1.5 | 17.5 | 5 | 25.7 | 11.8 |
| 8 | 0 | 0 | 1.5 | 21.5 | 2 | 25.7 | 18.8 |
| 9 | 1 | 3 | 1.5 | 17.5 | 5 | 25.7 | 11.8 |
| 10 | 2 | 4 | 1.5 | 15.5 | 5 | 25.7 | 9.8 |
| 11 | 0 | 4 | 1.5 | 17.5 | 5 | 25.7 | 11.8 |
| 12 | 1 | 3 | 1.5 | 17.5 | 5 | 25.7 | 11.8 |
| 13 | 0 | 0 | 1.5 | 21.5 | 2 | 25.7 | 18.8 |
| 14 | 1 | 3 | 0 | 19 | 3,5 | 25.7 | 14.8 |
| 15 | 2 | 3 | 0 | 18 | 4 | 25.7 | 13.3 |
| 16 | 1 | 4 | 1.5 | 16.5 | 5 | 25.7 | 10.8 |
| 17 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 18 | 2 | 2 | 0 | 19 | 2 | 25.7 | 16.3 |
| 19 | 1 | 4 | 0 | 18 | 4 | 25.7 | 13.3 |
| 20 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 21 | 2 | 3 | 0 | 18 | 4 | 25.7 | 13.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4.5-13: UE Power Class 3 test requirements (network signalled value "NS_13")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 2 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 3 | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 4 | 1 | 2 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 5 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 6 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 7 | 2 | 2 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4.5-14: UE Power Class 3 test requirements (network signalled value "NS_14")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 2 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 3 | 1 | 1 | 0 | 21 | 2 | 25.7 | 18.3 |
| 4 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 5 | 2 | 1 | 0 | 20 | 2,5 | 25.7 | 16.8 |
| 6 | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 7 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 8 | 1 | 1 | 0 | 21 | 2 | 25.7 | 18.3 |
| 9 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 10 | 2 | 1 | 0 | 20 | 2,5 | 25.7 | 16.8 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4.5-15: UE Power Class test requirements (network signalled value "NS_15")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 26 | | | | | 23 | +2.7 / -4.2 |
| 2 | 26 | | | | | 23 | +2.7 / -12.2 |
| 3 | 26 | | | | | 23 | +2.7 / -5.7 |
| 4 | 26 | | | | | 23 | +2.7 / -12.2 |
| 5 | 26 | | | | | 23 | +2.7 / -19.2 |
| 6 | 26 | | | | | 23 | +2.7 / -3.7 |
| 7 | 26 | | | | | 23 | +2.7 / -4.2 |
| 8 | 26 | | | | | 23 | +2.7 / -11.7 |
| 9 | 26 | | | | | 23 | +2.7 / -17.7 |
| 10 | 26 | | | | | 23 | +2.7 / -3.7 |
| 11 | 26 | | | | | 23 | +2.7 / -6.2 |
| 12 | 26 | | | | | 23 | +2.7 / -17.2 |
| 13 | 26 | | | | | 23 | +2.7 / -8.2 |
| 14 | 26 | | | | | 23 | +2.7 / -2.7 |
| 15 | 26 | | | | | 23 | +2.7 / -3.7 |
| 16 | 26 | | | | | 23 | +2.7 / -12.7 |
| 17 | 26 | | | | | 23 | +2.7 / -15.7 |
| 18 | 26 | | | | | 23 | +2.7 / -17.7 |
| 19 | 26 | | | | | 23 | +2.7 / 3.7- |
| 20 | 26 | | | | | 23 | +2.7 / -9.7 |
| 21 | 26 | | | | | 23 | +2.7 / -3.7 |
| 22 | 26 | | | | | 23 | +2.7 / -3.7 |
| 23 | 26 | | | | | 23 | +2.7 / -11.7 |
| 24 | 26 | | | | | 23 | +2.7 / -17.7 |
| 25 | 26 | | | | | 23 | +2.7 / -3.7 |
| 26 | 26 | | | | | 23 | +2.7 / -11.7 |

**Table 6.2.4.5-16A: UE Power Class test requirements (network signalled value "NS_16") when lower channel edge is at 807 MHz**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 27 | | | | | 23 | +2.7/-2.7 |
| 2 | 27 | | | | | 23 | +2.7/-3.7 |
| 3 | 27 | | | | | 23 | +2.7-4.7 |
| 4 | 27 | | | | | 23 | +2.7/-2.7 |
| 5 | 27 | | | | | 23 | +2.7 / -4.7 |
| 6 | 27 | | | | | 23 | +2.7 / -6.2 |
| 7 | 27 | | | | | 23 | +2.7 / -8.2 |
| 8 | 27 | | | | | 23 | +2.7 / -9.7 |
| 9 | 27 | | | | | 23 | +2.7 / -4.7 |
| 10 | 27 | | | | | 23 | +2.7 / -6.2 |
| 11 | 27 | | | | | 23 | +2.7 / -11.7 |
| 12 | 27 | | | | | 23 | +2.7 / -8.2 |
| 13 | 27 | | | | | 23 | +2.7 / -11.7 |
| 14 | 27 | | | | | 23 | +2.7 / -12.7 |
| 15 | 27 | | | | | 23 | +2.7 / -9.7 |
| 16 | 27 | | | | | 23 | +2.7/-2.7 |
| 17 | 27 | | | | | 23 | +2.7 / -8.2 |
| 18 | 27 | | | | | 23 | +2.7 / -4.7 |
| 19 | 27 | | | | | 23 | +2.7 / -8.2 |
| 20 | 27 | | | | | 23 | +2.7 / -13.7 |
| 21 | 27 | | | | | 23 | +2.7 / -13.7 |
| 22 | 27 | | | | | 23 | +2.7 / -14.7 |
| 23 | 27 | | | | | 23 | +2.7 / -13.7 |
| 24 | 27 | | | | | 23 | +2.7 / -13.7 |

**Table 6.2.4.5-16B: UE Power Class test requirements (network signalled value "NS_16") when lower channel edge is at 808.5 MHz**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 27 | | | | | 23 | +2.7/-2.7 |
| 2 | 27 | | | | | 23 | +2.7/-3.7 |
| 3 | 27 | | | | | 23 | +2.7/-5.2 |
| 4 | 27 | | | | | 23 | +2.7/-2.7 |
| 5 | 27 | | | | | 23 | +2.7 / -3.7 |
| 6 | 27 | | | | | 23 | +2.7 / -3.7 |
| 7 | 27 | | | | | 23 | +2.7 / -4.7 |
| 8 | 27 | | | | | 23 | +2.7 / -2.7 |
| 9 | 27 | | | | | 23 | +2.7 / -3.7 |
| 10 | 27 | | | | | 23 | +2.7 / -4.7 |
| 11 | 27 | | | | | 23 | +2.7 / -6.2 |
| 12 | 27 | | | | | 23 | +2.7 / -6.2 |
| 13 | 27 | | | | | 23 | +2.7 / -8.2 |
| 14 | 27 | | | | | 23 | +2.7 / -9.7 |
| 15 | 27 | | | | | 23 | +2.7 / -9.7 |
| 16 | 27 | | | | | 23 | +2.7/-2.7 |
| 17 | 27 | | | | | 23 | +2.7 / -6.2 |
| 18 | 27 | | | | | 23 | +2.7 / -4.7 |
| 19 | 27 | | | | | 23 | +2.7 / -4.7 |
| 20 | 27 | | | | | 23 | +2.7 / -9.7 |
| 21 | 27 | | | | | 23 | +2.7 / -11.7 |
| 22 | 27 | | | | | 23 | +2.7 / -12.7 |
| 23 | 27 | | | | | 23 | +2.7 / -11.7 |
| 24 | 27 | | | | | 23 | +2.7 / -11.7 |

**Table 6.2.4.5-16C: UE Power Class test requirements (network signalled value "NS_16") when lower channel edge is at 812 MHz**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 27 | | | | | 23 | +2.7/-2.7 |
| 2 | 27 | | | | | 23 | +2.7/-3.7 |
| 3 | 27 | | | | | 23 | +2.7/-4.7 |
| 4 | 27 | | | | | 23 | +2.7/-2.7 |
| 5 | 27 | | | | | 23 | +2.7 / -3.7 |
| 6 | 27 | | | | | 23 | +2.7 / -3.7 |
| 7 | 27 | | | | | 23 | +2.7 / -4.7 |
| 8 | 27 | | | | | 23 | +2.7 / -2.7 |
| 9 | 27 | | | | | 23 | +2.7 / -3.7 |
| 10 | 27 | | | | | 23 | +2.7 / -3.7 |
| 11 | 27 | | | | | 23 | +2.7 / -3.7 |
| 12 | 27 | | | | | 23 | +2.7 / -3.7 |
| 13 | 27 | | | | | 23 | +2.7 / -3.7 |
| 14 | 27 | | | | | 23 | +2.7 / -4.7 |
| 15 | 27 | | | | | 23 | +2.7 / -2.7 |
| 16 | | | | | | 23 | +2.7/-2.7 |
| 17 | 27 | | | | | 23 | +2.7 / -3.7 |
| 18 | 27 | | | | | 23 | +2.7 / -3.7 |
| 19 | 27 | | | | | 23 | +2.7 / -3.7 |
| 20 | 27 | | | | | 23 | +2.7 / -4.7 |
| 21 | 27 | | | | | 23 | +2.7 / -8.2 |
| 22 | 27 | | | | | 23 | +2.7 / -9.7 |
| 23 | 27 | | | | | 23 | +2.7 / -6.2 |
| 24 | 27 | | | | | 23 | +2.7 / -4.7 |

**Table 6.2.4.5-17: UE Power Class test requirements (network signalled value "NS_17")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 28 | | | | | 23 | +2.7 / -3.2 |
| 2 | 28 | | | | | 23 | +2.7 / -3.2 |
| 3 | 28 | | | | | 23 | +2.7 / -4.2 |
| 4 | 28 | | | | | 23 | +2.7 / -5.2 |
| 5 | 28 | | | | | 23 | +2.7 / -3.2 |
| 6 | 28 | | | | | 23 | +2.7 / -3.2 |
| 7 | 28 | | | | | 23 | +2.7 / -4.2 |
| 8 | 28 | | | | | 23 | +2.7 / -5.2 |

**Table 6.2.4.5-18: UE Power Class test requirements (network signalled value "NS_18")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 28 | | | | | 23 | +2.7 / -3.2 |
| 2 | 28 | | | | | 23 | +2.7 / -4.2 |
| 3 | 28 | | | | | 23 | +2.7 / -5.2 |
| 4 | 28 | | | | | 23 | +2.7 / -6.2 |
| 5 | 28 | | | | | 23 | +2.7 / -7.2 |
| 6 | 28 | | | | | 23 | +2.7 / -7.2 |
| 7 | 28 | | | | | 23 | + 2.7 / -8.7 |
| 8 | 28 | | | | | 23 | +2.7 / -9.2 |
| 9 | 28 | | | | | 23 | +2.7 / -7.2 |
| 10 | 28 | | | | | 23 | +2.7 / -7.2 |
| 11 | 28 | | | | | 23 | +2.7 / -8.7 |
| 12 | 28 | | | | | 23 | +2.7 / -9.2 |
| 13 | 28 | | | | | 23 | +2.7 / -7.2 |
| 14 | 28 | | | | | 23 | +2.7 / -7.2 |
| 15 | 28 | | | | | 23 | +2.7 / -8.7 |
| 16 | 28 | | | | | 23 | +2.7 / -9.2 |

**Table 6.2.4.5-19: UE Power Class test requirements (network signalled value "NS_19")**

| Configuration ID | Test Freq | RB location | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Low | Full RB | 1 | 0 | 1.5 | 20.5 | 2.5 | 25.7 | 17.3 |
| 2 | Low | Full RB | 2 | 0 | 1.5 | 19.5 | 3.5 | 25.7 | 15.3 |
| 3 | Low | Low | 1 | 1 | 0 | 21 | 2 | 25.7 | 18.3 |
| 3 | Low | High | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 4 | Low | Low | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 4 | Low | High | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| 5 | Low | Low | 0 | 2 | 1.5 | 19.5 | 3.5 | 25.7 | 15.3 |
| 5 | Low | High | 0 | 0 | 0 | 23 | 2 | 25.7 | 20.3 |
| 6 | Low | Low | 1 | 2 | 1.5 | 18.5 | 4 | 25.7 | 13.8 |
| 6 | Low | High | 1 | 0 | 0 | 22 | 2.5 | 25.7 | 18.8 |
| 7 | Low | Low | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 7 | Low | High | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 8 | Low | Low | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 8 | Low | High | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 9 | Low | Low | 2 | 3 | 0 | 18 | 4 | 25.7 | 13.3 |
| 9 | Low | High | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| 10 | Low | Low | 0 | 2 | 1.5 | 19.5 | 3.5 | 25.7 | 15.3 |
| 10 | Low | High | 0 | 0 | 0 | 23 | 2 | 25.7 | 20.3 |
| 11 | Low | Low | 1 | 2 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 11 | Low | High | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 12 | Low | Low | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 12 | Low | High | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 13 | Low | Low | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 13 | Low | High | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 14 | Low | Low | 2 | 3 | 0 | 18 | 4 | 25.7 | 13.3 |
| 14 | Low | High | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero, PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | |

**Table 6.2.4.5-20: UE Power Class test requirements (network signalled value "NS_20 for Band 23")**

| Configuration ID | EUTRA Band | Centre Frequency | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -24.7 (Note 1) |
| 1b | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -2.7 |
| 1c | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -2.7 |
| 1d | 23 | 2017.5 MHz | | | | | 23 | + 2.7 / -2.7 |
| 2a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -23.7 (Note 1) |
| 2b | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -7.7 |
| 2c | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -7.7 |
| 2d | 23 | 2017.5 MHz | | | | | 23 | + 2.7 / -3.7 |
| 3a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -23.7 (Note 1) |
| 3b | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 3c | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 3d | 23 | 2017.5 MHz | | | | | 23 | + 2.7 / -3.7 |
| 4a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -23.7 (Note 1) |
| 4b | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -7.7 |
| 4c | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -7.7 |
| 4d | 23 | 2017.5 MHz | | | | | 23 | + 2.7 / -3.7 |
| 5a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -23.7 (Note 1) |
| 5b | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 5c | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 5d | 23 | 2017.5 MHz | | | | | 23 | + 2.7 / -3.7 |
| 6a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -21.7 (Note 1) |
| 6b | 23 | 2015 MHz | | | | | 23 | + 2.7 / -2.7 |
| 7a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -7.7 (Note 1) |

| Configuration ID | EUTRA Band | Centre Frequency | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 7b | 23 | 2015 MHz | | | | | 23 | + 2.7 / -2.7 |
| 8a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -11.7 (Note 1) |
| 8b | 23 | 2015 MHz | | | | | 23 | + 2.7 / -8.7 |
| 9a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -8.7 (Note 1) |
| 9b | 23 | 2015 MHz | | | | | 23 | + 2.7 / -3.7 |
| 10a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -11.7 (Note 1) |
| 10b | 23 | 2005 MHz | | | | | 23 | + 2.7 / -8.7 |
| 11 | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 12 | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -7.7 |
| 13 | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 14 | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -17.7 |
| 15 | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -8.7 |
| 16 | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -12.7 |
| 17 | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -18.7 |
| 18 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -22.7 |
| 19 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -14.7 |
| 20 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -13.7 (Note 1) |
| 21 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -8.7 (Note 1) |
| 22 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -11.7 (Note 1) |
| 23 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -15.7 (Note 1) |
| 24 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -14.7 (Note 1) |
| 25 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -19.7 (Note 1) |
| 26 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -12.7 (Note 1) |
| Note 1: The output power within 2000-2005 MHz shall not be higher than 7.7 dBm | | | | | | | | |

**Table 6.2.4.5-21: UE Power Class 3 test requirements (network signalled value "NS_21 for Band 30")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 2 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 3 | 0 | 4 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 4 | 0 | 4 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 5 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 6 | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 7 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 8 | 2 | 3 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4.5-22: UE Power Class Test requirements (network signalled value "NS_22")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 2 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 3 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 4 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 5 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 6 | 1 | 4 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 7 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 8 | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 9 | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 10 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 11 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 12 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 13 | 1 | 4 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 14 | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 15 | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 16 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 17 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 18 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 19 | 1 | 4 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 20 | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 21 | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 22 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 23 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4.5-23: UE Power Class Test requirements (network signalled value "NS_23")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 2 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 3 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 4 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 5 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 6 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 7 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 8 | 1 | 0 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4.5-24: UE Power Class 3 test requirements (network signalled value "NS_24")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 10 | 0 | 13 | 5.0 | 25.7 | 7.3 |
| 2 | 0 | 10 | 0 | 13 | 5.0 | 25.7 | 7.3 |
| 3 | 1 | 10 | 0 | 12 | 6.0 | 25.7 | 5.3 |
| 4 | 2 | 10 | 0 | 11 | 6.0 | 25.7 | 4.3 |
| 5 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 6 | 0 | 2 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 7 | 2 | 2 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 8 | 1 | 2 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 9 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 10 | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 11 | 0 | 1 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 12 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 13 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 14 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 15 | 0 | 9 | 0 | 14 | 5.0 | 25.7 | 8.3 |
| 16 | 0 | 9 | 0 | 14 | 5.0 | 25.7 | 8.3 |
| 17 | 1 | 9 | 0 | 13 | 5.0 | 25.7 | 7.3 |
| 18 | 0 | 17 | 0 | 6 | 7.0 | 25.7 | -1.7 |
| 19 | 1 | 17 | 0 | 5 | 7.0 | 25.7 | -2.7 |
| 20 | 2 | 17 | 0 | 4 | 7.0 | 25.7 | -3.7 |
| 21 | 0 | 2 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 22 | 0 | 2 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 23 | 1 | 2 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 24 | 2 | 8 | 0 | 13 | 5.0 | 25.7 | 7.3 |
| 25 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 26 | 0 | 7 | 0 | 16 | 5.0 | 25.7 | 10.3 |
| 27 | 1 | 7 | 0 | 15 | 5.0 | 25.7 | 9.3 |
| 28 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 29 | 0 | 17 | 0 | 6 | 7.0 | 25.7 | -1.7 |
| 30 | 0 | 17 | 0 | 6 | 7.0 | 25.7 | -1.7 |
| 31 | 1 | 17 | 0 | 5 | 7.0 | 25.7 | -2.7 |
| 32 | 2 | 17 | 0 | 4 | 7.0 | 25.7 | -3.7 |
| 33 | 0 | 17 | 0 | 6 | 7.0 | 25.7 | -1.7 |
| 34 | 0 | 17 | 0 | 6 | 7.0 | 25.7 | -1.7 |
| 35 | 1 | 17 | 0 | 5 | 7.0 | 25.7 | -2.7 |
| 36 | 2 | 17 | 0 | 4 | 7.0 | 25.7 | -3.7 |

Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4.5-25: UE Power Class 3 test requirements (network signalled value "NS_25")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 2 | 2 | 5 | 0 | 16 | 5.0 | 25.7 | 10.3 |
| 3 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 4 | 0 | 2 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 5 | 0 | 2 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 6 | 1 | 2 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 7 | 0 | 2 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 8 | 2 | 2 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 9 | 1 | 2 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 10 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 11 | 0 | 3 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 12 | 0 | 1 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 13 | 0 | 1 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 14 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 15 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 16 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 17 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 18 | 1 | 1 | 0 | 21 | 2.0 | 25.7 | 18.3 |
| 19 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 20 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 21 | 0 | 10 | 0 | 13 | 5.0 | 25.7 | 7.3 |
| 22 | 0 | 10 | 0 | 13 | 5.0 | 25.7 | 7.3 |
| 23 | 1 | 10 | 0 | 12 | 6.0 | 25.7 | 5.3 |
| 24 | 2 | 10 | 0 | 11 | 6.0 | 25.7 | 4.3 |
| 25 | 1 | 7 | 0 | 15 | 5.0 | 25.7 | 9.3 |
| 26 | 2 | 7 | 0 | 14 | 5.0 | 25.7 | 8.3 |
| 27 | 1 | 11 | 0 | 11 | 6.0 | 25.7 | 4.3 |
| 28 | 2 | 11 | 0 | 10 | 6.0 | 25.7 | 3.3 |
| 29 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 30 | 0 | 4 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 31 | 1 | 4 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 32 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 33 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 34 | 0 | 1 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 35 | 0 | 1 | 0 | 22 | 2.0 | 25.7 | 19.3 |
| 36 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 37 | 0 | 13 | 0 | 10 | 6.0 | 25.7 | 3.3 |
| 38 | 0 | 13 | 0 | 10 | 6.0 | 25.7 | 3.3 |
| 39 | 1 | 13 | 0 | 9 | 6.0 | 25.7 | 2.3 |
| 40 | 2 | 13 | 0 | 8 | 6.0 | 25.7 | 1.3 |
| 41 | 0 | 11 | 0 | 12 | 6.0 | 25.7 | 5.3 |
| 42 | 0 | 11 | 0 | 12 | 6.0 | 25.7 | 5.3 |
| 43 | 2 | 11 | 0 | 10 | 6.0 | 25.7 | 3.3 |
| 44 | 1 | 11 | 0 | 11 | 6.0 | 25.7 | 4.3 |
| 45 | 0 | 13 | 0 | 10 | 6.0 | 25.7 | 3.3 |
| 46 | 2 | 13 | 0 | 8 | 6.0 | 25.7 | 1.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 47 | 0 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 |
| 48 | 0 | 13 | 0 | 10 | 6.0 | 25.7 | 3.3 |
| 49 | 0 | 13 | 0 | 10 | 6.0 | 25.7 | 3.3 |
| 50 | 1 | 13 | 0 | 9 | 6.0 | 25.7 | 2.3 |
| 51 | 2 | 13 | 0 | 8 | 6.0 | 25.7 | 1.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4.5-26: Reserved**

**Table 6.2.4.5-27: UE Power Class 3 test requirements (network signalled value "NS_27")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | MAX{$T_L$, $T(P_{CMAX_L,c})$} (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 23 | 3 | 26.0 | 19 |
| 2 | 0 | 0 | 0 | 23 | 3 | 26.0 | 19 |
| 3 | 1 | 0 | 0 | 22 | 3 | 26.0 | 18 |
| 4 | 2 | 0 | 0 | 21 | 3 | 26.0 | 17 |
| 5 | 0 | 0 | 0 | 23 | 3 | 26.0 | 19 |
| 6 | 0 | 0 | 0 | 23 | 3 | 26.0 | 19 |
| 7 | 1 | 0 | 0 | 22 | 3 | 26.0 | 18 |
| 8 | 2 | 0 | 0 | 21 | 3 | 26.0 | 17 |
| 9 | 0 | 4 | 0 | 19 | 3.5 | 26.0 | 14.5 |
| 10 | 0 | 0 | 0 | 23 | 3 | 26.0 | 19 |
| 11 | 0 | 0 | 0 | 23 | 3 | 26.0 | 19 |
| 12 | 0 | 4 | 0 | 19 | 3.5 | 26.0 | 14.5 |
| 13 | 0 | 0 | 0 | 23 | 3 | 26.0 | 19 |
| 14 | 0 | 0 | 0 | 23 | 3 | 26.0 | 19 |
| 15 | 1 | 2 | 0 | 20 | 3 | 26.0 | 16 |
| 16 | 2 | 2 | 0 | 19 | 3.5 | 26.0 | 14.5 |
| 17 | 0 | 4 | 0 | 19 | 3.5 | 26.0 | 14.5 |
| 18 | 0 | 1 | 0 | 22 | 3 | 26.0 | 18 |
| 19 | 0 | 0 | 0 | 23 | 3 | 26.0 | 19 |
| 20 | 1 | 0 | 0 | 22 | 3 | 26.0 | 18 |
| 21 | 0 | 4 | 0 | 19 | 3.5 | 26.0 | 14.5 |
| 22 | 0 | 1 | 0 | 22 | 3 | 26.0 | 18 |
| 23 | 0 | 0 | 0 | 23 | 3 | 26.0 | 19 |
| 24 | 1 | 0 | 0 | 22 | 3 | 26.0 | 18 |
| 25 | 1 | 3 | 0 | 19 | 3.5 | 26.0 | 14.5 |
| 26 | 2 | 3 | 0 | 18 | 4.0 | 26.0 | 13 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4.5-28: UE Power Class 3 test requirements (network signalled value "NS_35")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 2 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 3 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 4 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 5 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 6 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 7 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 8 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 9 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 10 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 11 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 12 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |

Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4.5-29: UE Power Class 3 test requirements (network signalled value "NS_36")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 2 | 0 | 21 | 2 | 25.7 | 18.3 |
| 2 | 1 | 4 | 0 | 18 | 4 | 25.7 | 13.3 |
| 3 | 1 | 1 | 0 | 21 | 2 | 25.7 | 18.3 |
| 4 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 5 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 6 | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| 7 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 8 | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| 9 | 1 | 10 | 0 | 12 | 6 | 25.7 | 5.3 |
| 10 | 0 | 10 | 0 | 13 | 5 | 25.7 | 7.3 |
| 11 | 1 | 8 | 0 | 14 | 5 | 25.7 | 8.3 |
| 12 | 1 | 6 | 0 | 16 | 5 | 25.7 | 10.3 |
| 13 | 0 | 6 | 0 | 17 | 5 | 25.7 | 11.3 |
| 14 | 0 | 0 | 0 | 23 | 2 | 25.7 | 20.3 |
| 15 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 16 | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| 17 | 1 | 10 | 0 | 12 | 6 | 25.7 | 5.3 |
| 18 | 1 | 9 | 0 | 13 | 5 | 25.7 | 7.3 |
| 19 | 1 | 7 | 0 | 15 | 5 | 25.7 | 9.3 |
| 20 | 0 | 6 | 0 | 17 | 5 | 25.7 | 11.3 |
| 21 | 0 | 0 | 0 | 23 | 2 | 25.7 | 20.3 |
| 22 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 23 | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| 24 | 1 | 0 | 0 | 22 | 2 | 25.7 | 19.3 |
| 25 | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

# 6.2.4_1 Additional Maximum Power Reduction (A-MPR) for HPUE

## 6.2.4_1.1 Test purpose

Same test purpose as in clause 6.2.4.1 with the follow exception:

- Instead of Table 6.2.2.3-1 → use Table 6.2.2_1.3-1

## 6.2.4_1.2 Test applicability

The requirements of this test apply in test case 6.6.2.2 Additional Spectrum Emission Mask for network signalled values NS_06 and NS_04, to all types of E-UTRA Power Class 1 or Power Class 2 UE release 10 and forward.

NOTE: As a result TC 6.2.4_1 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.4_1.3 Minimum conformance requirements

For UE Power Class 1 or Power Class 2 the specific requirements and identified sub-clauses are specified in Table 6.2.4_1.3-1 along with the allowed A-MPR values that may be used to meet these requirements. The allowed A-MPR

values specified in Table 6.2.4_1.3-1 are in addition to the allowed MPR requirements specified in clause 6.2.3_1. For the UE maximum output power modified by A-MPR, the power limits specified in clause 6.2.5_1 apply.

The normative reference for this requirement is TS 36.101 clause 6.2.4.

**Table 6.2.4_1.3-1: Additional Maximum Power Reduction (A-MPR) / Spectrum Emission requirements**

| Network Signalling value | Requirements (sub-clause) | E-UTRA Band | Channel bandwidth (MHz) | Resources Blocks ($N_{RB}$) | A-MPR (dB) |
|---|---|---|---|---|---|
| NS_04 | 6.6.2.2.3.2, 6.6.3.3.3.1 | 41 | 5,10,15,20 | Table 6.2.4_1.3-2 | |
| NS_06 | 6.6.2.2.3.3 | 12, 13, 14, 17 | 1.4, 3, 5, 10 | Table 5.4.2-1 | N/A |

**Table 6.2.4_1.3-2: A-MPR requirements for "NS_04" for Power Class 2 UE**

| Channel bandwidth [MHz] | Parameters | | | | | |
|---|---|---|---|---|---|---|
| 5 | Fc [MHz] | ≤ 2500.5 | | | | > 2500.5 |
| | $RB_{start}$ | 0 - 8 | | | 9 - 24 | 0 - 24 |
| | $L_{CRB}$ [RBs] | > 0 | | | > 0 | > 0 |
| | A-MPR [dB] | ≤ 3 | | | 0 | 0 |
| 10 | Fc [MHz] | ≤ 2504 | | | | > 2504 |
| | $RB_{start}$ | 0 – 8 | | | 9 - 35 | 36 - 49 | 0 - 49 |
| | $L_{CRB}$ [RBs] | ≤ 15 | > 15 and < 25 | ≥ 25 | N/A | > 0 | > 0 |
| | $RB_{start} + L_{CRB}$ [RBs] | N/A | N/A | N/A | ≥ 45 | N/A | N/A |
| | A-MPR [dB] | ≤ 5 | ≤ 2 | ≤ 3 | ≤ 1 | 0 | 0 |
| 15 | Fc [MHz] | ≤ 2510.8 | | | | > 2510.8 |
| | $RB_{start}$ | 0 – 13 | | | 14 – 59 | 60 – 74 | 0 - 74 |
| | $L_{CRB}$ [RBs] | ≤ 18 | > 18 and < 36 | ≥ 36 | N/A | > 0 | > 0 |
| | $RB_{start} + L_{CRB}$ [RBs] | N/A | N/A | N/A | ≥ 62 | N/A | N/A |
| | A-MPR [dB] | ≤ 5 | ≤ 2 | ≤ 4 | ≤ 3 | 0 | 0 |
| 20 | Fc [MHz] | ≤ 2517.5 | | | | > 2517.5 |
| | $RB_{start}$ | 0 – 22 | | | 23 – 76 | 77 – 99 | 0 - 99 |
| | $L_{CRB}$ [RBs] | ≤ 18 | > 18 and < 40 | ≥ 40 | N/A | > 0 | > 0 |
| | $RB_{start} + L_{CRB}$ [RBs] | N/A | N/A | N/A | ≥ 86 | N/A | N/A |
| | A-MPR [dB] | ≤ 5 | ≤ 2 | ≤ 4 | ≤ 3 | 0 | 0 |

NOTE 1: $RB_{start}$ indicates the lowest RB index of transmitted resource blocks
NOTE 2: $L_{CRB}$ is the length of a contiguous resource block allocation
NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis
NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe

For a power class 2 capable UE operating in Band 41, A-MPR according to Table 6.2.4.3-2, Table 6.2.4.3-3, or Table 6.2.4.3-4 for power class 3 is allowed when an IE *P-max* as defined in [5] of 23 dBm or lower is indicated in the cell or if the uplink/downlink configuration is 0 or 6.

## 6.2.4_1.4 Test description

Same test description as in clause 6.2.4.4 with the following exceptions:

**Instead of Table 6.2.4.4.1-4 → use Table 6.2.4_1.4-1 or Table 6.2.4_1.4-2.Table 6.2.4_1.4-1: Test Configuration Table (network signalled value "NS_04")**

| Initial Conditions | |
|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | Normal |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | Low Range, Mid Range, High Range<br>Additional test frequencies:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866 |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | 5MHz, 10MHz, 15MHz, 20MHz |

| Test Parameters for NS_05 A-MPR | | | | | | |
|---|---|---|---|---|---|---|
| | | Downlink Configuration | | Uplink Configuration | | |
| Configuration ID | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD | $RB_{start}$ FDD |
| 1 (Note 1) | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 (Note 1) | 5MHz | | | QPSK | 16 | 9 |
| 3 (Note 2) | 5MHz | | | QPSK | 25 | 0 |
| 4 (Note 1) | 5MHz | | | 16QAM | 16 | 9 |
| 5 (Note 2) | 5MHz | | | 16QAM | 25 | 0 |
| 6 (Note 1) | 10MHz | | | QPSK | 1 | 0 |
| 7 (Note 1) | 10MHz | | | QPSK | 1 | 49 |
| 8 (Note 1) | 10MHz | | | QPSK | 24 | 0 |
| 9 (Note 1) | 10MHz | | | QPSK | 40 | 10 |
| 10 | 10MHz | | | QPSK | 50 | 0 |
| 11 | 10MHz | | | 16QAM | 50 | 0 |
| 12 (Note 1) | 15MHz | | | QPSK | 1 | 0 |
| 13 (Note 1) | 15MHz | | | QPSK | 1 | 74 |
| 14 (Note 1) | 15MHz | | | QPSK | 32 | 0 |
| 15 (Note 1) | 15MHz | | | QPSK | 60 | 15 |
| 16 | 15MHz | | | QPSK | 75 | 0 |
| 17 | 15MHz | | | 16QAM | 75 | 0 |
| 18 (Note 1) | 20MHz | | | QPSK | 1 | 0 |
| 19 (Note 1) | 20MHz | | | QPSK | 1 | 99 |
| 20 (Note 1) | 20MHz | | | QPSK | 36 | 0 |
| 21 (Note 1) | 20MHz | | | QPSK | 75 | 25 |
| 22 | 20MHz | | | QPSK | 100 | 0 |
| 23 | 20MHz | | | 16QAM | 100 | 0 |

Note 1: Only applicable for Low Range.
Note 2: Only applicable for Mid, High Range and additional test frequencies.

**Table 6.2.4_1.4-2: Test Configuration Table (network signalled value "NS_06")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | |
| **Test Parameters for NS_06 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| Configuration ID | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 25 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | 16QAM | 8 |
| 4 | 10MHz | | | QPSK | 50 |
| 5 | 10MHz | | | QPSK | 12 |
| 6 | 10MHz | | | 16QAM | 12 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | |

## 6.2.4_1.5 Test requirements

The maximum output power, derived in step 2 of clause 6.2.4_1.4.2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.4_1.5-1 and 6.2.4_1.5-2. The allowed A-MPR values specified in Table 6.2.4_1.3-1 are in addition to the allowed MPR requirements specified in clause 6.2.3_1. For the UE maximum output power modified by MPR and/or A-MPR, the power limits specified in Table 6.2.5_1.3-1 apply.

**Table 6.2.4_1.5-1: HPUE Power Class 1 test requirements (network signalled value "NS_06")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) |
|---|---|---|---|
| 1 | 14 | 31 | +2.7 / -4.7 |
| 2 | 14 | 31 | +2.7 / -3.7 |
| 3 | 14 | 31 | +2.7 / -4.7 |
| 4 | 14 | 31 | +2.7 / -4.7 |
| 5 | 14 | 31 | +2.7 / -3.7 |
| 6 | 14 | 31 | +2.7 / -4.7 |

**Table 6.2.4_1.5-2: UE Power Class 2 test requirements (network signalled value "NS_04")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 3 | 1.5 | 21.5 | 2.0 | 28.7 | 18.8 |
| 2 | 1 | 0 | 0 | 25 | 2.0 | 28.7 | 22.3 |
| 3 | 1 | 0 | 0 | 25 | 2.0 | 28.7 | 22.3 |
| 4 | 2 | 0 | 0 | 24 | 2.0 | 28.7 | 21.3 |
| 5 | 2 | 0 | 0 | 24 | 2.0 | 28.7 | 21.3 |
| 6 | 0 | 5 | 1.5 | 19.5 | 3.5 | 28.7 | 15.3 |
| 7 | 0 | 0 | 0 | 26 | 2.0 | 28.7 | 23.3 |
| 8 | 1 | 2 | 0 | 23 | 2.0 | 28.7 | 20.3 |
| 9 | 1 | 1 | 0 | 24 | 2.0 | 28.7 | 21.3 |
| 10 (Low Range) | 1 | 3 | 0 | 22 | 2.0 | 28.7 | 19.3 |
| 10 (Mid, High Range, 2504.1 MHz) | 1 | 0 | 0 | 25 | 2.0 | 28.7 | 22.3 |
| 11 (Low Range) | 2 | 3 | 0 | 24 | 2.0 | 28.7 | 18.3 |
| 11 (Mid, High Range, 2504.1 MHz ) | 2 | 0 | 0 | 24 | 2.0 | 28.7 | 21.3 |
| 12 | 0 | 5 | 1.5 | 19.5 | 3.5 | 28.7 | 15.3 |
| 13 | 0 | 0 | 0 | 26 | 2.0 | 28.7 | 23.3 |
| 14 | 1 | 2 | 0 | 23 | 2.0 | 28.7 | 20.3 |
| 15 | 1 | 3 | 0 | 22 | 2.0 | 28.7 | 19.3 |
| 16 (Low Range) | 1 | 4 | 0 | 21 | 2.0 | 28.7 | 18.3 |
| 16 (Mid, High Range, 2510.9 MHz) | 1 | 0 | 0 | 25 | 2.0 | 28.7 | 22.3 |
| 17 (Low Range) | 2 | 4 | 0 | 24 | 2.5 | 28.7 | 16.8 |
| 17 (Mid, High Range, 2510.9 MHz) | 2 | 0 | 0 | 25 | 2.0 | 28.7 | 21.3 |
| 18 | 0 | 5 | 1.5 | 19.5 | 3.5 | 28.7 | 15.3 |
| 19 | 0 | 0 | 0 | 26 | 2.0 | 28.7 | 23.3 |
| 20 | 1 | 2 | 0 | 23 | 2.0 | 28.7 | 20.3 |
| 21 | 1 | 3 | 0 | 22 | 2.0 | 28.7 | 19.3 |
| 22 (Low Range) | 1 | 4 | 0 | 21 | 2.0 | 28.7 | 18.3 |
| 22 (Mid, High Range, 2517.6 MHz) | 1 | 0 | 0 | 25 | 2.0 | 28.7 | 22.3 |
| 23 (Low Range) | 2 | 4 | 0 | 20 | 2.5 | 28.7 | 16.8 |
| 23 (Mid, High Range, 2517.6 MHz) | 2 | 0 | 0 | 24 | 2.0 | 28.7 | 21.3 |

Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

# 6.2.4_2 Additional Maximum Power Reduction (A-MPR) for UL 64QAM

Editor's note:

- Test requirements values in this section need to be reviewed in order to take into account notes in Table 6.2.5.3-2: $\Delta T_{IB,c}$ regarding $\Delta T_{IB,c}$ and asymmetric lower tolerances in table 6.2.2.3-1.

## 6.2.4_2.1 Test purpose

Same test purpose as in clause 6.2.4.1

## 6.2.4_2.2 Test applicability

The requirements of this test apply in test case 6.6.2.2_1 Additional Spectrum Emission Mask for network signalled values NS_03, NS_04, NS_06, NS_07, NS_11, NS_20, NS_21, NS_27 and NS_35 to all types of E-UTRA UE from release 13 and forward that support UL 64QAM.

The requirements of this test apply in test case 6.6.3.3_1 Additional Spurious Emissions for network signalled values NS_04, NS_05, NS_07, NS_08, NS_09, NS_11, NS_12, NS_13, NS_14, NS_15, NS_16, NS_17, NS_18, NS_19, NS_20, NS_21, NS_22, NS_23, NS_24, NS_25, NS_27, NS_36, NS_38, NS_39 to all types of E-UTRA UE from release 13 and forward that support UL 64QAM.

NOTE: As a result TC 6.2.4_2 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.4_2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.4.3

## 6.2.4_2.4 Test description

### 6.2.4_2.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.4_2.4.1-1 through table 6.2.4_2.4.1-27. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4_2.4.1-1: Test Configuration Table (network signalled value "NS_03")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for NS_03 A-MPR** | | | | | | | |
| | | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1 | 1.4MHz | N/A for A-MPR testing | | | 64QAM | 5 | 5 |
| 2 | 3MHz | | | | 64QAM (Note 5) | 15 | 15 |
| 3 | 3MHz | | | | 64QAM | 4 | 4 |
| 4 | 5MHz | | | | 64QAM (Note 5) | 25 | 25 |
| 5 | 5MHz | | | | 64QAM | 8 | 8 |
| 6 | 10MHz | | | | 64QAM (Note 5) | 50 | 50 |
| 7 | 10MHz | | | | 64QAM | 12 | 12 |
| 8 | 15MHz | | | | 64QAM (Note 5) | 75 | 75 |
| 9 | 15MHz | | | | 64QAM | 16 | 16 |
| 10 | 20MHz | | | | 64QAM (Note 5) | 100 | 100 |
| 11 | 20MHz | | | | 64QAM | 18 | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_2.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

Note 4: For band 23, above table only applies to mid and high range test frequencies. Low range test frequencies will be covered by NS_11 test configuration table.

Note 5: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_03.

**Table 6.2.4_2.4.1-2: Test Configuration Table (network signalled value "NS_04")**

<table>
<tr><th colspan="7">Initial Conditions</th></tr>
<tr><td colspan="4">Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1)</td><td colspan="3">Normal</td></tr>
<tr><td colspan="4">Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="3">Low Range, Mid Range, High Range<br>Additional test frequencies for Rel-12 to Rel-13 and bit 2 of modifiedMPRbehavior = 0:<br><br>For 5 MHz bandwidth:<br>2499.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866<br><br>Additional test frequencies for Rel-12 and later and bit 2 of modifiedMPRbehavior = 1:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39686<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866</td></tr>
<tr><td colspan="4">Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="3">5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><th colspan="7">Test Parameters for NS_04 A-MPR</th></tr>
<tr><th></th><th></th><th colspan="2">Downlink Configuration</th><th colspan="3">Uplink Configuration</th></tr>
<tr><th>Configuration ID</th><th>Ch BW</th><th>Mod'n</th><th>RB allocation FDD</th><th>Mod'n</th><th>RB allocation FDD</th><th>$RB_{start}$ FDD</th></tr>
<tr><td>1 (Note 1)</td><td>5MHz</td><td colspan="2" rowspan="5">N/A for A-MPR testing</td><td>64QAM</td><td>16</td><td>9</td></tr>
<tr><td>2 (Note 2)</td><td>5MHz</td><td>64QAM</td><td>25</td><td>0</td></tr>
<tr><td>3</td><td>10MHz</td><td>64QAM</td><td>50</td><td>0</td></tr>
<tr><td>4</td><td>15MHz</td><td>64QAM</td><td>75</td><td>0</td></tr>
<tr><td>5</td><td>20MHz</td><td>64QAM</td><td>100</td><td>0</td></tr>
<tr><td colspan="7">Note 1: Only applicable for Low Range.<br>Note 2: Only applicable for Mid, High Range and additional test frequencies.<br>Note 3: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_04.</td></tr>
</table>

**Table 6.2.4_2.4.1-3: Test Configuration Table (network signalled value "NS_05")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range<br><br>In case of Low range:<br>- For 5 MHz Channel Bandwidth: 1927.2 MHz (NUL = 18072)<br>- For 10 MHz Channel Bandwidth: 1934.7 MHz (NUL = 18147)<br>- For 15 MHz Channel Bandwidth: 1932.5 MHz (NUL = 18125)<br>- For 20 MHz Channel Bandwidth: 1930 MHz (NUL = 18100) | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_05 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 64QAM | 25 |
| 2 | 10MHz | | | 64QAM | 50 (Note 2) |
| 3 | 15MHz | | | 64QAM | 75 (Note 2) |
| 4 | 20MHz | | | 64QAM | 100 (Note 2) |
| 5 | 10MHz | | | 64QAM | 50 (Note 3) |
| 6 | 15MHz | | | 64QAM | 75 (Note 3) |
| 7 | 20MHz | | | 64QAM | 100 (Note 3) |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_2.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 2: Applies only for Low Range.<br>Note 3: Applies only for Mid Range.<br>Note 4: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_05. | | | | | |

**Table 6.2.4_2.4.1-4: Test Configuration Table (network signalled value "NS_06")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | |
| **Test Parameters for NS_06 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 1.4MHz | N/A for A-MPR testing | | 64QAM | 5 |
| 2 | 5MHz | | | 64QAM | 8 |
| 3 | 10MHz | | | 64QAM | 12 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_2.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 4: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_06.

**Table 6.2.4_2.4.1-5: Test Configuration Table (network signalled value "NS_07")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Mid range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10MHz | | |
| **Test Parameters for NS_07 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 10MHz | N/A for A-MPR testing | | 64QAM | 36 | 13 |
| 2 | 10MHz | | | 64QAM | 16 | 19 |
| 3 | 10MHz | | | 64QAM | 30 | 19 |
| 4 | 10MHz | | | 64QAM | 50 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_2.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_07.

**Table 6.2.4_2.4.1-6: Test Configuration Table (network signalled value "NS_08")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz | |
| **Test Parameters for NS_08 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| **1** | **5MHz** | N/A for A-MPR testing | | **64QAM** | **25** |
| 2 | 10MHz | | | 64QAM | 50 |
| 3 | 15MHz | | | 64QAM | 75 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_2.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 2: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_08. | | | | | |

**Table 6.2.4_2.4.1-7: Test Configuration Table (network signalled value "NS_09")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| **1** | **5MHz** | N/A for A-MPR testing | | **64QAM** | **25** |
| 2 | 10MHz | | | 64QAM | 50 |
| 3 | 15MHz | | | 64QAM | 75 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_2.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 2: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_09. | | | | | |

**Table 6.2.4_2.4.1-8: Test Configuration Table (network signalled value "NS_10")**

| Void, not tested |
|---|

**Table 6.2.4_2.4.1-9: Test Configuration Table (network signalled value "NS_11")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 3 MHz Channel Bandwidth:<br>a. 2001.5 MHz ($N_{UL}$ = 25515)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br><br>For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br>c. 2007.5 MHz ($N_{UL}$ = 25575)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2005.5 MHz ($N_{UL}$ = 25555)<br>c. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2007.5 MHz ($N_{UL}$ = 25575)<br>b. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 3MHz, 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_11 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 3MHz | N/A for A-MPR testing | | 64QAM | 6 |
| 2 | 3MHz | | | 64QAM (Note 3) | 15 |
| 3 | 5MHz | | | 64QAM | 8 |
| 4 | 5MHz | | | 64QAM (Note 3) | 25 |
| 5 | 10MHz | | | 64QAM | 12 |
| 6 | 10MHz | | | 64QAM (Note 3) | 50 |
| 7 | 15MHz | | | 64QAM (Note 3) | 8 |
| 8 | 15MHz | | | 64QAM (Note 3) | 25 |
| 9 | 15MHz | | | 64QAM (Note 3) | 30 |
| 10 | 15MHz | | | 64QAM (Note 3) | 75 |
| 11 | 20MHz | | | 64QAM (Note 3) | 10 |
| 12 | 20MHz | | | 64QAM (Note 3) | 25 |
| 13 | 20MHz | | | 64QAM (Note 3) | 100 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_2.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_11.

**Table 6.2.4_2.4.1-10: Test Configuration Table (network signalled value "NS_12")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: UL 814.9 MHz ($N_{UL}$ = 26699)<br>For 5 MHz Channel Bandwidth: UL 816.7 MHz ($N_{UL}$ = 26717)<br>For 10 MHz Channel Bandwidth: UL 819.2 MHz ($N_{UL}$ = 26742)<br>For 15 MHz Channel Bandwidth: UL 821.7 MHz ($N_{UL}$ = 26767) | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 5 MHz, 10 MHz and 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for A-MPR testing | | 64QAM | 6 | 0 |
| 2 | 5 MHz | | | 64QAM | 25 | 0 |
| 3 | 10 MHz | | | 64QAM | 50 | 0 |
| 4 | 15 MHz | | | 64QAM | 75 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_12. | | | | | | |

**Table 6.2.4_2.4.1-11: Test Configuration Table (network signalled value "NS_13")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 5 MHz Channel Bandwidth: UL 821.5 MHz ($N_{UL}$ = 26765) | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 5 MHz | N/A for A-MPR testing | | 64QAM | 25 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_13. | | | | | | |

**Table 6.2.4_2.4.1-12: Test Configuration Table (network signalled value "NS_14")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 10 MHz Channel Bandwidth: UL 829 MHz ($N_{UL}$ = 26840)<br><br>For 15 MHz Channel Bandwidth: Mid range | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10 MHz, 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 10 MHz | N/A for A-MPR testing | | 64QAM | 50 | 0 |
| 2 | 15 MHz | | | 64QAM | 75 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_14. | | | | | | |

**Table 6.2.4_2.4.1-13: Test Configuration Table (network signalled value "NS_15")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: High range<br><br>For 3 MHz Channel Bandwidth: UL 843.5 MHz ($N_{UL}$ = 26985) or High range<br><br>For 5 MHz Channel Bandwidth: UL 842.5 MHz ($N_{UL}$ = 26975) or High range<br><br>For 10 MHz Channel Bandwidth: UL 840 MHz ($N_{UL}$ = 26950) or High range<br><br>For 15 MHz Channel Bandwidth: UL 837.5 MHz ($N_{UL}$ = 26925) or High range | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 (note 1) | 1.4 MHz | N/A for A-MPR testing | | 64QAM | 6 | 0 |
| 2 (note 1) | 3 MHz | | | 64QAM | 15 | 0 |
| 3 (note 1) | 5 MHz | | | 64QAM | 25 | 0 |
| 4 (note 1) | 10 MHz | | | 64QAM | 50 | 0 |
| 5 (note 1) | 15 MHz | | | 64QAM | 75 | 0 |
| Note 1: Applicable only to high range frequency testing.<br>Note 2: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_15. | | | | | | |

**Table 6.2.4_2.4.1-14: Test Configuration Table (network signalled value "NS_16")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: Low range<br><br>For 3 MHz Channel Bandwidth: Low range, 810 MHz ($N_{UL}$= 27070)<br><br>For 5 MHz Channel Bandwidth: Low range, 811 MHz ($N_{UL}$= 27080), 814.5 MHz ($N_{UL}$= 27115)<br><br>For 10 MHz Channel Bandwidth: Low range, 813.5 MHz ($N_{UL}$= 27105), 817 MHz ($N_{UL}$= 27140) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for A-MPR testing | | 64QAM | 6 | 0 |
| 2 | 3 MHz | | | 64QAM | 15 | 0 |
| 3 | 5 MHz | | | 64QAM | 25 | 0 |
| 4 | 10 MHz | | | 64QAM | 50 | 0 |
| Note 1: Applies only for 10 MHz channel for Low Range, and 813.5 MHz<br>Note 2: Applies only for 10 MHz channel for 817 MHz range<br>Note 3: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_16. | | | | | | |

**Table 6.2.4_2.4.1-15: Test Configuration Table (network signalled value "NS_17")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Mid range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 64QAM | 25 |
| 2 | 10MHz | | | 64QAM | 50 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_17. | | | | | |

**Table 6.2.4_2.4.1-16: Test Configuration Table (network signalled value "NS_18")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 64QAM | 25 |
| 2 | 10MHz | | | 64QAM | 50 |
| 3 | 15MHz | | | 64QAM | 75 |
| 4 | 20MHz | | | 64QAM | 100 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_18. | | | | | |

**Table 6.2.4_2.4.1-17: Test Configuration Table (network signalled value "NS_19")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 3MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 3MHz | N/A for A-MPR testing | | 64QAM | 15 |
| 2 | 10MHz | | | 64QAM | 40 |
| 3 | 15MHz | | | 64QAM | 45 |
| 4 | 20MHz | | | 64QAM | 50 |
| Note 1: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.<br>Note 2: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_19. | | | | | |

**Table 6.2.4_2.4.1-18: Test Configuration Table (network signalled value "NS_20")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2007.5 MHz ($N_{UL}$ = 25575)<br>c. 2012.5 MHz ($N_{UL}$ = 25625)<br>d. 2017.5 MHz ($N_{UL}$ = 25675)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_20 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 64QAM (Note 3) | 15 |
| 2 | 5MHz | | | 64QAM (Note 3) | 25 |
| 3 | 10MHz | | | 64QAM | 12 |
| 4 | 10MHz | | | 64QAM (Note 3) | 50 |
| 5 | 15MHz | | | 64QAM (Note 3) | 25 |
| 6 | 15MHz | | | 64QAM (Note 3) | 36 |
| 7 | 15MHz | | | 64QAM (Note 3) | 75 |
| 8 | 20MHz | | | 64QAM | 18 |
| 9 | 20MHz | | | 64QAM (Note 3) | 25 |
| 10 | 20MHz | | | 64QAM (Note 3) | 75 |
| 11 | 20MHz | | | 64QAM (Note 3) | 100 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_2.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

Note 3: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_20.

**Table 6.2.4_2.4.1-19: Test Configuration Table (network signalled value "NS_21")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | NC | | | | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | Low range or High range | | | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | 10 MHz | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 (note 1) | 10 MHz | N/A for A-MPR testing | | 64QAM | 50 | 0 |
| Note 1: Applicable only to high range frequency testing.<br>Note 2: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_21. | | | | | | |

**Table 6.2.4_2.4.1-20: Test Configuration Table (network signalled value "NS_22")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | Normal | | | | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | Low Range, Mid Range, High Range | | | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | 5MHz, 10MHz, 15MHz, 20MHz | | | | | |
| **Test Parameters for NS_22 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 64QAM | 1 | 0 |
| 2 | 5MHz | | | 64QAM | 1 | 24 |
| 3 | 10MHz | | | 64QAM | 1 | 0 |
| 4 | 10MHz | | | 64QAM | 1 | 49 |
| 5 | 15MHz | | | 64QAM | 1 | 0 |
| 6 | 15MHz | | | 64QAM | 1 | 74 |
| 7 | 20MHz | | | 64QAM | 1 | 0 |
| 8 | 20MHz | | | 64QAM | 1 | 99 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_22. | | | | | | |

**Table 6.2.4_2.4.1-21: Test Configuration Table (network signalled value "NS_23")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz | | |
| **Test Parameters for NS_23 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 64QAM | 1 | 0 |
| 2 | 5MHz | | | 64QAM | 1 | 24 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_23. | | | | | | |

**Table 6.2.4_2.4.1-22: Test Configuration Table (network signalled value "NS_24")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>10 and 15 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772) | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_24 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | High | 5MHz | N/A for A-MPR testing | | 64QAM | 25 | 0 |
| 2 | 1980 | 10MHz | | | 64QAM | 50 | 0 |
| 3 | 1990 | 10MHz | | | 64QAM | 50 | 0 |
| 4 | 1980 | 15MHz | | | 64QAM | 75 | 0 |
| 5 | High | 20MHz | | | 64QAM | 100 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_24. | | | | | | | |

**Table 6.2.4_2.4.1-23: Test Configuration Table (network signalled value "NS_25")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>10 and 15 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 132672)<br>- 1990 MHz ($N_{UL}$ = 132772) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_25 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | High | 5MHz | N/A for A-MPR testing | | 64QAM | 25 | 0 |
| 2 | 1980 | 10MHz | | | 64QAM | 50 | 0 |
| 3 | 1990 | 10MHz | | | 64QAM | 50 | 0 |
| 4 | 1980 | 15MHz | | | 64QAM | 75 | 0 |
| 5 | 1980 | 20MHz | | | 64QAM | 100 | 0 |
| 6 | High | 20MHz | | | 64QAM | 100 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_25. | | | | | | | |

**Table 6.2.4_2.4.1-24: Reserved**

**Table 6.2.4_2.4.1-25: Test Configuration Table (network signalled value "NS_27")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to Frequency column in test parameters | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_27 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Frequency** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | Low/Mid/High | 5MHz | | | 64QAM | 25 | 0 |
| 2 | Low/Mid/High | 10MHz | | | 64QAM | 50 | 0 |
| 3 | Low/Mid/High | 15MHz | | | 64QAM | 75 | 0 |
| 4 | Low/Mid/High | 20MHz | | | 64QAM | 100 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_27. | | | | | | | |

**Table 6.2.4_2.4.1-26: Test Configuration Table (network signalled value "NS_35")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_35 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 64QAM | 8 |
| 2 | 10MHz | | | 64QAM | 12 |
| 3 | 15MHz | | | 64QAM | 16 |
| 4 | 20MHz | | | 64QAM | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_2.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 4: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_35.

**Table 6.2.4_2.4.1-27: Test Configuration Table (network signalled value "NS_36")**

| | Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>5 MHz CH BW:<br>- 700.5 MHz ($N_{UL}$ = low range)<br>- 705.5 MHz ($N_{UL}$ =132747)<br>10 MHz CH BW:<br>- 703 MHz ($N_{UL}$ = low range)<br>- 708 MHz ($N_{UL}$ = 132772)<br>15 MHz CH BW:<br>- 705.5 MHz ($N_{UL}$ = low range)<br>- 710.5 MHz ($N_{UL}$ =132797 ) | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz | | |
| **Test Parameters for NS_36 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 700.5 | 5MHz | N/A for A-MPR testing | | 64QAM | 25 | 0 |
| 2 | 705.5 | 5MHz | | | 64QAM | 25 | 0 |
| 3 | 703 | 10MHz | | | 64QAM | 50 | 0 |
| 4 | 708 | 10MHz | | | 64QAM | 50 | 0 |
| 5 | 705.5 | 15MHz | | | 64QAM | 75 | 0 |
| 6 | 710.5 | 15MHz | | | 64QAM | 75 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: Void
Note 3: Void
Note 4: The 64QAM configurations shall not apply to UEs for which TC 6.2.4_4 is executed with network signalled value NS_36.

Editor's note: The following lines belong at the end of section 6.2.4_2.4.1. As new tables are added to this section, these lines should always follow the tables.

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to the applicable table from Table 6.2.4_2.4.1-1 to Table 6.2.4_2.4.1-27.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.4_2.4.3.

### 6.2.4_2.4.2 Test procedure

Same test procedure as in clause 6.2.4.4.2 with the following exceptions:

- Instead of Table 6.2.4.4.1-1 to 6.2.4.4.1-27 → use Table 6.2.4_2.4.1-1 to 6.2.4_2.4.1-27

### 6.2.4_2.4.3 Message contents

Same message contents as in clause 6.2.4.4.3 except table numbers.

## 6.2.4_2.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable table from Table 6.2.4_2.5-1 to Table 6.2.4_2.5-29. The allowed A-MPR values specified in Table 6.2.4_2.3-1 are in addition to the allowed MPR requirements specified in clause 6.2.3. For the UE maximum output power modified by MPR and/or A-MPR, the power limits specified in Table 6.2.5.3-1 apply.

**Table 6.2.4_2.5-1: UE Power Class test requirements (network signalled value "NS_03") (for Bands 4, 10, 23, 35, 36, 66, and 70)**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| 2 | 3 | 1 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 3 | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| 4 | 3 | 1 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 5 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 6 | 3 | 1 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 7 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 8 | 3 | 1 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 9 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 10 | 3 | 1 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 11 | 2 | 1 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-2: UE Power Class test requirements (network signalled value "NS_03") (for Bands 2 and 25)**

| Configuration ID | EUTRA band | Test Freq. | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | 2, 25 | Mid | | | | | 23 | +2.7 / -4.7 |
| 1 | 2, 25 | Low, High | | | | | 23 | +2.7 / -7.7 |
| 2 | 2, 25 | Mid | | | | | 23 | +2.7 / -8.2 |
| 2 | 2, 25 | Low, High | | | | | 23 | +2.7 / -11.2 |
| 3 | 2, 25 | Mid | | | | | 23 | +2.7 / -4.7 |
| 3 | 2, 25 | Low, High | | | | | 23 | +2.7 / -7.7 |
| 4 | 2, 25 | All | | | | | 23 | +2.7 / -8.2 |
| 5 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -6.2 |
| 5 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -9.2 |
| 6 | 2, 25 | All | | | | | 23 | +2.7 / -8.2 |
| 7 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -6.2 |
| 7 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -9.2 |
| 8 | 2, 25 | All | | | | | 23 | +2.7 / -8.2 |
| 9 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -6.2 |
| 9 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -9.2 |
| 10 | 2, 25 | All | | | | | 23 | +2.7 / -8.2 |
| 11 | 2, 25 | All | | | | | 23 | +2.7 / -6.2 |

**Table 6.2.4_2.5-3: UE Power Class test requirements (network signalled value "NS_04")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 2 | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 3 (Low Range) | 3 | 2 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 3 (Mid, High Range, 2504.1 MHz) | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 4 (Low Range) | 3 | 3 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 4 (Mid, High Range, 2510.9 MHz) | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 5 (Low Range) | 3 | 3 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 5 (Mid, High Range, 2517.6 MHz) | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-4: UE Power Class test requirements (network signalled value "NS_05")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 2 | 3 | 1 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 3 | 3 | 11 | 0 | 9 | 6.0 | 25.7 | 2.3 |
| 4 | 3 | 11 | 0 | 9 | 6.0 | 25.7 | 2.3 |
| 5 | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 6 | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 7 | 3 | 1 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-5: UE Power Class test requirements (network signalled value "NS_06") (for Bands 13, 14, and 17)**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 13,14,17 | | | | | 23 | +2.7 / -4.7 |
| 2 | 13,14,17 | | | | | 23 | +2.7 / -4.7 |
| 3 | 13,14,17 | | | | | 23 | +2.7 / -4.7 |

**Table 6.2.4_2.5-6: UE Power Class test requirements (network signalled value "NS_06") (for Band 12)**

| Configuration ID | EUTRA band | Test Freq. | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | 12 | Mid | | | | | 23 | +2.7 / -4.7 |
| 1 | 12 | Low, High | | | | | 23 | +2.7 / -5.2 |
| 2 | 12 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -4.7 |
| 2 | 12 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -7.7 |
| 3 | 12 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -4.7 |
| 3 | 12 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -7.7 |

**Table 6.2.4_2.5-7: UE Power Class test requirements (network signalled value "NS_07")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 13 | | | | | 23 | +2.7 / -21.7 |
| 2 | 13 | | | | | 23 | +2.7 / -6.2 |
| 3 | 13 | | | | | 23 | +2.7 / -14.7 |
| 4 | 13 | | | | | 23 | +2.7 / -21.7 |

**Table 6.2.4_2.5-8: UE Power Class test requirements (network signalled value "NS_08")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 2 | 3 | 3 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 3 | 3 | 3 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-9: UE Power Class test requirements (network signalled value "NS_09")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 2 | 3 | 1 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 3 | 3 | 2 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-10: UE Power Class test requirements (network signalled value "NS_10")**

| |
|---|
| Void, not tested |

**Table 6.2.4_2.5-11: UE Power Class test requirements (network signalled value "NS_11 for Band 23")**

| Configuration ID | EUTRA Band | Centre Frequency | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1a | 23 | 2001.5 MHz | | | | | 23 | + 2.7 / -13.7 |
| 1b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -8.2 |
| 2a | 23 | 2001.5 MHz | | | | | 23 | + 2.7 / -13.7 |
| 2b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -8.2 |
| 3a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -14.7 |
| 3b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -4.7 |
| 3c | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -6.2 |
| 4a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -15.7 |
| 4b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -12.7 |
| 4c | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -8.2 |
| 5a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -20.7 |
| 5b | 23 | 2005.5 MHz | | | | | 23 | + 2.7 / -20.7 |
| 5c | 23 | 2015 MHz | | | | | 23 | + 2.7 / -4.7 |
| 6a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -21.7 |
| 6b | 23 | 2005.5 MHz | | | | | 23 | + 2.7 / -21.7 |
| 6c | 23 | 2015 MHz | | | | | 23 | + 2.7 / -6.2 |
| 7a | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -24.7 |
| 7b (Note 1) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -18.7 |
| 7b (Note 2) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -14.2 |
| 8a (Note 1) | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -25.7 |
| 8a (Note 2) | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -6.2 |
| 8b (Note 1) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -19.7 |
| 8b (Note 2) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -9.7 |
| 9a (Note 1) | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -25.7 |
| 9a (Note 2) | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -14.7 |
| 9b (Note 1) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -19.7 |
| 9b (Note 2) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -9.7 |

| Configuration ID | EUTRA Band | Centre Frequency | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 10a | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -25.7 |
| 10b | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -19.7 |
| 11 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -24.7 |
| 12 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -4.7 |
| 13 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -25.7 |
| Note 1: $RB_{start}$ = RB# 0<br>Note 2: $RB_{start}$ = RB# (max +1 - RB allocation) | | | | | | | | |

**Table 6.2.4_2.5-12: UE Power Class 3 test requirements (network signalled value "NS_12")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 3 | 6 | 1.5 | 12.5 | 6 | 25.7 | 5.8 |
| 2 | 3 | 3 | 0 | 17 | 5 | 25.7 | 11.3 |
| 3 | 3 | 2 | 0 | 18 | 4 | 25.7 | 13.3 |
| 4 | 3 | 3 | 0 | 17 | 5 | 25.7 | 11.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-13: UE Power Class 3 test requirements (network signalled value "NS_13")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 3 | 2 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-14: UE Power Class 3 test requirements (network signalled value "NS_14")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 3 | 1 | 0 | 19 | 3 | 25.7 | 14.8 |
| 2 | 3 | 1 | 0 | 19 | 3 | 25.7 | 14.8 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-15: UE Power Class test requirements (network signalled value "NS_15")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 26 | | | | | 23 | +2.7 / -13.2 |
| 2 | 26 | | | | | 23 | +2.7 / -20.2 |
| 3 | 26 | | | | | 23 | +2.7 / -18.7 |
| 4 | 26 | | | | | 23 | +2.7 / -18.7 |
| 5 | 26 | | | | | 23 | +2.7 / -18.7 |

**Table 6.2.4_2.5-16A: UE Power Class test requirements (network signalled value "NS_16") when lower channel edge is at 807 MHz**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 27 | | | | | 23 | +2.7/-6.2 |
| 2 | 27 | | | | | 23 | +2.7 / -9.7 |
| 3 | 27 | | | | | 23 | +2.7 / -13.7 |
| 4 | 27 | | | | | 23 | +2.7 / -15.7 |

**Table 6.2.4_2.5-16B: UE Power Class test requirements (network signalled value "NS_16") when lower channel edge is at 808.5 MHz**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 27 | Not tested | | | | | |
| 2 | 27 | | | | | 23 | +2.7 / -6.2 |
| 3 | 27 | | | | | 23 | +2.7 / -11.7 |
| 4 | 27 | | | | | 23 | +2.7 / -13.7 |

**Table 6.2.4_2.5-16C: UE Power Class test requirements (network signalled value "NS_16") when lower channel edge is at 812 MHz**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 27 | Not tested | | | | | |
| 2 | 27 | Not tested | | | | | |
| 3 | 27 | | | | | 23 | +2.7 / -6.2 |
| 4 | 27 | | | | | 23 | +2.7 / -11.7 |

**Table 6.2.4_2.5-17: UE Power Class test requirements (network signalled value "NS_17")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 28 | | | | | 23 | +2.7 / -6.2 |
| 2 | 28 | | | | | 23 | +2.7 / -6.2 |

**Table 6.2.4_2.5-18: UE Power Class test requirements (network signalled value "NS_18")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 28 | | | | | 23 | +2.7 / -11.7 |
| 2 | 28 | | | | | 23 | +2.7 / -14.7 |
| 3 | 28 | | | | | 23 | +2.7 / -14.7 |
| 4 | 28 | | | | | 23 | +2.7 / -14.7 |

**Table 6.2.4_2.5-19: UE Power Class test requirements (network signalled value "NS_19")**

| Configuration ID | Test Freq | RB location | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Low | Full RB | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 2 | Low | Low | 3 | 1 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 2 | Low | High | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 3 | Low | Low | 3 | 3 | 0 | 17 | 5 | 25.7 | 11.3 |
| 3 | Low | High | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 4 | Low | Low | 3 | 3 | 0 | 17 | 5 | 25.7 | 11.3 |
| 4 | Low | High | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero, PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | |

**Table 6.2.4_2.5-20: UE Power Class test requirements (network signalled value "NS_20 for Band 23")**

| Configuration ID | EUTRA Band | Centre Frequency | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -24.7 (Note 1) |
| 1b (Note 2) | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -8.2 |
| 1b (Note 3) | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -6.2 |
| 1c | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -6.2 |
| 1d | 23 | 2017.5 MHz | | | | | 23 | + 2.7 / -6.2 |
| 2a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -27.1 (Note 1) |
| 2b | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -12.7 |
| 2c | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -6.2 |
| 2d | 23 | 2017.5 MHz | | | | | 23 | + 2.7 / -6.2 |
| 3a (Note 2) | 23 | 2005 MHz | | | | | 23 | + 2.7 / -25.7 (Note 1) |
| 3a (Note 3) | 23 | 2005 MHz | | | | | 23 | + 2.7 / -4.7 |
| 3b | 23 | 2015 MHz | | | | | 23 | + 2.7 / -4.7 |
| 4a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -26.7 (Note 1) |
| 4b | 23 | 2005 MHz | | | | | 23 | + 2.7 / -12.7 |
| 5 (Note 2) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -14.7 |
| 5 (Note 3) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -6.2 |
| 6 (Note 2) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -14.7 |
| 6 (Note 3) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -13.7 |
| 7 | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -20.7 |
| 8 (Note 2) | 23 | 2010 MHz | | | | | 23 | + 2.7 / -26.7 (Note 1) |
| 8 (Note 3) | 23 | 2010 MHz | | | | | 23 | + 2.7 / -25.7 (Note 1) |
| 9 (Note 2) | 23 | 2010 MHz | | | | | 23 | + 2.7 / -27.7 (Note 1) |
| 9 (Note 3) | 23 | 2010 MHz | | | | | 23 | + 2.7 / -26.7 (Note 1) |
| 10 (Note 2) | 23 | 2010 MHz | | | | | 23 | + 2.7 / |

| Configuration ID | EUTRA Band | Centre Frequency | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | -27.7 (Note 1) |
| 10 (Note 3) | 23 | 2010 MHz | | | | | 23 | + 2.7 / -21.7 (Note 1) |
| 11 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -27.7 (Note 1) |
| Note 1: The output power within 2000-2005 MHz shall not be higher than 7.7 dBm<br>Note 2: $RB_{start}$ = RB# 0<br>Note 3: $RB_{start}$ = RB# (max +1 - RB allocation) | | | | | | | | |

**Table 6.2.4_2.5-21: UE Power Class 3 test requirements (network signalled value "NS_21 for Band 30")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 3 | 3 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-22: UE Power Class Test requirements (network signalled value "NS_22")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 0 | 0 | 21 | 2.0 | 26.0 | 18.0 |
| 2 | 2 | 0 | 0 | 21 | 2.0 | 26.0 | 19.0 |
| 3 | 2 | 3 | 0 | 18 | 4.0 | 26.0 | 13.0 |
| 4 | 2 | 3 | 0 | 18 | 4.0 | 26.0 | 13.0 |
| 5 | 2 | 3 | 0 | 18 | 4.0 | 26.0 | 13.0 |
| 6 | 2 | 3 | 0 | 18 | 4.0 | 26.0 | 13.0 |
| 7 | 2 | 3 | 0 | 18 | 4.0 | 26.0 | 13.0 |
| 8 | 2 | 3 | 0 | 18 | 4.0 | 26.0 | 13.0 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-23: UE Power Class Test requirements (network signalled value "NS_23")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 0 | 0 | 21 | 2.0 | 21 | 2.0 |
| 2 | 2 | 0 | 0 | 21 | 2.0 | 21 | 2.0 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-24: UE Power Class 3 test requirements (network signalled value "NS_24")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 3 | 10 | 0 | 10 | 2.0 | 25.7 | 7.3 |
| 2 | 3 | 2 | 0 | 18 | 2.0 | 25.7 | 15.3 |
| 3 | 3 | 9 | 0 | 11 | 2.0 | 25.7 | 8.3 |
| 4 | 3 | 8 | 0 | 12 | 2.0 | 25.7 | 9.3 |
| 5 | 3 | 17 | 0 | 3 | 2.5 | 25.7 | -0.2 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-25: UE Power Class 3 test requirements (network signalled value "NS_25")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 3 | 5 | 0 | 15 | 2.0 | 25.7 | 12.3 |
| 2 | 3 | 1 | 0 | 19 | 2.0 | 25.7 | 16.3 |
| 3 | 3 | 5 | 0 | 15 | 2.0 | 25.7 | 12.3 |
| 4 | 3 | 4 | 0 | 16 | 2.0 | 25.7 | 13.3 |
| 5 | 3 | 11 | 0 | 9 | 2.0 | 25.7 | 6.3 |
| 6 | 3 | 13 | 0 | 7 | 2.0 | 25.7 | 4.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-26: Reserved**

**Table 6.2.4_2.5-27: UE Power Class 3 test requirements (network signalled value "NS_27")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $MAX\{T_L, T(P_{CMAX_L,c})\}$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 3 | 0 | 0 | 20 | 3 | 26.0 | 16 |
| 2 | 3 | 0 | 0 | 20 | 3 | 26.0 | 16 |
| 3 | 3 | 2 | 0 | 18 | 4.0 | 26.0 | 13.0 |
| 4 | 3 | 3 | 0 | 17 | 5.0 | 26.0 | 11.0 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-28: UE Power Class 3 test requirements (network signalled value "NS_35")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| 2 | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| 3 | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| 4 | 2 | 0 | 0 | 21 | 2 | 25.7 | 18.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_2.5-29: UE Power Class 3 test requirements (network signalled value "NS_36")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 3 | 4 | 0 | 16 | 5 | 25.7 | 10.3 |
| 2 | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 3 | 3 | 10 | 0 | 10 | 6 | 25.7 | 3.3 |
| 4 | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| 5 | 3 | 10 | 0 | 10 | 6 | 25.7 | 3.3 |
| 6 | 3 | 0 | 0 | 20 | 2.5 | 25.7 | 16.8 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

## 6.2.4_3 Additional Maximum Power Reduction (A-MPR) with PUSCH frequency hopping

Following aspects missing or not yet determined:

- Emissions test cases covering this test is missing
- HARQ configuration for re-transmissions is missing

### 6.2.4_3.1 Test purpose

Additional ACLR and spectrum emission requirements can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction A-MPR is allowed for the output power as specified in Table 6.2.2.3-1. Unless stated otherwise, an A-MPR of 0 dB shall be used. When PUSCH inter-subframe frequency hopping is configured the UE will use different resource blocks for HARQ retransmissions compared to the previous transmission resulting in potentially different A-MPR.

The purpose of this test is to ensure the UE is using A-MPR in a correct way fulfilling emissions requirements also when PUSCH frequency hopping is enabled.

### 6.2.4_3.2 Test applicability

The requirements of this test apply in test case 6.6.2.2_2 Additional Spectrum Emission Mask for network signalled values NS_07, NS_11 and NS_20 to all types of E-UTRA UE release 8 and forward.

The requirements of this test apply in test case TBD Additional Spurious Emissions for network signalled values NS_07, NS_11, NS_12, NS_13, NS_14, NS_15, NS_16, NS_19 and NS_20 to all types of E-UTRA UE release 8 and forward.

NOTE: As a result TC 6.2.4_3 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.4_3.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.4.3

### 6.2.4_3.4 Test description

#### 6.2.4_3.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test

parameters for each channel bandwidth, and are shown in table 6.2.4_3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4_3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Mid range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Test dependant | |
| **Test Parameters** | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | |
| Configuration ID | NS-value | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD |
| 1 | NS_07 | 10 MHz | N/A for A-MPR testing | | QPSK | 1 |
| 2 | NS_10 | 20 MHz | | | QPSK | 1 |
| 3 (Note 3) | NS_11 | 15 MHz | | | QPSK | 1 |
| 4 | NS_12 | 5 MHz | | | QPSK | 1 |
| 5 | NS_13 | 5 MHz | | | QPSK | 1 |
| 6 | NS_14 | 15 MHz | | | QPSK | 1 |
| 7 (Note 4) | NS_15 | 15 MHz | | | QPSK | 1 |
| 8 (Note 4) | NS_16 | 10 MHz | | | QPSK | 1 |
| 9 | NS_19 | 20 MHz | | | QPSK | 1 |
| 10 (Note 4) | NS_20 | 10 MHz | | | QPSK | 1 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_3.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 of the channel bandwidth.<br>Note 3: High range test frequency to be used.<br>Note 4: Low range test frequency to be used. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to the applicable table from Table 6.2.4_3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.4.4.3.

### 6.2.4_3.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 with hopping bit(s) set to 1 (PUSCH type 2 hopping) for C_RNTI to schedule the UL RMC according to the applicable Table 6.2.4_3.4.1-1. SS sends always NACK on PHICH to trigger UE retransmissions needed for mirroring of RBs. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode in a TTI. The period of measurement shall be one sub-frame (1ms) excluding the 20 us transient periods in beginning and end of the subframe.
4. Measure the mean power of the UE in the channel bandwidth of the radio access mode in the next TTI of the same HARQ process. The period of measurement shall be one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.2.4_3.4.3 Message contents

Same message contents as in 6.2.4.4.2

### 6.2.4_3.5 Test requirements

The maximum output power, derived in step 3 and 4 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable table 6.2.4_3.5-1 and 6.2.4_3.5-2. The allowed A-MPR values specified in Table 6.2.4.3-1 are in addition to the allowed MPR requirements specified in clause 6.2.3. For the UE maximum output power modified by MPR and/or A-MPR, the power limits specified in Table 6.2.5.3-1 apply.

**Table 6.2.4_3.5-1: UE Power Class 3 test requirements (for TTI where CURRENT_TX_NB mod2=0 hence without mirroring)**

| Configuration ID | NS-value | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|
| 1 | NS_07 | 0 | 12 | 0 | 11 | 6 | 25.7 | 4.3 |
| 2 | NS_10 | 0 | 5 | 0 | 18 | 4 | 25.7 | 13.3 |
| 3 | NS_11 | 0 | 10 | 0 | 13 | 5 | 25.7 | 7.3 |
| 4 | NS_12 | 0 | 5 | 0 | 18 | 4 | 25.7 | 13.3 |
| 5 | NS_13 | 0 | 3 | 0 | 20 | 2,5 | 25.7 | 16.8 |
| 6 | NS_14 | 0 | 3 | 0 | 20 | 2,5 | 25.7 | 16.8 |
| 7 | NS_15 | 0 | 4 | 1.5 | 17.5 | 5 | 25.7 | 11.8 |
| 8 | NS_16 | 0 | 5 | 0 | 18 | 4 | 25.7 | 13.3 |
| 9 | NS_19 | 0 | 2 | 0 | 21 | 2 | 25.7 | 18.3 |
| 10 | NS_20 | 0 | 16 | 0 | 7 | 7 | 25.7 | -0.7 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | |

**Table 6.2.4_3.5-2: UE Power Class 3 test requirements (for TTI where CURRENT_TX_NB mod2=1 hence with mirroring)**

| Configuration ID | NS-value | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|
| 1 | NS_07 | 0 | 3 | 0 | 20 | 6 | 25.7 | 13.3 |
| 2 | NS_10 | 0 | 0 | 0 | 23 | 4 | 25.7 | 18.3 |
| 3 | NS_11 | 0 | 6.5 | 0 | 16.5 | 5 | 25.7 | 10.8 |
| 4 | NS_12 | 0 | 0 | 0 | 23 | 4 | 25.7 | 18.3 |
| 5 | NS_13 | 0 | 0 | 0 | 23 | 2.5 | 25.7 | 19.8 |
| 6 | NS_14 | 0 | 0 | 0 | 23 | 2.5 | 25.7 | 19.8 |
| 7 | NS_15 | 0 | 9 | 0 | 14 | 5 | 25.7 | 8.3 |
| 8 | NS_16 | 0 | 0 | 0 | 23 | 4 | 25.7 | 18.3 |
| 9 | NS_19 | 0 | 0 | 0 | 23 | 2 | 25.7 | 20.3 |
| 10 | NS_20 | 0 | 6 | 0 | 17 | 7 | 25.7 | 9.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | |

## 6.2.4_4 Additional Maximum Power Reduction (A-MPR) for UL 256QAM

Editor's note: Some test requirements for NS_24 and NS_25 - for E-UTRA band 65 - need further investigation, due to unclear conformance requirements.

## 6.2.4_4.1 Test purpose

Same test purpose as in clause 6.2.4.1

## 6.2.4_4.2 Test applicability

The requirements of this test apply in test case 6.6.2.2_2 Additional Spectrum Emission Mask for network signalled values NS_03, NS_04, NS_06, NS_07, NS_11, NS_20, NS_21, NS_27 and NS_35 to all types of E-UTRA UE from release 14 and forward that support UL 256QAM.

The requirements of this test apply in test case 6.6.3.3_2 Additional Spurious Emissions for network signalled values NS_04, NS_05, NS_07, NS_08, NS_09, NS_11, NS_12, NS_13, NS_14, NS_15, NS_16, NS_17, NS_18, NS_19, NS_20, NS_21, NS_22, NS_23, NS_24, NS_25, NS_27, NS_36 to all types of E-UTRA UE from release 14 and forward that support UL 256QAM.

NOTE: As a result, TC 6.2.4_4 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.4_4.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.4.3

## 6.2.4_4.4 Test description

### 6.2.4_4.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.4_4.4.1-1 through table 6.2.4_4.4.1-27. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4_4.4.1-1: Test Configuration Table (network signalled value "NS_03")**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for NS_03 A-MPR** | | | | | | | |
| | | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1 | 3MHz | N/A for A-MPR testing | | | 256QAM | 15 | 15 |
| 2 | 5MHz | | | | 256QAM | 25 | 25 |
| 3 | 10MHz | | | | 256QAM | 50 | 50 |
| 4 | 15MHz | | | | 256QAM | 75 | 75 |
| 5 | 20MHz | | | | 256QAM | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_4.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 3: For band 23, above table only applies to mid and high range test frequencies. Low range test frequencies will be covered by NS_11 test configuration table. | | | | | | | |

**Table 6.2.4_4.4.1-2: Test Configuration Table (network signalled value "NS_04")**

<table>
<tr><th colspan="7">Initial Conditions</th></tr>
<tr><td colspan="4">Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1)</td><td colspan="3">Normal</td></tr>
<tr><td colspan="4">Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="3">Low Range, Mid Range, High Range<br>Additional test frequencies for Rel-12 to Rel-13 and bit 2 of modifiedMPRbehavior = 0:<br><br>For 5 MHz bandwidth:<br>2499.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866<br><br>Additional test frequencies for Rel-12 and later and bit 2 of modifiedMPRbehavior = 1:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39686<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866</td></tr>
<tr><td colspan="4">Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="3">5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><th colspan="7">Test Parameters for NS_04 A-MPR</th></tr>
<tr><th></th><th></th><th colspan="2">Downlink Configuration</th><th colspan="3">Uplink Configuration</th></tr>
<tr><th>Configuration ID</th><th>Ch BW</th><th>Mod'n</th><th>RB allocation FDD</th><th>Mod'n</th><th>RB allocation FDD</th><th>$RB_{start}$ FDD</th></tr>
<tr><td>1 (Note 2)</td><td>5MHz</td><td colspan="2" rowspan="5">N/A for A-MPR testing</td><td>256QAM</td><td>16</td><td>9</td></tr>
<tr><td>2 (Note 3)</td><td>5MHz</td><td>256QAM</td><td>25</td><td>0</td></tr>
<tr><td>3</td><td>10MHz</td><td>256QAM</td><td>50</td><td>0</td></tr>
<tr><td>4</td><td>15MHz</td><td>256QAM</td><td>75</td><td>0</td></tr>
<tr><td>5</td><td>20MHz</td><td>256QAM</td><td>100</td><td>0</td></tr>
<tr><td colspan="7">Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_4.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 1: Only applicable for Low Range.<br>Note 2: Only applicable for Mid, High Range and additional test frequencies.</td></tr>
</table>

**Table 6.2.4_4.4.1-3: Test Configuration Table (network signalled value "NS_05")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range<br><br>In case of Low range:<br>- For 5 MHz Channel Bandwidth: 1927.2 MHz (NUL = 18072)<br>- For 10 MHz Channel Bandwidth: 1934.7 MHz (NUL = 18147)<br>- For 15 MHz Channel Bandwidth: 1932.5 MHz (NUL = 18125)<br>- For 20 MHz Channel Bandwidth: 1930 MHz (NUL = 18100) | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_05 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 256QAM | 25 |
| 2 (Note 2) | 10MHz | | | 256QAM | 50 |
| 3(Note 2) | 15MHz | | | 256QAM | 75 |
| 4 (Note 2) | 20MHz | | | 256QAM | 100 |
| 5 (Note 3) | 10MHz | | | 256QAM | 50 |
| 6 (Note 3) | 15MHz | | | 256QAM | 75 |
| 7 (Note 3) | 20MHz | | | 256QAM | 100 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_4.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 2: Applies only for Low Range.<br>Note 3: Applies only for Mid Range. | | | | | |

**Table 6.2.4_4.4.1-4: Test Configuration Table (network signalled value "NS_06")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | |
| **Test Parameters for NS_06 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 1.4MHz | N/A for A-MPR testing | | 256QAM | 6 |
| 2 | 5MHz | | | 256QAM | 25 |
| 3 | 10MHz | | | 256QAM | 50 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_4.5 as not all combinations are necessarily required based on the applicability of the UE. | | | | | |

**Table 6.2.4_4.4.1-5: Test Configuration Table (network signalled value "NS_07")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Mid range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10MHz | | |
| **Test Parameters for NS_07 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 10MHz | N/A for A-MPR testing | | 256QAM | 36 | 13 |
| 2 | 10MHz | | | 256QAM | 16 | 19 |
| 3 | 10MHz | | | 256QAM | 30 | 19 |
| 4 | 10MHz | | | 256QAM | 50 | 0 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_4.5 as not all combinations are necessarily required based on the applicability of the UE. | | | | | | |

**Table 6.2.4_4.4.1-6: Test Configuration Table (network signalled value "NS_08")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz | |
| **Test Parameters for NS_08 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 256QAM | 25 |
| 2 | 10MHz | | | 256QAM | 50 |
| 3 | 15MHz | | | 256QAM | 75 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_4.5 as not all combinations are necessarily required based on the applicability of the UE. | | | | | |

**Table 6.2.4_4.4.1-7: Test Configuration Table (network signalled value "NS_09")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz | |
| **Test Parameters for NS_09 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 256QAM | 25 |
| 2 | 10MHz | | | 256QAM | 50 |
| 3 | 15MHz | | | 256QAM | 75 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_4.5 as not all combinations are necessarily required based on the applicability of the UE. | | | | | |

**Table 6.2.4_4.4.1-8: Test Configuration Table (network signalled value "NS_10")**

| Void, not tested |
|---|

**Table 6.2.4_4.4.1-9: Test Configuration Table (network signalled value "NS_11")**

<table>
<tr><th colspan="6">Initial Conditions</th></tr>
<tr><td colspan="3">Test Environment (as specified in TS 36.508 [7] subclause 4.1)</td><td colspan="3">Normal</td></tr>
<tr><td colspan="3">Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="3">For 3 MHz Channel Bandwidth:<br>a. 2001.5 MHz ($N_{UL}$ = 25515)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br><br>For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br>c. 2007.5 MHz ($N_{UL}$ = 25575)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2005.5 MHz ($N_{UL}$ = 25555)<br>c. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2007.5 MHz ($N_{UL}$ = 25575)<br>b. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600)</td></tr>
<tr><td colspan="3">Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="3">3MHz, 5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><th colspan="6">Test Parameters for NS_11 A-MPR</th></tr>
<tr><th></th><th></th><th colspan="2">Downlink Configuration</th><th colspan="2">Uplink Configuration</th></tr>
<tr><th>Configuration ID</th><th>Ch BW</th><th>Mod'n</th><th>RB allocation FDD</th><th>Mod'n</th><th>RB allocation FDD</th></tr>
<tr><td>1</td><td>3MHz</td><td colspan="2" rowspan="10">N/A for A-MPR testing</td><td>256QAM</td><td>15</td></tr>
<tr><td>2</td><td>5MHz</td><td>256QAM</td><td>25</td></tr>
<tr><td>3</td><td>10MHz</td><td>256QAM</td><td>50</td></tr>
<tr><td>4</td><td>15MHz</td><td>256QAM</td><td>8</td></tr>
<tr><td>5</td><td>15MHz</td><td>256QAM</td><td>25</td></tr>
<tr><td>6</td><td>15MHz</td><td>256QAM</td><td>30</td></tr>
<tr><td>7</td><td>15MHz</td><td>256QAM</td><td>75</td></tr>
<tr><td>8</td><td>20MHz</td><td>256QAM</td><td>10</td></tr>
<tr><td>9</td><td>20MHz</td><td>256QAM</td><td>25</td></tr>
<tr><td>10</td><td>20MHz</td><td>256QAM</td><td>100</td></tr>
<tr><td colspan="6">Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_4.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.</td></tr>
</table>

**Table 6.2.4_4.4.1-10: Test Configuration Table (network signalled value "NS_12")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: UL 814.9 MHz ($N_{UL}$ = 26699)<br><br>For 5 MHz Channel Bandwidth: UL 816.7 MHz ($N_{UL}$ = 26717)<br><br>For 10 MHz Channel Bandwidth: UL 819.2 MHz ($N_{UL}$ = 26742)<br><br>For 15 MHz Channel Bandwidth: UL 821.7 MHz ($N_{UL}$ = 26767) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 5 MHz, 10 MHz and 15 MHz | | |
| **Test Parameters for NS_12 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for A-MPR testing | | 256QAM | 6 | 0 |
| 2 | 5 MHz | | | 256QAM | 25 | 0 |
| 3 | 10 MHz | | | 256QAM | 50 | 0 |
| 4 | 15 MHz | | | 256QAM | 75 | 0 |

**Table 6.2.4_4.4.1-11: Test Configuration Table (network signalled value "NS_13")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 5 MHz Channel Bandwidth: UL 821.5 MHz ($N_{UL}$ = 26765) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5 MHz | | |
| **Test Parameters for NS_13 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 5 MHz | N/A for A-MPR testing | | 256QAM | 25 | 0 |

**Table 6.2.4_4.4.1-12: Test Configuration Table (network signalled value "NS_14")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 10 MHz Channel Bandwidth: UL 829 MHz ($N_{UL}$ = 26840)<br><br>For 15 MHz Channel Bandwidth: Mid range | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10 MHz, 15 MHz | | |
| **Test Parameters for NS_14 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 10 MHz | N/A for A-MPR testing | | 256QAM | 50 | 0 |
| 2 | 15 MHz | | | 256QAM | 75 | 0 |

**Table 6.2.4_4.4.1-13: Test Configuration Table (network signalled value "NS_15")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | High range | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz | | |
| **Test Parameters for NS_15 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for A-MPR testing | | 256QAM | 6 | 0 |
| 2 | 3 MHz | | | 256QAM | 15 | 0 |
| 3 | 5 MHz | | | 256QAM | 25 | 0 |
| 4 | 10 MHz | | | 256QAM | 50 | 0 |
| 5 | 15 MHz | | | 256QAM | 75 | 0 |

**Table 6.2.4_4.4.1-14: Test Configuration Table (network signalled value "NS_16")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: Low range<br><br>For 3 MHz Channel Bandwidth: Low range, 810 MHz ($N_{UL}$= 27070)<br><br>For 5 MHz Channel Bandwidth: Low range, 811 MHz ($N_{UL}$= 27080), 814.5 MHz ($N_{UL}$= 27115)<br><br>For 10 MHz Channel Bandwidth: Low range, 813.5 MHz ($N_{UL}$= 27105), 817 MHz ($N_{UL}$= 27140) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz | | |
| **Test Parameters for NS_16 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for A-MPR testing | | 256QAM | 6 | 0 |
| 2 | 3 MHz | | | 256QAM | 15 | 0 |
| 3 | 5 MHz | | | 256QAM | 25 | 0 |
| 4 | 10 MHz | | | 256QAM | 50 | 0 |

**Table 6.2.4_4.4.1-15: Test Configuration Table (network signalled value "NS_17")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Mid range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz | |
| **Test Parameters for NS_17 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 256QAM | 25 |
| 2 | 10MHz | | | 256QAM | 50 |

**Table 6.2.4_4.4.1-16: Test Configuration Table (network signalled value "NS_18")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_18 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 256QAM | 25 |
| 2 | 10MHz | | | 256QAM | 50 |
| 3 | 15MHz | | | 256QAM | 75 |
| 4 | 20MHz | | | 256QAM | 100 |

**Table 6.2.4_4.4.1-17: Test Configuration Table (network signalled value "NS_19")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 3MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_19 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 3MHz | N/A for A-MPR testing | | 256QAM | 15 |
| 2 | 10MHz | | | 256QAM | 40 |
| 3 | 15MHz | | | 256QAM | 45 |
| 4 | 20MHz | | | 256QAM | 50 |
| Note 1: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | |

**Table 6.2.4_4.4.1-18: Test Configuration Table (network signalled value "NS_20")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2007.5 MHz ($N_{UL}$ = 25575)<br>c. 2012.5 MHz ($N_{UL}$ = 25625)<br>d. 2017.5 MHz ($N_{UL}$ = 25675)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_20 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 256QAM | 15 |
| 2 | 5MHz | | | 256QAM | 25 |
| 3 | 10MHz | | | 256QAM | 50 |
| 4 | 15MHz | | | 256QAM | 25 |
| 5 | 15MHz | | | 256QAM | 36 |
| 6 | 15MHz | | | 256QAM | 75 |
| 7 | 20MHz | | | 256QAM | 25 |
| 8 | 20MHz | | | 256QAM | 75 |
| 9 | 20MHz | | | 256QAM | 100 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_4.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | |

**Table 6.2.4_4.4.1-19: Test Configuration Table (network signalled value "NS_21")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10 MHz | | |
| **Test Parameters for NS_21 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 10 MHz | N/A for A-MPR testing | | 256QAM | 50 | 0 |

**Table 6.2.4_4.4.1-20: Test Configuration Table (network signalled value "NS_22")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_22 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 256QAM | 1 | 0 |
| 2 | 5MHz | | | 256QAM | 1 | 24 |
| 3 | 10MHz | | | 256QAM | 1 | 0 |
| 4 | 10MHz | | | 256QAM | 1 | 49 |
| 5 | 15MHz | | | 256QAM | 1 | 0 |
| 6 | 15MHz | | | 256QAM | 1 | 74 |
| 7 | 20MHz | | | 256QAM | 1 | 0 |
| 8 | 20MHz | | | 256QAM | 1 | 99 |

**Table 6.2.4_4.4.1-21: Test Configuration Table (network signalled value "NS_23")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz | | |
| **Test Parameters for NS_23 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 256QAM | 1 | 0 |
| 2 | 5MHz | | | 256QAM | 1 | 24 |

**Table 6.2.4_4.4.1-22: Test Configuration Table (network signalled value "NS_24")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>10 and 15 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_24 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | High | 5MHz | N/A for A-MPR testing | | 256QAM | 25 | 0 |
| 2 | 1980 | 10MHz | | | 256QAM | 50 | 0 |
| 3 | 1990 | 10MHz | | | 256QAM | 50 | 0 |
| 4 | 1980 | 15MHz | | | 256QAM | 75 | 0 |
| 5 | High | 20MHz | | | 256QAM | 100 | 0 |

**Table 6.2.4_4.4.1-23: Test Configuration Table (network signalled value "NS_25")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>10 and 15 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 132672)<br>- 1990 MHz ($N_{UL}$ = 132772) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_25 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | High | 5MHz | N/A for A-MPR testing | | 256QAM | 25 | 0 |
| 2 | 1980 | 10MHz | | | 256QAM | 50 | 0 |
| 3 | 1990 | 10MHz | | | 256QAM | 50 | 0 |
| 4 | 1980 | 15MHz | | | 256QAM | 75 | 0 |
| 5 | 1980 | 20MHz | | | 256QAM | 100 | 0 |
| 6 | High | 20MHz | | | 256QAM | 100 | 0 |

**Table 6.2.4_4.4.1-24: Reserved**

**Table 6.2.4_4.4.1-25: Test Configuration Table (network signalled value "NS_27")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to Frequency column in test parameters | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_27 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Frequency** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | Low/Mid/High | 5MHz | N/A for A-MPR testing | | 256QAM | 25 | 0 |
| 2 | Low/Mid/High | 10MHz | | | 256QAM | 50 | 0 |
| 3 | Low/Mid/High | 15MHz | | | 256QAM | 75 | 0 |
| 4 | Low/Mid/High | 20MHz | | | 256QAM | 100 | 0 |

**Table 6.2.4_4.4.1-26: Test Configuration Table (network signalled value "NS_35")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_35 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 256QAM | 25 |
| 2 | 10MHz | | | 256QAM | 50 |
| 3 | 15MHz | | | 256QAM | 75 |
| 4 | 20MHz | | | 256QAM | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |
| Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_4.5 as not all combinations are necessarily required based on the applicability of the UE. | | | | | |

**Table 6.2.4_4.4.1-27: Test Configuration Table (network signalled value "NS_36")**

| | Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>5 MHz CH BW:<br>- 700.5 MHz ($N_{UL}$ = low range)<br>- 705.5 MHz ($N_{UL}$ =132747)<br>10 MHz CH BW:<br>- 703 MHz ($N_{UL}$ = low range)<br>- 708 MHz ($N_{UL}$ = 132772)<br>15 MHz CH BW:<br>- 705.5 MHz ($N_{UL}$ = low range)<br>- 710.5 MHz ($N_{UL}$ =132797 ) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz | | |
| **Test Parameters for NS_36 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 700.5 | 5MHz | N/A for A-MPR testing | | 256QAM | 25 | 0 |
| 2 | 705.5 | 5MHz | | | 256QAM | 25 | 0 |
| 3 | 703 | 10MHz | | | 256QAM | 50 | 0 |
| 4 | 708 | 10MHz | | | 256QAM | 50 | 0 |
| 5 | 705.5 | 15MHz | | | 256QAM | 75 | 0 |
| 6 | 710.5 | 15MHz | | | 256QAM | 75 | 0 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_4.5 as not all combinations are necessarily required based on the applicability of the UE. | | | | | | | |

Editor's note: The following lines belong at the end of section 6.2.4_4.4.1. As new tables are added to this section, these lines should always follow the tables.

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to the applicable table from Table 6.2.4_4.4.1-1 to Table 6.2.4_4.4.1-27.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.4_4.4.3.

### 6.2.4_4.4.2 Test procedure

Same test procedure as in clause 6.2.4.4.2 with the following exceptions:

- Instead of Table 6.2.4.4.1-1 to 6.2.4.4.1-26 → use Table 6.2.4_4.4.1-1 to 6.2.4_4.4.1-27

### 6.2.4_4.4.3 Message contents

Same message contents as in clause 6.2.4.4.3 except table numbers.

## 6.2.4_4.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable table from Table 6.2.4_4.5-1 to Table 6.2.4_4.5-29. The allowed A-MPR values specified in Table 6.2.4.3-1 are in addition to the allowed MPR requirements specified in clause 6.2.3. For the UE maximum output power modified by MPR and/or A-MPR, the power limits specified in Table 6.2.5.3-1 apply.

**Table 6.2.4_4.5-1: UE Power Class 3 test requirements (network signalled value "NS_03") (for Bands 4, 10, 23, 35, 36, 66, and 70)**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 0 | 0 | 18.0 | 4.0 | 25.7 | 13.3 |
| 2 | 3 | 1 | 0 | 17.0 | 5.0 | 25.7 | 11.3 |
| 3 | 2 | 0 | 0 | 18.0 | 4.0 | 25.7 | 13.3 |
| 4 | 3 | 1 | 0 | 17.0 | 5.0 | 25.7 | 11.3 |
| 5 | 2 | 1 | 0 | 17.0 | 5.0 | 25.7 | 11.3 |
| 6 | 3 | 1 | 0 | 17.0 | 5.0 | 25.7 | 11.3 |
| 7 | 2 | 1 | 0 | 17.0 | 5.0 | 25.7 | 11.3 |
| 8 | 3 | 1 | 0 | 17.0 | 5.0 | 25.7 | 11.3 |
| 9 | 2 | 1 | 0 | 17.0 | 5.0 | 25.7 | 11.3 |
| 10 | 3 | 1 | 0 | 17.0 | 5.0 | 25.7 | 11.3 |
| 11 | 2 | 1 | 0 | 17.0 | 5.0 | 25.7 | 11.3 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-2: UE Power Class test requirements (network signalled value "NS_03") (for Bands 2 and 25)**

| Configuration ID | EUTRA band | Test Freq. | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | 2, 25 | Mid | | | | | 23 | +2.7 / -9.7 |
| 1 | 2, 25 | Low, High | | | | | 23 | +2.7 / -12.2 |
| 2 | 2, 25 | Mid | | | | | 23 | +2.7 / -11.7 |
| 2 | 2, 25 | Low, High | | | | | 23 | +2.7 / -13.2 |
| 3 | 2, 25 | Mid | | | | | 23 | +2.7 / -9.7 |
| 3 | 2, 25 | Low, High | | | | | 23 | +2.7 / -12.2 |
| 4 | 2, 25 | All | | | | | 23 | +2.7 / -11.7 |
| 5 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -11.7 |
| 5 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -13.2 |
| 6 | 2, 25 | All | | | | | 23 | +2.7 / -11.7 |
| 7 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -11.7 |
| 7 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -13.2 |
| 8 | 2, 25 | All | | | | | 23 | +2.7 / -11.7 |
| 9 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -11.7 |
| 9 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -13.2 |
| 10 | 2, 25 | All | | | | | 23 | +2.7 / -11.7 |
| 11 | 2, 25 | All | | | | | 23 | +2.7 / -11.7 |

NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4_4.5-3: UE Power Class 3 test requirements (network signalled value "NS_04")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 (Low, Mid Range, 2500.6 MHz) | 5 | 0 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 1 (High Range) | 5 | 0 | 1.5 | 16.5 | 5.0 | 25.7 | 10.8 |
| 2 (Low Range) | 5 | 2 | 0 | 16 | 5.0 | 25.7 | 10.3 |
| 2 (Mid, High Range, 2500.6 MHz) | 5 | 0 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 3 (Low Range) | 5 | 2 | 0 | 16 | 5.0 | 25.7 | 10.3 |
| 3 (Mid, High Range, 2504.1 MHz) | 5 | 0 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 4 (Low Range) | 5 | 3 | 0 | 15 | 5.0 | 25.7 | 9.3 |
| 4 (Mid, High Range, 2510.9 MHz) | 5 | 0 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 5 (Low Range) | 5 | 3 | 0 | 15 | 5.0 | 25.7 | 9.3 |
| 5 (Mid, High Range, 2517.6 MHz) | 5 | 0 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-4: UE Power Class 3 test requirements (network signalled value "NS_05")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 0 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 2 | 5 | 1 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 3 | 5 | 11 | 0 | 7 | 7.0 | 25.7 | -0.7 |
| 4 | 5 | 11 | 0 | 7 | 7.0 | 25.7 | -0.7 |
| 5 | 5 | 0 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 6 | 5 | 0 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 7 | 5 | 1 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-5: UE Power Class test requirements (network signalled value "NS_06") (for Bands 13, 14, and 17)**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 13,14,17 | | | | | 23 | +2.7 / -9.7 |
| 2 | 13,14,17 | | | | | 23 | +2.7 / -9.7 |
| 3 | 13,14,17 | | | | | 23 | +2.7 / -9.7 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-6: UE Power Class test requirements (network signalled value "NS_06") (for Band 12)**

| Configuration ID | EUTRA band | Test Freq. | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | 12 | Mid | | | | | 23 | +2.7 / -9.7 |
| 1 | 12 | Low, High | | | | | 23 | +2.7 / -12.2 |
| 2 | 12 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -9.7 |
| 2 | 12 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -12.2 |
| 3 | 12 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -9.7 |
| 3 | 12 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -12.2 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | |

**Table 6.2.4_4.5-7: UE Power Class test requirements (network signalled value "NS_07")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 13 | | | | | 23 | +2.7 / -24.7 |
| 2 | 13 | | | | | 23 | +2.7 / -9.7 |
| 3 | 13 | | | | | 23 | +2.7 / -17.7 |
| 4 | 13 | | | | | 23 | +2.7 / -24.2 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-8: UE Power Class 3 test requirements (network signalled value "NS_08")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 0 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 2 | 5 | 3 | 0 | 15 | 5.0 | 25.7 | 9.3 |
| 3 | 5 | 3 | 0 | 15 | 5.0 | 25.7 | 9.3 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-9: UE Power Class 3 test requirements (network signalled value "NS_09")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 0 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| 2 | 5 | 1 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 3 | 5 | 2 | 0 | 16 | 5.0 | 25.7 | 10.3 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-10: UE Power Class test requirements (network signalled value "NS_10")**

| Void, not tested |
|---|

**Table 6.2.4_4.5-11: UE Power Class test requirements (network signalled value "NS_11")**

| Configuration ID | EUTRA Band | Centre Frequency | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1a | 23 | 2001.5 MHz | | | | | 23 | + 2.7 / -15.7 |
| 1b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 2a | 23 | 2001.5 MHz | | | | | 23 | + 2.7 / -15.7 |
| 2b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 3a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -18.7 |
| 3b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -9.7 |
| 3c | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 4a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -18.7 |
| 4b | 23 | 2004.5 MHz | | | | | 23 | + 2.7 / -14.7 |
| 4c | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 5a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -24.7 |
| 5b | 23 | 2005.5 MHz | | | | | 23 | + 2.7 / -24.7 |
| 5c | 23 | 2015 MHz | | | | | 23 | + 2.7 / -9.7 |
| 6a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -24.7 |
| 6b | 23 | 2005.5 MHz | | | | | 23 | + 2.7 / -24.7 |
| 6c | 23 | 2015 MHz | | | | | 23 | + 2.7 / -9.7 |
| 7a | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -27.7 |
| 7b (NOTE 2) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -21.7 |
| 7b (NOTE 3) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -18.2 |
| 8a (NOTE 2) | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -27.7 |
| 8a (NOTE 3) | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -9.7 |
| 8b (NOTE 2) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -21.7 |
| 8b (NOTE 3) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -12.7 |
| 9a (NOTE 2) | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -27.7 |
| 9a (NOTE 3) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -17.7 |
| 9b (NOTE 2) | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -21.7 |
| 9b (NOTE 3) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -12.7 |
| 10a | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -27.7 |
| 10b | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -21.7 |
| 11 | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -27.7 |
| 12 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -27.7 |
| 13 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -27.7 |

NOTE 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.
NOTE 2: $RB_{start}$ = RB# 0
NOTE 3: $RB_{start}$ = RB# (max +1 - RB allocation)

**Table 6.2.4_4.5-12: UE Power Class 3 test requirements (network signalled value "NS_12")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 6 | 1.5 | 10.5 | 6.0 | 25.7 | 3.8 |
| 2 | 5 | 3 | 0 | 15.0 | 5.0 | 25.7 | 9.3 |
| 3 | 5 | 2 | 0 | 16.0 | 5.0 | 25.7 | 10.3 |
| 4 | 5 | 3 | 0 | 15.0 | 5.0 | 25.7 | 9.3 |

NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4_4.5-13: UE Power Class 3 test requirements (network signalled value "NS_13")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 2 | 0 | 16 | 5.0 | 25.7 | 10.3 |

NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4_4.5-14: UE Power Class 3 test requirements (network signalled value "NS_14")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 1 | 0 | 17 | 5,0 | 25.7 | 11.3 |
| 2 | 5 | 1 | 0 | 17 | 5,0 | 25.7 | 11.3 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-15: UE Power Class test requirements (network signalled value "NS_15")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 26 | | | | | 23 | +2.7 / -15.2 |
| 2 | 26 | | | | | 23 | +2.7 / -23.2 |
| 3 | 26 | | | | | 23 | +2.7 / -20.7 |
| 4 | 26 | | | | | 23 | +2.7 / -20.7 |
| 5 | 26 | | | | | 23 | +2.7 / -20.7 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-16A: UE Power Class test requirements (network signalled value "NS_16") when lower channel edge is at 807 MHz**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 27 | | | | | 23 | +2.7 / -9.7 |
| 2 | 27 | | | | | 23 | +2.7 / -12.7 |
| 3 | 27 | | | | | 23 | +2.7 / -15.7 |
| 4 | 27 | | | | | 23 | +2.7 / -18.7 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-16B: UE Power Class test requirements (network signalled value "NS_16") when lower channel edge is at 808.5 MHz**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 27 | not tested | | | | | |
| 2 | 27 | | | | | 23 | +2.7 / -9.7 |
| 3 | 27 | | | | | 23 | +2.7 / -13.7 |
| 4 | 27 | | | | | 23 | +2.7 / -15.7 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-16C: UE Power Class test requirements (network signalled value "NS_16") when lower channel edge is at 812 MHz**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 27 | not tested | | | | | |
| 2 | 27 | not tested | | | | | |
| 3 | 27 | | | | | 23 | +2.7 / -9.7 |
| 4 | 27 | | | | | 23 | +2.7 / -13.7 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-17: UE Power Class test requirements (network signalled value "NS_17")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 28 | | | | | 23 | +2.7 / -9.7 |
| 2 | 28 | | | | | 23 | +2.7 / -9.7 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-18: UE Power Class test requirements (network signalled value "NS_18")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 28 | | | | | 23 | +2,7 / -11,7 |
| 2 | 28 | | | | | 23 | +2,7 / -14,7 |
| 3 | 28 | | | | | 23 | +2,7 / -14,7 |
| 4 | 28 | | | | | 23 | +2,7 / -14,7 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-19: UE Power Class 3 test requirements (network signalled value "NS_19")**

| Configuration ID | Test Freq | RB location | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Low | Full RB | 5 | 0 | 0 | 18,0 | 4,0 | 25.7 | 13,3 |
| 2 | Low | Low | 5 | 1 | 0 | 17,0 | 5,0 | 25.7 | 11,3 |
| 2 | Low | High | 5 | 0 | 0 | 18,0 | 4,0 | 25.7 | 13,3 |
| 3 | Low | Low | 5 | 3 | 0 | 15,0 | 5,0 | 25.7 | 9,3 |
| 3 | Low | High | 5 | 0 | 0 | 18,0 | 4,0 | 25.7 | 13,3 |
| 4 | Low | Low | 5 | 3 | 0 | 15,0 | 5,0 | 25.7 | 9,3 |
| 4 | Low | High | 5 | 0 | 0 | 18,0 | 4,0 | 25.7 | 13,3 |
| NOTE: Lower limit is assuming ΔTIB,c is zero. If non-zero, PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | |

**Table 6.2.4_4.5-20: UE Power Class test requirements (network signalled value "NS_20")**

| Configuration ID | EUTRA Band | Centre Frequency | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -29.7 |
| 1b (NOTE 2) | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -11.7 |
| 1b (NOTE 3) | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -9.7 |
| 1c | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -9.7 |
| 1d | 23 | 2017.5 MHz | | | | | 23 | + 2.7 / -9.7 |
| 2a | 23 | 2002.5 MHz | | | | | 23 | + 2.7 / -29.7 |
| 2b | 23 | 2007.5 MHz | | | | | 23 | + 2.7 / -14.7 |
| 2c | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -9.7 |
| 2d | 23 | 2017.5 MHz | | | | | 23 | + 2.7 / -9.7 |
| 3a (NOTE 2) | 23 | 2005 MHz | | | | | 23 | + 2.7 / -28.7 |
| 3a (NOTE 3) | 23 | 2005 MHz | | | | | 23 | + 2.7 / -9.7 |
| 3b | 23 | 2015 MHz | | | | | 23 | + 2.7 / -9.7 |
| 4a | 23 | 2005 MHz | | | | | 23 | + 2.7 / -29.7 |
| 4b | 23 | 2005 MHz | | | | | 23 | + 2.7 / -10.2 |
| 5 (NOTE 2) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -17.7 |
| 5 (NOTE 3) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -9.7 |
| 6 (NOTE 2) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -17.7 |
| 6 (NOTE 3) | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -15.7 |
| 7 | 23 | 2012.5 MHz | | | | | 23 | + 2.7 / -23.7 |
| 8 (NOTE 2) | 23 | 2010 MHz | | | | | 23 | + 2.7 / -29.7 |
| 8 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -28.7 |
| 9 (NOTE 2) | 23 | 2010 MHz | | | | | 23 | + 2.7 / -29.7 |
| 9 (NOTE 3) | 23 | 2010 MHz | | | | | 23 | + 2.7 / -28.7 |
| 10 (NOTE 2) | 23 | 2010 MHz | | | | | 23 | + 2.7 / -29.7 |
| 10 (NOTE 3) | 23 | 2010 MHz | | | | | 23 | + 2.7 / -24.7 |
| 11 | 23 | 2010 MHz | | | | | 23 | + 2.7 / -29.7 |

NOTE 1: Lower limit is assuming ΔTIB,c is zero. If non-zero, PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.
NOTE 2: $RB_{start}$ = RB# 0
NOTE 3: $RB_{start}$ = RB# (max +1 - RB allocation)

**Table 6.2.4_4.5-21: UE Power Class 3 test requirements (network signalled value "NS_21 for Band 30")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 3 | 0 | 15 | 5.0 | 25.7 | 9.3 |

NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4_4.5-22: UE Power Class 3 Test requirements (network signalled value "NS_22")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 0 | 0 | 18 | 4.0 | 26.0 | 13.0 |
| 2 | 5 | 0 | 0 | 18 | 4.0 | 26.0 | 13.0 |
| 3 | 5 | 3 | 0 | 15 | 5.0 | 26.0 | 9.0 |
| 4 | 5 | 3 | 0 | 15 | 5.0 | 26.0 | 9.0 |
| 5 | 5 | 3 | 0 | 15 | 5.0 | 26.0 | 9.0 |
| 6 | 5 | 3 | 0 | 15 | 5.0 | 26.0 | 9.0 |
| 7 | 5 | 3 | 0 | 15 | 5.0 | 26.0 | 9.0 |
| 8 | 5 | 3 | 0 | 15 | 5.0 | 26.0 | 9.0 |

NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4_4.5-23: UE Power Class 3 Test requirements (network signalled value "NS_23")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 0 | 0 | 18 | 4.0 | 26.0 | 13.0 |
| 2 | 5 | 0 | 0 | 18 | 4.0 | 26.0 | 13.0 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-24: UE Power Class 3 test requirements (network signalled value "NS_24")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | [0] | 0 | [18.0] | [4.0] | 25.7 | [13.3] |
| 2 | 5 | 2 | 0 | 16.0 | 5.0 | 25.7 | 10.3 |
| 3 | 5 | [0] | 0 | [18.0] | [4.0] | 25.7 | [13.3] |
| 4 | 5 | 8 | 0 | 10.0 | 6.0 | 25.7 | 3.3 |
| 5 | 5 | [0] | 0 | [18.0] | [4.0] | 25.7 | [13.3] |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-25: UE Power Class 3 test requirements (network signalled value "NS_25")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 5 | 0 | 13.0 | 5.0 | 25.7 | 7.3 |
| 2 | 5 | 1 | 0 | 17.0 | 5.0 | 25.7 | 11.3 |
| 3 | 5 | 5 | 0 | 13.0 | 5.0 | 25.7 | 7.3 |
| 4 | 5 | 4 | 0 | 14.0 | 5.0 | 25.7 | 8.3 |
| 5 | 5 | 11 | 0 | 7.0 | 7.0 | 25.7 | -0.7 |
| 6 | 5 | [0] | 0 | [18.0] | [4.0] | 25.7 | [13.3] |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-26: Reserved**

**Table 6.2.4_4.5-27: UE Power Class 3 test requirements (network signalled value "NS_27")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 0 | 0 | 18.0 | 4.0 | 26.0 | 13.0 |
| 2 | 5 | 0 | 0 | 18.0 | 4.0 | 26.0 | 13.0 |
| 3 | 5 | 2 | 0 | 16.0 | 5.0 | 26.0 | 10.0 |
| 4 | 5 | 3 | 0 | 15.0 | 5.0 | 26.0 | 9.0 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-28: UE Power Class 3 test requirements (network signalled value "NS_35")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 0 | 0 | 18.0 | 4.0 | 25.7 | 13.3 |
| 2 | 5 | 0 | 0 | 18.0 | 4.0 | 25.7 | 13.3 |
| 3 | 5 | 0 | 0 | 18.0 | 4.0 | 25.7 | 13.3 |
| 4 | 5 | 0 | 0 | 18.0 | 4.0 | 25.7 | 13.3 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4_4.5-29: UE Power Class 3 test requirements (network signalled value "NS_36")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 4 | 0 | 14.0 | 5.0 | 25.7 | 8.3 |
| 2 | 5 | 0 | 0 | 18.0 | 4.0 | 25.7 | 13.3 |
| 3 | 5 | 10 | 0 | 8.0 | 6.0 | 25.7 | 1.3 |
| 4 | 5 | 0 | 0 | 18.0 | 4.0 | 25.7 | 13.3 |
| 5 | 5 | 10 | 0 | 8.0 | 6.0 | 25.7 | 1.3 |
| 6 | 5 | 0 | 0 | 18.0 | 4.0 | 25.7 | 13.3 |
| NOTE: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

# 6.2.4A Additional Maximum Power Reduction (A-MPR) for CA

## 6.2.4A.1 Additional Maximum Power Reduction (A-MPR) for CA (intra-band contiguous DL CA and UL CA)

### 6.2.4A.1.1 Test purpose

Additional ACLR, spectrum emission and spurious emission requirements for carrier aggregation can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction (A-MPR) is allowed for the CA Power Class as specified in Table 6.2.2A.0-2.

### 6.2.4A.1.2 Test applicability

The requirements of this test apply in test case 6.6.2.2A.1 Additional Spectrum Emission Mask for CA (intra-band contiguous DL CA and UL CA) for network signalled value CA_NS_04 to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA but do not support UL 64QAM or UL 256QAM.

The requirements of this test apply in test case 6.6.3.3A.1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) for network signalled values CA_NS_01, CA_NS_02 and CA_NS_03, CA_NS_05, CA_NS_06, CA_NS_07 to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA but do not support UL 64QAM or UL 256QAM.

NOTE: As a result TC 6.2.4A.1 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.4A.1.3 Minimum conformance requirements

Additional ACLR, spectrum emission and spurious emission requirements for carrier aggregation can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction (A-MPR) is allowed for the CA Power Class as specified in Table 6.2.2A.0-2.

If for intra-band carrier aggregation the UE is configured for transmissions on a single serving cell, then subclauses 6.2.3 and 6.2 4 apply with the Network Signalling value indicated by the field *additionalSpectrumEmission*.

For intra-band contiguous aggregation with the UE configured for transmissions on two serving cells, the maximum output power reduction specified in Table 6.2.4A.1.3-1 is allowed for all serving cells of the applicable uplink CA configurations according to the CA network signalling value indicated by the field *additionalSpectrumEmissionSCell-r10*. Then clause 6.2.3A.1.3 does not apply, i.e. the carrier aggregation MPR = 0 dB, unless the value indicated is CA_NS_31.

For the UE maximum output power modified by A-MPR specified in table 6.2.4A.1.3-1, the power limits specified in subclause 6.2.5A.1.3 apply.

**Table 6.2.4A.1.3-1: Additional Maximum Power Reduction (A-MPR) for intra-band contiguous CA**

| CA Network Signalling value | Requirements (subclause) | Uplink CA Configuration | A-MPR [dB] (subclause) |
|---|---|---|---|
| CA_NS_01 | 6.6.3.3A.1.3.1 | CA_1C | 6.2.4A.1.3.1 |
| CA_NS_02 | 6.6.3.3A.1.3.2 | CA_1C | 6.2.4A.1.3.2 |
| CA_NS_03 | 6.6.3.3A.1.3.3 | CA_1C | 6.2.4A.1.3.3 |
| CA_NS_04 | 6.6.2.2A.1.3.1 | CA_41C | 6.2.4A.1.3.4 |
| CA_NS_05 | 6.6.3.3A.1.3.4 | CA_38C | 6.2.4A.1.3.5 |
| CA_NS_06 | 6.6.3.3A.1.3.5 | CA_7C | 6.2.4A.1.3.6 |
| CA_NS_07 | 6.6.3.3A.1.3.6 | CA_39C | 6.2.4A.1.3.7 |
| … | | | |
| CA_NS_31 | NOTE 1 | Table 5.4.2A.1-1 (NOTE 1) | N/A |
| CA_NS_32 | Reserved | | |

NOTE 1: Applicable for uplink CA configurations listed in Table 5.4.2A.1-1 for which none of the additional requirements in subclauses 6.6.3.3A or 6.6.2.2A apply.
NOTE 2: The index of the sequence CA_NS corresponds to the value of *additionalSpectrumEmissionSCell-r10*.

For PUCCH and SRS transmissions, the allowed A-MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For intra-band carrier aggregation, the A-MPR is evaluated per slot and given by the maximum value taken over the transmission(s) on all component carriers within the slot; the maximum A-MPR over the two slots is then applied for the entire subframe.

### 6.2.4A.1.3.1 A-MPR for CA_NS_01 for CA_1C

If the UE is configured to CA_1C and it receives IE CA_NS_01 the allowed maximum output power reduction applied to transmissions on the PCC and the SCC for contiguously aggregated signals is specified in table 6.2.4A.1.3.1-1.

**Table 6.2.4A.1.3.1-1: Contiguous allocation A-MPR for CA_NS_01**

| CA_1C: CA_NS_01 | $RB_{start}$ | $L_{CRB}$ [RBs] | $RB_{start} + L_{CRB}$ [RBs] | A-MPR for QPSK and 16-QAM [dB] |
|---|---|---|---|---|
| 100 RB / 100 RB | 0 – 23 and 176 - 199 | > 0 | N/A | ≤ 12.0 |
| | 24 – 105 | > 64 | N/A | ≤ 6.0 |
| | 106 – 175 | N/A | > 175 | ≤ 5.0 |
| 75 RB / 75 RB | 0 – 6 and 143 – 149 | $0 < L_{CRB} \leq 10$ | N/A | ≤ 11.0 |
| | | > 10 | N/A | ≤ 6.0 |
| | 7 – 90 | > 44 | N/A | ≤ 5.0 |
| | 91 – 142 | N/A | > 142 | ≤ 2.0 |

NOTE 1: RB_start indicates the lowest RB index of transmitted resource blocks
NOTE 2: L_CRB is the length of a contiguous resource block allocation
NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis
NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe

If the UE is configured to CA_1C and it receives IE CA_NS_01 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$\text{A-MPR} = \text{CEIL}\{M_A, 0.5\}$$

Where $M_A$ is defined as follows:

$$M_A = -22.5\,A + 17 \quad ; 0 \leq A < 0.20$$

$$-11.0\,A + 14.7 \quad ; 0.20 \leq A < 0.70$$

$$-1.7\ A + 8.2 \quad ; 0.70 \leq A \leq 1$$

Where $A = N_{RB_alloc} / N_{RB_agg}$

The normative reference for requirement is in TS 36.101 [2] clause 6.2.4A

### 6.2.4A.1.3.2 A-MPR for CA_NS_02 for CA_1C

If the UE is configured to CA_1C and it receives IE CA_NS_02 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1.3.2-1.

**Table 6.2.4A.1.3.2-1: Contiguous allocation A-MPR for CA_NS_02**

| CA_1C: CA_NS_02 | $RB_{end}$ | $L_{CRB}$ [RBs] | A-MPR for QPSK and 16 -QAM [dB] |
|---|---|---|---|
| 100 RB / 100 RB | 0 –20 | > 0 | ≤ 4 dB |
| | 21 – 46 | > 0 | ≤ 3 dB |
| | 47 – 99 | > $RB_{end}$ – 20 | ≤ 3 dB |
| | 100 – 184 | > 75 | ≤ 6 dB |
| | 185 – 199 | > 0 | ≤ 10 dB |
| 75 RB / 75 RB | 0 – 48 | > 0 | ≤ 2 dB |
| | 49 – 80 | > $RB_{end}$ – 20 | ≤ 3 dB |
| | 81 – 129 | > 60 | ≤ 5 dB |
| | 130 – 149 | > 85 | ≤ 6 dB |
| | 130 – 149 | 1 – 84 | ≤ 2 dB |

If the UE is configured to CA_1C and it receives IE CA_NS_02 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows:

$$\text{A-MPR} = \text{CEIL}\ \{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$[M_A = -22.5\ A + 17 \quad ; 0 \leq A < 0.20$$

$$-11.0\ A + 14.7 \quad ; 0.20 \leq A < 0.70$$

$$-1.7\ A + 8.2 \quad ; 0.70 \leq A \leq 1]$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

### 6.2.4A.1.3.3 A-MPR for CA_NS_03 for CA_1C

If the UE is configured to CA_1C and it receives IE CA_NS_03 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1.3.3-1.

**Table 6.2.4A.1.3.3-1: Contiguous allocation A-MPR for CA_NS_03**

| CA_1C: CA_NS_03 | $RB_{end}$ | $L_{CRB}$ [RBs] | A-MPR for QPSK and 16-QAM [dB] |
|---|---|---|---|
| 100 RB / 100 RB | 0 – 26 | > 0 | ≤ 10 dB |
| | 27 – 63 | ≥ $RB_{end}$ – 27 | ≤ 6 dB |
| | 27 – 63 | < $RB_{end}$ – 27 | ≤ 1 dB |
| | 64 – 100 | > $RB_{end}$ – 20 | ≤ 4 dB |
| | 101 – 171 | > 68 | ≤ 7 dB |
| | 172 – 199 | > 0 | ≤ 10 dB |
| 75 RB / 75 RB | 0 – 20 | > 0 | ≤ 10 dB |
| | 21 – 45 | > 0 | ≤ 4 dB |
| | 46 – 75 | > $RB_{end}$ – 13 | ≤ 2 dB |
| | 76 – 95 | > 45 | ≤ 5 dB |
| | 96 – 149 | > 43 | ≤ 8 dB |
| | 120 – 149 | 1 – 43 | ≤ 6 dB |

If the UE is configured to CA_1C and it receives IE CA_NS_03 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows:

$$\text{A-MPR} = \text{CEIL}\{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$[M_A = -23.33A + 17.5 \quad ; 0 \leq A < 0.15$$

$$-7.65A + 15.15 \quad ; 0.15 \leq A \leq 1]$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

### 6.2.4A.1.3.4 A-MPR for CA_NS_04 for CA_41C

If the UE is configured to CA_41C and it receives IE CA_NS_04 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1.3.4-1.

**Table 6.2.4A.1.3.4-1: Contiguous Allocation A-MPR for CA_NS_04**

| CA Bandwidth Class C | $RB_{Start}$ | $L_{CRB}$ [RBs] | $RB_{start} + L_{CRB}$ [RBs] | A-MPR for QPSK [dB] | A-MPR for 16QAM [dB] |
|---|---|---|---|---|---|
| 50RB / 100 RB | 0 – 44 and 105 – 149 | >0 | N/A | ≤4dB | ≤4dB |
| | 45 – 104 | N/A | >105 | ≤3dB | ≤4dB |
| 75 RB / 75 RB | 0 – 44 and 105 – 149 | >0 | N/A | ≤4dB | ≤4dB |
| | 45 – 104 | N/A | >105 | ≤4dB | ≤4dB |
| 100 RB / 75 RB | 0 – 49 and 125 – 174 | >0 | N/A | ≤4dB | ≤4dB |
| | 50 - 124 | N/A | >125 | ≤3dB | ≤4dB |
| 100 RB / 100 RB | 0 – 59 and 140 – 199 | >0 | N/A | ≤3dB | ≤4dB |
| | 60– 139 | N/A | >140 | ≤3dB | ≤4dB |

NOTE 1: $RB_{start}$ indicates the lowest RB index of transmitted resource blocks
NOTE 2: $L_{CRB}$ is the length of a contiguous resource block allocation
NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis
NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe

If the UE is configured to CA_41C and it receives IE CA_NS_04 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$A\text{-}MPR = CEIL\ \{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$M_A = 10.5, \quad 0 \leq A < 0.05$$
$$= -50.0A + 13.00, \quad 0.05 \leq A < 0.15$$
$$= -4.0A + 6.10, \quad 0.15 \leq A < 0.40$$
$$= -0.83A + 4.83, \quad 0.40 \leq A \leq 1$$

Where $A = N_{RB_alloc} / N_{RB_agg}$.

### 6.2.4A.1.3.5 A-MPR for CA_NS_05 for CA_38C

If the UE is configured to CA_38C and it receives IE CA_NS_05 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1.3.5-1.

**Table 6.2.4A.1.3.5-1: Contiguous Allocation A-MPR for CA_NS_05**

| CA_38C | $RB_{end}$ | $L_{CRB}$ [RBs] | A-MPR for QPSK and 16-QAM [dB] |
|---|---|---|---|
| 100RB/100RB | 0 – 12 | >0 | ≤ 5 dB |
| | 13 – 79 | > $RB_{end}$ – 13 | ≤ 2 dB |
| | 80 – 180 | >60 | ≤ 6 dB |
| | 181 – 199 | > 0 | ≤ 11 dB |
| 75RB/75RB | 0 – 70 | > max(0, $RB_{end}$ -10) | ≤ 2 dB |
| | 71- 108 | > 60 | ≤ 5 dB |
| | 109 – 140 | >0 | ≤ 5 dB |
| | 140 – 149 | ≤ 70 | ≤ 2 dB |
| | 140 – 149 | >70 | ≤ 6 dB |
| NOTE 1: $RB_{end}$ indicates the highest RB index of transmitted resource blocks<br>NOTE 2: $L_{CRB}$ is the length of a contiguous resource block allocation<br>NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis<br>NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe | | | |

If the UE is configured to CA_38C and it receives IE CA_NS_05 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$A\text{-}MPR = CEIL\ \{M_A, 0.5\}$$

Where MA is defined as follows

$$M_A = -14.17\ A + 16.50 \quad ; 0 \leq A < 0.60$$
$$-2.50\ A + 9.50 \quad ; 0.60 \leq A \leq 1$$

Where $A = N_{RB_alloc} / N_{RB_agg}$.

### 6.2.4A.1.3.6 A-MPR for CA_NS_06 for CA_7C

If the UE is configured to CA_7C and it receives IE CA_NS_06 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1.3.6-1.

**Table 6.2.4A.1.3.6-1: Contiguous Allocation A-MPR for CA_NS_06**

| CA Bandwidth Class C | $RB_{_end}$ | $L_{CRB}$ [RBs] | A-MPR for QPSK and 16-QAM [dB] |
|---|---|---|---|
| 100RB/100RB | [0 –22] | >[0] | ≤ [4] dB |
| | [23 – 33] | > [$RB_{end}$ – 10] | ≤ [2] dB |
| | [106 – 142] | > [75] | ≤ [3] dB |
| | [143 – 178] | >[70] | ≤ [5] dB |
| | [179 – 199] | > [0] | ≤ [10] dB |
| 75RB/75RB | [0 – 7] | >[0] | ≤ [5] dB |
| | [20- 75] | > [$RB_{end}$ – 10] | ≤ [2] dB |
| | [75 – 110] | >[64] | ≤ [2] dB |
| | [110 – 144] | >[35] | ≤ [6] dB |
| | [145 – 149] | >[0] | ≤ [10] dB |

If the UE is configured to CA_7C and it receives IE CA_NS_06 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows:

$$\text{A-MPR} = \text{CEIL}\ \{M_{A,}\ 0.5\}$$

Where $M_A$ is defined as follows

$$M_A = [-23.33A + 17.5;\ 0 \leq A < 0.15$$

$$-7.65A + 15.15;\ 0.15 \leq A \leq 1]$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

### 6.2.4A.1.3.7 A-MPR for CA_NS_07 for CA_39C

If the UE is configured to CA_39C and it receives IE CA_NS_07 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1.3.7-1.

**Table 6.2.4A.1.3.7-1: Contiguous Allocation A-MPR for CA_NS_07**

| CA_39C: CA_NS_07 | $RB_{Start}$ | $L_{CRB}$ [RBs] | A-MPR for QPSK and 16-QAM[dB] |
|---|---|---|---|
| 75 RB / 100 RB and 100 RB / 75 RB | 0 – 13 | > 0 | ≤ 11 |
| | 14 – 50 | ≤ 60 | ≤ 3 |
| | 14 – 100 | > 60 | ≤ 7 |
| | 101 – 155 | > max(155 - RBstart , 0) | ≤ 2 |
| | 156 – 174 | > 0 | ≤ 5 |
| 50 RB / 100 RB and 100 RB / 50 RB | 0 – 5 | > 0 | ≤ 11 |
| | 6 – 42 | ≤ 25 | ≤ 3 |
| | | > 25 | ≤ 6 |
| | 43 – 80 | > 50 | ≤ 5 |
| | 81 – 138 | > 20 | ≤ 2 |
| | 139 – 149 | > 0 | ≤ 5 |
| 25 RB / 100 RB and 100 RB / 25 RB | 0 – 32 | ≥ 84 | ≤ 6 |
| | | < 84 | ≤ 4 |
| | 33 – 60 | > 50 | ≤ 3 |
| | 61 – 124 | > 20 | ≤ 3 |

If the UE is configured to CA_39C and it receives IE CA_NS_07 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$\text{A-MPR} = \text{CEIL}\ \{M_{A,}\ 0.5\}$$

Where $M_A$ is defined as follows:

$$M_A = -16.25A + 21 \quad ; 0 \leq A < 0.80$$

$$-2.50\ A + 10.00 \quad ; 0.80 \leq A \leq 1$$

Where $A = N_{RB_alloc} / N_{RB_agg}$

## 6.2.4A.1.4 Test description

### 6.2.4A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.2.4A.1.4.1-1 to 6.2.4A.1.4.1-7. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4A.1.4.1-1: Test Configuration Table (network signalled value "CA_NS_01")**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | C: Low and High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | As in Table 6.2.4A.1.3.1-1 | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | QPSK | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | | |
| 3 | 75 | 75 | | QPSK | 45 | P_45@7 | S_0@0 | | |
| 4 | 75 | 75 | | QPSK | 8 | P_0@0 | S_8@67 | | |
| 5 | 75 | 75 | | QPSK | 129 | P_75@0 | S_54@0 | | |
| 6 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | | |
| 8 | 100 | 100 | | QPSK | 1 | P_1@0 | S_0@0 | | |
| 9 | 100 | 100 | | QPSK | 175 | P_75@25 | S_100@0 | | |
| 10 | 100 | 100 | | QPSK | 25 | P_0@0 | S_25@75 | | |
| 11 | 100 | 100 | | QPSK | 64 | P_64@24 | S_0@0 | | |
| 12 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

**Table 6.2.4A.1.4.1-2: Test Configuration Table (network signalled value "CA_NS_02")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | As in Table 6.2.4A.1.3.2-1 |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | QPSK | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | | |
| 3 | 75 | 75 | | QPSK | 129 | P_75@0 | S_54@0 | | |
| 4 | 75 | 75 | | QPSK | 129 | P_54@21 | S_75@0 | | |
| 5 | 75 | 75 | | QPSK | 1 | P_0@0 | S_1@74 | | |
| 6 | 75 | 75 | | QPSK | 1 | P_0@0 | S_1@54 | | |
| 7 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 8 | 100 | 100 | | QPSK | 1 | P_1@0 | S_0@0 | | |
| 9 | 100 | 100 | | QPSK | 1 | P_1@21 | S_0@0 | | |
| 10 | 100 | 100 | | QPSK | 90 | P_90@0 | S_0@0 | | |
| 11 | 100 | 100 | | QPSK | 180 | P_100@0 | S_80@0 | | |
| 12 | 100 | 100 | | QPSK | 1 | P_0@0 | S_1@99 | | |
| 13 | 100 | 100 | | QPSK | 1 | P_0@0 | S_1@83 | | |
| 14 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

**Table 6.2.4A.1.4.1-3: Test Configuration Table (network signalled value "CA_NS_03")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | As in Table 6.2.4A.1.3.3-1 |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | QPSK | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | QPSK | 1 | P_1@21 | S_0@0 | | |
| 3 | 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | | |
| 4 | 75 | 75 | | QPSK | 90 | P_75@0 | S_15@0 | | |
| 5 | 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | | |
| 6 | 75 | 75 | | QPSK | 1 | P_0@0 | S_1@74 | | |
| 7 | 75 | 75 | | QPSK | 1 | P_0@0 | S_1@44 | | |
| 8 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 9 | 100 | 100 | | QPSK | 1 | P_1@0 | S_0@0 | | |
| 10 | 100 | 100 | | QPSK | 60 | P_60@0 | S_0@0 | | |
| 11 | 100 | 100 | | QPSK | 1 | P_1@63 | S_0@0 | | |
| 12 | 100 | 100 | | QPSK | 90 | P_90@0 | S_0@0 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 13 | 100 | 100 | | QPSK | 164 | P_100@0 | S_64@0 | | |
| 14 | 100 | 100 | | QPSK | 1 | P_0@0 | S_1@99 | | |
| 15 | 100 | 100 | | QPSK | 1 | P_0@0 | S_1@70 | | |
| 16 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

**Table 6.2.4A.1.4.1-4: Test Configuration Table (network signalled value "CA_NS_04")**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | C: Low and High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | As in Table 6.2.4A.1.3.4-1 | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 100 | 50 | N/A | QPSK | 10 | P_10@20 | S_0@0 | | |
| 2 | 100 | 50 | | QPSK | 60 | P_50@50 | S_10@0 | | |
| 3 | 100 | 50 | | 16QAM | 15 | P_0@0 | S_15@0 | | |
| 4 | 100 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |
| 5 | 75 | 75 | | QPSK | 10 | P_10@20 | S_0@0 | | |
| 6 | 75 | 75 | | QPSK | 75 | P_30@45 | S_45@0 | | |
| 7 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 8 | 100 | 75 | | QPSK | 10 | P_10@20 | S_0@0 | | |
| 9 | 100 | 75 | | QPSK | 80 | P_50@50 | S_30@0 | | |
| 10 | 100 | 75 | | 16QAM | 20 | P_0@0 | S_20@15 | | |
| 11 | 100 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 12 | 100 | 100 | | QPSK | 10 | P_10@25 | S_0@0 | | |
| 13 | 100 | 100 | | QPSK | 90 | P_40@60 | S_50@0 | | |
| 14 | 100 | 100 | | 16QAM | 15 | P_0@0 | S_15@40 | | |
| 15 | 100 | 100 | | 16QAM | 20 | P_0@0 | S_20@30 | | |
| 16 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

**Table 6.2.4A.1.4.1-5: Test Configuration Table (network signalled value "CA_NS_05")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | C: Low and High range | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | As in Table 6.2.4A.1.3.5-1 | | | |
| **Test Parameters for CA Configurations** | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 75 | 75 | N/A | QPSK | 40 | P_40@0 | S_0@0 | | |
| 2 | 75 | 75 | | QPSK | 80 | P_50@25 | S_30@0 | | |
| 3 | 75 | 75 | | QPSK | 60 | P_10@65 | S_50@0 | | |
| 4 | 75 | 75 | | QPSK | 65 | P_1@74 | S_64@0 | | |
| 5 | 75 | 75 | | QPSK | 92 | P_20@55 | S_72@0 | | |
| 6 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | QPSK | 8 | P_8@0 | S_0@0 | | |
| 8 | 100 | 100 | | QPSK | 40 | P_40@0 | S_0@0 | | |
| 9 | 100 | 100 | | QPSK | 80 | P_50@50 | S_30@0 | | |
| 10 | 100 | 100 | | QPSK | 150 | P_60@40 | S_90@0 | | |
| 11 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

**Table 6.2.4A.1.4.1-6: Test Configuration Table (network signalled value "CA_NS_06")**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | As in Table 6.2.4A.1.3.6-1 |

**Test Parameters for CA Configurations**

| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | QPSK | 5 | P_5@0 | S_0@0 | | |
| 2 | 75 | 75 | | QPSK | 45 | P_45@0 | S_0@0 | | |
| 3 | 75 | 75 | | QPSK | 75 | P_60@15 | S_15@0 | | |
| 4 | 75 | 75 | | QPSK | 60 | P_10@65 | S_50@0 | | |
| 5 | 75 | 75 | | QPSK | 90 | P_18@57 | S_72@0 | | |
| 6 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | QPSK | 10 | P_10@0 | S_0@0 | | |
| 8 | 100 | 100 | | QPSK | 30 | P_30@0 | S_0@0 | | |
| 9 | 100 | 100 | | QPSK | 100 | P_75@25 | S_25@0 | | |
| 10 | 100 | 100 | | QPSK | 90 | P_40@60 | S_50@0 | | |
| 11 | 100 | 100 | | QPSK | 96 | P_15@85 | S_81@0 | | |
| 12 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

**Table 6.2.4A.1.4.1-7: Test Configuration Table (network signalled value "CA_NS_07")**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | As in Table 6.2.4A.1.3.7-1 |

**Test Parameters for CA Configurations**

| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | |
|---|---|---|---|---|---|---|
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 100 | 25 | N/A | QPSK | 1 | P_1@0 | S_0@0 | | |
| 2 | 100 | 25 | | QPSK | 85 | P_80@20 | S_5@0 | | |
| 3 | 100 | 25 | | QPSK | 65 | P_60@40 | S_5@0 | | |
| 4 | 100 | 25 | | QPSK | 35 | P_30@70 | S_5@0 | | |
| 5 | 100 | 25 | | QPSK | 2 | P_1@0 | S_1@24 | | |
| 6 | 100 | 50 | | QPSK | 1 | P_1@1 | S_0@0 | | |
| 7 | 100 | 50 | | QPSK | 10 | P_10@30 | S_0@0 | | |
| 8 | 100 | 50 | | QPSK | 30 | P_30@30 | S_0@0 | | |
| 9 | 100 | 50 | | QPSK | 60 | P_40@60 | S_20@0 | | |
| 10 | 100 | 50 | | QPSK | 30 | P_10@90 | S_20@0 | | |
| 11 | 100 | 50 | | QPSK | 5 | P_0@0 | S_5@45 | | |
| 12 | 100 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |
| 13 | 100 | 75 | | QPSK | 1 | P_1@1 | S_0@0 | | |
| 14 | 100 | 75 | | QPSK | 40 | P_40@20 | S_0@0 | | |
| 15 | 100 | 75 | | QPSK | 85 | P_80@20 | S_5@0 | | |
| 16 | 100 | 75 | | QPSK | 40 | P_0@0 | S_40@20 | | |
| 17 | 100 | 75 | | QPSK | 15 | P_0@0 | S_15@60 | | |
| 18 | 100 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to the applicable table from Table 6.2.4A.1.4.1-1 to 6.2.4A.1.4.1-7.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.4A.1.4.3.

### 6.2.4A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.2.4A.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to the applicable from Table 6.2.4A.1.4.1-1 to Table 6.2.4A.1.4.1-7 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach $P_{UMAX}$ level.
6. Measure the mean transmitted power over all component carriers in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

### 6.2.4A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.The following exceptions apply for each network signalled value.

6.2.4A.1.4.3.1 Message contents exceptions (network signalled value "CA_NS_01")

1. Information element additionalSpectrumEmissionSCell-r10 is set to CA_NS_01. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spectrum emission requirement for a specific deployment scenario.

**Table 6.2.4A.1.4.3.1-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NS_01"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 1 (CA_NS_01) | | |

6.2.4A.1.4.3.2 Message contents exceptions (network signalled value "CA_NS_02")

1. Information element additionalSpectrumEmissionSCell-r10 is set to CA_NS_02. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spectrum emission requirement for a specific deployment scenario.

**Table 6.2.4A.1.4.3.2-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NS_02"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 2 (CA_NS_02) | | |

6.2.4A.1.4.3.3 Message contents exceptions (network signalled value "CA_NS_03")

1. Information element additionalSpectrumEmissionSCell-r10 is set to CA_NS_03. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spectrum emission requirement for a specific deployment scenario.

**Table 6.2.4A.1.4.3.3-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NS_03"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 3 (CA_NS_03) | | |

6.2.4A.1.4.3.4 Message contents exceptions (network signalled value "CA_NS_04")

1. Information element additionalSpectrumEmissionSCell-r10 is set to CA_NS_04. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spectrum emission requirement for a specific deployment scenario.

**Table 6.2.4A.1.4.3.4-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NS_04"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 4 (CA_NS_04) | | |

6.2.4A.1.4.3.5 Message contents exceptions (network signalled value "CA_NS_05")

1. Information element additionalSpectrumEmissionSCell-r10 is set to CA_NS_05. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spectrum emission requirement for a specific deployment scenario.

**Table 6.2.4A.1.4.3.5-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NS_05"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 5 (CA_NS_05) | | |

6.2.4A.1.4.3.6 Message contents exceptions (network signalled value "CA_NS_06")

1. Information element additionalSpectrumEmissionSCell-r10 is set to CA_NS_06. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spectrum emission requirement for a specific deployment scenario.

**Table 6.2.4A.1.4.3.6-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NS_06"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 6 (CA_NS_06) | | |

6.2.4A.1.4.3.7 Message contents exceptions (network signalled value "CA_NS_07")

1. Information element additionalSpectrumEmissionSCell-r10 is set to CA_NS_07. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spectrum emission requirement for a specific deployment scenario.

**Table 6.2.4A.1.4.3.7-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NS_07"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 7 (CA_NS_07) | | |

## 6.2.4A.1.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable table from Table 6.2.4A.1.5-1 to Table 6.2.4A.1.5-7. The allowed maximum output power reduction is specified in Table 6.2.4A.1.3-1 and clause 6.2.3A.1 does not apply, i.e. carrier aggregation MPR = 0. For the UE maximum output power modified by A-MPR specified in table 6.2.4A.1.3-1, the power limits specified in Table 6.2.5A.1.3-1 apply.

**Table 6.2.4A.1.5-1: Test requirement (network signalled value "CA_NS_01")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -17.7 |
| 2 | | | | | 23 | +2.7 / -11.7 |
| 3 | | | | | 23 | +2.7 / -9.7 |
| 4 | | | | | 23 | +2.7 / -4.7 |
| 5 | | | | | 23 | +2.7 / -11.7 |
| 6 | | | | | 23 | +2.7 / -24.7 |
| 7 | | | | | 23 | +2.7 / -18.7 |
| 8 | | | | | 23 | +2.7 / -18.7 |
| 9 | | | | | 23 | +2.7 / -11.7 |
| 10 | | | | | 23 | +2.7 / -9.7 |
| 11 | | | | | 23 | +2.7 / -2.7 |
| 12 | | | | | 23 | +2.7 / -24.7 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

**Table 6.2.4A.1.5-2: Test requirement (network signalled value "CA_NS_02")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -4.7 |
| 2 | | | | | 23 | +2.7 / -6.2 |
| 3 | | | | | 23 | +2.7 / -9.7 |
| 4 | | | | | 23 | +2.7 / -11.7 |
| 5 | | | | | 23 | +2.7 / -4.7 |
| 6 | | | | | 23 | +2.7 / -2.7 |
| 7 | | | | | 23 | +2.7/-24.7 |
| 8 | | | | | 23 | +2.7 / -8.2 |
| 9 | | | | | 23 | +2.7 / -6.2 |
| 10 | | | | | 23 | +2.7 / -6.2 |
| 11 | | | | | 23 | +2.7 / -11.7 |
| 12 | | | | | 23 | +2.7 / -15.7 |
| 13 | | | | | 23 | +2.7 / -2.7 |
| 14 | | | | | 23 | +2.7/-24.7 |

Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1.

**Table 6.2.4A.1.5-3: Test requirement (network signalled value "CA_NS_03")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -15.7 |
| 2 | | | | | 23 | +2.7 / -8.2 |
| 3 | | | | | 23 | +2.7 / -4.7 |
| 4 | | | | | 23 | +2.7 / -9.7 |
| 5 | | | | | 23 | +2.7 / -13.7 |
| 6 | | | | | 23 | +2.7 / -11.7 |
| 7 | | | | | 23 | +2.7 / -2.7 |
| 8 | | | | | 23 | +2.7/-25.2 |
| 9 | | | | | 23 | +2.7 / -15.7 |
| 10 | | | | | 23 | +2.7 / -11.7 |
| 11 | | | | | 23 | +2.7 / -3.7 |
| 12 | | | | | 23 | +2.7 / -8.2 |
| 13 | | | | | 23 | +2.7 / -12.7 |
| 14 | | | | | 23 | +2.7 / -15.7 |
| 15 | | | | | 23 | +2.7 / -2.7 |
| 16 | | | | | 23 | +2.7/-25.2 |

Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1.

**Table 6.2.4A.1.5-4: Test requirement (network signalled value "CA_NS_04")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -8.2 |
| 2 | | | | | 23 | +2.7 / -6.2 |
| 3 | | | | | 23 | +2.7 / -8.2 |
| 4 | | | | | 23 | +2.7 / -18.7 |
| 5 | | | | | 23 | +2.7 / -8.2 |
| 6 | | | | | 23 | +2.7 / -8.2 |
| 7 | | | | | 23 | +2.7 / -18.7 |
| 8 | | | | | 23 | +2.7 / -8.2 |
| 9 | | | | | 23 | +2.7 / -6.2 |
| 10 | | | | | 23 | +2.7 / -8.2 |
| 11 | | | | | 23 | +2.7 / -18.7 |
| 12 | | | | | 23 | +2.7 / -6.2 |
| 13 | | | | | 23 | +2.7 / -6.2 |
| 14 | | | | | 23 | +2.7 / -8.2 |
| 15 | | | | | 23 | +2.7 / -8.2 |
| 16 | | | | | 23 | +2.7 / -18.7 |

Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1.

**Table 6.2.4A.1.5-5: Test requirement (network signalled value "CA_NS_05")**

| Configuration ID | Test Freq. | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | Low, High | | | | | 23 | +2.7 / -4.7 |
| 2 | Low, High | | | | | 23 | +2.7 / -9.7 |
| 3 | Low, High | | | | | 23 | +2.7 / -9.7 |
| 4 | Low, High | | | | | 23 | +2.7 / -9.7 |
| 5 | Low, High | | | | | 23 | +2.7 / -11.7 |
| 6 | Low, High | | | | | 23 | +2.7 / -24.2 |
| 7 | Low, High | | | | | 23 | +2.7 / -9.7 |
| 8 | Low, High | | | | | 23 | +2.7 / -4.7 |
| 9 | Low, High | | | | | 23 | +2.7 / -11.7 |
| 10 | Low, High | | | | | 23 | +2.7 / -17.7 |
| 11 | Low, High | | | | | 23 | +2.7 / -24.2 |

Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1.

**Table 6.2.4A.1.5-6: Test requirement (network signalled value "CA_NS_06")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -12.2 |
| 2 | | | | | 23 | +2.7 / -4.7 |
| 3 | | | | | 23 | +2.7 / -4.7 |
| 4 | | | | | 23 | +2.7 / -11.7 |
| 5 | | | | | 23 | +2.7 / -15.7 |
| 6 | | | | | 23 | +2.7 / -26.7 |
| 7 | | | | | 23 | +2.7 / -11.2 |
| 8 | | | | | 23 | +2.7 / -4.7 |
| 9 | | | | | 23 | +2.7 / -6.2 |
| 10 | | | | | 23 | +2.7 / -9.7 |
| 11 | | | | | 23 | +2.7 / -15.7 |
| 12 | | | | | 23 | +2.7 / -26.7 |

Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1.

**Table 6.2.4A.1.5-7: Test requirement (network signalled value "CA_NS_07")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -8.2 |
| 2 | | | | | 23 | +2.7 / -11.7 |
| 3 | | | | | 23 | +2.7 / -6.2 |
| 4 | | | | | 23 | +2.7 / -6.2 |
| 5 | | | | | 23 | +2.7 / -28.7 |
| 6 | | | | | 23 | +2.7 / -17.7 |
| 7 | | | | | 23 | +2.7 / -6.2 |
| 8 | | | | | 23 | +2.7 / -11.7 |
| 9 | | | | | 23 | +2.7 / -9.7 |
| 10 | | | | | 23 | +2.7 / -4.7 |
| 11 | | | | | 23 | +2.7 / -9.7 |
| 12 | | | | | 23 | +2.7 / -28.7 |
| 13 | | | | | 23 | +2.7 / -17.7 |
| 14 | | | | | 23 | +2.7 / -6.2 |
| 15 | | | | | 23 | +2.7 / -12.7 |
| 16 | | | | | 23 | +2.7 / -4.7 |
| 17 | | | | | 23 | +2.7 / -9.7 |
| 18 | | | | | 23 | +2.7 / -28.7 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

## 6.2.4A.1_1 Additional Maximum Power Reduction (A-MPR) for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM

Editor's notes:

- Minimum requirement for CA_NS_08 for this test case is undefined in TS 36.101.

- For a transition period until RAN5#83, this test case in version 15.3.1 of 36.521-1 shall be used. This is to ensure no test coverage is lost before the UL 256QAM test case becomes available.

### 6.2.4A.1_1.1 Test purpose

Same test purpose as in clause 6.2.4A.1.1.

### 6.2.4A.1_1.2 Test applicability

The requirements of this test apply in test case 6.6.2.2A.1_1 Additional Spectrum Emission Mask for CA (intra-band contiguous DL CA and UL CA) for network signalled value CA_NS_04 to all types of E-UTRA UE from release 13 and forward that support intra-band contiguous DL CA, UL CA and UL 64QAM but do not support UL 256QAM.

The requirements of this test apply in test case 6.6.3.3A.1_1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) for network signalled values CA_NS_01, CA_NS_02 and CA_NS_03, CA_NS_05, CA_NS_06, CA_NS_07, CA_NS_08 to all types of E-UTRA UE from release 13 and forward that support intra-band contiguous DL CA, UL CA and UL 64QAM but do not support UL 256QAM.

NOTE: As a result TC 6.2.4A.1_1 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.4A.1_1.3 Minimum conformance requirements

Additional ACLR, spectrum emission and spurious emission requirements for carrier aggregation can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction (A-MPR) is allowed for the CA Power Class as specified in Table 6.2.2A.0-2.

If for intra-band carrier aggregation the UE is configured for transmissions on a single serving cell, then subclauses 6.2.3 and 6.2 4 apply with the Network Signalling value indicated by the field *additionalSpectrumEmission*.

For intra-band contiguous aggregation with the UE configured for transmissions on two serving cells, the maximum output power reduction specified in Table 6.2.4A.1_1.3-1 is allowed for all serving cells of the applicable uplink CA configurations according to the CA network signalling value indicated by the field *additionalSpectrumEmissionSCell-r10*. Then clause 6.2.3A.1.3 does not apply, i.e. the carrier aggregation MPR = 0 dB, unless the value indicated is CA_NS_31. For uplink 64QAM, the applied maximum output power reduction is obtained by taking the maximum value of MPR requirements specified in Table 6.2.3A.1_1.3-1 and A-MPR requirements specified in Table 6.2.4A.1_1.3-1.

For the UE maximum output power modified by A-MPR specified in table 6.2.4A.1_1.3-1, the power limits specified in subclause 6.2.5A.1.3 apply.

**Table 6.2.4A.1_1.3-1: Additional Maximum Power Reduction (A-MPR) for intra-band contiguous CA**

| CA Network Signalling value | Requirements (subclause) | Uplink CA Configuration | A-MPR [dB] (subclause) |
|---|---|---|---|
| CA_NS_01 | 6.6.3.3A.1.3.1 | CA_1C | 6.2.4A.1_1.3.1 |
| CA_NS_02 | 6.6.3.3A.1.3.2 | CA_1C | 6.2.4A.1_1.3.2 |
| CA_NS_03 | 6.6.3.3A.1.3.3 | CA_1C | 6.2.4A.1_1.3.3 |
| CA_NS_04 | 6.6.2.2A.1.3.1 | CA_41C | 6.2.4A.1_1.3.4 |
| CA_NS_05 | 6.6.3.3A.1.3.4 | CA_38C | 6.2.4A.1_1.3.5 |
| CA_NS_06 | 6.6.3.3A.1.3.5 | CA_7C | 6.2.4A.1_1.3.6 |
| CA_NS_07 | 6.6.3.3A.1.3.6 | CA_39C | 6.2.4A.1_1.3.7 |
| CA_NS_08 | 6.6.3.3A.1.3.7 | CA_42C | 6.2.4A.1_1.3.8 |
| … | | | |
| CA_NS_31 | NOTE 1 | Table 5.4.2A.1-1 (NOTE 1) | N/A |
| CA_NS_32 | Reserved | | |

NOTE 1: Applicable for uplink CA configurations listed in Table 5.4.2A.1-1 for which none of the additional requirements in subclauses 6.6.3.3A or 6.6.2.2A apply.
NOTE 2: The index of the sequence CA_NS corresponds to the value of *additionalSpectrumEmissionSCell-r10*.

For PUCCH and SRS transmissions, the allowed A-MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For intra-band carrier aggregation, the A-MPR is evaluated per slot and given by the maximum value taken over the transmission(s) on all component carriers within the slot; the maximum A-MPR over the two slots is then applied for the entire subframe.

#### 6.2.4A.1_1.3.1 A-MPR for CA_NS_01 for CA_1C

If the UE is configured to CA_1C and it receives IE CA_NS_01 the allowed maximum output power reduction applied to transmissions on the PCC and the SCC for contiguously aggregated signals is specified in table 6.2.4A.1_1.3.1-1.

**Table 6.2.4A.1_1.3.1-1: Contiguous allocation A-MPR for CA_NS_01**

| CA_1C: CA_NS_01 | $RB_{start}$ | $L_{CRB}$ [RBs] | $RB_{start} + L_{CRB}$ [RBs] | A-MPR for 64-QAM [dB] |
|---|---|---|---|---|
| 100 RB / 100 RB | 0 – 23 and 176 - 199 | > 0 | N/A | ≤ 12.0 |
| | 24 – 105 | > 64 | N/A | ≤ 6.0 |
| | 106 – 175 | N/A | > 175 | ≤ 5.0 |
| 75 RB / 75 RB | 0 – 6 and 143 – 149 | $0 < L_{CRB} \leq 10$ | N/A | ≤ 11.0 |
| | | > 10 | N/A | ≤ 6.0 |
| | 7 – 90 | > 44 | N/A | ≤ 5.0 |
| | 91 – 142 | N/A | > 142 | ≤ 2.0 |

NOTE 1: RB_start indicates the lowest RB index of transmitted resource blocks
NOTE 2: L_CRB is the length of a contiguous resource block allocation
NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis
NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe

If the UE is configured to CA_1C and it receives IE CA_NS_01 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$\text{A-MPR} = \text{CEIL}\{M_A, 0.5\}$$

Where $M_A$ is defined as follows:

$$M_A = -22.5\,A + 17 \quad ; 0 \leq A < 0.20$$

$$-11.0\,A + 14.7 \quad ; 0.20 \leq A < 0.70$$

$$-1.7\,A + 8.2 \quad ; 0.70 \leq A \leq 1$$

Where $A = N_{RB_alloc} / N_{RB_agg}$

The normative reference for requirement is in TS 36.101 [2] clause 6.2.4A.

### 6.2.4A.1_1.3.2 A-MPR for CA_NS_02 for CA_1C

If the UE is configured to CA_1C and it receives IE CA_NS_02 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_1.3.2-1.

**Table 6.2.4A.1_1.3.2-1: Contiguous allocation A-MPR for CA_NS_02**

| CA_1C: CA_NS_02 | $RB_{end}$ | $L_{CRB}$ [RBs] | A-MPR for 64-QAM [dB] |
|---|---|---|---|
| 100 RB / 100 RB | 0 –20 | > 0 | ≤ 4 dB |
| | 21 – 46 | > 0 | ≤ 3 dB |
| | 47 – 99 | > $RB_{end}$ – 20 | ≤ 3 dB |
| | 100 – 184 | > 75 | ≤ 6 dB |
| | 185 – 199 | > 0 | ≤ 10 dB |
| 75 RB / 75 RB | 0 – 48 | > 0 | ≤ 2 dB |
| | 49 – 80 | > $RB_{end}$ – 20 | ≤ 3 dB |
| | 81 – 129 | > 60 | ≤ 5 dB |
| | 130 – 149 | > 85 | ≤ 6 dB |
| | 130 – 149 | 1 – 84 | ≤ 2 dB |

If the UE is configured to CA_1C and it receives IE CA_NS_02 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows:

$$A\text{-}MPR = CEIL\ \{M_{A,}\ 0.5\}$$

Where $M_A$ is defined as follows

$$[M_A = -22.5\ A + 17 \quad ;\ 0 \le A < 0.20$$

$$-11.0\ A + 14.7 \quad ;\ 0.20 \le A < 0.70$$

$$-1.7\ A + 8.2 \quad ;\ 0.70 \le A \le 1]$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

### 6.2.4A.1_1.3.3 A-MPR for CA_NS_03 for CA_1C

If the UE is configured to CA_1C and it receives IE CA_NS_03 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_1.3.3-1.

**Table 6.2.4A.1_1.3.3-1: Contiguous allocation A-MPR for CA_NS_03**

| CA_1C: CA_NS_03 | $RB_{end}$ | $L_{CRB}$ [RBs] | A-MPR for 64-QAM [dB] |
|---|---|---|---|
| 100 RB / 100 RB | 0 – 26 | > 0 | ≤ 10 dB |
| | 27 – 63 | ≥ $RB_{end}$ – 27 | ≤ 6 dB |
| | 27 – 63 | < $RB_{end}$ – 27 | ≤ 1 dB |
| | 64 – 100 | > $RB_{end}$ – 20 | ≤ 4 dB |
| | 101 – 171 | > 68 | ≤ 7 dB |
| | 172 – 199 | > 0 | ≤ 10 dB |
| 75 RB / 75 RB | 0 – 20 | > 0 | ≤ 10 dB |
| | 21 – 45 | > 0 | ≤ 4 dB |
| | 46 – 75 | > $RB_{end}$ – 13 | ≤ 2 dB |
| | 76 – 95 | > 45 | ≤ 5 dB |
| | 96 – 149 | > 43 | ≤ 8 dB |
| | 120 – 149 | 1 – 43 | ≤ 6 dB |

If the UE is configured to CA_1C and it receives IE CA_NS_03 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows:

$$A\text{-}MPR = CEIL\ \{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$[M_A = -23.33A + 17.5 \quad ; 0 \leq A < 0.15$$

$$-7.65A + 15.15 \quad ; 0.15 \leq A \leq 1]$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

### 6.2.4A.1_1.3.4 A-MPR for CA_NS_04 for CA_41C

If the UE is configured to CA_41C and it receives IE CA_NS_04 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_1.3.4-1.

**Table 6.2.4A.1.3.4-1: Contiguous Allocation A-MPR for CA_NS_04**

| CA Bandwidth Class C | $RB_{Start}$ | $L_{CRB}$ [RBs] | $RB_{start} + L_{CRB}$ [RBs] | A-MPR for 64-QAM [dB] |
|---|---|---|---|---|
| 50RB / 100 RB | 0 – 44 and 105 – 149 | >0 | N/A | ≤4dB |
| | 45 – 104 | N/A | >105 | ≤4dB |
| 75 RB / 75 RB | 0 – 44 and 105 – 149 | >0 | N/A | ≤4dB |
| | 45 – 104 | N/A | >105 | ≤4dB |
| 100 RB / 75 RB | 0 – 49 and 125 – 174 | >0 | N/A | ≤4dB |
| | 50 - 124 | N/A | >125 | ≤4dB |
| 100 RB / 100 RB | 0 – 59 and 140 – 199 | >0 | N/A | ≤4dB |
| | 60– 139 | N/A | >140 | ≤4dB |
| NOTE 1: RBstart indicates the lowest RB index of transmitted resource blocks<br>NOTE 2: LCRB is the length of a contiguous resource block allocation<br>NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis<br>NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe | | | | |

If the UE is configured to CA_41C and it receives IE CA_NS_04 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$A\text{-}MPR = CEIL\ \{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$M_A = 10.5, \quad 0 \leq A < 0.05$$

$$= -50.0A + 13.00, \quad 0.05 \leq A < 0.15$$

$$= -4.0A + 6.10, \quad 0.15 \leq A < 0.40$$

$$= -0.83A + 4.83, \quad 0.40 \leq A \leq 1$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

### 6.2.4A.1_1.3.5 A-MPR for CA_NS_05 for CA_38C

If the UE is configured to CA_38C and it receives IE CA_NS_05 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_1.3.5-1.

**Table 6.2.4A.1_1.3.5-1: Contiguous Allocation A-MPR for CA_NS_05**

| CA_38C | $RB_{end}$ | $L_{CRB}$ [RBs] | A-MPR for 64-QAM [dB] |
|---|---|---|---|
| 100RB/100RB | 0 – 12 | >0 | ≤ 5 dB |
| | 13 – 79 | > $RB_{end}$ – 13 | ≤ 2 dB |
| | 80 – 180 | >60 | ≤ 6 dB |
| | 181 – 199 | > 0 | ≤ 11 dB |
| 75RB/75RB | 0 – 70 | > max(0, $RB_{end}$ -10) | ≤ 2 dB |
| | 71- 108 | > 60 | ≤ 5 dB |
| | 109 – 140 | >0 | ≤ 5 dB |
| | 140 – 149 | ≤ 70 | ≤ 2 dB |
| | 140 – 149 | >70 | ≤ 6 dB |
| NOTE 1: $RB_{end}$ indicates the highest RB index of transmitted resource blocks<br>NOTE 2: $L_{CRB}$ is the length of a contiguous resource block allocation<br>NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis<br>NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe | | | |

If the UE is configured to CA_38C and it receives IE CA_NS_05 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$A\text{-}MPR = CEIL\ \{M_A, 0.5\}$$

Where MA is defined as follows

$$M_A = -14.17\ A + 16.50 \quad ; 0 \leq A < 0.60$$

$$-2.50\ A + 9.50 \quad ; 0.60 \leq A \leq 1$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

### 6.2.4A.1_1.3.6 A-MPR for CA_NS_06 for CA_7C

If the UE is configured to CA_7C and it receives IE CA_NS_06 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_1.3.6-1.

**Table 6.2.4A.1_1.3.6-1: Contiguous Allocation A-MPR for CA_NS_06**

| CA Bandwidth Class C | $RB_{end}$ | $L_{CRB}$ [RBs] | A-MPR for 64-QAM [dB] |
|---|---|---|---|
| 100RB/100RB | 0 –22 | >0 | ≤ 4 dB |
| | 23 – 99 | > max(0,$RB_{end}$ – 25) | ≤ 2 dB |
| | 100 – 142 | > 75 | ≤ 3 dB |
| | 143 – 177 | >70 | ≤ 5 dB |
| | 178 – 199 | > 0 | ≤ 10 dB |
| 75RB/75RB | 0 – 7 | >0 | ≤ 5 dB |
| | 8- 74 | > max(0,$RB_{end}$ – 10) | ≤ 2 dB |
| | 75 – 109 | >64 | ≤ 2 dB |
| | 110 – 144 | >35 | ≤ 6 dB |
| | 145 – 149 | >0 | ≤ 10 dB |
| 50RB/100RB and 100RB/50RB | 0 – 10 | > 0 | ≤ 5 dB |
| | 11 – 75 | > max(0, RB_End – 25) | ≤ 2 dB |
| | 76 – 103 | > 50 | ≤ 3 dB |
| | 104 – 144 | > 25 | ≤ 6 dB |
| | 145 – 149 | > 0 | ≤ 10 dB |
| 75RB/100RB and 100RB/75RB | 0 – 15 | > 0 | ≤ 5 dB |
| | 16 – 75 | > max(0, RB_End – 15) | ≤ 2 dB |
| | 76 – 120 | > 50 | ≤ 3 dB |
| | 121 – 160 | > 50 | ≤ 6 dB |
| | 161 – 174 | > 0 | ≤ 10 dB |

If the UE is configured to CA_7C and it receives IE CA_NS_06 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows:

$$\text{A-MPR} = \text{CEIL}\{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$M_A = \begin{cases} -23.33A + 17.5 & ; 0 \le A < 0.15 \\ -7.65A + 15.15 & ; 0.15 \le A \le 1 \end{cases}$$

Where $A = N_{RB_alloc} / N_{RB_agg}$.

### 6.2.4A.1_1.3.7 A-MPR for CA_NS_07 for CA_39C

If the UE is configured to CA_39C and it receives IE CA_NS_07 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_1.3.7-1.

**Table 6.2.4A.1_1.3.7-1: Contiguous Allocation A-MPR for CA_NS_07**

| CA_39C: CA_NS_07 | $RB_{Start}$ | $L_{CRB}$ [RBs] | A-MPR for 64-QAM [dB] |
|---|---|---|---|
| 75 RB / 100 RB and 100 RB / 75 RB | 0 – 13 | > 0 | ≤ 11 |
| | 14 – 50 | ≤ 60 | ≤ 3 |
| | 14 – 100 | > 60 | ≤ 7 |
| | 101 – 155 | > max(155 - RBstart , 0) | ≤ 2 |
| | 156 – 174 | > 0 | ≤ 5 |
| 50 RB / 100 RB and 100 RB / 50 RB | 0 – 5 | > 0 | ≤ 11 |
| | 6 – 42 | ≤ 25 | ≤ 3 |
| | | > 25 | ≤ 6 |

| | | | |
|---|---|---|---|
| | 43 – 80 | > 50 | ≤ 5 |
| | 81 – 138 | > 20 | ≤ 2 |
| | 139 – 149 | > 0 | ≤ 5 |
| 25 RB / 100 RB and 100 RB / 25 RB | 0 – 32 | ≥ 84 | ≤ 6 |
| | | < 84 | ≤ 4 |
| | 33 – 60 | > 50 | ≤ 3 |
| | 61 – 124 | > 20 | ≤ 3 |

If the UE is configured to CA_39C and it receives IE CA_NS_07 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$A\text{-}MPR = CEIL\ \{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$M_A = -16.25A + 21 \quad ; 0 \leq A < 0.80$$

$$-2.50\ A + 10.00 \quad ; 0.80 \leq A \leq 1$$

Where $A = N_{RB_alloc} / N_{RB_agg}$

#### 6.2.4A.1_1.3.8 A-MPR for CA_NS_08 for CA_42C

If the UE is configured to CA_42C and it receives IE CA_NS_08 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_1.3.8-1.

**Table 6.2.4A.1_1.3.8-1: Contiguous Allocation A-MPR for CA_NS_08**

| CA_42C: CA_NS_08 | $RB_{Start}$ | $L_{CRB}$ [RBs] | A-MPR for 64-QAM[dB] |
|---|---|---|---|
| 100RB/100RB | - | - | TBD |
| 75 RB / 100 RB and 100 RB / 75 RB | - | - | TBD |
| 50 RB / 100 RB and 100 RB / 50 RB | - | - | TBD |
| 25 RB / 100 RB and 100 RB / 25 RB | - | - | TBD |

### 6.2.4A.1_1.4 Test description

#### 6.2.4A.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.2.4A.1_1.4.1-1 to 6.2.4A.1_1.4.1-7. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4A.1_1.4.1-1: Test Configuration Table (network signalled value "CA_NS_01")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | As in Table 6.2.4A.1_1.3.1-1 |

**Test Parameters for CA Configurations**

| ID | CA Configuration / $N_{RB_agg}$ | | DL Allocation (PDCCH on PCC) | CC MOD | UL Allocation | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | PCC & SCC RB allocation | | $N_{RB_alloc}$ | PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$) | | | |
| 1 | 75 | 75 | N/A | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | 64QAM | 150 | P_75@0 | S_75@0 | | |
| 3 | 75 | 75 | | 64QAM | 45 | P_45@7 | S_0@0 | | |
| 4 | 75 | 75 | | 64QAM | 8 | P_0@0 | S_8@67 | | |
| 5 | 75 | 75 | | 64QAM | 129 | P_75@0 | S_54@0 | | |
| 6 | 75 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | 64QAM | 200 | P_100@0 | S_100@0 | | |
| 8 | 100 | 100 | | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 9 | 100 | 100 | | 64QAM | 175 | P_75@25 | S_100@0 | | |
| 10 | 100 | 100 | | 64QAM | 25 | P_0@0 | S_25@75 | | |
| 11 | 100 | 100 | | 64QAM | 64 | P_64@24 | S_0@0 | | |
| 12 | 100 | 100 | | 64QAM | 2 | P_1@0 | S_1@99 | | |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

**Table 6.2.4A.1_1.4.1-2: Test Configuration Table (network signalled value "CA_NS_02")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | As in Table 6.2.4A.1_1.3.2-1 |

**Test Parameters for CA Configurations**

| ID | CA Configuration / $N_{RB_agg}$ | | DL Allocation (PDCCH on PCC) | CC MOD | UL Allocation | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | PCC & SCC RB allocation | | $N_{RB_alloc}$ | PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$) | | | |
| 1 | 75 | 75 | N/A | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | 64QAM | 75 | P_75@0 | S_0@0 | | |
| 3 | 75 | 75 | | 64QAM | 129 | P_75@0 | S_54@0 | | |
| 4 | 75 | 75 | | 64QAM | 129 | P_54@21 | S_75@0 | | |
| 5 | 75 | 75 | | 64QAM | 1 | P_0@0 | S_1@74 | | |
| 6 | 75 | 75 | | 64QAM | 1 | P_0@0 | S_1@54 | | |
| 7 | 75 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 8 | 100 | 100 | | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 9 | 100 | 100 | | 64QAM | 1 | P_1@21 | S_0@0 | | |
| 10 | 100 | 100 | | 64QAM | 90 | P_90@0 | S_0@0 | | |
| 11 | 100 | 100 | | 64QAM | 180 | P_100@0 | S_80@0 | | |
| 12 | 100 | 100 | | 64QAM | 1 | P_0@0 | S_1@99 | | |
| 13 | 100 | 100 | | 64QAM | 1 | P_0@0 | S_1@83 | | |
| 14 | 100 | 100 | | 64QAM | 2 | P_1@0 | S_1@99 | | |

| Note 1: | CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. |
|---|---|

**Table 6.2.4A.1_1.4.1-3: Test Configuration Table (network signalled value "CA_NS_03")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | As in Table 6.2.4A.1_1.3.3-1 |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | 64QAM | 1 | P_1@21 | S_0@0 | | |
| 3 | 75 | 75 | | 64QAM | 75 | P_75@0 | S_0@0 | | |
| 4 | 75 | 75 | | 64QAM | 90 | P_75@0 | S_15@0 | | |
| 5 | 75 | 75 | | 64QAM | 150 | P_75@0 | S_75@0 | | |
| 6 | 75 | 75 | | 64QAM | 1 | P_0@0 | S_1@74 | | |
| 7 | 75 | 75 | | 64QAM | 1 | P_0@0 | S_1@44 | | |
| 8 | 75 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 9 | 100 | 100 | | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 10 | 100 | 100 | | 64QAM | 60 | P_60@0 | S_0@0 | | |
| 11 | 100 | 100 | | 64QAM | 1 | P_1@63 | S_0@0 | | |
| 12 | 100 | 100 | | 64QAM | 90 | P_90@0 | S_0@0 | | |
| 13 | 100 | 100 | | 64QAM | 164 | P_100@0 | S_64@0 | | |
| 14 | 100 | 100 | | 64QAM | 1 | P_0@0 | S_1@99 | | |
| 15 | 100 | 100 | | 64QAM | 1 | P_0@0 | S_1@70 | | |
| 16 | 100 | 100 | | 64QAM | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

**Table 6.2.4A.1_1.4.1-4: Test Configuration Table (network signalled value "CA_NS_04")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | As in Table 6.2.4A.1_1.3.4-1 |

| Test Parameters for CA Configurations | | | | | | |
|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 100 | 50 | N/A | 64QAM | 10 | P_10@20 | S_0@0 | | |
| 2 | 100 | 50 | | 64QAM | 60 | P_50@50 | S_10@0 | | |
| 3 | 100 | 50 | | 64QAM | 15 | P_0@0 | S_15@0 | | |
| 4 | 100 | 50 | | 64QAM | 2 | P_1@0 | S_1@49 | | |
| 5 | 75 | 75 | | 64QAM | 10 | P_10@20 | S_0@0 | | |
| 6 | 75 | 75 | | 64QAM | 75 | P_30@45 | S_45@0 | | |
| 7 | 75 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 8 | 100 | 75 | | 64QAM | 10 | P_10@20 | S_0@0 | | |
| 9 | 100 | 75 | | 64QAM | 80 | P_50@50 | S_30@0 | | |
| 10 | 100 | 75 | | 64QAM | 20 | P_0@0 | S_20@15 | | |
| 11 | 100 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 12 | 100 | 100 | | 64QAM | 10 | P_10@25 | S_0@0 | | |
| 13 | 100 | 100 | | 64QAM | 90 | P_40@60 | S_50@0 | | |
| 14 | 100 | 100 | | 64QAM | 15 | P_0@0 | S_15@40 | | |
| 15 | 100 | 100 | | 64QAM | 20 | P_0@0 | S_20@30 | | |
| 16 | 100 | 100 | | 64QAM | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

**Table 6.2.4A.1_1.4.1-5: Test Configuration Table (network signalled value "CA_NS_05")**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | C: Low and High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | As in Table 6.2.4A.1_1.3.5-1 | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | 64QAM | 40 | P_40@0 | S_0@0 | | |
| 2 | 75 | 75 | | 64QAM | 80 | P_50@25 | S_30@0 | | |
| 3 | 75 | 75 | | 64QAM | 60 | P_10@65 | S_50@0 | | |
| 4 | 75 | 75 | | 64QAM | 65 | P_1@74 | S_64@0 | | |
| 5 | 75 | 75 | | 64QAM | 92 | P_20@55 | S_72@0 | | |
| 6 | 75 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | 64QAM | 8 | P_8@0 | S_0@0 | | |
| 8 | 100 | 100 | | 64QAM | 40 | P_40@0 | S_0@0 | | |
| 9 | 100 | 100 | | 64QAM | 80 | P_50@50 | S_30@0 | | |
| 10 | 100 | 100 | | 64QAM | 150 | P_60@40 | S_90@0 | | |
| 11 | 100 | 100 | | 64QAM | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

**Table 6.2.4A.1_1.4.1-6: Test Configuration Table (network signalled value "CA_NS_06")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | As in Table 6.2.4A.1_1.3.6-1 |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | 64QAM | 5 | P_5@0 | S_0@0 | | |
| 2 | 75 | 75 | | 64QAM | 45 | P_45@0 | S_0@0 | | |
| 3 | 75 | 75 | | 64QAM | 75 | P_60@15 | S_15@0 | | |
| 4 | 75 | 75 | | 64QAM | 60 | P_10@65 | S_50@0 | | |
| 5 | 75 | 75 | | 64QAM | 90 | P_18@57 | S_72@0 | | |
| 6 | 75 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | 64QAM | 10 | P_10@0 | S_0@0 | | |
| 8 | 100 | 100 | | 64QAM | 30 | P_30@0 | S_0@0 | | |
| 9 | 100 | 100 | | 64QAM | 100 | P_75@25 | S_25@0 | | |
| 10 | 100 | 100 | | 64QAM | 90 | P_40@60 | S_50@0 | | |
| 11 | 100 | 100 | | 64QAM | 96 | P_15@85 | S_81@0 | | |
| 12 | 100 | 100 | | 64QAM | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

**Table 6.2.4A.1_1.4.1-7: Test Configuration Table (network signalled value "CA_NS_07")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | As in Table 6.2.4A.1_1.3.7-1 |

| Test Parameters for CA Configurations | | | | | | |
|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 100 | 25 | N/A | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 2 | 100 | 25 | | 64QAM | 85 | P_80@20 | S_5@0 | | |
| 3 | 100 | 25 | | 64QAM | 65 | P_60@40 | S_5@0 | | |
| 4 | 100 | 25 | | 64QAM | 35 | P_30@70 | S_5@0 | | |
| 5 | 100 | 25 | | 64QAM | 2 | P_1@0 | S_1@24 | | |
| 6 | 100 | 50 | | 64QAM | 1 | P_1@1 | S_0@0 | | |
| 7 | 100 | 50 | | 64QAM | 10 | P_10@30 | S_0@0 | | |
| 8 | 100 | 50 | | 64QAM | 30 | P_30@30 | S_0@0 | | |
| 9 | 100 | 50 | | 64QAM | 60 | P_40@60 | S_20@0 | | |
| 10 | 100 | 50 | | 64QAM | 30 | P_10@90 | S_20@0 | | |
| 11 | 100 | 50 | | 64QAM | 5 | P_0@0 | S_5@45 | | |
| 12 | 100 | 50 | | 64QAM | 2 | P_1@0 | S_1@49 | | |
| 13 | 100 | 75 | | 64QAM | 1 | P_1@1 | S_0@0 | | |
| 14 | 100 | 75 | | 64QAM | 40 | P_40@20 | S_0@0 | | |
| 15 | 100 | 75 | | 64QAM | 85 | P_80@20 | S_5@0 | | |
| 16 | 100 | 75 | | 64QAM | 40 | P_0@0 | S_40@20 | | |
| 17 | 100 | 75 | | 64QAM | 15 | P_0@0 | S_15@60 | | |
| 18 | 100 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

**Table 6.2.4A.1_1.4.1-8: Test Configuration Table (network signalled value "CA_NS_08")**

[Table 6.2.4A.1_1.4.1-8 TBD]

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to the applicable table from Table 6.2.4A.1_1.4.1-1 to 6.2.4A.1_1.4.1-7.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.4A.1_1.4.3.

### 6.2.4A.1_1.4.2 Test procedure

Same test procedure as in clause 6.2.4A.1.4.2

### 6.2.4A.1_1.4.3 Message contents

Same message contents as in clause 6.2.4A.1.4.3.

## 6.2.4A.1_1.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable table from Table 6.2.4A.1_1.5-1 to Table 6.2.4A.1_1.5-7. For uplink QPSK or 16QAM, the allowed maximum output power reduction is specified in Table 6.2.4A.1_1.3-1 and clause 6.2.3A.1 does not apply, i.e. carrier aggregation MPR = 0. For uplink 64QAM, the applied maximum output power reduction is obtained by taking the maximum value of MPR requirements specified in Table 6.2.3A.1_1.3-1 and A-MPR requirements specified in Table 6.2.4A.1_1.3-1. For the UE maximum output power modified by MPR specified in Table 6.2.3A.1_1.3-1 or A-MPR specified in Table 6.2.4A.1_1.3-1, the power limits specified in Table 6.2.5A.1.3-1 apply.

**Table 6.2.4A.1_1.5-1: Test requirement (network signalled value "CA_NS_01")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -17.7 |
| 2 | | | | | 23 | +2.7 / -11.7 |
| 3 | | | | | 23 | +2.7 / -9.7 |
| 4 | | | | | 23 | +2.7 / -4.7 |
| 5 | | | | | 23 | +2.7 / -11.7 |
| 6 | | | | | 23 | +2.7 / -24.7 |
| 7 | | | | | 23 | +2.7 / -18.7 |
| 8 | | | | | 23 | +2.7 / -18.7 |
| 9 | | | | | 23 | +2.7 / -11.7 |
| 10 | | | | | 23 | +2.7 / -9.7 |
| 11 | | | | | 23 | +2.7 / -6.2 |
| 12 | | | | | 23 | +2.7 / -23.7 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

**Table 6.2.4A.1_1.5-2: Test requirement (network signalled value "CA_NS_02")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -4.7 |
| 2 | | | | | 23 | +2.7 / -6.2 |
| 3 | | | | | 23 | +2.7 / -9.7 |
| 4 | | | | | 23 | +2.7 / -11.7 |
| 5 | | | | | 23 | +2.7 / -4.7 |
| 6 | | | | | 23 | +2.7 / -4.7 |
| 7 | | | | | 23 | +2.7 / -24.7 |
| 8 | | | | | 23 | +2.7 / -8.2 |
| 9 | | | | | 23 | +2.7 / -6.2 |
| 10 | | | | | 23 | +2.7 / -6.2 |
| 11 | | | | | 23 | +2.7 / -11.7 |
| 12 | | | | | 23 | +2.7 / -15.7 |
| 13 | | | | | 23 | +2.7 / -4.7 |
| 14 | | | | | 23 | +2.7 / -24.7 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

**Table 6.2.4A.1_1.5-3: Test requirement (network signalled value "CA_NS_03")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -15.7 |
| 2 | | | | | 23 | +2.7 / -8.2 |
| 3 | | | | | 23 | +2.7 / -6.2 |
| 4 | | | | | 23 | +2.7 / -9.7 |
| 5 | | | | | 23 | +2.7 / -13.7 |
| 6 | | | | | 23 | +2.7 / -11.7 |
| 7 | | | | | 23 | +2.7 / -4.7 |
| 8 | | | | | 23 | +2.7 / -25.2 |
| 9 | | | | | 23 | +2.7 / -15.7 |
| 10 | | | | | 23 | +2.7 / -11.7 |
| 11 | | | | | 23 | +2.7 / -4.7 |
| 12 | | | | | 23 | +2.7 / -8.2 |
| 13 | | | | | 23 | +2.7 / -12.7 |
| 14 | | | | | 23 | +2.7 / -15.7 |
| 15 | | | | | 23 | +2.7 / -4.7 |
| 16 | | | | | 23 | +2.7 / -25.2 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

**Table 6.2.4A.1_1.5-4: Test requirement (network signalled value "CA_NS_04")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -8.2 |
| 2 | | | | | 23 | +2.7 / -8.2 |
| 3 | | | | | 23 | +2.7 / -8.2 |
| 4 | | | | | 23 | +2.7 / -18.7 |
| 5 | | | | | 23 | +2.7 / -8.2 |
| 6 | | | | | 23 | +2.7 / -8.2 |
| 7 | | | | | 23 | +2.7 / -18.7 |
| 8 | | | | | 23 | +2.7 / -8.2 |
| 9 | | | | | 23 | +2.7 / -8.2 |
| 10 | | | | | 23 | +2.7 / -8.2 |
| 11 | | | | | 23 | +2.7 / -18.7 |
| 12 | | | | | 23 | +2.7 / -8.2 |
| 13 | | | | | 23 | +2.7 / -8.2 |
| 14 | | | | | 23 | +2.7 / -8.2 |
| 15 | | | | | 23 | +2.7 / -8.2 |
| 16 | | | | | 23 | +2.7 / -18.7 |

Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1.

**Table 6.2.4A.1_1.5-5: Test requirement (network signalled value "CA_NS_05")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -6.2 |
| 2 | | | | | 23 | +2.7 / -9.7 |
| 3 | | | | | 23 | +2.7 / -9.7 |
| 4 | | | | | 23 | +2.7 / -9.7 |
| 5 | | | | | 23 | +2.7 / -11.7 |
| 6 | | | | | 23 | +2.7 / -24.2 |
| 7 | | | | | 23 | +2.7 / -9.7 |
| 8 | | | | | 23 | +2.7 / -6.2 |
| 9 | | | | | 23 | +2.7 / -11.7 |
| 10 | | | | | 23 | +2.7 / -17.7 |
| 11 | | | | | 23 | +2.7 / -24.2 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

**Table 6.2.4A.1_1.5-6: Test requirement (network signalled value "CA_NS_06")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -12.2 |
| 2 | | | | | 23 | +2.7 / -6.2 |
| 3 | | | | | 23 | +2.7 / -6.2 |
| 4 | | | | | 23 | +2.7 / -11.7 |
| 5 | | | | | 23 | +2.7 / -15.7 |
| 6 | | | | | 23 | +2.7 / -26.7 |
| 7 | | | | | 23 | +2.7 / -11.2 |
| 8 | | | | | 23 | +2.7 / -6.2 |
| 9 | | | | | 23 | +2.7 / -6.2 |
| 10 | | | | | 23 | +2.7 / -9.7 |
| 11 | | | | | 23 | +2.7 / -15.7 |
| 12 | | | | | 23 | +2.7 / -26.7 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

**Table 6.2.4A.1_1.5-7: Test requirement (network signalled value "CA_NS_07")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -8.2 |
| 2 | | | | | 23 | +2.7 / -11.7 |
| 3 | | | | | 23 | +2.7 / -6.2 |
| 4 | | | | | 23 | +2.7 / -6.2 |
| 5 | | | | | 23 | +2.7 / -28.7 |
| 6 | | | | | 23 | +2.7 / -17.7 |
| 7 | | | | | 23 | +2.7 / -6.2 |
| 8 | | | | | 23 | +2.7 / -11.7 |
| 9 | | | | | 23 | +2.7 / -9.7 |
| 10 | | | | | 23 | +2.7 / -6.2 |
| 11 | | | | | 23 | +2.7 / -9.7 |
| 12 | | | | | 23 | +2.7 / -28.7 |
| 13 | | | | | 23 | +2.7 / -17.7 |
| 14 | | | | | 23 | +2.7 / -6.2 |
| 15 | | | | | 23 | +2.7 / -12.7 |
| 16 | | | | | 23 | +2.7 / -6.2 |
| 17 | | | | | 23 | +2.7 / -9.7 |
| 18 | | | | | 23 | +2.7 / -28.7 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

## 6.2.4A.1_2 Additional Maximum Power Reduction (A-MPR) for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM

Editor's notes: Minimum requirements for CA_NS_08 and CA_NS_09 for this test case are defined in TS 36.101, but test point selection for test case 6.2.4A.1 - hereupon test point selection for test case 6.2.4A.1_2 is based - is still outstanding.

### 6.2.4A.1_2.1 Test purpose

Same test purpose as in clause 6.2.4A.1.1.

### 6.2.4A.1_2.2 Test applicability

The requirements of this test apply in test case 6.6.2.2A.1_2 Additional Spectrum Emission Mask for CA (intra-band contiguous DL CA and UL CA) for network signalled value CA_NS_04 and NS_09 to all types of E-UTRA UE from release 14 and forward that support intra-band contiguous DL CA, UL CA and UL 256QAM.

The requirements of this test apply in test case 6.6.3.3A.1_2 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) for network signalled values CA_NS_01, CA_NS_02, CA_NS_03, CA_NS_05,

CA_NS_06, CA_NS_07 and CA_NS_08 to all types of E-UTRA UE from release 14 and forward that support intra-band contiguous DL CA, UL CA and UL 256QAM.

NOTE: As a result TC 6.2.4A.1_2 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.4A.1_2.3 Minimum conformance requirements

Additional ACLR, spectrum emission and spurious emission requirements for carrier aggregation can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction (A-MPR) is allowed for the CA Power Class as specified in Table 6.2.2A.0-2.

If for intra-band carrier aggregation the UE is configured for transmissions on a single serving cell, then subclauses 6.2.3 and 6.2 4 apply with the Network Signalling value indicated by the field *additionalSpectrumEmission*.

For intra-band contiguous aggregation with the UE configured for transmissions on two serving cells, the maximum output power reduction specified in Table 6.2.4A.1_2.3-1 is allowed for all serving cells of the applicable uplink CA configurations according to the CA network signalling value indicated by the field *additionalSpectrumEmissionSCell-r10*. Then clause 6.2.3A.1.3 does not apply, i.e. the carrier aggregation MPR = 0dB, unless the value indicated is CA_NS_31. For uplink 64 QAM and 256 QAM, the applied maximum output power reduction is obtained by taking the maximum value of MPR requirements specified in Table 6.2.3A.1_1.3-1 and A-MPR requirements specified in Table 6.2.4A.1_2.3-1.

For the UE maximum output power modified by A-MPR specified in table 6.2.4A.1_2.3-1, the power limits specified in subclause 6.2.5A.1.3 apply.

**Table 6.2.4A.1_2.3-1: Additional Maximum Power Reduction (A-MPR) for intra-band contiguous CA**

| CA Network Signalling value | Requirements (subclause) | Uplink CA Configuration | A-MPR [dB] (subclause) |
|---|---|---|---|
| CA_NS_01 | 6.6.3.3A.1.3.1 | CA_1C | 6.2.4A.1_2.3.1 |
| CA_NS_02 | 6.6.3.3A.1.3.2 | CA_1C | 6.2.4A.1_2.3.2 |
| CA_NS_03 | 6.6.3.3A.1.3.3 | CA_1C | 6.2.4A.1_2.3.3 |
| CA_NS_04 | 6.6.2.2A.1.3.1 | CA_41C | 6.2.4A.1_2.3.4 |
| CA_NS_05 | 6.6.3.3A.1.3.4 | CA_38C | 6.2.4A.1_2.3.5 |
| CA_NS_06 | 6.6.3.3A.1.3.5 | CA_7C | 6.2.4A.1_2.3.6 |
| CA_NS_07 | 6.6.3.3A.1.3.6 | CA_39C | 6.2.4A.1_2.3.7 |
| CA_NS_08 | 6.6.3.3A.1.3.7 | CA_42C | 6.2.4A.1_2.3.8 |
| CA_NS_09 | 6.6.2.2.3.1 | CA_66B | 6.2.4A.1_2.3.9 |
| | 6.6.2.2A.1.3.2 | CA_66C | 6.2.4A.1_2.3.9 |
| … | | | |
| CA_NS_31 | NOTE 1 | Table 5.4.2A.1-1 (NOTE 1) | N/A |
| CA_NS_32 | Reserved | | |

NOTE 1: Applicable for uplink CA configurations listed in Table 5.4.2A.1-1 for which none of the additional requirements in subclauses 6.6.2.2A or 6.6.3.3A apply.
NOTE 2: The index of the sequence CA_NS corresponds to the value of *additionalSpectrumEmissionSCell-r10*.

For PUCCH and SRS transmissions, the allowed A-MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For intra-band carrier aggregation, the A-MPR is evaluated per slot and given by the maximum value taken over the transmission(s) on all component carriers within the slot; the maximum A-MPR over the two slots is then applied for the entire subframe.

The normative reference for requirement is in TS 36.101 [2] clause 6.2.4A.

#### 6.2.4A.1_2.3.1 A-MPR for CA_NS_01 for CA_1C

If the UE is configured to CA_1C and it receives IE CA_NS_01 the allowed maximum output power reduction applied to transmissions on the PCC and the SCC for contiguously aggregated signals is specified in table 6.2.4A.1_2.3.1-1.

**Table 6.2.4A.1_2.3.1-1: Contiguous allocation A-MPR for CA_NS_01**

| CA_1C: CA_NS_01 | $RB_{start}$ | $L_{CRB}$ [RBs] | $RB_{start} + L_{CRB}$ [RBs] | A-MPR for QPSK, 16 QAM, 64 QAM and 256 QAM [dB] |
|---|---|---|---|---|
| 100 RB / 100 RB | 0 – 23 and 176 – 199 | > 0 | N/A | ≤ 12.0 |
| | 24 – 105 | > 64 | N/A | ≤ 6.0 |
| | 106 – 175 | N/A | > 175 | ≤ 5.0 |
| 75 RB / 75 RB | 0 – 6 and 143 – 149 | $0 < L_{CRB} \leq 10$ | N/A | ≤ 11.0 |
| | | > 10 | N/A | ≤ 6.0 |
| | 7 – 90 | > 44 | N/A | ≤ 5.0 |
| | 91 – 142 | N/A | > 142 | ≤ 2.0 |

NOTE 1: $RB_{start}$ indicates the lowest RB index of transmitted resource blocks
NOTE 2: $L_{CRB}$ is the length of a contiguous resource block allocation
NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis. For intra-slot or intra-subslot frequency hopping which intersects regions, notes 1 and 2 apply on a per $T_{no_hopping}$ basis.
NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe. For intra-slot frequency hopping which intersects regions, the larger A-MPR value may be applied for the slot. For intra-subslot frequency hopping which intersects regions, the larger A-MPR value may be applied for the subslot.

If the UE is configured to CA_1C and it receives IE CA_NS_01 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$\text{A-MPR} = \text{CEIL}\{M_A, 0.5\}$$

Where $M_A$ is defined as follows:

$$M_A = -22.5\,A + 17 \quad ; 0 \leq A < 0.20$$

$$-11.0\,A + 14.7 \quad ; 0.20 \leq A < 0.70$$

$$-1.7\,A + 8.2 \quad ; 0.70 \leq A \leq 1$$

Where $A = N_{RB_alloc} / N_{RB_agg}$

### 6.2.4A.1_2.3.2 A-MPR for CA_NS_02 for CA_1C

If the UE is configured to CA_1C and it receives IE CA_NS_02 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_2.3.2-1.

**Table 6.2.4A.1_2.3.2-1: Contiguous allocation A-MPR for CA_NS_02**

| CA_1C: CA_NS_02 | $RB_{end}$ | $L_{CRB}$ [RBs] | A-MPR for QPSK, 16 QAM, 64 QAM and 256 QAM [dB] |
|---|---|---|---|
| 100 RB / 100 RB | 0 –20 | > 0 | ≤ 4 dB |
| | 21 – 46 | > 0 | ≤ 3 dB |
| | 47 – 99 | $> RB_{end} - 20$ | ≤ 3 dB |
| | 100 – 184 | > 75 | ≤ 6 dB |
| | 185 – 199 | > 0 | ≤ 10 dB |
| 75 RB / 75 RB | 0 – 48 | > 0 | ≤ 2 dB |
| | 49 – 80 | $> RB_{end} - 20$ | ≤ 3 dB |
| | 81 – 129 | > 60 | ≤ 5 dB |
| | 130 – 149 | > 84 | ≤ 6 dB |
| | 130 – 149 | 1 – 84 | ≤ 2 dB |

If the UE is configured to CA_1C and it receives IE CA_NS_02 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows:

$$A\text{-}MPR = CEIL\ \{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$[M_A = -22.5\ A + 17 \quad ; 0 \leq A < 0.20$$

$$-11.0\ A + 14.7 \quad ; 0.20 \leq A < 0.70$$

$$-1.7\ A + 8.2 \quad ; 0.70 \leq A \leq 1]$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

### 6.2.4A.1_2.3.3 A-MPR for CA_NS_03 for CA_1C

If the UE is configured to CA_1C and it receives IE CA_NS_03 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_2.3.3-1.

**Table 6.2.4A.1_2.3.3-1: Contiguous allocation A-MPR for CA_NS_03**

| CA_1C: CA_NS_03 | $RB_{end}$ | $L_{CRB}$ [RBs] | A-MPR for QPSK, 16 QAM, 64 QAM and 256 QAM [dB] |
|---|---|---|---|
| 100 RB / 100 RB | 0 – 26 | > 0 | ≤ 10 dB |
| | 27 – 63 | ≥ $RB_{end}$ - 27 | ≤ 6 dB |
| | 27 – 63 | < $RB_{end}$ - 27 | ≤ 1 dB |
| | 64 – 100 | > $RB_{end}$ - 20 | ≤ 4 dB |
| | 101 – 171 | > 68 | ≤ 7 dB |
| | 172 – 199 | > 0 | ≤ 10 dB |
| 75 RB / 75 RB | 0 – 20 | > 0 | ≤ 10 dB |
| | 21 – 45 | > 0 | ≤ 4 dB |
| | 46 – 75 | > $RB_{end}$ – 13 | ≤ 2 dB |
| | 76 – 95 | > 45 | ≤ 5 dB |
| | 96 – 149 | > 43 | ≤ 8 dB |
| | 120 – 149 | 1 - 43 | ≤ 6 dB |

If the UE is configured to CA_1C and it receives IE CA_NS_03 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows:

$$A\text{-}MPR = CEIL\ \{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$[M_A = -23.33A + 17.5 \quad ; 0 \leq A < 0.15$$

$$-7.65A + 15.15 \quad ; 0.15 \leq A \leq 1]$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

### 6.2.4A.1_2.3.4 A-MPR for CA_NS_04 for CA_41C

If the UE is configured to CA_41C and it receives IE CA_NS_04 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_2.3.4-1.

**Table 6.2.4A.1_2.3.4-1: Contiguous Allocation A-MPR for CA_NS_04**

| CA Bandwidth Class C | $RB_{Start}$ | $L_{CRB}$ [RBs] | $RB_{start} + L_{CRB}$ [RBs] | A-MPR for QPSK [dB] | A-MPR for 16 QAM, 64 QAM and 256 QAM [dB] |
|---|---|---|---|---|---|
| 25 RB / 100 RB | 0 – 34 and 90 – 124 | >0 | N/A | ≤3dB | ≤3.5dB |
| | 35 – 89 | N/A | >90 | ≤1dB | ≤2.5dB |
| 50RB / 100 RB | 0 – 44 and 105 – 149 | >0 | N/A | ≤4dB | ≤4dB |
| | 45 – 104 | N/A | >105 | ≤3dB | ≤4dB |
| 75 RB / 75 RB | 0 – 44 and 105 – 149 | >0 | N/A | ≤4dB | ≤4dB |
| | 45 – 104 | N/A | >105 | ≤4dB | ≤4dB |
| 100 RB / 75 RB | 0 – 49 and 125 – 174 | >0 | N/A | ≤4dB | ≤4dB |
| | 50 - 124 | N/A | >125 | ≤3dB | ≤4dB |
| 100 RB / 100 RB | 0 – 59 and 140 – 199 | >0 | N/A | ≤3dB | ≤4dB |
| | 60– 139 | N/A | >140 | ≤3dB | ≤4dB |

NOTE 1: $RB_{start}$ indicates the lowest RB index of transmitted resource blocks
NOTE 2: $L_{CRB}$ is the length of a contiguous resource block allocation
NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis. For intra-slot or intra-subslot frequency hopping which intersects regions, notes 1 and 2 apply on a per $T_{no_hopping}$ basis..
NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe. For intra-slot frequency hopping which intersects regions, the larger A-MPR value may be applied for the slot. For intra-subslot frequency hopping which intersects regions, the larger A-MPR value may be applied for the subslot.

If the UE is configured to CA_41C and it receives IE CA_NS_04 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$\text{A-MPR} = \text{CEIL}\{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$\begin{aligned} M_A &= 11, && 0 \le A < 0.05 \\ &= 55.0A + 13.75, && 0.05 \le A < 0.15 \\ &= -4.0A + 6.10, && 0.15 \le A < 0.40 \\ &= -0.83A + 4.83, && 0.40 \le A \le 1 \end{aligned}$$

Where $A = N_{RB_alloc} / N_{RB_agg}$.

### 6.2.4A.1_2.3.5 A-MPR for CA_NS_05 for CA_38C

If the UE is configured to CA_38C and it receives IE CA_NS_05 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_2.3.5-1.

**Table 6.2.4A.1_2.3.5-1: Contiguous Allocation A-MPR for CA_NS_05**

| CA_38C | $RB_{end}$ | $L_{CRB}$ [RBs] | A-MPR for QPSK, 16 QAM, 64 QAM and 256 QAM [dB] |
|---|---|---|---|
| 100RB/100RB | 0 – 12 | >0 | ≤ 5 dB |
| | 13 – 79 | > $RB_{end}$ – 13 | ≤ 2 dB |
| | 80 – 180 | >60 | ≤ 6 dB |
| | 181 – 199 | > 0 | ≤ 11 dB |
| 75RB/75RB | 0 – 70 | > max (0, $RB_{end}$ -10) | ≤ 2 dB |
| | 71- 108 | > 60 | ≤ 5 dB |
| | 109 – 139 | >0 | ≤ 5 dB |
| | 140 – 149 | ≤ 70 | ≤ 2 dB |

| | | | |
|---|---|---|---|
| | 140 – 149 | >70 | ≤ 6 dB |

NOTE 1: $RB_{end}$ indicates the highest RB index of transmitted resource blocks
NOTE 2: $L_{CRB}$ is the length of a contiguous resource block allocation
NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis. For intra-slot or intra-subslot frequency hopping which intersects regions, notes 1 and 2 apply on a per $T_{no_hopping}$ basis.
NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe. For intra-slot frequency hopping which intersects regions, the larger A-MPR value may be applied for the slot. For intra-subslot frequency hopping which intersects regions, the larger A-MPR value may be applied for the subslot.

If the UE is configured to CA_38C and it receives IE CA_NS_05 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$A\text{-}MPR = CEIL\ \{M_{A,}\ 0.5\}$$

Where MA is defined as follows

$$M_A = -14.17\ A + 16.50 \quad ;\ 0 \leq A < 0.60$$

$$-2.50\ A + 9.50 \quad ;\ 0.60 \leq A \leq 1$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

### 6.2.4A.1_2.3.6 A-MPR for CA_NS_06 for CA_7C

If the UE is configured to CA_7C and it receives IE CA_NS_06 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_2.3.6-1.

**Table 6.2.4A.1_2.3.6-1: Contiguous Allocation A-MPR for CA_NS_06**

| CA Bandwidth Class C | $RB_{end}$ | $L_{CRB}$ [RBs] | A-MPR for QPSK, 16 QAM, 64 QAM and 256 QAM [dB] |
|---|---|---|---|
| 100RB/100RB | 0 –22 | >0 | ≤ 4 dB |
| | 23 – 99 | > max(0,$RB_{end}$ – 25) | ≤ 2 dB |
| | 100 – 142 | > 75 | ≤ 3 dB |
| | 143 – 177 | >70 | ≤ 5 dB |
| | 178 – 199 | > 0 | ≤ 10 dB |
| 75RB/75RB | 0 – 7 | >0 | ≤ 5 dB |
| | 8- 74 | > max(0,$RB_{end}$ – 10) | ≤ 2 dB |
| | 75 – 109 | >64 | ≤ 2 dB |
| | 110 – 144 | >35 | ≤ 6 dB |
| | 145 – 149 | >0 | ≤ 10 dB |
| 50RB/100RB and 100RB/50RB | 0 – 10 | > 0 | ≤ 5 dB |
| | 11 – 75 | > max(0, RB_End – 25) | ≤ 2 dB |
| | 76 – 103 | > 50 | ≤ 3 dB |
| | 104 – 144 | > 25 | ≤ 6 dB |
| | 145 – 149 | > 0 | ≤ 10 dB |
| 75RB/100RB and 100RB/75RB | 0 – 15 | > 0 | ≤ 5 dB |
| | 16 – 75 | > max(0, RB_End – 15) | ≤ 2 dB |
| | 76 – 120 | > 50 | ≤ 3 dB |
| | 121 – 160 | > 50 | ≤ 6 dB |
| | 161 – 174 | > 0 | ≤ 10 dB |

If the UE is configured to CA_7C and it receives IE CA_NS_06 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows:

$$A\text{-}MPR = CEIL\ \{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$M_A = \begin{cases} -13.33A + 17.5 & ; 0 \le A < 0.15 \\ -6.47A + 16.47 & ; 0.15 \le A \le 1 \end{cases}$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

### 6.2.4A.1_2.3.7 A-MPR for CA_NS_07 for CA_39C

If the UE is configured to CA_39C and it receives IE CA_NS_07 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_2.3.7-1.

**Table 6.2.4A.1_2.3.7-1: Contiguous Allocation A-MPR for CA_NS_07**

| CA_39C: CA_NS_07 | $RB_{Start}$ | $L_{CRB}$ [RBs] | A-MPR for QPSK, 16 QAM, 64 QAM and 256 QAM [dB] |
|---|---|---|---|
| 75 RB / 100 RB and 100 RB / 75 RB | 0 – 13 | > 0 | ≤ 11 |
| | 14 – 50 | ≤ 60 | ≤ 3 |
| | 14 – 100 | > 60 | ≤ 7 |
| | 101 – 155 | > max(155 - RBstart , 0) | ≤ 2 |
| | 156 – 174 | > 0 | ≤ 5 |
| 50 RB / 100 RB and 100 RB / 50 RB | 0 – 5 | > 0 | ≤ 11 |
| | 6 – 42 | ≤ 25 | ≤ 3 |
| | | > 25 | ≤ 6 |
| | 43 – 80 | > 50 | ≤ 5 |
| | 81 – 138 | > 20 | ≤ 2 |
| | 139 – 149 | > 0 | ≤ 5 |
| 25 RB / 100 RB and 100 RB / 25 RB | 0 – 32 | ≥ 84 | ≤ 6 |
| | | < 84 | ≤ 4 |
| | 33 – 60 | > 50 | ≤ 3 |
| | 61 – 124 | > 20 | ≤ 3 |

If the UE is configured to CA_39C and it receives IE CA_NS_07 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$A\text{-}MPR = CEIL\ \{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$M_A = \begin{cases} -16.25A + 21 & ; 0 \le A < 0.80 \\ -2.50\ A + 10.00 & ; 0.80 \le A \le 1 \end{cases}$$

Where $A = N_{RB_alloc} / N_{RB_agg}$

### 6.2.4A.1_2.3.8 A-MPR for CA_NS_08 for CA_42C

If the UE is configured to CA_42C and it receives IE CA_NS_08 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_2.3.8-1.

**Table 6.2.4A.1_2.3.8-1: Contiguous Allocation A-MPR for CA_NS_08**

| CA_42C: CA_NS_08 | RBstart | Condition | RBend | $L_{CRB}$ [RBs] | A-MPR for QPSK, 16 QAM, 64 QAM and 256 QAM [dB] |
|---|---|---|---|---|---|
| 100RB / 100RB | ≤ 21 | Or | ≥ 178 | ≤ 25 | ≤ 12 |
| | | | | > 25 and ≤ 80 | ≤ 6 |
| | ≥ 0 | N/A | N/A | > 80 and ≤ 172 | ≤ 8 |
| | | | | > 172 | ≤ 9 |
| | > 21 and ≤ 58 | Or | ≥ 141 and < 178 | < 48 | ≤ 3 |
| | > 21 | And | < 178 | ≥ 48 and ≤ 80 | ≤ 4 |
| 100RB / 75RB And 75RB / 100RB | ≤ 12 | Or | ≥ 162 | ≤ 25 | ≤ 12 |
| | | | | > 25 and ≤ 75 | ≤ 6 |
| | ≥ 0 | N/A | N/A | > 75 and <172 | ≤ 8 |
| | | | | ≥172 | 9 |
| | > 12 and ≤ 49 | Or | ≥ 125 and < 162 | < 54 | ≤ 3 |
| | > 12 | And | < 162 | ≥ 54 and ≤75 | ≤ 5 |
| | > 49 | And | < 125 | ≥ 36 and < 54 | ≤ 2 |
| 75RB / 75RB and 100RB / 50RB And 50RB / 100RB | ≤ 5 | Or | ≥ 144 | ≤ 16 | ≤ 12 |
| | | | | > 16 and ≤ 61 | ≤ 6 |
| | ≥ 0 | N/A | N/A | > 61 | ≤ 8 |
| | > 5 | And | < 144 | ≥ 36 and ≤ 61 | ≤ 5 |
| | > 5 and ≤ 41 | Or | ≥ 108 and < 144 | < 36 | ≤ 3 |
| 100RB / 25RB And 25RB / 100RB | ≤ 31 | Or | ≥ 92 | ≤ 34 | ≤ 4 |
| | | | | > 34 and ≤ 44 | ≤ 5 |
| | ≥ 0 | N/A | N/A | > 44 | ≤ 8 |

NOTE 1: $RB_{start}$ indicates the lowest RB index of transmitted resource blocks
NOTE 2: $L_{CRB}$ is the length of a contiguous resource block allocation
NOTE 3: $RB_{end}$ indicates the highest RB index of transmitted resource blocks
NOTE 4: If condition is "and" both $RB_{start}$ and $RB_{end}$ constraints need to be met. If condition is "or" either $RB_{start}$ or $RB_{end}$ constraints need to be met
NOTE 5: For intra-subframe frequency hopping which intersects regions, notes 1, 2, 3 and 4 apply on a per slot basis. For intra-slot or intra-subslot frequency hopping which intersects regions, notes 1,2,3 and 4 apply on a per $T_{no_hopping}$ basis.
NOTE 6: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe. For intra-slot frequency hopping which intersects regions, the larger A-MPR value may be applied for the slot. For intra-subslot frequency hopping which intersects regions, the larger A-MPR value may be applied for the subslot.

If the UE is configured to CA_42C and it receives IE CA_NS_08 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$\text{A-MPR} = \text{CEIL}\ \{M_A, 0.5\}$$

Where MA is defined as follows

$$M_A = \begin{cases} 20 & ; 0 \le A < 0.025 \\ 23 - 120A & ; 0.025 \le A < 0.05 \\ 17.53 - 10.59A & ; 0.05 \le A \le 0.9 \\ 8 & ; 0.9 \le A \le 1 \end{cases}$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

### 6.2.4A.1_2.3.9 A-MPR for CA_NS_09 for CA_66B and 66C

If the UE is configured to CA_66B and it receives IE CA_NS_09 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_2.3.9-1.

**Table 6.2.4A.1_2.3.9-1: Contiguous Allocation A-MPR for CA_66B CA_NS_09**

| CA_66B: CA_NS_09 | RBstart | Condition | RBend | $L_{CRB}$ [RBs] | A-MPR for QPSK, 16 QAM, 64 QAM and 256 QAM [dB] |
|---|---|---|---|---|---|
| 50RB / 50RB And 25RB /75RB | ≤ 10 | Or | ≥ 90 | ≤ 10 | ≤ 4.8 |
| | ≥ 0 | N/A | N/A | > 70 | ≤ 1.0 |
| | ≥ 15 | And | ≤ 85 | > 10 and ≤ 70 | ≤ 4.0 |
| 25RB / 50RB And 50RB / 25RB | ≤ 7 | Or | ≥ 68 | ≤ 7 | ≤ 4.6 |
| | ≥ 0 | N/A | N/A | > 45 | ≤ 1.6 |
| | ≥ 7 | And | ≤ 59 | > 7 and ≤ 52 | ≤ 1.9 |
| 25 RB / 25RB | ≤ 5 | Or | ≥ 45 | ≤ 5 | ≤ 4.6 |
| | ≥ 0 | N/A | N/A | > 35 | ≤ 1.4 |
| | > 5 | And | < 45 | > 5 and ≤ 35 | ≤ 1.7 |

NOTE 1: $RB_{start}$ indicates the lowest RB index of transmitted resource blocks
NOTE 2: $L_{CRB}$ is the length of a contiguous resource block allocation
NOTE 3: $RB_{end}$ indicates the highest RB index of transmitted resource blocks
NOTE 4: If condition is "and" both $RB_{start}$ and $RB_{end}$ constraints need to be met. If condition is "or" either $RB_{start}$ or $RB_{end}$ constraints need to be met
NOTE 5: For intra-subframe frequency hopping which intersects regions, notes 1, 2, 3 and 4 apply on a per slot basis. For intra-slot or intra-subslot frequency hopping which intersects regions, notes 1,2,3 and 4 apply on a per $T_{no_hopping}$ basis.
NOTE 6: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe. For intra-slot frequency hopping which intersects regions, the larger A-MPR value may be applied for the slot. For intra-subslot frequency hopping which intersects regions, the larger A-MPR value may be applied for the subslot.

If the UE is configured to CA_66C and it receives IE CA_NS_09 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.1_2.3.9-2.

**Table 6.2.4A.1_2.3.9-2: Contiguous Allocation A-MPR for CA_66C CA_NS_09**

| CA_66C: CA_NS_09 | RBstart | Condition | RBend | $L_{CRB}$ [RBs] | A-MPR for QPSK, 16 QAM, 64 QAM and 256 QAM [dB] |
|---|---|---|---|---|---|
| 100RB / 100RB | ≤ 21 | Or | ≥ 178 | ≤ 25 | ≤ 5.2 |
| | | | | > 25 and ≤ 80 | ≤ 2.5 |
| | ≥ 0 | N/A | N/A | > 80 and ≤ 172 | ≤ 1.3 |
| | | | | > 172 | ≤ 1.1 |
| | > 21 and ≤ 58 | Or | ≥ 141 and < 178 | < 48 | ≤ 2.3 |
| | > 21 | And | < 178 | ≥ 48 and ≤ 80 | ≤ 1.6 |
| 100RB / 75RB And 75RB / 100RB | ≤ 12 | Or | ≥ 162 | ≤ 25 | ≤ 4.7 |
| | | | | > 25 and ≤ 75 | ≤ 2.8 |
| | ≥ 0 | N/A | N/A | > 75 and <172 | ≤ 1.0 |
| | | | | ≥172 | ≤ 1.0 |
| | > 12 and ≤ 49 | Or | ≥ 125 and < 162 | < 54 | ≤ 4.8 |
| | > 12 | And | < 162 | ≥ 54 and ≤75 | ≤ 1.3 |
| | > 49 | And | < 125 | ≥ 36 and < 54 | ≤ 0 |
| 75RB / 75RB and 100RB / 50RB And 50RB / 100RB | ≤ 5 | Or | ≤ 144 | ≤ 16 | ≤ 4.7 |
| | | | | > 16 and ≤ 61 | ≤ 3.1 |
| | ≥ 0 | N/A | N/A | > 61 | ≤ 1.7 |
| | > 5 | And | < 144 | ≥ 36 and ≤ 61 | ≤ 1.7 |
| | > 5 and ≤ 41 | Or | ≥ 108 and < 144 | < 36 | ≤ 4.6 |
| 100RB / 25RB And 25RB / 100RB | ≤ 31 | Or | ≥ 92 | ≤ 34 | ≤ 4.6 |
| | | | | > 34 and ≤ 44 | ≤ 1.2 |
| | ≥ 0 | N/A | N/A | > 44 | ≤ 1.5 |

NOTE 1: $RB_{start}$ indicates the lowest RB index of transmitted resource blocks
NOTE 2: $L_{CRB}$ is the length of a contiguous resource block allocation
NOTE 3: $RB_{end}$ indicates the highest RB index of transmitted resource blocks
NOTE 4: If condition is "and" both $RB_{start}$ and $RB_{end}$ constraints need to be met. If condition is "or" either $RB_{start}$ or $RB_{end}$ constraints need to be met
NOTE 5: For intra-subframe frequency hopping which intersects regions, notes 1, 2, 3 and 4 apply on a per slot basis. For intra-slot or intra-subslot frequency hopping which intersects regions, notes 1,2,3 and 4 apply on a per $T_{no_hopping}$ basis.
NOTE 6: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe. For intra-slot frequency hopping which intersects regions, the larger A-MPR value may be applied for the slot. For intra-subslot frequency hopping which intersects regions, the larger A-MPR value may be applied for the subslot.

## 6.2.4A.1_2.4 Test description

### 6.2.4A.1_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.2.4A.1_2.4.1-1 to 6.2.4A.1_2.4.1-7. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4A.1_2.4.1-1: Test Configuration Table (network signalled value "CA_NS_01")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | As in Table 6.2.4A.1_2.3.1-1 |

**Test Parameters for CA Configurations**

| ID | CA Configuration / $N_{RB_agg}$ | | DL Allocation (PDCCH on PCC) | CC MOD | UL Allocation | | |
|---|---|---|---|---|---|---|---|
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | PCC & SCC RB allocation | | $N_{RB_alloc}$ | PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$) | |
| 1 | 75 | 75 | N/A | 256QAM | 1 | P_1@0 | S_0@0 |
| 2 | 75 | 75 | | 256QAM | 150 | P_75@0 | S_75@0 |
| 3 | 75 | 75 | | 256QAM | 45 | P_45@7 | S_0@0 |
| 4 | 75 | 75 | | 256QAM | 8 | P_0@0 | S_8@67 |
| 5 | 75 | 75 | | 256QAM | 129 | P_75@0 | S_54@0 |
| 6 | 75 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 |
| 7 | 100 | 100 | | 256QAM | 200 | P_100@0 | S_100@0 |
| 8 | 100 | 100 | | 256QAM | 1 | P_1@0 | S_0@0 |
| 9 | 100 | 100 | | 256QAM | 175 | P_75@25 | S_100@0 |
| 10 | 100 | 100 | | 256QAM | 25 | P_0@0 | S_25@75 |
| 11 | 100 | 100 | | 256QAM | 64 | P_64@24 | S_0@0 |
| 12 | 100 | 100 | | 256QAM | 2 | P_1@0 | S_1@99 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

**Table 6.2.4A.1_2.4.1-2: Test Configuration Table (network signalled value "CA_NS_02")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | C: Low and High range | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | As in Table 6.2.4A.1_2.3.2-1 | | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 1 | 75 | 75 | N/A | 256QAM | 1 | P_1@0 | S_0@0 |
| 2 | 75 | 75 | | 256QAM | 75 | P_75@0 | S_0@0 |
| 3 | 75 | 75 | | 256QAM | 129 | P_75@0 | S_54@0 |
| 4 | 75 | 75 | | 256QAM | 129 | P_54@21 | S_75@0 |
| 5 | 75 | 75 | | 256QAM | 1 | P_0@0 | S_1@74 |
| 6 | 75 | 75 | | 256QAM | 1 | P_0@0 | S_1@54 |
| 7 | 75 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 |
| 8 | 100 | 100 | | 256QAM | 1 | P_1@0 | S_0@0 |
| 9 | 100 | 100 | | 256QAM | 1 | P_1@21 | S_0@0 |
| 10 | 100 | 100 | | 256QAM | 90 | P_90@0 | S_0@0 |
| 11 | 100 | 100 | | 256QAM | 180 | P_100@0 | S_80@0 |
| 12 | 100 | 100 | | 256QAM | 1 | P_0@0 | S_1@99 |
| 13 | 100 | 100 | | 256QAM | 1 | P_0@0 | S_1@83 |
| 14 | 100 | 100 | | 256QAM | 2 | P_1@0 | S_1@99 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | |

**Table 6.2.4A.1_2.4.1-3: Test Configuration Table (network signalled value "CA_NS_03")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | C: Low and High range | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | As in Table 6.2.4A.1_2.3.3-1 | | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 1 | 75 | 75 | N/A | 256QAM | 1 | P_1@0 | S_0@0 |
| 2 | 75 | 75 | | 256QAM | 1 | P_1@21 | S_0@0 |
| 3 | 75 | 75 | | 256QAM | 75 | P_75@0 | S_0@0 |
| 4 | 75 | 75 | | 256QAM | 90 | P_75@0 | S_15@0 |
| 5 | 75 | 75 | | 256QAM | 150 | P_75@0 | S_75@0 |
| 6 | 75 | 75 | | 256QAM | 1 | P_0@0 | S_1@74 |
| 7 | 75 | 75 | | 256QAM | 1 | P_0@0 | S_1@44 |
| 8 | 75 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 |
| 9 | 100 | 100 | | 256QAM | 1 | P_1@0 | S_0@0 |
| 10 | 100 | 100 | | 256QAM | 60 | P_60@0 | S_0@0 |
| 11 | 100 | 100 | | 256QAM | 1 | P_1@63 | S_0@0 |
| 12 | 100 | 100 | | 256QAM | 90 | P_90@0 | S_0@0 |
| 13 | 100 | 100 | | 256QAM | 164 | P_100@0 | S_64@0 |
| 14 | 100 | 100 | | 256QAM | 1 | P_0@0 | S_1@99 |
| 15 | 100 | 100 | | 256QAM | 1 | P_0@0 | S_1@70 |
| 16 | 100 | 100 | | 256QAM | 2 | P_1@0 | S_1@99 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | |

**Table 6.2.4A.1_2.4.1-4: Test Configuration Table (network signalled value "CA_NS_04")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | C: Low and High range | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | As in Table 6.2.4A.1_2.3.4-1 | | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 1 | 100 | 50 | N/A | 256QAM | 10 | P_10@20 | S_0@0 |
| 2 | 100 | 50 | | 256QAM | 60 | P_50@50 | S_10@0 |
| 3 | 100 | 50 | | 256QAM | 15 | P_0@0 | S_15@0 |
| 4 | 100 | 50 | | 256QAM | 2 | P_1@0 | S_1@49 |
| 5 | 75 | 75 | | 256QAM | 10 | P_10@20 | S_0@0 |
| 6 | 75 | 75 | | 256QAM | 75 | P_30@45 | S_45@0 |
| 7 | 75 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 |
| 8 | 100 | 75 | | 256QAM | 10 | P_10@20 | S_0@0 |
| 9 | 100 | 75 | | 256QAM | 80 | P_50@50 | S_30@0 |
| 10 | 100 | 75 | | 256QAM | 20 | P_0@0 | S_20@15 |
| 11 | 100 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 |
| 12 | 100 | 100 | | 256QAM | 10 | P_10@25 | S_0@0 |
| 13 | 100 | 100 | | 256QAM | 90 | P_40@60 | S_50@0 |
| 14 | 100 | 100 | | 256QAM | 15 | P_0@0 | S_15@40 |
| 15 | 100 | 100 | | 256QAM | 20 | P_0@0 | S_20@30 |
| 16 | 100 | 100 | | 256QAM | 2 | P_1@0 | S_1@99 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | |

**Table 6.2.4A.1_2.4.1-5: Test Configuration Table (network signalled value "CA_NS_05")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | As in Table 6.2.4A.1_2.3.5-1 |

**Test Parameters for CA Configurations**

| ID | CA Configuration / $N_{RB_agg}$ | | DL Allocation (PDCCH on PCC) | CC MOD | UL Allocation | | |
|---|---|---|---|---|---|---|---|
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | PCC & SCC RB allocation | | $N_{RB_alloc}$ | PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$) | |
| 1 | 75 | 75 | N/A | 256QAM | 40 | P_40@0 | S_0@0 |
| 2 | 75 | 75 | | 256QAM | 80 | P_50@25 | S_30@0 |
| 3 | 75 | 75 | | 256QAM | 60 | P_10@65 | S_50@0 |
| 4 | 75 | 75 | | 256QAM | 65 | P_1@74 | S_64@0 |
| 5 | 75 | 75 | | 256QAM | 92 | P_20@55 | S_72@0 |
| 6 | 75 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 |
| 7 | 100 | 100 | | 256QAM | 8 | P_8@0 | S_0@0 |
| 8 | 100 | 100 | | 256QAM | 40 | P_40@0 | S_0@0 |
| 9 | 100 | 100 | | 256QAM | 80 | P_50@50 | S_30@0 |
| 10 | 100 | 100 | | 256QAM | 150 | P_60@40 | S_90@0 |
| 11 | 100 | 100 | | 256QAM | 2 | P_1@0 | S_1@99 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

**Table 6.2.4A.1_2.4.1-6: Test Configuration Table (network signalled value "CA_NS_06")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | As in Table 6.2.4A.1_2.3.6-1 |

**Test Parameters for CA Configurations**

| ID | CA Configuration / $N_{RB_agg}$ | | DL Allocation (PDCCH on PCC) | CC MOD | UL Allocation | | |
|---|---|---|---|---|---|---|---|
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | PCC & SCC RB allocation | | $N_{RB_alloc}$ | PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$) | |
| 1 | 75 | 75 | N/A | 256QAM | 5 | P_5@0 | S_0@0 |
| 2 | 75 | 75 | | 256QAM | 45 | P_45@0 | S_0@0 |
| 3 | 75 | 75 | | 256QAM | 75 | P_60@15 | S_15@0 |
| 4 | 75 | 75 | | 256QAM | 60 | P_10@65 | S_50@0 |
| 5 | 75 | 75 | | 256QAM | 90 | P_18@57 | S_72@0 |
| 6 | 75 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 |
| 7 | 100 | 100 | | 256QAM | 10 | P_10@0 | S_0@0 |
| 8 | 100 | 100 | | 256QAM | 30 | P_30@0 | S_0@0 |
| 9 | 100 | 100 | | 256QAM | 100 | P_75@25 | S_25@0 |
| 10 | 100 | 100 | | 256QAM | 90 | P_40@60 | S_50@0 |
| 11 | 100 | 100 | | 256QAM | 96 | P_15@85 | S_81@0 |
| 12 | 100 | 100 | | 256QAM | 2 | P_1@0 | S_1@99 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

**Table 6.2.4A.1_2.4.1-7: Test Configuration Table (network signalled value "CA_NS_07")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | C: Low and High range | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | As in Table 6.2.4A.1_2.3.7-1 | | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 1 | 100 | 25 | N/A | 256QAM | 1 | P_1@0 | S_0@0 |
| 2 | 100 | 25 | | 256QAM | 85 | P_80@20 | S_5@0 |
| 3 | 100 | 25 | | 256QAM | 65 | P_60@40 | S_5@0 |
| 4 | 100 | 25 | | 256QAM | 35 | P_30@70 | S_5@0 |
| 5 | 100 | 25 | | 256QAM | 2 | P_1@0 | S_1@24 |
| 6 | 100 | 50 | | 256QAM | 1 | P_1@1 | S_0@0 |
| 7 | 100 | 50 | | 256QAM | 10 | P_10@30 | S_0@0 |
| 8 | 100 | 50 | | 256QAM | 30 | P_30@30 | S_0@0 |
| 9 | 100 | 50 | | 256QAM | 60 | P_40@60 | S_20@0 |
| 10 | 100 | 50 | | 256QAM | 30 | P_10@90 | S_20@0 |
| 11 | 100 | 50 | | 256QAM | 5 | P_0@0 | S_5@45 |
| 12 | 100 | 50 | | 256QAM | 2 | P_1@0 | S_1@49 |
| 13 | 100 | 75 | | 256QAM | 1 | P_1@1 | S_0@0 |
| 14 | 100 | 75 | | 256QAM | 40 | P_40@20 | S_0@0 |
| 15 | 100 | 75 | | 256QAM | 85 | P_80@20 | S_5@0 |
| 16 | 100 | 75 | | 256QAM | 40 | P_0@0 | S_40@20 |
| 17 | 100 | 75 | | 256QAM | 15 | P_0@0 | S_15@60 |
| 18 | 100 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | |

**Table 6.2.4A.1_2.4.1-8: Test Configuration Table (network signalled value "CA_NS_08")**

TBD

**Table 6.2.4A.1_2.4.1-9a: Test Configuration Table (network signalled value "CA_NS_09" for CA_66B)**

TBD

**Table 6.2.4A.1_2.4.1-9b: Test Configuration Table (network signalled value "CA_NS_09" for CA_66C)**

TBD

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to the applicable table from Table 6.2.4A.1_2.4.1-1 to 6.2.4A.1_2.4.1-7.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.4A.1_2.4.3.

### 6.2.4A.1_2.4.2 Test procedure

Same test procedure as in clause 6.2.4A.1.4.2 with the following exception:

- In Step 4, instead of Table 6.2.4A.1.4.1-1 to Table 6.2.4A.1.4.1-7 use Table 6.2.4A.1_2.4.1-1 to Table 6.2.4A.1_2.4.1-7

### 6.2.4A.1_2.4.3 Message contents

Same message contents as in clause 6.2.4A.1.4.3.

## 6.2.4A.1_2.5 Test requirements

The maximum output power, derived in step 6 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable table from Table 6.2.4A.1_2.5-1 to Table 6.2.4A.1_2.5-7.

**Table 6.2.4A.1_2.5-1: Test requirement (network signalled value "CA_NS_01")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -17.7 |
| 2 | | | | | 23 | +2.7 / -11.7 |
| 3 | | | | | 23 | +2.7 / -9.7 |
| 4 | | | | | 23 | +2.7 / -9.7 |
| 5 | | | | | 23 | +2.7 / -11.7 |
| 6 | | | | | 23 | +2.7 / -24.7 |
| 7 | | | | | 23 | +2.7 / -18.7 |
| 8 | | | | | 23 | +2.7 / -18.7 |
| 9 | | | | | 23 | +2.7 / -11.7 |
| 10 | | | | | 23 | +2.7 / -9.7 |
| 11 | | | | | 23 | +2.7 / -9.7 |
| 12 | | | | | 23 | +2.7 / -24.7 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

**Table 6.2.4A.1_2.5-2: Test requirement (network signalled value "CA_NS_02")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -9.7 |
| 2 | | | | | 23 | +2.7 / -9.7 |
| 3 | | | | | 23 | +2.7 / -9.7 |
| 4 | | | | | 23 | +2.7 / -11.7 |
| 5 | | | | | 23 | +2.7 / -9.7 |
| 6 | | | | | 23 | +2.7 / -9.7 |
| 7 | | | | | 23 | +2.7 / -24.7 |
| 8 | | | | | 23 | +2.7 / -9.7 |
| 9 | | | | | 23 | +2.7 / -9.7 |
| 10 | | | | | 23 | +2.7 / -9.7 |
| 11 | | | | | 23 | +2.7 / -11.7 |
| 12 | | | | | 23 | +2.7 / -15.7 |
| 13 | | | | | 23 | +2.7 / -9.7 |
| 14 | | | | | 23 | +2.7 / -24.7 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

**Table 6.2.4A.1_2.5-3: Test requirement (network signalled value "CA_NS_03")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -15.7 |
| 2 | | | | | 23 | +2.7 / -9.7 |
| 3 | | | | | 23 | +2.7 / -9.7 |
| 4 | | | | | 23 | +2.7 / -9.7 |
| 5 | | | | | 23 | +2.7 / -13.7 |
| 6 | | | | | 23 | +2.7 / -11.7 |
| 7 | | | | | 23 | +2.7 / -9.7 |
| 8 | | | | | 23 | +2.7 / -25.2 |
| 9 | | | | | 23 | +2.7 / -15.7 |
| 10 | | | | | 23 | +2.7 / -11.7 |
| 11 | | | | | 23 | +2.7 / -9.7 |
| 12 | | | | | 23 | +2.7 / -9.7 |
| 13 | | | | | 23 | +2.7 / -12.7 |
| 14 | | | | | 23 | +2.7 / -15.7 |
| 15 | | | | | 23 | +2.7 / -9.7 |
| 16 | | | | | 23 | +2.7 / -25.2 |

Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1.

**Table 6.2.4A.1_2.5-4: Test requirement (network signalled value "CA_NS_04")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -9.7 |
| 2 | | | | | 23 | +2.7 / -9.7 |
| 3 | | | | | 23 | +2.7 / -9.7 |
| 4 | | | | | 23 | +2.7 / -19.2 |
| 5 | | | | | 23 | +2.7 / -9.7 |
| 6 | | | | | 23 | +2.7 / -9.7 |
| 7 | | | | | 23 | +2.7 / -19.2 |
| 8 | | | | | 23 | +2.7 / -9.7 |
| 9 | | | | | 23 | +2.7 / -9.7 |
| 10 | | | | | 23 | +2.7 / -9.7 |
| 11 | | | | | 23 | +2.7 / -19.2 |
| 12 | | | | | 23 | +2.7 / -9.7 |
| 13 | | | | | 23 | +2.7 / -9.7 |
| 14 | | | | | 23 | +2.7 / -9.7 |
| 15 | | | | | 23 | +2.7 / -9.7 |
| 16 | | | | | 23 | +2.7 / -19.2 |

Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1.

**Table 6.2.4A.1_2.5-5: Test requirement (network signalled value "CA_NS_05")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -9.7 |
| 2 | | | | | 23 | +2.7 / -9.7 |
| 3 | | | | | 23 | +2.7 / -9.7 |
| 4 | | | | | 23 | +2.7 / -9.7 |
| 5 | | | | | 23 | +2.7 / -11.7 |
| 6 | | | | | 23 | +2.7 / -24.2 |
| 7 | | | | | 23 | +2.7 / -9.7 |
| 8 | | | | | 23 | +2.7 / -9.7 |
| 9 | | | | | 23 | +2.7 / -11.7 |
| 10 | | | | | 23 | +2.7 / -17.7 |
| 11 | | | | | 23 | +2.7 / -24.2 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

**Table 6.2.4A.1_2.5-6: Test requirement (network signalled value "CA_NS_06")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 (low range) | | | | | 23 | +2.7 / -12.2 |
| 1 (high range) | | | | | 23 | +2.7 / -9.7 |
| 2 | | | | | 23 | +2.7 / -9.7 |
| 3 | | | | | 23 | +2.7 / -9.7 |
| 4 | | | | | 23 | +2.7 / -11.7 |
| 5 | | | | | 23 | +2.7 / -15.7 |
| 6 | | | | | 23 | +2.7 / -26.7 |
| 7 (low range) | | | | | 23 | +2.7 / -12.2 |
| 7 (high range) | | | | | 23 | +2.7 / -9.7 |
| 8 | | | | | 23 | +2.7 / -9.7 |
| 9 | | | | | 23 | +2.7 / -9.7 |
| 10 | | | | | 23 | +2.7 / -9.7 |
| 11 | | | | | 23 | +2.7 / -15.7 |
| 12 | | | | | 23 | +2.7 / -26.7 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

**Table 6.2.4A.1_2.5-7: Test requirement (network signalled value "CA_NS_07")**

| Configuration ID | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|
| 1 | | | | | 23 | +2.7 / -9.7 |
| 2 | | | | | 23 | +2.7 / -11.7 |
| 3 | | | | | 23 | +2.7 / -9.7 |
| 4 | | | | | 23 | +2.7 / -9.7 |
| 5 | | | | | 23 | +2.7 / -28.7 |
| 6 | | | | | 23 | +2.7 / -17.7 |
| 7 | | | | | 23 | +2.7 / -9.7 |
| 8 | | | | | 23 | +2.7 / -11.7 |
| 9 | | | | | 23 | +2.7 / -9.7 |
| 10 | | | | | 23 | +2.7 / -9.7 |
| 11 | | | | | 23 | +2.7 / -9.7 |
| 12 | | | | | 23 | +2.7 / -28.7 |
| 13 | | | | | 23 | +2.7 / -17.7 |
| 14 | | | | | 23 | +2.7 / -9.7 |
| 15 | | | | | 23 | +2.7 / -12.7 |
| 16 | | | | | 23 | +2.7 / -9.7 |
| 17 | | | | | 23 | +2.7 / -9.7 |
| 18 | | | | | 23 | +2.7 / -28.7 |
| Note 1: Lower limit is assuming $\Delta T_{IB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5A.1.3-1. | | | | | | |

## 6.2.4A.2 Additional Maximum Power Reduction (A-MPR) for CA (inter-band DL CA and UL CA)

Editor's note: For a transition period until RAN5#73, this test case in version 13.1.0 of 36.521-1 shall be used. This is to ensure no test coverage is lost before the UL 64QAM test case becomes available. Based on analysis for CA_3A-19A in TR 36.905 [19] no requirements in additional spurious emissions are required so A-MPR requirements are not tested for this CA configuration in any test case.

### 6.2.4A.2.1 Test purpose

Additional ACLR, spectrum emission and spurious emission requirements for carrier aggregation can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction (A-MPR) is allowed for the CA Power Class as specified in Table 6.2.2A.0-1.

### 6.2.4A.2.2 Test applicability

The requirements of this test apply in test case 6.6.2.2A.2 Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA) for network signalled value NS_01/NS_03, NS_03/NS_03, NS_03/NS_06, NS_03/NS_07, NS_03/NS_01, NS_01/NS_06, NS_01/NS_21, NS_03/NS_21, NS_06/NS_21, NS_03/NS_28, NS_03/NS_29, NS_03/NS_30, NS_03/NS_31 to all types of E-UTRA UE release 11 and forward but do not support UL 64QAM or UL 256QAM.

The requirements of this test apply in test case 6.6.3.3A.2 Additional spurious emissions for CA (inter-band DL CA and UL CA) for network signalled values NS_05/NS_01, NS_03/NS_07, NS_01/NS_12 and NS_01/NS15, NS_01/NS_21, NS_03/NS_21, NS_06/NS_21, NS_03/NS_28, NS_03/NS_29, NS_03/NS_30, NS_03/NS_31 to all types of E-UTRA UE release 11 and forward but do not support UL 64QAM or UL 256QAM.

NOTE: As a result TC 6.2.4A.2 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.4A.2.3 Minimum conformance requirements

If for inter-band carrier aggregation the UE is configured for transmissions on a single serving cell, then subclauses 6.2.3 and 6.2 4 apply with the Network Signalling value indicated by the field additionalSpectrumEmission.

For inter-band carrier aggregation with the UE configured for transmissions on two serving cells the maximum output power reduction specified in Table 6.2.4-1 is allowed for each serving cell of the applicable uplink CA configuration according to the Network Signalling value indicated by the field additionalSprectrumEmission for the PCC and the CA network signalling value indicated by the field additionalSpectrumEmissionSCell-r10 for the SCC. The value of additionalSpectrumEmissionSCell-r10 is equal to that of additionalSprectrumEmission configured on the SCC. MPR as specified in subclause 6.2.3A is allowed in addition.

For PUCCH and SRS transmissions, the allowed A-MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth. The normative reference for this requirement is in TS 36.101 [2] clause 6.2.4A.

### 6.2.4A.2.4 Test description

#### 6.2.4A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state. For the UE maximum output power modified by A-MPR specified in table 6.2.4A.2.4.1-1, the power limits specified in subclause 6.2.5A.2.3 apply.

**Table 6.2.4A.2.4.1-1: Additional Maximum Power Reduction (A-MPR) for inter-band CA**

| Uplink CA Configuration | NS-value per CC (in same order as UL CA Configuration column) | | Applicable emissions requirements (in same order as UL CA Configuration column) | |
|---|---|---|---|---|
| CA_1A-3A<br>CA_1A-5A<br>CA_1A-7A<br>CA_1A-8A<br>CA_1A-18A<br>CA_1A-26A<br>CA_1A-42A | NS_05 | NS_01 | Table 6.6.3.3.5.2-1 (Note 5) | N/A |
| CA_1A-19A | NS_05 | NS_08 | Table 6.6.3.3.5.2-1 (Note 5) | Table 6.6.3.3.5.4-1 |
| CA_1A-21A | NS_05 | NS_09 | Table 6.6.3.3.5.2-1 (Note 5) | Table 6.6.3.3.5.5-1 (Note 5) |
| CA_2A-4A,<br>CA_2A-66A | NS_03 | NS_03 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.1-1 |
| CA_2A-12A,<br>CA_2A-13A,<br>CA_4A-12A,<br>CA_4A-13A,<br>CA_4A-17A | NS_03 | NS_06 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.3-1 |
| CA_2A-13A,<br>CA_4A-13A | NS_03 | NS_07 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.3-1<br>Table 6.6.3.3.3.3-1 |
| CA_2A-30A | NS_03 | NS_21 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.1-1<br>Table 6.6.3.3.5.16-1<br>(Note 8) |
| CA_2A-46A | NS_03 | NS_28 | Table 6.6.2.2.3.1-1 | Table 6.6.3.3.3.22-1 |
| CA_2A-46A | NS_03 | NS_29 | Table 6.6.2.2.3.1-1 | Table 6.6.3.3.3.23-1 |
| CA_2A-46A | NS_03 | NS_30 | Table 6.6.2.2.3.1-1 | Table 6.6.3.3.3.24-1<br>Table 6.6.3.3.3.24-2<br>Table 6.6.3.3.3.24-3 |
| CA_2A-46A | NS_03 | NS_31 | Table 6.6.2.2.3.1-1 | Table 6.6.3.3.3.25-1<br>Table 6.6.3.3.3.25-2<br>Table 6.6.3.3.3.25-3<br>Table 6.6.3.3.3.25-4 |
| CA_3A-5A<br>CA_3A-7A<br>CA_3A-8A<br>CA_3A-18A<br>CA_5A-7A<br>CA_11A-18A<br>CA_39A-41A | NS_01 | NS_01 | N/A | N/A |
| CA_3A-19A | NS_01 | NS_08 | N/A | Table 6.6.3.3.5.4-1 |
| CA_3A-20A<br>CA_7A-20A | NS_01 | NS_10 | N/A | N/A<br>(Note 6) |
| CA_3A-26A | NS_01 | NS_12 | N/A | Table 6.6.3.3.3.7-1 (Note 5) |
| CA_3A-26A | NS_01 | NS_13 | N/A | Table 6.6.3.3.3.8-1 (Note 5) |
| CA_3A-26A | NS_01 | NS_14 | N/A | Table 6.6.3.3.3.9-1 (Note 5) |
| CA_3A-26A | NS_01 | NS_15 | N/A | Table 6.6.3.3.3.10-1 (Note 5) |
| CA_2A-5A<br>CA_2A-7A | NS_03 | NS_01 | Table 6.6.2.2.3.1-1 | N/A |

| | | | | |
|---|---|---|---|---|
| CA_4A-5A<br>CA_4A-7A | | | | |
| CA_5A-66A[Note 7] | NS_01 | NS_03 | N/A | Table 6.6.2.2.3.1-1 |
| CA_5A-12A<br>CA_5A-17A | NS_01 | NS_06 | N/A | Table 6.6.2.2.3.3-1 |
| CA_5A-30A | NS_01 | NS_21 | N/A | Table 6.6.2.2.3.1-1<br>Table 6.6.3.3.5.16-1<br>(Note 8) |
| 3A-28A<br>CA_7A-28A<br>CA_18A-28A | NS_01 | NS_17 | N/A | Table 6.6.3.3.5.12-1<br>(Note 5) |
| CA_3A-28A<br>CA_7A-28A | NS_01 | NS_18 | N/A | Table 6.6.3.3.5.13-1 (Note 5) |
| CA_12A-30A | NS_06 | NS_21 | Table 6.6.2.2.3.3-1 | Table 6.6.2.2.3.3-1<br>Table 6.6.3.3.5.16-1<br>(Note 8) |
| CA_12A-66A | NS_06 | NS_03 | Table 6.6.2.2.3.3-1 | Table 6.6.2.2.3.1-1 |
| CA_19A-21A | NS_08 | NS_09 | Table 6.6.3.3.5.4-1<br>(Note 5) | Table 6.6.3.3.5.5-1<br>(Note 5) |
| CA_1A-28A | NS_05 | NS_17 | Table 6.6.3.3.5.2-1 | Table 6.6.3.3.5.12-1<br>(Note 5) |

Note 1: For CCs with NS_01, there are no additional requirements defined in 36.101. Only CCs with NS-value different than NS_01 needs to be tested.
Note 2: A-MPR values for NS-values in this table are the same as in section 6.2.4.3.
Note 3: Selection of CA configurations and NS-values to test is derived in TR 36.905 [19]
Note 4: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column
Note 5: No test required since only A-Spur requirements apply, and the frequency range to test is unaffected by intermodulation products as described in section 4.3 in TR 36.905 [19] and refer to Table 4.1.3-1 in TR 36.905.
Note 6: No test required since no A_SEM and/or A-Spur requirements apply
Note 7: As an exception to note 4, PCC is mapped to the second band of the combination as listed in Uplink CA Configuration column.
Note 8: Only A_SEM requirements apply, as the frequency range to test for A-Spur requirements is unaffected by intermodulation products as described in section 4.3 in TR 36.905 [19] and refer to Table 4.1.3-1 in TR 36.905.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.2.4A.2.4.1-2 to 6.2.4A.1.4.1-17. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4A.2.4.1-2: Test Configuration Table (network signalled value NS_01/NS_06)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$ | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01)** | **SCC (NS_06)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 15 | 15 | N/A for this test | QPSK | QPSK | 6 | 6 |
| 2 | 15 | 15 | | 16QAM | 16QAM | 25 | 9 |
| 3 | 15 | 15 | | QPSK | 16QAM | 6 | 9 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12 |
| 5 | 50 | 50 | | 16QAM | 16QAM | 50 | 15 |
| 6 | 50 | 50 | | QPSK | 16QAM | 12 | 15 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4A.2.4.1-3: Test Configuration Table (network signalled value NS_01/NS_12)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for PCC SCC: (Note 3)<br>For 5 MHz Channel Bandwidth: UL 816.7 MHz ($N_{UL}$ = 26717)<br>For 10 MHz Channel Bandwidth: UL 819.2 MHz ($N_{UL}$ = 26742)<br>For 15 MHz Channel Bandwidth: UL 821.7 MHz ($N_{UL}$ = 26767) |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$(Note 2) |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_12) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)(Note 4)** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8@7 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 10 | 8 |
| 3 | 25 | 25 | | QPSK | 16QAM | 8 | 8 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12@16 |
| 5 | 50 | 50 | | 16QAM | 16QAM | 15 | 18 |
| 6 | 50 | 50 | | QPSK | 16QAM | 12 | 18 |
| 7 | 100 | 75 | | QPSK | QPSK | 15 | 16@31 |
| 8 | 100 | 75 | | 16QAM | 16QAM | 20 | 30 |
| 9 | 100 | 75 | | QPSK | 16QAM | 15 | 30 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.

Note 3: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1

Note 4: Test point with max A-MPR in B26 selected in region A with largest allocation giving max A-MPR at RBstart0; test point with min A-MPR in B26 selected in region A with same allocation but with shifted RBstart to give A-MPR=0;

**Table 6.2.4A.2.4.1-4: Test Configuration Table (network signalled value NS_01/NS_15)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | High range for both PCC and SCC(Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_15) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)(Note 4)** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 6@14 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 10 | 10@15 |
| 3 | 25 | 25 | | QPSK | 16QAM | 8 | 10@15 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12@25 |
| 5 | 50 | 50 | | 16QAM | 16QAM | 15 | 15@35 |
| 6 | 50 | 50 | | QPSK | 16QAM | 12 | 15@35 |
| 7 | 100 | 75 | | QPSK | QPSK | 18 | 18@19 |
| 8 | 100 | 75 | | 16QAM | 16QAM | 20 | 20@55 |
| 9 | 100 | 75 | | QPSK | 16QAM | 18 | 20@55 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.

Note 3: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.

Note 4: Test point with max A-MPR in B26 selected in region C with allocation giving max MPR+A-MPR+deltaTc at max RBend; Test point with min A-MPR in B26 selected in region B with max allocation and RBend giving A-MPR=0.

**Table 6.2.4A.2.4.1-5: Test Configuration Table (network signalled value NS_01/NS_17)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$ | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_17) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 5 | 5 | N/A for this test | QPSK | QPSK | 6 | 6 |
| 2 | 5 | 5 | | 16QAM | 16QAM | 25 | 25 |
| 3 | 5 | 5 | | 16QAM | QPSK | 25 | 6 |
| 4 | 5 | 10 | | QPSK | QPSK | 6 | 12 |
| 5 | 5 | 10 | | 16QAM | 16QAM | 25 | 25 |
| 6 | 5 | 10 | | 16QAM | QPSK | 25 | 12 |
| 7 | 10 | 10 | | QPSK | QPSK | 12 | 15 |
| 8 | 10 | 10 | | 16QAM | 16QAM | 50 | 25 |
| 9 | 10 | 10 | | 16QAM | QPSK | 50 | 12 |
| 10 | 15 | 10 | | QPSK | QPSK | 16 | 12 |
| 11 | 15 | 10 | | 16QAM | 16QAM | 50 | 25 |
| 12 | 15 | 10 | | 16QAM | QPSK | 50 | 12 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4A.2.4.1-6: Test Configuration Table (network signalled value NS_01/NS_21)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$ | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 3 | 25 | 25 | | QPSK | 16QAM | 8 | 25 |
| 4 (Note 4) | 50 | 50 | | QPSK | QPSK | 12 | 12@7 |
| 5 (Note 5) | 50 | 50 | | QPSK | QPSK | 12 | 12@31 |
| 6 | 50 | 50 | | 16QAM | 16QAM | 50 | 1 |
| 7 | 50 | 50 | | QPSK | 16QAM | 12 | 1 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1. | | | | | | | |
| Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |
| Note 4: Applicable only to Low range frequency testing. | | | | | | | |
| Note 5: Applicable only to High range frequency testing. | | | | | | | |

**Table 6.2.4A.2.4.1-7: Test Configuration Table (network signalled value NS_03/NS_01 or network signalled value NS_01/NS_03)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and high range for PCC<br>Mid range for SCC(Note 3) |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$(Note 2) |

**Test Parameters for CA Configurations**

| Config ID | CA Configuration / NRB_agg | | DL Allocation | CC MOD | | UL Allocation | |
|---|---|---|---|---|---|---|---|
| | NS_03 CC | NS_01 CC | PCC & SCC RB allocation | PCC | SCC | PCC & SCC RB allocations | |
| | NRB | NRB | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 8 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 3 | 25 | 25 | | 16QAM | QPSK | 25 | 8 |
| 4 | 50 | 50 | | QPSK | QPSK | 6 | 12 |
| 5 | 50 | 50 | | 16QAM | 16QAM | 50 | 50 |
| 6 | 50 | 50 | | 16QAM | QPSK | 50 | 12 |
| 7 | 50 | 100 | | QPSK | QPSK | 6 | 18 |
| 8 | 50 | 100 | | 16QAM | 16QAM | 50 | 100 |
| 9 | 50 | 100 | | 16QAM | QPSK | 50 | 18 |
| 10 | 100 | 50 | | QPSK | QPSK | 10 | 12 |
| 11 | 100 | 50 | | 16QAM | 16QAM | 100 | 50 |
| 12 | 100 | 50 | | 16QAM | QPSK | 100 | 12 |
| 13 | 100 | 100 | | QPSK | QPSK | 10 | 18 |
| 14 | 100 | 100 | | 16QAM | 16QAM | 100 | 100 |
| 15 | 100 | 100 | | 16QAM | QPSK | 100 | 18 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. For Mid range place test point with RBstart=0 and RBstart=RBmax-LCRB+1.

Note 4: Mapping of NS-value per CC and PCC/SCC selection are specified in Table 6.2.4A.2.4.1-1.

**Table 6.2.4A.2.4.1-8: Test Configuration Table (network signalled value NS_03/NS_03)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | Low and High range for both PCC and SCC (Note 3) | | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest and Highest $N_{RBagg}$ (Note 2) | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_03) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 15 | 25 | N/A for this test | QPSK | QPSK | 4 | 6 |
| 2 | 15 | 25 | | 16QAM | 16QAM | 15 | 25 |
| 3 | 15 | 25 | | 16QAM | QPSK | 15 | 6 |
| 4 | 25 | 25 | | QPSK | QPSK | 6 | 6 |
| 5 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 6 | 25 | 25 | | 16QAM | QPSK | 25 | 6 |
| 7 | 50 | 50 | | QPSK | QPSK | 6 | 6 |
| 8 | 50 | 50 | | 16QAM | 16QAM | 50 | 50 |
| 9 | 50 | 50 | | 16QAM | QPSK | 50 | 6 |
| 10 | 100 | 100 | | QPSK | QPSK | 10 | 10 |
| 11 | 100 | 100 | | 16QAM | 16QAM | 100 | 100 |
| 12 | 100 | 100 | | 16QAM | QPSK | 100 | 10 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.2.4A.2.4.1-9: Test Configuration Table (network signalled value NS_03/NS_06)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | Low and High range for both PCC and SCC (Note 3) | | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_06) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 15 | 25 | N/A for this test | QPSK | QPSK | 4 | 8 |
| 2 | 15 | 25 | | 16QAM | 16QAM | 15 | 25 |
| 3 | 15 | 25 | | 16QAM | QPSK | 15 | 8 |
| 4 | 25 | 15 | | QPSK | QPSK | 6 | 4 |
| 5 | 25 | 15 | | 16QAM | 16QAM | 25 | 15 |
| 6 | 25 | 15 | | 16QAM | QPSK | 25 | 4 |
| 7 | 25 | 25 | | QPSK | QPSK | 6 | 8 |
| 8 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 9 | 25 | 25 | | 16QAM | QPSK | 25 | 8 |
| 10 | 25 | 50 | | QPSK | QPSK | 6 | 12 |
| 11 | 25 | 50 | | 16QAM | 16QAM | 25 | 50 |
| 12 | 25 | 50 | | 16QAM | QPSK | 25 | 12 |
| 13 | 50 | 50 | | QPSK | QPSK | 6 | 12 |
| 14 | 50 | 50 | | 16QAM | 16QAM | 50 | 50 |
| 15 | 50 | 50 | | 16QAM | QPSK | 50 | 12 |
| 16 | 100 | 50 | | QPSK | QPSK | 10 | 12 |
| 17 | 100 | 50 | | 16QAM | 16QAM | 100 | 50 |
| 18 | 100 | 50 | | 16QAM | QPSK | 100 | 12 |
| X+1 | 75 | 25 | | QPSK | QPSK | 8 | 8 |
| X+2 | 75 | 25 | | 16QAM | 16QAM | 75 | 25 |
| X+3 | 75 | 25 | | 16QAM | QPSK | 75 | 8 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.2.4A.2.4.1-10: Test Configuration Table (network signalled value NS_03/NS_07)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_07) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 50 | N/A for this test | QPSK | QPSK | 6 | 7@13 |
| 2 | 25 | 50 | | 16QAM | 16QAM | 25 | 50 |
| 3 | 25 | 50 | | QPSK | 16QAM | 6 | 50 |
| 4 | 50 | 50 | | QPSK | QPSK | 6 | 7@13 |
| 5 | 50 | 50 | | 16QAM | 16QAM | 50 | 50 |
| 6 | 50 | 50 | | QPSK | 16QAM | 6 | 50 |
| 7 | 100 | 50 | | QPSK | QPSK | 10 | 7@13 |
| 8 | 100 | 50 | | 16QAM | 16QAM | 100 | 50 |
| 9 | 100 | 50 | | QPSK | 16QAM | 10 | 50 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.
Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.2.4A.2.4.1-11: Test Configuration Table (network signalled value NS_03/NS_21)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$ | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 8 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 3 | 25 | 25 | | 16QAM | QPSK | 25 | 8 |
| 4 (Note 4) | 100 | 50 | | QPSK | QPSK | 10 | 12@7 |
| 5 (Note 5) | 100 | 50 | | QPSK | QPSK | 10 | 12@31 |
| 6 | 100 | 50 | | 16QAM | 16QAM | 100 | 1 |
| 7 | 100 | 50 | | QPSK | 16QAM | 10 | 1 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1. | | | | | | | |
| Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |
| Note 4: Applicable only to Low range frequency testing. | | | | | | | |
| Note 5: Applicable only to High range frequency testing. | | | | | | | |

**Table 6.2.4A.2.4.1-12: Test Configuration Table (network signalled value NS_05/NS_01)**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low range, Mid range for PCC<br>In case of Low range:<br>- For 5MHz Channel Bandwidth: 1927.2MHz (NUL = 18072)<br>- For 10 MHz Channel Bandwidth: 1934.7 MHz (NUL = 18147)<br>- For 20 MHz Channel Bandwidth: 1930 MHz (NUL = 18100)<br>Mid range for SCC(Note 3) |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ (Note 2) |

| **Test Parameters for CA Configurations** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_05) NRB** | **SCC (NS_01) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 15 | N/A for this test | QPSK | QPSK | 6 | 4 |
| 2 | 25 | 15 | | 16QAM | 16QAM | 25 | 6 |
| 3 | 25 | 15 | | 16QAM | QPSK | 25 | 4 |
| 4 | 25 | 25 | | QPSK | QPSK | 6 | 6 |
| 5 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 6 | 25 | 25 | | 16QAM | QPSK | 25 | 6 |
| 7 | 25 | 50 | | QPSK | QPSK | 6 | 12 |
| 8 | 25 | 50 | | 16QAM | 16QAM | 25 | 25 |
| 9 | 25 | 50 | | 16QAM | QPSK | 25 | 12 |
| 10 | 50 | 50 | | QPSK | QPSK | 12 | 12 |
| 11 | 50 | 50 | | 16QAM | 16QAM | 50 | 25 |
| 12 | 50 | 50 | | 16QAM | QPSK | 50 | 12 |
| 13 | 100 | 50 | | QPSK | QPSK | 18 | 12 |
| 14 | 100 | 50 | | 16QAM | 16QAM | 50 | 25 |
| 15 | 100 | 50 | | 16QAM | QPSK | 50 | 12 |
| 16 | 100 | 75 | | QPSK | QPSK | 18 | 16 |
| 17 | 100 | 75 | | 16QAM | 16QAM | 50 | 25 |
| 18 | 100 | 75 | | 16QAM | QPSK | 50 | 16 |
| 19 | 100 | 100 | | QPSK | QPSK | 18 | 18 |
| 20 | 100 | 100 | | 16QAM | 16QAM | 50 | 25 |
| 21 | 100 | 100 | | 16QAM | QPSK | 50 | 18 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg.

only the combination with the highest NRB PCC is tested.
Note 3: For Low range place test point with RBstart=0. For Mid range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.2.4A.2.4.1-13: Test Configuration Table (network signalled value NS_06/NS_21)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$ | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06) NRB** | **SCC (NS_21) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 3 | 25 | 25 | | 16QAM | QPSK | 25 | 8 |
| 4 (Note 4) | 50 | 50 | | QPSK | QPSK | 12 | 12@7 |
| 5 (Note 5) | 50 | 50 | | QPSK | QPSK | 12 | 12@31 |
| 6 | 50 | 50 | | 16QAM | 16QAM | 50 | 1 |
| 7 | 50 | 50 | | QPSK | 16QAM | 12 | 1 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.
Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.
Note 4: Applicable only to Low range frequency testing.
Note 5: Applicable only to High range frequency testing.

**Table 6.2.4A.2.4.1-14: Test Configuration Table (network signalled value NS_03/NS_28)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Mid range for PCC.<br>For SCC<br>a. 5340 MHz for config ID 1-4<br>b. 5520 MHz for config ID 5-8 |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06) NRB** | **SCC (NS_21) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 100 | N/A for this test | QPSK | QPSK | 6 | L=1 |
| 2 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 3 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 4 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 5 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 6 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 7 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 8 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.

Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.2.4A.2.4.1-15: Test Configuration Table (network signalled value NS_03/NS_29)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Mid range for PCC.<br>For SCC, for configuration ID:<br>a. 5180 MHz for config ID 1-4<br>b. 5240 MHz for config ID 5-8<br>c. 5260 MHz for config ID 9-12<br>d. 5320 MHz for config ID 13-16<br>e. 5500 MHz for config ID 17-20<br>f. 5700 MHz for config ID 21-24 |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06) NRB** | **SCC (NS_21) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 100 | N/A for this test | QPSK | QPSK | 6 | L=1 |
| 2 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 3 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 4 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 5 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 6 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 7 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 8 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 9 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 10 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 11 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 12 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 13 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 14 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 15 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 16 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 17 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 18 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 19 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 20 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 21 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 22 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 23 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 24 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.

Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.2.4A.2.4.1-16: Test Configuration Table (network signalled value NS_03/NS_30)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for PCC.<br>For SCC, for configuration ID:<br>a. 5160 MHz for config ID 1-4<br>b. 5320 MHz for config ID 5-8<br>c. 5480 MHz for config ID 9-12<br>d. 5700 MHz for config ID 13-16<br>e. 5180 MHz for config ID 17-20 |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 100 | N/A for this test | QPSK | QPSK | 6 | L=1 |
| 2 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 3 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 4 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 5 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 6 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 7 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 8 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 9 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 10 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 11 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 12 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 13 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 14 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 15 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 16 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 17 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 18 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 19 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 20 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.

Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.2.4A.2.4.1-17: Test Configuration Table (network signalled value NS_03/NS_31)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for PCC.<br>For SCC, for configuration ID:<br>a. 5160 MHz for config ID 1-4<br>b. 5260 MHz for config ID 5-8<br>c. 5700 MHz for config ID 9-12<br>d. 5745 MHz for config ID 13-16<br>e. 5600 MHz for config ID 17-20 |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06) NRB** | **SCC (NS_21) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 100 | N/A for this test | QPSK | QPSK | 6 | L=1 |
| 2 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 3 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 4 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 5 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 6 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 7 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 8 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 9 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 10 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 11 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 12 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 13 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 14 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 15 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 16 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 17 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 18 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 19 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 20 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.
Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channel is set according to the applicable table from Table 6.2.4A.2.4.1-2 to 6.2.4A.2.4.1-13.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.4A.2.4.3.

### 6.2.4A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.2.4A.2.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to the applicable from Table 6.2.4A.2.4.1-2 to Table 6.2.4A.2.4.1-13 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach $P_{UMAX}$ level.

6. Measure the mean transmitted power over all component carriers in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

### 6.2.4A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. The following exceptions apply for each network signalled value.

#### 6.2.4A.2.4.3.1 Message contents exceptions (network signalled value " NS_03" on PCC)

1. Information element additionalSpectrumEmission is set to NS_03 for PCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.2.4A.2.4.3.1-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_03" on PCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 3 (NS_03) | | |

#### 6.2.4A.2.4.3.2 Message contents exceptions (network signalled value " NS_03" on SCC)

1. Information element additionalSpectrumEmission is set to NS_03 for SCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.2.4A.2.4.3.2-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_03" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 3 (NS_03) | | |

2. Information element additionalSpectrumEmissionSCell-r10 is set to NS_03 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.2.4A.2.4.3.2-2: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_03" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 3 (NS_03) | | |

6.2.4A.2.4.3.3 Message contents exceptions (network signalled value " NS_05" on PCC)

1. Information element additionalSpectrumEmission is set to NS_05 for PCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.2.4A.2.4.3.3-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_05" on PCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 5 (NS_05) | | |

6.2.4A.2.4.3.4 Message contents exceptions (network signalled value " NS_06" on SCC)

1. Information element additionalSpectrumEmission is set to NS_06 for SCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.2.4A.2.4.3.4-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_06" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 6 (NS_06) | | |

2. Information element additionalSpectrumEmissionSCell-r10 is set to NS_06 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.2.4A.2.4.3.4-2: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_06" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 6 (NS_06) | | |

6.2.4A.2.4.3.5 Message contents exceptions (network signalled value " NS_07" on SCC)

1. Information element additionalSpectrumEmission is set to NS_07 for SCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.2.4A.2.4.3.5-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_07" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 7 (NS_07) | | |

2. Information element additionalSpectrumEmissionSCell-r10 is set to NS_07 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.2.4A.2.4.3.5-2: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_07" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 7 (NS_07) | | |

6.2.4A.2.4.3.6 Message contents exceptions (network signalled value " NS_12" on SCC)

1. Information element additionalSpectrumEmission is set to NS_12 for SCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.2.4A.2.4.3.6-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_12" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 12 (NS_12) | | |

2. Information element additionalSpectrumEmissionSCell-r10 is set to NS_12 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.2.4A.2.4.3.6-2: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_12" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 12 (NS_12) | | |

6.2.4A.2.4.3.7 Message contents exceptions (network signalled value " NS_15" on SCC)

1. Information element additionalSpectrumEmission is set to NS_15 for SCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.2.4A.2.4.3.7-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_15" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 15 (NS_15) | | |

2. Information element additionalSpectrumEmissionSCell-r10 is set to NS_15 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.2.4A.2.4.3.7-2: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_15" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 15 (NS_15) | | |

6.2.4A.2.4.3.8 Message contents exceptions (network signalled value " NS_21" on SCC)

1. Information element additionalSpectrumEmission is set to NS_21 for SCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.2.4A.2.4.3.8-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_21" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 21 (NS_21) | | |

2. Information element additionalSpectrumEmissionSCell-r10 is set to NS_21 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.2.4A.2.4.3.8-2: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_21" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 21 (NS_21) | | |

6.2.4A.2.4.3.9 Message contents exceptions (network signalled value " NS_28" on SCC)

1. Information element additionalSpectrumEmission is set to NS_28 for SCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.2.4A.2.4.3.9-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_28" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 28 (NS_28) | | |

2. Information element additionalSpectrumEmissionSCell-r10 is set to NS_28 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.2.4A.2.4.3.9-2: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_28" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 28 (NS_28) | | |

6.2.4A.2.4.3.10 Message contents exceptions (network signalled value " NS_29" on SCC)

1. Information element additionalSpectrumEmission is set to NS_29 for SCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.2.4A.2.4.3.10-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_29" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 29 (NS_29) | | |

2. Information element additionalSpectrumEmissionSCell-r10 is set to NS_29 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.2.4A.2.4.3.10-2: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_29" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 29 (NS_29) | | |

6.2.4A.2.4.3.11 Message contents exceptions (network signalled value " NS_30" on SCC)

1. Information element additionalSpectrumEmission is set to NS_30 for SCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.2.4A.2.4.3.11-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_30" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 30 (NS_30) | | |

2. Information element additionalSpectrumEmissionSCell-r10 is set to NS_30 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.2.4A.2.4.3.11-2: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_30" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 30 (NS_30) | | |

6.2.4A.2.4.3.12 Message contents exceptions (network signalled value " NS_31" on SCC)

1. Information element additionalSpectrumEmission is set to NS_31 for SCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.2.4A.2.4.3.12-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_31" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 31 (NS_31) | | |

2. Information element additionalSpectrumEmissionSCell-r10 is set to NS_31 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.2.4A.2.4.3.12-2: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_31" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 31 (NS_31) | | |

### 6.2.4A.2.5 Test requirements

The maximum output power, derived in step 6 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable table from Table 6.2.4A.2.5-1 to Table 6.2.4A.2.5-16. For the UE maximum output power modified by A-MPR specified in sub-clause 6.2.4A.2.3, the power limits specified in Table 6.2.5A.3.3-1 apply.

**Table 6.2.4A.2.5-1: Test requirement (network signalled value NS_01/NS_03 or network signalled value NS_03/NS_01)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 3 | 2 | 0 | 1 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 6 | 2 | 0 | 1 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 9 | 2 | 0 | 1 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 10 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 11 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 12 | 2 | 0 | 1 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 13 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 14 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 15 | 2 | 0 | 1 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |
| Note 2: ΔTC,c does not apply in all bands. For bands without this lower limit is 19.3 dBm in all test points | | | | | | | | | | | | |

**Table 6.2.4A.2.5-2: Test requirement (network signalled value NS_01/NS_06)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 1.5 | 23 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 2 | 2 | 0 | 0 | 0 | 1.5 | 21 | 19.5 | 23.0 | 3 | 25.7 | 19.3 |
| 3 | 0 | 2 | 0 | 0 | 0 | 1.5 | 23 | 19.5 | 23.0 | 3 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 1.5 | 23 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 2 | 2 | 0 | 0 | 0 | 1.5 | 21 | 19.5 | 23.0 | 3 | 25.7 | 19.3 |
| 6 | 0 | 2 | 0 | 0 | 0 | 1.5 | 23 | 19.5 | 23.0 | 3 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2.5-3: Test requirement (network signalled value NS_01/NS_12)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 2 | 1 | 0 | 5 | 1.5 | 1.5 | 19.5 | 15.5 | 21.0 | 5 | 25.7 | 15.3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 0 | 1 | 0 | 5 | 1.5 | 1.5 | 21.5 | 15.5 | 22.5 | 5 | 25.7 | 16.8 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 2 | 2 | 0 | 4 | 1.5 | 1.5 | 19.5 | 15.5 | 21.0 | 5 | 25.7 | 15.3 |
| 6 | 0 | 2 | 0 | 4 | 1.5 | 1.5 | 21.5 | 15.5 | 22.5 | 5 | 25.7 | 16.8 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 2 | 2 | 0 | 4 | 0 | 0 | 21 | 17 | 22.5 | 5 | 25.7 | 16.8 |
| 9 | 0 | 2 | 0 | 4 | 1.5 | 0 | 21.5 | 17 | 22.8 | 5 | 25.7 | 17.1 |
| Note 1: | Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | |

**Table 6.2.4A.2.5-4: Test requirement (network signalled value NS_01/NS_15)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 2 | 2 | 0 | 9 | 1.5 | 1.5 | 19.5 | 10.5 | 20.0 | 6 | 25.7 | 13.3 |
| 3 | 0 | 2 | 0 | 9 | 1.5 | 1.5 | 21.5 | 10.5 | 21.8 | 5 | 25.7 | 16.1 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 2 | 2 | 0 | 9 | 1.5 | 1.5 | 19.5 | 10.5 | 20.0 | 6 | 25.7 | 13.3 |
| 6 | 0 | 2 | 0 | 9 | 1.5 | 1.5 | 21.5 | 10.5 | 21.8 | 5 | 25.7 | 16.1 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 2 | 2 | 0 | 9 | 0 | 0 | 21 | 12 | 21.5 | 5 | 25.7 | 15.8 |
| 9 | 0 | 2 | 0 | 9 | 0 | 0 | 21.5 | 12 | 23 | 5 | 25.7 | 19.3 |
| Note 1: | Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | |

**Table 6.2.4A.2.5-5: Test requirement (network signalled value NS_01/NS_17)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 2 | 2 | 0 | 0 | 0 | 0 | 21 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 3 | 2 | 0 | 0 | 0 | 0 | 0 | 21 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 2 | 2 | 0 | 0 | 0 | 0 | 21 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 6 | 2 | 0 | 0 | 0 | 0 | 0 | 21 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 9 | 2 | 0 | 1 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 11 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 12 | 2 | 0 | 1 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| Note 1: | Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | |

**Table 6.2.4A.2.5-6: Test requirement (network signalled value NS_01/NS_21)**

| Config ID | $MPR_c$ (dB) | $A\text{-}MPR_c$ (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ | Upper limit | Lower limit |
|---|---|---|---|---|---|---|---|---|

| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | (dB) | (dBm) | (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 2 | 2 | 0 | 0 | 0 | 0 | 21 | 21 | 23.0 | 3.0 | 25.7 | 19.3 |
| 3 | 0 | 2 | 0 | 0 | 0 | 0 | 23 | 21 | 23.0 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 6 | 2 | 1 | 0 | 4 | 0 | 0 | 21 | 18 | 22.8 | 5.0 | 25.7 | 17.1 |
| 7 | 0 | 1 | 0 | 4 | 0 | 0 | 23 | 18 | 23.0 | 3.0 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2.5-7: Test requirement (network signalled value NS_03/NS_03)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 2 | 2 | 1 | 1 | 1.5 | 0 | 18.5 | 20 | 22.3 | 5 | 25.7 | 16.6 |
| 3 | 2 | 0 | 1 | 0 | 1.5 | 0 | 18.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 2 | 2 | 1 | 1 | 0 | 0 | 20 | 20 | 23 | 3 | 25.7 | 19.3 |
| 6 | 2 | 0 | 1 | 0 | 1.5 | 0 | 18.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 2 | 2 | 1 | 1 | 0 | 0 | 20 | 20 | 23.0 | 3 | 25.7 | 19.3 |
| 9 | 2 | 0 | 1 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 10 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 11 | 2 | 2 | 1 | 1 | 0 | 0 | 20 | 20 | 23.0 | 3 | 25.7 | 19.3 |
| 12 | 2 | 0 | 1 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.<br>Note 2: ΔTC,c does not apply in all bands. For bands without this lower limit is 19.3 dBm in all test points | | | | | | | | | | | | |

**Table 6.2.4A.2.5-8: Test requirement (network signalled value NS_03/NS_06)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 2 | 2 | 1 | 0 | 1.5 | 0 | 18.5 | 21 | 22.9 | 5 | 25.7 | 17.2 |
| 3 | 2 | 0 | 1 | 0 | 1.5 | 1.5 | 18.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 6 | 2 | 0 | 1 | 0 | 0 | 1.5 | 20 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 9 | 2 | 0 | 1 | 0 | 0 | 1.5 | 20 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 10 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 11 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 12 | 2 | 0 | 1 | 0 | 0 | 1.5 | 20 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 13 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 14 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 2 | 0 | 1 | 0 | 0 | 1.5 | 20 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 16 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 17 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 18 | 2 | 0 | 1 | 0 | 0 | 1.5 | 20 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| X+1 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| X+2 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| X+3 | 2 | 0 | 1 | 0 | 0 | 1.5 | 20 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |
| Note 2: ΔTC,c does not apply in all bands. For bands without this lower limit is 19.3 dBm in all test points | | | | | | | | | | | | |

**Table 6.2.4A.2.5-9: Test requirement (network signalled value NS_03/NS_07)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| CA_2A-13A | | | | | | | | | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 2 | 2 | 1 | 12 | 0 | 0 | 20 | 9 | 20.3 | 6 | 25.7 | 13.6 |
| 3 | 0 | 2 | 0 | 12 | 1.5 | 0 | 21.5 | 9 | 21.7 | 5 | 25.7 | 16.0 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 2 | 2 | 1 | 12 | 0 | 0 | 20 | 9 | 20.3 | 6 | 25.7 | 13.6 |
| 6 | 0 | 2 | 0 | 12 | 1.5 | 0 | 21.5 | 9 | 21.7 | 5 | 25.7 | 16.0 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 2 | 2 | 1 | 12 | 0 | 0 | 20 | 9 | 20.3 | 6 | 25.7 | 13.6 |
| 9 | 0 | 2 | 0 | 12 | 1.5 | 0 | 21.5 | 9 | 21.7 | 5 | 25.7 | 16.0 |
| CA_4A-13A | | | | | | | | | | | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 2 | 2 | 1 | 12 | 0 | 0 | 20 | 9 | 20.3 | 6 | 25.7 | 13.6 |
| 3 | 0 | 2 | 0 | 12 | 0 | 0 | 23 | 9 | 23.0 | 3 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 2 | 2 | 1 | 12 | 0 | 0 | 20 | 9 | 20.3 | 6 | 25.7 | 13.6 |
| 6 | 0 | 2 | 0 | 12 | 0 | 0 | 23 | 9 | 23.0 | 3 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 2 | 2 | 1 | 12 | 0 | 0 | 20 | 9 | 20.3 | 6 | 25.7 | 13.6 |
| 9 | 0 | 2 | 0 | 12 | 0 | 0 | 23 | 9 | 23.0 | 3 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |
| Note 2: ΔTC,c does not apply in all bands. For bands without this lower limit is 19.3 dBm in all test points | | | | | | | | | | | | |

**Table 6.2.4A.2.5-10: Test requirement (network signalled value NS_03/NS_21)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3.0 | 25.7 | 19.3 |
| 3 | 2 | 0 | 1 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 6 | 2 | 1 | 1 | 4 | 0 | 0 | 20 | 18 | 22.1 | 5.0 | 25.7 | 16.4 |
| 7 | 0 | 1 | 0 | 4 | 1.5 | 0 | 21.5 | 18 | 23.0 | 3.0 | 25.7 | 19.3 |

| | |
|---|---|
| Note 1: | Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. |

**Table 6.2.4A.2.5-11: Test requirement (network signalled value NS_05/NS_01)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 2 | 2 | 0 | 0 | 0 | 0 | 21 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 3 | 2 | 0 | 0 | 0 | 0 | 0 | 21 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 2 | 2 | 0 | 0 | 0 | 0 | 21 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 6 | 2 | 0 | 0 | 0 | 0 | 0 | 21 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 2 | 2 | 0 | 0 | 0 | 0 | 21 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 9 | 2 | 0 | 0 | 0 | 0 | 0 | 21 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 11 | 2 | 2 | 1 | 0 | 0 | 0 | 20 | 21 | 23.0 | 3 | 25.7 | 19.3 |
| 12 | 2 | 0 | 1 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 13 | 0 | 0 | 11 | 0 | 0 | 0 | 12 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 14 | 2 | 2 | 11 | 0 | 0 | 0 | 10 | 21 | 21.3 | 5 | 25.7 | 15.6 Note 3 |
| 15 | 2 | 0 | 11 | 0 | 0 | 0 | 10 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 16 | 0 | 0 | 11 | 0 | 0 | 0 | 12 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 17 | 2 | 2 | 11 | 0 | 0 | 0 | 10 | 21 | 21.3 | 5 | 25.7 | 15.6 Note 3 |
| 18 | 2 | 0 | 11 | 0 | 0 | 0 | 10 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 19 | 0 | 0 | 11 | 0 | 0 | 0 | 12 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 20 | 2 | 2 | 11 | 0 | 0 | 0 | 10 | 21 | 21.3 | 5 | 25.7 | 15.6 Note 3 |
| 21 | 2 | 0 | 11 | 0 | 0 | 0 | 10 | 23 | 23.0 | 3 | 25.7 | 19.3 |

| | |
|---|---|
| Note 1: | Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. |
| Note 2: | Void |
| Note 3: | For PCC in mid frequency range the lower limit is 19.3 dBm. |

**Table 6.2.4A.2.5-12: Test requirement (network signalled value NS_06/NS_21)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 2 | 2 | 0 | 0 | 0 | 0 | 21 | 21 | 23.0 | 3.0 | 25.7 | 19.3 |
| 3 | 2 | 0 | 0 | 0 | 0 | 0 | 21 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 6 | 2 | 1 | 0 | 4 | 0 | 0 | 21 | 18 | 22.8 | 5.0 | 25.7 | 17.1 |
| 7 | 0 | 1 | 0 | 4 | 1.5 | 0 | 21.5 | 18 | 23.0 | 3.0 | 25.7 | 19.3 |

| | |
|---|---|
| Note 1: | Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. |

**Table 6.2.4A.2.5-13: Test requirement (network signalled value NS_03/NS_28)**

| Config ID | MPRc (dB) | | A-MPRc (dB) | | ΔTC,c (dB) | | PCMAX,c (dBm) | | PCMAX (dBm) | TLOW(PCMAX) (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 2.5 | 0 | 8 | 0 | 0 | 23 | 12.5 | 23.0 | 3 | 25.7 | 18.5 |
| 2 | 2 | 2 | 1 | 9 | 0 | 0 | 20 | 12 | 20.6 | 6 | 25.7 | 13.1 |
| 3 | 0 | 2.5 | 0 | 8 | 0 | 0 | 23 | 12.5 | 23.0 | 3 | 25.7 | 18.5 |
| 4 | 2 | 2 | 1 | 9 | 0 | 0 | 20 | 12 | 20.6 | 6 | 25.7 | 13.1 |
| 5 | 0 | 2.5 | 0 | 2 | 0 | 0 | 23 | 18.5 | 23.0 | 3 | 25.7 | 18.5 |
| 6 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| 7 | 0 | 2.5 | 0 | 2 | 0 | 0 | 23 | 18.5 | 23.0 | 3 | 25.7 | 18.5 |
| 8 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2.5-14: Test requirement (network signalled value NS_03/NS_29)**

| Config ID | MPRc (dB) | | A-MPRc (dB) | | ΔTC,c (dB) | | PCMAX,c (dBm) | | PCMAX (dBm) | TLOW(PCMAX) (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 2 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| 3 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 4 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| 5 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 6 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| 7 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 8 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| 9 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 10 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| 11 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 12 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| 13 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 14 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| 15 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 16 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| 17 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 18 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| 19 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 20 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| 21 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 22 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| 23 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 24 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2.5-15: Test requirement (network signalled value NS_03/NS_30)**

| Config ID | MPRc (dB) | | A-MPRc (dB) | | ΔTC,c (dB) | | PCMAX,c (dBm) | | PCMAX (dBm) | TLOW(PCMAX) (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 2.5 | 0 | 16 | 0 | 0 | 23 | 4.5 | 23.0 | 3 | 25.7 | 18.5 |
| 2 | 2 | 2 | 1 | 15 | 0 | 0 | 20 | 6 | 20.2 | 6 | 25.7 | 12.7 |
| 3 | 0 | 2.5 | 0 | 16 | 0 | 0 | 23 | 4.5 | 23.0 | 3 | 25.7 | 18.5 |
| 4 | 2 | 2 | 1 | 15 | 0 | 0 | 20 | 6 | 20.2 | 6 | 25.7 | 12.7 |
| 5 | 0 | 2.5 | 0 | 3 | 0 | 0 | 23 | 17.5 | 23.0 | 3 | 25.7 | 18.5 |
| 6 | 2 | 2 | 1 | 3 | 0 | 0 | 20 | 18 | 22.1 | 5 | 25.7 | 15.6 |
| 7 | 0 | 2.5 | 0 | 3 | 0 | 0 | 23 | 17.5 | 23.0 | 3 | 25.7 | 18.5 |
| 8 | 2 | 2 | 1 | 3 | 0 | 0 | 20 | 18 | 22.1 | 5 | 25.7 | 15.6 |
| 9 | 0 | 2.5 | 0 | 11 | 0 | 0 | 23 | 9.5 | 23.0 | 3 | 25.7 | 18.5 |
| 10 | 2 | 2 | 1 | 11 | 0 | 0 | 20 | 10 | 20.4 | 6 | 25.7 | 12.9 |
| 11 | 0 | 2.5 | 0 | 11 | 0 | 0 | 23 | 9.5 | 23.0 | 3 | 25.7 | 18.5 |
| 12 | 2 | 2 | 1 | 11 | 0 | 0 | 20 | 10 | 20.4 | 6 | 25.7 | 12.9 |
| 13 | 0 | 2.5 | 0 | 6 | 0 | 0 | 23 | 14.5 | 23.0 | 3 | 25.7 | 18.5 |
| 14 | 2 | 2 | 1 | 6 | 0 | 0 | 20 | 15 | 21.2 | 5 | 25.7 | 14.7 |
| 15 | 0 | 2.5 | 0 | 6 | 0 | 0 | 23 | 14.5 | 23.0 | 3 | 25.7 | 18.5 |
| 16 | 2 | 2 | 1 | 6 | 0 | 0 | 20 | 15 | 21.2 | 5 | 25.7 | 14.7 |
| 17 | 0 | 2.5 | 0 | NA | 0 | 0 | 23 | NA | NA | NA | NA | NA |
| 18 | 2 | 2 | 1 | 1 | 0 | 0 | 20 | 20 | 23.0 | 3 | 25.7 | 18.5 |
| 19 | 0 | 2.5 | 0 | NA | 0 | 0 | 23 | NA | NA | NA | NA | NA |
| 20 | 2 | 2 | 1 | 1 | 0 | 0 | 20 | 20 | 23.0 | 3 | 25.7 | 18.5 |

Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4A.2.5-16: Test requirement (network signalled value NS_03/NS_31)**

| Config ID | MPRc (dB) | | A-MPRc (dB) | | ΔTC,c (dB) | | PCMAX,c (dBm) | | PCMAX (dBm) | TLOW(PCMAX) (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 2.5 | 0 | 7 | 0 | 0 | 23 | 13.5 | 23.0 | 3 | 25.7 | 18.5 |
| 2 | 2 | 2 | 1 | 7 | 0 | 0 | 20 | 14 | 21.0 | 5 | 25.7 | 14.5 |
| 3 | 0 | 2.5 | 0 | 7 | 0 | 0 | 23 | 13.5 | 23.0 | 3 | 25.7 | 18.5 |
| 4 | 2 | 2 | 1 | 7 | 0 | 0 | 20 | 14 | 21.0 | 5 | 25.7 | 14.5 |
| 5 | 0 | 2.5 | 0 | 6 | 0 | 0 | 23 | 14.5 | 23.0 | 3 | 25.7 | 18.5 |
| 6 | 2 | 2 | 1 | 6 | 0 | 0 | 20 | 15 | 21.2 | 5 | 25.7 | 14.7 |
| 7 | 0 | 2.5 | 0 | 6 | 0 | 0 | 23 | 14.5 | 23.0 | 3 | 25.7 | 18.5 |
| 8 | 2 | 2 | 1 | 6 | 0 | 0 | 20 | 15 | 21.2 | 5 | 25.7 | 14.7 |
| 9 | 0 | 2.5 | 0 | 6 | 0 | 0 | 23 | 14.5 | 23.0 | 3 | 25.7 | 18.5 |
| 10 | 2 | 2 | 1 | 6 | 0 | 0 | 20 | 15 | 21.2 | 5 | 25.7 | 14.7 |
| 11 | 0 | 2.5 | 0 | 6 | 0 | 0 | 23 | 14.5 | 23.0 | 3 | 25.7 | 18.5 |
| 12 | 2 | 2 | 1 | 6 | 0 | 0 | 20 | 15 | 21.2 | 5 | 25.7 | 14.7 |
| 13 | 0 | 2.5 | 0 | 6 | 0 | 0 | 23 | 14.5 | 23.0 | 3 | 25.7 | 18.5 |
| 14 | 2 | 2 | 1 | 6 | 0 | 0 | 20 | 15 | 21.2 | 5 | 25.7 | 14.7 |
| 15 | 0 | 2.5 | 0 | 6 | 0 | 0 | 23 | 14.5 | 23.0 | 3 | 25.7 | 18.5 |
| 16 | 2 | 2 | 1 | 6 | 0 | 0 | 20 | 15 | 21.2 | 5 | 25.7 | 14.7 |
| 17 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 18 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| 19 | 0 | 2.5 | 0 | 1 | 0 | 0 | 23 | 19.5 | 23.0 | 3 | 25.7 | 18.5 |
| 20 | 2 | 2 | 1 | 2 | 0 | 0 | 20 | 19 | 22.5 | 5 | 25.7 | 16.0 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

## 6.2.4A.2_1 Additional Maximum Power Reduction (A-MPR) for CA (inter-band DL CA and UL CA) for UL 64QAM

Editor's note: For a transition period until RAN5#83, this test case in version 15.3.1 of 36.521-1 shall be used. This is to ensure no test coverage is lost before the UL 256QAM test case becomes available.

### 6.2.4A.2_1.1 Test purpose

Additional ACLR, spectrum emission and spurious emission requirements for carrier aggregation can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction (A-MPR) is allowed for the CA Power Class as specified in Table 6.2.2A.0-1.

### 6.2.4A.2_1.2 Test applicability

The requirements of this test apply in test case 6.6.2.2A.2_1 Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA) for network signalled value NS_03/NS_03, NS_03/NS_03, NS_03/NS_06, NS_03/NS_07, NS_03/NS_01, NS_01/NS_06 to all types of E-UTRA UE release 13 and forward that support inter-band DL CA and UL CA and UL 64QAM but do not support UL 256QAM.

The requirements of this test apply in test case 6.6.3.3A.2_1 Additional spurious emissions for CA (inter-band DL CA and UL CA) for network signalled values NS_05/NS_01, NS_03/NS_07, NS_01/NS_12 and NS_01/NS15 to all types of E-UTRA UE release 13 and forward that support inter-band DL CA and UL CA and UL 64QAM but do not support UL 256QAM.

NOTE: As a result TC 6.2.4A.2_1 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.4A.2_1.3 Minimum conformance requirements

If for inter-band carrier aggregation the UE is configured for transmissions on a single serving cell, then subclauses 6.2.3 and 6.2 4 apply with the Network Signalling value indicated by the field additionalSpectrumEmission.

For inter-band carrier aggregation with the UE configured for transmissions on two serving cells the maximum output power reduction specified in Table 6.2.4-1 is allowed for each serving cell of the applicable uplink CA configuration according to the Network Signalling value indicated by the field additionalSprectrumEmission for the PCC and the CA network signalling value indicated by the field additionalSpectrumEmissionSCell-r10 for the SCC. The value of additionalSpectrumEmissionSCell-r10 is equal to that of additionalSprectrumEmission configured on the SCC. MPR as specified in subclause 6.2.3A is allowed in addition.

For PUCCH and SRS transmissions, the allowed A-MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth. The normative reference for this requirement is in TS 36.101 [2] clause 6.2.4A.

## 6.2.4A.2_1.4 Test description

### 6.2.4A.2_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state. For the UE maximum output power modified by A-MPR specified in table 6.2.4A.2_1.4.1-1, the power limits specified in subclause 6.2.5A.2.3 apply.

**Table 6.2.4A.2_1.4.1-1: Additional Maximum Power Reduction (A-MPR) for inter-band CA**

| Uplink CA Configuration | NS-value per CC (in same order as UL CA Configuration column) | | Applicable emissions requirements (in same order as UL CA Configuration column) | |
|---|---|---|---|---|
| CA_1A-3A<br>CA_1A-5A<br>CA_1A-7A<br>CA_1A-8A<br>CA_1A-18A<br>CA_1A-26A<br>CA_1A-42A | NS_05 | NS_01 | Table 6.6.3.3.5.2-1 | N/A |
| CA_1A-19A | NS_05 | NS_08 | Table 6.6.3.3.5.2-1 | Table 6.6.3.3.5.4-1 |
| CA_1A-21A | NS_05 | NS_09 | Table 6.6.3.3.5.2-1 | Table 6.6.3.3.5.5-1 |
| CA_2A-4A,<br>CA_2A-66A | NS_03 | NS_03 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.1-1 |
| CA_2A-12A<br>CA_2A-13A,<br>CA_4A-12A,<br>CA_4A-13A,<br>CA_4A-17A | NS_03 | NS_06 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.3-1 |
| CA_2A-13A,<br>CA_4A-13A | NS_03 | NS_07 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.3-1<br>Table 6.6.3.3.3.3-1 |
| CA_3A-19A | NS_01 | NS_08 | N/A | Table 6.6.3.3.5.4-1 |
| CA_2A-30A | NS_03 | NS_21 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.1-1<br>Table 6.6.3.3.5.16-1 |
| CA_3A-26A | NS_01 | NS_12 | N/A | Table 6.6.3.3.3.7-1 |
| CA_3A-26A | NS_01 | NS_15 | N/A | Table 6.6.3.3.3.10-1 |
| CA_2A-5A,<br>CA_2A-7A,<br>CA_4A-5A,<br>CA_4A-7A | NS_03 | NS_01 | Table 6.6.2.2.3.1-1 | N/A |
| CA_5A-66A[Note 5] | NS_01 | NS_03 | N/A | Table 6.6.2.2.3.1-1 |
| CA_5A-12A | NS_01 | NS_06 | N/A | Table 6.6.2.2.3.3-1 |
| CA_18A-28A | NS_01 | NS_17 | N/A | Table 6.6.3.3.5.12-1 |
| CA_5A-30A | NS_01 | NS_21 | N/A | Table 6.6.2.2.3.1-1<br>Table 6.6.3.3.5.16-1 |
| CA_12A-30A | NS_06 | NS_21 | Table 6.6.2.2.3.3-1 | Table 6.6.2.2.3.3-1<br>Table 6.6.3.3.5.16-1 |
| CA_12A-66A | NS_06 | NS_03 | Table 6.6.2.2.3.3-1 | Table 6.6.2.2.3.1-1 |
| CA_19A-21A | NS_08 | NS_09 | Table 6.6.3.3.5.4-1 | Table 6.6.3.3.5.5-1 |
| CA_1A-28A | NS_05 | NS_17 | Table 6.6.3.3.5.2-1 | Table 6.6.3.3.5.12-1 |

Note 1: For CCs with NS_01, there are no additional requirements defined in 36.101. Only CCs with NS-value different than NS_01 needs to be tested.
Note 2: A-MPR values for NS-values in this table are the same as in section 6.2.4.3.
Note 3: Selection of CA configurations and NS-values to test is derived in TR 36.905 [19].
Note 4: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column.
Note 5: As an exception to note 4, PCC is mapped to the second band of the combination as listed in Uplink CA Configuration column.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.2.4A.2_1.4.1-2 to 6.2.4A.2_1.4.1-12. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4A.2_1.4.1-2: Test Configuration Table (network signalled value NS_01/NS_03 or network signalled value NS_03/NS_01)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and high range for PCC<br>Mid range for SCC(Note 3) |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$(Note 2) |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **NS_03 CC** | **NS_01 CC** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 8 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 3 | 25 | 25 | | 64QAM | QPSK | 25 | 8 |
| 4 | 50 | 50 | | QPSK | QPSK | 6 | 12 |
| 5 | 50 | 50 | | 64QAM | 64QAM | 50 | 50 |
| 6 | 50 | 50 | | 64QAM | QPSK | 50 | 12 |
| 7 | 50 | 100 | | QPSK | QPSK | 6 | 18 |
| 8 | 50 | 100 | | 64QAM | 64QAM | 50 | 100 |
| 9 | 50 | 100 | | 64QAM | QPSK | 50 | 18 |
| 10 | 100 | 50 | | QPSK | QPSK | 10 | 12 |
| 11 | 100 | 50 | | 64QAM | 64QAM | 100 | 50 |
| 12 | 100 | 50 | | 64QAM | QPSK | 100 | 12 |
| 13 | 100 | 100 | | QPSK | QPSK | 10 | 18 |
| 14 | 100 | 100 | | 64QAM | 64QAM | 100 | 100 |
| 15 | 100 | 100 | | 64QAM | QPSK | 100 | 18 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.
Note 3: For Low range place test point with RBstart=0. For High range place test point with RBstart=RBmax-LCRB+1. For Mid range place test point with RBstart=0 and RBstart=RBmax-LCRB+1.
Note 4: Mapping of NS-value per CC and PCC/SCC selection are specified in Table 6.2.4A.2_1.4.1-1.

**Table 6.2.4A.2_1.4.1-3: Test Configuration Table (network signalled value NS_01/NS_06)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$ | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01)** | **SCC (NS_06)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 6 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 25 | 9 |
| 3 | 25 | 25 | | QPSK | 64QAM | 6 | 9 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12 |
| 5 | 50 | 50 | | 64QAM | 64QAM | 50 | 15 |
| 6 | 50 | 50 | | QPSK | 64QAM | 12 | 15 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4A.2_1.4.1-4: Test Configuration Table (network signalled value NS_01/NS_12)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for PCC SCC: (Note 3)<br>For 5 MHz Channel Bandwidth: UL 816.7 MHz ($N_{UL}$ = 26717)<br>For 10 MHz Channel Bandwidth: UL 819.2 MHz ($N_{UL}$ = 26742)<br>For 15 MHz Channel Bandwidth: UL 821.7 MHz ($N_{UL}$ = 26767) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_12) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)(Note 4)** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8@7 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 10 | 8 |
| 3 | 25 | 25 | | QPSK | 64QAM | 8 | 8 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12@16 |
| 5 | 50 | 50 | | 64QAM | 64QAM | 15 | 18 |
| 6 | 50 | 50 | | QPSK | 64QAM | 12 | 18 |
| 7 | 100 | 75 | | QPSK | QPSK | 15 | 31 |
| 8 | 100 | 75 | | 64QAM | 64QAM | 20 | 30 |
| 9 | 100 | 75 | | QPSK | 64QAM | 15 | 30 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.<br>Note 3: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.<br>Note 4: Test point with max A-MPR in B26 selected in region A with largest allocation giving max A-MPR at RBstart0; test point with min A-MPR in B26 selected in region A with same allocation but with shifted RBstart to give A-MPR=0. | | | | | | | |

**Table 6.2.4A.2_1.4.1-5: Test Configuration Table (network signalled value NS_01/NS_15)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | High range for both PCC and SCC(Note 3) |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$(Note 2) |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_15) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)(Note 4)** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 6@14 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 10 | 10@15 |
| 3 | 25 | 25 | | QPSK | 64QAM | 8 | 10@15 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12@25 |
| 5 | 50 | 50 | | 64QAM | 64QAM | 15 | 15@35 |
| 6 | 50 | 50 | | QPSK | 64QAM | 12 | 15@35 |
| 7 | 100 | 75 | | QPSK | QPSK | 18 | 18@19 |
| 8 | 100 | 75 | | 64QAM | 64QAM | 20 | 20@55 |
| 9 | 100 | 75 | | QPSK | 64QAM | 18 | 20@55 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.

Note 3: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.

Note 4: Test point with max A-MPR in B26 selected in region C with allocation giving max MPR+A-MPR+deltaTc at max RBend; Test point with min A-MPR in B26 selected in region B with max allocation and RBend giving A-MPR=0.

**Table 6.2.4A.2_1.4.1-6: Test Configuration Table (network signalled value NS_01/NS_21)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$ | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 3 | 25 | 25 | | QPSK | 64QAM | 8 | 25 |
| 4 (Note 4) | 50 | 50 | | QPSK | QPSK | 12 | 12@7 |
| 5 (Note 5) | 50 | 50 | | QPSK | QPSK | 12 | 12@31 |
| 6 | 50 | 50 | | 64QAM | 64QAM | 50 | 1 |
| 7 | 50 | 50 | | QPSK | 64QAM | 12 | 1 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2_1.4.1-1. | | | | | | | |
| Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |
| Note 4: Applicable only to Low range frequency testing. | | | | | | | |
| Note 5: Applicable only to High range frequency testing. | | | | | | | |

**Table 6.2.4A.2_1.4.1-7: Test Configuration Table (network signalled value NS_03/NS_03)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | Low and High range for both PCC and SCC (Note 3) | | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest and Highest $N_{RBagg}$ (Note 2) | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_03) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 15 | 25 | N/A for this test | QPSK | QPSK | 4 | 6 |
| 2 | 15 | 25 | | 64QAM | 64QAM | 15 | 25 |
| 3 | 15 | 25 | | 64QAM | QPSK | 15 | 6 |
| 4 | 25 | 25 | | QPSK | QPSK | 6 | 6 |
| 5 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 6 | 25 | 25 | | 64QAM | QPSK | 25 | 6 |
| 7 | 50 | 50 | | QPSK | QPSK | 6 | 6 |
| 8 | 50 | 50 | | 64QAM | 64QAM | 50 | 50 |
| 9 | 50 | 50 | | 64QAM | QPSK | 50 | 6 |
| 10 | 100 | 100 | | QPSK | QPSK | 10 | 10 |
| 11 | 100 | 100 | | 64QAM | 64QAM | 100 | 100 |
| 12 | 100 | 100 | | 64QAM | QPSK | 100 | 10 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested. | | | | | | | |
| Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.2.4A.2_1.4.1-8: Test Configuration Table (network signalled value NS_03/NS_06)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03)** | **SCC (NS_06)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 15 | 25 | N/A for this test | QPSK | QPSK | 4 | 8 |
| 2 | 15 | 25 | | 64QAM | 64QAM | 15 | 25 |
| 3 | 15 | 25 | | 64QAM | QPSK | 15 | 8 |
| 4 | 25 | 15 | | QPSK | QPSK | 6 | 4 |
| 5 | 25 | 15 | | 64QAM | 64QAM | 25 | 15 |
| 6 | 25 | 15 | | 64QAM | QPSK | 25 | 4 |
| 7 | 25 | 25 | | QPSK | QPSK | 6 | 8 |
| 8 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 9 | 25 | 25 | | 64QAM | QPSK | 25 | 8 |
| 10 | 25 | 50 | | QPSK | QPSK | 6 | 12 |
| 11 | 25 | 50 | | 64QAM | 64QAM | 25 | 50 |
| 12 | 25 | 50 | | 64QAM | QPSK | 25 | 12 |
| 13 | 50 | 50 | | QPSK | QPSK | 6 | 12 |
| 14 | 50 | 50 | | 64QAM | 64QAM | 50 | 50 |
| 15 | 50 | 50 | | 64QAM | QPSK | 50 | 12 |
| 16 | 100 | 50 | | QPSK | QPSK | 10 | 12 |
| 17 | 100 | 50 | | 64QAM | 64QAM | 100 | 50 |
| 18 | 100 | 50 | | 64QAM | QPSK | 100 | 12 |
| X+1 | 75 | 25 | | QPSK | QPSK | 8 | 12 |
| X+2 | 75 | 25 | | 64QAM | 64QAM | 75 | 25 |
| X+3 | 75 | 25 | | 64QAM | QPSK | 75 | 12 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.2.4A.2_1.4.1-9: Test Configuration Table (network signalled value NS_03/NS_07)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_07) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 50 | N/A for this test | QPSK | QPSK | 6 | 7@13 |
| 2 | 25 | 50 | | 64QAM | 64QAM | 25 | 50 |
| 3 | 25 | 50 | | QPSK | 64QAM | 6 | 50 |
| 4 | 50 | 50 | | QPSK | QPSK | 6 | 7@13 |
| 5 | 50 | 50 | | 64QAM | 64QAM | 50 | 50 |
| 6 | 50 | 50 | | QPSK | 64QAM | 6 | 50 |
| 7 | 100 | 50 | | QPSK | QPSK | 10 | 7@13 |
| 8 | 100 | 50 | | 64QAM | 64QAM | 100 | 50 |
| 9 | 100 | 50 | | QPSK | 64QAM | 10 | 50 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.<br>Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.2.4A.2_1.4.1-10: Test Configuration Table (network signalled value NS_03/NS_21)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | Low and High range for both PCC and SCC | | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest and Highest $N_{RBagg}$ | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 8 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 3 | 25 | 25 | | 64QAM | QPSK | 25 | 8 |
| 4 (Note 4) | 100 | 50 | | QPSK | QPSK | 10 | 12@7 |
| 5 (Note 5) | 100 | 50 | | QPSK | QPSK | 10 | 12@31 |
| 6 | 100 | 50 | | 64QAM | 64QAM | 100 | 1 |
| 7 | 100 | 50 | | QPSK | 64QAM | 10 | 1 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2_1.4.1-1. | | | | | | | |
| Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |
| Note 4: Applicable only to Low range frequency testing. | | | | | | | |
| Note 5: Applicable only to High range frequency testing. | | | | | | | |

**Table 6.2.4A.2_1.4.1-11: Test Configuration Table (network signalled value NS_05/NS_01)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low range, Mid range for PCC<br>In case of Low range:<br>- For 5MHz Channel Bandwidth: 1927.2MHz (NUL = 18072)<br>- For 10 MHz Channel Bandwidth: 1934.7 MHz (NUL = 18147)<br>- For 20 MHz Channel Bandwidth: 1930 MHz (NUL = 18100)<br>Mid range for SCC(Note 3) |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ (Note 2) |

**Test Parameters for CA Configurations**

| Config ID | CA Configuration / NRB_agg | | DL Allocation | CC MOD | | UL Allocation | |
|---|---|---|---|---|---|---|---|
| | PCC (NS_05) NRB | SCC (NS_01) NRB | PCC & SCC RB allocation | PCC | SCC | PCC & SCC RB allocations | |
| 1 | 25 | 15 | N/A for this test | QPSK | QPSK | 6 | 4 |
| 2 | 25 | 15 | | 64QAM | 64QAM | 25 | 6 |
| 3 | 25 | 15 | | 64QAM | QPSK | 25 | 4 |
| 4 | 25 | 25 | | QPSK | QPSK | 6 | 6 |
| 5 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 6 | 25 | 25 | | 64QAM | QPSK | 25 | 6 |
| 7 | 25 | 50 | | QPSK | QPSK | 6 | 12 |
| 8 | 25 | 50 | | 64QAM | 64QAM | 25 | 25 |
| 9 | 25 | 50 | | 64QAM | QPSK | 25 | 12 |
| 10 | 50 | 50 | | QPSK | QPSK | 12 | 12 |
| 11 | 50 | 50 | | 64QAM | 64QAM | 50 | 25 |
| 12 | 50 | 50 | | 64QAM | QPSK | 50 | 12 |
| 13 | 100 | 50 | | QPSK | QPSK | 18 | 12 |
| 14 | 100 | 50 | | 64QAM | 64QAM | 50 | 25 |
| 15 | 100 | 50 | | 64QAM | QPSK | 50 | 12 |
| 16 | 100 | 75 | | QPSK | QPSK | 18 | 16 |
| 17 | 100 | 75 | | 64QAM | 64QAM | 50 | 25 |
| 18 | 100 | 75 | | 64QAM | QPSK | 50 | 16 |
| 19 | 100 | 100 | | QPSK | QPSK | 18 | 18 |
| 20 | 100 | 100 | | 64QAM | 64QAM | 50 | 25 |
| 21 | 100 | 100 | | 64QAM | QPSK | 50 | 18 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.2.4A.2_1.4.1-12: Test Configuration Table (network signalled value NS_06/NS_21)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | Low and High range for both PCC and SCC | | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest and Highest $N_{RBagg}$ | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 3 | 25 | 25 | | 64QAM | QPSK | 25 | 8 |
| 4 (Note 4) | 50 | 50 | | QPSK | QPSK | 12 | 12@7 |
| 5 (Note 5) | 50 | 50 | | QPSK | QPSK | 12 | 12@31 |
| 6 | 50 | 50 | | 64QAM | 64QAM | 50 | 1 |
| 7 | 50 | 50 | | QPSK | 64QAM | 12 | 1 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2_1.4.1-1.
Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.
Note 4: Applicable only to Low range frequency testing.
Note 5: Applicable only to High range frequency testing.

**Table 6.2.4A.2_1.4.1-13: Test Configuration Table (network signalled value NS_01/NS_17)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for both PCC and SCC |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_17) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 5 | 5 | N/A for this test | QPSK | QPSK | 6 | 6 |
| 2 | 5 | 5 | | 64QAM | 64QAM | 25 | 25 |
| 3 | 5 | 5 | | 64QAM | QPSK | 25 | 6 |
| 4 | 5 | 10 | | QPSK | QPSK | 6 | 12 |
| 5 | 5 | 10 | | 64QAM | 64QAM | 25 | 25 |
| 6 | 5 | 10 | | 64QAM | QPSK | 25 | 12 |
| 7 | 10 | 10 | | QPSK | QPSK | 12 | 12 |
| 8 | 10 | 10 | | 64QAM | 64QAM | 50 | 25 |
| 9 | 10 | 10 | | 64QAM | QPSK | 50 | 12 |
| 10 | 15 | 10 | | QPSK | QPSK | 16 | 12 |
| 11 | 15 | 10 | | 64QAM | 64QAM | 50 | 25 |
| 12 | 15 | 10 | | 64QAM | QPSK | 50 | 12 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to the applicable table from Table 6.2.4A.2_1.4.1-2 to 6.2.4A.2_1.4.1-13.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.4A.2_1.4.3.

### 6.2.4A.2_1.4.2 Test procedure

Same test procedure as defined in clause 6.2.4A.2.4.2 with the following exception:

- In Step 4, instead of Table 6.2.4A.2.4.1-2 to Table 6.2.4A.2.4.1-13 use Table 6.2.4A.2_1.4.1-2 to Table 6.2.4A.2_1.4.1-12

### 6.2.4A.2_1.4.3 Message contents

Same message contents as defined in clause 6.2.4A.2.4.3.

## 6.2.4A.2_1.5 Test requirements

The maximum output power, derived in step 6 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable table from Table 6.2.4A.2_1.5-1 to Table 6.2.4A.2_1.5-11. For the UE maximum output power modified by A-MPR specified in sub-clause 6.2.4A.2_1.3, the power limits specified in Table 6.2.5A.3.3-1 apply.

**Table 6.2.4A.2_1.5-1: Test requirement (network signalled value NS_01/NS_03 or network signalled value NS_03/NS_01)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 3 | 3 | 1 | 0 | 0 | 0 | 19 | 20 | 22.5 | 5 | 25.7 | 16.8 |
| 3 | 3 | 0 | 1 | 0 | 0 | 0 | 19 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 3 | 3 | 1 | 0 | 0 | 0 | 19 | 20 | 22.5 | 5 | 25.7 | 16.8 |
| 6 | 3 | 0 | 1 | 0 | 0 | 0 | 19 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 3 | 3 | 1 | 0 | 0 | 0 | 19 | 20 | 22.5 | 5 | 25.7 | 16.8 |
| 9 | 3 | 0 | 1 | 0 | 0 | 0 | 19 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 10 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 11 | 3 | 3 | 1 | 0 | 0 | 0 | 19 | 20 | 22.5 | 5 | 25.7 | 16.8 |
| 12 | 3 | 0 | 1 | 0 | 0 | 0 | 19 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 13 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 14 | 3 | 3 | 1 | 0 | 0 | 0 | 19 | 20 | 22.5 | 5 | 25.7 | 16.8 |
| 15 | 3 | 0 | 1 | 0 | 0 | 0 | 19 | 23 | 23.0 | 3 | 25.7 | 19.3 |

Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.
Note 2: ΔTC,c does not apply in all bands.

**Table 6.2.4A.2_1.5-2: Test requirement (network signalled value NS_01/NS_06)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 1.5 | 23 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 3 | 3 | 0 | 0 | 0 | 1.5 | 20 | 18.5 | 22.3 | 5 | 25.7 | 16.6 |
| 3 | 0 | 3 | 0 | 0 | 0 | 1.5 | 23 | 18.5 | 23.0 | 3 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 1.5 | 23 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 3 | 3 | 0 | 0 | 0 | 1.5 | 20 | 18.5 | 22.3 | 5 | 25.7 | 16.6 |
| 6 | 0 | 3 | 0 | 0 | 0 | 1.5 | 23 | 18.5 | 23.0 | 3 | 25.7 | 19.3 |

Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4A.2_1.5-3: Test requirement (network signalled value NS_01/NS_12)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 3 | 2 | 0 | 5 | 1.5 | 1.5 | 18.5 | 14.5 | 20.0 | 6 | 25.7 | 13.3 |
| 3 | 0 | 2 | 0 | 5 | 1.5 | 1.5 | 21.5 | 14.5 | 22.3 | 5 | 25.7 | 16.6 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 3 | 3 | 0 | 4 | 1.5 | 1.5 | 18.5 | 14.5 | 20.0 | 6 | 25.7 | 13.3 |
| 6 | 0 | 3 | 0 | 4 | 1.5 | 1.5 | 21.5 | 14.5 | 22.3 | 5 | 25.7 | 16.6 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 3 | 3 | 0 | 4 | 0 | 0 | 20 | 16 | 21.5 | 5 | 25.7 | 15.8 |
| 9 | 0 | 3 | 0 | 4 | 1.5 | 0 | 21.5 | 16 | 22.6 | 5 | 25.7 | 16.9 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2_1.5-4: Test requirement (network signalled value NS_01/NS_15)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 3 | 3 | 0 | 9 | 1.5 | 1.5 | 18.5 | 9.5 | 19.0 | 5 | 25.7 | 13.3 |
| 3 | 0 | 3 | 0 | 9 | 1.5 | 1.5 | 21.5 | 9.5 | 21.8 | 5 | 25.7 | 16.1 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 3 | 3 | 0 | 9 | 1.5 | 1.5 | 18.5 | 9.5 | 19.0 | 5 | 25.7 | 13.3 |
| 6 | 0 | 3 | 0 | 9 | 1.5 | 1.5 | 21.5 | 9.5 | 21.8 | 5 | 25.7 | 16.1 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 3 | 3 | 0 | 9 | 0 | 0 | 20 | 11 | 20.5 | 6 | 25.7 | 13.8 |
| 9 | 0 | 3 | 0 | 9 | 0 | 0 | 23 | 11 | 23.0 | 3 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2_1.5-5: Test requirement (network signalled value NS_01/NS_21)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 3 | 3 | 0 | 0 | 0 | 0 | 20 | 20 | 23.0 | 3.0 | 25.7 | 19.3 |
| 3 | 0 | 3 | 0 | 0 | 0 | 0 | 23 | 20 | 23.0 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 6 | 3 | 2 | 0 | 4 | 0 | 0 | 20 | 17 | 21.8 | 5.0 | 25.7 | 16.1 |
| 7 | 0 | 2 | 0 | 4 | 0 | 0 | 23 | 17 | 23.0 | 3.0 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2_1.5-6: Test requirement (network signalled value NS_03/NS_03)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 3 | 3 | 1 | 1 | 1.5 | 0 | 17.5 | 19 | 21.3 | 5 | 25.7 | 15.6 |
| 3 | 3 | 0 | 1 | 0 | 1.5 | 0 | 17.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 3 | 3 | 1 | 1 | 0 | 0 | 19 | 19 | 22.0 | 5 | 25.7 | 16.3 |
| 6 | 3 | 0 | 1 | 0 | 0 | 0 | 19 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 3 | 3 | 1 | 1 | 0 | 0 | 19 | 19 | 22.0 | 5 | 25.7 | 16.3 |
| 9 | 3 | 0 | 1 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 10 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 11 | 3 | 3 | 1 | 1 | 0 | 0 | 19 | 19 | 22.0 | 3 | 25.7 | 16.3 |
| 12 | 3 | 0 | 1 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |

Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.
Note 2: ΔTC,c does not apply in all bands. For bands without this lower limit is 19.3 dBm in all test points.

**Table 6.2.4A.2_1.5-7: Test requirement (network signalled value NS_03/NS_06)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 3 | 3 | 1 | 0 | 1.5 | 0 | 17.5 | 20 | 21.9 | 5 | 25.7 | 16.2 Note 2 |
| 3 | 3 | 0 | 1 | 0 | 1.5 | 1.5 | 17.5 | 21.5 | 22.9 | 3 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 3 | 3 | 1 | 0 | 0 | 0 | 19 | 20 | 22.5 | 5 | 25.7 | 16.8 |
| 6 | 3 | 0 | 1 | 0 | 0 | 1.5 | 19 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 3 | 2 | 1 | 0 | 0 | 0 | 19 | 21 | 23.0 | 3 | 25.7 | 16.8 |
| 9 | 3 | 0 | 1 | 0 | 0 | 1.5 | 19 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 10 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 11 | 3 | 3 | 1 | 0 | 0 | 0 | 19 | 20 | 22.5 | 5 | 25.7 | 16.8 |
| 12 | 3 | 0 | 1 | 0 | 0 | 1.5 | 19 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 13 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 14 | 3 | 3 | 1 | 0 | 0 | 0 | 19 | 20 | 22.5 | 5 | 25.7 | 16.8 |
| 15 | 3 | 0 | 1 | 0 | 0 | 1.5 | 19 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 16 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| 17 | 3 | 3 | 1 | 0 | 0 | 0 | 19 | 20 | 22.5 | 5 | 25.7 | 16.8 |
| 18 | 3 | 0 | 1 | 0 | 0 | 1.5 | 19 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| X+1 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |
| X+2 | 3 | 3 | 1 | 0 | 0 | 0 | 19 | 20 | 22.5 | 5 | 25.7 | 16.8 |
| X+3 | 3 | 0 | 1 | 0 | 0 | 1.5 | 19 | 21.5 | 23.0 | 3 | 25.7 | 19.3 |

Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.
Note 2: ΔTC,c does not apply in all bands. For bands without this lower limit is 16.8 dBm.

**Table 6.2.4A.2_1.5-8: Test requirement (network signalled value NS_03/NS_07)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| CA_2A-13A | | | | | | | | | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 2 | 2 | 1 | 12 | 0 | 0 | 20 | 9 | 20.3 | 6 | 25.7 | 13.6 |
| 3 | 0 | 2 | 0 | 12 | 1.5 | 0 | 21.5 | 9 | 21.7 | 5 | 25.7 | 16.0 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 2 | 2 | 1 | 12 | 0 | 0 | 20 | 9 | 20.3 | 6 | 25.7 | 13.6 |
| 6 | 0 | 2 | 0 | 12 | 1.5 | 0 | 21.5 | 9 | 21.7 | 5 | 25.7 | 16.0 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 2 | 2 | 1 | 12 | 0 | 0 | 20 | 9 | 20.3 | 6 | 25.7 | 13.6 |
| 9 | 0 | 2 | 0 | 12 | 1.5 | 0 | 21.5 | 9 | 21.7 | 5 | 25.7 | 16.0 |
| CA_4A-13A | | | | | | | | | | | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 2 | 2 | 1 | 12 | 0 | 0 | 20 | 9 | 20.3 | 6 | 25.7 | 13.6 |
| 3 | 0 | 2 | 0 | 12 | 0 | 0 | 23 | 9 | 23.0 | 3 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 2 | 2 | 1 | 12 | 0 | 0 | 20 | 9 | 20.3 | 6 | 25.7 | 13.6 |
| 6 | 0 | 2 | 0 | 12 | 0 | 0 | 23 | 9 | 23.0 | 3 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 2 | 2 | 1 | 12 | 0 | 0 | 20 | 9 | 20.3 | 6 | 25.7 | 13.6 |
| 9 | 0 | 2 | 0 | 12 | 0 | 0 | 23 | 9 | 23.0 | 3 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |
| Note 2: ΔTC,c does not apply in all bands. For bands without this lower limit is 19.3 dBm in all test points. | | | | | | | | | | | | |

**Table 6.2.4A.2_1.5-9: Test requirement (network signalled value NS_03/NS_21)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 3 | 3 | 1 | 0 | 0 | 0 | 19 | 20 | 22.5 | 5.0 | 25.7 | 16.8 |
| 3 | 3 | 0 | 1 | 0 | 0 | 0 | 19 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 6 | 3 | 2 | 1 | 4 | 0 | 0 | 19 | 17 | 21.1 | 5.0 | 25.7 | 15.4 |
| 7 | 0 | 2 | 0 | 4 | 1.5 | 0 | 21.5 | 17 | 22.8 | 5.0 | 25.7 | 17.1 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2_1.5-10: Test requirement (network signalled value NS_05/NS_01)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 2 | 3 | 3 | 0 | 0 | 0 | 0 | 20 | 20 | 23.0 | 3 | 25.7 | 19.3 |
| 3 | 3 | 0 | 0 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 5 | 3 | 3 | 0 | 0 | 0 | 0 | 20 | 20 | 23.0 | 3 | 25.7 | 19.3 |
| 6 | 3 | 0 | 0 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 3 | 3 | 0 | 0 | 0 | 0 | 20 | 20 | 23.0 | 3 | 25.7 | 19.3 |
| 9 | 3 | 0 | 0 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 11 | 3 | 3 | 1 | 0 | 0 | 0 | 19 | 20 | 22.5 | 5 | 25.7 | 16.8 |
| 12 | 3 | 0 | 1 | 0 | 0 | 0 | 19 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 13 | 0 | 0 | 11 | 0 | 0 | 0 | 12 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 14 | 3 | 3 | 11 | 0 | 0 | 0 | 9 | 20 | 20.3 | 6 | 25.7 | 13.6 Note 3 |
| 15 | 3 | 0 | 11 | 0 | 0 | 0 | 9 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 16 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |
| 17 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |
| 18 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |
| 19 | 0 | 0 | 11 | 0 | 0 | 0 | 12 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 20 | 3 | 3 | 11 | 0 | 0 | 0 | 9 | 20 | 20.3 | 6 | 25.7 | 13.6 Note 3 |
| 21 | 3 | 0 | 11 | 0 | 0 | 0 | 9 | 23 | 23.0 | 3 | 25.7 | 19.3 |

Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.
Note 2: Void.
Note 3: For PCC in mid frequency range the lower limit is 16.8 dBm.

**Table 6.2.4A.2_1.5-11: Test requirement (network signalled value NS_06/NS_21)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 3 | 3 | 0 | 0 | 0 | 0 | 20 | 20 | 23.0 | 3.0 | 25.7 | 19.3 |
| 3 | 3 | 0 | 0 | 0 | 0 | 0 | 20 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 6 | 3 | 2 | 0 | 4 | 0 | 0 | 20 | 17 | 21.8 | 5.0 | 25.7 | 16.1 |
| 7 | 0 | 2 | 0 | 4 | 1.5 | 0 | 21.5 | 17 | 22.8 | 5.0 | 25.7 | 17.1 |

Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.

## 6.2.4A.2_2 Additional Maximum Power Reduction (A-MPR) for CA (inter-band DL CA and UL CA) for UL 256QAM

### 6.2.4A.2_2.1 Test purpose

Additional ACLR, spectrum emission and spurious emission requirements for carrier aggregation can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction (A-MPR) is allowed for the CA Power Class as specified in Table 6.2.2A.0-1.

### 6.2.4A.2_2.2 Test applicability

The requirements of this test apply in test case 6.6.2.2A.2_2 Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA) for network signalled value NS_03/NS_03, NS_03/NS_03, NS_03/NS_06, NS_03/NS_07, NS_03/NS_01, NS_01/NS_06, NS_01/NS_21, NS_03/NS_21 and NS_06/NS_21 to all types of E-UTRA UE release 14 and forward that support inter-band DL CA and UL CA and UL 256QAM.

The requirements of this test apply in test case 6.6.3.3A.2_2 Additional spurious emissions for CA (inter-band DL CA and UL CA) for network signalled values NS_05/NS_01, NS_03/NS_07, NS_01/NS_12, NS_01/NS15, NS_03/NS_21, NS_01/NS_17, NS_01/NS_21 and NS_06/NS_21 to all types of E-UTRA UE release 14 and forward that support inter-band DL CA and UL CA and UL 256QAM.

NOTE: As a result TC 6.2.4A.2_2 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.4A.2_2.3 Minimum conformance requirements

If for inter-band carrier aggregation the UE is configured for transmissions on a single serving cell, then subclauses 6.2.3 and 6.2 4 apply with the Network Signalling value indicated by the field *additionalSpectrumEmission*.

For inter-band carrier aggregation with the UE configured for transmissions on two serving cells the maximum output power reduction specified in Table 6.2.4.3-1is allowed for each serving cell of the applicable uplink CA configuration according to the Network Signalling value indicated by the field *additionalSprectrumEmission* for the PCC and the CA network signalling value indicated by the field *additionalSpectrumEmissionSCell-r10* for the SCC. The value of *additionalSpectrumEmissionSCell-r10* is equal to that of *additionalSprectrumEmission* configured on the SCC. MPR as specified in subclause 6.2.3A is allowed in addition.

For PUCCH and SRS transmissions, the allowed A-MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.4A.

### 6.2.4A.2_2.4 Test description

#### 6.2.4A.2_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state. For the UE maximum output power modified by A-MPR specified in table 6.2.4A.2_2.4.1-1, the power limits specified in subclause 6.2.5A.3.3 apply.

**Table 6.2.4A.2_2.4.1-1: Additional Maximum Power Reduction (A-MPR) for inter-band CA**

| Uplink CA Configuration | NS-value per CC (in same order as UL CA Configuration column) | | Applicable emissions requirements (in same order as UL CA Configuration column) | |
|---|---|---|---|---|
| CA_1A-3A<br>CA_1A-5A<br>CA_1A-7A<br>CA_1A-8A<br>CA_1A-18A<br>CA_1A-26A<br>CA_1A-42A | NS_05 | NS_01 | Table 6.6.3.3.5.2-1 | N/A |
| CA_1A-19A | NS_05 | NS_08 | Table 6.6.3.3.5.2-1 | Table 6.6.3.3.5.4-1 |
| CA_1A-21A | NS_05 | NS_09 | Table 6.6.3.3.5.2-1 | Table 6.6.3.3.5.5-1 |
| CA_2A-4A,<br>CA_2A-66A | NS_03 | NS_03 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.1-1 |
| CA_2A-12A<br>CA_2A-13A,<br>CA_4A-12A,<br>CA_4A-13A,<br>CA_4A-17A | NS_03 | NS_06 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.3-1 |
| CA_2A-13A,<br>CA_4A-13A | NS_03 | NS_07 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.3-1<br>Table 6.6.3.3.3.3-1 |
| CA_3A-19A | NS_01 | NS_08 | N/A | Table 6.6.3.3.5.4-1 |
| CA_2A-30A | NS_03 | NS_21 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.1-1<br>Table 6.6.3.3.5.16-1 |
| CA_3A-26A | NS_01 | NS_12 | N/A | Table 6.6.3.3.3.7-1 |
| CA_3A-26A | NS_01 | NS_15 | N/A | Table 6.6.3.3.3.10-1 |
| CA_2A-5A,<br>CA_2A-7A,<br>CA_4A-5A,<br>CA_4A-7A | NS_03 | NS_01 | Table 6.6.2.2.3.1-1 | N/A |
| CA_5A-66A[Note 5] | NS_01 | NS_03 | N/A | Table 6.6.2.2.3.1-1 |
| CA_5A-12A | NS_01 | NS_06 | N/A | Table 6.6.2.2.3.3-1 |
| CA_18A-28A | NS_01 | NS_17 | N/A | Table 6.6.3.3.5.12-1 |
| CA_5A-30A | NS_01 | NS_21 | N/A | Table 6.6.2.2.3.1-1<br>Table 6.6.3.3.5.16-1 |
| CA_12A-30A | NS_06 | NS_21 | Table 6.6.2.2.3.3-1 | Table 6.6.2.2.3.3-1<br>Table 6.6.3.3.5.16-1 |
| CA_19A-21A | NS_08 | NS_09 | Table 6.6.3.3.5.4-1 | Table 6.6.3.3.5.5-1 |
| CA_1A-28A | NS_05 | NS_17 | Table 6.6.3.3.5.2-1 | Table 6.6.3.3.5.12-1 |

Note 1: For CCs with NS_01, there are no additional requirements defined in 36.101. Only CCs with NS-value different than NS_01 needs to be tested.
Note 2: A-MPR values for NS-values in this table are the same as in section 6.2.4.3.
Note 3: Selection of CA configurations and NS-values to test is derived in TR 36.905 [19].
Note 4: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column.
Note 5: As an exception to note 4, PCC is mapped to the second band of the combination as listed in Uplink CA Configuration column.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.2.4A.2_2.4.1-2 to 6.2.4A.2_2.4.1-13. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4A.2_2.4.1-2: Test Configuration Table (network signalled value NS_01/NS_03 or network signalled value NS_03/NS_01)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and high range for PCC<br>Mid range for SCC(Note 3) |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$(Note 2) |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **NS_03 CC** | **NS_01 CC** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 8 |
| 2 | 25 | 25 | | 256QAM | 256QAM | 25 | 25 |
| 3 | 25 | 25 | | 256QAM | QPSK | 25 | 8 |
| 4 | 50 | 50 | | QPSK | QPSK | 6 | 12 |
| 5 | 50 | 50 | | 256QAM | 256QAM | 50 | 50 |
| 6 | 50 | 50 | | 256QAM | QPSK | 50 | 12 |
| 7 | 50 | 100 | | QPSK | QPSK | 6 | 18 |
| 8 | 50 | 100 | | 256QAM | 256QAM | 50 | 100 |
| 9 | 50 | 100 | | 256QAM | QPSK | 50 | 18 |
| 10 | 100 | 50 | | QPSK | QPSK | 10 | 12 |
| 11 | 100 | 50 | | 256QAM | 256QAM | 100 | 50 |
| 12 | 100 | 50 | | 256QAM | QPSK | 100 | 12 |
| 13 | 100 | 100 | | QPSK | QPSK | 10 | 18 |
| 14 | 100 | 100 | | 256QAM | 256QAM | 100 | 100 |
| 15 | 100 | 100 | | 256QAM | QPSK | 100 | 18 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.
Note 3: Mapping of NS-value per CC and PCC/SCC selection are specified in Table 6.2.4A.2_2.4.1-1.

**Table 6.2.4A.2_2.4.1-3: Test Configuration Table (network signalled value NS_01/NS_06)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$ | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01)** | **SCC (NS_06)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 6 |
| 2 | 25 | 25 | | 256QAM | 256QAM | 25 | 9 |
| 3 | 25 | 25 | | QPSK | 256QAM | 6 | 9 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12 |
| 5 | 50 | 50 | | 256QAM | 256QAM | 50 | 15 |
| 6 | 50 | 50 | | QPSK | 256QAM | 12 | 15 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4A.2_2.4.1-4: Test Configuration Table (network signalled value NS_01/NS_12)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for PCC SCC: (Note 3)<br>For 5 MHz Channel Bandwidth: UL 816.7 MHz ($N_{UL}$ = 26717)<br>For 10 MHz Channel Bandwidth: UL 819.2 MHz ($N_{UL}$ = 26742)<br>For 15 MHz Channel Bandwidth: UL 821.7 MHz ($N_{UL}$ = 26767) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_12) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)(Note 4)** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8@7 |
| 2 | 25 | 25 | | 256QAM | 256QAM | 10 | 8 |
| 3 | 25 | 25 | | QPSK | 256QAM | 8 | 8 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12@16 |
| 5 | 50 | 50 | | 256QAM | 256QAM | 15 | 18 |
| 6 | 50 | 50 | | QPSK | 256QAM | 12 | 18 |
| 7 | 100 | 75 | | QPSK | QPSK | 15 | 16@31 |
| 8 | 100 | 75 | | 256QAM | 256QAM | 20 | 30 |
| 9 | 100 | 75 | | QPSK | 256QAM | 15 | 30 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.<br>Note 3: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.<br>Note 4: Test point with max A-MPR in B26 selected in region A with largest allocation giving max A-MPR at RBstart0; test point with min A-MPR in B26 selected in region A with same allocation but with shifted RBstart to give A-MPR=0. | | | | | | | |

**Table 6.2.4A.2_2.4.1-5: Test Configuration Table (network signalled value NS_01/NS_15)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | High range for both PCC and SCC(Note 3) |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$(Note 2) |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_15) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)(Note 4)** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 6@14 |
| 2 | 25 | 25 | | 256QAM | 256QAM | 10 | 10@15 |
| 3 | 25 | 25 | | QPSK | 256QAM | 8 | 10@15 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12@25 |
| 5 | 50 | 50 | | 256QAM | 256QAM | 15 | 15@35 |
| 6 | 50 | 50 | | QPSK | 256QAM | 12 | 15@35 |
| 7 | 100 | 75 | | QPSK | QPSK | 18 | 18@19 |
| 8 | 100 | 75 | | 256QAM | 256QAM | 20 | 20@55 |
| 9 | 100 | 75 | | QPSK | 256QAM | 18 | 20@55 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.

Note 3: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.

Note 4: Test point with max A-MPR in B26 selected in region C with allocation giving max MPR+A-MPR+deltaTc at max RBend; Test point with min A-MPR in B26 selected in region B with max allocation and RBend giving A-MPR=0.

**Table 6.2.4A.2_2.4.1-6: Test Configuration Table (network signalled value NS_01/NS_21)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | Low and High range for both PCC and SCC | | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest and Highest $N_{RBagg}$ | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8 |
| 2 | 25 | 25 | | 256QAM | 256QAM | 25 | 25 |
| 3 | 25 | 25 | | QPSK | 256QAM | 8 | 25 |
| 4 (Note 4) | 50 | 50 | | QPSK | QPSK | 12 | 12@7 |
| 5 (Note 5) | 50 | 50 | | QPSK | QPSK | 12 | 12@31 |
| 6 | 50 | 50 | | 256QAM | 256QAM | 50 | 1 |
| 7 | 50 | 50 | | QPSK | 256QAM | 12 | 1 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2_2.4.1-1. | | | | | | | |
| Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |
| Note 4: Applicable only to Low range frequency testing. | | | | | | | |
| Note 5: Applicable only to High range frequency testing. | | | | | | | |

**Table 6.2.4A.2_2.4.1-7: Test Configuration Table (network signalled value NS_03/NS_03)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for both PCC and SCC (Note 3) |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ (Note 2) |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_03) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 15 | 25 | N/A for this test | QPSK | QPSK | 4 | 6 |
| 2 | 15 | 25 | | 256QAM | 256QAM | 15 | 25 |
| 3 | 15 | 25 | | 256QAM | QPSK | 15 | 6 |
| 4 | 25 | 25 | | QPSK | QPSK | 6 | 6 |
| 5 | 25 | 25 | | 256QAM | 256QAM | 25 | 25 |
| 6 | 25 | 25 | | 256QAM | QPSK | 25 | 6 |
| 7 | 50 | 50 | | QPSK | QPSK | 6 | 6 |
| 8 | 50 | 50 | | 256QAM | 256QAM | 50 | 50 |
| 9 | 50 | 50 | | 256QAM | QPSK | 50 | 6 |
| 10 | 100 | 100 | | QPSK | QPSK | 10 | 10 |
| 11 | 100 | 100 | | 256QAM | 256QAM | 100 | 100 |
| 12 | 100 | 100 | | 256QAM | QPSK | 100 | 10 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.2.4A.2_2.4.1-8: Test Configuration Table (network signalled value NS_03/NS_06)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03)** | **SCC (NS_06)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 15 | 25 | N/A for this test | QPSK | QPSK | 4 | 8 |
| 2 | 15 | 25 | | 256QAM | 256QAM | 15 | 25 |
| 3 | 15 | 25 | | 256QAM | QPSK | 15 | 8 |
| 4 | 25 | 15 | | QPSK | QPSK | 6 | 4 |
| 5 | 25 | 15 | | 256QAM | 256QAM | 25 | 15 |
| 6 | 25 | 15 | | 256QAM | QPSK | 25 | 4 |
| 7 | 25 | 25 | | QPSK | QPSK | 6 | 8 |
| 8 | 25 | 25 | | 256QAM | 256QAM | 25 | 25 |
| 9 | 25 | 25 | | 256QAM | QPSK | 25 | 8 |
| 10 | 25 | 50 | | QPSK | QPSK | 6 | 12 |
| 11 | 25 | 50 | | 256QAM | 256QAM | 25 | 50 |
| 12 | 25 | 50 | | 256QAM | QPSK | 25 | 12 |
| 13 | 50 | 50 | | QPSK | QPSK | 6 | 12 |
| 14 | 50 | 50 | | 256QAM | 256QAM | 50 | 50 |
| 15 | 50 | 50 | | 256QAM | QPSK | 50 | 12 |
| 16 | 100 | 50 | | QPSK | QPSK | 10 | 12 |
| 17 | 100 | 50 | | 256QAM | 256QAM | 100 | 50 |
| 18 | 100 | 50 | | 256QAM | QPSK | 100 | 12 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.2.4A.2_2.4.1-9: Test Configuration Table (network signalled value NS_03/NS_07)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_07) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 50 | N/A for this test | QPSK | QPSK | 6 | 7@13 |
| 2 | 25 | 50 | | 256QAM | 256QAM | 25 | 50 |
| 3 | 25 | 50 | | QPSK | 256QAM | 6 | 50 |
| 4 | 50 | 50 | | QPSK | QPSK | 6 | 7@13 |
| 5 | 50 | 50 | | 256QAM | 256QAM | 50 | 50 |
| 6 | 50 | 50 | | QPSK | 256QAM | 6 | 50 |
| 7 | 100 | 50 | | QPSK | QPSK | 10 | 7@13 |
| 8 | 100 | 50 | | 256QAM | 256QAM | 100 | 50 |
| 9 | 100 | 50 | | QPSK | 256QAM | 10 | 50 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.<br>Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.2.4A.2_2.4.1-10: Test Configuration Table (network signalled value NS_03/NS_21)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | Low and High range for both PCC and SCC | | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest and Highest $N_{RBagg}$ | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 8 |
| 2 | 25 | 25 | | 256QAM | 256QAM | 25 | 25 |
| 3 | 25 | 25 | | 256QAM | QPSK | 25 | 8 |
| 4 (Note 4) | 100 | 50 | | QPSK | QPSK | 10 | 12@7 |
| 5 (Note 5) | 100 | 50 | | QPSK | QPSK | 10 | 12@31 |
| 6 | 100 | 50 | | 256QAM | 256QAM | 100 | 1 |
| 7 | 100 | 50 | | QPSK | 256QAM | 10 | 1 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2_2.4.1-1. | | | | | | | |
| Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |
| Note 4: Applicable only to Low range frequency testing. | | | | | | | |
| Note 5: Applicable only to High range frequency testing. | | | | | | | |

**Table 6.2.4A.2_2.4.1-11: Test Configuration Table (network signalled value NS_05/NS_01)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low range, Mid range for PCC<br>In case of Low range:<br>- For 5MHz Channel Bandwidth: 1927.2MHz (NUL = 18072)<br>- For 10 MHz Channel Bandwidth: 1934.7 MHz (NUL = 18147)<br>- For 20 MHz Channel Bandwidth: 1930 MHz (NUL = 18100)<br>Mid range for SCC(Note 3) |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ (Note 2) |

**Test Parameters for CA Configurations**

| Config ID | CA Configuration / NRB_agg | | DL Allocation | CC MOD | | UL Allocation | |
|---|---|---|---|---|---|---|---|
| | PCC (NS_05) NRB | SCC (NS_01) NRB | PCC & SCC RB allocation | PCC | SCC | PCC & SCC RB allocations | |
| 1 | 25 | 15 | N/A for this test | QPSK | QPSK | 6 | 4 |
| 2 | 25 | 15 | | 256QAM | 256QAM | 25 | 6 |
| 3 | 25 | 15 | | 256QAM | QPSK | 25 | 4 |
| 4 | 25 | 25 | | QPSK | QPSK | 6 | 6 |
| 5 | 25 | 25 | | 256QAM | 256QAM | 25 | 25 |
| 6 | 25 | 25 | | 256QAM | QPSK | 25 | 6 |
| 7 | 25 | 50 | | QPSK | QPSK | 6 | 12 |
| 8 | 25 | 50 | | 256QAM | 256QAM | 25 | 25 |
| 9 | 25 | 50 | | 256QAM | QPSK | 25 | 12 |
| 10 | 50 | 50 | | QPSK | QPSK | 12 | 12 |
| 11 | 50 | 50 | | 256QAM | 256QAM | 50 | 25 |
| 12 | 50 | 50 | | 256QAM | QPSK | 50 | 12 |
| 13 | 100 | 50 | | QPSK | QPSK | 18 | 12 |
| 14 | 100 | 50 | | 256QAM | 256QAM | 50 | 25 |
| 15 | 100 | 50 | | 256QAM | QPSK | 50 | 12 |
| 16 | 100 | 100 | | QPSK | QPSK | 18 | 18 |
| 17 | 100 | 100 | | 256QAM | 256QAM | 50 | 25 |
| 18 | 100 | 100 | | 256QAM | QPSK | 50 | 18 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.2.4A.2_2.4.1-12: Test Configuration Table (network signalled value NS_06/NS_21)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | Low and High range for both PCC and SCC | | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest and Highest $N_{RBagg}$ | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8 |
| 2 | 25 | 25 | | 256QAM | 256QAM | 25 | 25 |
| 3 | 25 | 25 | | 256QAM | QPSK | 25 | 8 |
| 4 (Note 4) | 50 | 50 | | QPSK | QPSK | 12 | 12@7 |
| 5 (Note 5) | 50 | 50 | | QPSK | QPSK | 12 | 12@31 |
| 6 | 50 | 50 | | 256QAM | 256QAM | 50 | 1 |
| 7 | 50 | 50 | | QPSK | 256QAM | 12 | 1 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2_2.4.1-1. | | | | | | | |
| Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |
| Note 4: Applicable only to Low range frequency testing. | | | | | | | |
| Note 5: Applicable only to High range frequency testing. | | | | | | | |

**Table 6.2.4A.2_2.4.1-13: Test Configuration Table (network signalled value NS_01/NS_17)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for both PCC and SCC |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_17) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 5 | 5 | N/A for this test | QPSK | QPSK | 6 | 6 |
| 2 | 5 | 5 | | 256QAM | 256QAM | 25 | 25 |
| 3 | 5 | 5 | | 256QAM | QPSK | 25 | 6 |
| 4 | 5 | 10 | | QPSK | QPSK | 6 | 12 |
| 5 | 5 | 10 | | 256QAM | 256QAM | 25 | 25 |
| 6 | 5 | 10 | | 256QAM | QPSK | 25 | 12 |
| 7 | 10 | 10 | | QPSK | QPSK | 12 | 12 |
| 8 | 10 | 10 | | 256QAM | 256QAM | 50 | 25 |
| 9 | 10 | 10 | | 256QAM | QPSK | 50 | 12 |
| 10 | 15 | 10 | | QPSK | QPSK | 16 | 12 |
| 11 | 15 | 10 | | 256QAM | 256QAM | 50 | 25 |
| 12 | 15 | 10 | | 256QAM | QPSK | 50 | 12 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to the applicable table from Table 6.2.4A.2_2.4.1-2 to 6.2.4A.2_2.4.1-13.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.4A.2_2.4.3.

### 6.2.4A.2_2.4.2 Test procedure

Same test procedure as defined in clause 6.2.4A.2.4.2 with the following exception:

- In Step 4, instead of Table 6.2.4A.2.4.1-2 to Table 6.2.4A.2.4.1-13 use Table 6.2.4A.2_2.4.1-2 to Table 6.2.4A.2_2.4.1-13

### 6.2.4A.2_2.4.3 Message contents

Same message contents as defined in clause 6.2.4A.2.4.3.

## 6.2.4A.2_2.5 Test requirements

The maximum output power, derived in step 6 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable table from Table 6.2.4A.2_2.5-1 to Table 6.2.4A.2_2.5-11. For the UE maximum output power modified by A-MPR specified in sub-clause 6.2.4A.2_2.3, the power limits specified in Table 6.2.5A.3.3-1 apply.

**Table 6.2.4A.2_2.5-1: Test requirement (network signalled value NS_01/NS_03 or network signalled value NS_03/NS_01)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 3 | 5 | 0 | 1 | 0 | 0 | 0 | 17 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 6 | 5 | 0 | 1 | 0 | 0 | 0 | 17 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 8 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 9 | 5 | 0 | 1 | 0 | 0 | 0 | 17 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 10 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 11 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 12 | 5 | 0 | 1 | 0 | 0 | 0 | 17 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 13 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 14 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 15 | 5 | 0 | 1 | 0 | 0 | 0 | 17 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |
| Note 2: ΔTC,c does not apply in all bands. | | | | | | | | | | | | |

**Table 6.2.4A.2_2.5-2: Test requirement (network signalled value NS_01/NS_06)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 1.5 | 23 | 21.5 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 5 | 5 | 0 | 0 | 0 | 1.5 | 18 | 16.5 | 20.3 | 6.0 | 25.7 | 13.6 |
| 3 | 0 | 5 | 0 | 0 | 0 | 1.5 | 23 | 16.5 | 23.0 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 1.5 | 23 | 21.5 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 5 | 5 | 0 | 0 | 0 | 1.5 | 18 | 16.5 | 20.3 | 6.0 | 25.7 | 13.6 |
| 6 | 0 | 5 | 0 | 0 | 0 | 1.5 | 23 | 16.5 | 23.0 | 3.0 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2_2.5-3: Test requirement (network signalled value NS_01/NS_12)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 5 | 5 | 0 | 5 | 1.5 | 1.5 | 16.5 | 11.5 | 17.7 | 5.0 | 25.7 | 12.0 |
| 3 | 0 | 5 | 0 | 5 | 1.5 | 1.5 | 21.5 | 11.5 | 21.9 | 5.0 | 25.7 | 16.2 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 5 | 5 | 0 | 4 | 1.5 | 1.5 | 16.5 | 12.5 | 18.0 | 5.0 | 25.7 | 12.3 |
| 6 | 0 | 5 | 0 | 4 | 1.5 | 1.5 | 21.5 | 12.5 | 22.0 | 5.0 | 25.7 | 16.3 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 8 | 5 | 5 | 0 | 4 | 0 | 0 | 18 | 14 | 19.5 | 5.0 | 25.7 | 13.8 |
| 9 | 0 | 5 | 0 | 4 | 1.5 | 0 | 21.5 | 14 | 22.2 | 5.0 | 25.7 | 16.5 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2_2.5-4: Test requirement (network signalled value NS_01/NS_15)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 5 | 5 | 0 | 9 | 1.5 | 1.5 | 16.5 | 7.5 | 17.0 | 5.0 | 25.7 | 11.3 |
| 3 | 0 | 5 | 0 | 9 | 1.5 | 1.5 | 21.5 | 7.5 | 21.7 | 5.0 | 25.7 | 16.0 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 5 | 5 | 0 | 9 | 1.5 | 1.5 | 16.5 | 7.5 | 17.0 | 5.0 | 25.7 | 11.3 |
| 6 | 0 | 5 | 0 | 9 | 1.5 | 1.5 | 21.5 | 7.5 | 21.7 | 5.0 | 25.7 | 16.0 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3 | 25.7 | 19.3 |
| 8 | 5 | 5 | 0 | 9 | 0 | 0 | 18 | 9 | 18.5 | 5 | 25.7 | 12.8 |
| 9 | 0 | 5 | 0 | 9 | 0 | 0 | 23 | 9 | 23.0 | 3 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2_2.5-5: Test requirement (network signalled value NS_01/NS_21)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 5 | 5 | 0 | 0 | 0 | 0 | 18 | 18 | 21.0 | 5.0 | 25.7 | 15.3 |
| 3 | 0 | 5 | 0 | 0 | 0 | 0 | 23 | 18 | 23.0 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 6 | 5 | 5 | 0 | 4 | 0 | 0 | 18 | 14 | 19.5 | 5.0 | 25.7 | 13.8 |
| 7 | 0 | 5 | 0 | 4 | 0 | 0 | 23 | 14 | 23.0 | 3.0 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2_2.5-6: Test requirement (network signalled value NS_03/NS_03)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 5 | 5 | 1 | 1 | 1.5 | 0 | 15.5 | 17 | 19.3 | 5.0 | 25.7 | 13.6 |
| 3 | 5 | 0 | 1 | 0 | 1.5 | 0 | 15.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 5 | 5 | 1 | 1 | 0 | 0 | 17 | 17 | 20.0 | 6.0 | 25.7 | 13.3 |
| 6 | 5 | 0 | 1 | 0 | 0 | 0 | 17 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 8 | 5 | 5 | 1 | 1 | 0 | 0 | 17 | 17 | 20.0 | 6.0 | 25.7 | 13.3 |
| 9 | 5 | 0 | 1 | 0 | 0 | 0 | 17 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 10 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 11 | 5 | 5 | 1 | 1 | 0 | 0 | 17 | 17 | 20.0 | 6.0 | 25.7 | 13.3 |
| 12 | 5 | 0 | 1 | 0 | 0 | 0 | 17 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |

Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4A.2_2.5-7: Test requirement (network signalled value NS_03/NS_06)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 5 | 5 | 1 | 0 | 1.5 | 0 | 15.5 | 18 | 19.9 | 5.0 | 25.7 | 13.8 |
| 3 | 5 | 0 | 1 | 0 | 1.5 | 1.5 | 15.5 | 21.5 | 22.5 | 5.0 | 25.7 | 17.1 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 6 | 5 | 0 | 1 | 0 | 0 | 1.5 | 17 | 21.5 | 22.8 | 5.0 | 25.7 | 17.1 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3.0 | 25.7 | 19.3 |
| 8 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 9 | 5 | 0 | 1 | 0 | 0 | 1.5 | 17 | 21.5 | 22.8 | 5.0 | 25.7 | 17.1 Note 2 |
| 10 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3.0 | 25.7 | 19.3 |
| 11 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 12 | 5 | 0 | 1 | 0 | 0 | 1.5 | 17 | 21.5 | 22.8 | 5.0 | 25.7 | 17.1 Note 2 |
| 13 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3.0 | 25.7 | 19.3 |
| 14 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 15 | 5 | 0 | 1 | 0 | 0 | 1.5 | 17 | 21.5 | 22.8 | 5.0 | 25.7 | 17.1 Note 2 |
| 16 | 0 | 0 | 0 | 0 | 1.5 | 1.5 | 21.5 | 21.5 | 23.0 | 3.0 | 25.7 | 19.3 |
| 17 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 18 | 5 | 0 | 1 | 0 | 0 | 1.5 | 17 | 21.5 | 22.8 | 5.0 | 25.7 | 17.1 Note 2 |

Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.
Note 2: ΔTC,c does not apply in all bands. If SCC is on bands without ΔTC,c, then lower limit is 19.3 dBm.

**Table 6.2.4A.2_2.5-8: Test requirement (network signalled value NS_03/NS_07)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 5 | 5 | 1 | 12 | 0 | 0 | 17 | 6 | 17.3 | 5.0 | 25.7 | 11.6 |
| 3 | 0 | 5 | 0 | 12 | 1.5 | 0 | 21.5 | 6 | 21.6 | 5.0 | 25.7 | 15.9 Note 2 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 5 | 5 | 1 | 12 | 0 | 0 | 17 | 6 | 17.3 | 5.0 | 25.7 | 11.6 |
| 6 | 0 | 5 | 0 | 12 | 1.5 | 0 | 21.5 | 6 | 21.6 | 5.0 | 25.7 | 15.9 Note 2 |
| 7 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 8 | 5 | 5 | 1 | 12 | 0 | 0 | 17 | 6 | 17.3 | 5.0 | 25.7 | 11.6 |
| 9 | 0 | 5 | 0 | 12 | 1.5 | 0 | 21.5 | 6 | 21.6 | 5.0 | 25.7 | 15.9 Note 2 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |
| Note 2: ΔTC,c does not apply in all bands. If PCC is on bands without ΔTC,c, then lower limit is 19.3 dBm. | | | | | | | | | | | | |

**Table 6.2.4A.2_2.5-9: Test requirement (network signalled value NS_03/NS_21)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 3 | 5 | 0 | 1 | 0 | 0 | 0 | 17 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 6 | 5 | 5 | 1 | 4 | 0 | 0 | 17 | 14 | 18.8 | 5.0 | 25.7 | 13.1 |
| 7 | 0 | 5 | 0 | 4 | 1.5 | 0 | 21.5 | 14 | 22.2 | 5.0 | 25.7 | 16.5 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2_2.5-10: Test requirement (network signalled value NS_05/NS_01)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 5 | 5 | 0 | 0 | 0 | 0 | 18 | 18 | 21.0 | 5.0 | 25.7 | 15.3 |
| 3 | 5 | 0 | 0 | 0 | 0 | 0 | 18 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 5 | 5 | 0 | 0 | 0 | 0 | 18 | 18 | 21.0 | 5.0 | 25.7 | 15.3 |
| 6 | 5 | 0 | 0 | 0 | 0 | 0 | 18 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 8 | 5 | 5 | 0 | 0 | 0 | 0 | 18 | 18 | 21.0 | 5.0 | 25.7 | 15.3 |
| 9 | 5 | 0 | 0 | 0 | 0 | 0 | 18 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 11 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 12 | 5 | 0 | 1 | 0 | 0 | 0 | 17 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 13 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 14 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 15 | 5 | 0 | 1 | 0 | 0 | 0 | 17 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 16 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 17 | 5 | 5 | 1 | 0 | 0 | 0 | 17 | 18 | 20.5 | 6.0 | 25.7 | 13.8 |
| 18 | 5 | 0 | 1 | 0 | 0 | 0 | 17 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

**Table 6.2.4A.2_2.5-11: Test requirement (network signalled value NS_06/NS_21)**

| Config ID | $MPR_c$ (dB) | | $A\text{-}MPR_c$ (dB) | | $\Delta T_{C,c}$ (dB) | | $P_{CMAX,c}$ (dBm) | | $P_{CMAX}$ (dBm) | $T_{LOW}(P_{CMAX})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | | | | |
| 1 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 2 | 5 | 5 | 0 | 0 | 0 | 0 | 18 | 18 | 21.0 | 5.0 | 25.7 | 15.3 |
| 3 | 5 | 0 | 0 | 0 | 0 | 0 | 18 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 5 | 0 | 0 | 0 | 0 | 1.5 | 0 | 21.5 | 23 | 23.0 | 3.0 | 25.7 | 19.3 |
| 6 | 5 | 5 | 0 | 4 | 0 | 0 | 18 | 14 | 19.5 | 5.0 | 25.7 | 13.8 |
| 7 | 0 | 5 | 0 | 4 | 1.5 | 0 | 21.5 | 14 | 22.2 | 5.0 | 25.7 | 16.5 |
| Note 1: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | | | | | | |

## 6.2.4A.3 Additional Maximum Power Reduction (A-MPR) for CA (intra-band non-contiguous DL CA and UL CA)

NOTE: No test case details specified because the additional maximum power reduction cannot be verified for the intra-band non-contiguous UL CA case due to A-MPR is N/A in current non-contiguous Uplink CA configuration CA_4A-4A according to Table 6.2.4A-2 in TS 36.101.

### 6.2.4A.3.1 Minimum conformance requirements

For intra-band non-contiguous carrier aggregation with the UE configured for transmissions on two serving cells, the maximum output power reduction specified in Table 6.2.4A.3.1-1 is allowed for all serving cells of the applicable uplink CA configurations according to the CA network signalling value indicated by the field

*additionalSpectrumEmissionSCell-r10*. MPR as specified in subclause 6.2.3A is not allowed in addition, unless A-MPR is N/A.

**Table 6.2.4A.3.1-1: Additional Maximum Power Reduction (A-MPR) for intra-band non-contiguous CA**

| CA Network Signalling value | Additional requirements for sub-blocks in order of increasing uplink carrier frequency | | Uplink CA Configuration | A-MPR for sub-blocks in order of increasing uplink carrier frequency |
|---|---|---|---|---|
| | Requirements (subclause) | Requirements (subclause) | | A-MPR [dB] (subclause) |
| CA_NC_NS_01 | 6.6.2.2.3.1 (NS_03) | 6.6.2.2.3.1 (NS_03) | CA_4A-4A | N/A |
| … | | | | |
| CA_NC_NS_31 | NOTE 1 | NOTE 1 | Table 5.6A.1-3 (NOTE 1) | N/A |
| CA_NC_NS_32 | Reserved | | | |
| NOTE 1: Applicable for uplink CA configurations listed in Table 5.6A.1-3 for which the additional requirements in subclause 6.6.2.1.3 (indicated by NS_01) applies in each sub-block.<br>NOTE 2: The index of the sequence CA_NC_NS corresponds to the value of *additionalSpectrumEmissionSCell-r10*. | | | | |

The normative reference for this requirement is TS 36.101 [2] subclause 6.2.4A.

## 6.2.4A.2_2 Void

## 6.2.4A.4 Additional Maximum Power Reduction (A-MPR) for CA (3UL CA)

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- Test requirement is TBD
- Test configuration table is TBD
- Test case need to be aligned with the Additional Spectrum Emission Mask & Additional spurious emissions for CA (3UL CA)
- There is no minimum requirement for intra-band contiguous combination for CA (3UL CA) in core-spec [2]
- There is no intra-band non-contiguous combination for CA (3UL CA)

### 6.2.4A.4.1 Test purpose

Additional ACLR, spectrum emission and spurious emission requirements for carrier aggregation can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction (A-MPR) is allowed for the CA Power Class as specified in Table 6.2.2A.0.

### 6.2.4A.4.2 Test applicability

This requirements of this test apply in test case 6.6.2.2A.4 Additional Spectrum Emission Mask for CA (intra-band contiguous 3DL CA and 3 UL CA) for network signalled value NS [TBD] to all types of E-UTRA UE release 13 and forward that support intra-band contiguous 3DL CA and 3UL CA but do not support UL 64QAM or UL 256QAM.

This requirements of this test apply in test case 6.6.2.2A.4 Additional Spectrum Emission Mask for CA (inter-band 3DL CA and 3 UL CA) for network signalled value NS_05/CA_NS_04, NS_01/CA_NS_04, NS_01/CA_NS_08, CA_NS_07/NS_04, NS_04/CA_NS_08 and CA_NS_04/NS_22 to all types of E-UTRA UE release 13 and forward that support inter-band 3DL CA and 3UL CA but do not support UL 64QAM or UL 256QAM.

The requirements of this test apply in test case 6.6.3.3A.4 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) for network signalled values CA_NS [TBD] to all types of E-UTRA UE release 13 and forward that support intra-band contiguous 3DL CA and 3UL CA.

The requirements of this test apply in test case 6.6.3.3A.4 Additional spurious emissions for CA (inter-band 3DL CA and 3UL CA) for network signalled values CA_NS [TBD] to all types of E-UTRA UE release 13 and forward that support inter-band 3DL CA and 3UL CA.

NOTE: As a result TC 6.2.4A.4 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.4A.4.3 Minimum conformance requirements

If for inter-band carrier aggregation the UE is configured for transmissions on a single serving cell, then subclauses 6.2.3 and 6.2 4 apply with the Network Signalling value indicated by the field *additionalSpectrumEmission*.

For inter-band carrier aggregation with the UE configured for transmissions on two serving cells the maximum output power reduction specified in Table 6.2.4-1 is allowed for each serving cell of the applicable uplink CA configuration according to the Network Signalling value indicated by the field *additionalSprectrumEmission* for the PCC and the CA network signalling value indicated by the field *additionalSpectrumEmissionSCell-r10* for the SCC. The value of *additionalSpectrumEmissionSCell-r10* is equal to that of *additionalSprectrumEmission* configured on the SCC. MPR as specified in subclause 6.2.3A is allowed in addition.

For PUCCH and SRS transmissions, the allowed A-MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.4A.

### 6.2.4A.4.4 Test description

#### 6.2.4A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state. For the UE maximum output power modified by A-MPR specified in table 6.2.4A.4.4.1-1, the power limits specified in subclause [TBD] apply.

**Table 6.2.4A.4.4.1-1: Additional Maximum Power Reduction (A-MPR) for inter-band CA**

| Uplink CA Configuration | NS-value per CC (in same order as UL CA Configuration column) | | Applicable emissions requirements (in same order as UL CA Configuration column) | |
|---|---|---|---|---|
| CA_1A-41C | NS_05 | CA_NS_08 | Table 6.6.3.3.5.2-1 | TBD |
| CA_3A-41C | NS_01 | CA_NS_04 | N/A | TBD |
| CA_3A-42C | NS_01 | CA_NS_08 | N/A | TBD |
| CA_39A-41C | NS_01 | CA_NS_04 | N/A | TBD |
| CA_39C-41A | CA_NS_07 | NS_04 | TBD | Table 6.6.2.2.3.2-1<br>Table 6.6.2.2.3.2-2<br>Table 6.6.3.3.3.1-1 |
| CA_41A-42C | NS_04 | CA_NS_08 | Table 6.6.2.2.3.2-1<br>Table 6.6.2.2.3.2-2<br>Table 6.6.3.3.3.1-1 | TBD |
| CA_41C-41A | CA_NS_04 | NS_04 | TBD | Table 6.6.2.2.3.2-1<br>Table 6.6.2.2.3.2-2<br>Table 6.6.3.3.3.1-1 |
| CA_41C-42A | CA_NS_04 | NS_22 | TBD | Table 6.6.3.3.3.17-1 |

Note 1: For CCs with NS_01, there are no additional requirements defined in 36.101. Only CCs with NS-value different than NS_01 needs to be tested.
Note 2: A-MPR values for NS-values in this table are the same as in section 6.2.4.3.
Note 3: Selection of CA configurations and NS-values to test is derived in TR 36.905 [19].
Note 4: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column.
Note 5: As an exception to note 4, PCC is mapped to the second band of the combination as listed in Uplink CA Configuration column.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test

parameters for each CA Configuration, and are shown in table 6.2.4A.4.4.1-2 to [TBD]. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4A.4.4.1-2: Test Configuration Table (network signalled value NS_05/CA_NS_04)**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for both PCC and SCC |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ |

**Test Parameters for CA Configurations**

| **Config ID** | **CA Configuration / NRB_agg** | | | **DL Allocation** | **CC MOD** | | | **UL Allocation** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **PCC (NS_05) NRB** | **SCC1 (CA_NS_04) NRB** | **SCC2 (CA_NS_04) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC1** | **SCC2** | **PCC & SCC RB allocations** | | |
| 1 | TBD | TBD | TBD | N/A for this test | TBD | TBD | TBD | TBD | TBD | TBD |
| 2 | TBD | TBD | TBD | | TBD | TBD | TBD | TBD | TBD | TBD |
| 3 | TBD | TBD | TBD | | TBD | TBD | TBD | TBD | TBD | TBD |
| 4 | TBD | TBD | TBD | | TBD | TBD | TBD | TBD | TBD | TBD |
| 5 | TBD | TBD | TBD | | TBD | TBD | TBD | TBD | TBD | TBD |
| 6 | TBD | TBD | TBD | | TBD | TBD | TBD | TBD | TBD | TBD |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration. which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: Lower limit is assuming ΔTIB,c is zero. If non-zero. PCMAX,c will decrease and T(PCMAX_L,c) may be higher resulting in different test requirements according to Table 6.2.5.3-1.

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.4A.4.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.4A.4.4.3.

### 6.2.4A.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.2.3A.4.4.3.

3. SS activates SCC by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.4A.4.4.1-1on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX}$ level.

6. Measure the mean power over all component carriers in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.2.4A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.2.4A.4.5 Test Requirements

TBD

## 6.2.4B Additional Maximum Power Reduction (A-MPR) for UL-MIMO

### 6.2.4B.1 Test purpose

Additional ACLR and spectrum emission requirements can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction A-MPR is allowed for the sum output power at each antenna connector as specified in Table 6.2.2B.3-1. Unless stated otherwise, an A-MPR of 0 dB shall be used.

### 6.2.4B.2 Test applicability

The requirements of this test apply in test case 6.6.2.2 B Additional Spectrum Emission Mask for network signalled values NS_03, NS_04, NS_06, NS_07, NS_11, NS_20, NS_21, NS_27 and NS_35 to all types of E-UTRA UE release 10 and forward that support UL MIMO.

The requirements of this test apply in test case 6.6.3.3 B Additional Spurious Emissions for network signalled values NS_04, NS_05, NS_07, NS_08, NS_09, NS_12, NS_13, NS_14, NS_15, NS_16, NS_17, NS_18, NS_19, NS_21, NS_22, NS_23, NS_24, NS_25, NS_27, NS_36, NS_38, NS_39 to all types of E-UTRA UE release 10 and forward that support UL MIMO.

NOTE: As a result TC 6.2.4B has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.4B.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.2.4.3.

### 6.2.4B.4 Test description

#### 6.2.4B.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.4B.4.1-1 through table 6.2.4B.4.1-23. The details of

the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4B.4.1-1: Test Configuration Table (network signalled value "NS_03")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] clause 4.1) | | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] clause 4.3.1) | | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] clause 4.3.1) | | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for NS_03 A-MPR** | | | | | | | |
| | | Downlink Configuration | | | Uplink Configuration | | |
| Configuration ID | Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | | FDD | TDD | | FDD | TDD |
| 1 | 1.4MHz | N/A for A-MPR testing. | | | QPSK | 6 | 6 |
| 2 | 1.4MHz | | | | QPSK | 5 | 5 |
| 3 | 1.4MHz | | | | 16QAM | 5 | 5 |
| 4 | 3MHz | | | | QPSK | 15 | 15 |
| 5 | 3MHz | | | | QPSK | 4 | 4 |
| 6 | 3MHz | | | | 16QAM | 15 | 15 |
| 7 | 3MHz | | | | 16QAM | 4 | 4 |
| 8 | 5MHz | | | | QPSK | 25 | 25 |
| 9 | 5MHz | | | | QPSK | 8 | 8 |
| 10 | 5MHz | | | | QPSK | 6 | 6 |
| 11 | 5MHz | | | | 16QAM | 25 | 25 |
| 12 | 5MHz | | | | 16QAM | 8 | 8 |
| 13 | 10MHz | | | | QPSK | 50 | 50 |
| 14 | 10MHz | | | | QPSK | 12 | 12 |
| 15 | 10MHz | | | | QPSK | 6 | 6 |
| 16 | 10MHz | | | | 16QAM | 50 | 50 |
| 17 | 10MHz | | | | 16QAM | 12 | 12 |
| 18 | 15MHz | | | | QPSK | 75 | 75 |
| 19 | 15MHz | | | | QPSK | 16 | 16 |
| 20 | 15MHz | | | | QPSK | 8 | 8 |
| 21 | 15MHz | | | | 16QAM | 75 | 75 |
| 22 | 15MHz | | | | 16QAM | 16 | 16 |
| 23 | 20MHz | | | | QPSK | 100 | 100 |
| 24 | 20MHz | | | | QPSK | 18 | 18 |
| 25 | 20MHz | | | | QPSK | 10 | 10 |
| 26 | 20MHz | | | | 16QAM | 100 | 100 |
| 27 | 20MHz | | | | 16QAM | 18 | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in clause 6.2.4B.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

Note 4: For band 23, above table only applies to mid and high range test frequencies. Low range test frequencies will be covered by NS_11 test configuration table.

**Table 6.2.4B.4.1-2: Test Configuration Table (network signalled value "NS_04")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range<br><br>Additional test frequencies for Rel-12 to Rel-13 and bit 2 of modifiedMPRbehavior = 0:<br><br>For 5 MHz bandwidth:<br>2499.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866<br><br>Additional test frequencies for Rel-12 and later and bit 2 of modifiedMPRbehavior = 1:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39686<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866 | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10 MHz, 15 MHz, 20MHz | | |
| **Test Parameters for NS_04 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation TDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 (Note 6) | 5MHz | N/A for A-MPR testing | | QPSK | 25 | 0 |
| 2 (Note 6) | 5MHz | | | QPSK | 8 | Note 3 |
| 3(Note 6) | 5MHz | | | QPSK | 6 | Note 3 |
| 4 (Note 6) | 5MHz | | | 16QAM (Note 5) | 25 | 0 |
| 5 (Note 6) | 5MHz | | | 16QAM (Note 5) | 8 | Note 3 |
| 6 (Note 6) | 10MHz | | | QPSK | 1 | 0 |
| 7 (Note 6) | 10MHz | | | QPSK | 12 | 0 |
| 8 (Note 6) | 10MHz | | | QPSK | 50 | 0 |
| 9 Note 6) | 10MHz | | | 16QAM (Note 5) | 50 (Note 4) | 0 |
| 10 (Note 6) | 10MHz | | | QPSK | 24 | 13 |
| 11 (Note 6) | 10MHz | | | 16QAM (Note 5) | 24 | 13 |
| 12 (Note 6) | 10MHz | | | QPSK | 36 | 13 |
| 13 (Note 6) | 10MHz | | | QPSK | 12 | 37 |
| 14 (Note 6) | 10MHz | | | QPSK | 1 | 49 |
| 15 (Note 6) | 15MHz | | | QPSK | 1 | 0 |
| 16 (Note 6) | 15MHz | | | QPSK | 16 | 0 |
| 17 (Note 6) | 15MHz | | | QPSK | 75 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| 18 (Note 6) | 15MHz | | 16QAM (Note 5) | 75 (Note 4) | 0 |
| 19 (Note 6) | 15MHz | | QPSK | 36 | 19 |
| 20 (Note 6) | 15MHz | | 16QAM (Note 5) | 36 (Note 4) | 19 |
| 21 (Note 6) | 15MHz | | QPSK | 50 | 19 |
| 22 (Note 6) | 15MHz | | QPSK | 18 | 56 |
| 23 (Note 6) | 15MHz | | QPSK | 1 | 74 |
| 24 (Note 6) | 20MHz | | QPSK | 1 | 0 |
| 25 (Note 6) | 20MHz | | QPSK | 18 | 0 |
| 26 (Note 6) | 20MHz | | QPSK | 100 | 0 |
| 27 (Note 6) | 20MHz | | 16QAM (Note 5) | 100 (Note 4) | 0 |
| 28 (Note 6) | 20MHz | | QPSK | 50 | 25 |
| 29 (Note 6) | 20MHz | | 16QAM (Note 5) | 50 (Note 4) | 25 |
| 30 (Note 6) | 20MHz | | QPSK | 75 | 25 |
| 31 (Note 6) | 20MHz | | QPSK | 25 | 75 |
| 32 (Note 6) | 20MHz | | QPSK | 1 | 99 |
| 33 (Note 8) | 5MHz | | QPSK | 1 | 0 |
| 34 (Note 8) | 5MHz | | QPSK | 16 | 9 |
| 35 (Note 9) | 5MHz | | QPSK | 25 | 0 |
| 36 (Note 8) | 5MHz | | 16QAM (Note 5) | 16 | 9 |
| 37 (Note 9) | 5MHz | | 16QAM (Note 5) | 25 | 0 |
| 38 (Note 8) | 10MHz | | QPSK | 1 | 0 |
| 39 (Note 8) | 10MHz | | QPSK | 1 | 49 |
| 40 (Note 8) | 10MHz | | QPSK | 24 | 0 |
| 41 (Note 8) | 10MHz | | QPSK | 40 | 10 |
| 42 (Note 7) | 10MHz | | QPSK | 50 | 0 |
| 43 (Note 7) | 10MHz | | 16QAM (Note 5) | 50 | 0 |
| 44 (Note 8) | 15MHz | | QPSK | 1 | 0 |
| 45 (Note 8) | 15MHz | | QPSK | 1 | 74 |
| 46 (Note 8) | 15MHz | | QPSK | 32 | 0 |
| 47 (Note 8) | 15MHz | | QPSK | 60 | 15 |
| 48 (Note 7) | 15MHz | | QPSK | 75 | 0 |
| 49 (Note 7) | 15MHz | | 16QAM (Note 5) | 75 | 0 |
| 50 (Note 8) | 20MHz | | QPSK | 1 | 0 |
| 51 (Note 8) | 20MHz | | QPSK | 1 | 99 |
| 52 (Note 8) | 20MHz | | QPSK | 36 | 0 |
| 53 (Note 8) | 20MHz | | QPSK | 75 | 25 |
| 54 (Note 7) | 20MHz | | QPSK | 100 | 0 |
| 55 (Note 7) | 20MHz | | 16QAM (Note 5) | 100 | 0 |

Note 1: Test Channel Bandwidths are checked separately for E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: The configuration ID will be used to map the applicable Test Configuration to be corresponding Test Requirement in subclause 6.2.4 as not all combinations are necessarily required based on the applicability of the UE.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 4: Applies only for UE-Categories ≥2.
Note 5: Void.
Note 6: Applies only for Rel-11 and earlier.
Note 7: Applies only for Rel-12 and later.
Note 8: Applies only for Rel-12 and later and Low Range.
Note 9: Applies only for Rel-12 and later and Mid, High Range and additional test frequencies.

**Table 6.2.4B.4.1-3: Test Configuration Table (network signalled value "NS_05")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range<br><br>In case of Low range:<br>- For 5MHz Channel Bandwidth: 1927.2MHz (NUL = 18072)<br>- For 10 MHz Channel Bandwidth: 1934.7 MHz (NUL = 18147)<br>- For 15 MHz Channel Bandwidth: 1932.5 MHz (NUL = 18125)<br>- For 20 MHz Channel Bandwidth: 1930 MHz (NUL = 18100) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_05 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 5MHz | | | QPSK | 1 | 24 |
| 3 | 5MHz | | | QPSK | 25 | 0 |
| 4 | 10MHz | | | QPSK | 1 | 0 |
| 5 | 10MHz | | | QPSK | 1 | 49 |
| 6 | 10MHz | | | QPSK | 12 | 0 |
| 7 | 10MHz | | | QPSK | 12 | 37 |
| 8 | 10MHz | | | QPSK | 48 | 0 |
| 9 | 10MHz | | | QPSK | 48 | 2 |
| 10 (Note 5) | 10MHz | | | QPSK | 50 | 0 |
| 11 (Note 5) | 10MHz | | | 16QAM | 50 (Note 4) | 0 |
| 12 (Note 6) | 15MHz | | | QPSK | 1 | 8 |
| 13 (Note 6) | 15MHz | | | QPSK | 1 | 66 |
| 14 (Note 6) | 15MHz | | | QPSK | 16 | 8 |
| 15 (Note 6) | 15MHz | | | QPSK | 16 | 51 |
| 16 (Note 6) | 15MHz | | | QPSK | 30 | 8 |
| 17 (Note 6) | 15MHz | | | QPSK | 30 | 38 |
| 18 (Note 6) | 20MHz | | | QPSK | 1 | 24 |
| 19 (Note 6) | 20MHz | | | QPSK | 1 | 75 |
| 20 (Note 6) | 20MHz | | | QPSK | 18 | 24 |
| 21 (Note 6) | 20MHz | | | QPSK | 18 | 58 |
| 22 (Note 6) | 20MHz | | | QPSK | 24 | 24 |
| 23 (Note 6) | 20MHz | | | QPSK | 24 | 52 |
| 24 (Note 7) | 15MHz | | | QPSK | 1 | 0 |
| 25 (Note 7) | 15MHz | | | QPSK | 1 | 74 |
| 26 (Note 7) | 15MHz | | | QPSK | 16 | 0 |
| 27 (Note 7) | 15MHz | | | QPSK | 16 | 59 |

| | | | | | |
|---|---|---|---|---|---|
| 28 (Note 7) | 15MHz | | QPSK | 48 | 0 |
| 29 (Note 7) | 15MHz | | QPSK | 48 | 27 |
| 30 (Note 7) | 15MHz | | QPSK | 75 | 0 |
| 31 (Note 7) | 15MHz | | 16QAM | 75 (Note 4) | 0 |
| 32 (Note 7) | 20MHz | | QPSK | 1 | 0 |
| 33 (Note 7) | 20MHz | | QPSK | 1 | 99 |
| 34 (Note 7) | 20MHz | | QPSK | 18 | 0 |
| 35 (Note 7) | 20MHz | | QPSK | 18 | 82 |
| 36 (Note 7) | 20MHz | | QPSK | 48 | 0 |
| 37 (Note 7) | 20MHz | | QPSK | 48 | 52 |
| 38 (Note 7) | 20MHz | | QPSK | 100 | 0 |
| 39 (Note 7) | 20MHz | | 16QAM | 100 (Note 4) | 0 |
| 40 (Note 8) | 10MHz | | QPSK | 50 | 0 |
| 41 (Note 8) | 10MHz | | 16QAM | 50 (Note 4) | 0 |
| 42 (Note 8) | 15MHz | | QPSK | 1 | 0 |
| 43 (Note 8) | 15MHz | | QPSK | 75 | 0 |
| 44 (Note 8) | 15MHz | | QPSK | 16 | 8 |
| 45 (Note 8) | 15MHz | | QPSK | 30 | 8 |
| 46 (Note 8) | 15MHz | | QPSK | 54 | 8 |
| 47 (Note 8) | 15MHz | | QPSK | 64 | 8 |
| 48 (Note 8) | 15MHz | | QPSK | 1 | 74 |
| 49 (Note 8) | 15MHz | | QPSK | 6 | 69 |
| 50 (Note 8) | 15MHz | | QPSK | 8 | 67 |
| 51 (Note 8) | 20MHz | | QPSK | 1 | 0 |
| 52 (Note 8) | 20MHz | | QPSK | 100 | 0 |
| 53 (Note 8) | 20MHz | | QPSK | 18 | 24 |
| 54 (Note 8) | 20MHz | | QPSK | 24 | 24 |
| 55 (Note 8) | 20MHz | | QPSK | 40 | 24 |
| 56 (Note 8) | 20MHz | | QPSK | 50 | 24 |
| 57 (Note 8) | 20MHz | | QPSK | 72 | 24 |
| 58 (Note 8) | 20MHz | | QPSK | 1 | 99 |
| 59 (Note 8) | 20MHz | | QPSK | 6 | 94 |
| 60 (Note 8) | 20MHz | | QPSK | 24 | 76 |
| 61 | 10MHz | | QPSK | 50 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| (Note 9) | | | | | |
| 62 (Note 9) | 10MHz | | 16QAM | 50 (Note 4) | 0 |
| 63 (Note 9) | 15MHz | | QPSK | 1 | 0 |
| 64 (Note 9) | 15MHz | | QPSK | 1 | 74 |
| 65 (Note 9) | 15MHz | | QPSK | 16 | 0 |
| 66 (Note 9) | 15MHz | | QPSK | 16 | 59 |
| 67 (Note 9) | 15MHz | | QPSK | 48 | 0 |
| 68 (Note 9) | 15MHz | | QPSK | 48 | 27 |
| 69 (Note 9) | 15MHz | | QPSK | 75 | 0 |
| 70 (Note 9) | 15MHz | | 16QAM | 75 (Note 4) | 0 |
| 71 (Note 9) | 20MHz | | QPSK | 1 | 0 |
| 72 (Note 9) | 20MHz | | QPSK | 1 | 99 |
| 73 (Note 9) | 20MHz | | QPSK | 18 | 0 |
| 74 (Note 9) | 20MHz | | QPSK | 18 | 82 |
| 75 (Note 9) | 20MHz | | QPSK | 48 | 0 |
| 76 (Note 9) | 20MHz | | QPSK | 48 | 52 |
| 77 (Note 9) | 20MHz | | QPSK | 100 | 0 |
| 78 (Note 9) | 20MHz | | 16QAM | 100 (Note 4) | 0 |

Note 1: Void
Note 2: Void
Note 3: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 4: Applies only for UE-Categories ≥2.
Note 5: Applies when bit number 1 in modifiedMPRbehavior = 0 (Rel-11 minimum requirements apply) for Band1 and not available for Band65.
Note 6: Applies for low range and when bit number 1 in modifiedMPRbehavior = 0 (Rel-11 minimum requirements apply) for Band1 and not available for Band65.
Note 7: Applies for mid range and when bit number 1 in modifiedMPRbehavior = 0 (Rel-11 minimum requirements apply) for Band1 and not available for Band65.
Note 8: Applies only for low range and when bit number 1 in modifiedMPRbehavior = 1 (Rel-12 minimum requirements apply) for Band1 and low range for Band65.
Note 9: Applies only for mid range and when bit number 1 in modifiedMPRbehavior = 1 (Rel-12 minimum requirements apply) for Band1 and mid range for Band65.
Note 10: ModifiedMPRbehavior is defined in annex J.1.

**Table 6.2.4B.4.1-4: Test Configuration Table (network signalled value "NS_06")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] clause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] clause 4.3.1) | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] clause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | |
| **Test Parameters for NS_05 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| Configuration ID | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD |
| 1 | 1.4MHz | N/A for A-MPR testing | | QPSK | 6 |
| 2 | 1.4MHz | | | QPSK | 5 |
| 3 | 1.4MHz | | | 16QAM | 5 |
| 4 | 3MHz | | | QPSK | 15 |
| 5 | 3MHz | | | QPSK | 4 |
| 6 | 3MHz | | | 16QAM | 4 |
| 7 | 5MHz | | | QPSK | 25 |
| 8 | 5MHz | | | QPSK | 8 |
| 9 | 5MHz | | | 16QAM | 8 |
| 10 | 10MHz | | | QPSK | 50 |
| 11 | 10MHz | | | QPSK | 12 |
| 12 | 10MHz | | | 16QAM | 12 |
| 13 | 15MHz | | | QPSK | 75 |
| 14 | 15MHz | | | QPSK | 16 |
| 15 | 15MHz | | | 16QAM | 16 |
| 16 | 20MHz | | | QPSK | 100 |
| 17 | 20MHz | | | QPSK | 18 |
| 18 | 20MHz | | | 16QAM | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in clause 6.2.4B.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 3: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

**Table 6.2.4B.4.1-5: Test Configuration Table (network signalled value "NS_07")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] clause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] clause 4.3.1) | | | | Mid range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] clause 4.3.1) | | | | 10MHz | | |
| **Test Parameters for NS_07 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Configuration ID | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD | $RB_{start}$ FDD |
| 1 | 10MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 10MHz | | | QPSK | 8 | 0 |
| 3 | 10MHz | | | QPSK | 6 | 13 |
| 4 | 10MHz | | | QPSK | 20 | 13 |
| 5 | 10MHz | | | QPSK | 12 | 13 |
| 6 | 10MHz | | | 16QAM | 36 | 13 |
| 7 | 10MHz | | | QPSK | 16 | 19 |
| 8 | 10MHz | | | QPSK | 12 | 19 |
| 9 | 10MHz | | | 16QAM | 16 | 19 |
| 10 | 10MHz | | | QPSK | 30 | 19 |
| 11 | 10MHz | | | 16QAM | 30 | 19 |
| 12 | 10MHz | | | QPSK | 6 | 43 |
| 13 | 10MHz | | | QPSK | 2 | 48 |
| 14 | 10MHz | | | QPSK | 50 | 0 |
| 15 | 10MHz | | | QPSK | 12 | 0 |
| 16 | 10MHz | | | 16QAM | 50 | 0 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in clause 6.2.4B.5 as not all combinations are necessarily required based on the applicability of the UE. | | | | | | |

**Table 6.2.4B.4.1-6: Test Configuration Table (network signalled value "NS_08")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] clause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] clause 4.3.1) | | | | High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] clause 4.3.1) | | | | 5MHz, 10MHz, 15MHz | |
| **Test Parameters for NS_08 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| Configuration ID | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | QPSK | 25 |
| 4 | 10MHz | | | QPSK | 1 |
| 5 | 10MHz | | | QPSK | 12 |
| 6 | 10MHz | | | QPSK | 40 |
| 7 | 10MHz | | | QPSK | 50 |
| 8 | 10MHz | | | 16QAM | 50 |
| 9 | 15MHz | | | QPSK | 1 |
| 10 | 15MHz | | | QPSK | 16 |
| 11 | 15MHz | | | QPSK | 40 |
| 12 | 15MHz | | | QPSK | 75 |
| 13 | 15MHz | | | 16QAM | 75 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in clause 6.2.4B.5 as not all combinations are necessarily required based on the applicability of the UE. | | | | | |
| Note 2: The 1 RB allocation shall be tested at both RB #0 and RB #max. | | | | | |
| Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max + 1 - RB allocation) of the channel bandwidth. | | | | | |

**Table 6.2.4B.4.1-7: Test Configuration Table (network signalled value "NS_09")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] clause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] clause 4.3.1) | | | | High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] clause 4.3.1) | | | | 5MHz, 10MHz, 15MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| Configuration ID | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | QPSK | 25 |
| 4 | 10MHz | | | QPSK | 1 |
| 5 | 10MHz | | | QPSK | 12 |
| 6 | 10MHz | | | QPSK | 40 |
| 7 | 10MHz | | | QPSK | 50 |
| 8 | 10MHz | | | 16QAM | 50 |
| 9 | 15MHz | | | QPSK | 1 |
| 10 | 15MHz | | | QPSK | 16 |
| 11 | 15MHz | | | QPSK | 40 |
| 12 | 15MHz | | | QPSK | 54 |
| 13 | 15MHz | | | QPSK | 75 |
| 14 | 15MHz | | | 16QAM | 75 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in clause 6.2.4B.5 as not all combinations are necessarily required based on the applicability of the UE. | | | | | |
| Note 2: The 1 RB allocation shall be tested at both RB #0 and RB #max. | | | | | |
| Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max + 1 - RB allocation) of the channel bandwidth. | | | | | |

**Table 6.2.4B.4.1-8: Test Configuration Table (network signalled value "NS_11")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] clause 4.1) | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] clause 4.3.1) | | | Low range<br>For 3 MHz Channel Bandwidth:<br>a. UL 2001.5 MHz (N_UL=25515), DL 2181.5 MHz(N_DL=7515)<br>b UL 2004.5 MHz (N_UL=25545), DL 2184.5 (N_DL=7545)<br><br>For 5 MHz Channel Bandwidth:<br>a. UL 2002.5 MHz (N_UL=25525), DL 2182.5 MHz(N_DL=7525)<br>b. UL 2004.5 MHz (N_UL=25545), DL 2184.5 MHz(N_DL=7545)<br>c. UL 2007.5 MHz (N_UL=25575), DL 2187.5 MHz(N_DL=7575)<br><br>For 10 MHz Channel Bandwidth:<br>UL 2005 MHz (N_UL=25550), DL 2185 MHz (N_DL=7550) | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] clause 4.3.1) | | | 1.4MHz, 3MHz, 5MHz, 10MHz | | |
| **Test Parameters for NS_11 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 3MHz | N/A for A-MPR testing | | QPSK | 6 |
| 2 | 3MHz | | | QPSK | 15 |
| 3 | 3MHz | | | 16QAM | 6 |
| 4 | 3MHz | | | 16QAM | 15 |
| 5 | 5MHz | | | QPSK | 1 |
| 6 | 5MHz | | | QPSK | 8 |
| 7 | 5MHz | | | QPSK | 25 |
| 8 | 5MHz | | | 16QAM | 8 |
| 9 | 5MHz | | | 16QAM | 25 |
| 10 | 10MHz | | | QPSK | 1 |
| 11 | 10MHz | | | QPSK | 12 |
| 12 | 10MHz | | | QPSK | 50 |
| 13 | 10MHz | | | 16QAM | 12 |
| 14 | 10MHz | | | 16QAM | 50 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in clause 6.2.4B.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

**Table 6.2.4B.4.1-9: Test Configuration Table (network signalled value "NS_12")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] clause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: UL 814.9 MHz (NUL = 26699)<br><br>For 3 MHz Channel Bandwidth: UL 815.7 MHz (NUL = 26707)<br><br>For 5 MHz Channel Bandwidth: UL 816.7 MHz (NUL = 26717)<br><br>For 10 MHz Channel Bandwidth: UL 819.2 MHz (NUL = 26742)<br><br>For 15 MHz Channel Bandwidth: UL 821.7 MHz (NUL = 26767) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz and 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation FDD | RBstart FDD |
| 1 | 1.4 MHz | N/A for A-MPR testing. | | QPSK | 1 | 0 |
| 2 | 1.4 MHz | | | QPSK | 6 | 0 |
| 3 | 1.4 MHz | | | QPSK | 1 | 1 |
| 4 | 1.4 MHz | | | QPSK | 5 | 1 |
| 5 | 1.4 MHz | | | 16QAM | 6 | 0 |
| 6 (Note 1) | 3 MHz | | | QPSK | 4 | 0 |
| 7 (Note 1) | 3 MHz | | | QPSK | 6 | 0 |
| 8 | 3 MHz | | | QPSK | 4 | 4 |
| 9 | 3 MHz | | | QPSK | 6 | 4 |
| 10 (Note 1) | 3 MHz | | | 16QAM | 15 | 0 |
| 11 | 5 MHz | | | QPSK | 8 | 0 |
| 12 | 5 MHz | | | QPSK | 15 | 0 |
| 13 | 5 MHz | | | QPSK | 8 | 7 |
| 14 (Note 1) | 5 MHz | | | QPSK | 15 | 7 |
| 15 | 5 MHz | | | 16QAM | 25 | 0 |
| 16 (Note 2) | 10 MHz | | | QPSK | 18 | 0 |
| 17 (Note 2) | 10 MHz | | | QPSK | 18 | 16 |
| 18 (Note 2) | 10 MHz | | | 16QAM | 50 | 0 |
| 19 (Note 2) | 15 MHz | | | QPSK | 30 | 0 |
| 20 (Note 2) | 15 MHz | | | QPSK | 30 | 31 |
| 21 (Note 2) | 15 MHz | | | 16QAM | 75 | 0 |
| Note 1: Only for UEs of Rel-11 and earlier<br>Note 2: Only for UEs of Rel-12 and later | | | | | | |

**Table 6.2.4B.4.1-10: Test Configuration Table (network signalled value "NS_13")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] clause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: UL 819.7 MHz (NUL = 26747)<br><br>For 3 MHz Channel Bandwidth: UL 820.5 MHz (NUL = 26755)<br><br>For 5 MHz Channel Bandwidth: UL 821.5 MHz (NUL = 26765) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | 1.4 MHz, 3MHz and 5 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Test Number** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 (Note 1) | 1.4 MHz | N/A for A-MPR testing. | | QPSK | 6 | 0 |
| 2 (Note 1) | 3 MHz | | | QPSK | 15 | 0 |
| 3 | 5 MHz | | | QPSK | 1 | 0 |
| 4 | 5 MHz | | | QPSK | 25 | 0 |
| 5 | 5 MHz | | | QPSK | 15 | 0 |
| 6 | 5 MHz | | | QPSK | 15 | 7 |
| 7 | 5 MHz | | | 16QAM | 25 | 0 |
| Note 1: Only for UEs of Rel-12 and later | | | | | | |

**Table 6.2.4B.4.1-11: Test Configuration Table (network signalled value "NS_14")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] clause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | For 10 MHz Channel Bandwidth: UL 829 MHz (NUL = 26840)<br><br>For 15 MHz Channel Bandwidth: Mid range | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | 10 MHz, 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation FDD | RBstart FDD |
| 1 | 10 MHz | N/A for A-MPR testing. | | QPSK | 1 | 0 |
| 2 | 10 MHz | | | QPSK | 25 | 0 |
| 3 | 10 MHz | | | QPSK | 50 | 0 |
| 4 | 10 MHz | | | QPSK | 25 | 1 |
| 5 | 10 MHz | | | 16QAM | 50 | 0 |
| 6 | 15 MHz | | | QPSK | 8 | 0 |
| 7 | 15 MHz | | | QPSK | 25 | 0 |
| 8 | 15 MHz | | | QPSK | 75 | 0 |
| 9 | 15 MHz | | | QPSK | 50 | 15 |
| 10 | 15 MHz | | | 16QAM | 75 | 0 |

**Table 6.2.4B.4.1-12: Test Configuration Table (network signalled value "NS_15")**

| Initial Conditions | |
|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | NC |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | For 1.4 MHz Channel Bandwidth: High range<br>For 3 MHz Channel Bandwidth: UL 843.5 MHz ($N_{UL}$ = 26985) or High range<br><br>For 5 MHz Channel Bandwidth: UL 842.5 MHz ($N_{UL}$ = 26975) or High range<br>For 10 MHz Channel Bandwidth: UL 840 MHz ($N_{UL}$ = 26950) or High range<br>For 15 MHz Channel Bandwidth: UL 837.5 MHz ($N_{UL}$ = 26925) or High range |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz |

| Test Parameters for Channel Bandwidths | | | | | | |
|---|---|---|---|---|---|---|
| | | Downlink Configuration | | Uplink Configuration | | |
| Configuration ID | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation FDD | RBstart FDD |
| 1 (note 3) | 1.4 MHz | N/A for A-MPR testing. | | QPSK | 4 | 0 |
| 2 (note 3) | 1.4 MHz | | | 16QAM | 6 | 0 |
| 3 (note 3) | 3 MHz | | | QPSK | 6 | 7 |
| 4 (note 3) | 3 MHz | | | QPSK | 12 | 1 |
| 5 (note 3) | 3 MHz | | | 16QAM | 15 | 0 |
| 6 (note 2) | 3 MHz | | | QPSK | 15 | 0 |
| 7 (note 3) | 5 MHz | | | QPSK | 6 | 14 |
| 8 (note 3) | 5 MHz | | | QPSK | 20 | 0 |
| 9 (note 3) | 5 MHz | | | 16QAM | 25 | 0 |
| 10 (note 2) | 5 MHz | | | QPSK | 16 | 9 |
| 11 (note 2) | 5 MHz | | | QPSK | 25 | 0 |
| 12 (note 3) | 10 MHz | | | QPSK | 1 | 39 |
| 13 (note 3) | 10 MHz | | | QPSK | 1 | 10 |
| 14 (note 3) | 10 MHz | | | QPSK | 3 | 0 |
| 15 (note 3) | 10 MHz | | | QPSK | 20 | 3 |
| 16 (note 3) | 10 MHz | | | QPSK | 36 | 1 |
| 17 (note 3) | 10 MHz | | | QPSK | 50 | 0 |
| 18 (note 1, 3) | 10 MHz | | | 16QAM | 50 | 0 |
| 19 (note 2) | 10 MHz | | | QPSK | 20 | 25 |
| 20 (note 2) | 10 MHz | | | QPSK | 45 | 0 |
| 21 (note 3) | 15 MHz | | | QPSK | 18 | 36 |
| 22 (note 3) | 15 MHz | | | QPSK | 25 | 1 |
| 23 (note 3) | 15 MHz | | | QPSK | 54 | 0 |
| 24 (note 1, 3) | 15 MHz | | | 16QAM | 75 | 0 |
| 25 (note 2) | 15 MHz | | | QPSK | 18 | 44 |

| | | | | | |
|---|---|---|---|---|---|
| 26 (note 2) | 15 MHz | | QPSK | 60 | 2 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: Applicable only test frequency < high range
Note 3: Applicable only to high range frequency testing

**Table 6.2.4B.4.1-13: Test Configuration Table (network signalled value "NS_16")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: Low range<br><br>For 3 MHz Channel Bandwidth: Low range, 810 MHz ($N_{UL}$= 27070)<br><br>For 5 MHz Channel Bandwidth: Low range, 811 MHz ($N_{UL}$= 27080), 814.5 MHz ($N_{UL}$= 27115)<br><br>For 10 MHz Channel Bandwidth: Low range, 813.5 MHz ($N_{UL}$= 27105), 817 MHz ($N_{UL}$= 27140) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for A-MPR testing. | | QPSK | 1 | 0 |
| 2 | 1.4 MHz | | | QPSK | 6 | 0 |
| 3 | 1.4 MHz | | | 16QAM | 6 | 0 |
| 4 | 3 MHz | | | QPSK | 1 | 0 |
| 5 | 3 MHz | | | QPSK | 12 | 1 |
| 62 | 3 MHz | | | QPSK | 15 | 0 |
| 7 | 3 MHz | | | 16QAM | 15 | 0 |
| 8 | 5 MHz | | | QPSK | 1 | 0 |
| 95 | 5 MHz | | | QPSK | 12 | 2 |
| 10 | 5 MHz | | | QPSK | 18 | 2 |
| 11 | 5 MHz | | | QPSK | 20 | 0 |
| 12 | 5 MHz | | | QPSK | 20 | 2 |
| 13 | 5 MHz | | | QPSK | 25 | 0 |
| 14 | 5 MHz | | | 16QAM | 25 | 0 |
| 15 | 10 MHz | | | QPSK | 1 | 0 |
| 16<br>(Note 2) | 10 MHz | | | QPSK | 1 | 10 |

| | | | | | |
|---|---|---|---|---|---|
| 17 (Note 2) | 10 MHz | | QPSK | 20 | 0 |
| 18 (Note 2) | 10 MHz | | QPSK | 27 | 15 |
| 19 (Note 2) | 10 MHz | | QPSK | 32 | 15 |
| 20 | 10 MHz | | QPSK | 32 | 0 |
| 21 | 10 MHz | | QPSK | 50 | 0 |
| 22 (Note 1) | 10 MHz | | 16QAM | 50 | 0 |
| 23 (Note 3) | 10 MHz | | QPSK | 40 | 0 |
| 24 (Note 3) | 10 MHz | | QPSK | 40 | 1 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: Applies only for 10 MHz channel for Low Range, and 813.5 MHz
Note 3: Applies only for 10 MHz channel for 817 MHz range

**Table 6.2.4B.4.1-14: Test Configuration Table (network signalled value "NS_20")**

**TBD**

**Table 6.2.4B.4.1-15: Test Configuration Table (network signalled value "NS_21")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | NC | | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | Low range or High range | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | 5 MHz, 10 MHz | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 (note 2) | 5 MHz | | | QPSK | 1 | 0 |
| 2 (note 2) | 5 MHz | | | QPSK | 25 | 0 |
| 3 (note 2) | 10 MHz | | | QPSK | 1 | 0 |
| 4 (note 3) | 10 MHz | | | QPSK | 1 | 49 |
| 5 (note 2) | 10 MHz | | | QPSK | 15 | 0 |
| 6 (note 3) | 10 MHz | | | QPSK | 3 | 47 |
| 7 (note 3) | 10 MHz | | | QPSK | 50 | 0 |
| 8 (note 1, 3) | 10 MHz | | | 16QAM | 50 | 0 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: Applicable only to low range frequency testing.
Note 3: Applicable only to high range frequency testing.

**Table 6.2.4B.4.1-16: Test Configuration Table (network signalled value "NS_22")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_22 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 5MHz | | | QPSK | 25 | 0 |
| 3 | 5MHz | | | QPSK | 1 | 24 |
| 4 | 5MHz | | | 16QAM | 1 | 0 |
| 5 | 5MHz | | | 16QAM | 1 | 24 |
| 6 | 10MHz | | | QPSK | 50 | 0 |
| 7 | 10MHz | | | QPSK | 36 | 0 |
| 8 | 10MHz | | | QPSK | 1 | 0 |
| 9 | 10MHz | | | QPSK | 1 | 49 |
| 10 | 10MHz | | | 16QAM | 1 | 0 |
| 11 | 10MHz | | | 16QAM | 1 | 49 |
| 12 | 15MHz | | | QPSK | 75 | 0 |
| 13 | 15MHz | | | QPSK | 50 | 0 |
| 14 | 15MHz | | | QPSK | 1 | 0 |
| 15 | 15MHz | | | QPSK | 1 | 74 |
| 16 | 15MHz | | | 16QAM | 1 | 0 |
| 17 | 15MHz | | | 16QAM | 1 | 74 |
| 18 | 20MHz | | | QPSK | 100 | 0 |
| 19 | 20MHz | | | QPSK | 64 | 0 |
| 20 | 20MHz | | | QPSK | 1 | 0 |
| 21 | 20MHz | | | QPSK | 1 | 99 |
| 22 | 20MHz | | | 16QAM | 1 | 0 |
| 23 | 20MHz | | | 16QAM | 1 | 99 |

**Table 6.2.4B.4.1-17: Test Configuration Table (network signalled value "NS_23")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_23 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 5MHz | | | QPSK | 1 | 24 |
| 3 | 5MHz | | | QPSK | 25 | 0 |
| 4 | 5MHz | | | 16QAM | 1 | 0 |
| 5 | 5MHz | | | 16QAM | 1 | 24 |
| 6 | 10MHz | | | QPSK | 50 | 0 |
| 7 | 15MHz | | | QPSK | 75 | 0 |
| 8 | 20MHz | | | QPSK | 100 | 0 |

**Table 6.2.4B.4.1-18: Test Configuration Table (network signalled value "NS_24")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>5MHz CH BW:<br>- 1985 MHz ($N_{UL}$ = 131722)<br>10 and 15 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_24 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | High | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | High | 5MHz | | | QPSK | 8 | 17 |
| 3 | High | 5MHz | | | QPSK | 25 | 0 |
| 4 (Notes 2,3) | High | 5MHz | | | 16QAM | 25 | 0 |
| 5 | 1985 | 5MHz | | | QPSK | 8 | 17 |
| 6 | 1980 | 10MHz | | | QPSK | 12 | 1 |
| 7 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 50 | 0 |
| 8 | 1980 | 10MHz | | | QPSK | 48 | 2 |
| 9 | 1980 | 10MHz | | | QPSK | 25 | 25 |
| 10 | 1980 | 10MHz | | | QPSK | 1 | 49 |
| 11 | 1980 | 10MHz | | | QPSK | 12 | 38 |
| 12 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 12 | 38 |
| 13 | 1980 | 10MHz | | | QPSK | 3 | 47 |
| 14 | 1980 | 10MHz | | | QPSK | 8 | 1 |
| 15 | 1990 | 10MHz | | | QPSK | 1 | 0 |
| 16 | 1990 | 10MHz | | | QPSK | 12 | 38 |
| 17 (Notes 2,3) | 1990 | 10MHz | | | 16QAM | 50 | 0 |
| 18 | High | 10MHz | | | QPSK | 12 | 38 |
| 19 | High | 10MHz | | | QPSK | 50 | 0 |
| 20 (Notes 2,3) | High | 10MHz | | | 16QAM | 50 | 0 |
| 21 | 1980 | 15MHz | | | QPSK | 1 | 11 |
| 22 | 1980 | 15MHz | | | QPSK | 16 | 11 |
| 23 | 1980 | 15MHz | | | QPSK | 45 | 11 |
| 24 (Notes 2,3) | 1980 | 15MHz | | | 16QAM | 50 | 0 |
| 25 | 1980 | 15MHz | | | QPSK | 16 | 28 |
| 26 | 1980 | 15MHz | | | QPSK | 16 | 59 |
| 27 | 1980 | 15MHz | | | QPSK | 60 | 15 |
| 28 | 1980 | 15MHz | | | QPSK | 30 | 12 |
| 29 | High | 15MHz | | | QPSK | 1 | 0 |
| 30 | High | 15MHz | | | QPSK | 16 | 59 |
| 31 (Notes 2,3) | High | 15MHz | | | 16QAM | 16 | 59 |
| 32 (Notes 2,3) | High | 15MHz | | | 16QAM | 75 | 0 |
| 33 | High | 20MHz | | | QPSK | 1 | 0 |
| 34 | High | 20MHz | | | QPSK | 18 | 82 |
| 35 (Notes 2,3) | High | 20MHz | | | 16QAM | 18 | 82 |
| 36 (Notes 2,3) | High | 20MHz | | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: Applies only for UE-Categories ≥2.
Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4B.4.1-19: Test Configuration Table (network signalled value "NS_25")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>10 and 15 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772) | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_25 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | High | 5MHz | N/A for A-MPR testing | | QPSK | 25 | 0 |
| 2 (Notes 2,3) | High | 5MHz | | | 16QAM | 25 | 0 |
| 3 | High | 5MHz | | | QPSK | 8 | 9 |
| 4 | High | 5MHz | | | QPSK | 1 | 24 |
| 5 | High | 5MHz | | | QPSK | 8 | 17 |
| 6 (Notes 2,3) | High | 5MHz | | | 16QAM | 8 | 17 |
| 7 | 1980 | 10MHz | | | QPSK | 12 | 1 |
| 8 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 50 | 0 |
| 9 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 48 | 2 |
| 10 | 1980 | 10MHz | | | QPSK | 25 | 25 |
| 11 | 1980 | 10MHz | | | QPSK | 1 | 49 |
| 12 | 1980 | 10MHz | | | QPSK | 12 | 38 |
| 13 | 1990 | 10MHz | | | QPSK | 12 | 0 |
| 14 | 1990 | 10MHz | | | QPSK | 25 | 0 |
| 15 | 1990 | 10MHz | | | QPSK | 50 | 0 |
| 16 (Notes 2,3) | 1990 | 10MHz | | | 16QAM | 25 | 0 |
| 17 | 1990 | 10MHz | | | QPSK | 48 | 2 |
| 18 | 1990 | 10MHz | | | QPSK | 30 | 19 |
| 19 (Notes 2,3) | 1990 | 10MHz | | | 16QAM | 30 | 19 |
| 20 | 1990 | 10MHz | | | QPSK | 12 | 31 |
| 21 | High | 10MHz | | | QPSK | 1 | 0 |
| 22 | High | 10MHz | | | QPSK | 12 | 6 |
| 23 | High | 10MHz | | | QPSK | 50 | 0 |
| 24 (Notes 2,3) | High | 10MHz | | | 16QAM | 50 | 0 |
| 25 | High | 10MHz | | | QPSK | 40 | 10 |
| 26 (Notes 2,3) | High | 10MHz | | | 16QAM | 40 | 10 |
| 27 | High | 10MHz | | | QPSK | 32 | 18 |
| 28 (Notes 2,3) | High | 10MHz | | | 16QAM | 32 | 18 |
| 29 | High | 10MHz | | | QPSK | 12 | 23 |
| 30 | 1980 | 15MHz | | | QPSK | 16 | 4 |
| 31 | 1980 | 15MHz | | | QPSK | 75 | 0 |
| 32 | 1980 | 15MHz | | | QPSK | 60 | 15 |
| 33 (Notes 2,3) | 1980 | 15MHz | | | 16QAM | 40 | 35 |
| 34 | 1980 | 15MHz | | | QPSK | 1 | 74 |
| 35 | 1980 | 15MHz | | | QPSK | 12 | 63 |
| 36 | 1980 | 15MHz | | | QPSK | 16 | 55 |
| 37 | High | 15MHz | | | QPSK | 1 | 0 |
| 38 | High | 15MHz | | | QPSK | 16 | 0 |
| 39 (Notes 2,3) | High | 15MHz | | | 16QAM | 16 | 0 |
| 40 (Notes 2,3) | High | 15MHz | | | 16QAM | 1 | 0 |
| 41 | 1980 | 20MHz | | | QPSK | 1 | 0 |
| 42 | 1980 | 20MHz | | | QPSK | 18 | 0 |
| 43 (Notes 2,3) | 1980 | 20MHz | | | 16QAM | 100 | 0 |
| 44 | 1980 | 20MHz | | | QPSK | 64 | 36 |
| 45 | 1980 | 20MHz | | | QPSK | 18 | 72 |
| 46 (Notes 2,3) | 1980 | 20MHz | | | 16QAM | 54 | 46 |
| 47 | 1980 | 20MHz | | | QPSK | 18 | 55 |
| 48 | High | 20MHz | | | QPSK | 1 | 0 |
| 49 | High | 20MHz | | | QPSK | 18 | 72 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 50 (Notes 2,3) | High | 20MHz | | 16QAM | 18 | 72 |
| 51 (Notes 2,3) | High | 20MHz | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: Applies only for UE-Categories ≥2.
Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4B.4.1-20: Reserved**

**Table 6.2.4B.4.1-21: Test Configuration Table (network signalled value "NS_27")**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to Frequency column in test parameters | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_27 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Frequency** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | Low/Mid | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | High | 5MHz | | | QPSK | 1 | 24 |
| 3 | Low/Mid/High | 5MHz | | | QPSK | 25 | 0 |
| 4 | Low/Mid/High | 5MHz | | | 16QAM | 25 | 0 |
| 5 | Low/Mid | 10MHz | | | QPSK | 1 | 0 |
| 6 | High | 10MHz | | | QPSK | 1 | 49 |
| 7 | Low/Mid/High | 10MHz | | | QPSK | 50 | 0 |
| 8 (Note 2) | Low/Mid/High | 10MHz | | | 16QAM | 50 | 0 |
| 9 | Low/Mid | 15MHz | | | QPSK | 1 | 0 |
| 10 | Low | 15MHz | | | QPSK | 1 | 7 |
| 11 | Low/Mid | 15MHz | | | QPSK | 16 | 0 |
| 12 | High | 15MHz | | | QPSK | 1 | 74 |
| 13 | High | 15MHz | | | QPSK | 1 | 67 |
| 14 | High | 15MHz | | | QPSK | 16 | 74 |
| 15 | Low/Mid/High | 15MHz | | | QPSK | 75 | 0 |
| 16 (Note 2) | Low/Mid/High | 15MHz | | | 16QAM | 75 | 0 |
| 17 | Low/Mid | 20MHz | | | QPSK | 1 | 0 |
| 18 | Low | 20MHz | | | QPSK | 1 | 13 |
| 19 | Low | 20MHz | | | QPSK | 1 | 16 |
| 20 | Low/Mid | 20MHz | | | QPSK | 21 | 0 |
| 21 | High | 20MHz | | | QPSK | 1 | 99 |
| 22 | High | 20MHz | | | QPSK | 1 | 86 |
| 23 | High | 20MHz | | | QPSK | 1 | 83 |
| 24 | High | 20MHz | | | QPSK | 21 | 0 |
| 25 | Low/Mid/High | 20MHz | | | QPSK | 100 | 0 |
| 26 (Note 2) | Low/Mid/High | 20MHz | | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4B.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: Applies only for UE-Categories ≥2.
Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.2.4B.4.1-22: Test Configuration Table (network signalled value "NS_35")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] clause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_35 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| Configuration ID | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 25 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | 16QAM | 8 |
| 4 | 10MHz | | | QPSK | 50 |
| 5 | 10MHz | | | QPSK | 12 |
| 6 | 10MHz | | | 16QAM | 12 |
| 7 | 15MHz | | | QPSK | 75 |
| 8 | 15MHz | | | QPSK | 16 |
| 9 | 15MHz | | | 16QAM | 16 |
| 10 | 20MHz | | | QPSK | 100 |
| 11 | 20MHz | | | QPSK | 18 |
| 12 | 20MHz | | | 16QAM | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in clause 6.2.4B.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 3: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | |

**Table 6.2.4B.4.1-23: Test Configuration Table (network signalled value "NS_36")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>5 MHz CH BW:<br>- 700.5 MHz ($N_{UL}$ = low range)<br>- 705.5 MHz ($N_{UL}$ =132747)<br>10 MHz CH BW:<br>- 703 MHz ($N_{UL}$ = low range)<br>- 708 MHz ($N_{UL}$ = 132772)<br>15 MHz CH BW:<br>- 705.5 MHz ($N_{UL}$ = low range)<br>- 710.5 MHz ($N_{UL}$ =132797 ) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz | | |
| **Test Parameters for NS_36 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 700.5 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 700.5 | 5MHz | | | QPSK | 25 | 0 |
| 3 | 700.5 | 5MHz | | | QPSK | 20 | 1 |
| 4 | 700.5 | 5MHz | | | QPSK | 24 | 1 |
| 5 | 700.5 | 5MHz | | | QPSK | 12 | 0 |
| 6 (Notes 2,3) | 700.5 | 5MHz | | | 16QAM | 12 | 0 |
| 7 | 705.5 | 5MHz | | | QPSK | 25 | 0 |
| 8 (Notes 2,3) | 705.5 | 5MHz | | | 16QAM | 25 | 0 |
| 9 | 703 | 10MHz | | | QPSK | 50 | 0 |
| 10 | 703 | 10MHz | | | QPSK | 1 | 0 |
| 11 | 703 | 10MHz | | | QPSK | 40 | 9 |
| 12 | 703 | 10MHz | | | QPSK | 36 | 13 |
| 13 | 703 | 10MHz | | | QPSK | 10 | 40 |
| 14 | 703 | 10MHz | | | QPSK | 6 | 44 |
| 15 | 708 | 10MHz | | | QPSK | 50 | 0 |
| 16 (Notes 2,3) | 708 | 10MHz | | | 16QAM | 50 | 0 |
| 17 | 705.5 | 15MHz | | | QPSK | 75 | 0 |
| 18 | 705.5 | 15MHz | | | QPSK | 50 | 17 |
| 19 | 705.5 | 15MHz | | | QPSK | 50 | 24 |
| 20 | 705.5 | 15MHz | | | QPSK | 1 | 57 |
| 21 | 705.5 | 15MHz | | | QPSK | 10 | 17 |
| 22 | 705.5 | 15MHz | | | QPSK | 18 | 24 |
| 23 (Notes 2,3) | 705.5 | 15MHz | | | 16QAM | 18 | 24 |
| 24 | 710.5 | 15MHz | | | QPSK | 75 | 0 |
| 25 | 710.5 | 15MHz | | | 16QAM | 75 | 0 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 2: Applies only for UE-Categories ≥2.<br>Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | | |

Editor's note: The following lines belong at the end of section 6.2.4B.4.1. As new tables are added to this section, these lines should always follow the tables.

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to the applicable table from Table 6.2.4B.4.1-1 to 6.2.4B.4.1-23.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.4B.4.3.

### 6.2.4B.4.2 Test procedure

Same test procedure as in clause 6.2.4.4.2.

### 6.2.4B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, with exceptions as in clause 6.2.4.4.3.

## 6.2.4B.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable table from Table 6.2.4B.5-1 to Table 6.2.4B.5-27. The allowed A-MPR values specified in Table 6.2.4B.3-1 are in addition to the allowed MPR requirements specified in clause 6.2.3B. For the UE maximum output power modified by MPR and/or A-MPR, the power limits specified in Table 6.2.5B.3-1 apply.

**Table 6.2.4B.5-1: UE Power Class test requirements (network signalled value "NS_03") (for Bands 2 and 25)**

| Configuration ID | EUTRA band | Test Freq. | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | 2, 25 | Mid | | | | | 23 | +2.7 / -3.7 |
| 1 | 2, 25 | Low, High | | | | | 23 | +2.7 / -5.7 |
| 2 | 2, 25 | Mid | | | | | 23 | +2.7 / -2.7 |
| 2 | 2, 25 | Low, High | | | | | 23 | +2.7 / -4.2 |
| 3 | 2, 25 | Mid | | | | | 23 | +2.7 / -3.7 |
| 3 | 2, 25 | Low, High | | | | | 23 | +2.7 / -5.7 |
| 4 | 2, 25 | Mid | | | | | 23 | +2.7 / -4.7 |
| 4 | 2, 25 | Low, High | | | | | 23 | +2.7 / -7.7 |
| 5 | 2, 25 | Mid | | | | | 23 | +2.7 / -2.7 |
| 5 | 2, 25 | Low, High | | | | | 23 | +2.7 / -4.2 |
| 6 | 2, 25 | Mid | | | | | 23 | +2.7 / -6.2 |
| 6 | 2, 25 | Low, High | | | | | 23 | +2.7 / -9.2 |
| 7 | 2, 25 | Mid | | | | | 23 | +2.7 / -3.7 |
| 7 | 2, 25 | Low, High | | | | | 23 | +2.7 / -5.7 |
| 8 | 2, 25 | All | | | | | 23 | +2.7 / -4.7 |
| 9 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -3.7 |
| 9 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -5.7 |
| 10 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 10 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 11 | 2, 25 | All | | | | | 23 | +2.7 / -6.2 |
| 12 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -4.7 |
| 12 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -7.7 |
| 13 | 2, 25 | All | | | | | 23 | +2.7 / -4.7 |
| 14 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -3.7 |
| 14 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB | | | | | 23 | +2.7 / -5.7 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | allocation) | | | | | | |
| 15 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 15 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 16 | 2, 25 | All | | | | | 23 | +2.7 / -6.2 |
| 17 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -4.7 |
| 17 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -7.7 |
| 18 | 2, 25 | All | | | | | 23 | +2.7 / -4.7 |
| 19 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -3.7 |
| 19 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -5.7 |
| 20 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 20 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 21 | 2, 25 | All | | | | | 23 | +2.7 / -6.2 |
| 22 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -4.7 |
| 22 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -7.7 |
| 23 | 2, 25 | All | | | | | 23 | +2.7 / -4.7 |
| 24 | 2, 25 | All | | | | | 23 | +2.7 / -3.7 |
| 25 | 2, 25 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 25 | 2, 25 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 26 | 2, 25 | All | | | | | 23 | +2.7 / -6.2 |
| 27 | 2, 25 | All | | | | | 23 | +2.7 / -4.7 |

**Table 6.2.4B.5-2: UE Power Class test requirements (network signalled value "NS_03") (for Bands 4, 10, 23, 35, 36, 66 and 70)**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 4,10, 23,35,36, 66 | | | | | 23 | +2.7 / -3.7 |
| 2 | 4,10, 23,35,36, 66 | | | | | 23 | +2.7 / -2.7 |
| 3 | 4,10, 23,35,36, 66 | | | | | 23 | +2.7 / -3.7 |
| 4 | 4,10, 23,35,36, 66 | | | | | 23 | 2.7 / -4.7 |
| 5 | 4,10, 23,35,36, 66 | | | | | 23 | +2.7 / -2.7 |
| 6 | 4,10, 23,35,36, 66 | | | | | 23 | +2.7 / -6.2 |
| 7 | 4,10, 23,35,36, 66 | | | | | 23 | +2.7 / -3.7 |
| 8 | 4,10, 23,35,36, 66,70 | | | | | 23 | 2.7 / -4.7 |
| 9 | 4,10, 23,35,36, 66,70 | | | | | 23 | +2.7 / -3.7 |
| 10 | 4,10, 23,35,36, 66,70 | | | | | 23 | +2.7 / -2.7 |
| 11 | 4,10, 23,35,36, 66,70 | | | | | 23 | +2.7 / -6.2 |
| 12 | 4,10, 23,35,36, 66,70 | | | | | 23 | 2.7 / -4.7 |
| 13 | 4,10, 23,35,36, 66,70 | | | | | 23 | 2.7 / -4.7 |
| 14 | 4,10, 23,35,36, 66,70 | | | | | 23 | +2.7 / -3.7 |
| 15 | 4,10, 23,35,36, 66,70 | | | | | 23 | +2.7 / -2.7 |
| 16 | 4,10, 23,35,36, 66,70 | | | | | 23 | +2.7 / -6.2 |
| 17 | 4,10, 23,35,36, 66,70 | | | | | 23 | 2.7 / -4.7 |
| 18 | 4,10,35,36, 66,70 | | | | | 23 | 2.7 / -4.7 |
| 19 | 4,10,35,36, 66,70 | | | | | 23 | +2.7 / -3.7 |
| 20 | 4,10,35,36, 66,70 | | | | | 23 | +2.7 / -2.7 |
| 21 | 4,10,35,36, 66,70 | | | | | 23 | +2.7 / -6.2 |
| 22 | 4,10,35,36, 66,70 | | | | | 23 | 2.7 / -4.7 |
| 23 | 4,10,35,36, 66,70 | | | | | 23 | 2.7 / -4.7 |
| 24 | 4,10,35,36, 66,70 | | | | | 23 | +2.7 / -3.7 |
| 25 | 4,10,35,36, 66,70 | | | | | 23 | +2.7 / -2.7 |
| 26 | 4,10,35,36, | | | | | 23 | +2.7 / |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 66,70 | | | | | | -6.2 |
| 27 | 4,10,35,36, 66,70 | | | | | 23 | 2.7 / -4.7 |

**Table 6.2.4B.5-3: UE Power Class test requirements (network signalled value "NS_04")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 2 (RBstart=0; Low Range) | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 |
| 2 (RBstart=0; Mid, High Range) | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 |
| 2 (RBstart=17; Low, Mid Range) | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 |
| 2 (RBstart=17; High Range) | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 |
| 3 (RBstart=0; Low Range) | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 |
| 3 (RBstart=0; Mid, High Range) | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 |
| 3 (RBstart=19; Low, Mid Range) | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 | 19.3 |
| 3 (RBstart=19; High Range) | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 |
| 4 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 5 (RBstart=0; Low Range) | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 |
| 5 (RBstart=0; Mid, High Range) | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 5 (RBstart=17; Low, Mid Range) | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 5 (RBstart=17; High Range) | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 |
| 6 (Low Range) | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |
| 6 (Mid, High Range) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 7 (Low Range) | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |
| 7 (Mid, High Range) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 8 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 9 | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 |
| 10 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 |
| 11 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 12 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 (Low, Mid Range) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 13 (High Range) | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |
| 14 (Low, Mid Range) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 14 (High Range) | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |
| 15 (Low Range) | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |
| 15 (Mid, High Range) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 16 (Low, Mid Range) | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |
| 16 (High Range) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 17 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 18 | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 |
| 19 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 |
| 20 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 21 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 22 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 23 (Low, Mid Range) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 23 (High Range) | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |
| 24 (Low Range) | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |
| 24 (Mid, High Range) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 25 (Low Range) | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |
| 25 (Mid, High Range) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 26 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 27 | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 |
| 28 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 |
| 29 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 30 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 31 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 32 (Low, Mid Range) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 32 (High Range) | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |
| 33 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 |
| 34 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 |
| 35 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 |
| 36 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 37 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 38 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |
| 39 | 17.3 | 17.3 | 17.3 | 17.3 | 17.3 | 17.3 | 17.3 |
| 40 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 41 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 42 (Low Range) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 42 (Mid, High | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Range, 2504.1 MHz) | | | | | | | |
| 43 (Low Range) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 43 (Mid, High Range, 2504.1 MHz ) | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 44 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |
| 45 | 17.3 | 17.3 | 17.3 | 17.3 | 17.3 | 17.3 | 17.3 |
| 46 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 47 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 48 (Low Range) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 48 (Mid, High Range, 2510.9 MHz) | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 |
| 49 (Low Range) | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 |
| 49 (Mid, High Range, 2510.9 MHz) | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 |
| 50 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 51 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 | 12.8 |
| 52 | 17.3 | 17.3 | 17.3 | 17.3 | 17.3 | 17.3 | 17.3 |
| 53 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 54 (Low Range) | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| 54 (Mid, High Range, 2517.6 MHz) | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 | 13.3 |
| 55 (Low Range) | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 |
| 55 (Mid, High Range, 2517.6 MHz) | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 | 12.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4B.5-4: UE Power Class test requirements (network signalled value "NS_05")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 2 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 3 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 4 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 5 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 6 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 7 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 8 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 9 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 10 | 1 | 1 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 11 | 2 | 1 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 12 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 13 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 14 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 15 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 16 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 17 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 18 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 19 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 20 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 21 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 22 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 23 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 24 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 25 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 26 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 27 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 28 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 29 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 30 | 1 | 1 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 31 | 2 | 1 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 32 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 33 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 34 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 35 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 36 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 37 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 38 | 1 | 1 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 39 | 2 | 1 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 40 | 1 | 1 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 41 | 2 | 1 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 42 | 0 | 11 | 0 | 12 | 6.0 | 25.7 | 5.3 |
| 43 | 1 | 11 | 0 | 11 | 6.0 | 25.7 | 4.3 |
| 44 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 45 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 46 | 1 | 3 | 0 | 19 | 5.0 | 25.7 | 13.3 |
| 47 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 48 | 0 | 5 | 0 | 18 | 5.0 | 25.7 | 12.3 |
| 49 | 0 | 5 | 0 | 18 | 5.0 | 25.7 | 12.3 |
| 50 | 0 | 1 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 51 | 0 | 11 | 0 | 12 | 6.0 | 25.7 | 5.3 |
| 52 | 1 | 11 | 0 | 11 | 6.0 | 25.7 | 4.3 |
| 53 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 54 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 55 | 1 | 3 | 0 | 19 | 5.0 | 25.7 | 13.3 |
| 56 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 57 | 1 | 10 | 0 | 12 | 6.0 | 25.7 | 5.3 |
| 58 | 0 | 5 | 0 | 18 | 5.0 | 25.7 | 12.3 |
| 59 | 0 | 5 | 0 | 18 | 5.0 | 25.7 | 12.3 |
| 60 | 1 | 1 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 61 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 62 | 2 | 0 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 63 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 64 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 65 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 66 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 67 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 68 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 69 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 70 | 2 | 0 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 71 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 72 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 73 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 74 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 75 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 76 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 77 | 1 | 1 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 78 | 2 | 1 | 0 | 20 | 6.0 | 25.7 | 13.3 |

**Table 6.2.4B.5-5: UE Power Class test requirements (network signalled value "NS_06") (for Band 12)**

| Configuration ID | EUTRA band | Test Freq. | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | 12 | Mid | | | | | 23 | +2.7 / -3.7 |
| 1 | 12 | Low, High | | | | | 23 | +2.7 / -5.7 |
| 2 | 12 | Mid | | | | | 23 | +2.7 / -2.7 |
| 2 | 12 | Low, High | | | | | 23 | +2.7 / -4.2 |
| 3 | 12 | Mid | | | | | 23 | +2.7 / -2.7 |
| 3 | 12 | Low, High | | | | | 23 | +2.7 / -4.2 |
| 4 | 12 | Mid | | | | | 23 | +2.7 / -3.7 |
| 4 | 12 | Low, High | | | | | 23 | +2.7 / -5.7 |
| 5 | 12 | Mid | | | | | 23 | +2.7 / -2.7 |
| 5 | 12 | Low, High | | | | | 23 | +2.7 / -4.2 |
| 6 | 12 | Mid | | | | | 23 | +2.7 / -3.7 |
| 6 | 12 | Low, High | | | | | 23 | +2.7 / -5.7 |
| 7 | 12 | All | | | | | 23 | +2.7 / -3.7 |
| 8 | 12 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 8 | 12 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 9 | 12 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -3.7 |
| 9 | 12 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -5.7 |
| 10 | 12 | All | | | | | 23 | +2.7 / -3.7 |
| 11 | 12 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 11 | 12 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 12 | 12 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -3.7 |
| 12 | 12 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -5.7 |

**Table 6.2.4B.5-6: UE Power Class test requirements (network signalled value "NS_06") (for Bands 13, 14, and 17)**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 2 | 13,14,17 | | | | | 23 | +2.7 / -2.7 |
| 3 | 13,14,17 | | | | | 23 | +2.7 / -2.7 |
| 4 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 5 | 13,14,17 | | | | | 23 | +2.7 / -2.7 |
| 6 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 7 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 8 | 13,14,17 | | | | | 23 | +2.7 / -2.7 |
| 9 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 10 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 11 | 13,14,17 | | | | | 23 | +2.7 / -2.7 |
| 12 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 13 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 14 | 13,14,17 | | | | | 23 | +2.7 / -2.7 |
| 15 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 16 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |
| 17 | 13,14,17 | | | | | 23 | +2.7 / -2.7 |
| 18 | 13,14,17 | | | | | 23 | +2.7 / -3.7 |

**Table 6.2.4B.5-7: UE Power Class test requirements (network signalled value "NS_07")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 13 | | | | | 23 | +2.7 / -18.7 |
| 2 | 13 | | | | | 23 | +2.7 / -13.7 |
| 3 | 13 | | | | | 23 | +2.7 / -2.7 |
| 4 | 13 | | | | | 23 | +2.7 / -19.7 |
| 5 | 13 | | | | | 23 | +2.7 / -18.7 |
| 6 | 13 | | | | | 23 | +2.7 / -20.7 |
| 7 | 13 | | | | | 23 | +2.7 / -3.7 |
| 8 | 13 | | | | | 23 | +2.7 / -2.7 |
| 9 | 13 | | | | | 23 | +2.7 / -4.7 |
| 10 | 13 | | | | | 23 | +2.7 / -12.7 |
| 11 | 13 | | | | | 23 | +2.7 / -13.7 |
| 12 | 13 | | | | | 23 | +2.7 / -2.7 |
| 13 | 13 | | | | | 23 | +2.0 / -5.5±TT |
| 14 | 13 | | | | | 23 | +2.7 / -19.7 |
| 15 | 13 | | | | | 23 | +2.7 / -18.7 |
| 16 | 13 | | | | | 23 | +2.7 / -20.7 |

**Table 6.2.4B.5-8: UE Power Class test requirements (network signalled value "NS_08")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 19 | | | | | 23 | +2.7 / -2.7 |
| 2 | 19 | | | | | 23 | +2.7 / -2.7 |
| 3 | 19 | | | | | 23 | +2.7 / -3.7 |
| 4 | 19 | | | | | 23 | +2.7 / -2.7 |
| 5 | 19 | | | | | 23 | +2.7 / -2.7 |
| 6 | 19 | | | | | 23 | +2.7 / -3.7 |
| 7 | 19 | | | | | 23 | +2.7 / -8.2 |
| 8 | 19 | | | | | 23 | +2.7 / -9.7 |
| 9 | 19 | | | | | 23 | +2.7 / -2.7 |
| 10 | 19 | | | | | 23 | +2.7 / -2.7 |
| 11 | 19 | | | | | 23 | +2.7 / -3.7 |
| 12 | 19 | | | | | 23 | +2.7 / -8.2 |
| 13 | 19 | | | | | 23 | +2.7 / -9.7 |

**Table 6.2.4B.5-9: UE Power Class test requirements (network signalled value "NS_09")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 21 | | | | | 23 | +2.7 / -2.7 |
| 2 | 21 | | | | | 23 | +2.7 / -2.7 |
| 3 | 21 | | | | | 23 | +2.7 / -3.7 |
| 4 | 21 | | | | | 23 | +2.7 / -2.7 |
| 5 | 21 | | | | | 23 | +2.7 / -2.7 |
| 6 | 21 | | | | | 23 | +2.7 / -3.7 |
| 7 | 21 | | | | | 23 | +2.7 / -4.7 |
| 8 | 21 | | | | | 23 | +2.7 / -6.2 |
| 9 | 21 | | | | | 23 | +2.7 / -2.7 |
| 19 | 21 | | | | | 23 | +2.7 / -2.7 |
| 11 | 21 | | | | | 23 | +2.7 / -3.7 |
| 12 | 21 | | | | | 23 | +2.7 / -4.7 |
| 13 | 21 | | | | | 23 | +2.7 / -6.2 |
| 14 | 21 | | | | | 23 | +2.7 / -8.2 |

**Table 6.2.4B.5-10: UE Power Class test requirements (network signalled value "NS_11 for Band 23")**

| Configuration ID | EUTRA band | Centre Frequency | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1a | 23 | UL 2001.5 MHz<br>DL 2181.5 MHz | | | | | | +2.7 /<br>-11.7 |
| 1b | 23 | UL 2004.5 MHz<br>DL 2184.5 MHz | | | | | | +2.7 /<br>-4.7 |
| 2a | 23 | UL 2001.5 MHz<br>DL 2181.5 MHz | | | | | | +2.7 /<br>-11.7 |
| 2b | 23 | UL 2004.5 MHz<br>DL 2184.5 MHz | | | | | | +2.7 /<br>-4.7 |
| 3a | 23 | UL 2001.5 MHz<br>DL 2181.5 MHz | | | | | | +2.7 /<br>-12.7 |
| 3b | 23 | UL 2004.5 MHz<br>DL 2184.5 MHz | | | | | | +2.7 /<br>-6.2 |
| 4a | 23 | UL 2001.5 MHz<br>DL 2181.5 MHz | | | | | | +2.7 /<br>-12.7 |
| 4b | 23 | UL 2004.5 MHz<br>DL 2184.5 MHz | | | | | | +2.7 /<br>-6.2 |
| 5a | 23 | UL 2002.5 MHz<br>DL 2182.5 MHz | | | | | | +2.7 /<br>-12.7 |
| 5b | 23 | UL 2004.5 MHz<br>DL 2184.5 MHz | | | | | | +2.7 /<br>-8.2 |
| 5c | 23 | UL 2007.5 MHz<br>DL 2187.5 MHz | | | | | | +2.7 /<br>-2.7 |
| 6a | 23 | UL 2002.5 MHz<br>DL 2182.5 MHz | | | | | | +2.7 /<br>-12.7 |
| 6b | 23 | UL 2004.5 MHz<br>DL 2184.5 MHz | | | | | | +2.7 /<br>-2.7 |
| 6c | 23 | UL 2007.5 MHz<br>DL 2187.5 MHz | | | | | | +2.7 /<br>-3.7 |
| 7a | 23 | UL 2002.5 MHz<br>DL 2182.5 MHz | | | | | | +2.7 /<br>-13.7 |
| 7b | 23 | UL 2004.5 MHz<br>DL 2184.5 MHz | | | | | | +2.7 /<br>-9.7 |
| 7c | 23 | UL 2007.5 MHz<br>DL 2187.5 MHz | | | | | | +2.7 /<br>-4.7 |
| 8a | 23 | UL 2002.5 MHz<br>DL 2182.5 MHz | | | | | | +2.7 /<br>-13.7 |
| 8b | 23 | UL 2004.5 MHz<br>DL 2184.5 MHz | | | | | | +2.7 /<br>-3.7 |
| 8c | 23 | UL 2007.5 MHz<br>DL 2187.5 MHz | | | | | | +2.7 /<br>-4.7 |
| 9a | 23 | UL 2002.5 MHz<br>DL 2182.5 MHz | | | | | | +2.7 /<br>-14.7 |
| 9b | 23 | UL 2004.5 MHz<br>DL 2184.5 MHz | | | | | | +2.7 /<br>-11.7 |
| 9c | 23 | UL 2007.5 MHz<br>DL 2187.5 MHz | | | | | | +2.7 /<br>-6.2 |
| 10 | 23 | UL 2005 MHz<br>DL 2185 MHz | | | | | | +2.7 /<br>-18.7 |
| 11 | 23 | UL 2005 MHz<br>DL 2185 MHz | | | | | | +2.7 /<br>-18.7 |
| 12 | 23 | UL 2005 MHz<br>DL 2185 MHz | | | | | | +2.7 /<br>-19.7 |
| 13 | 23 | UL 2005 MHz<br>DL 2185 MHz | | | | | | +2.7 /<br>-19.7 |
| 14 | 23 | UL 2005 MHz<br>DL 2185 MHz | | | | | | +2.7 /<br>-20.7 |

**Table 6.2.4B.5-11: UE Power Class test requirements (network signalled value "NS_12")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 3 | 1.5 | 18.5 | 4 | 25.7 | 13.8 |
| 2 | 1 | 4 | 1.5 | 16.5 | 5 | 25.7 | 10.8 |
| 3 | 0 | 0 | 1.5 | 21.5 | 3 | 25.7 | 17.8 |
| 4 | 0 | 3 | 1.5 | 18.5 | 4 | 25.7 | 13.8 |
| 5 | 2 | 4 | 1.5 | 15.5 | 5 | 25.7 | 9.8 |
| 6 | 0 | 4 | 1.5 | 17.5 | 5 | 25.7 | 11.8 |
| 7 | 1 | 3 | 1.5 | 17.5 | 5 | 25.7 | 11.8 |
| 8 | 0 | 0 | 1.5 | 21.5 | 3 | 25.7 | 17.8 |
| 9 | 1 | 3 | 1.5 | 17.5 | 5 | 25.7 | 11.8 |
| 10 | 2 | 4 | 1.5 | 15.5 | 5 | 25.7 | 9.8 |
| 11 | 0 | 4 | 1.5 | 17.5 | 5 | 25.7 | 11.8 |
| 12 | 1 | 3 | 1.5 | 17.5 | 5 | 25.7 | 11.8 |
| 13 | 0 | 0 | 1.5 | 21.5 | 3 | 25.7 | 17.8 |
| 14 | 1 | 3 | 0 | 19 | 3,5 | 25.7 | 14.8 |
| 15 | 2 | 3 | 0 | 18 | 4 | 25.7 | 13.3 |
| 16 | 1 | 4 | 1.5 | 16.5 | 5 | 25.7 | 10.8 |
| 17 | 1 | 0 | 0 | 22 | 3 | 25.7 | 18.3 |
| 18 | 2 | 2 | 0 | 19 | 3 | 25.7 | 15.3 |
| 19 | 1 | 4 | 0 | 18 | 4 | 25.7 | 13.3 |
| 20 | 1 | 0 | 0 | 22 | 3 | 25.7 | 18.3 |
| 21 | 2 | 3 | 0 | 18 | 4 | 25.7 | 13.3 |

Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4B.5-12: UE Power Class test requirements (network signalled value "NS_13")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 22 | 3 | 25.7 | 18,3 |
| 2 | 1 | 0 | 0 | 22 | 3 | 25.7 | 18,3 |
| 3 | 0 | 3 | 0 | 20 | 3 | 25.7 | 16,3 |
| 4 | 1 | 2 | 0 | 20 | 3 | 25.7 | 16,3 |
| 5 | 1 | 0 | 0 | 22 | 3 | 25.7 | 18,3 |
| 6 | 1 | 0 | 0 | 22 | 3 | 25.7 | 18,3 |
| 7 | 2 | 2 | 0 | 19 | 3,5 | 25.7 | 14,8 |

Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4B.5-13: UE Power Class 3 test requirements (network signalled value "NS_14")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 3 | 0 | 20 | 3 | 25.7 | 16.3 |
| 2 | 1 | 0 | 0 | 22 | 3 | 25.7 | 18.3 |
| 3 | 1 | 1 | 0 | 21 | 3 | 25.7 | 18.3 |
| 4 | 1 | 0 | 0 | 22 | 3 | 25.7 | 18.3 |
| 5 | 2 | 1 | 0 | 20 | 3 | 25.7 | 16.3 |
| 6 | 0 | 3 | 0 | 20 | 3 | 25.7 | 16.3 |
| 7 | 1 | 0 | 0 | 22 | 3 | 25.7 | 18.3 |
| 8 | 1 | 1 | 0 | 21 | 3 | 25.7 | 17.3 |
| 9 | 1 | 0 | 0 | 22 | 3 | 25.7 | 18.3 |
| 10 | 2 | 1 | 0 | 20 | 3 | 25.7 | 16.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4B.5-14: UE Power Class test requirements (network signalled value "NS_15")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 26 | | | | | 23 | +2.7 / -3.2 |
| 2 | 26 | | | | | 23 | +2.7 / -8.2 |
| 3 | 26 | | | | | 23 | +2.7 / -4.2 |
| 4 | 26 | | | | | 23 | +2.7 / -8.2 |
| 5 | 26 | | | | | 23 | +2.7 / -14.2 |
| 6 | 26 | | | | | 23 | +2.7 / -4.2 |
| 7 | 26 | | | | | 23 | +2.7 / -3.2 |
| 8 | 26 | | | | | 23 | +2.7 / -9.2 |
| 9 | 26 | | | | | 23 | +2.7 / -14.2 |
| 10 | 26 | | | | | 23 | +2.7 / -4.2 |
| 11 | 26 | | | | | 23 | +2.7 / -6.2 |
| 12 | 26 | | | | | 23 | +2.7 / -12.2 |
| 13 | 26 | | | | | 23 | +2.7 / -7.2 |
| 14 | 26 | | | | | 23 | +2.7 / -3.2 |
| 15 | 26 | | | | | 23 | +2.7 / -4.2 |
| 16 | 26 | | | | | 23 | +2.7 / -8.2 |
| 17 | 26 | | | | | 23 | +2.7 / -3.2 |
| 18 | 26 | | | | | 23 | +2.7 / -12.2 |
| 19 | 26 | | | | | 23 | +2.7 / -4.2 |
| 20 | 26 | | | | | 23 | +2.7 / -8.2 |
| 21 | 26 | | | | | 23 | +2.7 / -3.2 |
| 22 | 26 | | | | | 23 | +2.7 / -4.2 |
| 23 | 26 | | | | | 23 | +2.7 / -9.2 |
| 24 | 26 | | | | | 23 | +2.7 / -14.2 |
| 25 | 26 | | | | | 23 | +2.7 / -3.2 |
| 26 | 26 | | | | | 23 | +2.7 / -9.2 |

**Table 6.2.4B.5-15: UE Power Class test requirements (network signalled value "NS_16") when lower channel edge is at 807 MHz**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 27 | | | | | 23 | +2.7 / -2.7 |
| 2 | 27 | | | | | 23 | +2.7 / -3.7 |
| 3 | 27 | | | | | 23 | +2.7 / -4.7 |
| 4 | 27 | | | | | 23 | +2.7 / -2.7 |
| 5 | 27 | | | | | 23 | +2.7 / -4.7 |
| 6 | 27 | | | | | 23 | +2.7 / -6.2 |
| 7 | 27 | | | | | 23 | +2.7 / -8.2 |
| 8 | 27 | | | | | 23 | +2.7 / -9.7 |
| 9 | 27 | | | | | 23 | +2.7 / -4.7 |
| 10 | 27 | | | | | 23 | +2.7 / -6.2 |
| 11 | 27 | | | | | 23 | +2.7 / -11.7 |
| 12 | 27 | | | | | 23 | +2.7 / -8.2 |
| 13 | 27 | | | | | 23 | +2.7 / -11.7 |
| 14 | 27 | | | | | 23 | +2.7 / -12.7 |
| 15 | 27 | | | | | 23 | +2.7 / -9.7 |
| 16 | 27 | | | | | 23 | +2.7 / -2.7 |
| 17 | 27 | | | | | 23 | +2.7 / -8.2 |
| 18 | 27 | | | | | 23 | +2.7 / -4.7 |
| 19 | 27 | | | | | 23 | +2.7 / -8.2 |
| 20 | 27 | | | | | 23 | +2.7 / -13.7 |
| 21 | 27 | | | | | 23 | +2.7 / -13.7 |
| 22 | 27 | | | | | 23 | +2.7 / -14.7 |
| 23 | 27 | | | | | 23 | +2.7 / -13.7 |
| 24 | 27 | | | | | 23 | +2.7 / -13.7 |

**Table 6.2.4B.5-16: UE Power Class test requirements (network signalled value "NS_16") when lower channel edge is at 808.5 MHz**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 27 | | | | | 23 | +2.7 / -2.7 |
| 2 | 27 | | | | | 23 | +2.7 / -3.7 |
| 3 | 27 | | | | | 23 | +2.7 / -5.2 |
| 4 | 27 | | | | | 23 | +2.7 / -2.7 |
| 5 | 27 | | | | | 23 | +2.7 / -3.7 |
| 6 | 27 | | | | | 23 | +2.7 / -3.7 |
| 7 | 27 | | | | | 23 | +2.7 / -4.7 |
| 8 | 27 | | | | | 23 | +2.7 / -2.7 |
| 9 | 27 | | | | | 23 | +2.7 / -3.7 |
| 10 | 27 | | | | | 23 | +2.7 / -4.7 |
| 11 | 27 | | | | | 23 | +2.7 / -6.2 |
| 12 | 27 | | | | | 23 | +2.7 / -6.2 |
| 13 | 27 | | | | | 23 | +2.7 / -8.2 |
| 14 | 27 | | | | | 23 | +2.7 / -9.7 |
| 15 | 27 | | | | | 23 | +2.7 / -9.7 |
| 16 | 27 | | | | | 23 | +2.7 / -2.7 |
| 17 | 27 | | | | | 23 | +2.7 / -6.2 |
| 18 | 27 | | | | | 23 | +2.7 / -4.7 |
| 19 | 27 | | | | | 23 | +2.7 / -4.7 |
| 20 | 27 | | | | | 23 | +2.7 / -9.7 |
| 21 | 27 | | | | | 23 | +2.7 / -11.7 |
| 22 | 27 | | | | | 23 | +2.7 / -12.7 |
| 23 | 27 | | | | | 23 | +2.7 / -11.7 |
| 24 | 27 | | | | | 23 | +2.7 / -11.7 |

**Table 6.2.4B.5-17: UE Power Class test requirements (network signalled value "NS_16") when lower channel edge is at 812 MHz**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 27 | | | | | 23 | +2.7 / - 2.7 |
| 2 | 27 | | | | | 23 | +2.7 / - 3.7 |
| 3 | 27 | | | | | 23 | +2.7 / - 4.7 |
| 4 | 27 | | | | | 23 | +2.7 / - 2.7 |
| 5 | 27 | | | | | 23 | +2.7 / -3.7 |
| 6 | 27 | | | | | 23 | +2.7 / -3.7 |
| 7 | 27 | | | | | 23 | +2.7 / -4.7 |
| 8 | 27 | | | | | 23 | +2.7 / -2.7 |
| 9 | 27 | | | | | 23 | +2.7 / -3.7 |
| 10 | 27 | | | | | 23 | +2.7 / -3.7 |
| 11 | 27 | | | | | 23 | +2.7 / -3.7 |
| 12 | 27 | | | | | 23 | +2.7 / -3.7 |
| 13 | 27 | | | | | 23 | +2.7 / -3.7 |
| 14 | 27 | | | | | 23 | +2.7 / -4.7 |
| 15 | 27 | | | | | 23 | +2.7 / -2.7 |
| 16 | 27 | | | | | 23 | +2.7 / -2.7 |
| 17 | 27 | | | | | 23 | +2.7 / -3.7 |
| 18 | 27 | | | | | 23 | +2.7 / -3.7 |
| 19 | 27 | | | | | 23 | +2.7 / -3.7 |
| 20 | 27 | | | | | 23 | +2.7 / -4.7 |
| 21 | 27 | | | | | 23 | +2.7 / -8.2 |
| 22 | 27 | | | | | 23 | +2.7 / -9.7 |
| 23 | 27 | | | | | 23 | +2.7 / -6.2 |
| 24 | 27 | | | | | 23 | +2.7 / -4.7 |

**Table 6.2.4B.5-18: UE Power Class test requirements (network signalled value "NS_20 for Band 23")**

**TBD**

**Table 6.2.4B.5-19: UE Power Class 3 test requirements (network signalled value "NS_21 for Band 30")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 2 | 1 | 0 | 0 | 22 | 3.0 | 25.7 | 18.3 |
| 3 | 0 | 4 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 4 | 0 | 4 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 5 | 1 | 0 | 0 | 22 | 3.0 | 25.7 | 18.3 |
| 6 | 0 | 3 | 0 | 20 | 3.0 | 25.7 | 16.3 |
| 7 | 1 | 3 | 0 | 19 | 3.5 | 25.7 | 14.8 |
| 8 | 2 | 3 | 0 | 18 | 4.0 | 25.7 | 13.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4B.5-20: UE Power Class Test requirements (network signalled value "NS_22")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 2 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 3 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 4 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 5 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 6 | 1 | 4 | 0 | 18 | 5.0 | 25.7 | 12.3 |
| 7 | 1 | 3 | 0 | 19 | 5.0 | 25.7 | 13.3 |
| 8 | 0 | 3 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 9 | 0 | 3 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 10 | 1 | 3 | 0 | 19 | 5.0 | 25.7 | 13.3 |
| 11 | 1 | 3 | 0 | 19 | 5.0 | 25.7 | 13.3 |
| 12 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 13 | 1 | 4 | 0 | 18 | 5.0 | 25.7 | 12.3 |
| 14 | 0 | 3 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 15 | 0 | 3 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 16 | 1 | 3 | 0 | 19 | 5.0 | 25.7 | 13.3 |
| 17 | 1 | 3 | 0 | 19 | 5.0 | 25.7 | 13.3 |
| 18 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 19 | 1 | 4 | 0 | 18 | 5.0 | 25.7 | 12.3 |
| 20 | 0 | 3 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 21 | 0 | 3 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 22 | 1 | 3 | 0 | 19 | 5.0 | 25.7 | 13.3 |
| 23 | 1 | 3 | 0 | 19 | 5.0 | 25.7 | 13.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4B.5-21: UE Power Class Test requirements (network signalled value "NS_23")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 2 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 3 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 4 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 5 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 6 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 7 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 8 | 1 | 0 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4B.5-22: UE Power Class test requirements (network signalled value "NS_24")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 10 | 0 | 13 | 6.0 | 25.7 | 6.3 |
| 2 | 0 | 10 | 0 | 13 | 7.0 | 25.7 | 5.3 |
| 3 | 1 | 10 | 0 | 12 | 5.0 | 25.7 | 6.3 |
| 4 | 2 | 10 | 0 | 11 | 5.0 | 25.7 | 5.3 |
| 5 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 6 | 0 | 2 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 7 | 2 | 2 | 0 | 19 | 5.0 | 25.7 | 13.3 |
| 8 | 1 | 2 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 9 | 1 | 1 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 10 | 0 | 3 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 11 | 0 | 1 | 0 | 22 | 5.0 | 25.7 | 16.3 |
| 12 | 1 | 1 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 13 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 14 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 15 | 0 | 9 | 0 | 14 | 6.0 | 25.7 | 7.3 |
| 16 | 0 | 9 | 0 | 14 | 6.0 | 25.7 | 7.3 |
| 17 | 1 | 9 | 0 | 13 | 6.0 | 25.7 | 6.3 |
| 18 | 0 | 17 | 0 | 6 | 7.0 | 25.7 | -1.7 |
| 19 | 1 | 17 | 0 | 5 | 7.0 | 25.7 | -2.7 |
| 20 | 2 | 17 | 0 | 4 | 7.0 | 25.7 | -3.7 |
| 21 | 0 | 2 | 0 | 21 | 3.0 | 25.7 | 17.3 |
| 22 | 0 | 2 | 0 | 21 | 3.0 | 25.7 | 17.3 |
| 23 | 1 | 2 | 0 | 20 | 5.0 | 25.7 | 14.3 |
| 24 | 2 | 8 | 0 | 13 | 6.0 | 25.7 | 6.3 |
| 25 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 26 | 0 | 7 | 0 | 16 | 5.0 | 25.7 | 10.3 |
| 27 | 1 | 7 | 0 | 15 | 6.0 | 25.7 | 8.3 |
| 28 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 29 | 0 | 17 | 0 | 6 | 7.0 | 25.7 | -1.7 |
| 30 | 0 | 17 | 0 | 6 | 7.0 | 25.7 | -1.7 |
| 31 | 1 | 17 | 0 | 5 | 7.0 | 25.7 | -2.7 |
| 32 | 2 | 17 | 0 | 4 | 7.0 | 25.7 | -3.7 |
| 33 | 0 | 17 | 0 | 6 | 7.0 | 25.7 | -1.7 |
| 34 | 0 | 17 | 0 | 6 | 7.0 | 25.7. | -1.7 |
| 35 | 1 | 17 | 0 | 5 | 7.0 | 25.7 | -2.7 |
| 36 | 2 | 17 | 0 | 4 | 7.0 | 25.7 | -3.7 |

Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4B.5-23: UE Power Class test requirements (network signalled value "NS_25")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 2 | 2 | 5 | 0 | 16 | 5.0 | 25.7 | 10.3 |
| 3 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 4 | 0 | 2 | 0 | 21 | 3.0 | 25.7 | 17.3 |
| 5 | 0 | 2 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 6 | 1 | 2 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 7 | 0 | 2 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 8 | 2 | 2 | 0 | 19 | 5.0 | 25.7 | 13.3 |
| 9 | 1 | 2 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 10 | 1 | 1 | 0 | 21 | 3.0 | 25.7 | 17.3 |
| 11 | 0 | 3 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 12 | 0 | 1 | 0 | 22 | 3.0 | 25.7 | 18.3 |
| 13 | 0 | 1 | 0 | 22 | 3.0 | 25.7 | 18.3 |
| 14 | 1 | 1 | 0 | 21 | 3.0 | 25.7 | 17.3 |
| 15 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 16 | 2 | 1 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 17 | 1 | 5 | 0 | 17 | 5.0 | 25.7 | 11.3 |
| 18 | 1 | 1 | 0 | 21 | 5.0 | 25.7 | 15.3 |
| 19 | 2 | 1 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 20 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 21 | 0 | 10 | 0 | 13 | 6.0 | 25.7 | 6.3 |
| 22 | 0 | 10 | 0 | 13 | 6.0 | 25.7 | 6.3 |
| 23 | 1 | 10 | 0 | 12 | 6.0 | 25.7 | 5.3 |
| 24 | 2 | 10 | 0 | 11 | 6.0 | 25.7 | 4.3 |
| 25 | 1 | 7 | 0 | 15 | 6.0 | 25.7 | 8.3 |
| 26 | 2 | 7 | 0 | 14 | 6.0 | 25.7 | 7.3 |
| 27 | 1 | 11 | 0 | 11 | 6.0 | 25.7 | 4.3 |
| 28 | 2 | 11 | 0 | 10 | 7.0 | 25.7 | 2.3 |
| 29 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 30 | 0 | 4 | 0 | 19 | 5.0 | 25.7 | 13.3 |
| 31 | 1 | 4 | 0 | 18 | 5.0 | 25.7 | 12.3 |
| 32 | 1 | 3 | 0 | 19 | 5.0 | 25.7 | 13.3 |
| 33 | 2 | 1 | 0 | 20 | 6.0 | 25.7 | 13.3 |
| 34 | 0 | 1 | 0 | 22 | 3.0 | 25.7 | 18.3 |
| 35 | 0 | 1 | 0 | 22 | 3.0 | 25.7 | 18.3 |
| 36 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 37 | 0 | 13 | 0 | 10 | 7.0 | 25.7 | 2.3 |
| 38 | 0 | 13 | 0 | 10 | 7.0 | 25.7 | 2.3 |
| 39 | 1 | 13 | 0 | 9 | 7.0 | 25.7 | 1.3 |
| 40 | 2 | 13 | 0 | 8 | 7.0 | 25.7 | 0.3 |
| 41 | 0 | 11 | 0 | 12 | 6.0 | 25.7 | 5.3 |
| 42 | 0 | 11 | 0 | 12 | 6.0 | 25.7 | 5.3 |
| 43 | 2 | 11 | 0 | 10 | 7.0 | 25.7 | 2.3 |
| 44 | 1 | 11 | 0 | 11 | 6.0 | 25.7 | 4.3 |
| 45 | 0 | 13 | 0 | 10 | 7.0 | 25.7 | 2.3 |
| 46 | 2 | 13 | 0 | 8 | 7.0 | 25.7 | 0.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 47 | 0 | 0 | 0 | 23 | 3.0 | 25.7 | 19.3 |
| 48 | 0 | 13 | 0 | 10 | 7.0 | 25.7 | 2.3 |
| 49 | 0 | 13 | 0 | 10 | 7.0 | 25.7 | 2.3 |
| 50 | 1 | 13 | 0 | 9 | 7.0 | 25.7 | 1.3 |
| 51 | 2 | 13 | 0 | 8 | 7.0 | 25.7 | 0.3 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4B.5-24: Reserved**

**Table 6.2.4B.5-25: UE Power Class test requirements (network signalled value "NS_27")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 23 | 3.0 | 26 | 19 |
| 2 | 0 | 0 | 0 | 23 | 3.0 | 26 | 19 |
| 3 | 1 | 0 | 0 | 22 | 5.0 | 26 | 16 |
| 4 | 2 | 0 | 0 | 21 | 5.0 | 26 | 15 |
| 5 | 0 | 0 | 0 | 23 | 3.0 | 26 | 19 |
| 6 | 0 | 0 | 0 | 23 | 3.0 | 26 | 19 |
| 7 | 1 | 0 | 0 | 22 | 5.0 | 26 | 16 |
| 8 | 2 | 0 | 0 | 21 | 5.0 | 26 | 15 |
| 9 | 0 | 4 | 0 | 19 | 5.0 | 26 | 13 |
| 10 | 0 | 0 | 0 | 23 | 3.0 | 26 | 19 |
| 11 | 0 | 0 | 0 | 23 | 3.0 | 26 | 19 |
| 12 | 0 | 4 | 0 | 19 | 5.0 | 26 | 13 |
| 13 | 0 | 0 | 0 | 23 | 3.0 | 26 | 19 |
| 14 | 0 | 0 | 0 | 23 | 3.0 | 26 | 19 |
| 15 | 1 | 2 | 0 | 20 | 6.0 | 26 | 13 |
| 16 | 2 | 2 | 0 | 19 | 5.0 | 26 | 13 |
| 17 | 0 | 4 | 0 | 19 | 5.0 | 26 | 13 |
| 18 | 0 | 1 | 0 | 22 | 5.0 | 26 | 16 |
| 19 | 0 | 0 | 0 | 23 | 3.0 | 26 | 19 |
| 20 | 1 | 0 | 0 | 22 | 5.0 | 26 | 16 |
| 21 | 0 | 4 | 0 | 19 | 5.0 | 26 | 13 |
| 22 | 0 | 1 | 0 | 22 | 5.0 | 26 | 16 |
| 23 | 0 | 0 | 0 | 23 | 3.0 | 26 | 19 |
| 24 | 1 | 0 | 0 | 22 | 5.0 | 26 | 16 |
| 25 | 1 | 3 | 0 | 19 | 5.0 | 26 | 13 |
| 26 | 2 | 3 | 0 | 18 | 5.0 | 26 | 12 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |

**Table 6.2.4B.5-26: UE Power Class test requirements (network signalled value "NS_35")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 2 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 3 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 4 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 5 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 6 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 7 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 8 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 9 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 10 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 11 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |
| 12 | 0 | 0 | 0 | 23 | 2 | 25.7 | 18.8 |

Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

**Table 6.2.4B.5-27: UE Power Class 3 test requirements (network signalled value "NS_36")**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 2 | 0 | 21 | 5 | 25.7 | 15.3 |
| 2 | 1 | 4 | 0 | 18 | 5 | 25.7 | 12.3 |
| 3 | 1 | 1 | 0 | 21 | 5 | 25.7 | 15.3 |
| 4 | 1 | 3 | 0 | 19 | 5 | 25.7 | 13.3 |
| 5 | 1 | 0 | 0 | 22 | 5 | 25.7 | 16.3 |
| 6 | 2 | 0 | 0 | 21 | 5 | 25.7 | 15.3 |
| 7 | 1 | 0 | 0 | 22 | 5 | 25.7 | 16.3 |
| 8 | 2 | 0 | 0 | 21 | 5 | 25.7 | 15.3 |
| 9 | 1 | 10 | 0 | 12 | 6 | 25.7 | 5.3 |
| 10 | 0 | 10 | 0 | 13 | 6 | 25.7 | 6.3 |
| 11 | 1 | 8 | 0 | 14 | 6 | 25.7 | 7.3 |
| 12 | 1 | 6 | 0 | 16 | 5 | 25.7 | 10.3 |
| 13 | 0 | 6 | 0 | 17 | 5 | 25.7 | 11.3 |
| 14 | 0 | 0 | 0 | 23 | 3 | 25.7 | 19.3 |
| 15 | 1 | 0 | 0 | 22 | 5 | 25.7 | 16.3 |
| 16 | 2 | 0 | 0 | 21 | 5 | 25.7 | 15.3 |
| 17 | 1 | 10 | 0 | 12 | 6 | 25.7 | 5.3 |
| 18 | 1 | 9 | 0 | 13 | 6 | 25.7 | 6.3 |
| 19 | 1 | 7 | 0 | 15 | 6 | 25.7 | 8.3 |
| 20 | 0 | 6 | 0 | 17 | 5 | 25.7 | 11.3 |
| 21 | 0 | 0 | 0 | 23 | 3 | 25.7 | 19.3 |
| 22 | 1 | 0 | 0 | 22 | 5 | 25.7 | 16.3 |
| 23 | 2 | 0 | 0 | 21 | 5 | 25.7 | 15.3 |
| 24 | 1 | 0 | 0 | 22 | 5 | 25.7 | 16.3 |
| 25 | 2 | 0 | 0 | 21 | 5 | 25.7 | 15.3 |

Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

## 6.2.4E Additional Maximum Power Reduction (A-MPR) for UE category 0

### 6.2.4E.1 Test purpose

Same test purpose in clause 6.2.4.1.

### 6.2.4E.2 Test applicability

The requirements of this test apply in test case 6.6.2.2E Additional Spectrum Emission Mask for network signalled values NS_03, NS_04, NS_06 and NS_07 to all types of E-UTRA UE release 12 and forward of UE category 0.

The requirements of this test apply in test case 6.6.3E.3 Additional Spurious Emissions for network signalled values NS_07 and to all types of E-UTRA UE release 12 and forward of UE category 0.

NOTE: As a result TC 6.2.4E has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.4E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.4.3

## 6.2.4E.4 Test description

### 6.2.4E.4.1 Initial condition

Same initial conditions as in clause 6.2.4.4.1 with the following exceptions:

- Instead of Tables 6.2.4.4.1-1 to 6.2.4.4.1-24→ use Table 6.2.4E.4.1-1 to 6.2.4E.4.1-5.
- Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.2.4E.4.1-1: Test Configuration Table (network signalled value "NS_03")**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for NS_03 A-MPR** | | | | | | | |
| | | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | | **FDD** | **TDD** | | **FDD and HD-FDD** | **TDD** |
| 1 | 1.4MHz | N/A for A-MPR testing. | | | QPSK | 6 | 6 |
| 2 | 1.4MHz | | | | QPSK | 5 | 5 |
| 3 | 1.4MHz | | | | 16QAM | 5 | 5 |
| 4 | 3MHz | | | | QPSK | 15 | 15 |
| 5 | 3MHz | | | | QPSK | 4 | 4 |
| 6 | 3MHz | | | | 16QAM | 5 | 5 |
| 7 | 3MHz | | | | 16QAM | 4 | 4 |
| 8 | 5MHz | | | | QPSK | 25 | 25 |
| 9 | 5MHz | | | | QPSK | 8 | 8 |
| 10 | 5MHz | | | | QPSK | 6 | 6 |
| 11 | 5MHz | | | | 16QAM | 5 | 5 |
| 12 | 10MHz | | | | QPSK | 36 | 36 |
| 13 | 10MHz | | | | QPSK | 12 | 12 |
| 14 | 10MHz | | | | QPSK | 6 | 6 |
| 15 | 10MHz | | | | 16QAM | 5 | 5 |
| 16 | 15MHz | | | | QPSK | 36 | 36 |
| 17 | 15MHz | | | | QPSK | 16 | 16 |
| 18 | 15MHz | | | | QPSK | 8 | 8 |
| 19 | 15MHz | | | | 16QAM | 5 | 5 |
| 20 | 20MHz | | | | QPSK | 36 | 36 |
| 21 | 20MHz | | | | QPSK | 18 | 18 |
| 22 | 20MHz | | | | QPSK | 10 | 10 |
| 23 | 20MHz | | | | 16QAM | 5 | 5 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

**Table 6.2.4E.4.1-2: Test Configuration Table (network signalled value "NS_04")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10 MHz, 15 MHz, 20MHz | | |
| **Test Parameters for NS_04 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation TDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 25 | Note 3 |
| 2 | 5MHz | | | QPSK | 8 | Note 3 |
| 3 | 5MHz | | | QPSK | 6 | Note 3 |
| 4 | 5MHz | | | 16QAM | 5 | Note 3 |
| 6 | 10MHz | | | QPSK | 1 | 0 |
| 7 | 10MHz | | | QPSK | 12 | 0 |
| 8 | 10MHz | | | QPSK | 36 | 0 |
| 9 | 10MHz | | | 16QAM | 5 | 0 |
| 10 | 10MHz | | | QPSK | 24 | 13 |
| 11 | 10MHz | | | 16QAM | 5 | 13 |
| 12 | 10MHz | | | QPSK | 36 | 13 |
| 13 | 10MHz | | | QPSK | 12 | 37 |
| 14 | 10MHz | | | QPSK | 1 | 49 |
| 15 | 15MHz | | | QPSK | 1 | 0 |
| 16 | 15MHz | | | QPSK | 16 | 0 |
| 17 | 15MHz | | | QPSK | 36 | 0 |
| 18 | 15MHz | | | 16QAM | 5 | 0 |
| 19 | 15MHz | | | QPSK | 36 | 19 |
| 20 | 15MHz | | | 16QAM | 5 | 19 |
| 21 | 15MHz | | | QPSK | 36 | 33 |
| 22 | 15MHz | | | QPSK | 18 | 56 |
| 23 | 15MHz | | | QPSK | 1 | 74 |
| 24 | 20MHz | | | QPSK | 1 | 0 |
| 25 | 20MHz | | | QPSK | 18 | 0 |
| 26 | 20MHz | | | QPSK | 36 | 0 |
| 27 | 20MHz | | | 16QAM | 5 | 0 |
| 28 | 20MHz | | | QPSK | 36 | 36 |
| 29 | 20MHz | | | 16QAM | 5 | 25 |
| 30 | 20MHz | | | QPSK | 36 | 25 |
| 31 | 20MHz | | | QPSK | 25 | 75 |
| 32 | 20MHz | | | QPSK | 1 | 99 |

Note 1: Test Channel Bandwidths are checked separately for E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The configuration ID will be used to map the applicable Test Configuration to be corresponding Test Requirement in subclause 6.2.4 as not all combinations are necessarily required based on the applicability of the UE.

Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

**Table 6.2.4E.4.1-3: Test Configuration Table (network signalled value "NS_06")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | |
| **Test Parameters for NS_06 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD and HD_FDD** |
| 1 | 1.4MHz | N/A for A-MPR testing | | QPSK | 6 |
| 2 | 1.4MHz | | | QPSK | 5 |
| 3 | 1.4MHz | | | 16QAM | 5 |
| 4 | 3MHz | | | QPSK | 15 |
| 5 | 3MHz | | | QPSK | 4 |
| 6 | 3MHz | | | 16QAM | 4 |
| 7 | 5MHz | | | QPSK | 25 |
| 8 | 5MHz | | | QPSK | 8 |
| 9 | 5MHz | | | 16QAM | 5 |
| 10 | 10MHz | | | QPSK | 36 |
| 11 | 10MHz | | | QPSK | 12 |
| 12 | 10MHz | | | 16QAM | 5 |
| 13 | 15MHz | | | QPSK | 36 |
| 14 | 15MHz | | | QPSK | 16 |
| 15 | 15MHz | | | 16QAM | 5 |
| 16 | 20MHz | | | QPSK | 36 |
| 17 | 20MHz | | | QPSK | 18 |
| 18 | 20MHz | | | 16QAM | 5 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

**Table 6.2.4E.4.1-4: Test Configuration Table (network signalled value "NS_07")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Mid range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10MHz | | |
| **Test Parameters for NS_07 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD and HD-FDD** | **$RB_{start}$ FDD** |
| 1 | 10MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 10MHz | | | QPSK | 8 | 0 |
| 3 | 10MHz | | | QPSK | 6 | 13 |
| 4 | 10MHz | | | QPSK | 20 | 13 |
| 5 | 10MHz | | | QPSK | 12 | 13 |
| 6 | 10MHz | | | 16QAM | 5 | 13 |
| 7 | 10MHz | | | QPSK | 16 | 19 |
| 8 | 10MHz | | | QPSK | 12 | 19 |
| 9 | 10MHz | | | 16QAM | 5 | 19 |
| 10 | 10MHz | | | QPSK | 30 | 19 |
| 11 | 10MHz | | | QPSK | 6 | 43 |
| 12 | 10MHz | | | QPSK | 2 | 48 |
| 13 | 10MHz | | | QPSK | 36 | 0 |
| 14 | 10MHz | | | QPSK | 12 | 0 |
| 15 | 10MHz | | | 16QAM | 5 | 0 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE. | | | | | | |

### 6.2.4E.4.2 Test procedure

Same test procedure as in clause 6.2.4.4.2 with following exception for HD-FDD:

- In step 3, slots with transient periods are not under test. Half-duplex guard sub frame are not under test.

### 6.2.4E.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exceptions for each network signalled value.

#### 6.2.4E.4.3.1 Message contents exceptions (network signalled value "NS_03")

1. Information element additionalSpectrumEmission is set to NS_03. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4E.4.3.1-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_03"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 3 (NS_03) | | |

6.2.4E.4.3.2 Message contents exceptions (network signalled value "NS_04")

1. Information element additionalSpectrumEmission is set to NS_04. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4E.4.3.2-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_04"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 4 (NS_04) | | |

6.2.4E.4.3.3 Message contents exceptions (network signalled value "NS_06")

1. Information element additionalSpectrumEmission is set to NS_06. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4E.4.3.3-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_06"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 6 (NS_06) | | |

6.2.4E.4.3.4 Message contents exceptions (network signalled value "NS_07")

1. Information element additionalSpectrumEmission is set to NS_07. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4E.4.3.4-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_07"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 7 (NS_07) | | |

## 6.2.4E.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable table from Table 6.2.4E.5-1 to Table 6.2.4E.5-5. The allowed A-MPR values specified in Table 6.2.4.3-1 are in addition to the allowed MPR requirements specified in clause 6.2.3. For the UE maximum output power modified by MPR and/or A-MPR, the power limits specified in Table 6.2.5.3-1 apply.

**Table 6.2.4E.5-1: UE Power Class test requirements (network signalled value "NS_03") (for Band 2)**

| Configuration ID | EUTRA band | Test Freq. | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | Mid | | | | | 23 | +2.7 / -3.7 |
| 1 | 2 | Low, High | | | | | 23 | +2.7 / -5.7 |
| 2 | 2 | Mid | | | | | 23 | +2.7 / -2.7 |
| 2 | 2 | Low, High | | | | | 23 | +2.7 / -4.2 |
| 3 | 2 | Mid | | | | | 23 | +2.7 / -3.7 |
| 3 | 2 | Low, High | | | | | 23 | +2.7 / -5.7 |
| 4 | 2 | Mid | | | | | 23 | +2.7 / -4.7 |
| 4 | 2 | Low, High | | | | | 23 | +2.7 / -7.7 |
| 5 | 2 | Mid | | | | | 23 | +2.7 / -2.7 |
| 5 | 2 | Low, High | | | | | 23 | +2.7 / -4.2 |
| 6 | 2 | Mid | | | | | 23 | +2.7 / -6.2 |
| 6 | 2 | Low, High | | | | | 23 | +2.7 / -9.2 |
| 7 | 2 | Mid | | | | | 23 | +2.7 / -3.7 |
| 7 | 2 | Low, High | | | | | 23 | +2.7 / -5.7 |
| 8 | 2 | All | | | | | 23 | +2.7 / -4.7 |
| 9 | 2 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -3.7 |
| 9 | 2 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -5.7 |
| 10 | 2 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 10 | 2 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 11 | 2 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -4.7 |
| 11 | 2 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -7.7 |
| 12 | 2 | All | | | | | 23 | +2.7 / -4.7 |
| 13 | 2 | Low @ RB#(max+1-RB allocation), Mid, High @ RB#0 | | | | | 23 | +2.7 / -3.7 |
| 13 | 2 | Low @ RB#0, High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -5.7 |
| 14 | 2 | Low @ RB#(max+1-RB | | | | | 23 | +2.7 / |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | allocation),<br>Mid,<br>High @ RB#0 | | | | | | -2.7 |
| 14 | 2 | Low @ RB#0,<br>High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 15 | 2 | Low @ RB#(max+1-RB allocation),<br>Mid,<br>High @ RB#0 | | | | | 23 | +2.7 / -4.7 |
| 15 | 2 | Low @ RB#0,<br>High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -7.7 |
| 16 | 2 | All | | | | | 23 | +2.7 / -4.7 |
| 17 | 2 | Low @ RB#(max+1-RB allocation),<br>Mid,<br>High @ RB#0 | | | | | 23 | +2.7 / -3.7 |
| 17 | 2 | Low @ RB#0,<br>High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -5.7 |
| 18 | 2 | Low @ RB#(max+1-RB allocation),<br>Mid,<br>High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 18 | 2 | Low @ RB#0,<br>High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 19 | 2 | Low @ RB#(max+1-RB allocation),<br>Mid,<br>High @ RB#0 | | | | | 23 | +2.7 / -4.7 |
| 19 | 2 | Low @ RB#0,<br>High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -7.7 |
| 20 | 2 | All | | | | | 23 | +2.7 / -4.7 |
| 21 | 2 | All | | | | | 23 | +2.7 / -3.7 |
| 22 | 2 | Low @ RB#(max+1-RB allocation),<br>Mid,<br>High @ RB#0 | | | | | 23 | +2.7 / -2.7 |
| 22 | 2 | Low @ RB#0,<br>High @ RB#(max+1-RB allocation) | | | | | 23 | +2.7 / -4.2 |
| 23 | 2 | All | | | | | 23 | +2.7 / -4.7 |

**Table 6.2.4E.5-2: UE Power Class test requirements (network signalled value "NS_03") (for Band 4)**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 4 | | | | | 23 | +2.7 / -3.7 |
| 2 | 4 | | | | | 23 | +2.7 / -2.7 |
| 3 | 4 | | | | | 23 | +2.7 / -3.7 |
| 4 | 4 | | | | | 23 | +2.7 / -4.7 |
| 5 | 4 | | | | | 23 | +2.7 / -2.7 |
| 6 | 4 | | | | | 23 | +2.7 / -6.2 |
| 7 | 4 | | | | | 23 | +2.7 / -3.7 |
| 8 | 4 | | | | | 23 | +2.7 / -4.7 |
| 9 | 4 | | | | | 23 | +2.7 / -3.7 |
| 10 | 4 | | | | | 23 | +2.7 / -2.7 |
| 11 | 4 | | | | | 23 | +2.7 / -6.2 |
| 12 | 4 | | | | | 23 | +2.7 / -4.7 |
| 13 | 4 | | | | | 23 | +2.7 / -4.7 |
| 14 | 4 | | | | | 23 | +2.7 / -3.7 |
| 15 | 4 | | | | | 23 | +2.7 / -2.7 |
| 16 | 4 | | | | | 23 | +2.7 / -6.2 |
| 17 | 4 | | | | | 23 | +2.7 / -4.7 |
| 18 | 4 | | | | | 23 | +2.7 / -4.7 |
| 19 | 4 | | | | | 23 | +2.7 / -3.7 |
| 20 | 4 | | | | | 23 | +2.7 / -2.7 |
| 21 | 4 | | | | | 23 | +2.7 / -6.2 |
| 22 | 4 | | | | | 23 | +2.7 / -4.7 |
| 23 | 4 | | | | | 23 | +2.7 / -4.7 |

**Table 6.2.4E.5-3: UE Power Class test requirements (network signalled value "NS_04")**

| Configuration ID | EUTRA band | Bandwidth (MHz) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|
| 1 | 41 | 5 MHz | 23 | +2.7 / -4.7 |
| 2 | 41 | 5 MHz | 23 | +2.7 / -3.7 |
| 3 | 41 | 5 MHz | 23 | +2.7 / -2.7 |
| 4 | 41 | 5 MHz | 23 | +2.7 / -6.2 |
| 5 | 41 | 5 MHz | 23 | +2.7 / -4.7 |
| 6 | 41 | 10MHz | 23 | +2.7/ -6.2 |
| 7 | 41 | 10MHz | 23 | +2.7/ -6.2 |
| 8 | 41 | 10MHz | 23 | +2.7/ -8.2 |
| 9 | 41 | 10MHz | 23 | +2.7/ -9.7 |
| 10 | 41 | 10MHz | 23 | +2.7/ -3.7 |
| 11 | 41 | 10MHz | 23 | +2.7/ -4.7 |
| 12 | 41 | 10MHz | 23 | +2.7/ -6.2 |
| 13 | 41 | 10MHz | 23 | +2.7/ -6.2 |
| 14 | 41 | 10MHz | 23 | +2.7/ -6.2 |
| 15 | 41 | 15MHz | 23 | +2.7/ -6.2 |
| 16 | 41 | 15MHz | 23 | +2.7/ -6.2 |
| 17 | 41 | 15MHz | 23 | +2.7/ -8.2 |
| 18 | 41 | 15MHz | 23 | +2.7/ -9.7 |
| 19 | 41 | 15MHz | 23 | +2.7/ -3.7 |
| 20 | 41 | 15MHz | 23 | +2.7/ -4.7 |
| 21 | 41 | 15MHz | 23 | +2.7/ -6.2 |
| 22 | 41 | 15MHz | 23 | +2.7/ -8.2 |
| 23 | 41 | 15MHz | 23 | +2.7/ -6.2 |
| 24 | 41 | 20MHz | 23 | +2.7/ -6.2 |
| 25 | 41 | 20MHz | 23 | +2.7/ -6.2 |
| 26 | 41 | 20MHz | 23 | +2.7/ -8.2 |
| 27 | 41 | 20MHz | 23 | +2.7/ -9.7 |
| 28 | 41 | 20MHz | 23 | +2.7/ -3.7 |
| 29 | 41 | 20MHz | 23 | +2.7/ -4.7 |
| 30 | 41 | 20MHz | 23 | +2.7/ -6.2 |
| 31 | 41 | 20MHz | 23 | +2.7/ -8.2 |
| 32 | 41 | 20MHz | 23 | +2.7/ |

| | | | | |
|---|---|---|---|---|
| | | | | -6.2 |

**Table 6.2.4E.5-4: UE Power Class test requirements (network signalled value "NS_06") (for Bands 13)**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 13 | | | | | 23 | +2.7 / -3.7 |
| 2 | 13 | | | | | 23 | +2.7 / -2.7 |
| 3 | 13 | | | | | 23 | +2.7 / -2.7 |
| 4 | 13 | | | | | 23 | +2.7 / -3.7 |
| 5 | 13 | | | | | 23 | +2.7 / -2.7 |
| 6 | 13 | | | | | 23 | +2.7 / -3.7 |
| 7 | 13 | | | | | 23 | +2.7 / -3.7 |
| 8 | 13 | | | | | 23 | +2.7 / -2.7 |
| 9 | 13 | | | | | 23 | +2.7 / -3.7 |
| 10 | 13 | | | | | 23 | +2.7 / -3.7 |
| 11 | 13 | | | | | 23 | +2.7 / -2.7 |
| 12 | 13 | | | | | 23 | +2.7 / -3.7 |
| 13 | 13 | | | | | 23 | +2.7 / -3.7 |
| 14 | 13 | | | | | 23 | +2.7 / -2.7 |
| 15 | 13 | | | | | 23 | +2.7 / -3.7 |
| 16 | 13 | | | | | 23 | +2.7 / -3.7 |
| 17 | 13 | | | | | 23 | +2.7 / -2.7 |
| 18 | 13 | | | | | 23 | +2.7 / -3.7 |

**Table 6.2.4E.5-5: UE Power Class test requirements (network signalled value "NS_07")**

| Configuration ID | EUTRA band | Class 1 (dBm) | Tol. (dB) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | Tol. (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 13 | | | | | 23 | +2.7 / -18.7 |
| 2 | 13 | | | | | 23 | +2.7 / -13.7 |
| 3 | 13 | | | | | 23 | +2.7 / -2.7 |
| 4 | 13 | | | | | 23 | +2.7 / -19.7 |
| 5 | 13 | | | | | 23 | +2.7 / -18.7 |
| 6 | 13 | | | | | 23 | +2.7 / -20.7 |
| 7 | 13 | | | | | 23 | +2.7 / -3.7 |
| 8 | 13 | | | | | 23 | +2.7 / -2.7 |
| 9 | 13 | | | | | 23 | +2.7 / -4.7 |
| 10 | 13 | | | | | 23 | +2.7 / -12.7 |
| 11 | 13 | | | | | 23 | +2.7 / -2.7 |
| 12 | 13 | | | | | 23 | +2.7 / -6.2 |
| 13 | 13 | | | | | 23 | +2.7 / -19.7 |
| 14 | 13 | | | | | 23 | +2.7 / -18.7 |
| 15 | 13 | | | | | 23 | +2.7 / -20.7 |

## 6.2.4EA Additional Maximum Power Reduction (A-MPR) for UE category M1

Editor's note: This clause is incomplete. The following aspects are either missing or not yet determined:

- NS_04 (B41), NS_12 (B26): Minimum requirements in 36.101 are incomplete. Test configuration table and test requirements are missing

### 6.2.4EA.1 Test purpose

Additional ACLR and spectrum emission requirements can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction A-MPR is allowed for the output power as specified in Table 6.2.2 EA -1. Unless stated otherwise, an A-MPR of 0 dB shall be used.

### 6.2.4EA.2 Test applicability

The requirements of this test apply in test case 6.6.2.2EA Additional Spectrum Emission Mask for network signalled values NS_03, NS_04, NS_06 and NS_07to all types of E-UTRA UE release 13 and forward of UE category M1.

The requirements of this test apply in test case 6.6.3EA.3 Additional Spurious Emissions for network signalled values NS_05, NS_07, NS_08, NS_09, NS_12, NS_13, NS_14, NS_15, NS_16, NS_17, NS_18, NS_38 and NS_39 to all types of E-UTRA UE release 13 and forward of UE category M1.

NOTE: As a result TC 6.2.4EA has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

## 6.2.4EA.3 Minimum conformance requirements

Additional ACLR and spectrum emission requirements can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction (A-MPR) is allowed for the output power as specified in Table 6.2.2EA-1. Unless stated otherwise, an A-MPR of 0 dB shall be used.

For UE Power Class 3 and 5 the specific requirements and identified subclauses are specified in Table 6.2.4EA-1 along with the allowed A-MPR values that may be used to meet these requirements. The allowed A-MPR values specified below in Table 6.2.4EA-1 and from 6.2.4EA-2 to 6.2.4EA-3 are in addition to the allowed MPR requirements specified in subclause 6.2.3EA.

**Table 6.2.4EA-1: Additional Maximum Power Reduction (A-MPR) for category M1 UE**

| Network Signalling value | Requirements (subclause) | E-UTRA Band | Resources Blocks ($N_{RB}$) | A-MPR (dB) |
|---|---|---|---|---|
| NS_01 | 6.6.2.1.1 | Table 5.2-1 | Table 5.4.2-1 | N/A |
| NS_03 | 6.6.2.2.1 | 2, 4 | Table 5.4.2-1 | N/A |
| NS_04 | 6.6.2.2.2 | 41 | [TBD] | [TBD] |
| NS_05 | 6.6.3.3.3.2 | 1 | Table 5.4.2-1 | N/A |
| NS_06 | 6.6.2.2.3 | 12, 13, 14 | Table 5.4.2-1 | N/A |
| NS_07 | 6.6.2.2.3<br>6.6.3.3.3.3 | 13 | Table 6.2.4-2E | |
| NS_08 | 6.6.3.3.3.4 | 19 | Table 5.4.2-1 | N/A |
| NS_09 | 6.6.3.3.3.5 | 21 | Table 5.4.2-1 | N/A |
| NS_10 | | 20 | Table 5.4.2-1 | N/A |
| NS_12 | 6.6.3.3.3.7 | 26 | [TBD] | |
| NS_13 | 6.6.3.3.3.8 | 26 | Table 5.4.2-1 | N/A |
| NS_14 | 6.6.3.3.3.9 | 26 | Table 5.4.2-1 | N/A |
| NS_15 | 6.6.3.3.3.10 | 26 | Table 6.2.4-9 | |
| NS_16 | 6.6.3.3.3.11 | 27 | Table 5.4.2-1 | N/A |
| NS_17 | 6.6.3.3.3.12 | 28 | Table 5.4.2-1 | N/A |
| NS_18 | 6.6.3.3.3.13 | 28 | Table 5.4.2-1 | N/A |
| NS_32 | - | - | - | - |
| NS_35 | [TBD] | 71 | [TBD] | [TBD] |
| NS_38 | 6.6.3.3.3.27 | 74 | Table 5.4.2-1 | N/A |
| NS_39 | 6.6.3.3.3.28 | 74 | Table 5.4.2-1 | N/A |

No other A-MPR requirement than those specified in tables 6.2.4EA-1 applies to category M1 UE.

…

**Table 6.2.4EA-2: A-MPR for "NS_07“ for Cat-M1**

| BW [MHz] | 5 | | | | 10 | |
|---|---|---|---|---|---|---|
| ($NB_{index}$,$RB_{start}$) | (0,<6) | (0,<6) | (3,<6) | (3,<6) | (0,<6) | (7,<6) |
| LCRB | >4 and <7 | >1 and ≤4 | >4 and <7 | >1 and ≤4 | >2and <7 | >2and <7 |
| AMPR [dB] | 2 | 1 | 2 | 1 | 1 | 1 |
| NOTE 1: $NB_{index}$ is the narrowband index that is defined in 6.2.7 in [8]. The resource block assignment is defined within the narrowband as defined in 5.3.3.1.12 and 5.3.3.1.13 in [9]. | | | | | | |

**Table 6.2.4EA-3: A-MPR for "NS_15" for E-UTRA highest channel edge > 845 MHz and ≤ 849 MHz**

| Channel bandwidth [MHz] | Parameters | Region A | Region B | Region C |
|---|---|---|---|---|
| 1.4 | $RB_{end}$ [RB] | | | 4-5 |
| | A-MPR [dB] | | | ≤3 |
| 3 | $RB_{end}$ [RB] | 0-1 | 8-12 | 13-14 |
| | $L_{CRB}$ [RB] | ≤2 | ≥8 | >0 |
| | A-MPR [dB] | ≤4 | ≤4 | ≤9 |
| 5 | $RB_{end}$ [RB] | 0-4 | 12-19 | 20-24 |
| | $L_{CRB}$ [RB] | ≤2 | ≥8 | >0 |
| | A-MPR [dB] | ≤4 | ≤5 | ≤9 |
| 10 | $RB_{end}$ [RB] | 0-12 | 23-36 | 37-49 |
| | $L_{CRB}$ [RB] | ≤2 | ≥15 | >0 |
| | A-MPR [dB] | ≤4 | ≤6 | ≤9 |
| 15 | $RB_{end}$ [RB] | 0-20 | 26-53 | 54-74 |
| | $L_{CRB}$ [RB] | ≤2 | ≥20 | >0 |
| | A-MPR [dB] | ≤4 | ≤5 | ≤9 |

The normative reference for this requirement is TS 36.101 [2] subclause 6.2.4EA and 6.2.4.

## 6.2.4EA.4 Test description

### 6.2.4EA.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in sub-clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.2.4EA.4.1-1 to 6.2.4EA.4.1-15. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.2.4EA.4.1-1: Test Configuration Table (network signalled value "NS_03")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest, 5MHz, 10MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| **Low range, Mid range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 5 | 0 |
| 6 | 3MHz | | QPSK | 2 | 0 |
| 7 | 3MHz | | QPSK | 5 | 0 |
| 8 | 3MHz | | QPSK | 6 | 0 |
| 9 | 3MHz | | 16QAM | 2 | 0 |
| 10 | 3MHz | | 16QAM | 5 | 0 |
| 11 | 5MHz | | QPSK | 6 | 0 |
| 12 (Note 4) | 5MHz | | 16QAM | 1 | 0 |
| 13 | 5MHz | | 16QAM | 3 | 0 |
| 14 | 5MHz | | 16QAM | 5 | 0 |
| 15 (Note 4) | 10MHz | | QPSK | 4 | 0 |
| 16 | 10MHz | | QPSK | 6 | 0 |
| 17 (Note 4) | 10MHz | | 16QAM | 3 | 0 |
| 18 | 10MHz | | 16QAM | 5 | 0 |
| 19 | 15MHz | | QPSK | 6 | 0 |
| 20 | 15MHz | | 16QAM | 5 | 0 |
| 21 | 20MHz | | 16QAM | 5 | 0 |
| **High range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 5 | 0 |
| 6 | 3MHz | | QPSK | 2 | 1 |
| 7 | 3MHz | | QPSK | 5 | 1 |
| 8 | 3MHz | | QPSK | 6 | 1 |
| 9 | 3MHz | | 16QAM | 2 | 1 |
| 10 | 3MHz | | 16QAM | 5 | 1 |
| 11 | 5MHz | | QPSK | 6 | 3 |
| 12 (Note 4) | 5MHz | | 16QAM | 1 | 3 |
| 13 | 5MHz | | 16QAM | 3 | 3 |
| 14 | 5MHz | | 16QAM | 5 | 3 |
| 15 (Note 4) | 10MHz | | QPSK | 4 | 7 |
| 16 | 10MHz | | QPSK | 6 | 7 |
| 17 (Note 4) | 10MHz | | 16QAM | 3 | 7 |
| 18 | 10MHz | | 16QAM | 5 | 7 |
| 19 | 15MHz | | QPSK | 6 | 11 |
| 20 | 15MHz | | 16QAM | 5 | 11 |
| 21 | 20MHz | | 16QAM | 5 | 15 |

Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4

Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband.

Note 4: Only for power class 3 UE.

**Table 6.2.4EA.4.1-2: Test Configuration Table (network signalled value "NS_04")**

TBD

**Table 6.2.4EA.4.1-3: Test Configuration Table (network signalled value "NS_05")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low Range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 5MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 5MHz | | QPSK | 1 | 0 |
| 2 | 5MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.2.4EA.4.1-4: Test Configuration Table (network signalled value "NS_06")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest, 5MHz, 10MHz | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| **Low range, Mid range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 5 | 0 |
| 6 | 3MHz | | QPSK | 2 | 0 |
| 7 | 3MHz | | QPSK | 5 | 0 |
| 8 | 3MHz | | QPSK | 6 | 0 |
| 9 | 3MHz | | 16QAM | 2 | 0 |
| 10 | 3MHz | | 16QAM | 5 | 0 |
| 11 | 5MHz | | QPSK | 6 | 0 |
| 12 (Note 4) | 5MHz | | 16QAM | 1 | 0 |
| 13 | 5MHz | | 16QAM | 3 | 0 |
| 14 | 5MHz | | 16QAM | 5 | 0 |
| 15 (Note 4) | 10MHz | | QPSK | 4 | 0 |
| 16 | 10MHz | | QPSK | 6 | 0 |
| 17 (Note 4) | 10MHz | | 16QAM | 3 | 0 |
| 18 | 10MHz | | 16QAM | 5 | 0 |
| **High range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 5 | 0 |
| 6 | 3MHz | | QPSK | 2 | 1 |
| 7 | 3MHz | | QPSK | 5 | 1 |
| 8 | 3MHz | | QPSK | 6 | 1 |
| 9 | 3MHz | | 16QAM | 2 | 1 |
| 10 | 3MHz | | 16QAM | 5 | 1 |
| 11 | 5MHz | | QPSK | 6 | 3 |
| 12 (Note 4) | 5MHz | | 16QAM | 1 | 3 |
| 13 | 5MHz | | 16QAM | 3 | 3 |
| 14 | 5MHz | | 16QAM | 5 | 3 |
| 15 (Note 4) | 10MHz | | QPSK | 4 | 7 |
| 16 | 10MHz | | QPSK | 6 | 7 |
| 17 (Note 4) | 10MHz | | 16QAM | 3 | 7 |
| 18 | 10MHz | | 16QAM | 5 | 7 |

Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4
Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband.
Note 4: Only for power class 3 UE.

**Table 6.2.4EA.4.1-5: Test Configuration Table (network signalled value "NS_07")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | 10MHz | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| **Low range, Mid range** | | | | | |
| 1 | 10MHz | | QPSK | 1 | 0 |
| 2 | 10MHz | | QPSK | 4 | 0 |
| 3 | 10MHz | | QPSK | 6 | 0 |
| 4 | 10MHz | | 16QAM | 5 | 0 |
| **High range** | | | | | |
| 1 | 10MHz | | QPSK | 1 | 7 |
| 2 | 10MHz | | QPSK | 4 | 7 |
| 3 | 10MHz | | QPSK | 6 | 7 |
| 4 | 10MHz | | 16QAM | 5 | 7 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.2.4EA.4.1-6: Test Configuration Table (network signalled value "NS_08")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | High Range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | 5MHz | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 5MHz | | QPSK | 1 | 0 |
| 2 | 5MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.2.4EA.4.1-7: Test Configuration Table (network signalled value "NS_09")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | High Range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 5MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 5MHz | | QPSK | 1 | 0 |
| 2 | 5MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.2.4EA.4.1-8: Test Configuration Table (network signalled value "NS_10")**

| Void, not tested |
|---|

**Table 6.2.4EA.4.1-9: Test Configuration Table (network signalled value "NS_12")**

TBD

**Table 6.2.4EA.4.1-10: Test Configuration Table (network signalled value "NS_13")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | UL 819.7 MHz ($N_{UL}$ = 26747) | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 1.4MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 1.4MHz | | QPSK | 1 | 0 |
| 2 | 1.4MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.2.4EA.4.1-11: Test Configuration Table (network signalled value "NS_14")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | UL 829 MHz ($N_{UL}$ = 26840) | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 10MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 10MHz | | QPSK | 1 | 0 |
| 2 | 10MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.2.4EA.4.1-12: Test Configuration Table (network signalled value "NS_15")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Configuration ID 1-2: UL 844.3 MHz<br>Configuration ID 3-8: High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 1.4MHz, 3MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 1.4MHz | | QPSK | 1@0, 1@5 | 0 |
| 2 | 1.4MHz | | QPSK | 6 | 0 |
| 3 | 1.4MHz | | QPSK | 1@5 | 0 |
| 4 | 1.4MHz | | QPSK | 6 | 0 |
| 5 | 3MHz | | QPSK | 1@1 | 1 |
| 6 | 3MHz | | QPSK | 1@5 | 1 |
| 7 | 3MHz | | QPSK | 6 | 1 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4 | | | | | |

**Table 6.2.4EA.4.1-13: Test Configuration Table (network signalled value "NS_16")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 1.4MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 1.4MHz | | QPSK | 1 | 0 |
| 2 | 1.4MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.2.4EA.4.1-14: Test Configuration Table (network signalled value “NS_17”)**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | 720.5MHz | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 5MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 5MHz | | QPSK | 1 | 0 |
| 2 | 5MHz | | QPSK | 6 | 0 |
| | | | | | |
| | | | | | |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.2.4EA.4.1-15: Test Configuration Table (network signalled value "NS_18")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low Range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 5MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 5MHz | | QPSK | 1 | 0 |
| 2 | 5MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.4EA.4.1-1 to Table 6.2.4EA.4.1-15.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.2.4EA.4.3.

## 6.2.4EA.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via M-PDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to the applicable table from Table 6.2.4EA.4.1-1 to Table 6.2.4EA.4.1-15. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods and Half-duplex guard subframe are not under test.

## 6.2.4EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA, with the following exceptions for each network signalled value.

### 6.2.4EA.4.3.1 Message contents exceptions (network signalled value "NS_03")

1. Information element additionalSpectrumEmission is set to NS_03. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4EA.4.3.1-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_03"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 3 (NS_03) | | |

6.2.4EA.4.3.2 Message contents exceptions (network signalled value "NS_04")

1. Information element additionalSpectrumEmission is set to NS_04. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4EA.4.3.2-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_04"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 4 (NS_04) | | |

6.2.4EA.4.3.3 Message contents exceptions (network signalled value "NS_05")

1. Information element additionalSpectrumEmission is set to NS_08. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4EA.4.3.3-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_05"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 5 (NS_05) | | |

6.2.4EA.4.3.5 Message contents exceptions (network signalled value "NS_08")

1. Information element additionalSpectrumEmission is set to NS_05. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4EA.4.3.5-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_08"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 8 (NS_08) | | |

6.2.4EA.4.3.6 Message contents exceptions (network signalled value "NS_09")

1. Information element additionalSpectrumEmission is set to NS_09. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4EA.4.3.6-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_09"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 9 (NS_09) | | |

6.2.4EA.4.3.7 Message contents exceptions (network signalled value "NS_10")

1. Information element additionalSpectrumEmission is set to NS_10. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4EA.4.3.7-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_10"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 10 (NS_10) | | |

6.2.4EA.4.3.8 Message contents exceptions (network signalled value "NS_12")

1. Information element additionalSpectrumEmission is set to NS_12. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4EA.4.3.8-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_12"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 12 (NS_12) | | |

6.2.4EA.4.3.9 Message contents exceptions (network signalled value "NS_13")

1. Information element additionalSpectrumEmission is set to NS_13. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4EA.4.3.9-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_13"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 13 (NS_13) | | |

6.2.4EA.4.3.10 Message contents exceptions (network signalled value "NS_14")

1. Information element additionalSpectrumEmission is set to NS_14. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4EA.4.3.10-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_14"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 14 (NS_14) | | |

6.2.4EA.4.3.11 Message contents exceptions (network signalled value "NS_15")

1. Information element additionalSpectrumEmission is set to NS_15. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4EA.4.3.11-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_15"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 15 (NS_15) | | |

6.2.4EA.4.3.12 Message contents exceptions (network signalled value "NS_16")

1. Information element additionalSpectrumEmission is set to NS_16. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4EA.4.3.12-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_16"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 16 (NS_16) | | |

6.2.4EA.4.3.13 Message contents exceptions (network signalled value "NS_18")

1. Information element additionalSpectrumEmission is set to NS_18. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4EA.4.3.13-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_18"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 18 (NS_18) | | |

## 6.2.4EA.5 Test requirements

The maximum output power, derived in step 3 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable table from Table 6.2.4EA.5-1 to Table 6.2.4EA.5-17. The allowed A-MPR values specified in Table 6.2.4EA-1 are in addition to the allowed MPR requirements specified in clause 6.2.3 EA. For the UE maximum output power modified by MPR and/or A-MPR, the power limits specified in Table 6.2.5 EA.3-1 and 6.2.5EA.3-2 apply.

**Table 6.2.4EA.5-1: UE Power Class test requirements (network signalled value "NS_03") (for Band 2 Low/High range with $\Delta T_{C,c}$=*1.5 dB*)**

| Config ID | Power class 3 | | | | | Power class 5 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 21.5 | 2 | 25.7 | 18.8 | 0 | 18.5 | 4 | 22.7 | 13.8 |
| 2 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 22.7 | 11.8 |
| 3 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5 | 22.7 | 10.8 |
| 4 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 22.7 | 11.8 |
| 5 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5 | 22.7 | 10.8 |
| 6 | 0 | 21.5 | 2 | 25.7 | 18.8 | 0 | 18.5 | 4 | 22.7 | 13.8 |
| 7 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 22.7 | 11.8 |
| 8 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5 | 22.7 | 10.8 |
| 9 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 22.7 | 11.8 |
| 10 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5 | 22.7 | 10.8 |
| 11 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 22.7 | 11.8 |
| 12 | 0 | 21.5 | 2 | 25.7 | 18.8 | N/A | | | | |
| 13 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 0 | 18.5 | 4 | 22.7 | 13.8 |
| 14 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 1 | 17.5 | 5 | 22.7 | 11.8 |
| 15 | 0 | 21.5 | 2 | 25.7 | 18.8 | N/A | | | | |
| 16 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5 | 22.7 | 11.8 |
| 17 | 0 | 21.5 | 2 | 25.7 | 18.8 | N/A | | | | |
| 18 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 0 | 18.5 | 4 | 22.7 | 13.8 |
| 19 | 0 | 21.5 | 2 | 25.7 | 18.8 | 0 | 18.5 | 4 | 22.7 | 13.8 |
| 20 | 0 | 21.5 | 2 | 25.7 | 18.8 | 0 | 18.5 | 4 | 22.7 | 13.8 |
| 21 | 0 | 21.5 | 2 | 25.7 | 18.8 | 0 | 18.5 | 4 | 22.7 | 13.8 |

Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5
Note 2: $\Delta T_{C,c}$ applicability per band is indicated by note 2 in Table 6.2.2EA-1

**Table 6.2.4EA.5-2: UE Power Class test requirements (network signalled value "NS_03") (for Band 2 Mid range and Band 4 with $\Delta T_{C,c}$=*0 dB*)**

| Config ID | Power class 3 | | | | | Power class 5 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2.0 | 25.7 | 20.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 2 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 3 | 2 | 21 | 2.0 | 25.7 | 18.3 | 2 | 18 | 4.0 | 22.7 | 13.3 |
| 4 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 5 | 2 | 21 | 2.0 | 25.7 | 18.3 | 2 | 18 | 4.0 | 22.7 | 13.3 |
| 6 | 0 | 23 | 2.0 | 25.7 | 20.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 7 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 8 | 2 | 21 | 2.0 | 25.7 | 18.3 | 2 | 18 | 4.0 | 22.7 | 13.3 |
| 9 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 10 | 2 | 21 | 2.0 | 25.7 | 18.3 | 2 | 18 | 4.0 | 22.7 | 13.3 |
| 11 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 12 | 0 | 23 | 2.0 | 25.7 | 20.3 | N/A | | | | |
| 13 | 1 | 22 | 2.0 | 25.7 | 19.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 14 | 2 | 21 | 2.0 | 25.7 | 18.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 15 | 0 | 23 | 2.0 | 25.7 | 20.3 | N/A | | | | |
| 16 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 17 | 0 | 23 | 2.0 | 25.7 | 20.3 | N/A | | | | |
| 18 | 1 | 22 | 2.0 | 25.7 | 19.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 19 | 0 | 23 | 2.0 | 25.7 | 20.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 20 | 0 | 23 | 2.0 | 25.7 | 20.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 21 | 0 | 23 | 2.0 | 25.7 | 20.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5<br>Note 2: $\Delta T_{C,c}$ applicability per band is indicated by note 2 in Table 6.2.2EA-1 | | | | | | | | | | |

**Table 6.2.4EA.5-3: UE Power Class test requirements (network signalled value "NS_04") (for Band 41)**

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**Table 6.2.4EA.5-4: UE Power Class test requirements (network signalled value "NS_05") (for Band 1)**

| Configuration ID | MPR (dB) | Power class 3 | | | | Power class 5 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2 | 25.7 | 20.3 | 20 | 2 | 22.7 | 17.3 |
| 2 | 1 | 22 | 2 | 25.7 | 19.3 | 19 | 3.5 | 22.7 | 14.8 |
| Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5 | | | | | | | | | |

**Table 6.2.4EA.5-5: UE Power Class test requirements (network signalled value "NS_06") (for Band 12 Low/High range with $\Delta T_{C,c}$=*1.5 dB*)**

| Configuration ID | Power class 3 | | | | | Power class 5 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 21.5 | 2.0 | 25.7 | 18.8 | 0 | 18.5 | 4.0 | 22.7 | 13.8 |
| 2 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 3 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5.0 | 22.7 | 10.8 |
| 4 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 5 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5.0 | 22.7 | 10.8 |
| 6 | 0 | 21.5 | 2.0 | 25.7 | 18.8 | 0 | 18.5 | 4.0 | 22.7 | 13.8 |
| 7 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 8 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5.0 | 22.7 | 10.8 |
| 9 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 10 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 2 | 16.5 | 5.0 | 22.7 | 10.8 |
| 11 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 12 | 0 | 21.5 | 2.0 | 25.7 | 18.8 | N/A | | | | |
| 13 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 0 | 18.5 | 4.0 | 22.7 | 13.8 |
| 14 | 2 | 19.5 | 3.5 | 25.7 | 15.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 15 | 0 | 21.5 | 2.0 | 25.7 | 18.8 | N/A | | | | |
| 16 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 1 | 17.5 | 5.0 | 22.7 | 11.8 |
| 17 | 0 | 21.5 | 2.0 | 25.7 | 18.8 | N/A | | | | |
| 18 | 1 | 20.5 | 2.5 | 25.7 | 17.3 | 0 | 18.5 | 4.0 | 22.7 | 13.8 |

Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5
Note 2: $\Delta T_{C,c}$ applicability per band is indicated by note 2 in Table 6.2.2EA-1

**Table 6.2.4EA.5-6: UE Power Class test requirements (network signalled value "NS_06") (for Band 12 Mid range and Band 13 with $\Delta T_{C,c}$=*0 dB*)**

| Config ID | Power class 3 | | | | | Power class 5 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2.0 | 25.7 | 20.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 2 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 3 | 2 | 21 | 2.0 | 25.7 | 18.3 | 2 | 18 | 4.0 | 22.7 | 13.3 |
| 4 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 5 | 2 | 21 | 2.0 | 25.7 | 18.3 | 2 | 18 | 4.0 | 22.7 | 13.3 |
| 6 | 0 | 23 | 2.0 | 25.7 | 20.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 7 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 8 | 2 | 21 | 2.0 | 25.7 | 18.3 | 2 | 18 | 4.0 | 22.7 | 13.3 |
| 9 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 10 | 2 | 21 | 2.0 | 25.7 | 18.3 | 2 | 18 | 4.0 | 22.7 | 13.3 |
| 11 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 12 | 0 | 23 | 2.0 | 25.7 | 20.3 | N/A | | | | |
| 13 | 1 | 22 | 2.0 | 25.7 | 19.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 14 | 2 | 21 | 2.0 | 25.7 | 18.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 15 | 0 | 23 | 2.0 | 25.7 | 20.3 | N/A | | | | |
| 16 | 1 | 22 | 2.0 | 25.7 | 19.3 | 1 | 19 | 3.5 | 22.7 | 14.8 |
| 17 | 0 | 23 | 2.0 | 25.7 | 20.3 | N/A | | | | |
| 18 | 1 | 22 | 2.0 | 25.7 | 19.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |

Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5
Note 2: $\Delta T_{C,c}$ applicability per band is indicated by note 2 in Table 6.2.2EA-1

**Table 6.2.4EA.5-7: UE Power Class test requirements (network signalled value "NS_07") (for band 13)**

| Configuration ID | A-MPR (dB) | | Power class 3 | | | | | Power class 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 0 | 23 | 2.0 | 25.7 | 20.3 | 0 | 20 | 2.0 | 22.7 | 17.3 |
| 2 | 1 | 0 | 22 | 2.0 | 25.7 | 19.3 | 0 | 19 | 3.5 | 22.7 | 14.8 |
| 3 | 1 | 1 | 21 | 2.0 | 25.7 | 18.3 | 1 | 18 | 4.0 | 22.7 | 13.3 |
| 4 | 1 | 1 | 21 | 2.0 | 25.7 | 18.3 | 0 | 19 | 3.5 | 22.7 | 14.8 |

Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5

**Table 6.2.4EA.5-8: UE Power Class test requirements (network signalled value "NS_08") (for band 19)**

| Configuration ID | MPR (dB) | Power class 3 | | | | Power class 5 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2 | 25.7 | 20.3 | 20 | 2 | 22.7 | 17.3 |
| 2 | 1 | 22 | 2 | 25.7 | 19.3 | 19 | 3.5 | 22.7 | 14.8 |
| Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5 | | | | | | | | | |

**Table 6.2.4EA.5-9: UE Power Class test requirements (network signalled value "NS_09") (for band 21)**

| Configuration ID | MPR (dB) | Power class 3 | | | | Power class 5 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2 | 25.7 | 20.3 | 20 | 2 | 22.7 | 17.3 |
| 2 | 1 | 22 | 2 | 25.7 | 19.3 | 19 | 3.5 | 22.7 | 14.8 |
| Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5 | | | | | | | | | |

**Table 6.2.4EA.5-10: UE Power Class test requirements (network signalled value "NS_10") (for band 20)**

| Void, not tested |
|---|

**Table 6.2.4EA.5-11: UE Power Class 3 test requirements (network signalled value "NS_12") (for band 26)**

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**Table 6.2.4EA.5-12: UE Power Class 3 test requirements (network signalled value "NS_13") (for band 26)**

| Configuration ID | MPR (dB) | Power class 3 | | | | Power class 5 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2.0 | 25.7 | 20.3 | 20 | 2.0 | 22.7 | 17.3 |
| 2 | 1 | 21 | 2.0 | 25.7 | 18.3 | 18 | 4.0 | 22.7 | 13.3 |
| Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5<br>Note 2: $\Delta T_{C,c}$ is 0 dB for band 26 UL 819.7 MHz (NUL = 26747) as indicated by note 2 in Table 6.2.2EA-1 | | | | | | | | | |

**Table 6.2.4EA.5-13: UE Power Class 3 test requirements (network signalled value "NS_14") (for band 26)**

| Configuration ID | MPR (dB) | Power class 3 | | | | Power class 5 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2.0 | 25.7 | 20.3 | 20 | 2.0 | 22.7 | 17.3 |
| 2 | 1 | 21 | 2.0 | 25.7 | 18.3 | 18 | 4.0 | 22.7 | 13.3 |
| Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5 | | | | | | | | | |
| Note 2: $\Delta T_{C,c}$ is 0 dB for band 26 UL 829 MHz ($N_{UL}$ = 26840) as indicated by note 2 in Table 6.2.2EA-1 | | | | | | | | | |

**Table 6.2.4.5-14: UE Power Class test requirements (network signalled value "NS_15") (for band 26)**

| Configuration ID | DTC,c (dB) | A-MPR (dB) | MPR (dB) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| **Power class 3** | | | | | | | |
| 1 | 0 | 0 | 0 | 23 | 2 | 25.7 | 20.3 |
| 2 | 0 | 0 | 2 | 21 | 2 | 25.7 | 18.3 |
| 3 | 1.5 | 0 | 0 | 21.5 | 2 | 25.7 | 18.8 |
| 4 | 1.5 | 3 | 2 | 16.5 | 5 | 25.7 | 10.8 |
| 5 | 1.5 | 0 | 0 | 21.5 | 2 | 25.7 | 18.8 |
| 6 | 1.5 | 0 | 2 | 21.5 | 2 | 25.7 | 18.8 |
| 7 | 1.5 | 9 | 2 | 10.5 | 6 | 25.7 | 3.8 |
| **Power class 5** | | | | | | | |
| 1 | 0 | 0 | 0 | 20 | 2 | 22.7 | 17.3 |
| 2 | 0 | 0 | 2 | 18 | 4 | 22.7 | 13.3 |
| 3 | 1.5 | 0 | 0 | 18.5 | 4 | 22.7 | 13.8 |
| 4 | 1.5 | 3 | 2 | 13.5 | 5 | 22.7 | 7.8 |
| 5 | 1.5 | 0 | 0 | 18.5 | 4 | 22.7 | 13.8 |
| 6 | 1.5 | 0 | 2 | 18.5 | 4 | 22.7 | 13.8 |
| 7 | 1.5 | 9 | 2 | 7.5 | 7 | 22.7 | -0.2 |

**Table 6.2.4EA.5-15: UE Power Class test requirements (network signalled value "NS_16") (for band 27)**

| Configuration ID | MPR (dB) | Power class 3 | | | | Power class 5 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2 | 25.7 | 20.3 | 20 | 2 | 22.7 | 17.3 |
| 2 | 1 | 22 | 2 | 25.7 | 19.3 | 19 | 3.5 | 22.7 | 14.8 |
| Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5 | | | | | | | | | |

**Table 6.2.4.5-16: UE Power Class test requirements (network signalled value "NS_17") (for band 28)**

| Configuration ID | MPR (dB) | Power class 3 | | | | Power class 5 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2 | 25.7 | 19.8 | 20 | 2 | 22.7 | 16.8 |
| 2 | 1 | 22 | 2 | 25.7 | 18.8 | 19 | 3.5 | 22.7 | 14.3 |
| Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5 | | | | | | | | | |

**Table 6.2.4EA.5-17: UE Power Class test requirements (network signalled value "NS_18") (for band 28)**

| Configuration ID | MPR (dB) | Power class 3 | | | | Power class 5 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) | $P_{CMAX_L,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 0 | 23 | 2 | 25.7 | 19.8 | 20 | 2 | 22.7 | 16.8 |
| 2 | 1 | 22 | 2 | 25.7 | 18.8 | 19 | 3.5 | 22.7 | 14.3 |
| Note 1: $P_{CMAX,c}$ and $T(P_{CMAX_L,c})$ are defined in TS 36.101 [2] clause 6.2.5 | | | | | | | | | |

## 6.2.4EB Additional Maximum Power Reduction (A-MPR) for UE category 1bis

### 6.2.4EB.1 Test purpose

Same test purpose as in clause 6.2.4.1.

### 6.2.4EB.2 Test applicability

The requirements of this test apply in test case 6.6.2.2EB Additional Spectrum Emission Mask for network signalled values NS_03, NS_04, NS_06 and NS_07 to all types of E-UTRA UE release 13 and forward of UE category 1bis.

The requirements of this test apply in test case 6.6.3EB.3 Additional Spurious Emissions for network signalled values NS_04, NS_05, NS_07, NS_12, NS_13, NS_14, NS_15, NS_17 and NS_18 to all types of E-UTRA UE release 13 and forward of UE category 1bis.

NOTE: As a result TC 6.2.4EB has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.4EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.4.3.

### 6.2.4EB.4 Test description

#### 6.2.4EB.4.1 Initial conditions

Same initial conditions as in clause 6.2.3.4.1 with the following exceptions:

- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

### 6.2.4EB.4.2 Test procedure

Same test procedure as in clause 6.2.2.4.2.

### 6.2.4EB.4.3 Message contents

Same message contents as in clause 6.2.2.4.3.

### 6.2.4EB.5 Test requirement

The maximum output power, derived in step 2 of clause 6.2.3EB.4.2, shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.3EB.5-1.

**Table 6.2.3EB.5-1: UE Power Class test requirements**

| E-UTRA Band | Class 1 (dBm) | Tol. (Db) | Class 2 (dBm) | Tol. (dB) | Class 3 (dBm) | QPSK partial RB allocation Tol. (dB)) | QPSK full RB allocation Tol. (dB)) | 16QAM partial RB allocation Tol. (dB) | 16QAM full RB allocation Tol. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 2 | | | | | 23 | ±2.7[1] | +2.7 / -3.7 [1,2] | +2.7 / -3.7 [1,2] | +2.7 / -4.7 [1,2] |
| 3 | | | | | 23 | ±2.7[1] | +2.7 / -3.7 [1,2] | +2.7 / -3.7 [1,2] | +2.7 / -4.7 [1,2] |
| 4 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 5 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 7 | | | | | 23 | ±2.7[1] | +2.7 / -3.7 [1,2] | +2.7 / -3.7 [1,2] | +2.7 / -4.7 [1,2] |
| 8 | | | | | 23 | ±2.7[1] | +2.7 / -3.7 [1,2] | +2.7 / -3.7 [1,2] | +2.7 / -4.7 [1,2] |
| 12 | | | | | 23 | ±2.7[1] | +2.7 / -3.7 [1,2] | +2.7 / -3.7 [1,2] | +2.7 / -4.7 [1,2] |
| 13 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 18 | | | | | 23 | ±2.7[3] | +2.7 / -3.7 [3] | +2.7 / -3.7 [3] | +2.7 / -4.7 [3] |
| 20 | | | | | 23 | ±2.7[1] | +2.7 / -3.7 [1,2] | +2.7 / -3.7 [1,2] | +2.7 / -4.7 [1,2] |
| 26 | | | | | 23 | ±2.7[1] | +2.7 / -3.7 [1,2] | +2.7 / -3.7 [1,2] | +2.7 / -4.7 [1,2] |
| 28 | | | | | 23 | +2.7/-3.2 | +2.7/-4.2 | +2.7/-4.2 | +2.7/-5.2 |
| 31 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 39 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 41 | | | | | 23 | ±2.7[1] | +2.7 / -3.7 [1,2] | +2.7 / -3.7 [1,2] | +2.7 / -4.7 [1,2] |
| 66 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |
| 72 | | | | | 23 | ±2.7 | +2.7 / -3.7 | +2.7 / -3.7 | +2.7 / -4.7 |

Note 1: For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.

Note 2: For the UE maximum output power modified by MPR, the power limits specified in Table 6.2.5.3-1 apply

Note 3: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5dB for transmission bandwidths confined within 815 MHz and 818 MHz

## 6.2.4G Additional Maximum Power Reduction (A-MPR) for V2X Communication

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- NS_33 (B47): Minimum requirements in TS 36.101 are incomplete.

- The test point analysis in TS 36.905.

### 6.2.4G.1 Additional Maximum Power Reduction (A-MPR) for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

#### 6.2.4G.1.1 Test purpose

Additional ACLR and spectrum emission requirements can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction A-MPR is allowed for the output power as specified in Table 6.2.2.3-1. Unless stated otherwise, an A-MPR of 0 dB shall be used.

#### 6.2.4G.1.2 Test applicability

The requirements of this test apply in test case 6.6.2.2.4 Additional Spectrum Emission Mask for network signalled values NS_33 and NS_34 to all types of UE that support V2X Sidelink communication and Band 47.

The requirements of this test apply in test case 6.6.3.2 Additional Spurious Emissions for network signalled values NS_33 and NS_34 to all types of UE that support V2X Sidelink communication and Band 47.

NOTE: As a result TC 6.2.4G.1 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

#### 6.2.4G.1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.2G-1, the maximum output power reduction specified as

$$\text{A-MPR} = \text{CEIL}\{M_A, 0.5\}$$

Where $M_A$ is defined as follows

$$M_A = \text{A-MPR}_{Base} + G_{post\ connector} * \text{A-MPR}_{Step}$$

CEIL{$M_A$, 0.5} means rounding upwards to closest 0.5dB.

$\text{A-MPR}_{Base}$ and $\text{A-MPR}_{Step}$ are specified in Tables 6.2.4G.1.3-1, 6.2.4G.1.3-2 is allowed when network signalling value is provided. The supported post antenna connector gain $G_{post\ connector}$ is declared by the UE following the principle described in TS 36.101 [2] annex I.

NOTE: the A-MPRstep is the increase in A-MPR allowance to allow UE to meet tighter conducted A-SE and A-SEM requirements with higher value of declared Gpost connector. A-MPRBase is the default A-MPR value when no Gpost connector is declared. A-MPRBase and A-MPRstep vary depending on channel frequency and RB allocation. For channel frequencies and RB allocations that are close to the frequency range 5815-5855MHz, those value are much higher due to stringent emission requirement in this range.

**Table 6.2.4G.1.3-1: Additional Maximum Power Reduction (A-MPR) for power class 3 V2X UE**

| Network Signalling value | Requirements (subclause) | E-UTRA Band | Channel bandwidth (MHz) | A-MPR (dB) |
|---|---|---|---|---|
| NS_33 | 6.6.2.2.4 (A-SEM)<br>6.6.3.2 (A-SE)<br>6.6.2G | 47 | 10 | Table 6.2.4G.1.3-2 |

**Table 6.2.4G.1.3-2: A-MPR for NS_33**

| Resource pool | Carrier frequency(MHz) | Resources Blocks ($N_{RB}$) | Start Resource Block | $A\text{-}MPR_{Base}$ | $A\text{-}MPR_{Step}$ |
|---|---|---|---|---|---|
| Adjacent | 5860 | ≤ 10 | 0 | 15.5 | 0.86 |
| | | | 5, 6 | 8 | 0.64 |
| | | | 10, 12 | 6 | 0.50 |
| | | | ≥ 15 | 5 | 0.93 |
| | | >10 & ≤22 | 0 | 15 | 0.71 |
| | | | 5, 6 | 11.5 | 0.64 |
| | | | 10, 12 | 10 | 0.57 |
| | | | 15, 18 | 6 | 0.57 |
| | | | 20, 24, 25 | 5 | 0.57 |
| | | | ≥ 30 | 4.5 | 0.64 |
| | | >22 | 0, 5, 6 | 12.5 | 0.71 |
| | | | 10, 12 | 10.5 | 0.57 |
| | | | 15, 18 | 9.5 | 0.64 |
| | | | 20, 24, 25 | 6.5 | 0.71 |
| | 5870, 5910, 5920 | <20 | ≥ 0 | 3 | 0.64 |
| | | ≥ 20 and ≤45 | | 1.5 | 0.43 |
| | | >45 | | 2.5 | 0.36 |
| | 5880, 5890, 5900 | <10 | ≥ 0 | 3 | 0.43 |
| | | ≥ 10 and ≤38 | | 1.5 | 0.50 |
| | | >38 | | 2 | 0.43 |
| Non-Adjacent | 5860 | ≤ 5 | ≥ 0 | 13.5 | TBD |
| | | >5 | | 11.5 | TBD |
| | 5870, 5910, 5920 | ≤ 5 | ≥ 0 | 5 | TBD |
| | | >5 & ≤42 | | 3 | TBD |
| | | >42 | | 4.5 | TBD |
| | 5880, 5890, 5900 | ≤18 | ≥ 0 | 3.5 | TBD |
| | | >18 & ≤42 | | 2.5 | TBD |
| | | >42 | | 3 | TBD |

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.5G-1, the allowed A-MPR for the maximum output power for V2X physical channels PSCCH and PSSCH shall be as specified in Table 6.2.4G.1.3-3 and 6.2.4G.1.3-4 for V2X UE power class 2.

**Table 6.2.4G.1.3-3: Additional Maximum Power Reduction (A-MPR) for power class 2 V2X UE**

| Network Signalling value | Requirements (subclause) | E-UTRA Band | Channel bandwidth (MHz) | A-MPR (dB) |
|---|---|---|---|---|
| NS_34 | 6.6.2.2.4 (A-SEM)<br>6.6.3.2 (A-SE)<br>6.6.2G | 47 | 10 | Table 6.2.4G-4 |

**Table 6.2.4G.1.3-4: A-MPR for NS_34**

| Resource pool | Carrier frequency(MHz) | Resources Blocks ($N_{RB}$) | A-MPR (dB) |
|---|---|---|---|
| Adjacent | 5860 | <20 | 15 |
| | | >20 & <30 | 13 |
| | | >30 | 12 |
| | 5870, 5900, 5880, 5890, 5900 | <15 or >40 | 1 |
| Non-Adjacent | 5860 | - | 12.5 |
| | 5910, 5920 | <10 | 5.5 |
| | | <20 & >10 | 3 |
| | 5870, 5880, 5890, 5900 | <10 | 5.5 |

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.4G.

## 6.2.4G.1.4 Test description

### 6.2.4G.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.2G-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.4G.1.4.1-1 and 6.2.4G.1.4.1-2. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.2.4G.1.4.1-1: Test Configuration Table for Power Class 3**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | NC | | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | Low range, Mid range, High range | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | Lowest | | | |
| **Test Parameters for NS_33 A-MPR** | | | | | |
| | | **V2X Configuration to Transmit** | | | |
| **Configura-tion ID** | **Ch BW** | **Resource pool** | **Mod'n** | **PSSCH RB allocation** | **PSSCH $RB_{start}$** |
| 1 | 10MHz | adjacent | QPSK | 8 | 2 |
| 2 | 10MHz | | QPSK | 8 | 7 |
| 3 | 10MHz | | QPSK | 8 | 12 |
| 4 | 10MHz | | QPSK | 8 | 17 |
| 5 | 10MHz | | QPSK | 18 | 2 |
| 6 | 10MHz | | QPSK | 18 | 7 |
| 7 | 10MHz | | QPSK | 18 | 12 |
| 8 | 10MHz | | QPSK | 18 | 17 |
| 9 | 10MHz | | QPSK | 18 | 22 |
| 10 | 10MHz | | QPSK | 18 | 32 |
| 11 | 10MHz | | QPSK | 23 | 2 |
| 12 | 10MHz | | QPSK | 23 | 12 |
| 13 | 10MHz | | QPSK | 23 | 17 |
| 14 | 10MHz | | QPSK | 23 | 22 |
| 15 | 10MHz | | 16QAM | 8 | 2 |
| 16 | 10MHz | | 16QAM | 8 | 7 |
| 17 | 10MHz | | 16QAM | 8 | 12 |
| 18 | 10MHz | | 16QAM | 8 | 17 |
| 19 | 10MHz | | 16QAM | 18 | 2 |
| 20 | 10MHz | | 16QAM | 18 | 7 |
| 21 | 10MHz | | 16QAM | 18 | 12 |
| 22 | 10MHz | | 16QAM | 18 | 17 |
| 23 | 10MHz | | 16QAM | 18 | 22 |
| 24 | 10MHz | | 16QAM | 18 | 32 |
| 25 | 10MHz | | 16QAM | 23 | 2 |
| 26 | 10MHz | | 16QAM | 23 | 12 |
| 27 | 10MHz | | 16QAM | 23 | 17 |
| 28 | 10MHz | | 16QAM | 23 | 22 |
| 29 | 10MHz | | QPSK | 8 | 2 |
| 30 | 10MHz | | QPSK | 18 | 2 |
| 31 | 10MHz | | QPSK | 48 | 2 |
| 32 | 10MHz | | 16QAM | 8 | 2 |
| 33 | 10MHz | | 16QAM | 18 | 2 |
| 34 | 10MHz | | 16QAM | 48 | 2 |
| 35 | 10MHz | | QPSK | 3 | 2 |
| 36 | 10MHz | | QPSK | 8 | 2 |
| 37 | 10MHz | | QPSK | 48 | 2 |
| 38 | 10MHz | | 16QAM | 3 | 2 |
| 39 | 10MHz | | 16QAM | 8 | 2 |
| 40 | 10MHz | | 16QAM | 48 | 2 |
| 41 | 10MHz | non- adjacent | QPSK | 3 | 5 |
| 42 | 10MHz | | QPSK | 45 | 5 |
| 43 | 10MHz | | QPSK | 3 | 5 |
| 44 | 10MHz | | QPSK | 40 | 5 |
| 45 | 10MHz | | QPSK | 45 | 5 |
| 46 | 10MHz | | QPSK | 16 | 5 |
| 47 | 10MHz | | QPSK | 40 | 5 |
| 48 | 10MHz | | QPSK | 45 | 5 |

Note 1: Test Channel Bandwidths are checked separately for E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The configuration ID will be used to map the applicable Test Configuration to be corresponding Test Requirement in subclause 6.2.4G as not all combinations are necessarily required based on the applicability of the UE.

**Table 6.2.4G.1.4.1-2: Test Configuration Table for Power Class 2**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | NC | | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | Low range, Mid range, High range | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | Lowest | | | |
| **Test Parameters for NS_34 A-MPR** | | | | | |
| | | **V2X Configuration to Transmit** | | | |
| **Configura-tion ID** | **Ch BW** | **Resource pool** | **Mod'n** | **PSSCH RB allocation** | **PSSCH $RB_{start}$** |
| 1 | 10MHz | adjacent | QPSK | 16 | 2 |
| 2 | 10MHz | | QPSK | 27 | 2 |
| 3 | 10MHz | | QPSK | 48 | 2 |
| 4 | 10MHz | | 16QAM | 16 | 2 |
| 5 | 10MHz | | 16QAM | 27 | 2 |
| 6 | 10MHz | | 16QAM | 48 | 2 |
| 7 | 10MHz | | QPSK | 12 | 2 |
| 8 | 10MHz | | QPSK | 36 | 2 |
| 9 | 10MHz | | QPSK | 48 | 2 |
| 10 | 10MHz | | 16QAM | 12 | 2 |
| 11 | 10MHz | | 16QAM | 36 | 2 |
| 12 | 10MHz | | 16QAM | 48 | 2 |
| 13 | 10MHz | non- adjacent | QPSK | 45 | 5 |
| 14 | 10MHz | | QPSK | 6 | 5 |
| 15 | 10MHz | | QPSK | 16 | 5 |
| 16 | 10MHz | | QPSK | 45 | 5 |
| 17 | 10MHz | | QPSK | 6 | 5 |
| 18 | 10MHz | | QPSK | 45 | 5 |
| Note 1: Test Channel Bandwidths are checked separately for E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The configuration ID will be used to map the applicable Test Configuration to be corresponding Test Requirement in subclause 6.2.4G as not all combinations are necessarily required based on the applicability of the UE. | | | | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.2.4G.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.2.4G.1.4.1-1 and Table 6.2.4G.1.4.1-2.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.2.4G.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC. (UE should be already transmitting $P_{UMAX}$ after Initial Conditions setting)

2. Measure the mean power of the UE in the channel bandwidth for each test point in table 6.2.4G.1.5-1 according to the test configuration from Table 6.2.4G.1.4.1-1 for Power Class 3 and Table 6.2.4G.1.4.1-2 for Power Class 2. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

#### 6.2.4G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.2.4G.1.4.3-1: SL-CommResourcePoolV2X-r14 for non- adjacent resource pool**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20C SL-CommResourcePoolV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResourcePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| adjacencyPSCCH-PSSCH-r14 | FALSE | BOOLEAN | |
| numSubchannel-r14 | n9 | | |
| startRB-Subchannel-r14 | 5 | | 10 MHz |
| startRB-PSCCH-Pool-r14 | 0 | | |

##### 6.2.4G.1.4.3.1 Message contents exceptions (network signalled value "NS_33")

1. Information element additionalSpectrumEmission is set to NS_33. This can be set in the *SL-PreconfigGeneral-r12* as part of the *SL-V2X-Preconfiguration*. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4G.1.4.3.1-1: SL-V2X-PreconfigFreqInfo-r14-DEFAULT: Additional spurious emissions test requirement for "NS_33"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20K SL-V2X-PreconfigFreqInfo-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission-v1440 | 33 (NS_33) | | |

##### 6.2.4G.1.4.3.2 Message contents exceptions (network signalled value "NS_34")

1. Information element additionalSpectrumEmission is set to NS_34. This can be set in the *SL-PreconfigGeneral-r12* as part of the *SL-V2X-Preconfiguration*. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4G.1.4.3.2-1: SL-V2X-PreconfigFreqInfo-r14-DEFAULT: Additional spurious emissions test requirement for "NS_34"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20K SL-V2X-PreconfigFreqInfo-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission-v1440 | 34 (NS_34) | | |

### 6.2.4G.1.5 Test Requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable Table 6.2.4G.1.4.1-1 and Table 6.2.4G.1.4.1-2. For the UE maximum output power modified by A-MPR specified in sub-clause 6.2.4G.1.3, the power limits specified in Table 6.2.5.3-1 apply.

**Table 6.2.4G.1.5-1: Test requirement (network signalled value NS_33)**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 1.5 | 15.5 | 0 | 6 | 7.0 | 26.3 | -2.3 |
| 2 | 1.5 | 8 | 0 | 13.5 | 5.0 | 26.3 | 7.2 |
| 3 | 1.5 | 6 | 0 | 15.5 | 5.0 | 26.3 | 9.2 |
| 4 | 1.5 | 5 | 0 | 16.5 | 5.0 | 26.3 | -10.2 |
| 5 | 1.5 | 15 | 0 | 6.5 | 7.0 | 26.3 | -1.8 |
| 6 | 1.5 | 11.5 | 0 | 10 | 6.0 | 26.3 | 2.7 |
| 7 | 1.5 | 10 | 0 | 11.5 | 6.0 | 26.3 | 4.2 |
| 8 | 1.5 | 6 | 0 | 15.5 | 5.0 | 26.3 | 9.2 |
| 9 | 1.5 | 5 | 0 | 16.5 | 5.0 | 26.3 | 10.2 |
| 10 | 1.5 | 4.5 | 0 | 17 | 5.0 | 26.3 | 10.7 |
| 11 | 1.5 | 12.5 | 0 | 9 | 6.0 | 26.3 | 1.7 |
| 12 | 1.5 | 10.5 | 0 | 11 | 6.0 | 26.3 | 3.7 |
| 13 | 1.5 | 9.5 | 0 | 12 | 6.0 | 26.3 | 4.7 |
| 14 | 1.5 | 6.5 | 0 | 15 | 5.0 | 26.3 | 8.7 |
| 15 | 2 | 15.5 | 0 | 5.5 | 7.0 | 26.3 | -2.8 |
| 16 | 2 | 8 | 0 | 13 | 5.0 | 26.3 | 6.7 |
| 17 | 2 | 46 | 0 | 15 | 5.0 | 26.3 | 8.7 |
| 18 | 2 | 5 | 0 | 16 | 5.0 | 26.3 | 9.7 |
| 19 | 2 | 15 | 0 | 6 | 7.0 | 26.3 | -2.3 |
| 20 | 2 | 11.5 | 0 | 9.5 | 6.0 | 26.3 | 2.2 |
| 21 | 2 | 10 | 0 | 11 | 6.0 | 26.3 | 3.7 |
| 22 | 2 | 6 | 0 | 15 | 5.0 | 26.3 | 8.7 |
| 23 | 2 | 5 | 0 | 16 | 5.0 | 26.3 | 9.7 |
| 24 | 2 | 4.5 | 0 | 16.5 | 5.0 | 26.3 | 10.2 |
| 25 | 2 | 12.5 | 0 | 8.5 | 6.0 | 26.3 | 1.2 |
| 26 | 2 | 10.5 | 0 | 10.5 | 6.0 | 26.3 | 3.2 |
| 27 | 2 | 9.5 | 0 | 11.5 | 6.0 | 26.3 | 4.2 |
| 28 | 2 | 6.5 | 0 | 14.5 | 5.0 | 26.3 | 8.2 |
| 29 | 1.5 | 3 | 0 | 18.5 | 4.0 | 26.3 | 13.2 |
| 30 | 1.5 | 1.5 | 0 | 20 | 2.5 | 26.3 | 16.2 |
| 31 | 1.5 | 2.5 | 0 | 19 | 3.5 | 26.3 | 14.2 |
| 32 | 2 | 3 | 0 | 18 | 4.0 | 26.3 | 12.7 |
| 33 | 2 | 1.5 | 0 | 19.5 | 3.5 | 26.3 | 14.7 |
| 34 | 2 | 2.5 | 0 | 18.5 | 4.0 | 26.3 | 13.2 |
| 35 | 1.5 | 3 | 0 | 18.5 | 4.0 | 26.3 | 13.2 |
| 36 | 1.5 | 1.5 | 0 | 20 | 2.5 | 26.3 | 16.2 |
| 37 | 1.5 | 2 | 0 | 19.5 | 3.5 | 26.3 | 14.7 |
| 38 | 2 | 3 | 0 | 18 | 4.0 | 26.3 | 12.7 |
| 39 | 2 | 1.5 | 0 | 19.5 | 3.5 | 26.3 | 14.7 |
| 40 | 2 | 2 | 0 | 19 | 3.5 | 26.3 | 14.2 |
| 41 | 4.5 | 13.5 | 0 | 5 | 7.0 | 26.3 | -3.3 |
| 42 | 2 | 11.5 | 0 | 9.5 | 6.0 | 26.3 | 2.2 |
| 43 | 4.5 | 5 | 0 | 13.5 | 5.0 | 26.3 | 7.2 |
| 44 | 2 | 3 | 0 | 18 | 4.0 | 26.3 | 12.7 |
| 45 | 2 | 4.5 | 0 | 16.5 | 5.0 | 26.3 | 10.2 |
| 46 | 3.5 | 3.5 | 0 | 16 | 5.0 | 26.3 | 9.7 |
| 47 | 2 | 2.5 | 0 | 18.5 | 4.0 | 26.3 | 13.2 |
| 48 | 2 | 3 | 0 | 18 | 4.0 | 26.3 | 12.7 |

Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1.

Note 2: The default value of $G_{post\ connector}$ is 0dBi, if external antenna is not used.

**Table 6.2.4G.1.5-2: Test requirement (network signalled value NS_34)**

| Configuration ID | MPR (dB) | A-MPR (dB) | $\Delta T_{C,c}$ (dB) | $P_{CMAX,c}$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 15 | 0 | 9 | 6.0 | 29.3 | 1.7 |
| 2 | 2 | 13 | 0 | 11 | 6.0 | 29.3 | 3.7 |
| 3 | 2 | 12 | 0 | 12 | 6.0 | 29.3 | 4.7 |
| 4 | 2.5 | 15 | 0 | 8.5 | 6.0 | 29.3 | 1.2 |
| 5 | 2.5 | 13 | 0 | 10.5 | 6.0 | 29.3 | 3.2 |
| 6 | 2.5 | 12 | 0 | 11.5 | 6.0 | 29.3 | 4.2 |
| 7 | 2 | 1 | 0 | 23 | 2.0 | 29.3 | 19.7 |
| 8 | 2 | 0 | 0 | 24 | 2.0 | 29.3 | 20.7 |
| 9 | 2 | 1 | 0 | 23 | 2.0 | 29.3 | 19.7 |
| 10 | 2.5 | 1 | 0 | 22.5 | 2.0 | 29.3 | 19.2 |
| 11 | 2.5 | 0 | 0 | 23.5 | 2.0 | 29.3 | 20.2 |
| 12 | 2.5 | 1 | 0 | 22.5 | 2.0 | 29.3 | 19.2 |
| 13 | 2 | 12.5 | 0 | 11.5 | 6.0 | 29.3 | 4.2 |
| 14 | 2 | 5.5 | 0 | 18.5 | 4.0 | 29.3 | 13.2 |
| 15 | 2 | 3 | 0 | 21 | 2.0 | 29.3 | 17.7 |
| 16 | 2 | 0 | 0 | 24 | 2.0 | 29.3 | 20.7 |
| 17 | 2 | 5.5 | 0 | 18.5 | 4.0 | 29.3 | 13.2 |
| 18 | 2 | 0 | 0 | 24 | 2.0 | 29.3 | 20.7 |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5.3-1. | | | | | | | |
| Note 2: The default value of $G_{post\ connector}$ is 0dBi, if external antenna is not used. | | | | | | | |

## 6.2.4G.2 Additional Maximum Power Reduction (A-MPR) for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- The minimum requirements for NS_33 are still square brackets in RAN4

- The test point analysis in TS 36.905.

### 6.2.4G.2.1 Test purpose

Additional ACLR and spectrum emission requirements can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction A-MPR is allowed for the output power as specified in Table 6.2.2.3-1. Unless stated otherwise, an A-MPR of 0 dB shall be used.

### 6.2.4G.2.2 Test applicability

The requirements of this test apply in test case 6.6.2.2.4 Additional Spectrum Emission Mask for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for network signalled values NS_04/NS_33 to all types of E-UTRA Power Class 3 UE release 14 and forward that support V2X communication.

The requirements of this test apply in test case 6.6.3.3 Additional Spurious Emissions for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for network signalled values NS_04/NS_33 to all types of E-UTRA Power Class 3 UE release 14 and forward that support V2X communication.

NOTE: As a result TC 6.2.4G.2 has not been included in the test case applicability table 4.1-1, TS 36.521-2. This does not preclude the test from being used for R&D or other purposes if deemed useful.

### 6.2.4G.2.3 Minimum conformance requirements

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-2, the requirements in subclause 6.2.4G.1 apply for V2X PSSCH and PSCCH transmission. The allowed A-MPR requirements in subclause 6.2.4D [2] apply for other V2X sidelink transmission (PSBCH/PSSS/SSSS). The A-MPR requirements in subclause 6.2.4 apply for uplink transmission.

The normative reference for this requirement is in TS 36.101 [2] clause 6.2.4G.

## 6.2.4G.2.4 Test description

### 6.2.4G.2.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.4G.2.4.1-1. The details of the uplink and V2X reference measurement channels (RMCs) are specified in A.2 and A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4G.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | | | Low range for uplink and Low range for V2X, High range for uplink and High range for V2X | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | | | 5MHz for uplink and 10MHz for V2X<br>20MHz for uplink and 10MHz for V2X | | | | |
| **Test Parameters for NS_04 and NS_33 A-MPR** | | | | | | | | | |
| | **E-UTRA uplink Configuration to Transmit** | | | | **V2X Configuration to Transmit** | | | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **PUSCH RB allocation** | **$RB_{start}$ TDD** | **Ch BW** | **Resource pool** | **Mod'n** | **PSSCH RB allocation** | **PSSCH $RB_{start}$** |
| 1 | 5MHz | QPSK | 1 | 0 | 10MHz | adjacent | QPSK | 8 | 2 |
| 2 | 5MHz | QPSK | 16 | 9 | 10MHz | | QPSK | 23 | 2 |
| 3 | 5MHz | 16QAM | 16 | 9 | 10MHz | | QPSK | 8 | 2 |
| 4 | 5MHz | 16QAM | 16 | 9 | 10MHz | | QPSK | 23 | 2 |
| 5 | 5MHz | QPSK | 25 | 0 | 10MHz | | QPSK | 3 | 2 |
| 6 | 5MHz | QPSK | 25 | 0 | 10MHz | | QPSK | 48 | 2 |
| 7 | 5MHz | 16QAM | 25 | 0 | 10MHz | | QPSK | 8 | 2 |
| 8 | 5MHz | 16QAM | 25 | 0 | 10MHz | | QPSK | 48 | 2 |
| 9 | 20MHz | QPSK | 1 | 0 | 10MHz | | QPSK | 8 | 2 |
| 10 | 20MHz | QPSK | 100 | 0 | 10MHz | | QPSK | 23 | 2 |
| 11 | 20MHz | 16QAM | 100 | 0 | 10MHz | | QPSK | 8 | 2 |
| 12 | 20MHz | 16QAM | 100 | 0 | 10MHz | | QPSK | 23 | 2 |
| 13 | 20MHz | QPSK | 100 | 0 | 10MHz | | QPSK | 3 | 2 |
| 14 | 20MHz | QPSK | 100 | 0 | 10MHz | | QPSK | 48 | 2 |
| 15 | 20MHz | 16QAM | 100 | 0 | 10MHz | | 16QAM | 8 | 2 |
| 16 | 20MHz | 16QAM | 100 | 0 | 10MHz | | 16QAM | 48 | 2 |
| 17 | 5MHz | QPSK | 1 | 0 | 10MHz | non-adjacent | 16QAM | 3 | 2 |
| 18 | 5MHz | QPSK | 16 | 9 | 10MHz | | 16QAM | 45 | 2 |
| 19 | 5MHz | 16QAM | 16 | 9 | 10MHz | | 16QAM | 3 | 2 |
| 20 | 5MHz | 16QAM | 16 | 9 | 10MHz | | 16QAM | 45 | 2 |
| 21 | 5MHz | QPSK | 25 | 0 | 10MHz | | 16QAM | 16 | 2 |
| 22 | 5MHz | QPSK | 25 | 0 | 10MHz | | 16QAM | 45 | 2 |
| 23 | 5MHz | 16QAM | 25 | 0 | 10MHz | | 16QAM | 16 | 2 |
| 24 | 5MHz | 16QAM | 25 | 0 | 10MHz | | 16QAM | 45 | 2 |
| 25 | 20MHz | QPSK | 1 | 0 | 10MHz | | 16QAM | 3 | 2 |
| 26 | 20MHz | QPSK | 100 | 0 | 10MHz | | 16QAM | 45 | 2 |
| 27 | 20MHz | 16QAM | 100 | 0 | 10MHz | | 16QAM | 3 | 2 |
| 28 | 20MHz | 16QAM | 100 | 0 | 10MHz | | 16QAM | 45 | 2 |
| 29 | 20MHz | QPSK | 100 | 0 | 10MHz | | QPSK | 16 | 2 |
| 30 | 20MHz | QPSK | 100 | 0 | 10MHz | | QPSK | 45 | 2 |
| 31 | 20MHz | 16QAM | 100 | 0 | 10MHz | | QPSK | 16 | 2 |
| 32 | 20MHz | 16QAM | 100 | 0 | 10MHz | | 16QAM | 45 | 2 |
| Note 1: Test Channel Bandwidths are checked separately for E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The configuration ID will be used to map the applicable Test Configuration to be corresponding Test Requirement in subclause 6.2.4G as not all combinations are necessarily required based on the applicability of the UE. | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.2.4G.2.4.3

3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and V2X Reference Measurement Channels are set according to Table 6.2.4G.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 6.2.4G.2.4.3.

### 6.2.4G.2.4.2 Test procedure

1. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.2.4G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX}$ level. Configure the UE to transmit PSCCH and PSSCH with the $P_{UMAX}$ level of each test points; allow at least 200ms for the UE to reach $P_{UMAX}$ level.

3. Measure the mean power over all component carriers in the V2X con-current band configuration. The period of measurement shall be at least continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

### 6.2.4G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.2.4G.2.4.3-1: SL-CommResourcePoolV2X-r14 for non- adjacent resource pool**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20C SL-CommResourcePoolV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResourcePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| adjacencyPSCCH-PSSCH-r14 | FALSE | BOOLEAN | |
| numSubchannel-r14 | n9 | | |
| startRB-Subchannel-r14 | 5 | | 10 MHz |
| startRB-PSCCH-Pool-r14 | 0 | | |

#### 6.2.4G.2.4.3.1 Message contents exceptions (network signalled value "NS_04" for E-UTRA uplink transmission)

1. Information element additionalSpectrumEmission is set to NS_04. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4G.2.4.3.1-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_04"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 4 (NS_04) | | |

#### 6.2.4G.2.4.3.2 Message contents exceptions (network signalled value "NS_33" for E-UTRA V2X sidelink transmission)

1. Information element additionalSpectrumEmission is set to NS_33. This can be set in the *SL-PreconfigGeneral-r12* as part of the *SL-V2X-Preconfiguration*. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.2.4G.2.4.3.1-2: SL-PreconfigGeneral-r12: Additional spurious emissions test requirement for "NS_33"**

| Derivation Path: TS 36.331 [5] clause 9.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 33 (NS_33) | | |

### 6.2.4G.2.5 Test Requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in the applicable Table 6.2.4G.2.4.1-1. For the UE maximum output power modified by A-MPR specified in sub-clause 6.2.4G.2.3, the power limits specified in Table 6.2.5.3-1 apply.

**Table 6.2.4G.2.5-1: Test requirement (network signalled value NS_04/NS_33)**

| Configuration ID | $MPR_{E-UTRA}$ (dB) | $A\text{-}MPR_{E-UTRA}$ (dB) | $\Delta T_{C,c.E-UTRA}$ (dB) | $P_{CMAX,c,E-UTRA}$ (dBm) | $MPR_{V2X}$ (dB) | $A\text{-}MPR_{V2X}$ (dB) | $\Delta T_{C,c,V2X}$ (dB) | $P_{CMAX,c,V2X}$ (dBm) | $\Delta T_{IB,c}$ (dB) | $P_{CMAX_L}(p, q)$ (dBm) | $T(P_{CMAX_L,c})$ (dB) | Upper limit (dBm) | Lower limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 2 | 1.5 | 19.5 | 1.5 | [15.5] | 0 | [6] | 0 | [19.69] | 5 | 26.3 | [13.4] |
| 2 | 1 | 0 | 0 | 22 | 1.5 | [12.5] | 0 | [9] | 0 | [22.21] | 5 | 26.3 | [15.9] |
| 3 | 2 | 0 | 0 | 21 | 2 | [15.5] | 0 | [5.5] | 0 | [21.12] | 5 | 26.3 | [14.8] |
| 4 | 2 | 0 | 0 | 21 | 2 | [12.5] | 0 | [8.5] | 0 | [21.24] | 5 | 26.3 | [14.9] |
| 5 | 1 | 0 | 0 | 22 | 1.5 | [3] | 0 | [18.5] | 0 | [23.00] | 3 | 26.3 | [18.7] |
| 6 | 1 | 0 | 0 | 22 | 1.5 | [2] | 0 | [19.5] | 0 | [23.00] | 3 | 26.3 | [18.7] |
| 7 | 2 | 0 | 0 | 21 | 2 | [1.5] | 0 | [19.5] | 0 | [23.00] | 3 | 26.3 | [18.7] |
| 8 | 2 | 0 | 0 | 21 | 2 | [2] | 0 | [19] | 0 | [23.00] | 3 | 26.3 | [18.7] |
| 9 | 0 | 3 | 1.5 | 18.5 | 1.5 | [15.5] | 0 | [6] | 0 | [18.74] | 5 | 26.3 | [12.4] |
| 10 | 1 | 3 | 0 | 19 | 1.5 | [12.5] | 0 | [9] | 0 | [19.41] | 5 | 26.3 | [13.1] |
| 11 | 2 | 3 | 0 | 18 | 2 | [15.5] | 0 | [5.5] | 0 | [18.24] | 5 | 26.3 | [11.9] |
| 12 | 2 | 3 | 0 | 18 | 2 | [12.5] | 0 | [8.5] | 0 | [18.46] | 5 | 26.3 | [12.2] |
| 13 | 1 | 0 | 0 | 22 | 1.5 | [3] | 0 | [18.5] | 0 | [23.00] | 3 | 26.3 | [18.7] |
| 14 | 1 | 0 | 0 | 22 | 1.5 | [2] | 0 | [19.5] | 0 | [23.00] | 3 | 26.3 | [18.7] |
| 15 | 2 | 0 | 0 | 21 | 2 | [1.5] | 0 | [19.5] | 0 | [23.00] | 3 | 26.3 | [18.7] |
| 16 | 2 | 0 | 0 | 21 | 2 | [2] | 0 | [19] | 0 | [23.00] | 3 | 26.3 | [18.7] |
| 17 | 0 | 2 | 1.5 | 19.5 | 4.5 | [13.5] | 0 | [5] | 0 | [19.65] | 5 | 26.3 | [13.4] |
| 18 | 1 | 0 | 0 | 22 | 2 | [11.5] | 0 | [9.5] | 0 | [22.24] | 5 | 26.3 | [15.9] |
| 19 | 2 | 0 | 0 | 21 | 4.5 | [13.5] | 0 | [5] | 0 | [21.11] | 5 | 26.3 | [14.8] |
| 20 | 2 | 0 | 0 | 21 | 2 | [11.5] | 0 | [9.5] | 0 | [21.30] | 5 | 26.3 | [15.0] |
| 21 | 1 | 0 | 0 | 22 | 3.5 | [3.5] | 0 | [16] | 0 | [22.97] | 5 | 26.3 | [16.7] |
| 22 | 1 | 0 | 0 | 22 | 2 | [3] | 0 | [18] | 0 | [23.00] | 3 | 26.3 | [18.7] |
| 23 | 2 | 0 | 0 | 21 | 3.5 | [3.5] | 0 | [16] | 0 | [22.19] | 5 | 26.3 | [15.9] |
| 24 | 2 | 0 | 0 | 21 | 2 | [3] | 0 | [18] | 0 | [22.76] | 5 | 26.3 | [16.5] |
| 25 | 0 | 3 | 1.5 | 18.5 | 4.5 | [13.5] | 0 | [5] | 0 | [18.69] | 5 | 26.3 | [12.4] |
| 26 | 1 | 3 | 0 | 19 | 2 | [11.5] | 0 | [9.5] | 0 | [19.46] | 5 | 26.3 | [13.2] |
| 27 | 2 | 3 | 0 | 18 | 4.5 | [13.5] | 0 | [5] | 0 | [18.21] | 5 | 26.3 | [11.9] |
| 28 | 2 | 3 | 0 | 18 | 2 | [11.5] | 0 | [9.5] | 0 | [18.57] | 5 | 26.3 | [12.3] |
| 29 | 1 | 0 | 0 | 22 | 3.5 | [3.5] | 0 | [16] | 0 | [22.97] | 5 | 26.3 | [16.7] |
| 30 | 1 | 0 | 0 | 22 | 2 | [3] | 0 | [18] | 0 | [23.00] | 3 | 26.3 | [18.7] |
| 31 | 2 | 0 | 0 | 21 | 3.5 | [3.5] | 0 | [16] | 0 | [22.19] | 5 | 26.3 | [15.9] |
| 32 | 2 | 0 | 0 | 21 | 2 | [3] | 0 | [18] | 0 | [22.76] | 5 | 26.3 | [16.5] |
| Note 1: Lower limit is assuming $\Delta_{TIB,c}$ is zero. If non-zero, $P_{CMAX,c}$ will decrease and $T(P_{CMAX_L,c})$ may be higher resulting in different test requirements according to Table 6.2.5G.2.3-1. | | | | | | | | | | | | | |

## 6.2.5 Configured UE transmitted Output Power

Editor's notes: This clause is incomplete waiting for RAN4 decision for CA_7A-40A, CA_7A-40C, CA_42A-46A, CA_2A-4A-29A and CA_7A-8A-20A:

- $\Delta T_{IB,c}$ is still in square brackets

### 6.2.5.1 Test purpose

To verify the UE does not exceed the minimum between the $P_{EMAX}$ maximum allowed UL TX Power signalled by the E-UTRAN and the $P_{UMAX}$ maximum UE power the UE power class.

### 6.2.5.2 Test applicability

This test applies to all types of E-UTRA Power Class 3 UE release 8 and forward.

### 6.2.5.3 Minimum conformance requirements

The UE is allowed to set its configured maximum output power $P_{CMAX,c}$ for serving cell *c*. The configured maximum output power $P_{CMAX}$ is set within the following bounds:

$$P_{CMAX_L,c} \le P_{CMAX,c} \le P_{CMAX_H,c} \text{ with}$$

$P_{CMAX_L,c}$ = MIN {$P_{EMAX,c} - \Delta T_{C,c}$, $(P_{PowerClass} - \Delta P_{PowerClass}) - MAX(MPR_c + A\text{-}MPR_c + \Delta T_{IB,c} + \Delta T_{C,c} + \Delta T_{ProSe}, P\text{-}MPR_c)$}

$$P_{CMAX_H,c} = MIN \{P_{EMAX,c}, P_{PowerClass} - \Delta P_{PowerClass} \}$$

where

- $P_{EMAX,c}$ is the value given by IE *P-Max* for serving cell *c*, defined in [5];
- $P_{PowerClass}$ is the maximum UE power specified in Table 6.2.2.3-1 without taking into account the tolerance specified in the Table 6.2.2.3-1;
- $\Delta P_{PowerClass}$ = 3 dB for a power class 2 capable UE operating in Band 41, when *P-max* of 23 dBm or lower is indicated or if the uplink/downlink configuration is 0 or 6 in the cell; otherwise, $\Delta P_{PowerClass}$ = 0 dB
- $MPR_c$ and $A\text{-}MPR_c$ for serving cell *c* are specified in subclause 6.2.3 and subclause 6.2.4, respectively;
- $\Delta T_{IB,c}$ is the additional tolerance for serving cell *c* as specified in Table 6.2.5.3-2; $\Delta T_{IB,c}$ = 0 dB otherwise;
- $\Delta T_{C,c}$ = 1.5 dB when NOTE 2 in Table 6.2.2.3-1 applies;
- $\Delta T_{C,c}$ = 0 dB when NOTE 2 in Table 6.2.2.3-1 does not apply.
- $\Delta T_{ProSe}$ = 0.1 dB when the UE supports ProSe Direct Discovery and/or ProSe Direct Communication on the corresponding E-UTRA ProSe band; $\Delta T_{ProSe}$ = 0 dB otherwise.
- For a power class higher than default UE power class capable UE, $\Delta P_{PowerClass} = P_{PowerClass} - P_{PowerClass_Default}$ dB, when the band is a TDD band whose frame configuration is 0 or 6; or P-m*ax* is <u>not</u> indicated in the cell; or P-Max is provided and set to the maximum output power of the default power class or lower, otherwise, $\Delta P_{PowerClass}$ = 0 dB.

$P\text{-}MPR_c$ is the allowed maximum output power reduction for

a) ensuring compliance with applicable electromagnetic energy absorption requirements and addressing unwanted emissions / self desense requirements in case of simultaneous transmissions on multiple RAT(s) for scenarios not in scope of 3GPP RAN specifications;

b) ensuring compliance with applicable electromagnetic energy absorption requirements in case of proximity detection is used to address such requirements that require a lower maximum output power.

The UE shall apply $P\text{-}MPR_c$ for serving cell *c* only for the above cases. For UE conducted conformance testing $P\text{-}MPR_c$ shall be 0 dB

NOTE 1: $P\text{-}MPR_c$ was introduced in the $P_{CMAX,c}$ equation such that the UE can report to the eNB the available maximum output transmit power. This information can be used by the eNB for scheduling decisions.

NOTE 2: $P\text{-}MPR_c$ may impact the maximum uplink performance for the selected UL transmission path.

$T_{REF}$ and $T_{eval}$ are specified in Table 6.2.5.3-0 for different TTI patterns. For each $T_{REF}$, the $P_{CMAX_L,c}$ for serving cell *c* is evaluated per $T_{eval}$ and given by the minimum value taken over the transmission(s) within the $T_{eval}$; the minimum $P_{CMAX_L,c}$ over the one or more $T_{eval}$ is then applied for the entire $T_{REF}$. $P_{PowerClass}$ shall not be exceeded by the UE during any period of time.

**Table 6.2.5.3-0: $P_{CMAX}$ evaluation window for different TTI patterns**

| TTI pattern | $T_{REF}$ | $T_{eval}$ | $T_{eval}$ with frequency hopping |
|---|---|---|---|
| Subframe | 1 subframe | 1 slot | 1 slot |
| Subslot | 2 OS | 2 OS | Min($T_{no_hopping}$, 2OS) |
| Slot | 7 OS | 7 OS | Min($T_{no_hopping}$, 7OS) |

The measured configured maximum output power $P_{UMAX,c}$ shall be within the following bounds:

$$P_{CMAX_L,c} - MAX\{T_{L,c}\ T(P_{CMAX_L,c})\ \} \le P_{UMAX,c} \le P_{CMAX_H,c} + T(P_{CMAX_H,c})$$

where the tolerance $T(P_{CMAX,c})$ for applicable values of $P_{CMAX,c}$ is specified in Table 6.2.5.3-1, Table 6.2.5.3-1A and Table 6.2.5.3-1B. The tolerance $T_{L,c}$ is the absolute value of the lower tolerance for the applicable operating band as specified in Table 6.2.2.3-1.

**Table 6.2.5.3-1: $P_{CMAX}$ tolerance**

| $P_{CMAX,c}$ (dBm) | Tolerance $T(P_{CMAX,c})$ (dB) |
|---|---|
| $23 < P_{CMAX,c} \le 33$ | 2.0 |
| $21 \le P_{CMAX,c} \le 23$ | 2.0 |
| $20 \le P_{CMAX,c} < 21$ | 2.5 |
| $19 \le P_{CMAX,c} < 20$ | 3.5 |
| $18 \le P_{CMAX,c} < 19$ | 4.0 |
| $13 \le P_{CMAX,c} < 18$ | 5.0 |
| $8 \le P_{CMAX,c} < 13$ | 6.0 |
| $-40 \le P_{CMAX,c} < 8$ | 7.0 |

**Table 6.2.5.3-1A: $P_{CMAX}$ tolerance for power class 5**

| $P_{CMAX,c}$ (dBm) | Tolerance $T(P_{CMAX,c})$ (dB) |
|---|---|
| $P_{CMAX,c} = 20$ | 2.0 |
| $19 \le P_{CMAX,c} < 20$ | 3.5 |
| $18 \le P_{CMAX,c} < 19$ | 4.0 |
| $13 \le P_{CMAX,c} < 18$ | 5.0 |
| $8 \le P_{CMAX,c} < 13$ | 6.0 |
| $-40 \le P_{CMAX,c} < 8$ | 7.0 |

**Table 6.2.5.3-1B: PCMAX tolerance for power class 6 for category M1 and M2 UE**

| $P_{CMAX,c}$ (dBm) | Tolerance $T(P_{CMAX,c})$ (dB) |
|---|---|
| $13 \le P_{CMAX,c} \le 14$ | 2.5 |
| $12 \le P_{CMAX,c} < 13$ | 3.5 |
| $11 \le P_{CMAX,c} < 12$ | 4 |
| $8 \le P_{CMAX,c} < 11$ | 5 |
| $5 \le P_{CMAX,c} < 8$ | 6.0 |
| $-40 \le P_{CMAX,c} < 5$ | 7.0 |

For the UE which supports inter-band carrier aggregation configurations with the uplink assigned to one or two E-UTRA bands the $\Delta T_{IB,c}$ is defined for applicable bands in Tables 6.2.5.3-2, 6.2.5.3-3 and 6.2.5.3-4 where unless

otherwise stated, the same $\Delta T_{IB,c}$ is applicable to E-UTRA band(s) part for CA configurations which have the same E-UTRA operating band combination.

**Table 6.2.5.3-2: $\Delta T_{IB,c}$ (two bands)**

| E-UTRA operating band combination | E-UTRA Band | $\Delta T_{IB,c}$ [dB] |
|---|---|---|
| CA_1-3, CA_1-1-3, CA_1-3-3 | 1 | 0.3 |
| | 3 | 0.3 |
| CA_1-5 | 1 | 0.3 |
| | 5 | 0.3 |
| CA_1-7, CA_1-1-7, CA_1-7-7 | 1 | 0.5 |
| | 7 | 0.6 |
| CA_1-8 | 1 | 0.3 |
| | 8 | 0.3 |
| CA_1-11 | 1 | 0.3 |
| | 11 | 0.3 |
| CA_1-18 | 1 | 0.3 |
| | 18 | 0.3 |
| CA_1-19 | 1 | 0.3 |
| | 19 | 0.3 |
| CA_1-20 | 1 | 0.3 |
| | 20 | 0.3 |
| CA_1-21 | 1 | 0.3 |
| | 21 | 0.3 |
| CA_1-26 | 1 | 0.3 |
| | 26 | 0.3 |
| CA_1-28, CA_1-1-28 | 1 | 0.3 |
| | 28 | 0.6 |
| CA_1-32 | 1 | 0.5 |
| | 32 | N/A |
| CA_1-38 | 1 | 0.5 |
| | 38 | 0.5 |
| CA_1-40 | 1 | 0.5 |
| | 40 | 0.5 |
| CA_1-41[8] | 1 | 0.5 |
| | 41 | 0.5 |
| CA_1-42, CA_1-42-42 | 1 | 0.3 |
| | 42 | 0.8 |
| CA_1-43 | 1 | 0.3 |
| | 43 | 0.8 |
| CA_1-46 | 1 | 0 |
| CA_2-4, CA_2-2-4, CA_2-4-4, CA_2-2-4-4 | 2 | 0.5 |
| | 4 | 0.5 |
| CA_2-5, CA_2-2-5 | 2 | 0.3 |
| | 5 | 0.3 |
| CA_2-7, CA_2-2-7, CA_2-7-7 | 2 | 0.5 |
| | 7 | 0.5 |
| CA_2-12, CA_2-2-12, CA_2-12-12, CA_2-2-12-12 | 2 | 0.3 |
| | 12 | 0.3 |
| CA_2-13, CA_2-2-13 | 2 | 0.3 |
| | 13 | 0.3 |
| CA_2-14, CA_2-2-14 | 2 | 0.3 |
| | 14 | 0.3 |
| CA_2-17 | 2 | 0.3 |
| | 17 | 0.8 |
| CA_2-28 | 2 | 0.3 |
| | 28 | 0.3 |
| CA_2-29, CA_2-2-29 | 2 | 0.3 |
| CA_2-30, CA_2-2-30 | 2 | 0.5 |
| | 30 | 0.3 |
| CA_2-46, CA_2-2-46, CA_2-46-46 | 2 | 0 |

| | | |
|---|---|---|
| CA_2-48, CA_2-48-48 | 2 | 0.6 |
| | 48 | 0.8 |
| CA_2-49 | 2 | 0.6 |
| CA_2-66, CA_2-2-66, CA_2-66-66, CA_2-2-66-66, CA_2-66-66-66 | 2 | 0.5 |
| | 66 | 0.5 |
| CA_2-71, CA_2-2-71 | 2 | 0.3 |
| | 71 | 0.3 |
| CA_3-5 | 3 | 0.3 |
| | 5 | 0.3 |
| CA_3-7, CA_3-3-7, CA_3-7-7, CA_3-3-7-7 | 3 | 0.5 |
| | 7 | 0.5 |
| CA_3-8, CA_3-3-8 | 3 | 0.3 |
| | 8 | 0.3 |
| CA_3-11 | 3 | 0.8 |
| | 11 | 0.9 |
| CA_3-18A | 3 | 0.3 |
| | 18 | 0.3 |
| CA_3-19, CA_3-3-19 | 3 | 0.3 |
| | 19 | 0.3 |
| CA_3-20, CA_3-3-20 | 3 | 0.3 |
| | 20 | 0.3 |
| CA_3-21, CA_3-3-21 | 3 | 0.8 |
| | 21 | 0.9 |
| CA_3-26 | 3 | 0.3 |
| | 26 | 0.3 |
| CA_3-27 | 3 | 0.3 |
| | 27 | 0.3 |
| CA_3-28 | 3 | 0.3 |
| | 28 | 0.3 |
| CA_3-31 | 3 | 0.3 |
| | 31 | 0.6 |
| CA_3-32 | 3 | 0.5 |
| CA_3-38 | 3 | 0.5 |
| | 38 | 0.5 |
| CA_3-40, CA_3-40-40 | 3 | 0.5 |
| | 40 | 0.5 |
| CA_3-41, CA_3-3-41 | 3 | 0.5 |
| | 41 | 0.3[10] |
| | | 0.8[11] |

| | | |
|---|---|---|
| CA_3-42, CA_3-3-42, CA_3-42-42 | 3 | 0.6 |
| | 42 | 0.8 |
| CA_3-43 | 3 | 0.3 |
| | 43 | 0.8 |
| CA_3-46, CA_3-3-46 | 3 | 0 |
| CA_3-69 | 3 | 0.5 |
| CA_4-5, CA_4-4-5 | 4 | 0.3 |
| | 5 | 0.3 |
| CA_4-7, CA_4-4-7, CA_4-7-7 | 4 | 0.5 |
| | 7 | 0.5 |
| CA_4-12, CA_4-4-12, CA_4-12-12, CA_4-4-12-12 | 4 | 0.3 |
| | 12 | 0.8 |
| CA_4-13, CA_4-4-13 | 4 | 0.3 |
| | 13 | 0.3 |
| CA_4-17 | 4 | 0.3 |
| | 17 | 0.8 |
| CA_4-27 | 4 | 0.3 |
| | 27 | 0.3 |
| CA_4-28 | 4 | 0.3 |
| | 28 | 0.6 |
| CA_4-29, CA_4-4-29 | 4 | 0.3 |
| CA_4-30, CA_4-4-30 | 4 | 0.5 |
| | 30 | 0.3 |
| CA_4-46, CA_4-46-46 | 4 | 0 |
| CA_4-48 | 4 | 0.3 |
| | 48 | 0.8 |
| CA_4-71, CA_4-4-71 | 4 | 0.3 |
| | 71 | 0.3 |
| CA_5-7, CA_5-7-7 | 5 | 0.3 |
| | 7 | 0.3 |
| CA_5-12, CA_5-12-12 | 5 | 0.8 |
| | 12 | 0.4 |
| CA_5-13 | 5 | 0.5 |
| | 13 | 0.5 |
| CA_5-17 | 5 | 0.8 |
| | 17 | 0.4 |
| CA_5-25 | 5 | 0.3 |
| | 25 | 0.3 |
| CA_5-28 | 5 | 0.5 |
| | 28 | 0.5 |
| CA_5-29 | 5 | 0.5 |
| CA_5-30 | 5 | 0.3 |
| | 30 | 0.3 |
| CA_5-38 | 5 | 0.3 |
| | 38 | 0.3 |
| CA_5-40, CA_5-5-40, CA_5-40-40 | 5 | 0.3 |
| | 40 | 0.3 |
| CA_5-41 | 5 | 0.3 |
| | 41 | 0.3 |
| CA_5-46 | 5 | 0 |
| CA_5-48 | 5 | 0.3 |
| | 48 | 0.3 |
| CA_5-66, CA_5-5-66, CA_5-66-66, CA_5-5-66-66 | 5 | 0.3 |
| | 66 | 0.3 |
| CA_7-8, CA_7-7-8 | 7 | 0.3 |
| | 8 | 0.6 |
| CA_7-12 | 7 | 0.3 |

| | | |
|---|---|---|
| | 12 | 0.3 |
| CA_7-20 | 7 | 0.3 |
| | 20 | 0.3 |
| CA_7-22 | 7 | 0.5 |
| | 22 | 0.8 |
| CA_7-26, CA_7-7-26 | 7 | 0.3 |
| | 26 | 0.3 |
| CA_7-28 | 7 | 0.3 |
| | 28 | 0.3 |
| CA_7-30 | 7 | 0.5 |
| | 30 | 0.5 |
| CA_7-32 | 7 | 0.7 |
| CA_7-40 | 7 | 0.5 |
| | 40 | [0.6] |
| CA_7-42, CA_7-42-42 | 7 | 0.5 |
| | 42 | 0.8 |
| CA_7-46, CA_7-7-46 | 7 | 0 |
| CA_7-66, CA_7-7-66, CA_7-66-66, CA_7-7-66-66 | 7 | 0.5 |
| | 66 | 0.5 |
| CA_8-11 | 8 | 0.3 |
| | 11 | 0.4 |
| CA_8-20 | 8 | 0.4 |
| | 20 | 0.4 |
| CA_8-27 | 8 | 0.8 |
| | 27 | 0.8 |
| CA_8-28[14] | 8 | 0.6 |
| | 28 | 0.5 |
| CA_8-32 | 8 | 0.3 |
| CA_8-38 | 8 | 0.3 |
| | 38 | 0.3 |
| CA_8-39 | 8 | 0.3 |
| | 39 | 0.3 |
| CA_8-40 | 8 | 0.3 |
| | 40 | 0.3 |
| CA_8-41 | 8 | 0.3 |
| | 41 | 0.3 |
| CA_8-42 | 8 | 0.6 |
| | 42 | 0.8 |
| CA_8-46 | 8 | 0 |
| CA_11-18 | 11 | 0.3 |
| | 18 | 0.3 |
| CA_11-26 | 11 | 0.3 |
| | 26 | 0.3 |
| CA_11-28 | 11 | 0.4 |
| | 28 | 0.6 |
| CA_11-41 | 11 | 0.3 |
| | 41 | 0.3 |
| CA_11-42 | 11 | 0.4 |
| | 42 | 0.8 |
| CA_11-46 | 11 | 0 |
| CA_12-25 | 12 | 0.3 |
| | 25 | 0.3 |
| CA_12-30 | 12 | 0.3 |
| | 30 | 0.3 |
| CA_12-46 | 12 | 0 |
| | 46 | 0 |
| CA_12-48 | 12 | 0.3 |
| | 48 | 0.3 |
| CA_12-66, CA_12-66-66 | 12 | 0.8 |
| | 66 | 0.3 |
| CA_13-46 | 13 | 0 |

| | | |
|---|---|---|
| CA_13-48, CA_13-48-48 | 13 | 0.3 |
| | 48 | 0.3 |
| CA_13-66, CA_13-66-66 | 13 | 0.3 |
| | 66 | 0.3 |
| CA_14-30 | 14 | 0.3 |
| | 30 | 0.3 |
| CA_14-66, CA_14-66-66, CA_14-66-66-66 | 14 | 0.3 |
| | 66 | 0.3 |
| CA_18-28[9] | 18 | 0.5 |
| | 28 | 0.5 |
| CA_19-21 | 19 | 0.3 |
| | 21 | 0.4 |
| CA_19-28[9] | 19 | 0.5 |
| | 28 | 0.5 |
| CA_19-42 | 19 | 0.3 |
| | 42 | 0.8 |
| CA_19-46 | 19 | 0 |
| CA_20-28 | 20 | 0.5 |
| | 28 | 0.5 |
| CA_20-31 | 20 | 0.5 |
| | 31 | 0.5 |
| CA_20-32 | 20 | 0.3 |
| CA_20-38 | 20 | 0.3 |
| | 38 | 0.3 |
| CA_20-40, CA_20-40-40 | 20 | 0.3 |
| | 40 | 0.3 |
| CA_20-42, CA_20-42-42 | 20 | 0.6 |
| | 42 | 0.8 |
| CA_20-43 | 20 | 0.3 |
| | 43 | 0.8 |
| CA_20-67 | 20 | 0.5 |
| CA_20-75 | 20 | 0.3 |
| CA_20-76 | 20 | 0.3 |
| CA_21-28 | 21 | 0.4 |
| | 28 | 0.3 |
| CA_21-42 | 21 | 0.4 |
| | 42 | 0.8 |
| CA_21-46 | 21 | 0 |
| CA_23-29 | 23 | 0.3 |
| CA_25-26, CA_25-25-26 | 25 | 0.3 |
| | 26 | 0.3 |
| CA_25-41[8], CA_25-25-41[8] | 25 | 0.5 |
| | 41 | 0.5 |
| CA_25-46 | 25 | 0 |
| | 46 | 0 |
| CA_26-41 | 26 | 0.3 |
| | 41 | 0.3 |
| CA_26-46 | 26 | 0 |
| CA_26-48, CA_26-48-48 | 26 | 0.3 |
| | 48 | 0.3 |
| CA_28-38 | 28 | 0.3 |
| | 38 | 0.3 |
| CA_28-40 | 28 | 0.3 |
| | 40 | 0.3 |
| CA_28-41 | 28 | 0.3 |
| | 41 | 0.3 |
| CA_28-42 | 28 | 0.5 |
| | 42 | 0.8 |
| CA_28-46 | 28 | 0 |
| CA_29-30 | 30 | 0.3 |
| CA_29-66, CA_29-66-66 | 66 | 0.3 |

| | | |
|---|---|---|
| CA_29-70 | 70 | 0.3 |
| CA_30-66, CA_30-66-66 | 30 | 0.3 |
| | 66 | 0.5 |
| CA_32-42 | 42 | 0.8 |
| CA_32-43 | 43 | 0.8 |
| CA_34-39 | 34 | 0[1] |
| | 39 | 0[1] |
| CA_34-41 | 34 | 0[1] |
| | 41 | 0[1] |
| CA_38-40, CA_38-40-40 | 38 | 0[4] |
| | 40 | 0[4] |
| CA_39-40 | 39 | 0[4] |
| | 40 | 0[4] |
| CA_39-41 | 39 | 0[4] |
| | 41 | 0[4] |
| CA_39-41 | 39 | 0.5[7] |
| | 41 | 0.5[7] |
| CA_39-42 | 39 | 0[4] |
| | 42 | 0.5[4] |
| CA_39-46 | 39 | 0 |
| CA_40-41 | 40 | 0.5[4] |
| | 41 | 0.5[4] |
| CA_40-42 | 40 | 0[4] |
| | 42 | 0.5[4] |
| CA_40-43 | 40 | 0[4] |
| | 43 | 0.5[4] |
| CA_40-46 | 40 | 0 |
| CA_41-42 | 41 | 0[4] |
| | 42 | 0.5[4] |
| CA_41-42 | 41 | 0.3[7] |
| | 42 | 0.8[7] |

| | | |
|---|---|---|
| CA_41-46 | 41 | 0 |
| CA_41-48 | 41 | 0[4] |
| | 48 | 0.5[4] |
| CA_42-43 | 42 | 0[4] |
| | 43 | 0[4] |
| CA_42-46 | 42 | [0.5] |
| CA_46-48, CA_46-48-48 | 48 | 0.8 |
| CA_46-66, CA_46-46-66, CA_46-66-66 | 66 | 0 |
| CA_46-70 | 70 | 0 |
| CA_46-71 | 71 | 0 |
| CA_48-66, CA_48-48-66, CA_48-66-66, CA_48-48-66-66 | 48 | 0.8 |
| | 66 | 0.6 |
| CA_48-71, CA_48-48-71 | 48 | 0.3 |
| | 71 | 0.3 |
| CA_66-70, CA_66-66-70 | 66 | 0.5 |
| | 70 | 0.5 |
| CA_66-71, CA_66-66-71 | 66 | 0.3 |
| | 71 | 0.3 |
| CA_70-71 | 70 | 0.3 |
| | 71 | 0.6 |

NOTE 1: The above additional tolerances are only applicable for the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations

NOTE 2: The above additional tolerances also apply in non-aggregated operation for the supported E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations

NOTE 3: In case the UE supports more than one of the above 2DL inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one 2DL inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the 2DL tolerances above, truncated to one decimal place for that operating band among the supported 2DL CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 2DL carrier aggregation configurations involving such band shall be applied
- When the E-UTRA operating band frequency range is >1GHz, the applicable additional 2DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 2DL CA configurations

NOTE 4: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRA band and without simultaneous Rx/Tx.

NOTE 5: Unless otherwise specified, in case the UE supports more than one of the above 3DL inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one 3DL inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz and the tolerances are the same, the value applies to the band. If the tolerances are different, the applicable additional 3DL tolerance is FFS. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 3DL carrier aggregation configurations involving such band shall be applied.
- When the E-UTRA operating band frequency range is >1GHz, the applicable additional 3DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 3DL CA configurations.

NOTE 6: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.

NOTE 7: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx.

NOTE 8: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in the FDD band.

NOTE 9: For Band 28, the requirements only apply for the restricted frequency range specified for this CA configuration (Table 5.2A-2).
NOTE 10: The requirement is applied for UE transmitting on the frequency range of 2545-2690MHz.
NOTE 11: The requirement is applied for UE transmitting on the frequency range of 2496-2545MHz.
NOTE 12: For UE supporting E-UTRA band 65 and CA configurations including Band 1, the Band 65 $\Delta T_{IB,c}$ is the max(Band 65 $\Delta T_{IB,c}$ , Band 1 $\Delta T_{IB,c}$)
NOTE 13: For UE supporting E-UTRA band 42, 43 or 48 and CA configurations including Band 42, 43 or 48, the applicable $\Delta T_{IB,c}$ in Band 42, 43, or 48 is the max(Band 42 $\Delta T_{IB,c}$ , Band 43 $\Delta T_{IB,c}$, Band 48 $\Delta T_{IB,c}$).
NOTE 14: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 8.

NOTE 3: The above additional tolerances do not apply to supported UTRA operating bands with frequency range below 1 GHz that correspond to the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations when such bands are belonging only to band combination(s) where one band is <1GHz and another band is >1.7GHz and there is no harmonic relationship between the low band UL and high band DL. Otherwise the above additional tolerances also apply to supported UTRA operating bands that correspond to the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.

NOTE 4: To meet the $\Delta T_{IB,c}$ requirements for CA_3A-7A with state-of-the-art technology, an increase in power consumption of the UE may be required. It is also expected that as the state-of-the-art technology evolves in the future, this possible power consumption increase can be reduced or eliminated.

**Table 6.2.5.3-3: $\Delta T_{IB,c}$ (three bands)**

| E-UTRA operating band combination | E-UTRA Band | $\Delta T_{IB,c}$ [dB] |
|---|---|---|
| CA_1-3-5, CA_1-1-3-5 | 1 | 0.3 |
| | 3 | 0.3 |
| | 5 | 0.3 |
| CA_1-3-7, CA_1-1-3-7, CA_1-3-3-7, CA_1-3-3-7-7, CA_1-3-7-7 | 1 | 0.6 |
| | 3 | 0.6 |
| | 7 | 0.6 |
| CA_1-3-8, CA_1-3-3-8 | 1 | 0.3 |
| | 3 | 0.3 |
| | 8 | 0.3 |
| CA_1-3-11 | 1 | 0.3 |
| | 3 | 0.8 |
| | 11 | 0.9 |
| | 8 | 0.3 |
| CA_1-3-18 | 1 | 0.3 |
| | 3 | 0.3 |
| | 18 | 0.3 |
| CA_1-3-19, CA_1-3-3-19 | 1 | 0.3 |
| | 3 | 0.3 |
| | 19 | 0.3 |
| CA_1-3-20, CA_1-3-3-20 | 1 | 0.3 |
| | 3 | 0.3 |
| | 20 | 0.3 |
| CA_1-3-21, CA_1-3-3-21 | 1 | 0.3 |
| | 3 | 0.8 |
| | 21 | 0.9 |
| CA_1-3-26 | 1 | 0.3 |
| | 3 | 0.3 |
| | 26 | 0.3 |
| CA_1-3-28 CA_1-1-3-28, CA_1-3-3-28 | 1 | 0.3 |
| | 3 | 0.3 |
| | 28 | 0.6 |
| CA_1-3-32 | 1 | 0.5 |
| | 3 | 0.5 |
| CA_1-3-38 | 1 | 0.5 |
| | 3 | 0.5 |
| | 38 | 0.5 |
| CA_1-3-40 | 1 | 0.5 |
| | 3 | 0.5 |
| | 40 | 0.5 |
| CA_1-3-41 | 1 | 0.5 |
| | 3 | 0.5 |
| | 41 | 0.3[5]/0.8[6] |
| CA_1-3-42, CA_1-3-3-42 | 1 | 0.6 |
| | 3 | 0.6 |
| | 42 | 0.8 |
| CA_1-3-43 | 1 | 0.3 |
| | 3 | 0.3 |
| | 43 | 0.8 |
| CA_1-5-7, CA_1-5-7-7 | 1 | 0.5 |
| | 5 | 0.3 |
| | 7 | 0.6 |
| CA_1-5-40 | 1 | 0.5 |
| | 5 | 0.3 |
| | 40 | 0.5 |
| CA_1-5-41 | 1 | 0.5 |
| | 5 | 0.3 |
| | 41 | 0.5 |
| CA_1-5-46 | 1 | 0.3 |
| | 5 | 0.3 |

| | | |
|---|---|---|
| CA_1-7-8, CA_1-7-7-8 | 1 | 0.5 |
| | 7 | 0.6 |
| | 8 | 0.6 |
| CA_1-7-20 | 1 | 0.5 |
| | 7 | 0.6 |
| | 20 | 0.3 |
| CA_1-7-26, CA_1-7-7-26 | 1 | 0.5 |
| | 7 | 0.6 |
| | 26 | 0.3 |
| CA_1-7-28 | 1 | 0.5 |
| | 7 | 0.6 |
| | 28 | 0.6 |
| CA_1-7-32 | 1 | 0.7 |
| | 7 | 0.7 |
| CA_1-7-40 | 1 | 0.6 |
| | 7 | 0.8 |
| | 40 | 0.9 |
| CA_1-7-42 | 1 | 0.6 |
| | 7 | 0.6 |
| | 42 | 0.8 |
| CA_1-7-46 | 1 | 0.5 |
| | 7 | 0.8 |
| CA_1-8-11 | 1 | 0.3 |
| | 8 | 0.3 |
| | 11 | 0.4 |
| CA_1-8-20 | 1 | 0.3 |
| | 8 | 0.4 |
| | 20 | 0.4 |
| CA_1-8-28[11] | 1 | 0.3 |
| | 8 | 0.6 |
| | 28 | 0.6 |
| CA_1-8-38 | 1 | 0.5 |
| | 8 | 0.3 |
| | 38 | 0.5 |
| CA_1-8-40 | 1 | 0.5 |
| | 8 | 0.3 |
| | 40 | 0.5 |
| CA_1-11-18 | 1 | 0.3 |
| | 11 | 0.4 |
| | 18 | 0.3 |
| CA_1-11-28 | 1 | 0.3 |
| | 11 | 0.4 |
| | 28 | 0.6 |
| CA_1-18-28 | 1 | 0.3 |
| | 18 | 0.5 |
| | 28 | 0.5 |
| CA_1-19-21 | 1 | 0.3 |
| | 19 | 0.3 |
| | 21 | 0.4 |
| CA_1-19-28 | 1 | 0.3 |
| | 19 | 0.5 |
| | 28 | 0.5 |
| CA_1-19-42 | 1 | 0.3 |
| | 19 | 0.3 |
| | 42 | 0.8 |
| CA_1-20-28 | 1 | 0.3 |
| | 20 | 0.6 |
| | 28 | 0.6 |
| CA_1-20-32 | 1 | 0.5 |
| | 20 | 0.3 |
| CA_1-20-42 | 1 | 0.3 |
| | 20 | 0.3 |
| | 42 | 0.8 |
| CA_1-20-43 | 1 | 0.3 |
| | 20 | 0.3 |

| | | |
|---|---|---|
| | 43 | 0.8 |
| CA_1-21-28 | 1 | 0.3 |
| | 21 | 0.4 |
| | 28 | 0.6 |
| CA_1-21-42 | 1 | 0.3 |
| | 21 | 0.4 |
| | 42 | 0.8 |
| CA_1-28-42 | 1 | 0.3 |
| | 28 | 0.6 |
| | 42 | 0.8 |
| CA_1-32-42 | 1 | 0.5 |
| | 42 | 0.8 |
| CA_1-32-43 | 1 | 0.5 |
| | 43 | 0.8 |
| CA_1-41-42[8, 13] | 1 | 0.5 |
| | 41 | 0.5 |
| | 42 | 0.8 |
| CA_1-42-43[13] | 1 | 0.3 |
| | 42 | 0.8 |
| | 43 | 0.8 |
| CA_2-4-5, CA_2-2-4-5, CA_2-4-4-5 | 2 | 0.5 |
| | 4 | 0.5 |
| | 5 | 0.3 |
| CA_2-4-7, CA_2-4-7-7 | 2 | 0.5 |
| | 4 | 0.5 |
| | 7 | 0.5 |
| CA_2-4-12, CA_2-2-4-12, CA_2-4-4-12, CA_2-4-12-12 | 2 | 0.5 |
| | 4 | 0.5 |
| | 12 | 0.8 |
| CA_2-4-13 | 2 | 0.5 |
| | 4 | 0.5 |
| | 13 | 0.3 |
| CA_2-4-28 | 2 | 0.5 |
| | 4 | 0.5 |
| | 28 | 0.8 |
| CA_2-4-29 | 2 | [0.5] |
| | 4 | 0.5 |
| CA_2-4-30 | 2 | 0.5 |
| | 4 | 0.5 |
| | 30 | 0.3 |
| CA_2-4-71, CA_2-2-4-71 | 2 | 0.5 |
| | 4 | 0.5 |
| | 71 | 0.3 |
| CA_2-5-12, CA_2-2-5-12, CA_2-5-12-12 | 2 | 0.3 |
| | 5 | 0.8 |
| | 12 | 0.4 |
| CA_2-5-7 | 2 | 0.5 |
| | 5 | 0.3 |
| | 7 | 0.5 |
| CA_2-5-13 | 2 | 0.3 |
| | 5 | 0.5 |
| | 13 | 0.5 |
| CA_2-5-28 | 2 | 0.3 |
| | 5 | 0.8 |
| | 28 | 0.4 |
| CA_2-5-29 | 2 | 0.3 |
| | 5 | 0.5 |
| CA_2-5-30, CA_2-2-5-30 | 2 | 0.5 |
| | 5 | 0.3 |
| | 30 | 0.3 |
| CA_2-5-46 | 2 | 0.3 |
| | 5 | 0.3 |
| CA_2-5-66, CA_2-2-5-66, | 2 | 0.5 |
| | 5 | 0.3 |

| | | |
|---|---|---|
| CA_2-5-66-66 | 66 | 0.5 |
| CA_2-7-12, CA_2-2-7-12 | 2 | 0.5 |
| | 7 | 0.5 |
| | 12 | 0.3 |
| CA_2-7-28 | 2 | 0.5 |
| | 7 | 0.5 |
| | 28 | 0.3 |
| CA_2-7-30 | 2 | 0.5 |
| | 7 | 0.5 |
| | 30 | 0.5 |
| CA_2-7-46 | 2 | 0.5 |
| | 7 | 0.5 |
| CA_2-7-66, CA_2-7-7-66, CA_2-7-7-66, CA_2-7-66-66 | 2 | 0.5 |
| | 7 | 0.5 |
| | 66 | 0.5 |
| CA_2-12-30, CA_2-2-12-30 | 2 | 0.5 |
| | 12 | 0.3 |
| | 30 | 0.3 |
| CA_2-12-66, CA_2-2-12-66, CA_2-12-66-66, CA_2-2-12-66-66 | 2 | 0.5 |
| | 12 | 0.8 |
| | 66 | 0.5 |
| CA_2-13-46 | 2 | 0.3 |
| | 13 | 0.3 |
| CA_2-13-48, CA_2-13-48-48 | 2 | 0.6 |
| | 13 | 0.3 |
| | 48 | 0.8 |
| CA_2-13-66, CA_2-2-13-66, CA_2-13-66-66 | 2 | 0.5 |
| | 13 | 0.3 |
| | 66 | 0.5 |
| CA_2-14-30, CA_2-2-14-30 | 2 | 0.5 |
| | 14 | 0.3 |
| | 30 | 0.5 |
| CA_2-14-66, CA_2-2-14-66, CA_2-14-66-66, CA_2-2-14-66-66, CA_2-14-66-66-66 | 2 | 0.5 |
| | 14 | 0.3 |
| | 66 | 0.5 |
| CA_2-29-30, CA_2-2-29-30 | 2 | 0.5 |
| | 30 | 0.3 |
| CA_2-29-66 | 2 | 0.5 |
| | 66 | 0.5 |
| CA_2-30-66, CA_2-2-30-66, CA_2-30-66-66 | 2 | 0.5 |
| | 30 | 0.3 |
| | 66 | 0.5 |
| CA_2-46-48 | 2 | 0.6 |
| | 48 | 0.8 |
| CA_2-46-66, CA_2-46-46-66 | 2 | 0.5 |
| | 66 | 0.5 |
| CA_2-48-66, CA_2-48-48-66 | 2 | 0.6 |
| | 48 | 0.8 |
| | 66 | 0.6 |
| CA_2-66-71, CA_2-2-66-71, CA_2-66-66-71 | 2 | 0.5 |
| | 66 | 0.5 |
| | 71 | 0.3 |
| CA_3-5-7, CA_3-5-7-7 | 3 | 0.5 |
| | 5 | 0.3 |
| | 7 | 0.5 |
| CA_3-5-40, CA_3-5-40-40 | 3 | 0.5 |
| | 5 | 0.3 |
| | 40 | 0.5 |
| CA_3-5-41 | 3 | 0.5 |
| | 5 | 0.3[18] |

| | | |
|---|---|---|
| | 41 | 0.3[5] |
| | | 0.8[6] |
| CA_3-7-8, CA_3-3-7-8, CA_3-3-7-7-8 | 3 | 0.5 |
| | 7 | 0.5 |
| | 8 | 0.6 |
| CA_3-7-20, CA_3-3-7-20 | 3 | 0.5 |
| | 7 | 0.5 |
| | 20 | 0.3 |
| CA_3-7-26, CA_3-7-7-26 | 3 | 0.5 |
| | 7 | 0.5 |
| | 26 | 0.3 |
| CA_3-7-28, CA_3-3-7-28 | 3 | 0.5 |
| | 7 | 0.5 |
| | 28 | 0.3 |
| CA_3-7-32 | 3 | 0.7 |
| | 7 | 0.7 |
| | | |
| CA_3-7-38 | 3 | 0.5 |
| | 7 | 0.5 |
| | 38 | 0.5 |
| CA_3-7-40 | 3 | 0.6 |
| | 7 | 0.8 |
| | 40 | 0.9 |
| CA_3-7-42 | 3 | 0.6 |
| | 7 | 0.6 |
| | 42 | 0.8 |
| CA_3-7-46 | 3 | 0.5 |
| | 7 | 0.5 |
| CA_3-8-11 | 3 | 0.8 |
| | 8 | 0.3 |
| | 11 | 0.9 |
| CA_3-8-20 | 3 | 0.3 |
| | 8 | 0.4 |
| | 20 | 0.4 |
| CA_3-8-28[12] | 3 | 0.3 |
| | 8 | 0.6 |
| | 28 | 0.5 |
| CA_3-8-32 | 3 | 0.8 |
| | 8 | 0.3 |
| CA_3-8-38 | 3 | 0.5 |
| | 8 | 0.3 |
| | 38 | 0.5 |
| CA_3-8-40 | 3 | 0.5 |
| | 8 | 0.3 |
| | 40 | 0.5 |
| CA_3-11-18 | 3 | 0.8 |
| | 11 | 0.9 |
| | 18 | 0.3 |
| CA_3-11-26 | 3 | 0.8 |
| | 11 | 0.9 |
| | 26 | 0.3 |
| CA_3-11-28 | 3 | 0.8 |
| | 11 | 0.9 |
| | 28 | 0.6 |
| CA_3-19-21, CA_3-3-19-21 | 3 | 0.8 |
| | 19 | 0.3 |
| | 21 | 0.9 |
| CA_3-19-42 | 3 | 0.6 |
| | 19 | 0.3 |
| | 42 | 0.8 |
| CA_3-20-28, CA_3-3-20-28 | 3 | 0.3 |
| | 20 | 0.5 |
| | 28 | 0.5 |
| CA_3-20-32 | 3 | 0.5 |
| | 20 | 0.3 |

| | | |
|---|---|---|
| CA_3-20-42 | 3 | 0.6 |
| | 20 | 0.3 |
| | 42 | 0.8 |
| CA_3-20-43 | 3 | 0.3 |
| | 20 | 0.3 |
| | 43 | 0.8 |
| CA_3-21-28 | 3 | 0.8 |
| | 21 | 0.9 |
| | 28 | 0.3 |
| CA_3-21-42 | 3 | 0.8 |
| | 21 | 0.9 |
| | 42 | 0.8 |
| CA_3-28-38 | 3 | 0.5 |
| | 28 | 0.5 |
| | 38 | 0.5 |
| CA_3-28-40 | 3 | 0.5 |
| | 28 | 0.3 |
| | 40 | 0.5 |
| CA_3-28-41 | 3 | 0.5 |
| | 28 | 0.3 |
| | 41 | 0.3[5]/0.8[6] |
| CA_3-28-42 | 3 | 0.6 |
| | 28 | 0.5 |
| | 42 | 0.8 |
| CA_3-32-42 | 3 | 0.6 |
| | 42 | 0.8 |
| CA_3-32-43 | 3 | 0.3 |
| | 43 | 0.8 |
| CA_3-41-42[14] | 3 | 1 |
| | 41 | 0.3[5]/0.8[6] |
| | 42 | 0.8 |
| CA_3-42-43[13] | 3 | 0.6 |
| | 42 | 0.8 |
| | 43 | 0.8 |
| CA_4-5-12, CA_4-5-12-12, CA_4-4-5-12 | 4 | 0.3 |
| | 5 | 0.8 |
| | 12 | 0.8 |
| CA_4-5-13 | 4 | 0.3 |
| | 5 | 0.5 |
| | 13 | 0.5 |
| CA_4-5-29 | 4 | 0.3 |
| | 5 | 0.5 |
| CA_4-5-30, CA_4-4-5-30 | 4 | 0.5 |
| | 5 | 0.3 |
| | 30 | 0.3 |
| CA_4-7-12 | 4 | 0.5 |
| | 7 | 0.5 |
| | 12 | 0.8 |
| CA_4-7-28 | 4 | 0.5 |
| | 7 | 0.5 |
| | 28 | 0.6 |
| CA_4-12-30, CA_4-4-12-30 | 4 | 0.5 |
| | 12 | 0.8 |
| | 30 | 0.3 |
| CA_4-29-30, CA_4-4-29-30 | 4 | 0.5 |
| | 30 | 0.3 |
| CA_5-7-28 | 5 | 0.5 |
| | 7 | 0.3 |
| | 28 | 0.5 |
| CA_5-7-46 | 5 | 0.3 |
| | 7 | 0.3 |
| CA_5-12-46 | 5 | 0.8 |
| | 12 | 0.4 |
| CA_5-12-48 | 5 | 0.8 |
| | 12 | 0.4 |

| | | |
|---|---|---|
| | 48 | 0.3 |
| CA_5-12-66 | 5 | 0.3 |
| | 12 | 0.8 |
| | 66 | 0.8 |
| CA_5-30-66, CA_5-30-66-66 | 5 | 0.3 |
| | 30 | 0.3 |
| | 66 | 0.5 |
| CA_5-40-41 | 5 | 0.3 |
| | 40 | 0.5 |
| | 41 | 0.5 |
| CA_5-46-66 | 5 | 0.3 |
| | 66 | 0.3 |
| CA_7-8-20 | 7 | 0.3 |
| | 8 | 0.6 |
| | 20 | [0.6] |
| CA_7-8-38 | 7 | 0.5 |
| | 8 | 0.5 |
| | 38 | 0.5 |
| CA_7-8-40 | 7 | 0.5 |
| | 8 | 0.6 |
| | 40 | 0.6 |
| CA_7-12-66 | 7 | 0.5 |
| | 12 | 0.8 |
| | 66 | 0.5 |
| CA_7-20-28 | 7 | 0.3 |
| | 20 | 0.6 |
| | 28 | 0.6 |
| CA_7-20-32 | 7 | 0.7 |
| | 20 | 0.3 |
| | 32 | N/A |
| CA_7-20-38 | 7 | 0.3 |
| | 20 | 0.3 |
| | 38 | 0.3 |
| CA_7-20-42 | 7 | 0.3 |
| | 20 | 0.3 |
| | 42 | 0.8 |
| CA_7-28-38 | 7 | 0.3 |
| | 28 | 0.3 |
| | 38 | 0.3 |
| CA_7-30-66 | 7 | 0.5 |
| | 30 | 0.5 |
| | 66 | 0.5 |
| CA_7-46-66 | 7 | 0.5 |
| | 66 | 0.5 |
| CA_8-11-28[17] | 8 | 0.6 |
| | 11 | 0.4 |
| | 28 | 0.6 |
| CA_8-20-28 | 8 | 0.6 |
| | 20 | 0.5 |
| | 28 | 0.5 |
| CA_8-28-41[15] | 8 | 0.6 |
| | 28 | 0.5 |
| | 41 | 0.3 |
| CA_8-39-41 | 8 | 0.3 |
| | 39 | 0.3[19] |
| | 41 | 0.3[19] |
| CA_12-30-66, CA_12-30-66-66 | 12 | 0.8 |
| | 30 | 0.3 |
| | 66 | 0.5 |
| CA_13-46-66 | 13 | 0.3 |
| | 66 | 0.3 |
| CA_13-48-66 | 13 | 0.3 |
| | 48 | 0.8 |
| | 66 | 0.6 |
| CA_14-30-66, | 14 | 0.3 |

| | | |
|---|---|---|
| CA_14-30-66-66 | 30 | 0.3 |
| | 66 | 0.5 |
| CA_19-21-42 | 19 | 0.3 |
| | 21 | 0.4 |
| | 42 | 0.8 |
| CA_20-32-42 | 20 | 0.5 |
| | 42 | 0.8 |
| CA_20-32-43 | 20 | 0.3 |
| | 43 | 0.8 |
| CA_20-38-40[20], CA_20-38-40-40[20] | 20 | 0.3 |
| | 38 | 0.3 |
| | 40 | 0.3 |
| CA_21-28-42 | 21 | 0.4 |
| | 28 | 0.5 |
| | 42 | 0.8 |
| CA_25-26-41, CA_25-25-26-41 | 25 | 0.3 |
| | 26 | 0.3 |
| | 41 | 0.3 |
| CA_28-41-42[10] | 28 | 0.5 |
| | 41 | 0.3[1] |
| | 42 | 0.8[1] |
| CA_29-30-66, CA_29-30-66-66 | 30 | 0.3 |
| | 66 | 0.5 |
| CA_29-46-66 | 66 | 0.3 |
| CA_29-66-70, CA_29-66-66-70 | 66 | 0.5 |
| | 70 | 0.5 |
| CA_32-42-43[13] | 42 | 0.8 |
| | 43 | 0.8 |
| CA_46-48-66 | 48 | 0.8 |
| | 66 | 0.6 |
| CA_46-48-71, CA_46-48-48-71 | 46 | 0 |
| | 48 | 0.8 |
| | 71 | 0.3 |
| CA_66-70-71, CA_66-66-70-71 | 66 | 0.5 |
| | 70 | 0.5 |
| | 71 | 0.6 |

NOTE 1: The above additional tolerances are only applicable for the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations

NOTE 2: The above additional tolerances also apply in non-aggregated operation for the supported E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations

NOTE 3: Unless otherwise specified, in case the UE supports more than one of the above 3DL inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one 3DL inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz and the tolerances are the same, the value applies to the band. If the tolerances are different, the applicable additional 3DL tolerance is FFS. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 3DL carrier aggregation configurations involving such band shall be applied
- When the E-UTRA operating band frequency range is >1GHz, the applicable additional 3DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 3DL CA configurations.

NOTE 4: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.

NOTE 5**:** The requirement is specified for the frequency range of 2545-2690MHz.

NOTE 6**:** The requirement is specified for the frequency range of 2496-2545MHz.

NOTE 7: For UE supporting E-UTRA band 65 and CA configurations including Band 1, the Band 65 $\Delta T_{IB,c}$ is the max(Band 65 $\Delta T_{IB,c}$ , Band 1 $\Delta T_{IB,c}$)

NOTE 8: Only applicable for UE supporting inter-band carrier aggregation with the

uplink active in Band 1 or Band 42.

NOTE 9: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRA band and without simultaneous Rx/Tx on Band 41 and Band 42.

NOTE 10: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx among TDD bands.

NOTE 11: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 1 or Band 8

NOTE 12: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 3 or Band 8.

NOTE 13: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx among TDD bands.

NOTE 14: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx among TDD bands.

NOTE 15: Only applicable for UE supporting inter-band carrier aggregration with the uplink active in Band 8 or Band 41.

NOTE 16: For UE supporting E-UTRA band 42, 43 or 48 and CA configurations including Band 42, 43 or 48, the applicable $\Delta T_{IB,c}$ in Band 42, 43, or 48 is the max(Band 42 $\Delta T_{IB,c}$ , Band 43 $\Delta T_{IB,c}$, Band 48 $\Delta T_{IB,c}$).

NOTE 17: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 8 or Band 11.

NOTE 18: The values in the table reflect what can be achieved with the present state of the art technology. They shall be reconsidered when the state of the art technology progresses.

NOTE19: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRAN band and without simultaneous Rx/Tx on band 39 and band 41.

NOTE 20: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRA band and without simultaneous Rx/Tx among TDD bands.

**Table 6.2.5.3-4: $\Delta T_{IB,c}$ (four bands)**

| E-UTRA operating band combination | E-UTRA Band | $\Delta T_{IB,c}$ [dB] |
|---|---|---|
| CA_1-3-5-7, CA_1-3-5-7-7 | 1 | 0.6 |
| | 3 | 0.6 |
| | 5 | 0.3 |
| | 7 | 0.6 |
| CA_1-3-5-40 | 1 | 0.5 |
| | 3 | 0.5 |
| | 5 | 0.3 |
| | 40 | 0.5 |
| CA_1-3-5-41 | 1 | 0.5 |
| | 3 | 0.5 |
| | 5 | 0.3[9] |
| | 41 | 0.5[7] |
| | | 0.8[8] |
| CA_1-3-7-8 | 1 | 0.6 |
| | 3 | 0.6 |
| | 7 | 0.6 |
| | 8 | 0.6 |
| CA_1-3-7-20, CA_1-3-3-7-20 | 1 | 0.6 |
| | 3 | 0.6 |
| | 7 | 0.6 |
| | 20 | 0.3 |
| CA_1-3-7-26, CA_1-3-7-7-26 | 1 | 0.6 |
| | 3 | 0.6 |
| | 7 | 0.6 |
| | 26 | 0.3 |
| CA_1-3-7-28 | 1 | 0.6 |
| | 3 | 0.6 |
| | 7 | 0.6 |
| | 28 | 0.6 |
| CA_1-3-7-32 | 1 | 0.6 |
| | 3 | 0.6 |
| | 7 | 0.6 |
| CA_1-3-7-40 | 1 | 0.6 |
| | 3 | 0.6 |
| | 7 | 0.8 |
| | 40 | 0.9 |
| CA_1-3-7-42 | 1 | 0.7 |
| | 3 | 0.7 |
| | 7 | 0.7 |
| | 42 | 0.8 |
| CA_1-3-8-11 | 1 | 0.3 |
| | 3 | 0.8 |
| | 8 | 0.3 |
| | 11 | 0.9 |
| CA_1-3-8-20 | 1 | 0.3 |
| | 3 | 0.3 |
| | 8 | 0.4 |
| | 20 | 0.4 |
| CA_1-3-8-28[10] | 1 | 0.3 |
| | 3 | 0.3 |
| | 8 | 0.6 |
| | 28 | 0.6 |
| CA_1-3-8-38 | 1 | 0.5 |
| | 3 | 0.5 |
| | 8 | 0.3 |
| | 38 | 0.5 |
| CA_1-3-8-40 | 1 | 0.5 |
| | 3 | 0.5 |
| | 8 | 0.3 |
| | 40 | 0.5 |
| CA_1-3-11-28 | 1 | 0.3 |

| | | |
|---|---|---|
| | 3 | 0.8 |
| | 11 | 0.9 |
| | 28 | 0.6 |
| CA_1-3-19-21, CA_1-3-3-19-21 | 1 | 0.3 |
| | 3 | 0.8 |
| | 19 | 0.3 |
| | 21 | 0.9 |
| CA_1-3-19-42 | 1 | 0.6 |
| | 3 | 0.6 |
| | 19 | 0.3 |
| | 42 | 0.8 |
| CA_1-3-20-28, CA_1-3-3-20-28 | 1 | 0.3 |
| | 3 | 0.3 |
| | 20 | 0.6 |
| | 28 | 0.6 |
| CA_1-3-20-32 | 1 | 0.5 |
| | 3 | 0.5 |
| | 20 | 0.3 |
| CA_1-3-20-42 | 1 | 0.6 |
| | 3 | 0.6 |
| | 20 | 0.3 |
| | 42 | 0.8 |
| CA_1-3-20-43 | 1 | 0.3 |
| | 3 | 0.3 |
| | 20 | 0.3 |
| | 43 | 0.8 |
| CA_1-3-21-28 | 1 | 0.3 |
| | 3 | 0.8 |
| | 21 | 0.9 |
| | 28 | 0.6 |
| CA_1-3-21-42 | 1 | 0.6 |
| | 3 | 0.8 |
| | 21 | 0.9 |
| | 42 | 0.8 |
| CA_1-3-28-42 | 1 | 0.6 |
| | 3 | 0.6 |
| | 28 | 0.6 |
| | 42 | 0.8 |
| CA_1-3-32-42 | 1 | 0.6 |
| | 3 | 0.6 |
| | 42 | 0.8 |
| CA_1-3-32-43 | 1 | 0.5 |
| | 3 | 0.5 |
| | 43 | 0.8 |
| CA_1-3-42-43[13] | 1 | 0.6 |
| | 3 | 0.6 |
| | 42 | 0.8 |
| | 43 | 0.8 |
| CA_1-5-7-46 | 1 | 0.5 |
| | 5 | 0.3 |
| | 7 | 0.6 |
| CA_1-7-8-20 | 1 | 0.5 |
| | 7 | 0.6 |
| | 8 | 0.6 |
| | 20 | 0.6 |
| CA_1-7-8-40 | 1 | 0.6 |
| | 7 | 0.8 |
| | 8 | 0.6 |
| | 40 | 0.9 |
| CA_1-7-20-28 | 1 | 0.5 |
| | 7 | 0.6 |
| | 20 | 0.6 |
| | 28 | 0.6 |
| CA_1-7-20-32 | 1 | 0.7 |
| | 7 | 0.7 |

| | | |
|---|---|---|
| | 20 | 0.3 |
| CA_1-7-20-42 | 1 | 0.6 |
| | 7 | 0.7 |
| | 20 | 0.4 |
| | 42 | 0.8 |
| CA_1-8-11-28[11] | 1 | 0.3 |
| | 8 | 0.6 |
| | 11 | 0.4 |
| | 28 | 0.6 |
| CA_1-8-20-28 | 1 | 0.3 |
| | 8 | 0.6 |
| | 20 | 0.6 |
| | 28 | 0.6 |
| CA_1-19-21-42 | 1 | 0.3 |
| | 19 | 0.3 |
| | 21 | 0.4 |
| | 42 | 0.8 |
| CA_1-20-32-42 | 1 | 0.5 |
| | 20 | 0.4 |
| | 42 | 0.8 |
| CA_1-20-32-43 | 1 | 0.5 |
| | 20 | 0.3 |
| | 43 | 0.8 |
| CA_1-21-28-42 | 1 | 0.3 |
| | 21 | 0.4 |
| | 28 | 0.6 |
| | 42 | 0.8 |
| CA_1-32-42-43[13] | 1 | 0.5 |
| | 42 | 0.8 |
| | 43 | 0.8 |
| CA_2-4-5-12 | 2 | 0.5 |
| | 4 | 0.5 |
| | 5 | 0.8 |
| | 12 | 0.8 |
| CA_2-4-5-29 | 2 | 0.5 |
| | 4 | 0.5 |
| | 5 | 0.5 |
| CA_2-4-5-30 | 2 | 0.5 |
| | 4 | 0.5 |
| | 5 | 0.3 |
| | 30 | 0.3 |
| CA_2-4-7-12 | 2 | 0.5 |
| | 4 | 0.5 |
| | 7 | 0.5 |
| | 12 | 0.8 |
| CA_2-4-12-30 | 2 | 0.5 |
| | 4 | 0.5 |
| | 12 | 0.8 |
| | 30 | 0.3 |
| CA_2-4-29-30 | 2 | 0.5 |
| | 4 | 0.5 |
| | 30 | 0.3 |
| CA_2-5-7-28 | 2 | 0.5 |
| | 5 | 0.6 |
| | 7 | 0.6 |
| | 28 | 0.6 |
| CA_2-5-12-66, CA_2-2-5-12-66 | 2 | 0.5 |
| | 5 | 0.8 |
| | 12 | 0.5 |
| | 66 | 0.8 |
| CA_2-5-30-66, CA_2-2-5-30-66, CA_2-5-30-66-66 | 2 | 0.5 |
| | 5 | 0.3 |
| | 30 | 0.3 |
| | 66 | 0.5 |
| CA_2-7-46-66 | 2 | 0.5 |

| | | |
|---|---|---|
| | 7 | 0.5 |
| | 46 | 0 |
| | 66 | 0.5 |
| CA_2-12-30-66, CA_2-2-12-30-66, CA_2-12-30-66-66 | 2 | 0.5 |
| | 12 | 0.8 |
| | 30 | 0.3 |
| | 66 | 0.5 |
| CA_2-13-48-66, CA_2-13-48-48-66 | 2 | 0.6 |
| | 13 | 0.3 |
| | 48 | 0.8 |
| | 66 | 0.6 |
| CA_2-14-30-66, CA_2-2-14-30-66, CA_2-14-30-66-66 | 2 | 0.5 |
| | 14 | 0.3 |
| | 30 | 0.3 |
| | 66 | 0.5 |
| CA_2-7-12-66, CA_2-2-7-12-66 | 2 | 0.5 |
| | 7 | 0.5 |
| | 12 | 0.8 |
| | 66 | 0.5 |
| CA_2-29-30-66 | 2 | 0.5 |
| | 30 | 0.3 |
| | 66 | 0.5 |
| CA_2-46-48-66 | 2 | 0.6 |
| | 48 | 0.8 |
| | 66 | 0.6 |
| CA_3-7-8-20 | 3 | 0.5 |
| | 7 | 0.5 |
| | 8 | 0.4 |
| | 20 | 0.4 |
| CA_3-7-8-38 | 3 | 0.5 |
| | 7 | 0.5 |
| | 8 | 0.5 |
| | 38 | 0.5 |
| CA_3-7-8-40 | 3 | 0.6 |
| | 7 | 0.8 |
| | 8 | 0.6 |
| | 40 | 0.9 |
| CA_3-7-20-28 | 3 | 0.5 |
| | 7 | 0.5 |
| | 20 | 0.6 |
| | 28 | 0.5 |
| CA_3-7-20-32 | 3 | 0.7 |
| | 7 | 0.7 |
| | 20 | 0.3 |
| CA_3-7-20-42 | 3 | 0.6 |
| | 7 | 0.6 |
| | 20 | 0.3 |
| | 42 | 0.8 |
| CA_3-7-28-38 | 3 | 0.5 |
| | 7 | 0.5 |
| | 28 | 0.5 |
| | 38 | 0.5 |
| CA_3-8-11-28[12] | 3 | 0.8 |
| | 8 | 0.6 |
| | 11 | 0.9 |
| | 28 | 0.6 |
| CA_3-8-20-28 | 3 | 0.3 |
| | 8 | 0.6 |
| | 20 | 0.5 |
| | 28 | 0.5 |
| CA_3-19-21-42 | 3 | 0.8 |
| | 19 | 0.3 |
| | 21 | 0.9 |
| | 42 | 0.8 |
| | 42 | 0.8 |

| | | |
|---|---|---|
| CA_3-20-32-42 | 3 | 0.6 |
| | 20 | 0.4 |
| | 42 | 0.8 |
| CA_3-20-32-43 | 3 | 0.5 |
| | 20 | 0.3 |
| | 43 | 0.8 |
| CA_3-21-28-42 | 3 | 0.8 |
| | 21 | 0.9 |
| | 28 | 0.5 |
| | 42 | 0.8 |
| CA_3-28-41-42 | 3 | 1 |
| | 28 | 0.5 |
| | 41 | 0.3[7]/0.8[8] |
| | 42 | 0.8 |
| CA_3-32-42-43[13] | 3 | 0.6 |
| | 42 | 0.8 |
| | 43 | 0.8 |

NOTE 1: The above additional tolerances are only applicable for the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.
NOTE 2: The above additional tolerances also apply in non-aggregated operation for the supported E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.
NOTE 3: Tolerances for a UE supporting multiple 4DL inter-band CA configurations are FFS.
NOTE 4: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.
NOTE 5: For UE supporting E-UTRA band 65 and CA configurations including Band 1, the Band 65 $\Delta T_{IB,c}$ is the max(Band 65 $\Delta T_{IB,c}$ , Band 1 $\Delta T_{IB,c}$).
NOTE 6: For UE supporting E-UTRA band 42, 43 or 48 and CA configurations including Band 42, 43 or 48, the applicable $\Delta T_{IB,c}$ in Band 42, 43, or 48 is the max(Band 42 $\Delta T_{IB,c}$ , Band 43 $\Delta T_{IB,c}$, Band 48 $\Delta T_{IB,c}$).
NOTE 7: The requirement is applied for UE transmitting on the frequency range of 2545-2690MHz.
NOTE 8: The requirement is applied for UE transmitting on the frequency range of 2496-2545MHz.
NOTE 9: The values in the table reflect what can be achieved with the present state of the art technology. They shall be reconsidered when the state of the art technology progresses.
NOTE 10: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 1, Band 3 or Band 8.
NOTE 11: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 1, Band 8 or Band 11.
NOTE 12: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 3, Band 8 or Band 11.
NOTE 13: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx among TDD bands.

**Table 6.2.5.3-5: $\Delta T_{IB,c}$ (five bands)**

| E-UTRA operating band combination | E-UTRA Band | $\Delta T_{IB,c}$ [dB] |
|---|---|---|
| CA_1-3-7-20-28 | 1 | 0.6 |
| | 3 | 0.6 |
| | 7 | 0.6 |
| | 20 | 0.6 |
| | 28 | 0.6 |
| CA_1-3-7-20-42 | 1 | 0.7 |
| | 3 | 0.7 |
| | 7 | 0.7 |
| | 20 | 0.3 |
| | 42 | 0.8 |
| CA_1-3-8-11-28 | 1 | 0.3 |
| | 3 | 0.8 |
| | 8 | 0.6 |
| | 11 | 0.9 |
| | 28 | 0.6 |
| CA_1-3-20-32-42 | 1 | 0.6 |
| | 3 | 0.6 |
| | 20 | 0.4 |
| | 42 | 0.8 |
| CA_1-3-20-32-43 | 1 | 0.5 |
| | 3 | 0.5 |
| | 20 | 0.3 |
| | 43 | 0.8 |
| CA_1-3-32-42-43 | 1 | 0.6 |
| | 3 | 0.6 |
| | 42 | 0.8 |
| | 43 | 0.8 |
| NOTE 1: The above additional tolerances are only applicable for the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations. | | |
| NOTE 2: The above additional tolerances also apply in non-aggregated operation for the supported E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations. | | |
| NOTE 3: Tolerances for a UE supporting multiple 5DL inter-band CA configurations are FFS. | | |
| NOTE 4: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration. | | |

NOTE: The above additional tolerances do not apply to supported UTRA operating bands with frequency range below 1 GHz that correspond to the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations when such bands are belonging only to band combination(s) where one band is <1GHz and other bands are >1.7GHz and there is no harmonic relationship between the low band UL and high band DL. Otherwise the above additional tolerances also apply to supported UTRA operating bands that correspond to the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.

The normative reference for this requirement is TS 36.101 [2] clause 6.2.5.

## 6.2.5.4 Test description

### 6.2.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.5.4.1-1. The details of the uplink reference

measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.5.4.1-1: Test Configuration Table**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Configured UE transmitted Output Power test case | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 5 | 5 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |
| Note 2: For the uplink RB allocation the $RB_{start}$ shall be RB #0. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.5.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.5.4.3.

### 6.2.5.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.5.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Send transmit uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach the Pumax level of the test point.
3. Measure the mean power of the UE in the channel bandwidth for each test point in table 6.2.5.5-1 according to the test configuration from Table 6.2.5.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

### 6.2.5.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.2.5.4.3-1: SystemInformationBlockType1: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | -10 | | |

**Table 6.2.5.4.3-2: SystemInformationBlockType1: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 10 | | |

**Table 6.2.5.4.3-3: SystemInformationBlockType1: Test point 3**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 15 | | |

### 6.2.5.5 Test requirement

The maximum output power measured shall not exceed the values specified in Table 6.2.5.5-1.

**Table 6.2.5.5-1: $P_{CMAX}$ configured UE output power**

| | **Channel bandwidth / maximum output power** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Measured UE output power test point 1 | For carrier frequency f ≤ 3.0GHz: -10 dBm ± 7.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -10 dBm ± 8.0 | | | | | |
| Measured UE output power test point 2 | For carrier frequency f ≤ 3.0GHz: 10 dBm ± 6.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 10 dBm ± 7.0 | | | | | |
| Measured UE output power test point 3 | For carrier frequency f ≤ 3.0GHz: 15 dBm ± 5.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 15 dBm ± 6.0 | | | | | |
| Note: In addition note 2 in Table 6.2.2.3-1 shall apply to the tolerances. | | | | | | |

For the UE which supports inter-band carrier aggregation configurations with uplink assigned to one E-UTRA band the $\Delta T_{IB,c}$ in Tables 6.2.5.3-2, 6.2.5.3-3 and 6.2.5.3-4 shall be applied for applicable bands.

In case the UE supports more than one of the above inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 6.2.5.3-2, truncated to one decimal place for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 6.2.5.3-2 that applies for that operating band among the supported CA configurations.

## 6.2.5_1 Configured UE transmitted Output Power for HPUE

### 6.2.5_1.1 Test purpose

To verify the UE does not exceed the minimum between the $P_{EMAX}$ maximum allowed UL TX Power signalled by the E-UTRAN and the $P_{PowerClass}$ maximum UE power the UE power class.

Additionally, for power class 2 UE in band 41, to verify that $P_{CMAX,c}$ is reduced when the uplink/downlink configuration is 0 or 6 in the cell.

## 6.2.5_1.2 Test applicability

This test applies to all types of E-UTRA power Class 1 or power Class 2 UE release 10 and forward.

## 6.2.5_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.5.3 with the following exceptions:

- Instead of Table 6.2.2.3-1 → use Table 6.2.2_1.3-1
- Instead of Section 6.2.3 → use Section 6.2.3_1
- Instead of Section 6.2.4 → use Section 6.2.4_1

The normative reference for this requirement is TS 36.101 [2] clause 6.2.5.

## 6.2.5_1.4 Test description

### 6.2.5_1.4.1 Initial conditions

Same initial conditions as in clause 6.2.5.4.1 with the following exceptions

- Instead of clause 6.2.5.4.3 → use clause 6.2.5_1.4.3
- Instead of table 6.2.5.4.1-1 → use table 6.2.5_1.4.1-1

**Table 6.2.5_1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Configured UE transmitted Output Power test case | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 5 | 5 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: For the uplink RB allocation the $RB_{start}$ shall be RB #0.<br>Note 3: For power class 2 operation in band 41, RMC with UL-DL config 1 is used in test points 1 to 4 and RMC with UL-DL config 0 is used in test point 5. | | | | |

### 6.2.5_1.4.2 Test procedure

Same test procedure as in clause 6.2.5.4.2 with the following exceptions:

- Instead of Table 6.2.5.5-1 → use Tables 6.2.5_1.5-1 and 6.2.5_1.5-2

### 6.2.5_1.4.3 Message contents

Same message contents as in clause 6.2.5.4.3 with the following additional test point:

**Table 6.2.5_1.4.3-1: SystemInformationBlockType1: Test point 4 for Power class 1**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 25 | | |

**Table 6.2.5_1.4.3-2: SystemInformationBlockType1: Test point 4 for Power class 2**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 21 | | |

**Table 6.2.5_1.4.3-3: SystemInformationBlockType1: Test point 5**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 26 | | |

**Table 6.2.5_1.4.3-4: TDD-Config-DEFAULT: Test point 5**

| Derivation Path: TS 36.508 [7] clause 5.3.1, Table 5.3.1-1: TDD-Config-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa0 | To enable PC3 fallback operation | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

## 6.2.5_1.5 Test requirement

The maximum output power measured shall not exceed the values specified in Table 6.2.5_1.5-1 and Table 6.2.5_1.5-2.

**Table 6.2.5_1.5-1: $P_{CMAX}$ configured HPUE output power for Power class 1**

| | **Channel bandwidth / maximum output power** | |
|---|---|---|
| | **5MHz** | **10MHz** |
| Measured UE output power test point 1 | -10 dBm ± 7.7 | |
| Measured UE output power test point 2 | 10 dBm ± 6.7 | |
| Measured UE output power test point 3 | 15 dBm ± 5.7 | |
| Measured UE output power test point 4 | 25dBm ± 2.7 | |
| Note 1: Only applicable to power class 2 capable UE operating on Band 41with ULDL config 0 or 6. | | |

**Table 6.2.5_1.5-2: $P_{CMAX}$ configured HPUE output power for Power class 2**

| | **Channel bandwidth / maximum output power** | |
|---|---|---|
| | **5MHz** | **20MHz** |

| | |
|---|---|
| Measured UE output power test point 1 | -10 dBm ± 7.7 |
| Measured UE output power test point 2 | 10 dBm ± 6.7 |
| Measured UE output power test point 3 | 15 dBm ± 5.7 |
| Measured UE output power test point 4 | 21 dBm ±2.7 |
| Measured UE output power test point 5 (Note 1) | 23 dBm ± 2.7 |
| Note 1: Only applicable to power class 2 capable UE operating on Band 41with UL-DL config 0 or 6. | |

## 6.2.5A Configured transmitted power for CA

### 6.2.5A.1 Configured UE transmitted Output Power for CA (intra-band contiguous DL CA and UL CA)

#### 6.2.5A.1.1 Test purpose

To verify the UE does not exceed the minimum between the $P_{EMAX,c}$ maximum allowed UL TX Power signalled by the E-UTRAN and the $P_{UMAX}$ maximum UE power for the UE power class.

#### 6.2.5A.1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

#### 6.2.5A.1.3 Minimum conformance requirements

For uplink carrier aggregation the UE is allowed to set its configured maximum output power $P_{CMAX,c}$ for serving cell c and its total configured maximum output power $P_{CMAX}$.

The configured maximum output power $P_{CMAX,c}$ on serving cell *c* shall be set as specified in subclause 6.2.5.

For uplink inter-band carrier aggregation, $MPR_c$ and $A\text{-}MPR_c$ apply per serving cell c and are specified in clause 6.2.3 and clause 6.2.4, respectively. $P\text{-}MPR_c$ accounts for power management for serving cell *c*. $P_{CMAX,c.}$ $P_{CMAX,c}$ is calculated under the assumption that the transmit power is increased independently on all component carriers.

For uplink intra-band contiguous carrier aggregation, $MPR_c$ = MPR and $A\text{-}MPR_c$ = A-MPR with MPR and A-MPR specified in clause 6.2.3A and clause 6.2.4A respectively. There is one power management term for the UE, denoted $P\text{-}MPR_c$, and $P\text{-}MPR_c$ = P-MPR. $P_{CMAX,c}$ is calculated under the assumption that the transmit power is increased by the same amount in dB on all component carriers.

The total configured maximum output power $P_{CMAX}$ shall be set within the following bounds:

$$P_{CMAX_L} \leq P_{CMAX} \leq P_{CMAX_H}$$

For uplink inter-band carrier aggregation with one serving cell c per operating band,

$$P_{CMAX_L} = \text{MIN}\ \{10\log_{10}\textstyle\sum \text{MIN}\ [p_{EMAX,c}/(\Delta t_{C,c}),\ p_{PowerClass}/(mpr_c \cdot a\text{-}mpr_c \cdot \Delta t_{C,c} \cdot \Delta t_{IB,c}),\ p_{PowerClass}/(pmpr_c \cdot \Delta t_{C,c})],\ P_{PowerClass}\}$$

$$P_{CMAX_H} = \text{MIN}\{10\ \log_{10} \textstyle\sum p_{EMAX,c},\ P_{PowerClass}\}$$

where

- $p_{EMAX,c}$ is the linear value of $P_{EMAX,\,c}$ which is given by IE *P-Max* for serving cell *c* in [5];
- $P_{PowerClass}$ is the maximum UE power specified in Table 6.2.2A.0-2 without taking into account the tolerance specified in the Table 6.2.2A.1.3-1; $p_{PowerClass}$ is the linear value of $P_{PowerClass}$;

- $mpr_c$ and $a\text{-}mpr_c$ are the linear values of $MPR_c$ and $A\text{-}MPR_c$ as specified in subclause 6.2.3 and subclause 6.2.4, respectively;

- $pmpr_c$ is the linear value of $P\text{-}MPR_c$;

- $\Delta t_{C,c}$ is the linear value of $\Delta T_{C,c}$. $\Delta t_{C,c} = 1.41$ when Note 2 in Table 6.2.2A.0-2 applies for a serving cell *c*, otherwise $\Delta t_{C,c} = 1$;

- $\Delta t_{IB,c}$ is the linear value of the inter-band relaxation term $\Delta T_{IB,c}$ of the serving cell *c* as specified in Table 6.2.5.3-2; otherwise $\Delta t_{IB,c} = 1$.

For uplink intra-band contiguous carrier aggregation,

$$P_{CMAX_L} = MIN\{10 \log10 \sum P_{EMAX,c} - \Delta T_C , P_{PowerClass} - MAX(MPR + A\text{-}MPR + \Delta T_{IB,c}, P\text{-}MPR ) - \Delta T_C\}$$

$$P_{CMAX_H} = MIN\{10 \log10 \sum P_{EMAX,c} , P_{PowerClass}\}$$

where

- $P_{EMAX,c}$ is the linear value of $P_{EMAX,\,c}$ which is given by IE *P-Max* for serving cell *c* in [5] ;

- $P_{PowerClass}$ is the maximum UE power specified in Table 6.2.2A.0-2 without taking into account the tolerance specified in the Table 6.2.2A.0-2;

- MPR and A-MPR are specified in clause 6.2.3A and clause 6.2.4A respectively ;

- $\Delta T_{IB,c}$ is the additional tolerance for serving cell *c* as specified in Table 6.2.5.3-2 ;

- P-MPR is the power management term for the UE ;

- $\Delta T_C$ is the highest value $\Delta T_{C,c}$ among all serving cells *c* in the subframe over both timeslots. $\Delta T_{C,c} = 1.5$ dB when Note 2 in Table 6.2.2A.0-2 applies to the serving cell *c*; otherwise $\Delta T_{C,c} = 0$ dB.

For each subframe, the $P_{CMAX_L}$ is evaluated per slot and given by the minimum value taken over the transmission(s) within the slot; the minimum $P_{CMAX_L}$ over the two slots is then applied for the entire subframe. $P_{PowerClass}$ shall not be exceeded by the UE during any period of time.

The measured maximum output power $P_{UMAX}$ over all serving cells shall be within the following range:

$$P_{CMAX_L} - T(P_{CMAX_L}) \leq P_{UMAX} \leq P_{CMAX_H} + T(P_{CMAX_H})$$

$$P_{UMAX} = 10 \log10 \sum P_{UMAX,c}$$

where

- $P_{UMAX,c}$ denotes the measured maximum output power for serving cell *c* expressed in linear scale.

The tolerance $T(P_{CMAX})$ is defined by the table below and applies to $P_{CMAX_L}$ and $P_{CMAX_H}$ separately.

**Table 6.2.5A.1.3-1: $P_{CMAX}$ tolerance for intra-band with two active UL serving cells**

| $P_{CMAX}$ (dBm) | Tolerance $T_{LOW}(P_{CMAX})$ (dB) | Tolerance $T_{HIGH}(P_{CMAX})$ (dB) |
|---|---|---|
| $21 \leq P_{CMAX} \leq 23$ | 2.0 | |
| $20 \leq P_{CMAX} < 21$ | 2.5 | |
| $19 \leq P_{CMAX} < 20$ | 3.5 | |
| $18 \leq P_{CMAX} < 19$ | 4.0 | |
| $13 \leq P_{CMAX} < 18$ | 5.0 | |
| $8 \leq P_{CMAX} < 13$ | 6.0 | |
| $-40 \leq P_{CMAX} < 8$ | 7.0 | |

The normative reference for this requirement is TS 36.101 [2] clause 6.2.5A.

### 6.2.5A.1.4 Test description

#### 6.2.5A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.5A.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.5A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Mid range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | | |
| 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | | |
| 75 | 75 | N/A for this test | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 100 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 100 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.5A.1.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.5A.1.4.3.

#### 6.2.5A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.2.5A.1.4.3.
3. SS activates SCC by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.5A.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send transmit uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach the $P_{UMAX}$ level of the test point.
6. Measure the mean power over all component carriers in the CA configuration for each test point in table 6.2.5A.1.5-1 according to the test configuration from Table 6.2.5A.1.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.2.5A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions. In test procedure step 2, for SCC configuration there are no additional message contents.

**Table 6.2.5A.1.4.3-1: SystemInformationBlockType1: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | -10 | | |

**Table 6.2.5A.1.4.3-2: SystemInformationBlockType1: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 10 | | |

**Table 6.2.5A.1.4.3-3: SystemInformationBlockType1: Test point 3**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 15 | | |

### 6.2.5A.1.5 Test requirement

The maximum output power measured shall not exceed the values specified in Table 6.2.5A.1.5-1.

**Table 6.2.5A.1.5-1: $P_{CMAX}$ configured UE output power**

| | Channel bandwidth / maximum output power | | | | |
|---|---|---|---|---|---|
| | **25RB+50RB (5 MHz + 10 MHz)** | **50RB+50RB (10 MHz + 10 MHz)** | **50RB+100RB (10 MHz + 20 MHz)** | **75RB + 75RB (15 MHz + 15 MHz)** | **100RB (20 MHz** |
| Measured UE output power test point 1 | For carrier frequency f ≤ 3.0GHz: -10 dBm ± 7.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -10 dBm ± 8.0 | | | | |
| Measured UE output power test point 2 | For carrier frequency f ≤ 3.0GHz: 10 dBm ± 6.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 10 dBm ± 7.0 | | | | |
| Measured UE output power test point 3 | For carrier frequency f ≤ 3.0GHz: 15 dBm ± 5.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 15 dBm ± 6.0 | | | | |
| Note: In addition Note 2 in Table 6.2.2A.0-2 shall apply to the tolerances. | | | | | |

For the UE which supports inter-band carrier aggregation configurations with uplink assigned to one E-UTRA band the $\Delta T_{IB,c}$ in Tables 6.2.5.3-2, 6.2.5.3-3 and 6.2.5.3-4 shall be applied for applicable bands.

In case the UE supports more than one of the above inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 6.2.5.3-2, truncated to one decimal place for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied
- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 6.2.5.3-2 that applies for that operating band among the supported CA configurations.

## 6.2.5A.2 Void

## 6.2.5A.3 Configured UE transmitted Output Power for CA (inter-band DL CA and UL CA)

### 6.2.5A.3.1 Test purpose

To verify the UE does not exceed the minimum between the $P_{EMAX,c}$ maximum allowed UL TX Power signalled by the E-UTRAN and the $P_{UMAX}$ maximum UE power for the UE power class.

### 6.2.5A.3.2 Test applicability

This test applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA.

### 6.2.5A.3.3 Minimum conformance requirements

For uplink carrier aggregation the UE is allowed to set its configured maximum output power $P_{CMAX,c}$ for serving cell *c* and its total configured maximum output power $P_{CMAX}$.

The configured maximum output power $P_{CMAX,c}$ on serving cell *c* shall be set as specified in subclause 6.2.5.

For uplink inter-band carrier aggregation, $MPR_c$ and A-$MPR_c$ apply per serving cell *c* and are specified in subclause 6.2.3 and subclause 6.2.4, respectively. P-$MPR_c$ accounts for power management for serving cell *c*. $P_{CMAX,c}$ is calculated under the assumption that the transmit power is increased independently on all component carriers.

For uplink intra-band contiguous and non-contiguous carrier aggregation, $MPR_c$ = MPR and A-$MPR_c$ = A-MPR with MPR and A-MPR specified in subclause 6.2.3A and subclause 6.2.4A respectively. There is one power management

term for the UE, denoted P-MPR, and P-MPR $_c$ = P-MPR. $P_{CMAX,c}$ is calculated under the assumption that the transmit power is increased by the same amount in dB on all component carriers.

The total configured maximum output power $P_{CMAX}$ shall be set within the following bounds:

$$P_{CMAX_L} \leq P_{CMAX} \leq P_{CMAX_H}$$

For uplink inter-band carrier aggregation with one serving cell c per operating band,

$$P_{CMAX_L} = MIN \{10\log_{10}\sum MIN [ p_{EMAX,c}/ (\Delta t_{C,c}), \quad p_{PowerClass}/(mpr_c \cdot a\text{-}mpr_c \cdot \Delta t_{C,c} \cdot \Delta t_{IB,c}) , p_{PowerClass}/pmpr_c], P_{PowerClass}\}$$

$$P_{CMAX_H} = MIN\{10 \log_{10} \sum p_{EMAX,c} , P_{PowerClass}\}$$

where

- $p_{EMAX,c}$ is the linear value of $P_{EMAX, c}$ which is given by IE *P-Max* for serving cell *c* in [5];
- $P_{PowerClass}$ is the maximum UE power specified in Table 6.2.2A.0-1 without taking into account the tolerance specified in the Table 6.2.2A.0-1; $p_{PowerClass}$ is the linear value of $P_{PowerClass}$;
- mpr $_c$ and a-mpr $_c$ are the linear values of MPR $_c$ and A-MPR $_c$ as specified in subclause 6.2.3 and subclause 6.2.4, respectively;
- $pmpr_c$ is the linear value of P-MPR $_c$;
- $\Delta t_{C,c}$ is the linear value of $\Delta T_{C,c}$. $\Delta t_{C,c}$ = 1.41 when Note 2 in Table 6.2.2.3-1 applies for a serving cell *c*, otherwise $\Delta t_{C,c}$ = 1;
- $\Delta t_{IB,c}$ is the linear value of the inter-band relaxation term $\Delta T_{IB,c}$ of the serving cell *c* as specified in Table 6.2.5.3-2; otherwise $\Delta t_{IB,c}$ = 1.

For each subframe, the $P_{CMAX_L}$ is evaluated per slot and given by the minimum value taken over the transmission(s) within the slot; the minimum $P_{CMAX_L}$ over the two slots is then applied for the entire subframe. $P_{PowerClass}$ shall not be exceeded by the UE during any period of time.

If the UE is configured with multiple TAGs and transmissions of the UE on subframe *i* for any serving cell in one TAG overlap some portion of the first symbol of the transmission on subframe *i* +1 for a different serving cell in another TAG, the UE minimum of $P_{CMAX_L}$ for subframes *i* and *i* + 1 applies for any overlapping portion of subframes *i* and *i* + 1. $P_{PowerClass}$ shall not be exceeded by the UE during any period of time.

The measured maximum output power $P_{UMAX}$ over all serving cells shall be within the following range:

$$P_{CMAX_L} - MAX\{T_L, T_{LOW}(P_{CMAX_L})\} \leq P_{UMAX} \leq P_{CMAX_H} + T_{HIGH}(P_{CMAX_H})$$

$$P_{UMAX} = 10 \log_{10} \sum p_{UMAX,c}$$

where $p_{UMAX,c}$ denotes the measured maximum output power for serving cell *c* expressed in linear scale. The tolerances $T_{LOW}(P_{CMAX})$ and $T_{HIGH}(P_{CMAX})$ for applicable values of $P_{CMAX}$ are specified in Table 6.2.5A.3.3-1 for inter-band carrier aggregation. The tolerance $T_L$ is the absolute value of the lower tolerance for applicable E-UTRA CA configuration as specified in Table 6.2.2A.0-1 for inter-band carrier aggregation.

**Table 6.2.5A.3.3-1: $P_{CMAX}$ tolerance for dual-uplink inter-band CA**

| $P_{CMAX}$ (dBm) | Tolerance $T_{LOW}(P_{CMAX})$ (dB) | Tolerance $T_{HIGH}(P_{CMAX})$ (dB) |
|---|---|---|
| $P_{CMAX}$ = 23 | 3.0 | 2.0 |
| 22 ≤ $P_{CMAX}$ < 23 | 5.0 | 2.0 |
| 21 ≤ $P_{CMAX}$ < 22 | 5.0 | 3.0 |
| 20 ≤ $P_{CMAX}$ < 21 | 6.0 | 4.0 |
| 16 ≤ $P_{CMAX}$ < 20 | 5.0 | |
| 11 ≤ $P_{CMAX}$ < 16 | 6.0 | |
| -40 ≤ $P_{CMAX}$ < 11 | 7.0 | |

The normative reference for this requirement is TS 36.101 [2] clause 6.2.5A.

## 6.2.5A.3.4 Test description

### 6.2.5A.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.5A.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.5A.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | Mid range for PCC and SCC | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/A for this test | QPSK | 13 | P_5@0 | S_8@0 | - | - |
| 6 | 50 | | QPSK | 17 | P_5@0 | S_12@0 | - | - |
| 15 | 25 | | QPSK | 12 | S_4@0 | P_8@0 | | |
| 25 | 6 | | QPSK | 13 | P_8@0 | P_5@0 | | |
| 25 | 15 | | QPSK | 12 | P_8@0 | S_4@0 | - | - |
| 25 | 25 | | QPSK | 16 | P_8@0 | S_8@0 | - | - |
| 25 | 50 | | QPSK | 20 | P_8@0 | S_12@0 | - | - |
| 25 | 75 | | QPSK | 24 | P_8@0 | S_16@0 | | |
| 50 | 50 | | QPSK | 24 | P_12@0 | S_12@0 | - | - |
| 50 | 100 | | QPSK | 30 | P_12@0 | S_18@0 | - | - |
| 75 | 25 | | QPSK | 24 | P_16@0 | S_8@0 | - | - |
| 75 | 75 | | QPSK | 32 | P_16@0 | S_16@0 | - | - |
| 75 | 100 | | QPSK | 34 | P_16@0 | S_18@0 | - | - |
| 100 | 50 | | QPSK | 30 | P_18@0 | S_12@0 | - | - |
| 100 | 100 | | QPSK | 36 | P_18@0 | S_18@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channel is set according to Table 6.2.5A.3.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.5A.3.4.3.

### 6.2.5A.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.2.5A.3.4.3.
3. SS activates SCC by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.5A.3.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send transmit uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach the $P_{UMAX}$ level of the test point.
6. Measure the mean power over all component carriers in the CA configuration for each test point in table 6.2.5A.3.5-1 according to the test configuration from Table 6.2.5A.3.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

### 6.2.5A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions. In test procedure step 2, for SCC configuration there are no additional message contents.

**Table 6.2.5A.3.4.3-1: SystemInformationBlockType1: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | -10 | | |

**Table 6.2.5A.3.4.3-2: SystemInformationBlockType1: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 10 | | |

**Table 6.2.5A.3.4.3-3: SystemInformationBlockType1: Test point 3**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 15 | | |

**Table 6.2.5A.3.4.3-4: RadioResourceConfigCommonSCell-r10: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A RadioResourceConfigCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigCommonSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| p-Max-r10 | -10 | | |
| } | | | |
| } | | | |

**Table 6.2.5A.3.4.3-5: RadioResourceConfigCommonSCell-r10: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A RadioResourceConfigCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigCommonSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| p-Max-r10 | 10 | | |
| } | | | |
| } | | | |

**Table 6.2.5A.3.4.3-6: RadioResourceConfigCommonSCell-r10: Test point 3**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A RadioResourceConfigCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigCommonSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| p-Max-r10 | 15 | | |
| } | | | |
| } | | | |

### 6.2.5A.3.5 Test requirement

The maximum output power measured shall not exceed the values specified in Table 6.2.5A.3.5-1.

**Table 6.2.5A.3.5-1: $P_{CMAX}$ configured UE output power**

| Test point | maximum output power |
|---|---|
| Measured UE output power test point 1 | For carrier frequency f ≤ 3.0GHz: -7 dBm ± 7.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -7 dBm ± 8.0 |
| Measured UE output power test point 2 | For carrier frequency f ≤ 3.0GHz: 13 dBm ± 6.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 13 dBm ± 7.0 |
| Measured UE output power test point 3 | For carrier frequency f ≤ 3.0GHz: 18 dBm ± 5.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 18 dBm ± 6.0 |

For the UE which supports inter-band carrier aggregation configurations with uplink assigned to one E-UTRA band the $\Delta T_{IB,c}$ in Tables 6.2.5.3-2, 6.2.5.3-3 and 6.2.5.3-4 shall be applied for applicable bands.

In case the UE supports more than one of the above inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 6.2.5.3-2, truncated to one decimal place for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied.

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 6.2.5.3-2 that applies for that operating band among the supported CA configurations.

## 6.2.5A.4 Configured UE transmitted Output Power for CA (intra-band non-contiguous DL CA and UL CA)

### 6.2.5A.4.1 Test purpose

To verify the UE does not exceed the minimum between the $P_{EMAX,c}$ maximum allowed UL TX Power signalled by the E-UTRAN and the $P_{UMAX}$ maximum UE power for the UE power class.

### 6.2.5A.4.2 Test applicability

This test applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

### 6.2.5A.4.3 Minimum conformance requirements

For uplink carrier aggregation the UE is allowed to set its configured maximum output power $P_{CMAX,c}$ for serving cell c and its total configured maximum output power $P_{CMAX}$.

The configured maximum output power $P_{CMAX,c}$ on serving cell *c* shall be set as specified in subclause 6.2.5.

For uplink intra-band contiguous and non-contiguous carrier aggregation, $MPR_c$ = MPR and $A\text{-}MPR_c$ = A-MPR with MPR and A-MPR specified in clause 6.2.3A and clause 6.2.4A respectively. There is one power management term for the UE, denoted $P\text{-}MPR_c$, and $P\text{-}MPR_c$ = P-MPR. $P_{CMAX,c}$ is calculated under the assumption that the transmit power is increased by the same amount in dB on all component carriers.

The total configured maximum output power $P_{CMAX}$ shall be set within the following bounds:

$$P_{CMAX_L} \leq P_{CMAX} \leq P_{CMAX_H}$$

For uplink intra-band contiguous and non-contiguous carrier aggregation,

$$P_{CMAX_L} = \text{MIN}\{10 \log_{10} \sum p_{EMAX,c} - \Delta T_C, P_{PowerClass} - \text{MAX}(\text{MPR} + \text{A-MPR} + \Delta T_{IB,c} + \Delta T_C, \text{P-MPR})\}$$

$$P_{CMAX_H} = \text{MIN}\{10 \log_{10} \sum p_{EMAX,c}, P_{PowerClass}\}$$

where

- $p_{EMAX,c}$ is the linear value of $P_{EMAX,c}$ which is given by IE *P-Max* for serving cell *c* in [5];
- $P_{PowerClass}$ is the maximum UE power specified in Table 6.2.2A.0-2 without taking into account the tolerance specified in the Table 6.2.2A.0-2;
- MPR and A-MPR are specified in subclause 6.2.3A and subclause 6.2.4A respectively;
- $\Delta T_{IB,c}$ is the additional tolerance for serving cell *c* as specified in Table 6.2.5.3-2;
- P-MPR is the power management term for the UE;
- $\Delta T_C$ is the highest value $\Delta T_{C,c}$ among all serving cells *c* in the subframe over both timeslots. $\Delta T_{C,c}$ = 1.5 dB when Note 2 in Table 6.2.2A.0-2 applies to the serving cell *c*, otherwise $\Delta T_{C,c}$ = 0 dB.

For each subframe, the $P_{CMAX_L}$ is evaluated per slot and given by the minimum value taken over the transmission(s) within the slot; the minimum $P_{CMAX_L}$ over the two slots is then applied for the entire subframe. $P_{PowerClass}$ shall not be exceeded by the UE during any period of time.

If the UE is configured with multiple TAGs and transmissions of the UE on subframe *i* for any serving cell in one TAG overlap some portion of the first symbol of the transmission on subframe *i* +1 for a different serving cell in another TAG, the UE minimum of $P_{CMAX_L}$ for subframes *i* and *i* + 1 applies for any overlapping portion of subframes *i* and *i* + 1. $P_{PowerClass}$ shall not be exceeded by the UE during any period of time.

The measured maximum output power $P_{UMAX}$ over all serving cells shall be within the following range:

$$P_{CMAX_L} - \text{MAX}\{T_L, T_{LOW}(P_{CMAX_L})\} \leq P_{UMAX} \leq P_{CMAX_H} + T_{HIGH}(P_{CMAX_H})$$

$$P_{UMAX} = 10 \log_{10} \sum p_{UMAX,c}$$

where $p_{UMAX,c}$ denotes the measured maximum output power for serving cell *c* expressed in linear scale. The tolerances $T_{LOW}(P_{CMAX})$ and $T_{HIGH}(P_{CMAX})$ for applicable values of $P_{CMAX}$ are specified in Table 6.2.5A.4.3-1 for intra-band carrier aggregation. The tolerance $T_L$ is the absolute value of the lower tolerance for applicable E-UTRA CA configuration as specified in Table 6.2.2A-2 of TS 36.101 for intra-band non-contiguous carrier aggregation.

**Table 6.2.5A.4.3-1: $P_{CMAX}$ tolerance**

| $P_{CMAX}$ (dBm) | Tolerance $T_{LOW}(P_{CMAX})$ (dB) | Tolerance $T_{HIGH}(P_{CMAX})$ (dB) |
|---|---|---|
| $21 \le P_{CMAX} \le 23$ | 2.0 | |
| $20 \le P_{CMAX} < 21$ | 2.5 | |
| $19 \le P_{CMAX} < 20$ | 3.5 | |
| $18 \le P_{CMAX} < 19$ | 4.0 | |
| $13 \le P_{CMAX} < 18$ | 5.0 | |
| $8 \le P_{CMAX} < 13$ | 6.0 | |
| $-40 \le P_{CMAX} < 8$ | 7.0 | |

The normative reference for this requirement is TS 36.101 [2] clause 6.2.5A.

## 6.2.5A.4.4 Test description

### 6.2.5A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.5A.4.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.5A.4.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: Low Wgap, Maximum Wgap | | | | | | | | |
| Test CC Combination setting ($N_{RB}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A for this test | | QPSK | P_1@0 | QPSK | S_1@24 |
| 2 | 25 | 25 | 35 | | | QPSK | P_25@0 | QPSK | S_25@0 |
| 3 | 25 | 25 | 5 | | | QPSK | P_1@0 | QPSK | S_1@24 |
| 4 | 25 | 25 | 5 | | | QPSK | P_25@0 | QPSK | S_25@0 |
| 5 | 100 | 100 | 5 | | | QPSK | P_1@0 | QPSK | S_1@99 |
| 6 | 100 | 100 | 5 | | | QPSK | P_100@0 | QPSK | S_100@0 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.5A.4.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.5A.4.4.3.

### 6.2.5A.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.2.5A.4.4.3.
3. SS activates SCC by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.5A.4.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send transmit uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach the $P_{UMAX}$ level of the test point.

6. Measure the mean power over all component carriers in the CA configuration for each test point in table 6.2.5A.4.5-1 according to the test configuration from Table 6.2.5A.4.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

### 6.2.5A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions. In test procedure step 2, for SCC configuration there are no additional message contents.

**Table 6.2.5A.4.4.3-1: SystemInformationBlockType1: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | -13 | | |

**Table 6.2.5A.4.4.3-2: SystemInformationBlockType1: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 7 | | |

**Table 6.2.5A.4.4.3-3: SystemInformationBlockType1: Test point 3**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 12 | | |

### 6.2.5A.4.5 Test requirement

The maximum output power measured shall not exceed the values specified in Table 6.2.5A.4.5-1.

**Table 6.2.5A.4.5-1: $P_{CMAX}$ configured UE output power**

| Configuration ID | MPR (dB) | $P_{CMAX}$ (dBm) | $T(P_{CMAX_L})$ (dB) | maximum output power | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Measured UE output power test point 1 | | Measured UE output power test point 2 | | Measured UE output power test point 3 | |
| | | | | Upper limit (dBm) | Lower limit (dBm) | Upper limit (dBm) | Lower limit (dBm) | Upper limit (dBm) | Lower limit (dBm) |
| 1 | 18 | 5 | 7 | -2.3 | -17.7 | 16.7 | -2.7 | 20.7 | -2.7 |
| 2 | 12 | 11 | 6 | | | | 3.3 | | 4.3 |
| 3 | 18 | 5 | 7 | | | | -2.7 | | -2.7 |
| 4 | 7 | 16 | 5 | | | | 3.3 | | 9.3 |

For the UE which supports inter-band carrier aggregation configurations with uplink assigned to one E-UTRA band the $\Delta T_{IB,c}$ in Tables 6.2.5.3-2, 6.2.5.3-3 and 6.2.5.3-4 shall be applied for applicable bands.

In case the UE supports more than one of the above inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is $\leq$ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 6.2.5.3-2, truncated to one decimal place for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 6.2.5.3-2 that applies for that operating band among the supported CA configurations.

## 6.2.5A.5 Configured UE transmitted Output Power for CA (3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

-Test Configuration Table is incomplete

-The test applicability needs to be added to TS36.521-2

### 6.2.5A.5.1 Test purpose

To verify the UE does not exceed the minimum between the $P_{EMAX,c}$ maximum allowed UL TX Power signalled by the E-UTRAN and the $P_{UMAX}$ maximum UE power for the UE power class.

### 6.2.5A.5.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward that s3UL CA.

### 6.2.5A.5.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.5A.4.3.

### 6.2.5A.5.4 Test description

#### 6.2.5A.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.5A.5.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.5A.5.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br><br>A: Low Wgap, Maximum Wgap |
| Test CC Combination setting ($N_{RB}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

| Test Parameters for CA Configurations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ [MHz] | DL Allocation | | UL Allocation | | | | |
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | | CC MOD | PCC & SCC RB allocation | CC MOD | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) |
| Test Parameters for CA Configurations | | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A for this test | | QPSK | P_1@0 | QPSK | S_1@24 | QPSK | S_1@24 |
| 2 | 25 | 25 | 35 | | | QPSK | P_25@0 | QPSK | S_25@0 | QPSK | S_25@0 |
| 3 | 25 | 25 | 5 | | | QPSK | P_1@0 | QPSK | S_1@24 | QPSK | S_1@24 |
| 4 | 25 | 25 | 5 | | | QPSK | P_25@0 | QPSK | S_25@0 | QPSK | S_25@0 |
| 5 | 100 | 100 | 5 | | | QPSK | P_1@0 | QPSK | S_1@99 | QPSK | S_1@99 |
| 6 | 100 | 100 | 5 | | | QPSK | P_100@0 | QPSK | S_100@0 | QPSK | S_100@0 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.5A.5.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.5A.5.4.3.

### 6.2.5A.5.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.2.5A.5.4.3.
3. SS activates SCC by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.5A.5.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send transmit uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach the $P_{UMAX}$ level of the test point.

6. Measure the mean power over all component carriers in the CA configuration for each test point in table 6.2.5A.5.5-1 according to the test configuration from Table 6.2.5A.5.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

### 6.2.5A.5.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions. In test procedure step 2, for SCC configuration there are no additional message contents.

**Table 6.2.5A.5.4.3-1: SystemInformationBlockType1: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | TBD | | |

**Table 6.2.5A.5.4.3-2: SystemInformationBlockType1: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | TBD | | |

**Table 6.2.5A.5.4.3-3: SystemInformationBlockType1: Test point 3**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | TBD | | |

### 6.2.5A.5.5 Test requirement

The maximum output power measured shall not exceed the values specified in Table 6.2.5A.5.5-1.

**Table 6.2.5A.5.5-1: $P_{CMAX}$ configured UE output power**

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For the UE which supports inter-band carrier aggregation configurations with uplink assigned to one E-UTRA band the $\Delta T_{IB,c}$ in Tables 6.2.5.3-2, 6.2.5.3-3 and 6.2.5.3-4 shall be applied for applicable bands.

In case the UE supports more than one of the above inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is $\leq$ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 6.2.5.3-2, truncated to one decimal place for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 6.2.5.3-2 that applies for that operating band among the supported CA configurations.

# 6.2.5B Configured UE transmitted Output Power for UL-MIMO

Editor's notes: The following items are missing or incomplete:

- Test Tolerance

## 6.2.5B.1 Test purpose

To verify the UE does not exceed the minimum between the $P_{EMAX}$ maximum allowed UL TX Power for UL-MIMO signalled by the E-UTRAN and the $P_{UMAX}$ maximum UE power for the UE power class.

## 6.2.5B.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL- MIMO.

## 6.2.5B.3 Minimum conformance requirements

For UE with multiple transmit antenna connectors, the transmitted power is configured per each UE.

The definitions of configured maximum output power $P_{CMAX,c}$, the lower bound $P_{CMAX_L,c}$, and the higher bound $P_{CMAX_H,c}$ specified in Section 6.2.5 shall apply to UE with multiple transmit antenna connectors, where

- $P_{PowerClass}$ and $\Delta T_{C,c}$ are specified in Section 6.2.2B;
- $MPR_c$ is specified in Section 6.2.3B;
- $A\text{-}MPR_c$ is specified in Section 6.2.4B.

The measured configured maximum output power $P_{UMAX,c}$ for serving cell *c* shall be within the following bounds:

$$P_{CMAX_L,c} - MAX\{T_L, T_{LOW}(P_{CMAX_L,c})\} \leq P_{UMAX,c} \leq P_{CMAX_H,c} + T_{HIGH}(P_{CMAX_H,c})$$

where $T_{LOW}(P_{CMAX_L,c})$ and $T_{HIGH}(P_{CMAX_H,c})$ are defined as the tolerance and applies to $P_{CMAX_L,c}$ and $P_{CMAX_H,c}$ separately, while $T_L$ is the absolute value of the lower tolerance in Table 6.2.2B.3-1 for the applicable operating band.

For UE with two transmit antenna connectors, the tolerance is specified in Table 6.2.5B.3-1 with UL-MIMO configurations specified in Table 6.2.2B.3-2.

**Table 6.2.5B.3-1: $P_{CMAX,c}$ tolerance in closed-loop spatial multiplexing scheme**

| $P_{CMAX,c}$ (dBm) | Tolerance $T_{LOW}(P_{CMAX_L,c})$ (dB) | Tolerance $T_{HIGH}(P_{CMAX_H,c})$ (dB) |
|---|---|---|
| $P_{CMAX,c}$ =23 | 3.0 | 2.0 |
| [22] ≤ $P_{CMAX,c}$ < [23] | [5.0] | [2.0] |
| [21] ≤ $P_{CMAX,c}$ < [22] | [5.0] | [3.0] |
| [20] ≤ $P_{CMAX,c}$ < [21] | [6.0] | [4.0] |
| [16] ≤ $P_{CMAX,c}$ < [20] | [5.0] | |
| [11] ≤ $P_{CMAX,c}$ < [16] | [6.0] | |
| [-40] ≤ $P_{CMAX,c}$ < [11] | [7.0] | |

The normative reference for this requirement is TS 36.101 [2] clause 6.2.5B.

## 6.2.5B.4 Test description

### 6.2.5B.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test

parameters for each channel bandwidth, and are shown in table 6.2.5B.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.5B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Configured UE transmitted Output Power test case | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 5 | 5 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: For the uplink RB allocation the $RB_{start}$ shall be RB #0. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.5B.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.2.5B.4.3.

### 6.2.5B.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.2.5B.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Send transmit uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach the $P_{umax}$ level of the test point.
3. Measure the sum mean power of the UE at each UE antenna connector in the associated measurement bandwidth for each test point in table 6.2.5B.5-1 according to the test configuration from Table 6.2.5B.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

### 6.2.5B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 6.2.5B.4.3-1: SystemInformationBlockType1: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | -10 | | |

**Table 6.2.5B.4.3-2: SystemInformationBlockType1: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 13 | | |

**Table 6.2.5B.4.3-3: SystemInformationBlockType1: Test point 3**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 18 | | |

### 6.2.5B.5 Test requirement

The maximum output power measured shall not exceed the values specified in Table 6.2.5B.5-1.

**Table 6.2.5B.5-1: $P_{CMAX}$ configured UE output power**

| | **Channel bandwidth / maximum output power** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Measured UE output power test point 1 | For carrier frequency f ≤ 3.0GHz: -10 dBm ± [7.7]<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -10 dBm ± [8] | | | | | |
| Measured UE output power test point 2 | For carrier frequency f ≤ 3.0GHz: 13 dBm ± [6.7]<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 13 dBm ± [7] | | | | | |
| Measured UE output power test point 3 | For carrier frequency f ≤ 3.0GHz: 18 dBm ± [5.7]<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 18 dBm ± [6] | | | | | |
| Note: In addition note 2 in Table 6.2.2B.3-1 shall apply to the tolerances. | | | | | | |

For the UE which supports inter-band carrier aggregation configurations with uplink assigned to one E-UTRA band the $\Delta T_{IB,c}$ in Tables 6.2.5.3-2, 6.2.5.3-3 and 6.2.5.3-4 shall be applied for applicable bands.

In case the UE supports more than one of the above inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 6.2.5.3-2, truncated to one decimal place for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 6.2.5.3-2 that applies for that operating band among the supported CA configurations.

## 6.2.5E Configured UE transmitted Output Power for UE category 0

### 6.2.5E.1 Test purpose

Same test purpose as on clause 6.2.5.1.

## 6.2.5E.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

## 6.2.5E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.2.3.

## 6.2.5E.4 Test description

### 6.2.5E.4.1 Initial conditions

Same initial conditions as in clause 6.2.5.4.1 with following exceptions:

- Instead of Table 6.2.5.4.1-1 → use Table 6.2.5E.4.1-1.
- Connect SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.2.5E.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Configured UE transmitted Output Power test case | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 1.4MHz | | QPSK | 5 | 5 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: For the uplink RB allocation the $RB_{start}$ shall be RB #0. | | | | |

### 6.2.5E.4.2 Test procedure

Same test procedure as in clause 6.2.5.4.2 with following exception for HD-FDD:

- In step 3, slots with transient periods are not under test. Half-duplex guard sub frame are not under test.

### 6.2.5E.4.3 Message contents

Same message contents as in clause 6.2.5.4.3.

## 6.2.5E.5 Test requirement

The maximum output power measured shall not exceed the values specified in Table 6.2.5E.5-1.

**Table 6.2.5E.5-1: $P_{CMAX}$ configured UE output power**

| | **Channel bandwidth / maximum output power** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| | |
|---|---|
| Measured UE output power test point 1 | For carrier frequency f ≤ 3.0GHz: -10 dBm ± 7.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -10 dBm ± 8.0 |
| Measured UE output power test point 2 | For carrier frequency f ≤ 3.0GHz: 10 dBm ± 6.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 10 dBm ± 7.0 |
| Measured UE output power test point 3 | For carrier frequency f ≤ 3.0GHz: 15 dBm ± 5.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 15 dBm ± 6.0 |
| Note: In addition note 2 in Table 6.2.2.3-1 shall apply to the tolerances. | |

# 6.2.5EA Configured UE transmitted Power for UE category M1

## 6.2.5EA.1 Test purpose

To verify the UE does not exceed the minimum between the $P_{EMAX}$ maximum allowed UL TX Power signalled by the E-UTRAN and the $P_{UMAX}$ maximum UE power for the UE power class.

## 6.2.5EA.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

## 6.2.5EA.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.5.3 with the following exceptions:

- Instead of Table 6.2.2.3-1 → use Table 6.2.2EA-1
- Instead of Section 6.2.3 → use Section 6.2.3EA
- Instead of Section 6.2.4 → use Section 6.2.4EA
- Instead of Table 6.2.5.3-1 → use Table 6.2.5EA.3-1 and Table 6.2.5EA.3-2

**Table 6.2.5EA.3-1: $P_{CMAX,c}$ tolerance for power class 3**

| $P_{CMAX,c}$ (dBm) | Tolerance $T(P_{CMAX,c})$ (dB) |
|---|---|
| $23 < P_{CMAX,c} \leq 33$ | 2.0 |
| $21 \leq P_{CMAX,c} \leq 23$ | 2.0 |
| $20 \leq P_{CMAX,c} < 21$ | 2.5 |
| $19 \leq P_{CMAX,c} < 20$ | 3.5 |
| $18 \leq P_{CMAX,c} < 19$ | 4.0 |
| $13 \leq P_{CMAX,c} < 18$ | 5.0 |
| $8 \leq P_{CMAX,c} < 13$ | 6.0 |
| $-40 \leq P_{CMAX,c} < 8$ | 7.0 |

**Table 6.2.5EA.3-2: $P_{CMAX}$ tolerance for power class 5**

| $P_{CMAX,c}$ (dBm) | Tolerance $T(P_{CMAX,c})$ (dB) |
|---|---|
| $P_{CMAX,c} = 20$ | 2.0 |
| $19 \leq P_{CMAX,c} < 20$ | 3.5 |
| $18 \leq P_{CMAX,c} < 19$ | 4.0 |
| $13 \leq P_{CMAX,c} < 18$ | 5.0 |
| $8 \leq P_{CMAX,c} < 13$ | 6.0 |
| $-40 \leq P_{CMAX,c} < 8$ | 7.0 |

The normative reference for this requirement is TS 36.101 [2] clause 6.2.5.

## 6.2.5EA.4 Test description

### 6.2.5EA.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.5EA.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.2.5EA.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for Configured UE transmitted Output Power test case | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index (Note 1) |
| 5MHz | | QPSK | 1 (Note 3), 3 (Note 4) | 1 (Note 3), 3 (Note 4) | 0 |
| Note 1: Denote where in the channel bandwidth the narrowband shall be placed. Narrowband and narrowband index are defined in TS 36.211, 5.2.4.<br>Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0 of the narrowband.<br>Note 3: Only applicable for Power class 3<br>Note 4: Only applicable for Power class 5 | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.2.5EA.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.2.5EA.4.3.

### 6.2.5EA.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.2.5EA.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Send transmit uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach the Pumax level of the test point.

3. Measure the mean power of the UE in the channel bandwidth for each test point in table 6.2.5EA.5-1 for power class 3 and table 6.2.5EA.5-2 for power class 5 according to the test configuration from Table 6.2.5EA.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods and Half-duplex guard subframe are not under test.

### 6.2.5EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.2.5EA.4.3-1: SystemInformationBlockType1-BR-r13: Test point 1 for power class 3**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3A SystemInformationBlockType1-BR-r13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | -10 | | |

**Table 6.2.5EA.4.3-2: SystemInformationBlockType1-BR-r13: Test point 2 for power class 3**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3A SystemInformationBlockType1-BR-r13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 10 | | |

**Table 6.2.5EA.4.3-3: SystemInformationBlockType1-BR-r13: Test point 3 for power class 3**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3A SystemInformationBlockType1-BR-r13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 15 | | |

**Table 6.2.5EA.4.3-4: SystemInformationBlockType1-BR-r13: Test point 1 for power class 5**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3A SystemInformationBlockType1-BR-r13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | -10 | | |

**Table 6.2.5EA.4.3-5: SystemInformationBlockType1-BR-r13: Test point 2 for power class 5**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3A SystemInformationBlockType1-BR-r13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 7 | | |

**Table 6.2.5EA.4.3-6: SystemInformationBlockType1-BR-r13: Test point 3 for power class 5**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3A SystemInformationBlockType1-BR-r13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 12 | | |

## 6.2.5EA.5 Test requirements

The maximum output power measured shall not exceed the values specified in Table 6.2.5EA.5-1 for power class 3 and Table 6.2.5EA.5-2 for power class 5.

**Table 6.2.5EA.5-1: $P_{CMAX}$ configured UE output power for UE category M1 power class 3**

| | Channel bandwidth / maximum output power | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Measured UE output power test point 1 | For carrier frequency f ≤ 3.0GHz: -10 dBm ± 7.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -10 dBm ± 8.0 | | | | | |
| Measured UE output power test point 2 | For carrier frequency f ≤ 3.0GHz: 10 dBm ± 6.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 10 dBm ± 7.0 | | | | | |
| Measured UE output power test point 3 | For carrier frequency f ≤ 3.0GHz: 15 dBm ± 5.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 15 dBm ± 6.0 | | | | | |
| Note: In addition note 2 in Table 6.2.2EA-1 shall apply to the tolerances. | | | | | | |

**Table 6.2.5EA.5-2: $P_{CMAX}$ configured UE output power for UE category M1 power class 5**

| | Channel bandwidth / maximum output power | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Measured UE output power test point 1 | For carrier frequency f ≤ 3.0GHz: -10 dBm ± 7.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -10 dBm ± 8.0 | | | | | |
| Measured UE output power test point 2 | For carrier frequency f ≤ 3.0GHz: 7 dBm ± 6.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 7 dBm ± 7.0 | | | | | |
| Measured UE output power test point 3 | For carrier frequency f ≤ 3.0GHz: 12 dBm ± 5.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 12 dBm ± 6.0 | | | | | |
| Note: In addition note 2 in Table 6.2.2EA-1 shall apply to the tolerances. | | | | | | |

# 6.2.5EB Configured UE transmitted Power for UE category 1bis

## 6.2.5EB.1 Test purpose

Same test purpose as in clause 6.2.5.1.

## 6.2.5EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of category 1bis.

## 6.2.5EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.5.3

## 6.2.5EB.4 Test description

### 6.2.5EB.4.1 Initial conditions

Same initial conditions as in clause 6.2.5.4.1 with following exception:

- Connect SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

### 6.2.5EB.4.2 Test procedure

Same test procedure as in clause 6.2.5.4.2.

### 6.2.5EB.4.3 Message contents

Same message contents as in clause 6.2.5.4.3.

### 6.2.5EB.5 Test requirement

The maximum output power measured shall not exceed the values specified in Table 6.2.5EB.5-1.

**Table 6.2.5EB.5-1: $P_{CMAX}$ configured UE output power**

| | Channel bandwidth / maximum output power | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Measured UE output power test point 1 | For carrier frequency f ≤ 3.0GHz: -10 dBm ± 7.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -10 dBm ± 8.0 | | | | | |
| Measured UE output power test point 2 | For carrier frequency f ≤ 3.0GHz: 10 dBm ± 6.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 10 dBm ± 7.0 | | | | | |
| Measured UE output power test point 3 | For carrier frequency f ≤ 3.0GHz: 15 dBm ± 5.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: 15 dBm ± 6.0 | | | | | |
| Note: In addition note 2 in Table 6.2.2.3-1 shall apply to the tolerances. | | | | | | |

## 6.2.5EC Configured UE transmitted Power for UE category M2

### 6.2.5EC.1 Test purpose

Same test purpose as in clause 6.2.5EA.

### 6.2.5EC.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward of UE category M2.

### 6.2.5EC.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.2.5EA.3.

### 6.2.5EC.4 Test description

#### 6.2.5EC.4.1 Initial condition

Same initial description as in clause 6.2.5EA.4.1 but with the following exception:

- instead of Table 6.2.5EA.4.1-1 → use Table 6.2.5EC.4.1-1

**Table 6.2.5EC.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for Configured UE transmitted Output Power test case | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index (Note 1) |
| 5MHz | | QPSK | 1 (Note 3), 3 (Note 4) | 1 (Note 3), 3 (Note 4) | 0 |
| Note 1: Denote where in the channel bandwidth the narrowband shall be placed. Narrowband and narrowband index are defined in TS 36.211, 5.2.4. | | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0 of the narrowband. | | | | | |
| Note 3: Only applicable for Power class 3 | | | | | |
| Note 4: Only applicable for Power class 5 | | | | | |

### 6.2.5EC.4.2 Test procedure

Same test procedure as in clause 6.2.5EA.4.2.

### 6.2.5EC.4.3 Message contents

Same message contents as in clause 6.2.5EA.4.3.

### 6.2.5EC.5 Test requirements

Same test requirements as in clause 6.2.5EA.5.

## 6.2.5F Configured UE transmitted Output Power for UE category NB1 and NB2

### 6.2.5F.1 Test purpose

To verify the UE does not exceed the minimum between the $P_{EMAX}$ maximum allowed UL TX Power signalled by the E-UTRAN and the $P_{UMAX}$ maximum UE power for the UE power class.

### 6.2.5F.2 Test applicability

This test case applies to all types of UE release 13 and forward of UE category NB1.

This test case applies to all types of UE release 14 and forward of UE category NB2.

### 6.2.5F.3 Minimum conformance requirements

For each slot *i* the NB IoT UE is allowed to set its configured maximum output power $P_{CMAX,c}$. The configured maximum output power $P_{CMAX,c}$ is set within the following bounds:

$$P_{CMAX_L,c} \leq P_{CMAX,c} \leq P_{CMAX_H,c}$$

Where

- $P_{CMAX_L,c} = MIN \{ P_{EMAX,c}, P_{PowerClass} - MPR_c - A\text{-}MPR_c \}$
- $P_{CMAX_H,c} = MIN \{ P_{EMAX,c}, P_{PowerClass} \}$

- $P_{EMAX,c}$ is the value given to IE *P-Max*, defined in [7]
- $P_{PowerClass}$ is the maximum category NB1 and NB2 UE power specified in Table 6.2.2F.3-1 without taking into account the associated tolerance
- $MPR_c$ is specified in subclause 6.2.3F
- A-$MPR_c$ = 0dB unless otherwise stated.

The measurement period for $P_{UMAX,c}$ is at least one sub-frame **(**1ms) for 15 KHz channel spacing, and at least a 2ms slot (excluding the 2304Ts gap when UE is not transmitting) respectively for the 3.75 KHz channel spacing. The measured maximum output power $P_{UMAX,c}$ shall be within the following bounds:

$$P_{CMAX_L,c} - T(P_{CMAX_L,c}) \leq P_{UMAX,c} \leq P_{CMAX_H,c} + T(P_{CMAX_H,c})$$

Where $T(P_{CMAX})$ is defined by the tolerance table below and applies to $P_{CMAX_L,c}$ and $P_{CMAX_H,c}$ separately.

**Table 6.2.5F.3-1: $P_{CMAX}$ tolerance for power class 3**

| $P_{CMAX}$ (dBm) | Tolerance $T(P_{CMAX})$ (dB) |
|---|---|
| $21 \leq P_{CMAX} \leq 23$ | 2.0 |
| $20 \leq P_{CMAX} < 21$ | 2.5 |
| $19 \leq P_{CMAX} < 20$ | 3.5 |
| $18 \leq P_{CMAX} < 19$ | 4.0 |
| $13 \leq P_{CMAX} < 18$ | 5.0 |
| $8 \leq P_{CMAX} < 13$ | 6.0 |
| $-40 \leq P_{CMAX} < 8$ | 7.0 |

**Table 6.2.5F.3-2: $P_{CMAX}$ tolerance for power class 5**

| $P_{CMAX,c}$ (dBm) | Tolerance $T(P_{CMAX,c})$ (dB) |
|---|---|
| $18 \leq P_{CMAX} \leq 20$ | 2.0 |
| $17 \leq P_{CMAX,c} < 18$ | 2.5 |
| $16 \leq P_{CMAX,c} < 17$ | 3.5 |
| $15 \leq P_{CMAX,c} < 16$ | 4.0 |
| $10 \leq P_{CMAX,c} < 15$ | 5.0 |
| $5 \leq P_{CMAX,c} < 10$ | 6.0 |
| $-40 \leq P_{CMAX,c} < 5$ | 7.0 |

The normative reference for this requirement is TS 36.101 [2] clause 6.2.5F.

## 6.2.5F.4 Test description

### 6.2.5F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.5F.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in A.2.4. Configurations of NPDSCH and NPDCCH before measurement are specified in TBD.

**Table 6.2.5F.4.1-1: Test Configuration Table**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 8.1.1 | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.1 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A | Modulation | $N_{tones}$ | Sub-carrier spacing (kHz) |
| 1 | | QPSK | 1@0 | 3.75 |
| 2 | | QPSK | 1@47 | 3.75 |
| 3 | | QPSK | 1@0 | 15 |
| 4 | | QPSK | 1@11 | 15 |
| 5 (Note 1) | | QPSK | 12@0 | 15 |
| Note 1: Applicable to UE supporting UL multi-tone transmissions | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C, and uplink signals according to Annex H.
4. The UL Reference Measurement channel is set according to Table 6.2.5F.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.2.5F.4.3.

### 6.2.5F.4.2 Test procedure

1. SS sends uplink scheduling information for UL HARQ process via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.2.5F.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Configure UE to transmit NPUSCH with the Pumax level of each test points.
3. Measure the mean power of the UE in the channel bandwidth for each test point in table 6.2.5F.5-1 according to the test configuration from Table 6.2.5F.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame **(**1ms) for 15 KHz channel spacing, and at least a 2ms slot (excluding the 2304Ts gap when UE is not transmitting) respectively for the 3.75 KHz channel spacing.

### 6.2.5F.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 with the following exceptions:

**Table 6.2.5F.4.3-1: SystemInformationBlockType1: Test point 1 for power class 3**

| Derivation Path: TS 36.508 [7] clause 8.1.4, Table 8.1.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | -10 | | |

**Table 6.2.5F.4.3-2: SystemInformationBlockType1: Test point 2 for power class 3**

| Derivation Path: TS 36.508 [7] clause 8.1.4, Table 8.1.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 10 | | |

**Table 6.2.5F.4.3-3: SystemInformationBlockType1: Test point 3 for power class 3**

| Derivation Path: TS 36.508 [7] clause 8.1.4, Table 8.1.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 15 | | |

**Table 6.2.5F.4.3-4: SystemInformationBlockType1: Test point 1 for power class 5**

| Derivation Path: TS 36.508 [7] clause 8.1.4, Table 8.1.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | -10 | | |

**Table 6.2.5F.4.3-5: SystemInformationBlockType1: Test point 2 for power class 5**

| Derivation Path: TS 36.508 [7] clause 8.1.4, Table 8.1.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 7 | | |

**Table 6.2.5F.4.3-6: SystemInformationBlockType1: Test point 3 for power class 5**

| Derivation Path: TS 36.508 [7] clause 8.1.4, Table 8.1.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 12 | | |

## 6.2.5F.5 Test requirement

The maximum output power measured shall not exceed the values specified in Table 6.2.5F.5-1.

**Table 6.2.5F.5-1: $P_{CMAX}$ configured UE output power for power class 3**

| | **maximum output power** |
|---|---|
| Measured UE output power test point 1 | For carrier frequency f ≤ 3.0GHz: -10 dBm ± 7.7 |
| Measured UE output power test point 2 | For carrier frequency f ≤ 3.0GHz: 10 dBm ± 6.7 |
| Measured UE output power test point 3 | For carrier frequency f ≤ 3.0GHz: 15 dBm ± 5.7 |

**Table 6.2.5F.5-2: $P_{CMAX}$ configured UE output power for power class 5**

| | **maximum output power** |
|---|---|
| Measured UE output power test point 1 | For carrier frequency f ≤ 3.0GHz: -10 dBm ± 7.7 |
| Measured UE output power test point 2 | For carrier frequency f ≤ 3.0GHz: 7 dBm ± 6.7 |
| Measured UE output power test point 3 | For carrier frequency f ≤ 3.0GHz: 12 dBm ± 5.7 |

# 6.2.5FA Configured UE transmitted Output Power for UE category NB1 and NB2/Power Class 6

## 6.2.5FA.1 Test purpose

Same test purpose as in clause 6.2.5F.1.

## 6.2.5FA.2 Test applicability

This test case applies to all types of UE release 14 and forward of UE category NB1 and NB2.

## 6.2.5FA.3 Minimum conformance requirements

For each slot *i* the NB IoT UE is allowed to set its configured maximum output power $P_{CMAX,c}$. The configured maximum output power $P_{CMAX,c}$ is set within the following bounds:

$$P_{CMAX_L,c} \leq \quad P_{CMAX,c} \quad \leq \quad P_{CMAX_H,c}$$

Where

- $P_{CMAX_L,c}$ = MIN { $P_{EMAX,c}$ , $P_{PowerClass} - MPR_c - A\text{-}MPR_c$}
- $P_{CMAX_H,c}$ = MIN { $P_{EMAX,c}$, $P_{PowerClass}$}
- $P_{EMAX,c}$ is the value given to IE *P-Max,* defined in [7]
- $P_{PowerClass}$ is the maximum category NB1 and NB2 UE power specified in Table 6.2.2FA.3-1 without taking into account the associated tolerance
- $MPR_c$ is specified in subclause 6.2.3FA
- $A\text{-}MPR_c$ = 0dB unless otherwise stated.

The measurement period for $P_{UMAX,c}$ is at least one sub-frame **(**1ms) for 15 KHz channel spacing, and at least a 2ms slot (excluding the 2304Ts gap when UE is not transmitting) respectively for the 3.75 KHz channel spacing. The measured maximum output power $P_{UMAX,c}$ shall be within the following bounds:

$$P_{CMAX_L,c} - \quad T(P_{CMAX_L,c}) \quad \leq \quad P_{UMAX,c} \quad \leq \quad P_{CMAX_H,c} \quad + \quad T(P_{CMAX_H,c})$$

Where $T(P_{CMAX})$ is defined by the tolerance table below and applies to $P_{CMAX_L,c}$ and $P_{CMAX_H,c}$ separately.

**Table 6.2.5FA.3-1: $P_{CMAX}$ tolerance for power class 6**

| $P_{CMAX,c}$ (dBm) | Tolerance $T(P_{CMAX,c})$ (dB) |
|---|---|
| $13 \leq P_{CMAX,c} \leq 14$ | 2.5 |
| $12 \leq P_{CMAX,c} < 13$ | 3.5 |
| $11 \leq P_{CMAX,c} < 12$ | 4.0 |
| $8 \leq P_{CMAX,c} < 11$ | 5.0 |
| $5 \leq P_{CMAX,c} < 8$ | 6.0 |
| $-40 \leq P_{CMAX,c} < 5$ | 7.0 |

The normative reference for this requirement is TS 36.101 [2] clause 6.2.5F.

## 6.2.5FA.4 Test description

### 6.2.5FA.4.1 Initial conditions

Same initial conditions as in clause 6.2.5F.4.1.

### 6.2.5FA.4.2 Test procedure

Same test procedure as in clause 6.2.5F.4.2.

### 6.2.5FA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 with the following exceptions:

**Table 6.2.5FA.4.3-1: SystemInformationBlockType1: Test point 1 for power class 6**

| Derivation Path: TS 36.508 [7] clause 8.1.4, Table 8.1.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | -10 | | |

**Table 6.2.5FA.4.3-2: SystemInformationBlockType1: Test point 2 for power class 6**

| Derivation Path: TS 36.508 [7] clause 8.1.4, Table 8.1.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 6 | | |

**Table 6.2.5FA.4.3-3: SystemInformationBlockType1: Test point 3 for power class 6**

| Derivation Path: TS 36.508 [7] clause 8.1.4, Table 8.1.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 9 | | |

### 6.2.5FA.5 Test requirement

**The maximum output power measured shall not exceed the values specified in Table 6.2.5FA.5-1.Table 6.2.5FA.5-1: $P_{CMAX}$ configured UE output power for power class 6**

| | **maximum output power** |
|---|---|
| Measured UE output power test point 1 | For carrier frequency f ≤ 3.0GHz: -10 dBm ± 7.7 |
| Measured UE output power test point 2 | For carrier frequency f ≤ 3.0GHz: 6 dBm ± 6.7 |
| Measured UE output power test point 3 | For carrier frequency f ≤ 3.0GHz: 9 dBm ± 5.7 |

## 6.2.5G Configured UE transmitted Output Power for V2X Communication

### 6.2.5G.1 Configured UE transmitted Output Power for V2X Communication / Non-concurrent with E-UTRA uplink transmission

#### 6.2.5G.1.1 Test purpose

To verify the UE does not exceed the minimum between the $P_{EMAX}$ maximum allowed UL TX Power signalled by the E-UTRAN and the $P_{UMAX}$ maximum UE power the UE power class.

#### 6.2.5G.1.2 Test applicability

This test applies to all types of UE that support V2X Sidelink Communication and Band 47.

### 6.2.5G.1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.2G-1, the V2X UE is allowed to set its configured maximum output power $P_{CMAX,c}$ for component carrier *c*. The configured maximum output power $P_{CMAX,c}$ is set within the following bounds:

$$P_{CMAX_L,c} \leq P_{CMAX,c} \leq P_{CMAX_H,c} \text{ with}$$

$P_{CMAX_L,c}$ = MIN {$P_{EMAX,c} - \Delta T_{C,c}$, $P_{PowerClass}$ — MAX($MPR_c$ + A-$MPR_c$ + $\Delta T_{IB,c}$ + $\Delta T_{C,c}$ + $\Delta T_{ProSe}$, P-$MPR_c$), $P_{Regulatory,c}$ }

$P_{CMAX_H,c}$ = MIN {$P_{EMAX,c}$, $P_{PowerClass}$, $P_{Regulatory,c}$ }

where

- For the total transmitted power $P_{CMAX,c}$ of PSSCH and PSCCH, $P_{EMAX,c}$ is the value given by IE *maxTxPower*, defined by [5], when the UE is not associated with a serving cell on the V2X carrier.
- For $P_{CMAX,PSBCH}$, $P_{EMAX,c}$ is the value given by the IE *maxTxPower* in [5] when the UE is not associated with a serving cell on the V2X carrier.
- For $P_{CMAX,SSSS}$, the value is as calculated for $P_{CMAX,PSBCH}$ and applying the MPR for SSSS as specified in Section 6.2.3D.
- $P_{PowerClass}$ is the maximum UE power specified in Table 6.2.2.3-1 without taking into account the tolerance specified in the Table 6.2.2.3-1;
- $MPR_c$ and A-$MPR_c$ for serving cell *c* are specified in subclause 6.2.3G and subclause 6.2.4G, respectively;
- $\Delta T_{IB,c}$, $\Delta T_{C,c}$, $\Delta T_{ProSe}$ and P-$MPR_c$ are specified in subclause 6.2.5
- $P_{Regulatory,c}$ = 10 dBm when the V2X UE is within the protected zone [13] of CEN DSRC tolling system and operating in Band 47; $P_{Regulatory,c}$ = 33 dBm otherwise.

The maximum output power $P_{CMAX,PSSCH}$ and $P_{CMAX,PSCCH}$ are derived from $P_{CMAX,c}$ based on the PSD offset following subclause 14.1.1.5 in [10]. For all cases, the PSD difference between PSCCH and PSSCH shall be the same as the PSD offset value.

For the measured configured maximum output power $P_{UMAX,c}$ for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions, the same requirement as in subclause 6.2.5 shall be applied.

The normative reference for this requirement is TS 36.101 [2] clause 6.2.5G.

### 6.2.5G.1.4 Test description

#### 6.2.5G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.5G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.2.5G.1.4.1-1: Test Configuration Table**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 96 |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 6.8.2. Message content exceptions are defined in clause 6.2.5G.1.4.3.
3. The V2X Reference Measurement channel is set according to Table 6.2.5G.1.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.2.5G.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Measure the mean power of the UE in the channel bandwidth for each test point in table 6.2.5G.1.5-1 according to the test configuration from Table 6.2.5G.1.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

### 6.2.5G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.2.5G.1.4.3-1: SL-V2X-PreconfigFreqInfo-r14-DEFAULT: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20E SL-V2X-PreconfigFreqInfo-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | | |
| maxTxPower-r12 | -10 | | |
| } | | | |

**Table 6.2.5G.1.4.3-2: SL-V2X-PreconfigFreqInfo-r14-DEFAULT: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20E SL-V2X-PreconfigFreqInfo-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | | |
| maxTxPower-r12 | 10 | | |
| } | | | |

**Table 6.2.5G.1.4.3-3: SL-V2X-PreconfigFreqInfo-r14-DEFAULT: Test point 3**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20E SL-V2X-PreconfigFreqInfo-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | | |
| maxTxPower-r12 | 15 | | |
| } | | | |

### 6.2.5G.1.5 Test requirements

The maximum output power measured shall not exceed the values specified in Table 6.2.5G.1.5-1.

**Table 6.2.5G.1.5-1: $P_{CMAX}$ configured UE output power**

| | **maximum output power** |
|---|---|
| Measured UE output power test point 1 | For carrier frequency 4.2GHz < f ≤ 6.0GHz: -10 dBm ± 8.5 |
| Measured UE output power test point 2 | For carrier frequency 4.2GHz < f ≤ 6.0GHz: 10 dBm ± 7.3 |
| Measured UE output power test point 3 | For carrier frequency -4.2GHz < f ≤ 6.0GHz: 15 dBm ± 6.3 |

## 6.2.5G.2 Configured UE transmitted Output Power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission

### 6.2.5G.2.1 Test purpose

To verify the UE does not exceed the minimum between the $P_{EMAX}$ maximum allowed UL TX Power signalled by the E-UTRAN and the $P_{UMAX}$ maximum UE power the UE power class.

### 6.2.5G.2.2 Test applicability

This test applies to all types of E-UTRA UE release 14 and forward that support V2X Communication.

### 6.2.5G.2.3 Minimum conformance requirements

When a UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-2, the UE is allowed to set its configured maximum output power $P_{CMAX,c,E\text{-}UTRA}$ and $P_{CMAX,c,V2X}$ for the configured E-UTRA uplink carrier and the configured E-UTRA V2X carrier, respectively, and its total configured maximum output power $P_{CMAX,c}$. The $\Delta T_{IB,c}$ of $P_{CMAX,c,E\text{-}UTRA}$ is specified in Table 6.2.5G.2.3-2.

The configured maximum output power $P_{CMAX\ c,E\text{-}UTRA}(p)$ in subframe $p$ for the configured E-UTRA uplink carrier shall be set within the bounds:

$$P_{CMAX_L,c,E\text{-}UTRA}(p) \le P_{CMAX,c,E\text{-}UTRA}(p) \le P_{CMAX_H,c,E\text{-}UTRA}(p)$$

where $P_{CMAX_L,c,E\text{-}UTRA}$ and $P_{CMAX_H,c,E\text{-}UTRA}$ are the limits for a serving cell c as specified in subclause 6.2.5.

The configured maximum output power $P_{CMAX\ c,V2X}(q)$ in subframe $q$ for the configured E-UTRA V2X carrier shall be set within the bounds:

$$P_{CMAX,c,V2X}(q) \le \quad P_{CMAX_H,c,V2X}(q)$$

where $P_{CMAX_H,c,V2X}$ is the limit as specified in subclause 6.2.5G.

The total UE configured maximum output power $P_{CMAX}(p,q)$ in a subframe $p$ of an E-UTRA uplink carrier and a subframe $q$ of an E-UTRA V2X sidelink that overlap in time shall be set within the following bounds for synchronous and asynchronous operation unless stated otherwise:

$$P_{CMAX_L}(p,q) \le P_{CMAX}(p,q) \le P_{CMAX_H}(p,q)$$

with

$$P_{CMAX_L}(p,q) = P_{CMAX_L,c,E\text{-}UTRA}(p)$$

$$P_{CMAX_H}(p,q) = \text{MIN}\ \{10 \log_{10} [p_{CMAX_H,c,E\text{-}UTRA}(p) + p_{CMAX_H,c,V2X}(q)],\ P_{PowerClass}\}$$

where $p_{CMAX_H,c,V2X}$ and $p_{CMAX_H,c,E\text{-}UTRA}$ are the limits $P_{CMAX_H,c,V2X}(q)$ and $P_{CMAX_H,c,E\text{-}UTRA}(p)$ expressed in linear scale.

The measured total maximum output power $P_{UMAX}$ over both the E-UTRA uplink and E-UTRA V2X carriers is

$$P_{UMAX} = 10 \log_{10} [p_{UMAX,c,E\text{-}UTRA} + p_{UMAX,c,V2X}],$$

where $p_{UMAX,c,E\text{-}UTRA}$ denotes the measured output power of serving cell *c* for the configured E-UTRA uplink carrier, and $p_{UMAX,c,V2X}$ denotes the measured output power for the configured E-UTRA V2X carrier expressed in linear scale.

When a UE is configured for synchronous V2X sidelink and uplink transmissions,

$$P_{CMAX_L}(p, q) - T_{LOW}(P_{CMAX_L}(p, q)) \leq P_{UMAX} \leq P_{CMAX_H}(p, q) + T_{HIGH}(P_{CMAX_H}(p, q))$$

where $P_{CMAX_L}(p,q)$ and $P_{CMAX_H}(p,q)$ are the limits for the pair $(p,q)$ and with the tolerances $T_{LOW}(P_{CMAX})$ and $T_{HIGH}(P_{CMAX})$ for applicable values of $P_{CMAX}$ specified in Table 6.2.5G.2.3-1. $P_{CMAX_L}$ may be modified for any overlapping portion of subframes *(p, q)* and *(p +1, q+1).*

When a UE is configured for asynchronous V2X and uplink transmissions, the subframe *p* for the E-UTRA uplink carrier and subframe *q* for the E-UTRA V2X carrier overlap in time and

1. if uplink carrier leads in time over q and V2X UE sidelink transmission has SCI whose “Priority” field is set to a value less than the high layer parameter thresSL-TxPrioritization, then p is the reference subframe and the (p,q) and (p,q-1) pairs are considered for determining the PCMAX tolerance
2. if uplink carrier leads in time over q and V2X UE sidelink transmission has SCI whose “Priority” field is set to a value larger than the high layer parameter thresSL-TxPrioritization, then q is the reference subframe and the (p,q) and (p+1,q) pairs are considered for determining the PCMAX tolerance
3. if V2X carrier leads in time over p and V2X UE sidelink transmission has SCI whose “Priority” field is set to a value less than the high layer parameter thresSL-TxPrioritization, then p is the reference subframe and the (p,q) and (p,q+1) pairs are considered for determining the PCMAX tolerance
4. if V2X carrier leads in time over p and V2X UE sidelink transmission has SCI whose “Priority” field is set to a value larger than the high layer parameter thresSL-TxPrioritization,, then q is the reference subframe and the (p-1,q) and (p,q) pairs are considered for determining the PCMAX tolerance

For the reference subframe *p* duration when uplink carrier leads:

$$P'_{CMAX_L} = P_{CMAX_L,,cE\text{-}UTRA}(p)$$

$$P'_{CMAX_H} = \text{MAX}\ \{P_{CMAX_H}(p,q\text{-}1)\ ,\ P_{CMAX_H}\ (p,q)\}$$

For the reference subframe *p* duration when V2X carrier leads:

$$P'_{CMAX_L} = P_{CMAX_L,c,E\text{-}UTRA}(p)$$

$$P'_{CMAX_H} = \text{MAX}\ \{P_{CMAX_H}(p,q)\ ,\ P_{CMAX_H}(p,q+1)\}$$

For the reference subframe *q* duration when uplink carrier leads:

$$P'_{CMAX_L} = P_{CMAX_L,c,V2X}(q)$$

$$P'_{CMAX_H} = \text{MAX}\ \{P_{CMAX_H}(p,q)\ ,\ P_{CMAX_H}(p+1,q)\}$$

For the reference subframe *q* duration when V2X carrier leads:

$$P'_{CMAX_L} = P_{CMAX_L,cE\text{-}UTRA}(p)$$

$$P'_{CMAX_H} = \text{MAX}\ \{P_{CMAX_H}\ (p\text{-}1,q)\ ,\ P_{CMAX_H}\ (p,q)\}$$

where $P_{CMAX_L,,cE\text{-}UTRA}(p)$ and $P_{CMAX_H}$ are the applicable limits for each overlapping subframe pairs above 4case with *(p,q)*, (*p, q-1*) or *(p,q), (p, q+1)* or *(p,q), (p+1,q)* or *(p,q),* (*p-1, q*). The measured total configured maximum output power $P_{UMAX}$ shall be within the following bounds:

$$P'_{CMAX_L} - T_{LOW}(P'_{CMAX_L}) \leq P_{UMAX} \leq P'_{CMAX_H} + T_{HIGH}(P'_{CMAX_H})$$

with the tolerances $T_{LOW}(P_{CMAX})$ and $T_{HIGH}(P_{CMAX})$ for applicable values of $P_{CMAX}$ specified in Table 6.2.5G.2.3-1.

**Table 6.2.5G.2.3-1: $P_{CMAX}$ tolerance**

| $P_{CMAX}$(dBm) | Tolerance $T_{LOW}(P_{CMAX_L})$(dB) | Tolerance $T_{HIGH}(P_{CMAX_H})$(dB) |
|---|---|---|
| $P_{CMAX}$ = 23 | 3.0 | 2.0 |
| 22 ≤$P_{CMAX,}$< 23 | 5.0 | 2.0 |
| 21 ≤ $P_{CMAX}$< 22 | 5.0 | 3.0 |
| 20 ≤ $P_{CMAX,}$ < 21 | 6.0 | 4.0 |
| 16 ≤ $P_{CMAX}$ < 20 | 5.0 | |
| 11 ≤ $P_{CMAX,}$ < 16 | 6.0 | |
| -40 ≤ $P_{CMAX}$ < 11 | 7.0 | |

**Table 6.2.5G.2.3-2: $\Delta T_{IB,c}$ for inter-band con-current V2X operation (two bands)**

| V2X con-current band Configuration | E-UTRA or V2X Operating Band | $\Delta T_{IB,c}$ [dB] |
|---|---|---|
| V2X_3A-47A | 3 | 0.0 |
| V2X_5A-47A | 5 | 0.2 |
| V2X_7A-47A | 7 | 0.0 |
| V2X_8A-47A | 8 | 0.0 |
| V2X_20A-47A | 20 | 0.2 |
| V2X_34A-47A | 34 | 0.0 |
| V2X_39A-47A | 39 | 0.0 |
| V2X_41A-47A | 41 | 0.0 |

The normative reference for this requirement is TS 36.101 [2] clause 6.2.5G.

## 6.2.5G.2.4 Test description

### 6.2.5G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.5G.2.4.1-1. The details of the uplink and V2X reference measurement channels (RMCs) are specified in Annexes A.2 and A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.5G.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Mid range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest $N_{RB_agg}$,Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink** | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | N/A for Configured UE transmitted Output Power test case | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | | QPSK | 5 | 10 MHz | QPSK | 48@2 |
| 3 MHz | | QPSK | 4 | 20 MHz | QPSK | 96@2 |
| 5 MHz | | QPSK | 8 | | | |
| 10 MHz | | QPSK | 12 | | | |
| 15 MHz | | QPSK | 16 | | | |
| 20 MHz | | QPSK | 18 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | |
| Note 2: For the uplink RB allocation on the E-UTRA carrier the $RB_{start}$ shall be RB #0. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.2.5G.2.4.3
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to Table 6.2.5G.2.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 6.2.5G.2.4.3.

### 6.2.5G.2.4.2 Test procedure

1. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.2.5G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX}$ level. Configure the UE to transmit PSCCH and PSSCH with the $P_{UMAX}$ level of each test points. Allow at least 200ms for the UE to reach the $P_{UMAX}$ level of the test point.
3. Measure the mean power over all component carriers in the V2X con-current band configuration. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

### 6.2.5G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.2.5G.2.4.3-1: SystemInformationBlockType1: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | -10 | | |

**Table 6.2.5G.2.4.3-2: SL-InterFreqInfoV2X-r14-DEFAULT: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20E SL-InterFreqInfoV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-InterFreqInfoV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-MaxTxPower-r14 | -10 | INTEGER (-30..33) | |
| } | | | |

**Table 6.2.5G.2.4.3-3: SystemInformationBlockType1: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 10 | | |

**Table 6.2.5G.2.4.3-4: SL-InterFreqInfoV2X-r14-DEFAULT: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20E SL-InterFreqInfoV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-InterFreqInfoV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-MaxTxPower-r14 | 10 | INTEGER (-30..33) | |
| } | | | |

**Table 6.2.5G.2.4.3-5: SystemInformationBlockType1: Test point 3**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 15 | | |

**Table 6.2.5G.2.4.3-6: SL-InterFreqInfoV2X-r14-DEFAULT: Test point 3**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20E SL-InterFreqInfoV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-InterFreqInfoV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-MaxTxPower-r14 | 15 | INTEGER (-30..33) | |
| } | | | |

### 6.2.5G.2.5 Test requirements

The maximum output power measured shall not exceed the values specified in Table 6.2.5G.2.5-1.

**Table 6.2.5G.2.5-1: $P_{CMAX}$ configured UE output power**

| | **maximum output power** |
|---|---|
| Measured UE output power test point 1 | -7 dBm ± 8.5 |
| Measured UE output power test point 2 | 13 dBm ± 7.3 |
| Measured UE output power test point 3 | 18 dBm ± 6.3 |

## 6.2.5G.3 Configured UE transmitted Output Power for V2X Communication / Intra-band contiguous multi-carrier operation

Editor's note: This test case is incomplete. The following items are missing or incomplete:

- Test requirement including the test tolerance in Annex F.3.2

- Applicability spec

### 6.2.5G.3.1 Test purpose

To verify the UE does not exceed the minimum between the $P_{EMAX}$ maximum allowed UL TX Power signalled by the E-UTRAN and the $P_{UMAX}$ maximum UE power the UE power class.

### 6.2.5G.3.2 Test applicability

This test applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 6.2.5G.3.3 Minimum conformance requirements

For intra-band contiguous multi-carrier operation, $MPR_c$ = MPR and $A\text{-}MPR_c$ = A-MPR with MPR and A-MPR specified in subclause 6.2.3G and subclause 6.2.4G respectively. There is one power management term for the UE, denoted P-MPR, and $P\text{-}MPR_c$ = P-MPR. $P_{CMAX,c}$ is calculated under the assumption that the transmit power is increased by the same amount in dB on all component carriers.

The total configured maximum output power $P_{CMAX}$ shall be set within the following bounds:

$$P_{CMAX_L} \le P_{CMAX} \le P_{CMAX_H}$$

$P_{CMAX_L}$ = MIN{10 $\log_{10} \sum p_{EMAX,c}$ - $\Delta T_C$ , $P_{PowerClass}$ – MAX(MPR + A-MPR + $\Delta T_{IB,c}$ + $\Delta T_C$ + $\Delta T_{ProSe}$, P-MPR ), $P_{Regulatory}$ }

$$P_{CMAX_H} = \text{MIN}\{10 \log_{10} \sum p_{EMAX,c} , P_{PowerClass}, P_{Regulatory} \}$$

where

- $p_{EMAX,c}$ is the linear value of $P_{EMAX,c}$ which is given by IE *maxTxPower* in [5];
- $P_{PowerClass}$ is the maximum UE power specified in Table 6.2.2G.2.3-1 without taking into account the tolerance specified in the Table 6.2.2G.2.3-1;
- MPR and A-MPR are specified in subclause 6.2.3G and subclause 6.2.4G respectively;
- $\Delta T_{IB,c}$ is the additional tolerance for serving cell *c* as specified in Table 6.2.5.3-2;
- P-MPR is the power management term for the UE;
- $\Delta T_C$ is the highest value $\Delta T_{C,c}$ among all serving cells *c* in the subframe over both timeslots. $\Delta T_{C,c}$ = 1.5 dB when NOTE 2 in Table 6.2.2.3-1 applies, otherwise $\Delta T_{C,c}$ = 0 dB;
- $\Delta T_{ProSe}$ applies as specified in subclause 6.2.5.
- $P_{Regulatory}$ = 10 dBm when V2X UE is within the protected zone [23] of CEN DSRC tolling system and operating in Band 47; $P_{Regulatory}$ = 33 dBm otherwise.

The normative reference for this requirement is TS 36.101 [2] clause 6.2.5G.

### 6.2.5G.3.4 Test description

#### 6.2.5G.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-4. All of these configurations shall be tested with applicable test

parameters for each channel bandwidth, and are shown in table 6.2.5G.3.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.2.5G.3.4.1-1: Test Configuration Table**

| Initial Conditions | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Mid range | |
| Test Channel Bandwidths as specified in subclause 5.4.2G | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for Channel Bandwidths** | | | |
| **V2X multi-carrier Configuration** | | **V2X PSSCH Allocation** | |
| **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **CC1 and CC2 RB Allocation** |
| 10MHz | 10MHz | QPSK | 48+48 |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.89a.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.2.5G.3.4.3.
3. The V2X reference measurement channel is set according to Table 6.2.5G.3.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.2.5G.3.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Measure the mean power of the UE in the channel bandwidth for each test point in Table 6.2.5G.3.5-1 according to the test configuration from Table 6.2.5G.3.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

### 6.2.5G.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.2.5G.3.4.3-0: +CCUTLE (Initial condition)**

| Derivation Path: 36.508 Table 4.7I-2: +CCUTLE, condition Close and Transmit |
|---|

**Table 6.2.5G.3.4.3-1: SL-PSSCH-TxConfig-r14-DEFAULT: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20F SL-PSSCH-TxConfig-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| maxTxPower-r14 | -10 | | |

**Table 6.2.5G.3.4.3-2: SL-PSSCH-TxConfig-r14-DEFAULT: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20F SL-PSSCH-TxConfig-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| maxTxPower-r14 | 10 | | |

**Table 6.2.5G.3.4.3-3: SL-PSSCH-TxConfig-r14-DEFAULT: Test point 3**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20F SL-PSSCH-TxConfig-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| maxTxPower-r14 | 15 | | |

### 6.2.5G.3.5 Test requirement

The maximum output power measured shall not exceed the values specified in Table 6.2.5G.3.5-1.

**Table 6.2.5G.3.5-1: $P_{CMAX}$ configured UE output power**

| | **maximum output power** |
|---|---|
| Measured UE output power test point 1 | For carrier frequency 4.2GHz < f ≤ 6.0GHz: -10 dBm ± TT |
| Measured UE output power test point 2 | For carrier frequency 4.2GHz < f ≤ 6.0GHz: 10 dBm ± TT |
| Measured UE output power test point 3 | For carrier frequency -4.2GHz < f ≤ 6.0GHz: 15 dBm ± TT |

# 6.3 Output Power Dynamics

## 6.3.1 Void

## 6.3.2 Minimum Output Power

### 6.3.2.1 Test purpose

To verify the UE's ability to transmit with a broadband output power below the value specified in the test requirement when the power is set to a minimum value.

### 6.3.2.2 Test applicability

This test applies to all types of E-UTRA UE release 8 and forward.

### 6.3.2.3 Minimum conformance requirements

The minimum output power is defined as the mean power in one sub-frame (1ms). The minimum output power shall not exceed the values specified in Table 6.3.2.3-1.

**Table 6.3.2.3-1: Minimum output power**

| | Channel bandwidth / minimum output power / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Minimum output power | -40 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.2.1.

Minimum output power test verifies the UE's ability to transmit with a broadband output power below the specified limit when the power is set to a minimum value. The broadband output power is defined as the power in the channel bandwidth, for all transmit bandwidth configurations (resource blocks).

An excess minimum output power potentially increases the Rise Over Thermal (RoT) and therefore reduces the cell coverage area for other UEs.

## 6.3.2.4 Test description

### 6.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for min output power test | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 50 | 50 |
| 15MHz | | QPSK | 75 | 75 |
| 20MHz | | QPSK | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channel is set according to Table 6.3.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.2.4.3.

#### 6.3.2.4.2 Test procedure

SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.2.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC

2. Send continuous uplink power control "down" commands in the uplink scheduling information to the UE to ensure that the UE transmits at its minimum output power.
3. Measure the mean power of the UE in the associated measurement bandwidth specified in Table 6.3.2.5-1 for the specific channel bandwidth under test. The period of measurement shall be the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.3.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.2.5 Test requirement

The minimum output power measured shall not exceed the values specified in Table 6.3.2.5-1.

**Table 6.3.2.5-1: Minimum output power**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | For carrier frequency f ≤ 3.0GHz: ≤ -39 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -38.7 dBm | | | | | |
| Measurement bandwidth (Note 1) | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Note 1: Different implementations such as FFT or spectrum analyzer approach are allowed. For spectrum analyzer approach the measurement bandwidth is defined as an equivalent noise bandwidth. | | | | | | |

## 6.3.2A Minimum Output Power for CA

### 6.3.2A.0 Minimum conformance requirements

For intra-band contiguous carrier aggregation, the minimum controlled output power of the UE is defined as the transmit power of the UE per component carrier, i.e., the power in the channel bandwidth of each component carrier for all transmit bandwidth configurations (resource blocks), when the power on both component carriers are set to a minimum value.

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the minimum output power is defined per carrier and the requirement is specified in subclause 6.3.2A.2-1. If two contiguous component carriers are assigned to one E-UTRA band, the requirements in subclause 6.3.2A.2-2 apply for those component carriers.

**Table 6.3.2A.0-1: Minimum output power**

| | Channel bandwidth / Minimum output power / Measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Minimum output power | -40 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

**Table 6.3.2A.0-2: Minimum output power for intra-band contiguous and non-contiguous CA UE**

| | CC Channel bandwidth / Minimum output power / Measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Minimum output power | -40 dBm | | | | | |
| Measurement bandwidth | | | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.2A.

## 6.3.2A.1 Minimum Output Power for CA (intra-band contiguous DL CA and UL CA)

### 6.3.2A.1.1 Test purpose

To verify the UE's ability to transmit with a broadband output power below the value specified in the test requirement when the power on each component carrier is set to a minimum value.

### 6.3.2A.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 6.3.2A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.2A.0.

### 6.3.2A.1.4 Test description

#### 6.3.2A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.2A.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.2A.1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low and High range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | | |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | | |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 100 | 25 | | QPSK | 125 | P_100@0 | S_25@0 | - | - |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | | |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.2A.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.2A.1.4.3.

### 6.3.2A.1.4.2 Test procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.3.2A.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.2A.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "down" commands in every uplink scheduling information to the UE to ensure that the UE transmits at its minimum output power.

6. Measure the mean transmitted power of each component carrier in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.3.2A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.3.2A.1.5 Test requirements

For each component carrier, the minimum output power measured shall not exceed the values specified in Table 6.3.2A.1.5-1.

**Table 6.3.2A.1.5-1: Minimum output power for intra-band contiguous CA UE**

| | **CC Channel bandwidth / Minimum output power / Measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | For carrier frequency f ≤ 3.0GHz: ≤ -39 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -38.7 dBm | | | | | |
| Measurement bandwidth | | | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Note 1: Different implementations such as FFT or spectrum analyzer approach are allowed. For spectrum analyzer approach the measurement bandwidth is defined as an equivalent noise bandwidth. | | | | | | |

## 6.3.2A.2 Minimum Output Power for CA (inter-band DL CA and UL CA)

### 6.3.2A.2.1 Test purpose

To verify the UE's ability to transmit with a broadband output power below the value specified in the test requirement when the power on each component carrier is set to a minimum value.

### 6.3.2A.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA.

### 6.3.2A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.2A.0.

### 6.3.2A.2.4 Test description

#### 6.3.2A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.2A.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.2A.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | Low range for PCC and SCC<br>High range for PCC and SCC | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/Afor this test | QPSK | 31 | P_6@0 | S_25@0 | - | - |
| 6 | 50 | | QPSK | 56 | P_6@0 | S_50@0 | - | - |
| 15 | 25 | | QPSK | 12 | S_4@0 | P_8@0 | | |
| 25 | 6 | | QPSK | 13 | P_8@0 | P_5@0 | | |
| 25 | 15 | | QPSK | 40 | P_25@0 | S_15@0 | - | - |
| 25 | 25 | | QPSK | 50 | P_25@0 | S_25@0 | - | - |
| 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | - | - |
| 25 | 75 | | QPSK | 24 | P_8@0 | S_16@0 | | |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | - | - |
| 50 | 100 | | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 75 | 25 | | QPSK | 100 | P_75@0 | S_25@0 | | |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.2A.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.2A.2.4.3.

### 6.3.2A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.3.2A.2.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.2A.2.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "down" commands in every uplink scheduling information to the UE to ensure that the UE transmits at its minimum output power.

6. Measure the mean transmitted power of each component carrier in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.3.2A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.3.2A.2.5 Test requirements

For each component carrier, the minimum output power measured shall not exceed the values specified in Table 6.3.2A.2.5-1.

**Table 6.3.2A.2.5-1: Minimum output power for inter-band CA UE**

| | **CC Channel bandwidth / Minimum output power / Measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | For carrier frequency f ≤ 3.0GHz: ≤ -39 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -38.7 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Note 1: Different implementations such as FFT or spectrum analyzer approach are allowed. For spectrum analyzer approach the measurement bandwidth is defined as an equivalent noise bandwidth. | | | | | | |

## 6.3.2A.3 Minimum Output Power for CA (intra-band non-contiguous DL CA and UL CA)

### 6.3.2A.3.1 Test purpose

To verify the UE's ability to transmit with a broadband output power below the value specified in the test requirement when the power on each component carrier is set to a minimum value.

### 6.3.2A.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

### 6.3.2A.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.2A.0.

### 6.3.2A.3.4 Test description

#### 6.3.2A.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.2A.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.2A.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Maximum Wgap |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC<br>(Note 2) |

| **Test Parameters for CA Configurations** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | QPSK | P_25@0 | QPSK | S_25@0 |
| 2 | 100 | 100 | 5 | N/A | N/A | QPSK | P_100@0 | QPSK | S_100@0 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.
Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.2A.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.2A.3.4.3.

#### 6.3.2A.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.3.2A.3.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.2A.3.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "down" commands in every uplink scheduling information to the UE to ensure that the UE transmits at its minimum output power.

6. Measure the mean transmitted power of each component carrier in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.3.2A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.3.2A.3.5 Test requirements

For each component carrier, the minimum output power measured shall not exceed the values specified in Table 6.3.2A.3.5-1.

**Table 6.3.2A.3.5-1: Minimum output power for intra-band non-contiguous CA UE**

| | **CC Channel bandwidth / Minimum output power / Measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | For carrier frequency f ≤ 3.0GHz: ≤ -39 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -38.7 dBm | | | | | |
| Measurement bandwidth | | | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Note 1: Different implementations such as FFT or spectrum analyzer approach are allowed. For spectrum analyzer approach the measurement bandwidth is defined as an equivalent noise bandwidth. | | | | | | |

## 6.3.2A.4 Minimum Output Power for CA (3UL CA)

### 6.3.2A.4.1 Test purpose

To verify the UE's ability to transmit with a broadband output power below the value specified in the test requirement when the power on each component carrier is set to a minimum value.

### 6.3.2A.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band contiguous or inter-band or intra-band non-contiguous DL CA and UL CA.

### 6.3.2A.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.2A.0.

### 6.3.2A.4.4 Test description

#### 6.3.2A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.2A.4.4.1-1 & 6.3.2A.4.4.1-2. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.2A.4.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low and High range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC1 & SCC2 RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | | QPSK | 56 | P_6@0 | S_25@0 | S_25@0 | - |
| 6 | 50 | | QPSK | 106 | P_6@0 | S_50@0 | S_50@0 | - |
| 25 | 15 | | QPSK | 55 | P_25@0 | S_15@0 | S_15@0 | - |
| 25 | 25 | | QPSK | 75 | P_25@0 | S_25@0 | S_25@0 | - |
| 25 | 50 | | QPSK | 125 | P_25@0 | S_50@0 | S_50@0 | - |
| 50 | 50 | | QPSK | 150 | P_50@0 | S_50@0 | S_50@0 | - |
| 75 | 75 | | QPSK | 225 | P_75@0 | S_75@0 | S_75@0 | - |
| 100 | 25 | | QPSK | 150 | P_100@0 | S_25@0 | S_25@0 | - |
| 100 | 50 | | QPSK | 200 | P_100@0 | S_50@0 | S_50@0 | - |
| 100 | 75 | | QPSK | 250 | P_100@0 | S_75@0 | S_75@0 | |
| 100 | 100 | | QPSK | 300 | P_100@0 | S_100@0 | S_100@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , only the first of those is tested, according to the order on the Test Configuration Table list. | | | | | | | | |

**Table 6.3.2A.4.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Maximum Wgap |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC<br>(Note 2) |

| Test Parameters for CA Configurations | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ [MHz] | DL Allocation | | UL Allocation | | | | | |
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | | CC MOD | PCC & SCC RB allocation | CC MOD | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) |
| **Test Parameters for CA_XA-XA-XA Configurations** | | | | | | | | | | | |
| 1 | All RBs | All RBs | Max | N/A | N/A | QPSK | Full RBs | QPSK | Full RBs | QPSK | Full RBs |
| 2 | All RBs | All RBs | Max | N/A | N/A | QPSK | Full RBs | QPSK | Full RBs | QPSK | Full RBs |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.
Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.2A.4.4.1-1 & 6.3.2A.4.4.1-2.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.2A.4.4.3.

### 6.3.2A.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.3.2A.4.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.2A.4.4.1-1 & 6.3.2A.4.4.1-2 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "down" commands in every uplink scheduling information to the UE to ensure that the UE transmits at its minimum output power.

6. Measure the mean transmitted power of each component carrier in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

#### 6.3.2A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.3.2A.4.5 Test requirements

For each component carrier, the minimum output power measured shall not exceed the values specified in Table 6.3.2A.4.5-1 & 6.3.2A.4.5-2.

**Table 6.3.2A.4.5-1: Minimum output power for inter-band CA UE**

| | **CC Channel bandwidth / Minimum output power / Measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | For carrier frequency f ≤ 3.0GHz: ≤ -39 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -38.7 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Note 1: Different implementations such as FFT or spectrum analyzer approach are allowed. For spectrum analyzer approach the measurement bandwidth is defined as an equivalent noise bandwidth. | | | | | | |

**Table 6.3.2A.4.5-2: Minimum output power for intra-band contiguous and non-contiguous CA UE**

| | **CC Channel bandwidth / Minimum output power / Measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | For carrier frequency f ≤ 3.0GHz: ≤ -39 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -38.7 dBm | | | | | |
| Measurement bandwidth | | | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Note 1: Different implementations such as FFT or spectrum analyzer approach are allowed. For spectrum analyzer approach the measurement bandwidth is defined as an equivalent noise bandwidth. | | | | | | |

## 6.3.2B Minimum Output Power for UL-MIMO

### 6.3.2B.1 Test purpose

To verify the UE's ability to transmit with a UL-MIMO broadband output power below the value specified in the test requirement when the power is set to a minimum value.

### 6.3.2B.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO

## 6.3.2B.3 Minimum conformance requirements

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the minimum output power is defined as the sum of the mean power at each UE antenna connector in one sub-frame (1ms). The minimum output power shall not exceed the values specified in Table 6.3.2B.3-1.

**Table 6.3.2B.3-1: Minimum output power**

| | **Channel bandwidth / Minimum output power / Measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | -40 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.2B.1.

## 6.3.2B.4 Test description

### 6.3.2B.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.2B.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.2B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in **TS 36.508 [7] subclause 4.3.1** | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for min output power test | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 50 | 50 |
| 15MHz | | QPSK | 75 | 75 |
| 20MHz | | QPSK | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.2B.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.2B.4.3.

### 6.3.2B.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.3.2B.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuous uplink power control "down" commands in the uplink scheduling information to the UE to ensure that the UE transmits at its minimum output power.

3. Measure the sum of mean power of the UE at each UE antenna connector in the associated measurement bandwidth specified in Table 6.3.2B.5-1 for the specific channel bandwidth under test. The period of measurement shall be the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

### 6.3.2B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

## 6.3.2B.5 Test requirement

The minimum sum of mean output power of the UE at each antenna connector measured shall not exceed the values specified in Table 6.3.2B.5-1.

**Table 6.3.2B.5-1: Minimum output power**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | For carrier frequency f ≤ 3.0GHz: ≤ -39dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -38.7 dBm | | | | | |
| Measurement bandwidth (Note 1) | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Note 1: Different implementations such as FFT or spectrum analyzer approach are allowed. For spectrum analyzer approach the measurement bandwidth is defined as an equivalent noise bandwidth. | | | | | | |

# 6.3.2E Minimum Output Power for UE category 0

## 6.3.2E.1 Test purpose

Same test purpose as in clause 6.3.2.1.

## 6.3.2E.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

## 6.3.2E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.3.2.3.

## 6.3.2E.4 Test description

### 6.3.2E.4.1 Initial conditions

Same initial conditions as in clause 6.3.2.4.1 with following exceptions:

- Instead of Table 6.3.2.4.1-1 → use Table 6.3.2E.4.1-1.
- Connect SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.3.2E.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for min output power test | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 36 | 36 |
| 15MHz | | QPSK | 36 | 36 |
| 20MHz | | QPSK | 36 | 36 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

### 6.3.2E.4.2 Test procedure

Same test procedure as in clause 6.3.2.4.2 with the following exception for HD-FDD:

- In step 3, slots with transient periods are not under test. Half-duplex guard subframes are not under test.

### 6.3.2E.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.3.2E.5 Test requirement

The minimum output power measured shall not exceed the values specified in Table 6.3.2E.5-1.

**Table 6.3.2E.5-1: Minimum output power**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | For carrier frequency f ≤ 3.0GHz: ≤ -39 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -38.7 dBm | | | | | |
| Measurement bandwidth (Note 1) | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Note 1: Different implementations such as FFT or spectrum analyzer approach are allowed. For spectrum analyzer approach the measurement bandwidth is defined as an equivalent noise bandwidth. | | | | | | |

# 6.3.2EA Minimum Output Power for UE category M1

## 6.3.2EA.1 Test purpose

To verify the UE's ability to transmit with a broadband output power below the value specified in the test requirement when the power is set to a minimum value.

## 6.3.2EA.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

## 6.3.2EA.3 Minimum conformance requirements

The minimum output power is defined as the mean power in one sub-frame (1ms). The minimum output power shall not exceed the values specified in Table 6.3.2EA.3-1.

**Table 6.3.2EA.3-1: Minimum output power**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | -40 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.2.1.

Minimum output power test verifies the UE's ability to transmit with a broadband output power below the specified limit when the power is set to a minimum value. The broadband output power is defined as the power in the channel bandwidth, for all transmit bandwidth configurations (resource blocks).

An excess minimum output power potentially increases the Rise Over Thermal (RoT) and therefore reduces the cell coverage area for other UEs.

## 6.3.2EA.4 Test description

### 6.3.2EA.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.2EA.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.3.2EA.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for min output power test | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index (Note 1) |
| 5MHz | | QPSK | 6 | 6 | 0 |
| Note 1: Denote where in the channel bandwidth the narrowband shall be placed. Narrowband and narrowband index are defined in TS 36.211, 5.2.4. | | | | | |
| Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.2EA.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.3.2EA.4.3.

### 6.3.2EA.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.3.2EA.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Send continuous uplink power control "down" commands in the uplink scheduling information to the UE to ensure that the UE transmits at its minimum output power.
3. Measure the mean power of the UE in the associated measurement bandwidth specified in Table 6.3.2EA.5-1 for the specific channel bandwidth under test. The period of measurement shall be the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods and Half-duplex guard subframe are not under test.

### 6.3.2EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.3.2EA.5 Test requirements

The minimum output power measured shall not exceed the values specified in Table 6.3.2EA.5-1.

**Table 6.3.2EA.5-1: Minimum output power for UE category M1**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| Minimum output power | For carrier frequency f ≤ 3.0GHz: ≤ -39 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -38.7 dBm | | | | | |
|---|---|---|---|---|---|---|
| Measurement bandwidth (Note 1) | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Note 1: Different implementations such as FFT or spectrum analyzer approach are allowed. For spectrum analyzer approach the measurement bandwidth is defined as an equivalent noise bandwidth. | | | | | | |

## 6.3.2EB Minimum Output Power for UE category 1bis

### 6.3.2EB.1 Test purpose

Same test purpose as in clause 6.3.2.1.

### 6.3.2EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of category 1bis.

### 6.3.2EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.3.2.3.

### 6.3.2EB.4 Test description

#### 6.3.2EB.4.1 Initial conditions

Same initial conditions as in clause 6.3.2.4.1 with following exceptions:

- Connect SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.3.2EB.4.2 Test procedure

Same test procedure as in clause 6.3.2.4.2.

#### 6.3.2EB.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.2EB.5 Test requirement

The minimum output power measured shall not exceed the values specified in Table 6.3.2EB.5-1.

**Table 6.3.2EB.5-1: Minimum output power**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | For carrier frequency f ≤ 3.0GHz: ≤ -39 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -38.7 dBm | | | | | |
| Measurement bandwidth (Note 1) | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Note 1: Different implementations such as FFT or spectrum analyzer approach are allowed. For spectrum analyzer approach the measurement bandwidth is defined as an equivalent noise bandwidth. | | | | | | |

# 6.3.2EC Minimum Output Power for UE category M2

## 6.3.2EC.1 Test purpose

Same as in clause 6.3.2EA.1.

## 6.3.2EC.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward of UE category M2.

## 6.3.2EC.3 Minimum conformance requirements

Same as in clause 6.3.2EA.3.

## 6.3.2EC.4 Test description

### 6.3.2EC.4.1 Initial condition

Same as in clause 6.3.2EA.4.1 with the following exceptions:

- Instead of Table 6.3.2EA.4.1-1 -> use Table 6.3.2EC.4.1-1

**Table 6.3.2EC.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for min output power test | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index (Note 1) |
| 5MHz | | QPSK | 24 | 24 | 0 |
| Note 1: Denotes where in the channel bandwidth the wideband shall be placed. Narrowband index and Wideband are defined in TS 36.211, 5.2.4.<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |

### 6.3.2EC.4.2 Test procedure

Same as in clause 6.3.2EA.4.2 with the following exceptions:

- Instead of Table 6.3.2EA.4.1-1 -> use Table 6.3.2EC.4.1-1

### 6.3.2EC.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.3.2EC.5 Test requirements

Same as in clause 6.3.2EA.5.

# 6.3.2F Minimum Output Power for category NB1 and NB2

## 6.3.2F.1 Test purpose

To verify the UE's ability to transmit with a broadband output power below the value specified in the test requirement when the power is set to a minimum value.

## 6.3.2F.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

## 6.3.2F.3 Minimum conformance requirements

For category NB1 and NB2 UE the single-tone and multi-tone transmission minimum output power requirement for the channel bandwidth is -40 dBm. For 3.75kHz sub-carrier spacing the minimum output power is defined as mean power in one slot (2ms) excluding the 2304Ts gap when UE is not transmitting. For 15kHz sub-carrier spacing the minimum output power is defined as mean power in one sub-frame (1ms).

The normative reference for this requirement is TS 36.101 [2] clause 6.3.2F.

## 6.3.2F.4 Test description

### 6.3.2F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters, and are shown in table 6.3.2F.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 6.3.2F.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 8.1.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.1 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A | Modulation | $N_{tones}$ | Sub-carrier spacing (kHz) |
| 1 (Note 2) | | BPSK | 1@0 | 3.75 |
| 2 (Note 3) | | BPSK | 1@47 | 3.75 |
| 3 (Note 2) | | QPSK | 1@0 | 15 |
| 4 (Note 3) | | QPSK | 1@11 | 15 |
| 5 (Note 1) | | QPSK | 12@0 | 15 |
| Note 1: Applicable to UE supporting UL multi-tone transmissions<br>Note 2: only applicable for low range<br>Note 3: only applicable for high range | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only the main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1.1 and H.4.0.
4. The UL Reference Measurement channel is set according to Table 6.3.2F.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.3.2F.4.3.

### 6.3.2F.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via NPDCCH with DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.3.2F.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1ms) for sub-carrier spacing of 15 kHz or one slot (2ms) excluding the 2304Ts gap when UE is not transmitting for sub-carrier spacing of 3.75 kHz. Half-Duplex guard subframes are not under test.

NOTE 1: For configuration IDs applicable to UE depending on UE capability in Test Configuration Table with different UL sub-carrier spacing, the SS shall release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the appropriate UL subcarrier spacing in Random Access Response message.

### 6.3.2F.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 with the following exception.

**Table 6.3.2F4.3-1: NPDSCH-ConfigCommon-NB-DEFAULT**

| Derivation Path: 36.508 clause 8.1.6.3, Table 8.1.6.3-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPDSCH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| nrs-Power-r13 | -55 (dBm) | | |
| } | | | |

**Table 6.3.2F4.3-2: UplinkPowerControlCommon-NB-DEFAULT**

| Derivation Path: 36.508 clause 8.1.6.3. Table 8.1.6.3-14 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalNPUSCH-r13 | -95 (-95 dBm) | | |
| alpha-r13 | al1 (1) | | |
| deltaPreambleMsg3-r13 | 4 | | |
| } | | | |

## 6.3.2F.5 Test requirements

The minimum output power measured shall not exceed the value of -39 dBm for the channel bandwidth of category NB1 and NB2 UE.

# 6.3.2G Minimum output power for V2X Communication

## 6.3.2G.1 Minimum output power for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 6.3.2G.1.1 Test purpose

To verify the UE's ability to transmit with a broadband output power below the value specified in the test requirement when the power is set to a minimum value.

### 6.3.2G.1.2 Test applicability

This test applies to all types of UE that support V2X Sidelink Communication and Band 47.

### 6.3.2G.1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.2G-1.

The minimum output power is defined as the mean power in one sub-frame (1ms). The minimum output power shall not exceed the values specified in Table 6.3.2G.1.3-1.

**Table 6.3.2G.1.3-1: Minimum output power**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | -30 dBm | | | | | |
| Measurement bandwidth | | | | 9.0 MHz | | 18 MHz |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.2G.

### 6.3.2G.1.4 Test description

#### 6.3.2G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.2G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.3.2G.1.4.1-1: Test Configuration Table**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 96 |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, in Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.3.2G.1.4.3.
3. The V2X Reference Measurement channel is set according to Table 6.3.2G.1.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.3.2G.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Measure the mean power of the UE in the channel bandwidth for each test point in Table 6.3.2G.1.5-1 according to the test configuration from Table 6.3.2G.1.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

### 6.3.2G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, 4.7I and 4.10 with the following exceptions.

**Table 6.3.2G.1.4.3-1: SL-V2X-PreconfigCommPool-r14-DEFAULT**

| Derivation Path: TS 36.508 [7] Table 4.6.3-20J | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigCommPool-r14-DEFAULT ::= SEQUENCE { | | | |
| dataTxParameters-r14 | -70 | p0-r12 | |
| } | | | |

## 6.3.2G.1.5 Test requirements

The minimum output power measured shall not exceed the values specified in Table 6.3.2G.1.5-1.

**Table 6.3.2G.1.5-1: Minimum output power**

| | Channel bandwidth / minimum output power / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Minimum output power | -28.5 dBm | | | | | |
| Measurement bandwidth (Note 1) | | | | 9.0 MHz | | 18 MHz |
| Note 1: Different implementations such as FFT or spectrum analyzer approach are allowed. For spectrum analyzer approach the measurement bandwidth is defined as an equivalent noise bandwidth. | | | | | | |

## 6.3.2G.2 Minimum output power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

### 6.3.2G.2.1 Test purpose

To verify the UE's ability to transmit with a broadband output power below the value specified in the test requirement when the power is set to a minimum value.

### 6.3.2G.2.2 Test applicability

This test applies to all types of E-UTRA UE release 14 and forward that support V2X Communication.

### 6.3.2G.2.3 Minimum conformance requirements

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-2, the requirements in subclause 6.3.2A shall apply for the uplink and the requirements specified in subclause 6.3.2G.1 shall apply for the sidelink.

The minimum output power is defined as the mean power in one sub-frame (1ms). The minimum output power shall not exceed the values specified in Table 6.3.2G.2.3-1.

**Table 6.3.2G.2.3-1: Minimum output power**

| | Channel bandwidth / minimum output power / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Minimum output power | -40 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.2G.

### 6.3.2G.2.4 Test description

#### 6.3.2G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.2G.2.4.1-1. The details of the uplink and V2X reference measurement channels (RMCs) are specified in Annexes A.2 and A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.2G.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range for uplink and Low range for V2X, High range for uplink and High range for V2X | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink** | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | N/A for min output power test | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | | QPSK | 6 | 10 MHz | QPSK | 48@2 |
| 3 MHz | | QPSK | 15 | 20 MHz | QPSK | 96@2 |
| 5 MHz | | QPSK | 25 | | | |
| 10 MHz | | QPSK | 50 | | | |
| 15 MHz | | QPSK | 75 | | | |
| 20 MHz | | QPSK | 100 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.3.2G.2.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement channels are set according to Table 6.3.2G.2.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message contents are defined in clause 6.3.2G.2.4.3.

### 6.3.2G.2.4.2 Test procedure

1. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.3.2G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.
2. Send continuous uplink power control "down" commands in the uplink scheduling information to the UE to ensure that the UE transmits at its minimum output power.
3. Measure the mean power of each component carrier in the V2X con-current band configuration. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

### 6.3.2G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.3.2G.2.4.3-1: SL-V2X-ConfigDedicated-r14-DEFAULT**

| Derivation Path: TS 36.508 [7] Table 4.6.3-20HA, SL-V2X-ConfigDedicated-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-ConfigDedicated-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-InterFreqInfoList-r14 SEQUENCE (SIZE (0..maxFreqV2X-1-r14)) OF SL-InterFreqInfoV2X-r14 { | | | |
| SL-InterFreqInfoV2X-r14[1] SEQUENCE { | | | |
| v2x-SchedulingPool-r14 SEQUENCE { | | | |
| dataTxParameters-r14 SEQUENCE { | | | |
| p0-r12 | -70 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

## 6.3.2G.2.5 Test requirements

The minimum output power measured shall not exceed the values specified in Table 6.3.2G.2.5-1.

**Table 6.3.2G.2.5-1: Minimum output power for Inter-band con-current V2X**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | For carrier frequency f ≤ 3.0GHz: ≤ -39 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -38.7 dBm<br>For carrier frequency 4.2GHz < f ≤ 6.0GHz: ≤ -28.5 dBm | | | | | |
| Measurement bandwidth (Note 1) | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Note 1: Different implementations such as FFT or spectrum analyzer approach are allowed. For spectrum analyzer approach the measurement bandwidth is defined as an equivalent noise bandwidth. | | | | | | |

## 6.3.2G.3 Minimum output power for V2X Communication / Intra-band contiguous multi-carrier operation

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- part 2 spec need to be updated

### 6.3.2G.3.1 Test purpose

To verify the UE's ability to transmit with a broadband output power below the value specified in the test requirement when the power is set to a minimum value.

### 6.3.2G.3.2 Test applicability

This test applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 6.3.2G.3.3 Minimum conformance requirements

For intra-band contiguous E-UTRA V2X multiple carrier transmissions, the requirements in subclause 6.3.2 G.1 shall apply for each sidelink carrier.

The minimum output power is defined as the mean power in one sub-frame (1ms). The minimum output power shall not exceed the values specified in Table 6.3.2G.3.3-1.

**Table 6.3.2G.3.3-1: Minimum output power for Intra-band contiguous multi-carrier V2X operation**

| | Channel bandwidth / minimum output power / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Minimum output power | -30 dBm | | | | | |
| Measurement bandwidth | | | | 9.0 MHz | | 18 MHz |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.2G.

## 6.3.2G.3.4 Test description

### 6.3.2G.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-4. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.2G.3.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annexes A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.3.2G.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low range, Mid range , High range | | | |
| Test Channel Bandwidths as specified in subclause 5.4.2G | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | |
| **Test Parameters for V2X MCC Configuration** | | | | | | |
| **V2X MCC Channel Bandwidth** | | | **V2X Sidelink Configuration** | | | |
| **Configuration ID** | **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **$N_{RB_agg}$** | **CC1 and CC2 RB Allocation (LCRB @ RBstart)** | |
| 1 | 50 | 50 | QPSK | 48 | CC1_48@0 | CC2_0@0 |
| 2 | 50 | 50 | QPSK | 96 | CC1_48@0 | CC2_48@2 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G | | | | | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.89a.

2. The parameter settings for V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4. 10.1. Message content exceptions are defined in clause 6.3.2G.3.4.3.

3. The UL V2X Reference Measurement channels are set according to Table 6.3.2G.3.4.1-1.

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 5A-V2X according to TS 36.508 [7] clause 4.5.9.

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 6.3.2G.3.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMCs.

2. Measure the mean power of the UE in the channel bandwidth for each test point in Table 6.3.2G.3.5-1 according to the test configuration from Table 6.2.2G.3.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

#### 6.3.2G.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, 4.7I and 4.10 with the following exceptions:

**Table 6.3.2G.1.4.3-1: SL-V2X-PreconfigCommPool-r14-DEFAULT**

| Derivation Path: TS 36.508 [7] Table 4.6.3-20J | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigCommPool-r14-DEFAULT ::= SEQUENCE { | | | |
| dataTxParameters-r14 | -70 | p0-r12 | |
| } | | | |

### 6.3.2G.3.5 Test requirements

The minimum output power measured shall not exceed the values specified in Table 6.3.2G.3.5-1.

**Table 6.3.2G.3.5-1: Minimum output power for Intra-band contiguous multi-carrier V2X operation**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Minimum output power | -28.5 dBm | | | | | |
| Measurement bandwidth (Note 1) | | | | 9.0 MHz | | 18 MHz |
| Note 1: Different implementations such as FFT or spectrum analyzer approach are allowed. For spectrum analyzer approach the measurement bandwidth is defined as an equivalent noise bandwidth. | | | | | | |

## 6.3.3 Transmit OFF power

### 6.3.3.1 Test purpose

To verify that the UE transmit OFF power is lower than the value specified in the test requirement.

### 6.3.3.2 Test applicability

The requirements of this test apply in test cases 6.3.4.1 General ON/OFF time mask and 6.3.4.2 PRACH and SRS time mask to all types of E-UTRA UE release 8 and forward.

### 6.3.3.3 Minimum conformance requirement

The transmit OFF power is defined as the mean power in a duration of at least one sub-frame (1ms) excluding any transient periods. The requirement for the transmit OFF power shall not exceed the values specified in Table 6.3.3.3-1.

**Table 6.3.3.3-1: Transmit OFF power**

| | Channel bandwidth / Transmit OFF power / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Transmit OFF power | -50 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.3.

Transmit OFF power is defined as the mean power when the transmitter is OFF. The transmitter is considered to be OFF when the UE is not allowed to transmit or during periods when the UE is not transmitting a sub-frame. During DTX and measurements gaps, the UE is not considered to be OFF.

An excess transmit OFF power potentially increases the Rise Over Thermal (RoT) and therefore reduces the cell coverage area for other UEs

### 6.3.3.4 Test description

This test is covered by clause 6.3.4.1 General ON/OFF time mask and 6.3.4.2 PRACH and SRS time mask.

### 6.3.3.5 Test requirement

The requirement for the transmit OFF power shall not exceed the values specified in Table 6.3.3.5-1.

**Table 6.3.3.5-1: Transmit OFF power**

| | Channel bandwidth / Transmit OFF power / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

## 6.3.3A UE Transmit OFF power for CA

### 6.3.3A.0 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, transmit OFF power requirement is defined per carrier and the requirement is specified in subclause 6.3.3.3.

For intra-band contiguous and non-contiguous carrier aggregation the transmit OFF power is defined as the mean power in a duration of at least one sub-frame (1ms) excluding any transient periods. The transmit OFF power shall not exceed the values specified in Table 6.3.3A.0-1.

**Table 6.3.3A.0-1: Transmit OFF power for intra-band contiguous and non-contiguous CA UE**

| | CC Channel bandwidth / Transmit OFF power / Measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Transmit OFF power | -50 dBm | | | | | |
| Measurement bandwidth | | | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands and intra-band contiguous and non-contiguous carrier aggregation, transmit OFF power is defined as the mean power per component carrier when the transmitter is OFF on all component carriers. The transmitter is considered to be OFF when the UE is not allowed to transmit or during periods when the UE is not transmitting a sub-frame. During measurements gaps, the UE is not considered to be OFF.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.3A.

## 6.3.3A.1 UE Transmit OFF power for CA (intra-band contiguous DL CA and UL CA)

### 6.3.3A.1.1 Test purpose

For intra-band contiguous carrier aggregation the transmit OFF power is defined as the mean power per component carrier when the transmitter is OFF on both component carriers. The transmitter is considered to be OFF when the UE is not allowed to transmit or during periods when the UE is not transmitting a sub-frame. During measurements gaps, the UE is not considered to be OFF.

To verify that the UE transmit OFF power for CA is lower than the value specified in the test requirement.

### 6.3.3A.1.2 Test applicability

The requirements of this test case apply in test cases 6.3.4A.1 General ON/OFF time mask for CA and 6.3.4.2 PRACH and SRS time mask to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 6.3.3A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.3A.0.

### 6.3.3A.1.4 Test description

This test is covered by clause 6.3.4A.1.1 General ON/OFF time mask for CA and 6.3.4.2 PRACH and SRS time mask.

### 6.3.3A.1.5 Test Requirements

**Table 6.3.3A.1.5-1: Transmit OFF power for intra-band contiguous CA UE**

| | **Channel bandwidth / Minimum output power / Measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -48.2 dBm | | | | | |
| Measurement bandwidth | | | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

## 6.3.3A.2 UE Transmit OFF power for CA (inter-band DL CA and UL CA)

### 6.3.3A.2.1 Test purpose

For inter-band carrier aggregation with uplink assigned to two non-contiguous carriers within one E-UTRA band the transmit OFF power is defined as the mean power per component carrier when the transmitter is OFF. The transmitter is considered to be OFF when the UE is not allowed to transmit or during periods when the UE is not transmitting a sub-frame. During measurements gaps, the UE is not considered to be OFF.

To verify that the UE transmit OFF power for CA is lower than the value specified in the test requirement.

### 6.3.3A.2.2 Test applicability

The requirements of this test case apply in test cases 6.3.4A.2 General ON/OFF time mask for CA and 6.3.4.2 PRACH and SRS time mask to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA.

### 6.3.3A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.3A.0.

### 6.3.3A.2.4 Test description

This test is covered by clause 6.3.4A.1.2 General ON/OFF time mask for CA (inter-band DL CA and UL CA) and 6.3.4.2 PRACH and SRS time mask.

### 6.3.3A.2.5 Test Requirements

The requirement for the transmit OFF power per each component carrier shall not exceed the values specified in Table 6.3.3A.2.5-1.

**Table 6.3.3A.2.5-1: Transmit OFF power**

| | **Channel bandwidth / Transmit OFF power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

## 6.3.3A.3 UE Transmit OFF power for CA (intra-band non-contiguous DL CA and UL CA)

### 6.3.3A.3.1 Test purpose

For intra-band non-contiguous carrier aggregation with uplink assigned to two non-contiguous carriers within one E-UTRA band the transmit OFF power is defined as the mean power per component carrier when the transmitter is OFF. The transmitter is considered to be OFF when the UE is not allowed to transmit or during periods when the UE is not transmitting a sub-frame. During measurements gaps, the UE is not considered to be OFF.

To verify that the UE transmit OFF power for CA is lower than the value specified in the test requirement.

### 6.3.3A.3.2 Test applicability

The requirements of this test case apply in test cases 6.3.4A.1 General ON/OFF time mask for CA and 6.3.4.2 PRACH and SRS time mask to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

### 6.3.3A.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.3A.0.

### 6.3.3A.3.4 Test description

This test is covered by clause 6.3.4A.1.3 General ON/OFF time mask for CA (intra-band non-contiguous DL CA and UL CA).

### 6.3.3A.3.5 Test Requirements

**Table 6.3.3A.3.5-1: Transmit OFF power for intra-band contiguous and non-contiguous CA UE**

| | CC Channel bandwidth / Transmit OFF power / Measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Measurement bandwidth | | | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

## 6.3.3A.4 UE Transmit OFF power for CA (3UL CA)

### 6.3.3A.4.1 Test purpose

For intra-band non-contiguous carrier aggregation with uplink assigned to two non-contiguous carriers within one E-UTRA band the transmit OFF power is defined as the mean power per component carrier when the transmitter is OFF. The transmitter is considered to be OFF when the UE is not allowed to transmit or during periods when the UE is not transmitting a sub-frame. During measurements gaps, the UE is not considered to be OFF.

To verify that the UE transmit OFF power for CA is lower than the value specified in the test requirement.

### 6.3.3A.4.2 Test applicability

The requirements of this test case apply in test cases 6.3.4A.1 General ON/OFF time mask for CA and 6.3.4.2 PRACH and SRS time mask to all types of E-UTRA UE release 13 and forward that support intra-band contiguous or inter-band or intra-band non-contiguous DL CA and UL CA.

### 6.3.3A.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.3A.0.

### 6.3.3A.4.4 Test description

This test is covered by clause 6.3.4A.1.4 General ON/OFF time mask for CA (3UL CA).

### 6.3.3A.4.5 Test Requirements

**Table 6.3.3A.4.5-1: Transmit OFF power for inter-band CA UE**

| | Channel bandwidth / Transmit OFF power / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

**Table 6.3.3A.4.5-2: Transmit OFF power for intra-band contiguous and non-contiguous CA UE**

| | CC Channel bandwidth / Transmit OFF power / Measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Measurement bandwidth | | | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

# 6.3.3B UE Transmit OFF power for UL-MIMO

## 6.3.3B.1 Test purpose

To verify that the UE transmit OFF power for UL-MIMO is lower than the value specified in the test requirement.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

## 6.3.3B.2 Test applicability

The requirements of this test apply in test cases 6.3.4B.1 General ON/OFF time mask to all types of E-UTRA UE release 10 and forward that support UL-MIMO

## 6.3.3B.3 Minimum conformance requirement

The transmit OFF power is defined as the mean power at each transmit connector in a duration of at least one sub-frame (1ms) excluding any transient periods. The transmit OFF power at each transmit connector shall not exceed the values specified in Table 6.3.3B.3-1.

**Table 6.3.3B.3-1: Transmit OFF power per antenna port**

| | **Channel bandwidth / Minimum output power / Measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | -50 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.3B.1.

## 6.3.3B.4 Test description

This test is covered by clause 6.3.4B.1 General ON/OFF time mask.

## 6.3.3B.5 Test requirement

The requirement for the transmit OFF power at each transmit antenna connector shall not exceed the values specified in Table 6.3.3B.5-1.

**Table 6.3.3B.5-1: Transmit OFF power**

| | **Channel bandwidth / Transmit OFF power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

# 6.3.3C

# 6.3.3D UE Transmit OFF power for ProSe

## 6.3.3D.0 Minimum conformance requirements

When UE is configured for E-UTRA ProSe sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA ProSe operating bands specified in Table 5.2D-1, the Prose UE shall meet the Transmit OFF power at all times when the UE is not associated with a serving cell on the ProSe carrier and does not have knowledge of its geographical area or is provisioned with pre-configured radio parameters that are not associated with any known Geographical Area.

The requirements specified in subclause 6.3.3.3 shall apply to UE supporting ProSe when

- the UE is associated with a serving cell on the ProSe carrier, or
- the UE is not associated with a serving cell on the ProSe carrier and is provisioned with the preconfigured radio parameters for ProSe Direct Communications and/or ProSe Direct Discovery that are associated with known Geographical Area, or
- the UE is associated with a serving cell on a carrier different than the ProSe carrier, and the radio parameters for ProSe Direct Discovery on the ProSe carrier are provided by the serving cell, or
- the UE is associated with a serving cell on a carrier different than the ProSe carrier, and has a non-serving cell selected on the ProSe carrier that supports ProSe Direct Discovery and/or ProSe Direct Communication.

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.2D-2, transmit OFF power is defined as the mean power per component carrier when the transmitter is OFF on all component carriers. During measurement gaps and transmission/reception gaps for ProSe, the UE is not considered to be OFF. Transmit OFF power requirement as specified in subclause 6.3.3.3 apply per carrier.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.3D.

## 6.3.3D.1 UE Transmit OFF power for ProSe Direct Discovery

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- It is not yet clear how many test scenarios are required to cover the set of requirements
- The Test description may be replaced by a reference to the General ON/OFF time mask for ProSe Direct Discovery Test Case
- Message exceptions content
- Test procedure for concurrent operation with E-UTRA uplink transmissions is not defined.
- The Downlink configuration is likely to require discontinuous transmission

### 6.3.3D.1.1 Test purpose

To verify that the UE transmit OFF power is lower than the value specified in the test requirement.

### 6.3.3D.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward which supports ProSe Direct Discovery.

### 6.3.3D.1.3 Minimum Conformance requirements

The minimum conformance requirements are defined in clause 6.3.3D.0.

An excess transmit OFF power potentially increases the Rise over Thermal (RoT) and therefore reduces the cell coverage area for other UEs

### 6.3.3D.1.4 Test description

Editor's note: FFS: The Test description may be replaced by a reference to the General ON/OFF time mask for ProSe Direct Discovery Test Case

#### 6.3.3D.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.3D.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2, and details of the sidelink reference measurement channels are specified in Annex A.6. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.3D.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, Highest | | |
| | **Downlink Configuration** | **Uplink Configuration** | **Sidelink Configuration (PSDCH transmission)** |
| Ch BW | RB allocation | RB allocation | RB allocation |
| 5MHz | 8 | 8 | 2 |
| 10MHz | 16 | 16 | 2 |
| 15MHz | 25 | 25 | 2 |
| 20MHz | 30 | 30 | 2 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.67.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exception is defined in clause 6.3.3D.1.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.3.3D.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message content exception is defined in clause 6.3.3D.1.4.3.
7. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is closed and UE is set to announce discovery.

#### 6.3.3D.1.4.2 Test procedure

1. [The method to configure the UE is FFS].
2. The SS configures the UE with an UL assignment such that the UE transmits [Physical Channel FFS, from the set {PSDCH, PSCCH, PSSCH, PSSS, SSSS, PSBCH}] on the ProSe carrier, on UL sub-frame [FFS] of every radio frame.

3. For FDD: Measure the UE transmission OFF power during the sub-frame prior to the [Physical Channel FFS] subframe. For TDD: Measure the UE transmission OFF power during the 10 SCFDMA symbols prior to the [Physical Channel FFS] subframe.
4. Measure the output power of the UE [Physical Channel FFS] transmission during one sub-frame, excluding a transient period of 20 µs at the beginning of the subframe.
5. Measure the UE transmission OFF power during one sub-frame following the [Physical Channel FFS] subframe, excluding a transient period of 20 µs at the beginning of the subframe.

#### 6.3.3D.1.4.3 Message contents

[FFS]

### 6.3.3D.1.5 Test requirements

The requirement for the power measured in steps (3) and (5) of the test procedure shall not exceed the values specified in Table 6.3.4.1.5-1.

**Table 6.3.3D.1.5-1: Transmit OFF power**

| | **Channel bandwidth / Transmit OFF power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | | | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Measurement bandwidth | | | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

## 6.3.3E UE Transmit OFF power for UE category 0

### 6.3.3E.1 Test purpose

Same test purpose as in clause 6.3.3.1.

### 6.3.3E.2 Test applicability

The requirements of this test apply in test cases 6.3.4E.1 General ON/OFF time mask and 6.3.4E.2 PRACH and SRS time mask to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.3.3E.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.3.3

### 6.3.3E.4 Test description

This test is covered by clause 6.3.4E.1 General ON/OFF time mask and 6.3.4E.2 PRACH and SRS time mask.

### 6.3.3E.5 Test requirement

The requirement for the transmit OFF power shall not exceed the values specified in Table 6.3.3E.5-1.

**Table 6.3.3E.5-1: Transmit OFF power**

| | **Channel bandwidth / Transmit OFF power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

# 6.3.3EA UE Transmit OFF power for UE category M1

## 6.3.3EA.1 Test purpose

To verify that the UE transmit OFF power is lower than the value specified in the test requirement.

## 6.3.3EA.2 Test applicability

The requirements of this test apply in test cases 6.3.4EA.1 General ON/OFF time mask and 6.3.4EA.2 PRACH and SRS time mask to all types of E-UTRA UE release 13 and forward of UE category M1.

## 6.3.3EA.3 Minimum conformance requirements

The transmit OFF power is defined as the mean power in a duration of at least one sub-frame (1ms) excluding any transient periods. The requirement for the transmit OFF power shall not exceed the values specified in Table 6.3.3EA.3-1.

**Table 6.3.3EA.3-1: Transmit OFF power**

| | **Channel bandwidth / Transmit OFF power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | -50 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.3.

Transmit OFF power is defined as the mean power when the transmitter is OFF. The transmitter is considered to be OFF when the UE is not allowed to transmit or during periods when the UE is not transmitting a sub-frame. During DTX and measurements gaps, the UE is not considered to be OFF.

An excess transmit OFF power potentially increases the Rise over Thermal (RoT) and therefore reduces the cell coverage area for other UEs.

## 6.3.3EA.4 Test description

This test is covered by clause 6.3.4EA.1 General ON/OFF time mask and 6.3.4EA.2 PRACH and SRS time mask.

## 6.3.3EA.5 Test requirements

The requirement for the transmit OFF power shall not exceed the values specified in Table 6.3.3EA.5-1.

**Table 6.3.3EA.5-1: Transmit OFF power for UE category M1**

| | Channel bandwidth / Transmit OFF power / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

# 6.3.3EB UE Transmit OFF power for UE category 1bis

## 6.3.3EB.1 Test purpose

Same test purpose as in clause 6.3.3.1.

## 6.3.3EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of category 1bis.

## 6.3.3EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.3.3.3.

## 6.3.3EB.4 Test description

This test is covered by clause 6.3.4EB.1 General ON/OFF time mask and 6.3.4EB.2 PRACH and SRS time mask:

## 6.3.3EB.5 Test requirement

The requirement for the transmit OFF power shall not exceed the values specified in Table 6.3.3EB.5-1.

**Table 6.3.3EB.5-1: Transmit OFF power**

| | Channel bandwidth / Transmit OFF power / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

# 6.3.3EC UE Transmit OFF power for UE category M2

## 6.3.3EC.1 Test purpose

Same as in clause 6.3.3EA.1.

## 6.3.3EC.2 Test applicability

The requirements of this test apply in test cases 6.3.4EC.1 General ON/OFF time mask and 6.3.4EC.2 PRACH and SRS time mask to all types of E-UTRA UE release 14 and forward of UE category M2.

### 6.3.3EC.3 Minimum conformance requirements

Same as in clause 6.3.3EA.3.

### 6.3.3EC.4 Test description

This test is covered by clause 6.3.4EC.1 General ON/OFF time mask and 6.3.4EC.2 PRACH and SRS time mask.

### 6.3.3EC.5 Test requirements

Same as in clause 6.3.3EA.5.

## 6.3.3F Transmit OFF power for category NB1 and NB2

### 6.3.3F.1 Test purpose

To verify that the UE transmit OFF power is lower than the value specified in the test requirement.

### 6.3.3F.2 Test applicability

The requirements of this test apply in test cases 6.3.4F.1 General ON/OFF time mask for category NB1 and NB2 and 6.3.4F.2 NPRACH time mask for category NB1 and NB2 to all types of E-UTRA UE release 13 and forward of category NB1.

The requirements of this test apply in test cases 6.3.4F.1 General ON/OFF time mask for category NB1 and NB2 and 6.3.4F.2 NPRACH time mask for category NB1 and NB2 to all types of E-UTRA UE release 14 and forward of category NB2.

### 6.3.3F.3 Minimum conformance requirement

For category NB1 and NB2 UE the transmit OFF power requirement for the channel bandwidth is -50 dBm. For 3.75 kHz sub-carrier spacing the transmit OFF power is defined as mean power in one slot (2ms) excluding the 2304Ts gap when UE is not transmitting. For 15 kHz sub-carrier spacing the transmit OFF power is defined as mean power in one sub-frame (1ms).

The normative reference for this requirement is TS 36.101 [2] clause 6.3.3F.

### 6.3.3F.4 Test description

This test is covered by clause 6.3.4F.1 General ON/OFF time mask for category NB1 and NB2 and 6.3.4F.2 NPRACH time mask for category NB1 and NB2.

### 6.3.3F.5 Test requirement

The requirement for the transmit OFF power shall not exceed the values of -50 dBm for the channel bandwidth of category NB1 and NB2.

## 6.3.3G UE Transmit OFF power for V2X Communication

### 6.3.3G.1 UE Transmit OFF power for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

#### 6.3.3G.1.1 Test purpose

To verify that the UE transmit OFF power is lower than the value specified in the test requirement.

### 6.3.3G.1.2 Test applicability

The requirements of this test case apply in the test case 6.3.4G.1 General ON/OFF time mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions to all types of UE that support V2X Sidelink communication and Band 47.

### 6.3.3G.1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in TS 36.101 [2] Table 5.5G-1, the V2X UE shall meet the Transmit OFF power in subclause 6.3.3D.0.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.3G.

### 6.3.3G.1.4 Test description

This test is covered by clause 6.3.4G.1 General ON/OFF time mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions.

### 6.3.3G.1.5 Test requirements

The requirement for the transmit OFF power shall not exceed the values specified in Table 6.3.3G.1.5-1.

**Table 6.3.3G.1.5-1: Transmit OFF power**

| | Channel bandwidth / Transmit OFF power / measurement bandwidth | |
|---|---|---|
| | 10 MHz | 20 MHz |
| Transmit OFF power | For carrier frequency 4.2GHz < f ≤ 6.0GHz: ≤ -48 dBm | |
| Measurement bandwidth | 9.0 MHz | 18.0 MHz |

## 6.3.3G.2 UE Transmit OFF power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

### 6.3.3G.2.1 Test purpose

To verify that the UE transmit OFF power is lower than the value specified in the test requirement.

### 6.3.3G.2.2 Test applicability

The requirements of this test case apply in the test case 6.3.4G.2 General ON/OFF time mask for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions to all types of E-UTRA UE release 14 and forward that support V2X communication.

### 6.3.3G.2.3 Minimum conformance requirements

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in TS 36.101 [2] Table 5.2G-2, the requirements in subclause 6.3.3A apply for as specified for the corresponding inter-band con-current operation with uplink assigned to two bands.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.3G.

### 6.3.3G.2.4 Test description

This test is covered by clause 6.3.4G.2 General ON/OFF time mask for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions.

### 6.3.3G.2.5 Test requirements

The requirement for the transmit OFF power shall not exceed the values specified in Table 6.3.3G.2.5-1.

**Table 6.3.3G.2.5-1: Transmit OFF power**

| | Channel bandwidth / Minimum output power / Measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤-48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤-48.2 dBm<br>For carrier frequency 4.2GHz < f ≤ 6.0GHz : ≤-48 dBm | | | | | |
| Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

## 6.3.3G.3 UE Transmit OFF power for V2X Communication / Intra-band contiguous multi-carrier operation

Editor's note: This test case is incomplete. The following items are missing or incomplete:

- Annexes A, F.1.2 and the test tolerance in Annexes F.3.2

- Applicability spec

### 6.3.3G.3.1 Test purpose

To verify that the UE transmit OFF power is lower than the value specified in the test requirement.

### 6.3.3G.3.2 Test applicability

The requirements of this test case apply in the test case 6.3.4G.3 General ON/OFF time mask for V2X Communication / Intra-band contiguous multi-carrier operation to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 6.3.3G.3.3 Minimum conformance requirements

For intra-band contiguous E-UTRA V2X multiple carrier transmissions, the requirements in subclause 6.3.3A apply as specified for the corresponding intra band contiguous carrier aggregation.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.3G.

### 6.3.3G.3.4 Test description

This test is covered by clause 6.3.4G.4 General ON/OFF time mask for V2X Communication / Intra-band contiguous multi-carrier operation.

### 6.3.3G.3.5 Test requirement

The requirement for the transmit OFF power shall not exceed the values specified in Table 6.3.3G.3.5-1.

**Table 6.3.3G.3.5-1: Transmit OFF power**

| | Channel bandwidth / Transmit OFF power / measurement bandwidth |
|---|---|
| | 20 MHz |
| Transmit OFF power | For carrier frequency 4.2GHz < f ≤ 6.0GHz: ≤ -50+TT dBm |
| Measurement bandwidth | 18.0 MHz |

# 6.3.4 ON/OFF time mask

## 6.3.4.1 General ON/OFF time mask

### 6.3.4.1.1 Test purpose

To verify that the general ON/OFF time mask meets the requirements given in 6.3.4.1.5.

The time mask for transmit ON/OFF defines the ramping time allowed for the UE between transmit OFF power and transmit ON power.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

### 6.3.4.1.2 Test applicability

This test applies to all types of E-UTRA UE release 8 and forward.

### 6.3.4.1.3 Minimum conformance requirement

The General ON/OFF time mask defines the observation period between Transmit OFF and ON power and between Transmit ON and OFF power. ON/OFF scenarios include; the beginning or end of DTX, measurement gap, contiguous, and non contiguous transmission

The OFF power measurement period is defined in a duration of at least one sub-frame excluding any transient periods. The ON power is defined as the mean power over one sub-frame excluding any transient period.

There are no additional requirements on UE transmit power beyond that which is required in clause 6.2.2 and clause 6.6.2.3.

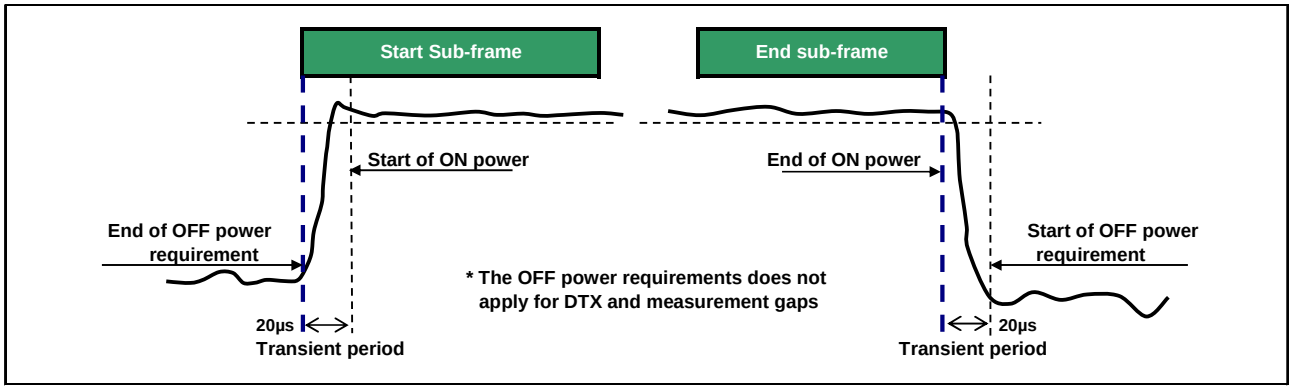



**Figure 6.3.4.1.3-1: General ON/OFF time mask**

The normative reference for this requirement is TS 36.101 [2] clause 6.3.4.1.

### 6.3.4.1.4 Test description

#### 6.3.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.4.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

**Table 6.3.4.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in **TS 36.508 [7] subclause 4.3.1** | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for General On/Off Time Mask test case | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 50 | 50 |
| 15MHz | | QPSK | 75 | 75 |
| 20MHz | | QPSK | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.3.4.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.4.1.4.3. Note that PDCCH DCI format 0 sent after resetting uplink power with RRC Connection Reconfiguration, should have TPC command 0dB.

### 6.3.4.1.4.2 Test procedure

1. SS sends uplink scheduling information via PDCCH DCI format 0 with TPC command 0dB for C_RNTI to schedule the UL RMC according to Table 6.3.4.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The UL assignment is such that the UE transmits on UL sub-frame 2 of every radio frame.
2. For FDD: Measure the UE transmission OFF power during the sub-frame prior to the PUSCH subframe. For TDD: Measure the UE transmission OFF power during the 10 SCFDMA symbols prior to the PUSCH subframe.
3. Measure the output power of the UE PUSCH transmission during one sub-frame, excluding a transient period of 20 µs at the beginning of the subframe.
4. Measure the UE transmission OFF power during one sub-frame following the PUSCH subframe, excluding a transient period of 20 µs at the beginning of the subframe.

### 6.3.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.3.4.1.4.3-1: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE {<br>p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.4.1.4.3-2: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| UplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | SRB1 |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |

**Table 6.3.4.1.4.3-3: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | SRB1 |
| | 0 | | RBC |
| } | | | |

**Table 6.3.4.1.4.3-4: TDD-Config-DEFAULT: On/OFF time mask measurement**

| Derivation Path: 36.508 clause 5.3.1 Table 5.3.1-1 (*SystemInformationBlockType1*) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp5 | To enable two symbol UpPTS, and to have 9 symbols GP. | |
| } | | | |

## 6.3.4.1.5 Test requirement

The requirement for the power measured in steps (2), (3) and (4) of the test procedure shall not exceed the values specified in Table 6.3.4.1.5-1.

**Table 6.3.4.1.5-1: General ON/OFF time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
|---|---|---|---|---|---|---|
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected Transmission ON Measured power | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

## 6.3.4A.1.4 General ON/OFF time mask for CA (3UL CA)

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Table 6.3.4A.1.4.4.1-1 for Inter-band & Intra-band contiguous CA configuration is investigating.
- The test applicability needs to be added to TS36.521-2

### 6.3.4A.1.4.1 Test purpose

To verify that the general ON/OFF time mask for CA meets the requirements given in 6.3.4A.1.4.5.

The time mask for transmit ON/OFF for CA defines the ramping time allowed for the UE between transmit OFF power and transmit ON power for CA.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

### 6.3.4A.1.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band contiguous or inter-band or intra-band non-contiguous DL CA and UL CA.

### 6.3.4A.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.4A.0.

### 6.3.4A.1.4.4 Test description

#### 6.3.4A.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.4A.1.4.4.1-1 & 6.3.4A.1.4.4.1-2. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexe A.2 and A3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.4A.1.4.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low and High range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC1 & SCC2 RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | | QPSK | 56 | P_6@0 | S_25@0 | S_25@0 | - |
| 6 | 50 | | QPSK | 106 | P_6@0 | S_50@0 | S_50@0 | - |
| 25 | 15 | | QPSK | 55 | P_25@0 | S_15@0 | S_15@0 | - |
| 25 | 25 | | QPSK | 75 | P_25@0 | S_25@0 | S_25@0 | - |
| 25 | 50 | | QPSK | 125 | P_25@0 | S_50@0 | S_50@0 | - |
| 50 | 50 | | QPSK | 150 | P_50@0 | S_50@0 | S_50@0 | - |
| 75 | 75 | | QPSK | 225 | P_75@0 | S_75@0 | S_75@0 | - |
| 100 | 25 | | QPSK | 150 | P_100@0 | S_25@0 | S_25@0 | - |
| 100 | 50 | | QPSK | 200 | P_100@0 | S_50@0 | S_50@0 | - |
| 100 | 75 | | QPSK | 250 | P_100@0 | S_75@0 | S_75@0 | |
| 100 | 100 | | QPSK | 300 | P_100@0 | S_100@0 | S_100@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , only the first of those is tested, according to the order on the Test Configuration Table list. | | | | | | | | |

**Table 6.3.4A.1.4.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Maximum Wgap |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC<br>(Note 2) |

| Test Parameters for CA Configurations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ [MHz] | DL Allocation | | UL Allocation | | | | | |
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | | CC MOD | PCC & SCC RB allocation | CC MOD | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) |
| Test Parameters for CA_XA-XA-XA Configurations | | | | | | | | | | | |
| 1 | All RBs | All RBs | Max | N/A | N/A | QPSK | Full RBs | QPSK | Full RBs | QPSK | Full RBs |
| 2 | All RBs | All RBs | Max | N/A | N/A | QPSK | Full RBs | QPSK | Full RBs | QPSK | Full RBs |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.
Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.4A.1.4.4.1-1 & 6.3.4A.1.4.4.1-2.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.4A.1.4.4.3.

### 6.3.4A.1.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.3.4A.1.4.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.4A.1.4.4.1-1 & 6.3.4A.1.4.4.1-2 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The each UL assignment is such that the UE transmits on UL sub-frame 2 of every radio frame.

5. For FDD: Measure the UE transmission OFF power for each component carrier during the sub-frame prior to the PUSCH subframe. For TDD: Measure the UE transmission OFF power during the 10 SCFDMA symbols prior to the PUSCH subframe.

6. Measure the output power of the UE PUSCH transmission for each component carrier during one sub-frame, excluding a transient period of 20 µs at the beginning of the subframe.

7. Measure the UE transmission OFF power for each component carrier during one sub-frame following the PUSCH subframe, excluding a transient period of 20 µs at the beginning of the subframe.

#### 6.3.4A.1.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with exceptions as in clause 6.3.4A.1.1.4.3.

#### 6.3.4A.1.4.5 Test requirement

The requirement for the power measured in steps 5, 6 and 7 of the test procedure shall not exceed the values specified in Table 6.3.4A.1.4.5-1.

**Table 6.3.4A.1.4.5-1: General ON/OFF time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected Transmission ON Measured power | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

## 6.3.4.2 PRACH and SRS time mask

### 6.3.4.2.1 PRACH time mask

#### 6.3.4.2.1.1 Test purpose

To verify that the PRACH time mask meets the requirements given in 6.3.4.2.1.5.

The time mask for PRACH time mask defines the ramping time allowed for the UE between transmit OFF power and transmit ON power when transmitting the PRACH.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

#### 6.3.4.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 8 and forward.

#### 6.3.4.2.1.3 Minimum conformance requirement

For the PRACH Power / Time mask defines the observation period for PRACH transmissions. The PRACH ON power is specified as the mean power over the PRACH measurement period excluding any transient periods. The measurement period for different PRACH preamble format is specified in Table 6.3.4.2.1.3-1.

There are no additional requirements on UE transmit power beyond that which is required in clause 6.2.2 and clause 6.6.2.3

**Table 6.3.4.2.1.3-1: PRACH ON power measurement period**

| PRACH preamble format | Measurement period (ms) |
|---|---|
| 0 | 0.9031 |
| 1 | 1.4844 |
| 2 | 1.8031 |
| 3 | 2.2844 |
| 4 | 0.1479 |

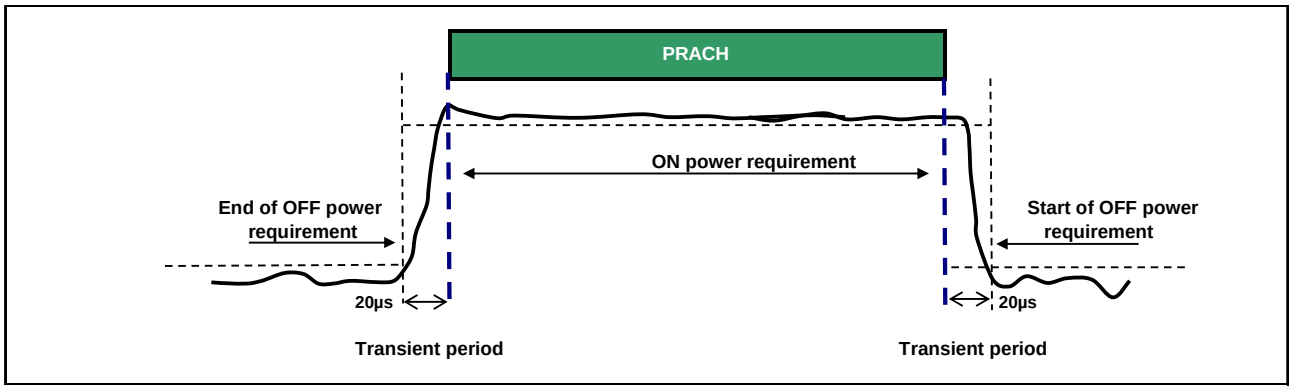



**Figure 6.3.4.2.1.3-1: PRACH ON/OFF time mask**

The normative reference for this requirement is TS 36.101 [2] clause 6.3.4.2.1.

#### 6.3.4.2.1.4 Test description

##### 6.3.4.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.4.2.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3.

**Table 6.3.4.2.1.4.1-1: Test Configuration Table**

| Initial Conditions | | |
|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | Mid range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | Lowest, 5MHz, Highest | |
| PRACH preamble format | | |
| | FDD | TDD |
| PRACH Configuration Index | 3 | 51 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.4.2.1.4.3.

#### 6.3.4.2.1.4.2 Test procedure

1. The SS shall signal a Random Access Preamble ID via a PDCCH order to the UE and initiate a Non-contention based Random Access procedure.
2. The UE shall send the signalled preamble to the SS.
3. For FDD UE, the SS measure the UE transmission OFF power during the sub-frame preceding the PRACH preamble excluding a transient period of 20 µs according to Figure 6.3.4.2.1.3-1. For TDD UE, the SS measure the UE transmission OFF power starting (20us+the duration of 8 OFDM symbols) before the PRACH starts, and ending 20us before PRACH starts. Note, the nominal PRACH timing for TDD is not aligned with the sub frame and symbol raster.
4. Measure the output power of the transmitted PRACH preamble according to Figure 6.3.4.2.1.3-1.
5. Measure the UE transmission OFF power, starting 20 µs after the PRACH preamble ends for a measurement period of 980 µs.

#### 6.3.4.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.3.4.2.1.4.3-1: *RACH-ConfigCommon-DEFAULT:* PRACH measurement**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-12 RACH-ConfigCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon-DEFAULT ::= SEQUENCE { | | | |
| powerRampingParameters SEQUENCE { | | | |
| powerRampingStep | dB0 | | |
| preambleInitialReceivedTargetPower | dBm-104 | | PRACH Format 0 |
| | dBm-112 | | PRACH Format 4 |
| } | | | |
| ) | | | |

**Table 6.3.4.2.1.4.3-2: *PRACH-Config-DEFAULT:* PRACH measurement for TDD**

| Derivation Path: TS 36.508 [7] clause 5.3.1, Table 5.3.1-3: PRACH-Config-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PRACH-Config-DEFAULT ::= SEQUENCE { | | | |
| prach-ConfigIndex | 51 | | TDD |
| } | | | |

**Table 6.3.4.2.1.4.3-3: *TDD-Config-DEFAULT:* PRACH measurement for TDD**

| Derivation Path: TS 36.508 [7] clause 5.3.1, Table 5.3.1-1: TDD-Config-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp5 | To enable two symbol UpPTS, and to have 9 symbols GP. | |
| } | | | |

#### 6.3.4.2.1.5 Test requirement

The requirement for the power measured in steps (3), (4) and (5) of the test procedure shall not exceed the values specified in Table 6.3.4.2.1.5-1.

**Table 6.3.4.2.1.5-1: PRACH time mask**

| | **Channel bandwidth / Output Power [dBm] / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected PRACH Transmission ON Measured power | -1 dBm | -1 dBm | -1 dBm | -1 dBm | -1 dBm | -1 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

### 6.3.4.2.2 SRS time mask

#### 6.3.4.2.2.1 Test purpose

To verify that the SRS time mask meets the requirements given in 6.3.4.2.2.5.

The time mask for SRS time mask defines the ramping time allowed for the UE between transmit OFF power and transmit ON power when transmitting the SRS.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

#### 6.3.4.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 8 and forward.

#### 6.3.4.2.2.3 Minimum conformance requirement

In the case a single SRS transmission, the ON power is defined as the mean power for each symbol duration excluding any transient period. Figure 6.3.4.2.2.3-1.

In the case a dual SRS transmission, the ON power is defined as the mean power for each symbol duration excluding any transient period. Figure 6.3.4.2.2.3-2.

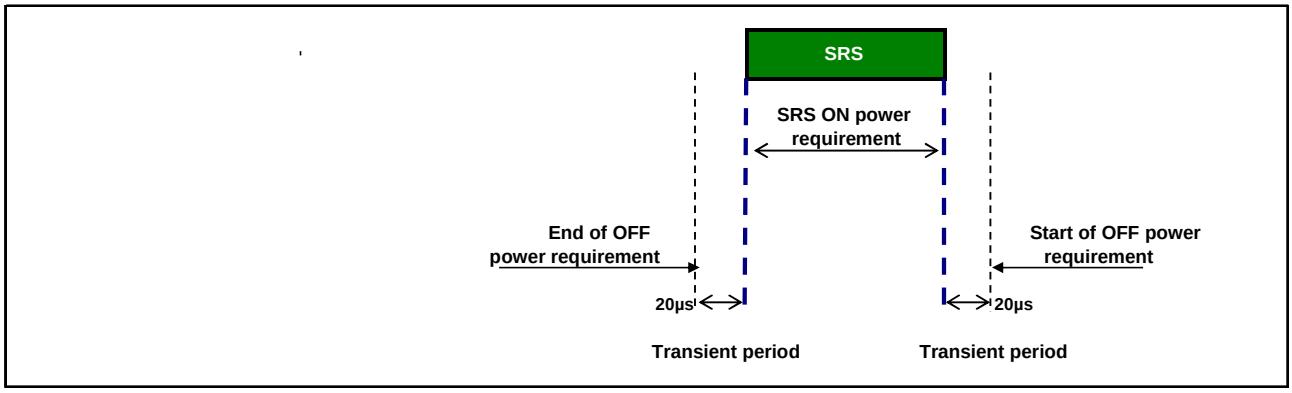



**Figure 6.3.4.2.2.3-1: Single SRS time mask**

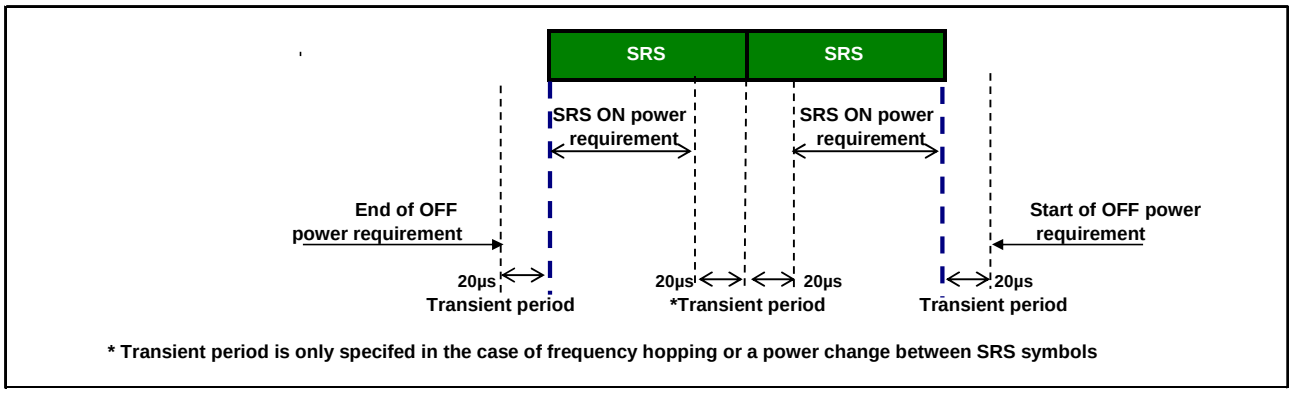



**Figure 6.3.4.2.2.3-2: Dual SRS time mask for the case of UpPTS transmissions**

### 6.3.4.2.2.4 Test description

#### 6.3.4.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.4.2.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3.

**Table 6.3.4.2.2.4.1-1: Test Configuration Table**

| Initial Conditions | | |
|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | Mid range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | Lowest, 5MHz, Highest | |
| SRS configuration | | |
| | FDD | TDD |
| srs-BandwidthConfig | bw7 | bw7 (for BW 1.4 MHz)<br>bw5 (for BW 3 MHz)<br>bw2 (for BW 5 MHz)<br>bw0 (for BW 10, 15, 20 MHz) |
| srs-SubframeConfig | sc3 | sc0 |
| ackNackSRS-SimultaneousTransmission | FALSE | FALSE |
| srsMaxUpPts | N/A | N/A |
| srs-Bandwidth | bw3 | bw3 |
| srs-HoppingBandwidth | hbw3 | hbw0 |
| freqDomainPosition | 0 | 0 |
| Duration | TRUE | TRUE |
| srs-ConfigIndex | 7 | 0 |
| transmissionComb | 0 | 0 |
| cyclicShift | cs0 | cs0 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.4.2.2.4.3. Note that PDCCH DCI format 0 sent after resetting uplink power with RRC Connection Reconfiguration, should have TPC command 0dB.

### 6.3.4.2.2.4.2 Test procedure

1. For FDD UE, the SS measure the UE transmission OFF power during the 13 symbols preceding the SRS symbol excluding a transient period of 20 µs according to Figure 6.3.4.2.2.3-1. For TDD UE, the SS measure the UE transmission OFF power during the 8 symbols preceding the two SRS symbols excluding a transient period of 20µs according to Figure 6.3.4.2.2.3-2.
2. Measure the output power of the transmitted SRS according to Figure 6.3.4.2.2.3-1 for FDD UE and according to Figure 6.3.4.2.2.3-2 for TDD UE, The transient periods are excluded from measurement accordingly.
3. Measure the UE transmission OFF power during the sub-frame following the SRS under test, excluding a transient period of 20 µs according to Figure 6.3.4.2.2.3-1 for FDD UE and according to Figure 6.3.4.2.2.3-2 for TDD UE.

### 6.3.4.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.3.4.2.2.4.3-1: *RadioResourceConfigCommonSIB-DEFAULT*: SRS measurement**

| Derivation Path: 36.508 clause 5.3.1 Table 5.3.1-2 RadioResourceConfigCommonSIB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigCommon-DEFAULT ::= SEQUENCE { | | | |
| rach-ConfigCommon | RACH-ConfigCommon-DEFAULT | | |
| bcch-Config | BCCH-Config-DEFAULT | | |
| pcch-Config | PCCH-Config-DEFAULT | | |
| prach-Config | PRACH-ConfigSIB-DEFAULT | | |
| pdsch-ConfigCommon | PDSCH-ConfigCommon-DEFAULT | | |
| pusch-ConfigCommon | PUSCH-ConfigCommon-DEFAULT | | |
| pucch-ConfigCommon | PUCCH-ConfigCommon-DEFAULT | | |
| soundingRSUL-ConfigCommon | *SoundingRS-UL-ConfigCommon-DEFAULT* | | |
| uplinkPowerControlCommon | UplinkPowerControlCommon-DEFAULT | | |
| ul-CyclicPrefixLength | len1 | | |
| } | | | |

**Table 6.3.4.2.2.4.3-2: *SoundingRS-UL-ConfigCommon-DEFAULT*: SRS time mask measurement**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-21 SoundingRS-UL-ConfigCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SoundingRS-UL-ConfigCommon-DEFAULT ::= SEQUENCE { | | | |
| setup SEQUENCE { | | | |
| srs-BandwidthConfig | bw7 | | FDD |
| | bw7 | | TDD (BW 1.4 MHz) |
| | bw5 | | TDD (BW 3 MHz) |
| | bw2 | | TDD (BW 5 MHz) |
| | bw0 | | TDD (BW 10, 15, 20 MHz) |
| srs-SubframeConfig | sc3 | Periodicity of 5ms, with offset of 0. | FDD |
| | sc0 | Periodicity of 5ms, with offset of 1. | TDD |
| ackNackSRS-SimultaneousTransmission | FALSE | | |
| srsMaxUpPts | Not present | | |
| } | | | |
| } | | | |

**Table 6.3.4.2.2.4.3-3: PhysicalConfigDedicated-DEFAULT: SRS time mask measurement**

| Derivation Path: 36.508 clause 5.5.1 Table 5.5.1.2-1: PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| soundingRS-UL-ConfigDedicated | *SoundingRSUL-ConfigDedicated-DEFAULT* | | |
| } | | | |

**Table 6.3.4.2.2.4.3-4: *SoundingRSUL-ConfigDedicated-DEFAULT*: SRS time mask measurement**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-22 SoundingRS-UL-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SoundingRS-UL-ConfigDedicated-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| srs-Bandwidth | bw3 | bw3 used to ensure that the bandwidth is constantly 4 RBs irrespective of channel bandwidth. | |
| srs-HoppingBandwidth | hbw3 | This is selected so that hopping is disabled | FDD |
| | hbw0 | This is selected so that hopping is enabled | TDD |
| freqDomainPosition | 0 | | |
| Duration | TRUE | Indefinite duration | |
| srs-ConfigIndex | 7 | SRS periodicity of 10ms, Toffset=0. | FDD |
| | 0 | SRS periodicity of 2ms, Ksrs=0,1, this is two symbols UpPTS in first half subframe. | TDD |
| transmissionComb | 0 | | |
| cyclicShift | cs0 | No cyclic shift | |
| } | | | |
| } | | | |

**Table 6.3.4.2.2.4.3-5: TDD-Config-DEFAULT: SRS time mask measurement**

| Derivation Path: 36.508 331 clause 65.3.21 Table 5.3.1-1 (*SystemInformationBlockType1*) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp5 | To enable two symbol UpPTS, and to have 9 symbols GP. | |
| } | | | |

**Table 6.3.4.2.2.4.3-6: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| uplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | SRB1 |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |

**Table 6.3.4.2.2.4.3-7: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | SRB1 |
| | 0 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| FDD | FDD cell environment |
| TDD | TDD cell environment |

#### 6.3.4.2.2.5 Test requirement

The requirement for the power measured in steps (1), (2) and (3) of the test procedure shall not exceed the values specified in Table 6.3.4.2.2.5-1.

**Table 6.3.4.2.2.5-1: SRS time mask**

| | **Channel bandwidth / Output Power [dBm] / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected SRS Transmission ON Measured power | -2.6 dBm | -2.6 dBm | -2.6 dBm | -2.6 dBm | -2.6 dBm | -2.6 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

## 6.3.4A ON/OFF time mask for CA

### 6.3.4A.0 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands and intra-band contiguous and non-contiguous carrier aggregation, the general output power ON/OFF time mask specified in subclause 6.3.4.1.3 is applicable for each component carrier during the ON power period and the transient periods. The OFF period as specified in subclause 6.3.4.1.3 shall only be applicable for each component carrier when all the component carriers are OFF.

The normative references for this requirement are TS 36.101 [2] clauses 6.3.4A and 6.3.4.

### 6.3.4A.1 General ON/OFF time mask for CA

#### 6.3.4A.1.1 General ON/OFF time mask for CA (intra-band contiguous DL CA and UL CA)

##### 6.3.4A.1.1.1 Test purpose

To verify that the general ON/OFF time mask for CA meets the requirements given in 6.3.4A.1.1.5.

The time mask for transmit ON/OFF for CA defines the ramping time allowed for the UE between transmit OFF power and transmit ON power for CA.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

#### 6.3.4A.1.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

#### 6.3.4A.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.4A.0.

#### 6.3.4A.1.1.4 Test description

##### 6.3.4A.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.4A.1.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexe A.2 and A3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.4A.1.1.4.1-1: Test Configuration Table**

<table>
<tr><th colspan="10">Initial Conditions</th></tr>
<tr><td colspan="3">Test Environment as specified in TS 36.508 [7] clause 4.1</td><td colspan="7">NC, TL/VL, TL/VH, TH/VL, TH/VH</td></tr>
<tr><td colspan="3">Test Frequencies as specified in TS 36.508 [7] clause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2.</td><td colspan="7">Low range, High range</td></tr>
<tr><td colspan="3">Test CC Combination setting ($N_{RB_agg}$) as specified in clause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE.</td><td colspan="7">Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2)</td></tr>
<tr><td colspan="10">Test Parameters for CA Configurations</td></tr>
<tr><th colspan="2">CA Configuration / $N_{RB_agg}$</th><th>DL Allocation</th><th colspan="7">UL Allocation</th></tr>
<tr><th>PCC $N_{RB}$</th><th>SCCs $N_{RB}$</th><th>PCC & SCC RB allocation</th><th>CC MOD</th><th>$N_{RB_alloc}$</th><th colspan="4">PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)</th></tr>
<tr><td>25</td><td>50</td><td rowspan="7">N/A for this test</td><td>QPSK</td><td>75</td><td>P_25@0</td><td>S_50@0</td><td></td><td></td></tr>
<tr><td>50</td><td>50</td><td>QPSK</td><td>100</td><td>P_50@0</td><td>S_50@0</td><td></td><td></td></tr>
<tr><td>75</td><td>75</td><td>QPSK</td><td>150</td><td>P_75@0</td><td>S_75@0</td><td>-</td><td>-</td></tr>
<tr><td>100</td><td>25</td><td>QPSK</td><td>125</td><td>P_100@0</td><td>S_25@0</td><td>-</td><td>-</td></tr>
<tr><td>100</td><td>50</td><td>QPSK</td><td>150</td><td>P_100@0</td><td>S_50@0</td><td>-</td><td>-</td></tr>
<tr><td>100</td><td>75</td><td>QPSK</td><td>175</td><td>P_100@0</td><td>S_75@0</td><td>-</td><td>-</td></tr>
<tr><td>100</td><td>100</td><td>QPSK</td><td>200</td><td>P_100@0</td><td>S_100@0</td><td>-</td><td>-</td></tr>
<tr><td colspan="10">Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.</td></tr>
</table>

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.4A.1.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.4A.1.1.4.3.

#### 6.3.4A.1.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.3.4A.1.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.4A.1.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The each UL assignment is such that the UE transmits on UL sub-frame 2 of every radio frame.
5. For FDD: Measure the UE transmission OFF power for each component carrier during the sub-frame prior to the PUSCH subframe. For TDD: Measure the UE transmission OFF power during the 10 SCFDMA symbols prior to the PUSCH subframe.
6. Measure the output power of the UE PUSCH transmission for each component carrier during one sub-frame, excluding a transient period of 20 µs at the beginning of the subframe.
7. Measure the UE transmission OFF power for each component carrier during one sub-frame following the PUSCH subframe, excluding a transient period of 20 µs at the beginning of the subframe.

#### 6.3.4A.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 6.3.4A.1.1.4.3-1: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission for PCC | |

**Table 6.3.4A.1.1.4.3-2: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| UplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | UL CA |

**Table 6.3.4A.1.1.4.3-3: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | RBC |
| | 0 | | UL CA |
| } | | | |

**Table 6.3.4A.1.1.4.3-4: UplinkPowerControlCommonSCell-r10: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25A UplinkPowerControlCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommonSCell-r10 ::= SEQUENCE { | | | |
| p0-NominalPUSCH-r10 | -105 | Test point 1 to verify a UE relative low initial power transmission for SCC | |

**Table 6.3.4A.1.1.4.3-5: TDD-Config-DEFAULT: On/OFF time mask measurement**

| Derivation Path: 36.508 [7] clause 5.3.1, Table 5.3.1-1 (*SystemInformationBlockType1*) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp5 | To enable two symbol UpPTS, and to have 9 symbols GP. | |
| } | | | |

#### 6.3.4A.1.1.5 Test requirement

The requirement for the power measured in steps 5, 6 and 7 of the test procedure shall not exceed the values specified in Table 6.3.4.1.5-1.

### 6.3.4A.1.2 General ON/OFF time mask for CA (inter-band DL CA and UL CA)

#### 6.3.4A.1.2.1 Test purpose

To verify that the general ON/OFF time mask for CA meets the requirements given in 6.3.4A.1.2.5.

The time mask for transmit ON/OFF for CA defines the ramping time allowed for the UE between transmit OFF power and transmit ON power for CA.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

#### 6.3.4A.1.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA.

#### 6.3.4A.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.4A.0.

6.3.4A.1.2.4 Test description

6.3.4A.1.2.4.1 Initial conditions

Same as in clause 6.3.4A.1.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands.
- Instead of Table 6.3.4A.1.1.4.1-1→ use Table 6.3.4A.1.2.4.1-1.
- Instead of clause 6.3.4A.1.1.4.3 use clause 6.3.4A.1.2.4.3.

**Table 6.3.4A.1.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | Low range for PCC and SCC<br>High range for PCC and SCC | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/Afor this test | QPSK | 31 | P_6@0 | S_25@0 | - | - |
| 6 | 50 | | QPSK | 56 | P_6@0 | S_50@0 | - | - |
| 15 | 25 | | QPSK | 12 | S_4@0 | P_8@0 | | |
| 25 | 6 | | QPSK | 13 | P_8@0 | P_5@0 | | |
| 25 | 15 | | QPSK | 40 | P_25@0 | S_15@0 | - | - |
| 25 | 25 | | QPSK | 50 | P_25@0 | S_25@0 | - | - |
| 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | - | - |
| 25 | 75 | | QPSK | 24 | P_8@0 | S_16@0 | | |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | - | - |
| 50 | 100 | | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 75 | 25 | | QPSK | 100 | P_75@0 | S_25@0 | - | - |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | - | - |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

6.3.4A.1.2.4.2 Test procedure

Same test procedure as in clause 6.3.4A.1.1.4.2.

- Instead of Table 6.3.4A.1.1.4.1-1→ use Table 6.3.4A.1.2.4.1-1.
- Instead of clause 6.3.4A.1.1.4.3 use clause 6.3.4A.1.2.4.3.

#### 6.3.4A.1.2.4.3 Message contents

The message contents are the same as in clause 6.3.4A.1.1.4.3.

### 6.3.4A.1.2.5 Test requirement

The requirement for the power measured in steps 5, 6 and 7 of the test procedure shall not exceed the values specified in Table 6.3.4A.1.2.5-1.

**Table 6.3.4A.1.2.5-1: General ON/OFF time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected Transmission ON Measured power | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

## 6.3.4A.1.3 General ON/OFF time mask for CA (intra-band non-contiguous DL CA and UL CA)

### 6.3.4A.1.3.1 Test purpose

To verify that the general ON/OFF time mask for CA meets the requirements given in 6.3.4A.1.3.5.

The time mask for transmit ON/OFF for CA defines the ramping time allowed for the UE between transmit OFF power and transmit ON power for CA.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

### 6.3.4A.1.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

### 6.3.4A.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.4A.0.

### 6.3.4A.1.3.4 Test description

#### 6.3.4A.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.4A.1.3.4.1-1. The details of the uplink and downlink

reference measurement channels (RMCs) are specified in Annexe A.2 and A3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.4A.1.3.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: Low Wgap, Maximum Wgap | | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | QPSK | P_25@0 | QPSK | S_25@0 |
| 2 | 25 | 25 | 5 | N/A | N/A | QPSK | P_25@0 | QPSK | S_25@0 |
| 3 | 100 | 100 | 5 | N/A | N/A | QPSK | P_100@0 | QPSK | S_100@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.<br>Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band. | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.4A.1.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.4A.1.3.4.3.

### 6.3.4A.1.3.4.2 Test procedure

Same test procedure as in clause 6.3.4A.1.1.4.2.

### 6.3.4A.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with exceptions as in clause 6.3.4A.1.1.4.3.

### 6.3.4A.1.3.5 Test requirement

The requirement for the power measured in steps 5, 6 and 7 of the test procedure shall not exceed the values specified in Table 6.3.4.1.5-1.

### 6.3.4A.1.4 General ON/OFF time mask for CA (3UL CA)

#### 6.3.4A.1.4.1 Test purpose

To verify that the general ON/OFF time mask for CA meets the requirements given in 6.3.4A.1.4.5.

The time mask for transmit ON/OFF for CA defines the ramping time allowed for the UE between transmit OFF power and transmit ON power for CA.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

#### 6.3.4A.1.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band contiguous or inter-band DL CA and UL CA.

#### 6.3.4A.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.4A.0.

#### 6.3.4A.1.4.4 Test description

##### 6.3.4A.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.4A.1.4.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexe A.2 and A3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.4A.1.4.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low and High range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC1 & SCC2 RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | | QPSK | 56 | P_6@0 | S_25@0 | S_25@0 | - |
| 6 | 50 | | QPSK | 106 | P_6@0 | S_50@0 | S_50@0 | - |
| 25 | 15 | | QPSK | 55 | P_25@0 | S_15@0 | S_15@0 | - |
| 25 | 25 | | QPSK | 75 | P_25@0 | S_25@0 | S_25@0 | - |
| 25 | 50 | | QPSK | 125 | P_25@0 | S_50@0 | S_50@0 | - |
| 50 | 50 | | QPSK | 150 | P_50@0 | S_50@0 | S_50@0 | - |
| 75 | 75 | | QPSK | 225 | P_75@0 | S_75@0 | S_75@0 | - |
| 100 | 25 | | QPSK | 150 | P_100@0 | S_25@0 | S_25@0 | - |
| 100 | 50 | | QPSK | 200 | P_100@0 | S_50@0 | S_50@0 | - |
| 100 | 75 | | QPSK | 250 | P_100@0 | S_75@0 | S_75@0 | |
| 100 | 100 | | QPSK | 300 | P_100@0 | S_100@0 | S_100@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , only the first of those is tested, according to the order on the Test Configuration Table list. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.4A.1.4.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.4A.1.4.4.3.

### 6.3.4A.1.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.3.4A.1.4.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.4A.1.4.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The each UL assignment is such that the UE transmits on UL sub-frame 2 of every radio frame.

5. For FDD: Measure the UE transmission OFF power for each component carrier during the sub-frame prior to the PUSCH subframe. For TDD: Measure the UE transmission OFF power during the 10 SCFDMA symbols prior to the PUSCH subframe.

6. Measure the output power of the UE PUSCH transmission for each component carrier during one sub-frame, excluding a transient period of 20 µs at the beginning of the subframe.

7. Measure the UE transmission OFF power for each component carrier during one sub-frame following the PUSCH subframe, excluding a transient period of 20 µs at the beginning of the subframe.

#### 6.3.4A.1.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with exceptions as in clause 6.3.4A.1.1.4.3.

#### 6.3.4A.1.4.5 Test requirement

The requirement for the power measured in steps 5, 6 and 7 of the test procedure shall not exceed the values specified in Table 6.3.4A.1.4.5-1.

**Table 6.3.4A.1.4.5-1: General ON/OFF time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected Transmission ON Measured power | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

## 6.3.4B ON/OFF time mask for UL-MIMO

### 6.3.4B.1 General ON/OFF time mask for UL-MIMO

Editor's note: The measurement period in the minimum requirement is defined to be 1 subframe (14 symbols). Due to practical reasons the TDD measurement period for off power prior the PUSCH is 10 symbols. It is FFS, if this deviation is acceptable.

Editor's notes: The following items are missing or incomplete:

- The initial conditions and test procedure are subject to further investigation

#### 6.3.4B.1.1 Test purpose

To verify that the general ON/OFF time mask for UL-MIMO meets the requirements given in 6.3.4B.1.5.

The time mask for transmit ON/OFF defines the ramping time allowed for each transmit antenna of UE between transmit OFF power and transmit ON power.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

### 6.3.4B.1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO

### 6.3.4B.1.3 Minimum conformance requirement

For UE with multiple transmit antenna connectors, the ON/OFF time mask requirements in subclause 6.3.4.1.3 apply to each transmit antenna connector.

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the general ON/OFF time mask requirements specified in subclause 6.3.4.1.3 apply to each transmit antenna connector with the UL-MIMO configurations specified in Table 6.2.2B.3-2.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.4B

### 6.3.4B.1.4 Test description

#### 6.3.4B.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.4B.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

**Table 6.3.4B.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in **TS 36.508 [7] subclause 4.3.1** | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for General On/Off Time Mask test case | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 50 | 50 |
| 15MHz | | QPSK | 75 | 75 |
| 20MHz | | QPSK | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 6.3.4B.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.4B.1.4.3. Note that PDCCH DCI format 4 sent after resetting uplink power with RRC Connection Reconfiguration, should have TPC command 0dB.

### 6.3.4B.1.4.2 Test procedure

1. SS sends uplink scheduling information via PDCCH with DCI format 4 and TPC command 0dB for C_RNTI to schedule the UL RMC according to Table 6.3.4B.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The UL assignment is such that the UE transmits on UL sub-frame 2 of every radio frame.
2. For FDD: Measure the UE transmission OFF power during the sub-frame prior to the PUSCH subframe. For TDD: Measure the UE transmission OFF power during the 10 SCFDMA symbols prior to the PUSCH subframe.
3. Measure the output power of the UE PUSCH transmission during one sub-frame, excluding a transient period of 20 µs at the beginning of the subframe.
4. Measure the UE transmission OFF power during one sub-frame following the PUSCH subframe, excluding a transient period of 20 µs at the beginning of the subframe.
5. Repeat step 2) until 4) for each of transmit antenna of the UE.

### 6.3.4B.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 6.3.4B.1.4.3-1: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::=<br>SEQUENCE {<br>p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.4B.1.4.3-2: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::=<br>SEQUENCE { | | | |
| UplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See clause 4.6.3 | SRB1 |
| | UplinkPowerControlDedicated-DEFAULT | See clause 4.6.3 | RBC |

**Table 6.3.4B.1.4.3-3: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::=<br>SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | SRB1 |
| | 0 | | RBC |
| } | | | |

**Table 6.3.4B.1.3-4: TDD-Config-DEFAULT: On/OFF time mask measurement**

| Derivation Path: 36.508 clause 5.3.1 Table 5.3.1-1 (*SystemInformationBlockType1*) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp5 | To enable two symbol UpPTS, and to have 9 symbols GP. | |
| } | | | |

### 6.3.4B.1.5 Test requirement

The requirement for the power measured in steps (2), (3) and (4) of the test procedure shall not exceed the values specified in Table 6.3.4B.1.5-1.

**Table 6.3.4B.1.5-1: General ON/OFF time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected Transmission ON Measured power | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | 7.5 dB<br>±7.8dB | 7.5 dB<br>±7.8dB | 7.5dB<br>±7.8dB | 7.5dB<br>±7.8dB | 7.5dB<br>±7.8dB | 7.5dB<br>±7.8dB |

## 6.3.4C ON/OFF time mask for DC

### 6.3.4C.1 General ON/OFF time mask for Dual Connectivity

#### 6.3.4C.1.1 Test purpose

To verify that the general ON/OFF time mask meets the requirements given in 6.3.4A.1.2.5 in a synchronous Dual Connectivity scenario with maximum (33us) time offset between carriers.

The time mask for transmit ON/OFF for CA and DC defines the ramping time allowed for the UE between transmit OFF power and transmit ON power for CA and DC.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

#### 6.3.4C.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward that support Dual Connectivity.

#### 6.3.4C.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.4A.0.

### 6.3.4C.1.4 Test description

#### 6.3.4C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E UTRA CA configurations specified in table 5.4.2A.1-2 with support of Uplink CA. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.4C.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexe A.2 and A3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.4C.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | Low range for MCG & SCG<br>High range for MCG & SCG | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **MCG CC $N_{RB}$** | **SCG CC $N_{RB}$** | **MCG & SCG RB allocation** | | **$N_{RB_alloc}$** | **MCG & SCG RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/Afor this test | QPSK | 31 | P_6@0 | S_25@0 | - | - |
| 6 | 50 | | QPSK | 56 | P_6@0 | S_50@0 | - | - |
| 25 | 15 | | QPSK | 40 | P_25@0 | S_15@0 | - | - |
| 25 | 25 | | QPSK | 50 | P_25@0 | S_25@0 | - | - |
| 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | - | - |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | - | - |
| 50 | 100 | | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | - | - |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for MCG CC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.4C.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-DC1 according to TS 36.508 [7] clause 5.2A.2A. Message contents are defined in clause 6.3.4C.1.4.3.

### 6.3.4C.1.4.2 Test procedure

1. Configure SCG CC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels with a time offset of +33 us compared to PCG CC

2. The SS shall configure SCG CC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.3.4C.1.4.3.

3. SS activates SCG CC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.4C.1.4.1-1 on both MCG CC and SCG CC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Each UL assignment is such that the UE transmits on UL sub-frame 2 of every radio frame.

5. For FDD: Measure the UE transmission OFF power for each component carrier during the sub-frame prior to the PUSCH subframe. For TDD: Measure the UE transmission OFF power during the 10 SCFDMA symbols prior to the PUSCH subframe. In time domain, the measurement shall end at the subframe border of MCG CC.

6. Measure the output power of the UE PUSCH transmission for each component carrier during one sub-frame, excluding a transient period of 20 µs at the beginning of each subframe.

7. Measure the UE transmission OFF power for each component carrier during one sub-frame following the PUSCH subframe, excluding a transient period of 20 µs at the beginning of the subframe. In time domain, the measurement shall start 20 µs after the subframe border of SCG CC.

### 6.3.4C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 6.3.4C.1.4.3-1: UplinkPowerControlCommon**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::=<br>SEQUENCE {<br>p0-NominalPUSCH | -105 | | |

**Table 6.3.4C.1.4.3-2: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| UplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | UL CA |

**Table 6.3.4C.1.4.3-3: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | RBC |
| | 0 | | UL CA |
| } | | | |

**Table 6.3.4C.1.4.3-4: UplinkPowerControlCommonSCell-r10**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25A UplinkPowerControlCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommonSCell-r10 ::= SEQUENCE { | | | |
| p0-NominalPUSCH-r10 | -105 | | |

**Table 6.3.4C.1.4.3-5: TDD-Config-DEFAULT**

| Derivation Path: 36.508 [7] clause 5.3.1, Table 5.3.1-1 (*SystemInformationBlockType1*) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp5 | To enable two symbol UpPTS, and to have 9 symbols GP. | |
| } | | | |

## 6.3.4C.1.5 Test requirement

The requirement for the power measured in steps 5, 6 and 7 of the test procedure shall not exceed the values specified in Table 6.3.4A.1.2.5-1.

**Table 6.3.4C.1.5-1: General ON/OFF time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected Transmission ON Measured power | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

## 6.3.4C.1_1 General ON/OFF time mask for asynchronous Dual Connectivity

### 6.3.4C.1_1.1 Test purpose

To verify that the general ON/OFF time mask meets the requirements given in 6.3.4A.1.2.5 in an asynchronous Dual Connectivity scenario with maximum (500us) time offset between carriers.

The time mask for transmit ON/OFF for CA and DC defines the ramping time allowed for the UE between transmit OFF power and transmit ON power for CA and DC.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

### 6.3.4C.1_1.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward that support asynchronous Dual Connectivity.

### 6.3.4C.1_1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.4A.0.

### 6.3.4C.1_1.4 Test description

#### 6.3.4C.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E UTRA CA configurations specified in table 5.4.2A.1-2 with support of Uplink CA. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.4C.1_1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexe A.2 and A3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.4C.1_1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | Low range for MCG & SCG<br>High range for MCG & SCG | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **MCG CC $N_{RB}$** | **SCG CC $N_{RB}$** | **MCG & SCG RB allocation** | | **$N_{RB_alloc}$** | **MCG & SCG RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/Afor this test | QPSK | 31 | P_6@0 | S_25@0 | - | - |
| 6 | 50 | | QPSK | 56 | P_6@0 | S_50@0 | - | - |
| 25 | 15 | | QPSK | 40 | P_25@0 | S_15@0 | - | - |
| 25 | 25 | | QPSK | 50 | P_25@0 | S_25@0 | - | - |
| 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | - | - |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | - | - |
| 50 | 100 | | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | - | - |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for MCG CC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.4C.1_1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-DC1 according to TS 36.508 [7] clause 5.2A.2A. Message contents are defined in clause 6.3.4C.1_1.4.3.

### 6.3.4C.1_1.4.2 Test procedure

1. Configure SCG CC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels with a time offset of +500 us compared to PCG CC
2. The SS shall configure SCG CC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.3.4C.1_1.4.3.

3. SS activates SCG CC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.4C.1_1.4.1-1 on both MCG CC and SCG CC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Each UL assignment is such that the UE transmits on UL sub-frame 2 of every radio frame.

5. For FDD: Measure the UE transmission OFF power for each component carrier during the sub-frame prior to the PUSCH subframe. For TDD: Measure the UE transmission OFF power during the 10 SCFDMA symbols prior to the PUSCH subframe. In time domain, the measurement shall end at the subframe border of MCG CC.

6. Measure the output power of the UE PUSCH transmission for each component carrier during one sub-frame, excluding a transient period of 20 µs at the beginning of each subframe.

7. Measure the UE transmission OFF power for each component carrier during one sub-frame following the PUSCH subframe, excluding a transient period of 20 µs at the beginning of the subframe. In time domain, the measurement shall start 20 µs after the subframe border of SCG CC.

### 6.3.4C.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 6.3.4C.1_1.4.3-1: UplinkPowerControlCommon**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalPUSCH | -105 | | |

**Table 6.3.4C.1_1.4.3-2: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| UplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | UL CA |

**Table 6.3.4C.1_1.4.3-3: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | RBC |
| | 0 | | UL CA |
| } | | | |

**Table 6.3.4C.1_1.4.3-4: UplinkPowerControlCommonSCell-r10**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25A UplinkPowerControlCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommonSCell-r10 ::= SEQUENCE { | | | |
| p0-NominalPUSCH-r10 | -105 | | |

**Table 6.3.4C.1_1.4.3-5: TDD-Config-DEFAULT**

| Derivation Path: 36.508 [7] clause 5.3.1, Table 5.3.1-1 (*SystemInformationBlockType1*) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp5 | To enable two symbol UpPTS, and to have 9 symbols GP. | |
| } | | | |

**Table 6.3.4C.1_1.4.3-6: SCG-Configuration-r12-DEFAULT**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-19F: SCG-Configuration-r12-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| | | | |
| setup SEQUENCE { | | | PSCell_Mod, PSCell_Add_Split_DRB, PSCell_Add_SCG_DRB |
| scg-ConfigPartMCG-r12 SEQUENCE { | | | |
| scg-Counter-r12 | 0 | INTEGER (0..65535) | |
| powerCoordinationInfo-r12 SEQUENCE { | | | |
| p-MeNB-r12 | 6 (30%) | INTEGER (1..16) mapped to 0..15 in Table 5.1.4.2-1 in TS 36.213 for power allocation for DC (0% - 100%) | |
| p-SeNB-r12 | 6 (30%) | INTEGER (1..16) mapped to 0..15 in Table 5.1.4.2-1 in TS 36.213 for power allocation for DC (0% - 100%) | |
| powerControlMode-r12 | 2 | DC power control mode 2 | |
| } | | | |
| } | | | |

## 6.3.4C.1_1.5 Test requirement

The requirement for the power measured in steps 5, 6 and 7 of the test procedure shall not exceed the values specified in Table 6.3.4A.1.2.5-1.

**Table 6.3.4C.1_1.5-1: General ON/OFF time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
|---|---|---|---|---|---|---|
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected Transmission ON Measured power | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

# 6.3.4E ON/OFF time mask for UE category 0

## 6.3.4E.1 General ON/OFF time mask for UE category 0

### 6.3.4E.1.1 Test purpose

Same test purpose as in clause 6.3.4.1.1.

### 6.3.4E.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.3.4E.1.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.4.1.3.

### 6.3.4E.1.4 Test description

#### 6.3.4E.1.4.1 Initial conditions

Same initial conditions as in clause 6.3.4.1.4.1 with following exception:

- Instead of Table 6.3.4.1.4.1-1 → use Table 6.3.4E.1.4.1-1.
- Connect SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.3.4E.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in **TS 36.508 [7] subclause 4.3.1** | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for General On/Off Time Mask test case | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 36 | 36 |
| 15MHz | | QPSK | 36 | 36 |
| 20MHz | | QPSK | 36 | 36 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

### 6.3.4E.1.4.2 Test procedure

Same test procedure as in clause 6.3.4.1.4.2 with the following exception for HD-FDD:

- In step 2, measure the transmission OFF power as for FDD.

### 6.3.4E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.3.4E.1.4.3-1: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.4E.1.4.3-2: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| UplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | SRB1 |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |

**Table 6.3.4E.1.4.3-3: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | SRB1 |
| | 0 | | RBC |
| } | | | |

**Table 6.3.4E.1.4.3-4: TDD-Config-DEFAULT: On/OFF time mask measurement**

| Derivation Path: 36.508 clause 5.3.1 Table 5.3.1-1 (*SystemInformationBlockType1*) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp5 | To enable two symbol UpPTS, and to have 9 symbols GP. | |
| } | | | |

## 6.3.4E.1.5 Test requirement

The requirement for the power measured in steps (2), (3) and (4) of the test procedure shall not exceed the values specified in Table 6.3.4E.1.5-1.

**Table 6.3.4E.1.5-1: General ON/OFF time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected Transmission ON Measured power | -14.8 dBm | -10.8 dBm | -8.6 dBm | -7 dBm | -7 dBm | -7 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

# 6.3.4E.2 PRACH and SRS time mask for UE category 0

## 6.3.4E.2.1 PRACH time mask for UE category 0

### 6.3.4E.2.1.1 Test purpose

Same test purpose as in clause 6.3.4.2.1.1.

### 6.3.4E.2.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

#### 6.3.4E.2.1.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.4.2.1.3.

#### 6.3.4E.2.1.4 Test description

##### 6.3.4E.2.1.4.1 Initial conditions

Same initial conditions as in clause 6.3.4.2.1.4.1 with the following exception:

- Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

##### 6.3.4E.2.1.4.2 Test procedure

Same test procedure as in clause 6.3.4.2.1.4.2.

##### 6.3.4E.2.1.4.3 Message contents

Same message contents as in clause 6.3.4.2.1.3.

#### 6.3.4E.2.1.5 Test requirement

The requirement for the power measured in steps (3), (4) and (5) of the test procedure shall not exceed the values specified in Table 6.3.4E.2.1.5-1.

**Table 6.3.4E.2.1.5-1: PRACH time mask**

| | **Channel bandwidth / Output Power [dBm] / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected PRACH Transmission ON Measured power | -1 dBm | -1 dBm | -1 dBm | -1 dBm | -1 dBm | -1 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

### 6.3.4E.2.2 SRS time mask for UE category 0

#### 6.3.4E.2.2.1 Test purpose

Same test purpose as in clause 6.3.4.2.2.1.

#### 6.3.4E.2.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

#### 6.3.4E.2.2.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.4.2.2.3.

#### 6.3.4E.2.2.4 Test description

##### 6.3.4E.2.2.4.1 Initial conditions

Same initial conditions as in clause 6.3.4.2.2.4.1 with the following exception:

- Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

##### 6.3.4E.2.2.4.2 Test procedure

Same test procedure as in clause 6.3.4.2.2.4.2.

##### 6.3.4E.2.2.4.3 Message contents

Same message contents as in clause 6.3.4.2.2.4.3.

#### 6.3.4E.2.2.5 Test requirement

The requirement for the power measured in steps (1), (2) and (3) of the test procedure shall not exceed the values specified in Table 6.3.4E.2.2.5-1.

**Table 6.3.4E.2.2.5-1: SRS time mask**

| | **Channel bandwidth / Output Power [dBm] / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected SRS Transmission ON Measured power | -2.6 dBm | -2.6 dBm | -2.6 dBm | -2.6 dBm | -2.6 dBm | -2.6 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

## 6.3.4EA ON/OFF time mask for UE category M1

### 6.3.4EA.1 General ON/OFF time mask for UE category M1

#### 6.3.4EA.1.1 Test purpose

Same test purpose as in clause 6.3.4.1.1.

#### 6.3.4EA.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

#### 6.3.4EA.1.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.4.1.3.

## 6.3.4EA.1.4 Test description

### 6.3.4EA.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.4EA.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2

**Table 6.3.4EA.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5 MHz | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for General On/Off Time Mask test case | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| 5MHz | | QPSK | 6 | 6 | 0 |
| Note 1: Denote where in the channel bandwidth the narrowband shall be placed. Narrowband and narrowband index are defined in TS 36.211, 5.2.4. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.3.4EA.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.3.4EA.1.4.3. Note that MPDCCH DCI format 6-0A sent after resetting uplink power with RRC Connection Reconfiguration, should have TPC command 0dB.

### 6.3.4EA.1.4.2 Test procedure

1. The SS sends uplink scheduling information via MPDCCH DCI format 6-0A with TPC command 0dB for C_RNTI to schedule the UL RMC according to Table 6.3.4EA.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. For FDD and TDD: The UL assignment is such that the UE transmits on UL sub-frame 2 of every radio frame. For HD-FDD: The UL assignment is such that the UE transmits on UL sub-frame 5 of every radio frame.
2. For FDD and HD-FDD: Measure the UE transmission OFF power during the sub-frame prior to the PUSCH subframe. For TDD: Measure the UE transmission OFF power during the 10 SCFDMA symbols prior to the PUSCH subframe.
3. Measure the output power of the UE PUSCH transmission during one sub-frame, excluding a transient period of 20 µs at the beginning of the subframe.
4. Measure the UE transmission OFF power during one sub-frame following the PUSCH subframe, excluding a transient period of 20 µs at the beginning of the subframe.

### 6.3.4EA.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA and the following exceptions:

**Table 6.3.4EA.1.4.3-1: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.4EA.1.4.3-2: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| UplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | SRB1 |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |

**Table 6.3.4EA.1.4.3-3: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | SRB1 |
| | 0 | | RBC |
| } | | | |

**Table 6.3.4EA.1.4.3-4: TDD-Config-DEFAULT: On/OFF time mask measurement**

| Derivation Path: 36.508 clause 5.3.1 Table 5.3.1-1 (*SystemInformationBlockType1*) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp5 | To enable two symbol UpPTS, and to have 9 symbols GP. | |
| } | | | |

### 6.3.4EA.1.5 Test requirement

The requirement for the power measured in steps (2), (3) and (4) of the test procedure shall not exceed the values specified in Table 6.3.4EA.1.5-1.

**Table 6.3.4EA.1.5-1: General ON/OFF time mask**

| | Channel bandwidth / minimum output power / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | N/A | N/A | 4.5 MHz | N/A | N/A | N/A |
| Expected Transmission ON Measured power | N/A | N/A | -14.8 dBm | N/A | N/A | N/A |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | N/A | N/A | ± 7.5dB<br>± 7.8dB | N/A | N/A | N/A |

## 6.3.4EA.2 PRACH and SRS ON/OFF time mask for UE category M1

### 6.3.4EA.2.1 PRACH time mask for UE category M1

#### 6.3.4EA.2.1.1 Test purpose

Same test purpose as in clause 6.3.4.2.1.1.

#### 6.3.4EA.2.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

#### 6.3.4EA.2.1.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.4.2.1.3.

#### 6.3.4EA.2.1.4 Test description

##### 6.3.4EA.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.4EA.2.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3.

**Table 6.3.4EA.2.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | Mid range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | 5 MHz | |
| PRACH preamble format | FDD and HD-FDD | TDD |
| PRACH Configuration Index | 3 | 51 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.3.4EA.2.1.4.3.

#### 6.3.4EA.2.1.4.2 Test procedure

1. The SS shall signal a Random Access Preamble ID via a MPDCCH order to the UE and initiate a Non-contention based Random Access procedure.
2. The UE shall send the signalled preamble to the SS.
3. For FDD UE, the SS measure the UE transmission OFF power during the sub-frame preceding the PRACH preamble excluding a transient period of 20 µs according to Figure 6.3.4.2.1.3-1. For TDD UE, the SS measure the UE transmission OFF power starting (20us+the duration of 8 OFDM symbols) before the PRACH starts, and ending 20us before PRACH starts. Note, the nominal PRACH timing for TDD is not aligned with the sub frame and symbol raster.
4. Measure the output power of the transmitted PRACH preamble according to Figure 6.3.4.2.1.3-1.
5. Measure the UE transmission OFF power, starting 20 µs after the PRACH preamble ends for a measurement period of 980 µs.

#### 6.3.4EA.2.1.4.3 Message contents

Same message contents as in clause 6.3.4.2.1.4.3 with the condition CEModeA.

### 6.3.4EA.2.1.5 Test requirement

The requirement for the power measured in steps (3), (4) and (5) of the test procedure shall not exceed the values specified in Table 6.3.4EA.2.1.5-1.

**Table 6.3.4EA.2.1.5-1: PRACH time mask**

| | **Channel bandwidth / Output Power [dBm] / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | N/A | N/A | 4.5 MHz | N/A | N/A | N/A |
| Expected PRACH Transmission ON Measured power | N/A | N/A | -1 dBm | N/A | N/A | N/A |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | N/A | N/A | ± 7.5dB<br>± 7.8dB | N/A | N/A | N/A |

## 6.3.4EA.2.2 SRS time mask for UE category M1

### 6.3.4EA.2.2.1 Test purpose

Same test purpose as in clause 6.3.4.2.2.1.

### 6.3.4EA.2.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

### 6.3.4EA.2.2.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.4.2.2.3.

### 6.3.4EA.2.2.4 Test description

#### 6.3.4EA.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.4EA.2.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3.

**Table 6.3.4EA.2.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | Mid range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | 5 MHz | |
| SRS configuration | | |
| | FDD and HD-FDD | TDD |
| srs-BandwidthConfig | bw7 | bw7 |
| srs-SubframeConfig | sc3 | sc0 |
| ackNackSRS-SimultaneousTransmission | FALSE | FALSE |
| srsMaxUpPts | N/A | N/A |
| srs-Bandwidth | bw3 | bw3 |
| srs-HoppingBandwidth | hbw3 | hbw0 |
| freqDomainPosition | 0 | 0 |
| Duration | TRUE | TRUE |
| srs-ConfigIndex | 7 | 0 |
| transmissionComb | 0 | 0 |
| cyclicShift | cs0 | cs0 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.3.4EA.2.2.4.3. Note that MPDCCH DCI format 6-0A sent after resetting uplink power with RRC Connection Reconfiguration, should have TPC command 0dB.

#### 6.3.4EA.2.2.4.2 Test procedure

1. For FDD and HD-FDD UE, the SS measure the UE transmission OFF power during the 13 symbols preceding the SRS symbol excluding a transient period of 20 μs according to Figure 6.3.4.2.2.3-1. For TDD UE, the SS

measure the UE transmission OFF power during the 8 symbols preceding the two SRS symbols excluding a transient period of 20μs according to Figure 6.3.4.2.2.3-2.

2. Measure the output power of the transmitted SRS according to Figure 6.3.4.2.2.3-1 for FDD and HD-FDD UE and according to Figure 6.3.4.2.2.3-2 for TDD UE, the transient periods are excluded from measurement accordingly.

3. Measure the UE transmission OFF power during the sub-frame following the SRS under test, excluding a transient period of 20 μs according to Figure 6.3.4.2.2.3-1 for FDD and HD-FDD UE and according to Figure 6.3.4.2.2.3-2 for TDD UE.

#### 6.3.4EA.2.2.4.3 Message contents

Same message contents as in clause 6.3.4.2.2.4.3 with the following exception.

**Table 6.3.4EA.2.2.4.3-1: SchedulingRequest-Config**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SchedulingRequest-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| sr-ConfigIndex | 33 | | HD-FDD |
| } | | | |
| } | | | |

| **Condition** | **Explanation** |
|---|---|
| **HD-FDD** | **Half Duplex FDD cell environment** |

#### 6.3.4EA.2.2.5 Test requirement

The requirement for the power measured in steps (1), (2) and (3) of the test procedure shall not exceed the values specified in Table 6.3.4EA.2.2.5-1.

**Table 6.3.4EA.2.2.5-1: SRS time mask**

| | **Channel bandwidth / Output Power [dBm] / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | N/A | N/A | 4.5 MHz | N/A | N/A | N/A |
| Expected SRS Transmission ON Measured power | N/A | N/A | -2.6 dBm | N/A | N/A | N/A |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | N/A | N/A | ± 7.5dB<br>± 7.8dB | N/A | N/A | N/A |

## 6.3.4EB ON/OFF time mask for UE category 1bis

### 6.3.4EB.1 General ON/OFF time mask for UE category 1bis

#### 6.3.4EB.1.1 Test purpose

Same test purpose as in clause 6.3.4.1.1

### 6.3.4EB.1.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of category 1bis.

### 6.3.4EB.1.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.4.1.3.

### 6.3.4EB.1.4 Test description

#### 6.3.4EB.1.4.1 Initial conditions

Same initial conditions as in clause 6.3.4.1.4.1 with following exception:

- Connect SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.3.4EB.1.4.2 Test procedure

Same test procedure as in clause 6.3.4.1.4.2.

#### 6.3.4EB.1.4.3 Message contents

Same message contents as in clause 6.3.4.1.4.3.

### 6.3.4EB.1.5 Test requirement

The requirement for the power measured in steps (2), (3) and (4) of the test procedure shall not exceed the values specified in Table 6.3.4EB.1.5-1.

**Table 6.3.4EB.1.5-1: General ON/OFF time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected Transmission ON Measured power | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

## 6.3.4EB.2 PRACH and SRS ON/OFF time mask for UE category 1bis

### 6.3.4EB.2.1 PRACH time mask for UE category 1bis

#### 6.3.4EB.2.1.1 Test purpose

Same test purpose as in clause 6.3.4.2.1.1

#### 6.3.4EB.2.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of category 1bis

#### 6.3.4EB.2.1.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.4.2.1.3.

#### 6.3.4EB.2.1.4 Test description

##### 6.3.4EB.2.1.4.1 Initial conditions

Same initial conditions as in clause 6.3.4.2.1.4.1 with the following exception:

- Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna

##### 6.3.4EB.2.1.4.2 Test procedure

Same test procedure as in clause 6.3.4.2.1.4.2.

##### 6.3.4EB.2.1.4.3 Message contents

Same message contents as in clause 6.3.4.2.1.4.3.

#### 6.3.4EB.2.1.5 Test requirement

The requirement for the power measured in steps (2), (3) and (4) of the test procedure shall not exceed the values specified in Table 6.3.4EB.2.1.5-1.

**Table 6.3.4EB.2.1.5-1: General ON/OFF time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected Transmission ON Measured power | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

### 6.3.4EB.2.2 SRS time mask for UE category 1bis

#### 6.3.4EB.2.2.1 Test purpose

Same test purpose as in clause 6.3.4.2.2.1

#### 6.3.4EB.2.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of category 1bis

#### 6.3.4EB.2.2.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.4.2.2.3.

#### 6.3.4EB.2.2.4 Test description

##### 6.3.4EB.2.2.4.1 Initial conditions

Same initial conditions as in clause 6.3.4.2.2.4.1 with the following exception:

- Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna

##### 6.3.4EB.2.2.4.2 Test procedure

Same test procedure as in clause 6.3.4.2.2.4.2.

##### 6.3.4EB.2.2.4.3 Message contents

Same message contents as in clause 6.3.4.2.2.4.3.

#### 6.3.4EB.2.2.5 Test requirement

The requirement for the power measured in steps (1), (2) and (3) of the test procedure shall not exceed the values specified in Table 6.3.4.2.2.5-1.

**Table 6.3.4.2.2.5-1: SRS time mask**

| | **Channel bandwidth / Output Power [dBm] / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤ -48.2 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected SRS Transmission ON Measured power | -2.6 dBm | -2.6 dBm | -2.6 dBm | -2.6 dBm | -2.6 dBm | -2.6 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB | ± 7.5dB<br>± 7.8dB |

## 6.3.4EC ON/OFF time mask for UE category M2

### 6.3.4EC.1 General ON/OFF time mask for UE category M2

#### 6.3.4EC.1.1 Test purpose

Same test purpose as in clause 6.3.4.1.1.

#### 6.3.4EC.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward of UE category M2.

### 6.3.4EC.1.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.4.1.3.

### 6.3.4EC.1.4 Test description

#### 6.3.4EC.1.4.1 Initial conditions

Same as in clause 6.3.4EA.1.4.1 with the following exceptions:

- Instead of Table 6.3.4EA.1.4.1-1 -> use Table 6.3.4EC.1.4.1-1

**Table 6.3.4EC.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5 MHz | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for General On/Off Time Mask test case | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| 5MHz | | QPSK | 24 | 24 | 0 |
| Note 1: Denotes where in the channel bandwidth the wideband shall be placed. Narrowband index and Wideband are defined in TS 36.211, 5.2.4 | | | | | |

#### 6.3.4EC.1.4.2 Test procedure

Same as in clause 6.3.4EA.1.4.2 with the following exceptions:

- Instead of Table 6.3.4EA.1.4.1-1 -> use Table 6.3.4EC.1.4.1-1

#### 6.3.4EC.1.4.3 Message contents

Same as in clause 6.3.4EA.1.4.3.

### 6.3.4EC.1.5 Test requirement

Same as in clause 6.3.4EA.1.5.

## 6.3.4F ON/OFF time mask for category NB1 and NB2

### 6.3.4F.1 General ON/OFF time mask for category NB1 and NB2

#### 6.3.4F.1.1 Test purpose

To verify that the general ON/OFF time mask meets the requirements given in 6.3.4F.1.5.

The time mask for transmit ON/OFF defines the ramping time allowed for the UE between transmit OFF power and transmit ON power.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

### 6.3.4F.1.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

### 6.3.4F.1.3 Minimum conformance requirement

E-UTRA general ON/OFF time mask in subclause 6.3.4.1 applies for category NB1 and NB2 UE with an exception that for 3.75kHz sub-carrier spacing the transmit OFF power is defined as mean power in one slot (2ms) and for 15kHz sub-carrier spacing the transmit OFF power is defined as mean power in one sub-frame (1ms), excluding any transient periods. The ON power is defined as the mean power over one RU excluding any transient periods.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.4F.1.

### 6.3.4F.1.4 Test description

#### 6.3.4F.1.4.1 Initial conditions

Initial conditions are set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.4F.1.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annex A.2. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 6.3.4F.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 8.1.1 | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.1 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A | **Modulation** | **$N_{tones}$** | **Sub-carrier spacing (kHz)** |
| 1 | | QPSK | 1@0 | 15kHz |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to [Annex H.1 and H.3.0].

4. The UL Reference Measurement channel is set according to Table 6.3.4F.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.3.4F.1.4.3.

#### 6.3.4F.1.4.2 Test procedure

1. SS sends uplink scheduling information via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.3.4F.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. (UE should be already transmitting $P_{UMAX}$ after Initial Conditions setting)

2. Measure the UE transmission OFF power as the mean power in one sub-frame (1ms) prior to the NPUSCH RU, excluding a transient period of 20 µs at the beginning of the sub-frame.

3. Measure the output power of the UE NPUSCH transmission as the mean power in one RU, excluding a transient period of 20 µs at the beginning of the RU.

4. Measure the UE transmission OFF power power as the mean power in one sub-frame (1ms) following the NPUSCH RU, excluding a transient period of 20 µs at the beginning of the sub-frame.

#### 6.3.4F.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 with the following exceptions.

**Table 6.3.4F.1.4.3-1: P0-NominalNPUSCH-r13 configuration**

| Derivation Path: 36.508 clause 8.1.6.3 Table 8.1.6.3-14: UplinkPowerControlCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalNPUSCH-r13 | -117 (dBm) | | |
| alpha-r13 | al1 (1) | | |
| deltaPreambleMsg3-r13 | 4 | | |
| } | | | |

**Table 6.3.4F.1.4.3-2: NPDSCH-ConfigCommon-NB-DEFAULT configuration**

| Derivation Path: 36.508 clause 8.1.6.3 Table 8.1.6.3-4: NPDSCH-ConfigCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPDSCH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| nrs-Power-r13 | 21 (dBm) | | |
| } | | | |

### 6.3.4F.1.5 Test requirement

The requirement for the power measured in steps (2), (3) and (4) of the test procedure shall not exceed the values specified in Table 6.3.4F.1.5-1.

**Table 6.3.4F.1.5-1: General ON/OFF time mask for category NB1 and NB2**

| | **Channel bandwidth / minimum output power / measurement bandwidth** |
|---|---|
| | **200 kHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm |
| Transmission OFF Measurement bandwidth | 180kHz |
| Expected Transmission ON Measured power | -11 dBm |
| ON power tolerance f ≤ 3.0GHz | ± 7.5 dB |

## 6.3.4F.2 NPRACH time mask for category NB1 and NB2

### 6.3.4F.2.1 Test purpose

To verify that the NPRACH time mask meets the requirements given in 6.3.4F.2.5.

The time mask for NPRACH time mask defines the ramping time allowed for the UE between transmit OFF power and transmit ON power when transmitting the NPRACH.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

### 6.3.4F.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of category NB1.

This test case applies to all types of E-UTRA UE release 14 and forward of category NB2.

### 6.3.4F.2.3 Minimum conformance requirement

The NPRACH ON power is specified as the mean power over the NPRACH measurement period excluding any transient periods as shown in Figure 6.3.4F.2.3-1. The measurement period for different NPRACH preamble format is specified in Table 6.3.4F.2.3-1.

There are no additional requirements on UE transmit power beyond that which is required in subclause 6.2.2F and subclause 6.6.2F.3.

**Table 6.3.4F.2.3-1: NPRACH ON power measurement period**

| NPRACH preamble format | Measurement period (ms) |
|---|---|
| 0 | 5.6 |
| 1 | 6.4 |

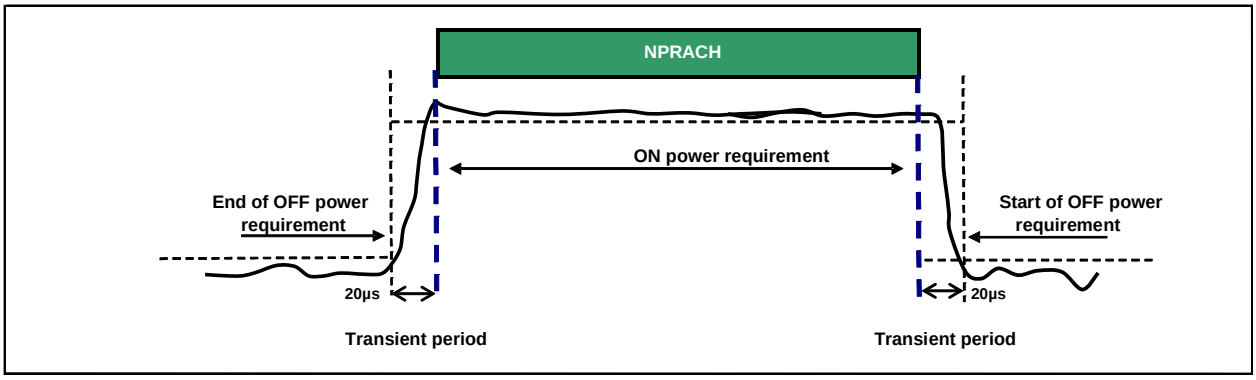



**Figure 6.3.4F.2.3-1: NPRACH ON/OFF time mask**

The normative reference for this requirement is TS 36.101 [2] clause 6.3.4F.2.

### 6.3.4F.2.4 Test description

#### 6.3.4F.2.4.1 Initial conditions

Initial conditions are set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.4F.2.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annex A.2.4.

**Table 6.3.4F.2.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 8.1.1 | Normal |

| | |
|---|---|
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | Frequency ranges defined in Annex K.1.1 |
| NPRACH preamble format | 0 |
| | 1 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to [Annex H.1 and H.3.0].
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.3.4F.2.4.3 with NPRACH Format 0.

### 6.3.4F.2.4.2 Test procedure

1. The SS shall set RS EPRE according to Table 6.3.4F.2.4.1-1.
2. The SS send the paging and UE shall send a preamble to the SS.
3. The SS measure the UE transmission OFF power during the sub-frame preceding the NPRACH preamble excluding a transient period of 20 µs according to Figure 6.3.4F.2.3-1.
4. Measure the output power of the transmitted NPRACH preamble according to Figure 6.3.4F.2.3-1.
5. Measure the UE transmission OFF power, starting 20 µs after the NPRACH preamble ends for a measurement period of 980 µs.
6. Switches off and on the UE and ensures the UE is in State 3A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.3.4F.1.4.3 with NPRACH Format 1.
7. Repeat test with step 1-4.

### 6.3.4F.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.6 with the following exceptions:

**Table 6.3.4F.2.4.3-1: RACH-ConfigCommon-NB-DEFAULT*:* NPRACH measurement**

| Derivation Path: TS 36.508 [7] clause 8.1.6, Table 8.1.6.3-8 RACH-ConfigCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| powerRampingParameters-r13 SEQUENCE { | | | |
| powerRampingStep | dB0 | 0 dB | |
| preambleInitialReceivedTargetPower | -dBm-120 | -120 dBm | NPRACH Format 0 |
| | dBm-120 | -120 dBm | NPRACH Format 1 |
| } | | | |
| ) | | | |

**Table 6.3.4F.2.4.3-2: NPDSCH-ConfigCommon-NB-DEFAULT configuration**

| Derivation Path: TS 36.508 [7] clause 8.1.6.3, Table 8.1.6.3-4 NPDSCH-ConfigCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPDSCH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| nrs-Power-r13 | 24 (dBm) | | |
| } | | | |

### 6.3.4F.2.5 Test requirement

The requirement for the power measured in steps (3), (4) and (5) of the test procedure shall not exceed the values specified in Table 6.3.4F.2.5-1.

**Table 6.3.4F.2.5-1: NPRACH time mask for category NB1 and NB2**

| | **Channel bandwidth / minimum output power / measurement bandwidth** |
|---|---|
| | **200 kHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤ -48.5 dBm |
| Transmission OFF Measurement bandwidth | 180 kHz |
| Expected NPRACH Transmission ON Measured power | -11 dBm |
| ON power tolerance f ≤ 3.0GHz | ± 7.5 dB |

## 6.3.4G ON/OFF time mask for V2X Communication

### 6.3.4G.1 General ON/OFF time mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

#### 6.3.4G.1.1 Test purpose

To verify that the general ON/OFF time mask meets the requirements given in 6.3.4G.1.5.

#### 6.3.4G.1.2 Test applicability

This test applies to all types of UE that support V2X Sidelink Communication and Band 47.

#### 6.3.4G.1.3 Minimum conformance requirements

For V2X Communications, additional requirements on ON/OFF time masks for V2X physical channels and signals are specified in this clause.

The General ON/OFF time mask in subclause 6.3.4D.1 [2] apply for E-UTRA V2X sidelink UE.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.4G.

#### 6.3.4G.1.4 Test description

##### 6.3.4G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-1. All of these configurations shall be tested with applicable test

parameters for each channel bandwidth, and are shown in Table 6.3.4G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annexes A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.3.4G.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10 MHz | QPSK | 48 |
| 20 MHz | QPSK | 96 |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.3.4G.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.3.4G.1.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.3.4G.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Measure the UE transmission OFF power the sub-frame prior to the PSSCH subframe.
3. Measure the output power of the UE PSSCH transmission during one sub-frame, excluding a transient period of 20 µs at the beginning of the subframe.
4. Measure the UE transmission OFF power during one sub-frame following the PSSCH subframe, excluding a transient period of 20 µs at the beginning of the subframe.

### 6.3.4G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7I and 4.10 with the following exceptions:

**Table 6.3.4G.1.4.3-1: SL-CommResourcePoolV2X-r14**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20C SL-CommResourcePoolV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResourcePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| dataTxParameters-r14 | -20 | INTEGER (-126..31) | |
| } | | | |

### 6.3.4G.1.5 Test requirement

The requirement for the power measured in steps 2, 3 and 4 of the test procedure shall not exceed the values specified in Table 6.3.4G.1.5-1.

**Table 6.3.4G.1.5-1: General ON/OFF time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency 4.2GHz < f ≤ 6.0GHz: ≤ -48 dBm | | | | | |
| Transmission OFF Measurement bandwidth | N/A | N/A | N/A | 9 MHz | N/A | 18 MHz |
| Expected Transmission ON Measured power | N/A | N/A | N/A | -2.8 dBm | N/A | 0.0 dBm |
| ON power tolerance 4.2GHz < f ≤ 6.0GHz | N/A | N/A | N/A | ± 8.0dB | N/A | ± 8.0 dB |

## 6.3.4G.2 General ON/OFF time mask for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

### 6.3.4G.2.1 Test purpose

To verify that the general ON/OFF time mask meets the requirements given in 6.3.4G.2.5.

### 6.3.4G.2.2 Test applicability

This test applies to all types of E-UTRA UE release 14 and forward that support V2X Communication.

### 6.3.4G.2.3 Minimum conformance requirements

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-2, the requirements in subclause 6.3.4G [2] apply for the V2X sidelink transmission and the requirements in subclause 6.3.4 [2] apply for the E-UTRA uplink transmission.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.4G.

### 6.3.4G.2.4 Test description

#### 6.3.4G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.3.4G.2.4.1-1. The details of the uplink and V2X

reference measurement channels (RMCs) are specified in Annexes A.2 and A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.4G.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | | Low range for uplink and Low range for V2X, High range for uplink and High range for V2X | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink** | **Uplink Configuration** | | | **V2X Configuration** | | |
| Ch BW | N/A for General ON/OFF time mask test case | Mod'n | RB allocation | | Ch BW | Mod'n | RB allocation |
| | | | FDD | TDD | | | |
| 1.4 MHz | | QPSK | 6 | 6 | 10 MHz | QPSK | 48@2 |
| 3 MHz | | QPSK | 15 | 15 | 20 MHz | QPSK | 96@2 |
| 5 MHz | | QPSK | 25 | 25 | | | |
| 10 MHz | | QPSK | 50 | 50 | | | |
| 15 MHz | | QPSK | 75 | 75 | | | |
| 20 MHz | | QPSK | 100 | 100 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.3.4G.2.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X reference measurement channel is set according to Table 6.3.4G.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 6.3.4G.2.4.3.

### 6.3.4G.2.4.2 Test procedure

1. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.3.4G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.
2. Measure the UE transmission OFF power during the sub-frame prior to the PSSCH subframe for E-UTRA V2X sidelink.
   Measure the UE transmission OFF power during the sub-frame prior to the PUSCH subframe for E-UTRA FDD uplink. Meausre the UE transmission OFF power during 10 SCFDMA symbols prior to the PUSCH subframe for E-UTRA TDD uplink.
3. Measure the output power of the UE PSSCH transmission during one sub-frame, excluding a transient period of 20 µs at the beginning of the subframe, and excluding the last symbol as guard period for E-UTRA V2X sidelink.
   Measure the output power of the UE PUSCH transmission during one sub-frame, excluding a transient period of 20 µs at the beginning of the subframe for E-UTRA uplink.
4. Measure the UE transmission OFF power during the last symbol of PSSCH subframe, and one sub-frame following the PSSCH subframe, excluding a transient period of 20 µs at the beginning of the last symbol of PSSCH subframe for E-UTRA V2X sidelink.
   Measure the UE transmission OFF power during one sub-frame following the PUSCH subframe, excluding a transient period of 20 µs at the beginning of the subframe for E-UTRA uplink.

6.3.4G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.10 with the following exceptions:

**Table 6.3.4G.2.4.3-1: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE {<br>p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.4G.2.4.3-2: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| UplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | SRB1 |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |

**Table 6.3.4G.2.4.3-3: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | SRB1 |
| | 0 | | RBC |
| } | | | |

**Table 6.3.4G.2.4.3-4: TDD-Config-DEFAULT: On/OFF time mask measurement**

| Derivation Path: 36.508 clause 5.3.1 Table 5.3.1-1 (*SystemInformationBlockType1*) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp5 | To enable two symbol UpPTS, and to have 9 symbols GP. | |
| } | | | |

**Table 6.3.4G.2.4.3-5: SL-CommResourcePoolV2X-r14**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20C SL-CommResourcePoolV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResourcePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| dataTxParameters-r14 SEQUENCE { | | | |
| p0-r12 | -20 | INTEGER (-126..31) | |
| } | | | |
| } | | | |

### 6.3.4G.2.5 Test requirement

The requirement for the power measured in steps 2, 3 and 4 of the test procedure shall not exceed the values specified in Table 6.3.4G.2.5-1.

**Table 6.3.4G.2.5-1: General ON/OFF time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency f ≤ 3.0GHz: ≤-48.5 dBm<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: ≤-48.2 dBm<br>For carrier frequency 4.2GHz < f ≤ 6.0GHz : ≤-48 dBm | | | | | |
| Transmission OFF Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Expected Transmission ON Measured power for E-UTRA uplink transmission | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Expected Transmission ON Measured power for E-UTRA V2X sidelink transmission | N/A | N/A | N/A | -2.8 dBm | N/A | 0.0 dBm |
| ON power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz<br>4.2GHz < f ≤ 6.0GHz | <br>± 7.5dB<br>± 7.8dB | <br>± 7.5dB<br>± 7.8dB | <br>± 7.5dB<br>± 7.8dB | <br>± 7.5dB<br>± 7.8dB<br>± 8.0dB | <br>± 7.5dB<br>± 7.8dB | <br>± 7.5dB<br>± 7.8dB<br>± 8.0dB |

## 6.3.4G.3 General ON/OFF time mask for V2X Communication / Intra-band contiguous multi-carrier operation

Editor's note: This test case is incomplete. The following items are missing or incomplete:

- Test requirement including the test tolerance in Annex F.3.2

- Applicability spec

### 6.3.4G.3.1 Test purpose

To verify that the general ON/OFF time mask meets the requirements given in 6.3.4G.3.5.

### 6.3.4G.3.2 Test applicability

This test applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 6.3.4G.3.3 Minimum conformance requirements

For intra-band contiguous multi-carrier operation the general ON/OFF time mask is applicable for each component carrier during the ON power period and the transient periods. The OFF period shall only be applicable for each component carrier when all the component carriers are OFF.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.4G.

## 6.3.4G.3.4 Test description

### 6.3.4G.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-4. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.4G.3.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.3.4G.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Mid range | |
| Test Channel Bandwidths as specified in subclause 5.4.2G | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for Channel Bandwidths** | | | |
| **V2X multi-carrier Configuration** | | **V2X PSSCH Allocation** | |
| **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **CC1 and CC2 RB Allocation** |
| 10MHz | 10MHz | QPSK | 48+48 |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.89a.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.3.4G.3.4.3.
3. The V2X reference measurement channel is set according to Table 6.3.4G.3.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.3.4G.3.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Measure the UE transmission OFF power for each component carrier during the sub-frame prior to the PSSCH subframe.
3. Measure the output power of the UE PSSCH transmission for each component carrier during one sub-frame, excluding a transient period of 20 µs at the beginning of the subframe.
4. Measure the UE transmission OFF power for each component carrier during one sub-frame following the PSSCH subframe, excluding a transient period of 20 µs at the beginning of the subframe.

### 6.3.4G.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.3.4G.3.4.3-0: +CCUTLE (Initial condition)**

| Derivation Path: 36.508 Table 4.7I-2: +CCUTLE, condition Close and Transmit |
|---|

**Table 6.3.4G.3.4.3-1: SL-CommResourcePoolV2X-r14**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20C SL-CommResourcePoolV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResourcePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| dataTxParameters-r14 | -20 | INTEGER (-126..31) | |
| } | | | |

## 6.3.4G.3.5 Test requirement

The requirement for the power measured in steps 2, 3 and 4 of the test procedure shall not exceed the values specified in Table 6.3.4G.3.5-1.

**Table 6.3.4G.3.5-1: General ON/OFF time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency 4.2GHz < f ≤ 6.0GHz: ≤ [-48.2] dBm | | | | | |
| Transmission OFF Measurement bandwidth | N/A | N/A | N/A | N/A | N/A | 18 MHz |
| Expected Transmission ON Measured power | N/A | N/A | N/A | N/A | N/A | 0.0 dBm |
| ON power tolerance 4.2GHz < f ≤ 6.0GHz | N/A | N/A | N/A | N/A | N/A | [± 7.8] dB |

## 6.3.4G.4 PSSS/SSSS time mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 6.3.4G.4.1 Test purpose

To verify that the PSSS/SSSS time mask meets the requirements given in 6.3.4G.4.5.

### 6.3.4G.4.2 Test applicability

This test applies to all types of UE that support V2X Sidelink Communication and Band 47.

### 6.3.4G.4.3 Minimum conformance requirements

The PSSS time mask / SSSS time mask defines the observation period between the Transmit OFF and ON power and between Transmit ON and OFF power for PSSS/SSSS transmissions in a subframe when not multiplexed with PSBCH in that subframe.

There are no additional requirements on UE transmit power beyond that which is required in subclause 6.2.2 and subclause 6.6.2.3.

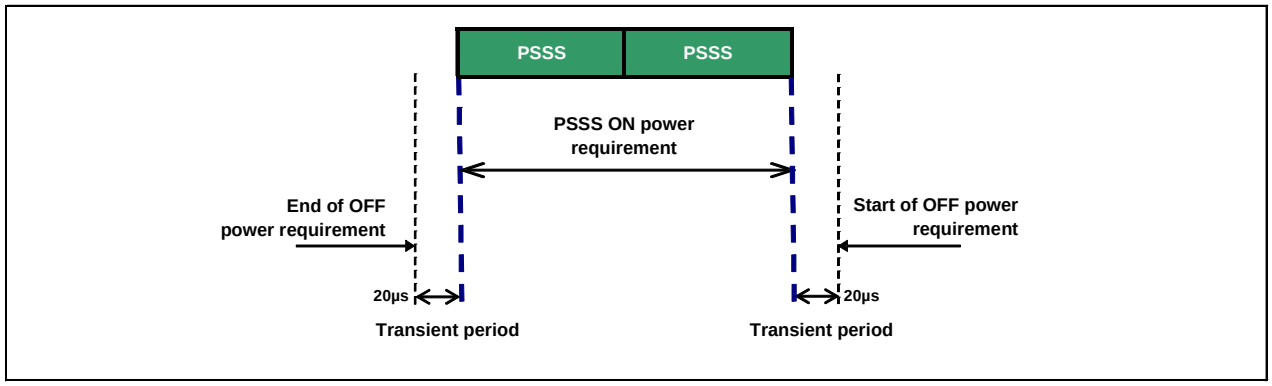



**Figure 6.3.4G.4.3-1: PSSS time mask for normal CP transmission (when not time-multiplexed with PSBCH)**

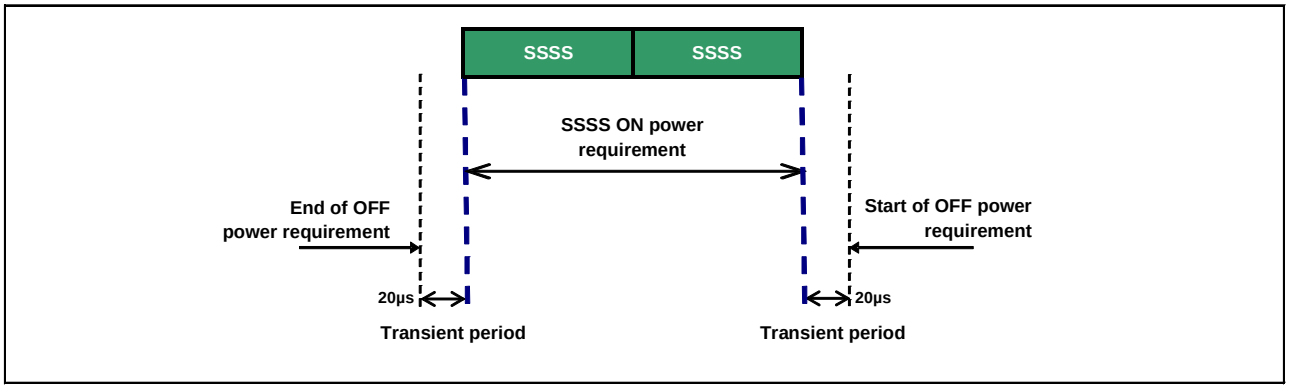



**Figure 6.3.4G.4.3-2: SSSS time mask (when not time-multiplexed with PSBCH)**

The normative reference for this requirement is TS 36.101 [2] clause 6.3.4G.

## 6.3.4G.4.4 Test description

### 6.3.4G.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.4G.4.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.3.4G.4.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest |
| **Test Parameters for Channel Bandwidths** | |
| **V2X Configuration to Transmit** | |
| $N_{ID}^{SL}$ | 168 |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.3.4G.4.4.3.
3. The V2X reference measurement channel is set according to Table 6.3.4G.4.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.3.4G.4.4.2 Test procedure

1. Measure the UE transmission OFF power during the sub-frame preceding the PSSS and the SSSS symbol excluding a transient period of 20 µs according to Figure 6.3.4G.4.3-1 and Figure 6.3.4G.4.3-2.
2. Measure the mean power of the transmitted PSSS and SSSS according to Figure 6.3.4G.4.3-1 and Figure 6.3.4G.4.3-2. The transient periods are excluded from measurement accordingly.
3. Measure the UE transmission OFF power during the sub-frame after the PSSS and the SSSS symbol excluding a transient period of 20 µs according to Figure 6.3.4G.4.3-1 and Figure 6.3.4G.4.3-2.

### 6.3.4G.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.3.4G.4.4.3-1: SL-V2X-PreconfigFreqInfo-r14**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20K SL-V2X-PreconfigFreqInfo-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-CommPreconfigSync-r14 :: SEQUENCE { | | | |
| syncOffsetIndicators-r14 :: SEQUENCE { | | | |
| syncOffsetIndicator1-r14 | 10 | | |
| syncOffsetIndicator2-r14 | 10 | | |
| syncOffsetIndicator3-r14 | 10 | | |
| } | | | |
| syncTxParameters-r14 | -10 | | |
| syncTxThreshOoC-r14 | 11 | | |
| filterCoefficient-r14 | fc0 | | |
| syncRefMinHyst-r14 | dB0 | | |
| syncRefDiffHyst-r14 | dB0 | | |
| } | | | |
| } | | | |

### 6.3.4G.4.5 Test requirement

The requirement for the power measured in all steps of the test procedure shall not exceed the values specified in Table 6.3.4G.4.5-1.

**Table 6.3.4G.4.5-1: PSSS/SSSS time mask**

| | **Channel bandwidth / minimum output power / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Transmit OFF power | For carrier frequency 4.2GHz < f ≤ 6.0GHz: ≤ -48 dBm | | | | | |
| Transmission OFF Measurement bandwidth | N/A | N/A | N/A | 9 MHz | N/A | 18 MHz |
| Expected Transmission ON Measured power | N/A | N/A | N/A | -2.2 dBm | N/A | -2.2 dBm |
| ON power tolerance 4.2GHz < f ≤ 6.0GHz | N/A | N/A | N/A | ± 8.0 dB | N/A | ± 8.0 dB |

## 6.3.5 Power Control

Power control is used to limit the interference level and compensate the channel fading. The UE power is defined as the mean power in a subframe or ON power duration, whichever is available.

The UE transmission can be in two contiguity modes, i.e. contiguous transmission and non-contiguous transmission. The former has a transmission gap of 0 and the later has a transmission gap larger than 0. The transmission gap is the time interval between the end of the last UE transmission subframe and the beginning of the next UE transmission subframe or the UpPTS (for TDD).

### 6.3.5.1 Power Control Absolute power tolerance

#### 6.3.5.1.1 Test purpose

To verify the ability of the UE transmitter to set its initial output power to a specific value at the start of a contiguous transmission or non-contiguous transmission with a long transmission gap, i.e. transmission gap is larger than 20 ms.

#### 6.3.5.1.2 Test applicability

This test applies to all types of E-UTRA Power Class 3 UE release 8 and forward.

### 6.3.5.1.3 Minimum conformance requirement

Absolute power tolerance is the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap larger than 20ms.

The minimum requirement on absolute power tolerance is given in Table 6.3.5.1.3-1 over the power range bounded by the Maximum output power as defined in sub-clause 6.2.2 and the Minimum output power as defined in sub clause 6.3.2.

For operating bands under Note 2 in Table 6.2.2.3-1, the absolute power tolerance as specified in Table 6.3.5.1.3-1 is relaxed by reducing the lower limit by 1.5 dB when the transmission bandwidth is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$.

**Table 6.3.5.1.3-1: Absolute power tolerance**

| Conditions | Tolerance |
|---|---|
| Normal conditions | ± 9.0 dB |
| Extreme conditions | ± 12.0 dB |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5.1.1.

### 6.3.5.1.4 Test description

#### 6.3.5.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5.1.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in **TS 36.508 [7] subclause 4.3.1** | | Mid range | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | | Lowest, 5MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Power Control Absolute power tolerance test case | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 50 | 50 |
| 15MHz | | QPSK | 75 | 75 |
| 20MHz | | QPSK | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channel is set according to Table 6.3.5.1.4.1-1.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5.1.4.3. Note that PDCCH DCI format 0 sent after resetting uplink power with RRC Connection Reconfiguration, should have TPC command 0dB.

#### 6.3.5.1.4.2 Test procedure

1. SS sends uplink scheduling information via PDCCH DCI format 0 with TPC command 0dB for C_RNTI to schedule the UL RMC according to Table 6.3.5.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Measure the initial output power of the first subframe of UE PUSCH first transmission. The transient periods of 20us are excluded.

3. Repeat for the two test points as indicated in section 6.3.5.1.4.3. The timing of the execution between the two test points shall be larger than 20ms.

#### 6.3.5.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.3.5.1.4.3-1: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::=<br>SEQUENCE {<br>p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.5.1.4.3-2: UplinkPowerControlCommon: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::=<br>SEQUENCE {<br>p0-NominalPUSCH | -93 | Test point 2 to verify a UE relative high initial power transmission | |

**Table 6.3.5.1.4.3-3: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| uplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | SRB1 |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |

**Table 6.3.5.1.4.3-4: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | SRB1 |
| | 0 | | RBC |
| } | | | |

### 6.3.5.1.5 Test requirement

The requirement for the power measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5.1.5-1 and 6.3.5.1.5-2.

**Table 6.3.5.1.5-1: Absolute power tolerance: test point 1**

| | **Channel bandwidth / expected output power (dBm)** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB |
| Expected Measured power Extreme conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2.3 | | | | | | |

**Table 6.3.5.1.5-2: Absolute power tolerance: test point 2**

| | **Channel bandwidth / expected output power (dBm)** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB |
| Expected Measured power Extreme conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2.3 | | | | | | |

## 6.3.5.2 Power Control Relative power tolerance

### 6.3.5.2.1 Test purpose

To verify the ability of the UE transmitter to set its output power relatively to the power in a target sub-frame relatively to the power of the most recently transmitted reference sub-frame if the transmission gap between these sub-frames is ≤ 20 ms.

### 6.3.5.2.2 Test applicability

This test applies to all types of E-UTRA Power Class 3 UE release 8 and forward.

### 6.3.5.2.3 Minimum conformance requirement

The UE shall meet the requirements specified in Table 6.3.5.2.3-1.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each of two test patterns. The test patterns are a monotonically increasing power sweep and a monotonically decreasing power sweep over a range bounded by the requirements of minimum power and maximum power specified in clauses 6.3.2.3 and 6.2.2.3. For these exceptions the power tolerance limit is a maximum of ±6.0 dB in Table 6.3.5.2.3-1.

**Table 6.3.5.2.3-1 Relative Power Tolerance for Transmission (normal conditions)**

| Power step ΔP (Up or down) [dB] | All combinations of PUSCH and PUCCH transitions [dB] | All combinations of PUSCH/PUCCH and SRS transitions between sub-frames [dB] | PRACH [dB] |
|---|---|---|---|
| ΔP < 2 | ±2.5 (Note 3) | ±3.0 | ±2.5 |
| 2 ≤ ΔP < 3 | ±3.0 | ±4.0 | ±3.0 |
| 3 ≤ ΔP < 4 | ±3.5 | ±5.0 | ±3.5 |
| 4 ≤ ΔP ≤ 10 | ±4.0 | ±6.0 | ±4.0 |
| 10 ≤ ΔP < 15 | ±5.0 | ±8.0 | ±5.0 |
| 15 ≤ ΔP | ±6.0 | ±9.0 | ±6.0 |

Note 1: For extreme conditions an additional ± 2.0 dB relaxation is allowed

Note 2: For operating bands under Note 2 in Table 6.2.2.3-1, the relative power tolerance is relaxed by increasing the upper limit by 1.5 dB if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges; if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges, then the tolerance is relaxed by reducing the lower limit by 1.5 dB.

Note 3: For PUSCH to PUSCH transitions with the allocated resource blocks fixed in frequency and no transmission gaps other than those generated by downlink subframes, DwPTS fields or Guard Periods for TDD: for a power step ΔP ≤ 1 dB, the relative power tolerance for transmission is ±1.0 dB.

The power step (ΔP) is defined as the difference in the calculated setting of the UE Transmit power between the target and reference sub-frames with the power setting according to Clause 5.1 of TS 36.213. The error is the difference between ΔP and the power change measured at the UE antenna port with the power of the cell-specific reference signals kept constant. The error shall be less than the relative power tolerance specified in Table 6.3.5.2.3-1.

The normative reference for this requirement is TS 36.101 clause 6.3.5.2.

### 6.3.5.2.4 Test description

#### 6.3.5.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Power Control Relative power tolerance test case | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | See table 6.3.5.2.5-1 6.3.5.2.5-2 6.3.5.2.5-13 | See table 6.3.5.2.5-1 6.3.5.2.5-2 6.3.5.2.5-13 |
| 3MHz | | QPSK | See table 6.3.5.2.5-3 6.3.5.2.5-4 6.3.5.2.5-13 | See table 6.3.5.2.5-3 6.3.5.2.5-4 6.3.5.2.5-13 |
| 5MHz | | QPSK | See table 6.3.5.2.5-5 6.3.5.2.5-6 6.3.5.2.5-13 | See table 6.3.5.2.5-5 6.3.5.2.5-6 6.3.5.2.5-13 |
| 10MHz | | QPSK | See table 6.3.5.2.5-7 6.3.5.2.5-8 6.3.5.2.5-13 | See table 6.3.5.2.5-7 6.3.5.2.5-8 6.3.5.2.5-13 |
| 15MHz | | QPSK | See table 6.3.5.2.5-9 6.3.5.2.5-10 6.3.5.2.5-13 | See table 6.3.5.2.5-9 6.3.5.2.5-10 6.3.5.2.5-13 |
| 20MHz | | QPSK | See table 6.3.5.2.5-11 6.3.5.2.5-12 6.3.5.2.5-13 | See table 6.3.5.2.5-11 6.3.5.2.5-12 6.3.5.2.5-13 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1<br>Note 2: The starting resource block shall be RB# 0. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channel is set according to table 6.3.5.2.4.1-1

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5.2.4.3.

### 6.3.5.2.4.2 Test procedure

The procedure is separated in various subtests to verify different aspects of relative power control. The power patterns of the subtests are described in figure 6.3.5.2.4.2-1.

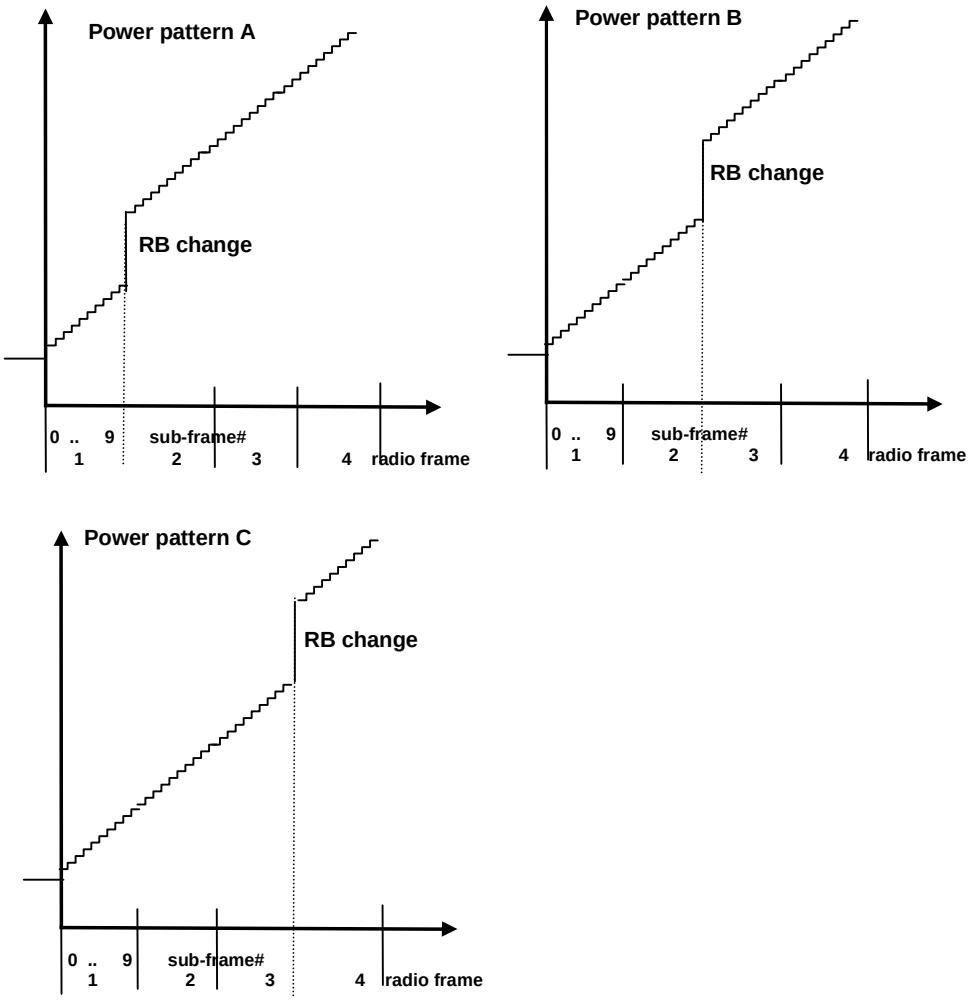



**Figure 6.3.5.2.4.2-1: FDD ramping up test power patterns**

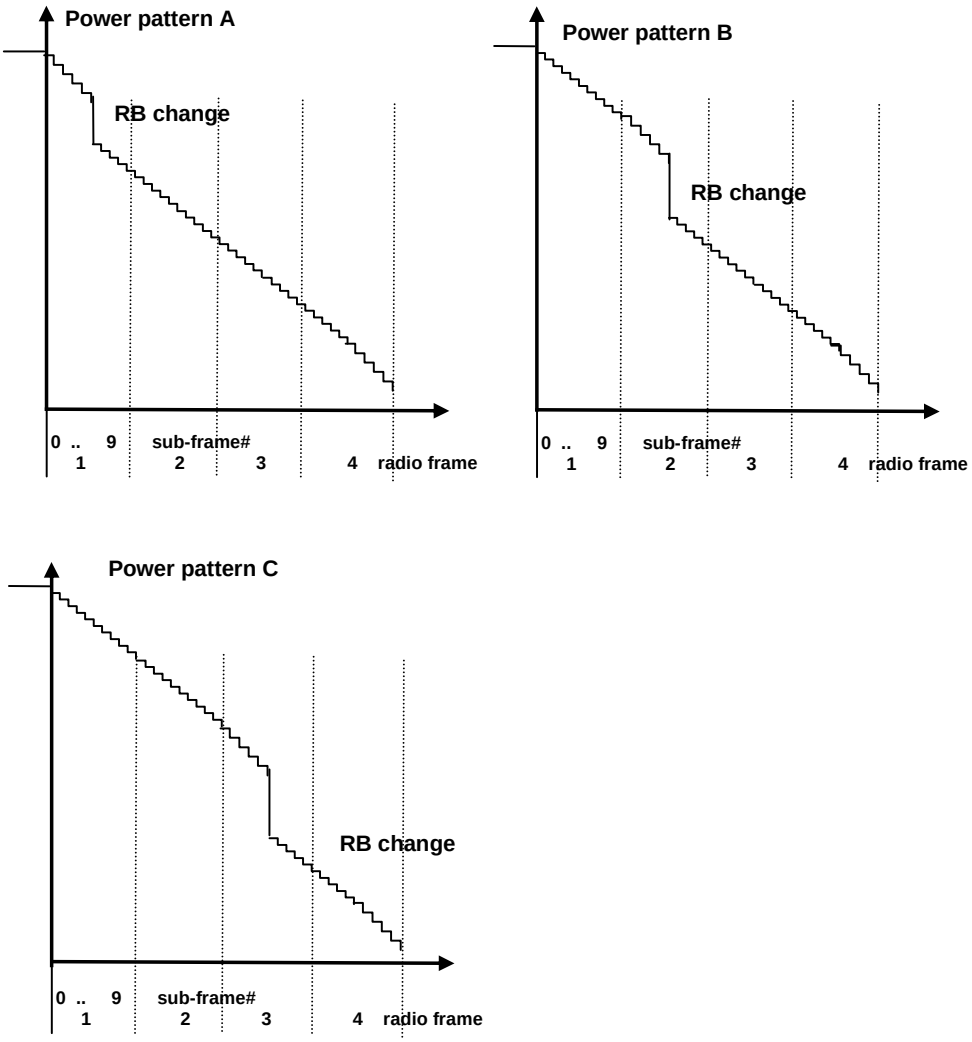



**Figure 6.3.5.2.4.2-2: FDD ramping down test power patterns**

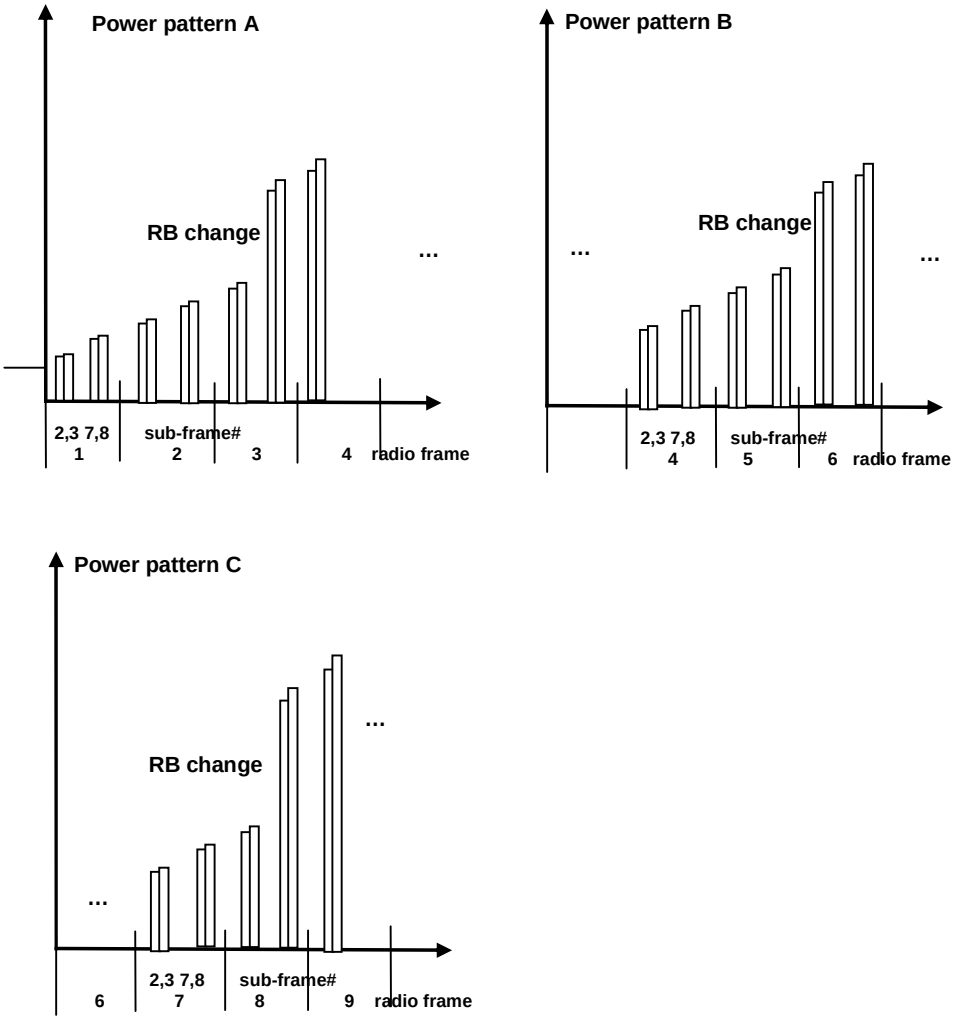



**Figure 6.3.5.2.4.2-3: TDD ramping up test power patterns**

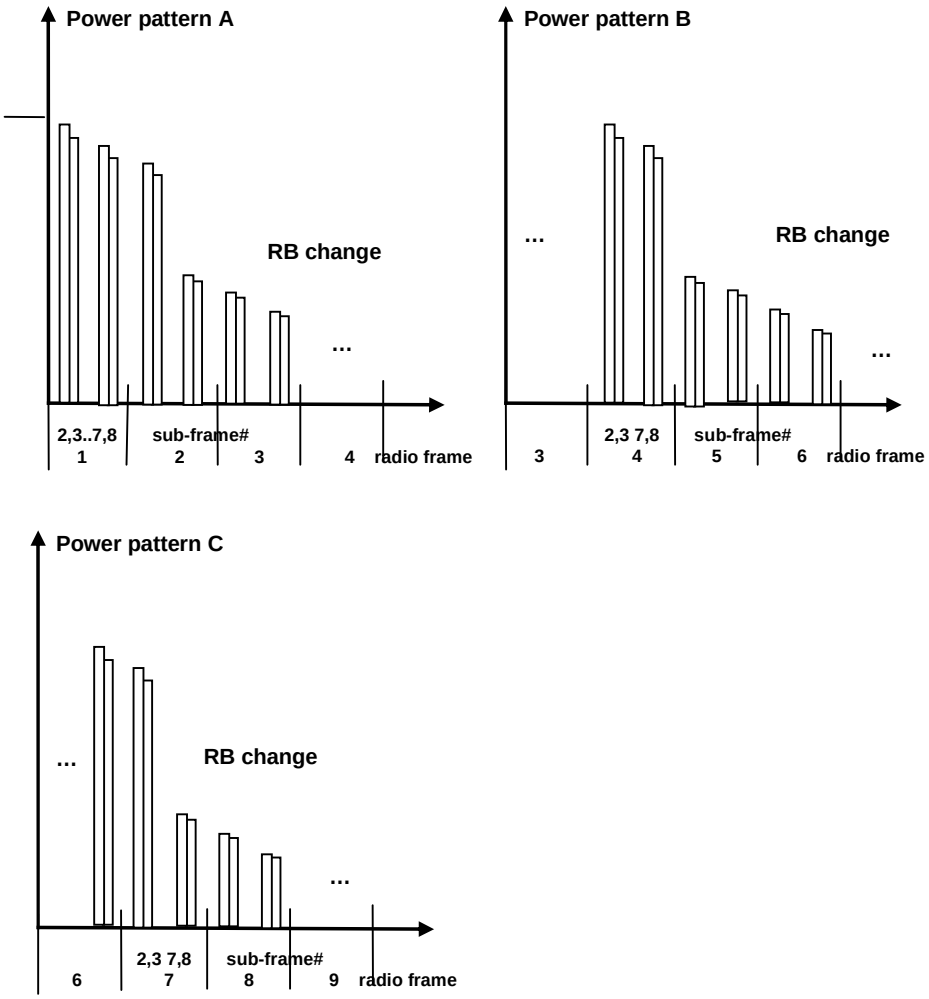



**Figure 6.3.5.2.4.2-4: TDD ramping down test power patterns**

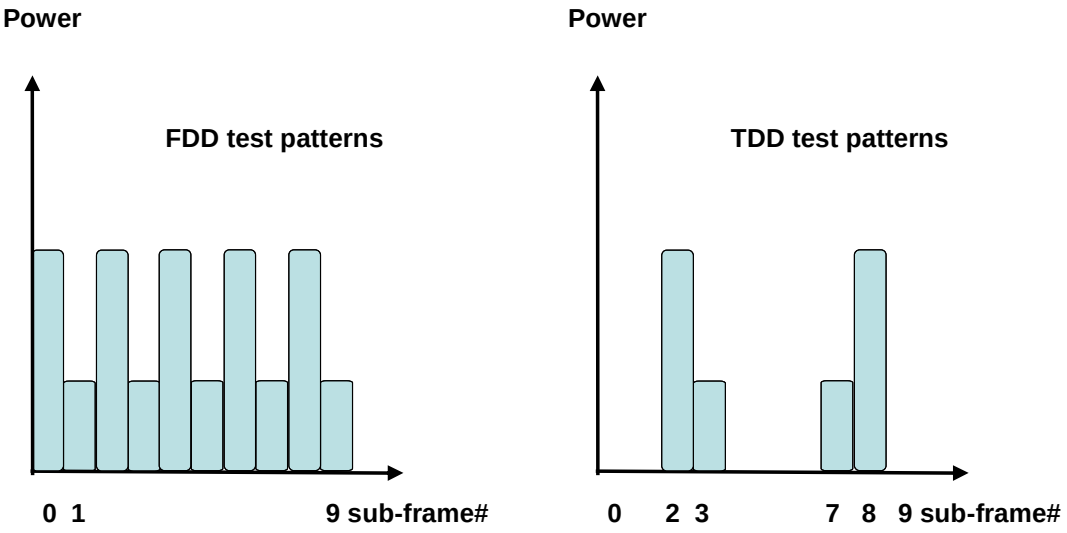



**Figure 6.3.5.2.4.2-5: Alternating Test Power patterns**

1. Sub test: ramping up pattern

   1.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the PUSCH. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at -36.8dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz or at -36.5dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

   1.2. Schedule the UE's PUSCH data transmission as described in Figure 6.3.5.2.4.2-1 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame) and Figure 6.3.5.2.4.2-3 (TDD pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) with an uplink RB allocation as defined in tables 6.3.5.2.5-1 thru 6.3.5.2.5-12 depending on channel bandwidth. On the PDCCH format 0 for the scheduling of the PUSCH the SS will transmit a +1dB TPC command. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

   1.3. Measure the power of PUSCH transmissions to verify the UE relative power control meet test requirements 6.3.5.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

   1.4. Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5.2.5-1 thru Table 6.3.5.2.5-12 to force bigger UE power steps at various points in the power range.

2. Sub test: ramping down pattern

   2.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the PUSCH. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at +18.0dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz or at +17.7dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

   2.2. Schedule the UE's PUSCH data transmission as described in Figure 6.3.5.2.4.2-2 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame) and Figure 6.3.5.2.4.2-4 (TDD pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) with an uplink RB allocation as defined in tables 6.3.5.2.5-1 thru 6.3.5.2.5-12 depending on channel bandwidth. On the PDCCH format 0 for the scheduling of the PUSCH the SS will transmit a -1dB

TPC command. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

2.3. Measure the power of PUSCH transmissions to verify the UE relative power control meet test requirements 6.3.5.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

2.4. Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5.2.5-1 thru Table 6.3.5.2.5-12 to force bigger UE power steps at various points in the power range.

3. Sub test: alternating pattern

3.1 SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the PUSCH. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at -10dBm +/- 3.2 dB for carrier frequency $f \leq 3.0$GHz or at -10dBm +/- 3.5 dB for carrier frequency 3.0GHz $< f \leq$ 4.2GHz. The initial uplink RB allocation is defined as the smaller uplink RB allocation value specified in tables 6.3.5.2.5-13. The power level and RB allocation are reset for each sub-test.

3.2. Schedule the UE's PUSCH data transmission as described in Figure 6.3.5.2.4.2-5for 10 sub-frames with an uplink RB allocation alternating pattern as defined in table 6.3.5.2.5-13 while transmitting 0dB TPC command for PUSCH via the PDCCH.

3.3. Measure the power of PUSCH transmissions to verify the UE relative power control meet test requirements specified in clause 6.3.5.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

#### 6.3.5.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.5.2.5 Test requirement

Each UE power step measured in the test procedure 6.3.5.2.4.2 should satisfy the test requirements specified in Table 6.3.5.2.5-1, thru 6.3.5.2.5-13 for normal conditions; for extreme conditions an additional ± 2.0 dB relaxation is allowed.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each of ramping up and ramping down test patterns. For these exceptions the power tolerance limit is a maximum of ±6.7 dB. If there is an exception in the power step caused by the RB change for all test patterns (A, B, C) then fail the UE.

**Table 6.3.5.2.5-1: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 1.4MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 6 RBs | TPC=+1dB | 8.78 | 4 ≤ ΔP < 10 | 8.78 ± (4.7) Note 2<br>8.78 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed = 6 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5.2.5-2: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 1.4MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 5 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 5 to 1 RBs | TPC=-1dB | 7.99 | 4 ≤ ΔP < 10 | 7.99 ± (4.7) Note 2<br>7.99 +4.7/-6.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5.2.5-3: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 3MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 4 RBs | TPC=+1dB | 7.02 | 4 ≤ ΔP < 10 | 7.02 ± (4.7) Note 2<br>7.02 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed =4 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5.2.5-4: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 3MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 15 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 15 to 1 RBs | TPC=-1dB | 12.76 | 10 ≤ ΔP < 15 | 12.76 ± (5.7) Note 2<br>12.76 +5.7/-7.2 Note 4 |
| Subframes after RB change | Fixed =1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern **A** the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5.2.5-5: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 20 | TPC=+1dB | 14.01 | 10 ≤ ΔP < 15 | 14.01 ± (5.7) Note 2<br>14.01 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 20 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5.2.5-6: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 25 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 25 to 1 | TPC=-1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± (5.7) Note 2<br>14.98 +5.7/-7.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5.2.5-7: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 10MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 25 | TPC=+1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± (5.7) Note 2<br>14.98 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 25 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5.2.5-8: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 10MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 50 ( UE-Categories ≥2)<br><br>Fixed = 48 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 50 to 1 ( UE-Categories ≥2)<br><br>Change from 48 to 1 (UE cat 1) | TPC=-1dB | 17.99<br><br>17.81 | 15 ≤ Δ | 17.99 ± (6.7) Note 2<br>17.99 +6.7/-8.2 Note 4<br><br>17.81 ± (6.7) Note 2<br>17.81 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5.2.5-9: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 50 | TPC=+1dB | 17.99 | 15 ≤ ΔP | 17.99±(6.7) Note 2<br>17.99 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 50 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5.2.5-10: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 75 ( UE-Categories ≥2)<br><br>Fixed = 50 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 75 to 1 ( UE-Categories ≥2)<br><br>Change from 50 to 1 (UE Cat 1) | TPC=-1dB | 19.75<br><br>17.99 | 15 ≤ ΔP | 19.75 ± (6.7) Note 2<br>19.75 +6.7/-8.2 Note 4<br><br>17.99 ± (6.7) Note 2<br>17.99 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5.2.5-11: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 75 | TPC=+1dB | 19.75 | 15 ≤ ΔP | 19.75 ± (6.7) Note 2<br>19.75 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 75 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5.2.5-12: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 100 ( UE-Categories ≥2)<br><br>Fixed = 75 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 100 to 1 ( UE-Categories ≥2)<br><br>Change from 75 to 1 (UE Cat 1) | TPC=-1dB | 21.0<br><br>19.75 | 15 ≤ ΔP | 21.0 ± (6.7) Note 2<br>21.0 +6.7/-8.2 Note 4<br><br>19.75 ± (6.7) Note 2<br>19.75 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5.2.5-13: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) (Alternating pattern)**

| Sub-test | Uplink RB allocation | TPC command | Expected power step size (Up or down) ΔP [dB] | Power step size range (Up or down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| 1.4 MHz | Alternating 1 and 6 | TPC=0dB | 7.78 | 4 ≤ ΔP < 10 | 7.78 ± (6.7) Note 1,2<br>7.78 +8.2/-6.7 Note 3<br>7.78 +6.7/-8.2 Note 4 |
| 3 MHz | Alternating 1 and 15 | TPC=0dB | 11.76 | 10 ≤ ΔP < 15 | 11.76 ± (6.7) Note 1,2<br>11.76 +8.2/-6.7 Note 3<br>11.76 +6.7/-8.2 Note 4 |
| 5 MHZ | Alternating 1 and 25 | TPC=0dB | 13.98 | 10 ≤ ΔP < 15 | 13.98 ± (6.7) Note 1,2<br>13.98 +8.2/-6.7 Note 3<br>13.98 +6.7/-8.2 Note 4 |
| 10 MHZ | Alternating 1 and 50 ( UE-Categories ≥2)<br><br>Alternating 1 and 48 (UE Cat 1) | TPC=0dB | 16.99<br><br>16,81 | 15 ≤ ΔP | 16.99 ± (6.7) Note 1,2<br>16.99 +8.2/-6.7 Note 3<br>16.99 +6.7/-8.2 Note 4<br><br>16.81 ± (6.7) Note 1,2<br>16.81 +8.2/-6.7 Note 3<br>16.81 +6.7/-8.2 Note 4 |
| 15 MHZ | Alternating 1 and 75 ( UE-Categories ≥2)<br><br>Alternating 1 and 50 (UE Cat 1) | TPC=0dB | 18.75<br><br>16.99 | 15 ≤ ΔP | 18.75 ± (6.7) Note 1,2<br>18.75 +8.2/-6.7 Note 3<br>18.75 +6.7/-8.2 Note 4<br><br>16.99 ± (6.7) Note 1,2<br>16.99 +8.2/-6.7 Note 3<br>16.99 +6.7/-8.2 Note 4 |
| 20 MHZ | Alternating 1 and 100 ( UE-Categories ≥2)<br><br>Alternating 1 and 75 (UE Cat 1) | TPC=0dB | 20.00<br><br>18.75 | 15 ≤ ΔP | 20.00 ± (6.7) Note 1,2<br>20.00 +8.2/-6.7 Note 3<br>20.00 +6.7/-8.2 Note 4<br><br>18.75 ± (6.7) Note 1,2<br>18.75 +8.2/-6.7 Note 3<br>18.75 +6.7/-8.2 Note 4 |

Note 1: Test tolerance +/- 6.7 dB was selected to allow PA switch possible exceptions to occur.
Note 2: When neither Note 3 nor Note 4 applies.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

## 6.3.5.3 Aggregate power control tolerance

### 6.3.5.3.1 Test purpose

To verify the ability of the UE to maintain its power level in non-contiguous transmission within 21 ms in response to 0 dB TPC commands with respect to the first UE transmission, when the power control parameters specified in TS 36.213 are constant.

### 6.3.5.3.2 Test applicability

This test applies to all types of E-UTRA Power Class 3 UE release 8 and forward.

### 6.3.5.3.3 Minimum conformance requirement

The UE shall meet the requirements specified in Table 6.3.5.3.3-1 for relative power control over the power range bounded by the minimum output power as defined in sub clause 6.3.2 and the maximum output power in subclause 6.2.2.

**Table 6.3.5.3.3-1: Power control tolerance**

| TPC command | UL channel | Aggregate power tolerance within 21 ms |
|---|---|---|
| 0 dB | PUCCH | ±2.5 dB |
| 0 dB | PUSCH | ±3.5 dB |
| Note 1: The UE transmission gap is 4 ms. TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission. | | |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5.3.1.

### 6.3.5.3.4 Test description

#### 6.3.5.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5.3.4.1-1: Test Configuration Table: PUCCH sub-test**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | Normal |
| Test Frequencies as specified in **TS 36.508 [7] subclause 4.3.1** | | | | Mid range |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | | | | Lowest, 5MHz, Highest |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** |
| Ch BW | Mod'n | RB allocation | | FDD: PUCCH format = Format 1a<br>TDD: PUCCH format = Format 1a/1b |
| | | FDD | TDD | |

| | | | | |
|---|---|---|---|---|
| 1.4MHz | QPSK | 3 | 3 | |
| 3MHz | QPSK | 4 | 4 | |
| 5MHz | QPSK | 8 | 8 | |
| 10MHz | QPSK | 16 | 16 | |
| 15MHz | QPSK | 25 | 25 | |
| 20MHz | QPSK | 30 | 30 | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

**Table 6.3.5.3.4.1-2: Test Configuration Table: PUSCH sub-test**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal | | | |
| Test Frequencies as specified in **TS 36.508 [7] subclause 4.3.1** | Mid range | | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for PUSCH sub-test | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 1 | 1 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 6.3.5.3.4.1-1 (PUCCH sub-test) and Table 6.3.5.3.4.1-2 (PUSCH sub-test).

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5.3.4.3.

### 6.3.5.3.4.2 Test procedure

The procedure is separated in two subtests to verify PUCCH and PUSCH aggregate power control tolerance respectively. The uplink transmission patterns are described in figure 6.3.5.3.4.2-1.

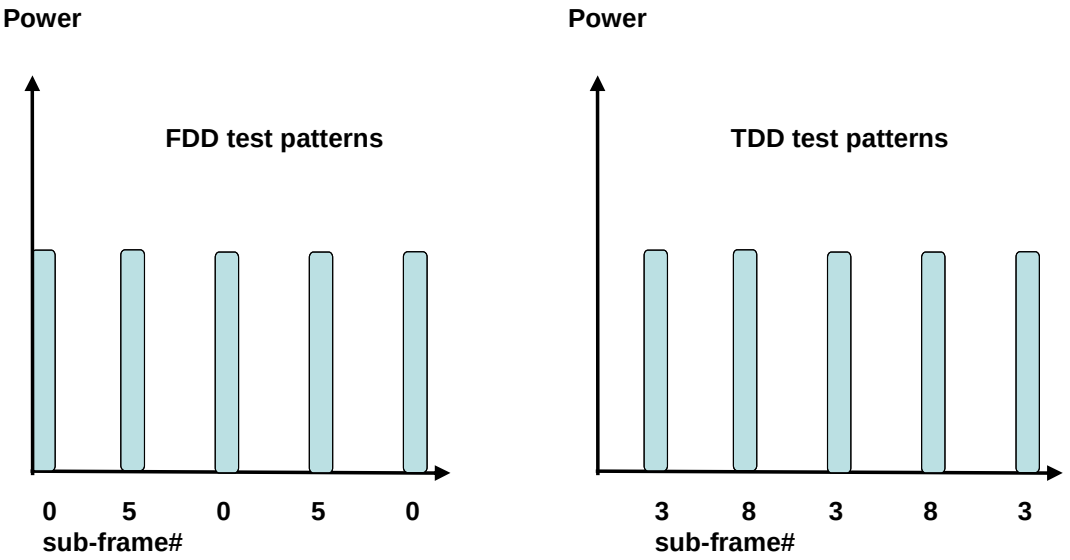



**Figure 6.3.5.3.4.2-1 Test uplink transmission**

1. PUCCH sub test:

1.1 The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.3.5.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The transmission of PDSCH will make the UE send uplink ACK/NACK using PUCCH. Send the appropriate TPC commands for PUCCH to the UE to ensure that the UE transmits PUCCH at 0dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.2. Every 5 subframes transmit to the UE downlink PDSCH MAC padding bits as well as 0 dB TPC command for PUCCH via the PDCCH to make the UE transmit ACK/NACK on the PUCCH with transmission gap of 4 subframes. The downlink transmission is scheduled in the appropriate sub-frames to make the UE transmit PUCCH as described in figure 6.3.5.3.4.2-1.

1.3. Measure the power of 5 consecutive PUCCH transmissions to verify the UE transmitted PUCCH power is maintained within 21 ms. The transient periods of 20us are excluded from the power measurement.

2. PUSCH sub test:

2.1. The SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the PUSCH. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at 0dBm +/- 3.2.dB for carrier frequency f ≤ 3.0GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.2. Every 5 subframes schedule the UE's PUSCH data transmission and transmit 0 dB TPC command for PUSCH via the PDCCH to make the UE transmit PUSCH with 4 subframes gap. The uplink transmission patterns are described in figure 6.3.5.3.4.2-1.

2.3. Measure the power of 5 consecutive PUSCH transmissions to verify the UE transmitted PUSCH power is maintained within 21 ms. The transient periods of 20us are excluded from the power measurement.

### 6.3.5.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

#### 6.3.5.3.5 Test requirement

The requirement for the power measurements made in step (1.3) and (2.3) of the test procedure shall not exceed the values specified in Table 6.3.5.3.5-1. The power measurement period shall be 1 sub-frame excluding transient periods.

**Table 6.3.5.3.5-1: Power control tolerance**

| TPC command | UL channel | Test requirement measured power |
|---|---|---|
| 0 dB | PUCCH | Given 5 power measurements in the pattern, the 2nd, 3rd, 4th, and 5th measurements shall be within ± 3.2 dB of the 1st measurement. |
| 0 dB | PUSCH | Given 5 power measurements in the pattern, the 2nd, 3rd, 4th, and 5th measurements shall be within ± 4.2 dB of the 1st measurement. |
| Note 1: The UE transmission gap is 4 ms. TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission. | | |

## 6.3.5_1 Power Control for HPUE

Same text as in clause 6.3.5.

### 6.3.5_1.1 Power Control Absolute power tolerance for HPUE

#### 6.3.5_1.1.1 Test purpose

Same test purpose as in clause 6.3.5.1.1.

#### 6.3.5_1.1.2 Test applicability

This test applies to all types of E-UTRA Power Class 1 or Power Class 2 UE release 10 and forward.

#### 6.3.5_1.1.3 Minimum conformance requirement

Same minimum conformance requirement as in clause 6.3.5.1.3 with the following exceptions:

- Instead of sub-clause 6.2.2 → use sub-clause 6.2.2_1

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5.1.1.

#### 6.3.5_1.1.4 Test description

Same test description as in clause 6.3.5.1.4 with the following exceptions:

- For test point 2, instead of Table 6.3.5.1.4.3-2 → use Table 6.3.5_1.1.4.3-1 or 6.3.5_1.1.4.3-2

**Table 6.3.5_1.1.4.3-1: UplinkPowerControlCommon: Test point 2 for Power Class 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalPUSCH | -85 | Test point 2 to verify a UE relative high initial power transmission | |

**Table 6.3.5_1.1.4.3-2: UplinkPowerControlCommon: Test point 2 for Power Class 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH | -90 | Test point 2 to verify a UE relative high initial power transmission | |

## 6.3.5_1.1.5 Test requirement

The requirement for the power measured in step (2) of the test procedure is not to exceed the values specified in Tables 6.3.5_1.1.5-1, 6.3.5_1.1.5-2, 6.3.5_1.1.5-3, and 6.3.5_1.1.5-4.

**Table 6.3.5_1.1.5-1: Absolute power tolerance: test point 1 for Power Class 1**

| | **Channel bandwidth / expected output power (dBm)** | |
|---|---|---|
| | **5 MHz** | **10 MHz** |
| Expected Measured power Normal conditions | -8.6 dBm | -5.6 dBm |
| Power tolerance | ± 10.0dB | ± 10.0dB |
| Expected Measured power Extreme conditions | -8.6 dBm | -5.6 dBm |
| Power tolerance | ± 13.0dB | ± 13.0dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2.3 | | |

**Table 6.3.5_1.1.5-2: Absolute power tolerance: test point 1 for Power Class 2**

| | **Channel bandwidth / expected output power (dBm)** | | | |
|---|---|---|---|---|
| | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz | ± 10.0dB | ± 10.0dB | ± 10.0dB | ± 10.0dB |
| Expected Measured power Extreme conditions | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz | ± 13.0dB | ± 13.0dB | ± 13.0dB | ± 13.0dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2.3 | | | | |

**Table 6.3.5_1.1.5-3: Absolute power tolerance: test point 2 for Power Class 1**

| | **Channel bandwidth / expected output power (dBm)** | |
|---|---|---|
| | **5 MHz** | **10 MHz** |
| Expected Measured power Normal conditions | 11.4 dBm | 14.4 dBm |
| Power tolerance | ± 10.0dB | ± 10.0dB |
| Expected Measured power Extreme conditions | 11.4 dBm | 14.4 dBm |
| Power tolerance | ± 13.0dB | ± 13.0dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined by the power class in sub-clause 6.2.2_1.3. | | |

**Table 6.3.5_1.1.5-4: Absolute power tolerance: test point 2 for Power Class 2**

| | Channel bandwidth / expected output power (dBm) | | | |
|---|---|---|---|---|
| | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Expected Measured power Normal conditions | 6.4 dBm | 9.4 dBm | 11.2 dBm | 12.4 dBm |
| Power tolerance f ≤ 3.0GHz | ± 10.0dB | ± 10.0dB | ± 10.0dB | ± 10.0dB |
| Expected Measured power Extreme conditions | 6.4 dBm | 9.4 dBm | 11.2 dBm | 12.4 dBm |
| Power tolerance f ≤ 3.0GHz | ± 13.0dB | ± 13.0dB | ± 13.0dB | ± 13.0dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined by the power class in sub-clause 6.2.2_1.3 | | | | |

## 6.3.5_1.2 Power Control Relative power tolerance for HPUE

### 6.3.5_1.2.1 Test purpose

Same test purpose as in clause 6.3.5.2.1.

### 6.3.5_1.2.2 Test applicability

This test applies to all types of E-UTRA Power Class 1 or Power Class 2 UE release 10 and forward.

### 6.3.5_1.2.3 Minimum conformance requirement

Same minimum conformance requirement as in clause 6.3.5.2.3 with the following exceptions

- Instead of clause 6.2.2.3 → use sub-clause 6.2.2_1.3

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5.2.

### 6.3.5_1.2.4 Test description

Same test description as in clause 6.3.5.2.4 with the following exceptions:

- Power Class 1: In clause 6.3.5.2.4.2, test step 2.1, setting the UE PUSCH power at +26dBm +/-3.2dB instead of +18.0dBm +/-3.2dB
- Power Class 2: In clause 6.3.5.2.4.2, test step 2.1, setting the UE PUSCH power at +21dBm +/-3.2dB instead of +18.0dBm +/-3.2dB

### 6.3.5_1.2.5 Test requirement

Same test requirement as in clause 6.3.5.2.5.

## 6.3.5_1.3 Aggregate power control tolerance for HPUE

### 6.3.5_1.3.1 Test purpose

Same test purpose as in clause 6.3.5.3.1.

### 6.3.5_1.3.2 Test applicability

This test applies to all types of E-UTRA Power Class 1 or Power Class 2 UE release 10 and forward.

### 6.3.5_1.3.3 Minimum conformance requirement

Same minimum conformance requirement as in clause 6.3.5.3.3 with the following exception:

- Instead of sub-clause 6.2.2 → use sub-clause 6.2.2_1

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5.3.1.

#### 6.3.5_1.3.4 Test description

Same test description as in clause 6.3.5.3.4.

#### 6.3.5_1.3.5 Test requirement

Same test requirement as in clause 6.3.5.3.5.

## 6.3.5A Power Control for CA

### 6.3.5A.1 Power Control Absolute power tolerance for CA

#### 6.3.5A.1.0 Minimum conformance requirements

The absolute power tolerance is the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap on each active component carriers larger than 20ms. For component carriers with Frame Structure Type 3 the absolute power tolerance requirements apply when the said transmission gaps are larger than 40 ms. The requirement can be tested by time aligning any transmission gaps on the component carriers.

When SRS carrier based switching is used, then the above mentioned absolute power tolerance is the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap on component carriers (to which SRS switching occurs) larger than 40ms.

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the absolute power control tolerance is specified on each component carrier exceed the minimum output power as defined in subclause 6.3.2A and the total power is limited by maximum output power as defined in subclause 6.2.2A. The requirements defined in Table 6.3.5A.1.0-1 shall apply on each component carrier with all component carriers active. The requirements can be tested by time aligning any transmission gaps on all the component carriers.

For intra-band contiguous carrier aggregation bandwidth class B and C and intra-band non-contiguous carrier aggregation the absolute power control tolerance per component carrier is given in Table 6.3.5A.1.0-1.

**Table 6.3.5A.1.0-1: Absolute power tolerance for CA**

| Conditions | Tolerance |
|---|---|
| Normal | ± 9.0 dB |
| Extreme | ± 12.0 dB |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5A.1.

### 6.3.5A.1.1 Power Control Absolute power tolerance for CA (intra-band contiguous DL CA and UL CA)

#### 6.3.5A.1.1.1 Test purpose

To verify the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap on each active component carriers larger than 20ms.

#### 6.3.5A.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

#### 6.3.5A.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.5A.1.0

#### 6.3.5A.1.1.4 Test description

##### 6.3.5A.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.1.1.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.1.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 4.1 | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS 36.508 [7] clause [4.3.1] for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Mid range | | | | | |
| Test CC Combination setting (NRB_agg) as specified in clause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 50 | N/A for this test | QPSK | 75 | P_25@0 | S_50@0 | | |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | | |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | | |
| 100 | 25 | | QPSK | 125 | P_100@0 | S_25@0 | | |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | | |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | | |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.5A.1.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.1.1.4.3. Any PDCCH DCI format 0 sent to the UE during the configuration should have TPC command 0dB.

#### 6.3.5A.1.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for UplinkPowerControlCommonSCell-r10 are defined in clause 6.3.5A.1.1.4.3. Any PDCCH DCI format 0 sent to the UE during the configuration should have TPC command 0dB.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 with TPC command 0dB for C_RNTI to schedule the UL RMC according to Table 6.3.5A.1.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Measure the initial output power of the first subframe of the PUSCH first transmission for each component carrier. The transient periods of 20us are excluded.
6. Repeat for the two test points as indicated in section 6.3.5A.1.1.4.3. The timing of the execution between the two test points shall be larger than 20ms.

#### 6.3.5A.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions.

**Table 6.3.5A.1.1.4.3-1: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::=<br>SEQUENCE {<br>p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.5A.1.1.4.3-2: UplinkPowerControlCommonSCell-r10: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25A UplinkPowerControlCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommonSCell-r10 ::=<br>SEQUENCE {<br>p0-NominalPUSCH-r10 | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.5A.1.1.4.3-3: UplinkPowerControlCommon: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::=<br>SEQUENCE {<br>p0-NominalPUSCH | -93 | Test point 2 to verify a UE relative high initial power transmission | |

**Table 6.3.5A.1.1.4.3-4: UplinkPowerControlCommonSCell-r10: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25A UplinkPowerControlCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommonSCell-r10 ::= SEQUENCE { p0-NominalPUSCH-r10 | -93 | Test point 2 to verify a UE relative high initial power transmission | |

**Table 6.3.5A.1.1.4.3-5: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| uplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | UL CA |

**Table 6.3.5A.1.1.4.3-6: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | RBC |
| | 0 | | UL CA |
| } | | | |

### 6.3.5A.1.1.5 Test requirement

For intra-band contiguous carrier aggregation bandwidth class C, the absolute power control tolerance per component carrier measured in step (5) of the test procedure is not to exceed the values specified in Table 6.3.5A.1.1.5-1 and 6.3.5A.1.1.5-2. The test requirement tables are originated from tables 6.3.5.1.5-1 and 6.3.5.1.5-2.

**Table 6.3.5A.1.1.5-1: Absolute power tolerance for intra-band contiguous CA: test point 1**

| | **Channel bandwidth / expected output power (dBm)** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB |
| Expected Measured power Extreme conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2.A.13 | | | | | | |

**Table 6.3.5A.1.1.5-2: Absolute power tolerance for intra-band contiguous CA: test point 2**

| | Channel bandwidth / expected output power (dBm) | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Expected Measured power Normal conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB |
| Expected Measured power Extreme conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2A.1.3 | | | | | | |

## 6.3.5A.1.2 Power Control Absolute power tolerance for CA (inter-band DL CA and UL CA)

### 6.3.5A.1.2.1 Test purpose

To verify the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap on each active component carriers larger than 20ms. For component carriers with Frame Structure Type 3 the absolute power tolerance requirements apply when the said transmission gaps are larger than 40 ms.

### 6.3.5A.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA.

The requirements also apply to all types of E-UTRA UE release 14 and forward that support UL eLAA.

### 6.3.5A.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.5A.1.0.

### 6.3.5A.1.2.4 Test description

#### 6.3.5A.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.1.2.4.1-1 or 6.3.5A.1.2.4.1-2. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.1.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | Mid range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/A for this test | QPSK | 31 | P_6@0 | S_25@0 | - | - |
| 6 | 50 | | QPSK | 56 | P_6@0 | S_50@0 | - | - |
| 15 | 25 | | QPSK | 12 | S_4@0 | P_8@0 | | |
| 25 | 6 | | QPSK | 13 | P_8@0 | P_5@0 | | |
| 25 | 15 | | QPSK | 40 | P_25@0 | S_15@0 | - | - |
| 25 | 25 | | QPSK | 50 | P_25@0 | S_25@0 | - | - |
| 25 | 75 | | QPSK | 24 | P_8@0 | S_16@0 | | |
| 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | - | - |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | - | - |
| 50 | 100 | | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 75 | 25 | | QPSK | 100 | P_75@0 | S_25@0 | - | - |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | - | - |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | |

**Table 6.3.5A.1.2.4.1-2: Test Configuration Table for UL LAA**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | Mid range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 15 | 100 | N/A for this test | QPSK | 115 | P_15@0 | S_100@0 | - | - |
| 25 | 100 | | QPSK | 125 | P_25@0 | S_100@0 | - | - |
| 50 | 100 | | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 75 | 100 | | QPSK | 175 | P_75@0 | S_100@0 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: Applicable only for an LAA Scell configured in Band 46. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.5A.1.2.4.1-1 or 6.3.5A.1.2.4.1-2.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.1.2.4.3. Any PDCCH DCI format 0 sent to the UE during the configuration should have TPC command 0dB.

### 6.3.5A.1.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for UplinkPowerControlCommonSCell-r10 and uplink LAA are defined in clause 6.3.5A.1.2.4.3. Any PDCCH DCI format 0 or 0A for LAA SCC sent to the UE during the configuration should have TPC command 0dB.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 or 0A for LAA SCC with TPC command 0dB for C_RNTI to schedule the UL RMC according to Table 6.3.5A.1.2.4.1-1 or 6.3.5A.1.2.4.1-2 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Measure the initial output power of the first subframe of the PUSCH first transmission for each component carrier. The transient periods of 20us are excluded.

6. Repeat for the two test points as indicated in section 6.3.5A.1.2.4.3. The timing of the execution between the two test points shall be larger than 20ms or 40ms if with LAA SCC operation.

#### 6.3.5A.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions.

In test procedure step 2, for SCC configuration there are no additional message contents.

For SCC in the case of uplink LAA, message contents are according to TS 36.508[7] subclause4.6 with the following exceptions specified in Tables 6.3.5A.1.2.4.3-1 and 6.3.5A.1.2.4.3-2.

**Table 6.3.5A.1.2.4.3-1 LogicalChannelConfig-DRB (Initial Condition, step 14, Table 4.5.2.3-1)**

| Derivation Path: 36.508 Table 4.8.2.1.4-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LogicalChannelConfig-DRB ::= SEQUENCE { | | | |
| ul-SpecificParameters SEQUENCE { | | | |
| laa-UL-Allowed-r14 | true | | |
| } | | | |
| } | | | |

**Table 6.3.5A.1.2.4.3-2 PhysicalConfigDedicatedSCell (Step 2, test procedure)**

| Derivation Path: 36.508 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| laa-SCellConfiguration-v1430 ::= SEQUENCE { | | | |
| | NULL | | |
| } | | | |
| } | | | |

**Table 6.3.5A.1.2.4.3-3: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.5A.1.2.4.3-4: UplinkPowerControlCommonSCell-r10: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25A UplinkPowerControlCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommonSCell-r10 ::= SEQUENCE { p0-NominalPUSCH-r10 | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.5A.1.2.4.3-5: UplinkPowerControlCommon: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH | -93 | Test point 2 to verify a UE relative high initial power transmission | |

**Table 6.3.5A.1.2.4.3-6: UplinkPowerControlCommonSCell-r10: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25A UplinkPowerControlCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommonSCell-r10 ::= SEQUENCE { p0-NominalPUSCH-r10 | -93 | Test point 2 to verify a UE relative high initial power transmission | |

**Table 6.3.5A.1.2.4.3-7: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| uplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | UL CA |

**Table 6.3.5A.1.2.4.3-8: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | RBC |
| | 0 | | UL CA |
| } | | | |

### 6.3.5A.1.2.5 Test requirement

The absolute power control tolerance per component carrier measured in step (5) of the test procedure is not to exceed the values specified in Table 6.3.5A.1.2.5-1 and 6.3.5A.1.2.5-2. The test requirement tables are originated from tables 6.3.5.1.5-1 and 6.3.5.1.5-2.

**Table 6.3.5A.1.2.5-1: Absolute power tolerance for inter-band CA: test point 1**

| | Channel bandwidth / expected output power (dBm) | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz<br>4.2GHz < f ≤ 6GHz | ± 10.0dB<br>± 10.4dB<br>± 11.1dB | ± 10.0dB<br>± 10.4dB<br>± 11.1dB | ± 10.0dB<br>± 10.4dB<br>± 11.1dB | ± 10.0dB<br>± 10.4dB<br>± 11.1dB | ± 10.0dB<br>± 10.4dB<br>± 11.1dB | ± 10.0dB<br>± 10.4dB<br>± 11.1dB |
| Expected Measured power Extreme conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz<br>4.2GHz < f ≤ 6GHz | ± 13.0dB<br>± 13.4dB<br>± 14.1dB | ± 13.0dB<br>± 13.4dB<br>± 14.1dB | ± 13.0dB<br>± 13.4dB<br>± 14.1dB | ± 13.0dB<br>± 13.4dB<br>± 14.1dB | ± 13.0dB<br>± 13.4dB<br>± 14.1dB | ± 13.0dB<br>± 13.4dB<br>± 14.1dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2.A.23 | | | | | | |

**Table 6.3.5A.1.2.5-2: Absolute power tolerance for inter-band CA: test point 2**

| | Channel bandwidth / expected output power (dBm) | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz<br>4.2GHz < f ≤ 6GHz | ± 10.0dB<br>± 10.4dB<br>± 11.1dB | ± 10.0dB<br>± 10.4dB<br>± 11.1dB | ± 10.0dB<br>± 10.4dB<br>± 11.1dB | ± 10.0dB<br>± 10.4dB<br>± 11.1dB | ± 10.0dB<br>± 10.4dB<br>± 11.1dB | ± 10.0dB<br>± 10.4dB<br>± 11.1dB |
| Expected Measured power Extreme conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz<br>4.2GHz < f ≤ 6GHz | ± 13.0dB<br>± 13.4dB<br>± 14.1dB | ± 13.0dB<br>± 13.4dB<br>± 14.1dB | ± 13.0dB<br>± 13.4dB<br>± 14.1dB | ± 13.0dB<br>± 13.4dB<br>± 14.1dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB<br>± 14.1dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2A.2.3 | | | | | | |

## 6.3.5A.1.3 Power Control Absolute power tolerance for CA (intra-band non-contiguous DL CA and UL CA)

### 6.3.5A.1.3.1 Test purpose

To verify the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap on each active component carriers larger than 20ms.

#### 6.3.5A.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

#### 6.3.5A.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.5A.1.0.

#### 6.3.5A.1.3.4 Test description

##### 6.3.5A.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.1.3.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.1.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | Refer to test points<br>A: Low Wgap, Maximum Wgap | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | QPSK | P_25@0 | QPSK | S_25@0 |
| 2 | 25 | 25 | 5 | N/A | N/A | QPSK | P_25@0 | QPSK | S_25@0 |
| 3 | 100 | 100 | 5 | N/A | N/A | QPSK | P_100@0 | QPSK | S_100@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.<br>Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band. | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channel is set according to Table 6.3.5A.1.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.1.3.4.3. Any PDCCH DCI format 0 sent to the UE during the configuration should have TPC command 0dB.

#### 6.3.5A.1.3.4.2 Test procedure

Same test procedure as in clause 6.3.5A.1.1.4.2 with the following exceptions.

- Instead of Table 6.3.5A.1.1.4.1-1→ use Table 6.3.5A.1.3.4.1-1.
- Instead of clause 6.3.5A.1.1.4.3→ use clause 6.3.5A.1.3.4.3.

#### 6.3.5A.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions.

**Table 6.3.5A.1.3.4.3-1: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::=<br>SEQUENCE {<br>p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.5A.1.3.4.3-2: UplinkPowerControlCommonSCell-r10: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25A UplinkPowerControlCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommonSCell-r10 ::=<br>SEQUENCE {<br>p0-NominalPUSCH-r10 | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.5A.1.3.4.3-3: UplinkPowerControlCommon: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::=<br>SEQUENCE {<br>p0-NominalPUSCH | -93 | Test point 2 to verify a UE relative high initial power transmission | |

**Table 6.3.5A.1.3.4.3-4: UplinkPowerControlCommonSCell-r10: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25A UplinkPowerControlCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommonSCell-r10 ::=<br>SEQUENCE {<br>p0-NominalPUSCH-r10 | -93 | Test point 2 to verify a UE relative high initial power transmission | |

**Table 6.3.5A.1.3.4.3-5: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| uplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | UL CA |

**Table 6.3.5A.1.3.4.3-6: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | RBC |
| | 0 | | UL CA |
| } | | | |

6.3.5A.1.3.5 Test requirement

The absolute power control tolerance per component carrier measured in step (5) of the test procedure is not to exceed the values specified in Table 6.3.5A.1.3.5-1 and 6.3.5A.1.3.5-2. The test requirement tables are originated from tables 6.3.5.1.5-1 and 6.3.5.1.5-2.

**Table 6.3.5A.1.3.5-1: Absolute power tolerance for inter-band CA: test point 1**

| | **Channel bandwidth / expected output power (dBm)** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB |
| Expected Measured power Extreme conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2A.3.3 | | | | | | |

**Table 6.3.5A.1.3.5-2: Absolute power tolerance for inter-band CA: test point 2**

| | Channel bandwidth / expected output power (dBm) | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Expected Measured power Normal conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB |
| Expected Measured power Extreme conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 62.2A.3.3 | | | | | | |

### 6.3.5A.1.4 Power Control Absolute power tolerance for CA (3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

-The test applicability needs to be added to TS36.521-2

#### 6.3.5A.1.4.1 Test purpose

To verify the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap on each active component carriers larger than 20ms.

#### 6.3.5A.1.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band contiguous or inter-band or intra-band non-contiguous 3DL CA and 3UL CA.

#### 6.3.5A.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.5A.1.0.

#### 6.3.5A.1.4.4 Test description

##### 6.3.5A.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.1.4.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.1.4.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Mid range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | | QPSK | 56 | P_6@0 | S_25@0 | S_25@0 | - |
| 6 | 50 | | QPSK | 106 | P_6@0 | S_50@0 | S_50@0 | - |
| 25 | 15 | | QPSK | 55 | P_25@0 | S_15@0 | S_15@0 | - |
| 25 | 25 | | QPSK | 75 | P_25@0 | S_25@0 | S_25@0 | - |
| 25 | 50 | | QPSK | 125 | P_25@0 | S_50@0 | S_50@0 | - |
| 50 | 50 | | QPSK | 150 | P_50@0 | S_50@0 | S_50@0 | - |
| 75 | 75 | | QPSK | 225 | P_75@0 | S_75@0 | S_75@0 | - |
| 100 | 25 | | QPSK | 150 | P_100@0 | S_25@0 | S_25@0 | - |
| 100 | 50 | | QPSK | 200 | P_100@0 | S_50@0 | S_50@0 | - |
| 100 | 75 | | QPSK | 250 | P_100@0 | S_75@0 | S_75@0 | - |
| 100 | 100 | | QPSK | 300 | P_100@0 | S_100@0 | S_100@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , only the first of those is tested, according to the order on the Test Configuration Table list. | | | | | | | | |

**Table 6.3.5A.1.4.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Maximum Wgap | | | | | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC<br>(Note 2) | | | | | | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_XA-XA-XA Configurations** | | | | | | | | | | | | |
| 1 | All RBs | All RBs | Max | N/A | N/A | QPSK | Full RBs | | QPSK | Full RBs | | QPSK | Full RBs |
| 2 | All RBs | All RBs | Max | N/A | N/A | QPSK | Full RBs | | QPSK | Full RBs | | QPSK | Full RBs |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.<br>Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band. | | | | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channel is set according to Table 6.3.5A.1.4.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.1.4.4.3. Any PDCCH DCI format 0 sent to the UE during the configuration should have TPC command 0dB.

### 6.3.5A.1.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.3.5A.1.4.4.3. Any PDCCH DCI format 0 sent to the UE during the configuration should have TPC command 0dB.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 with TPC command 0dB for C_RNTI to schedule the UL RMC according to Table 6.3.5A.1.4.4.1-1 on both PCC and

SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Measure the initial output power of the first subframe of the PUSCH first transmission for each component carrier. The transient periods of 20us are excluded..

6. Repeat for the two test points as indicated in section 6.3.5A.1.1.4.3. The timing of the execution between the two test points shall be larger than 20ms.

#### 6.3.5A.1.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions.

**Table 6.3.5A.1.4.4.3-1: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.5A.1.4.4.3-2: UplinkPowerControlCommonSCell-r10: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25A UplinkPowerControlCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommonSCell-r10 ::= SEQUENCE { p0-NominalPUSCH-r10 | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.5A.1.4.4.3-3: UplinkPowerControlCommon: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH | -93 | Test point 2 to verify a UE relative high initial power transmission | |

**Table 6.3.5A.1.4.4.3-4: UplinkPowerControlCommonSCell-r10: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25A UplinkPowerControlCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommonSCell-r10 ::= SEQUENCE { p0-NominalPUSCH-r10 | -93 | Test point 2 to verify a UE relative high initial power transmission | |

**Table 6.3.5A.1.4.4.3-5: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| uplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | UL CA |

**Table 6.3.5A.1.4.4.3-6: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | RBC |
| | 0 | | UL CA |
| } | | | |

## 6.3.5A.1.4.5 Test Requirements

For intra-band contiguous carrier aggregation bandwidth class D, the absolute power control tolerance per component carrier measured in step (5) of the test procedure is not to exceed the values specified in Table 6.3.5A.1.4.5-1 and 6.3.5A.1.4.5-2. The test requirement tables are originated from tables 6.3.5.1.5-1 and 6.3.5.1.5-2.

**Table 6.3.5A.1.4.5-1: Absolute power tolerance for intra-band contiguous CA: test point 1**

| | **Channel bandwidth / expected output power (dBm)** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB |
| Expected Measured power Extreme conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2.A.13 | | | | | | |

**Table 6.3.5A.1.4.5-2: Absolute power tolerance for intra-band contiguous CA: test point 2**

| | Channel bandwidth / expected output power (dBm) | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Expected Measured power Normal conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB | ± 10.0dB<br>± 10.4dB |
| Expected Measured power Extreme conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance<br>f ≤ 3.0GHz<br>3.0GHz < f ≤ 4.2GHz | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB | ± 13.0dB<br>± 13.4dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2A.1.3 | | | | | | |

## 6.3.5A.1.5 Power Control Absolute power tolerance for CA(SRS carrier based switching)

### 6.3.5A.1.5.1 Test purpose

To verify the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap on component carriers (to which SRS switching occurs) larger than 40ms.

### 6.3.5A.1.5.2 Test applicability

This test applies to all types of E-UTRA UE release 14 and forward that support SRS carrier based switching, and support intra-band contiguous DL CA, intra-band non-contiguous DL CA and inter-band DL CA.

### 6.3.5A.1.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.5A.1.0

### 6.3.5A.1.5.4 Test description

#### 6.3.5A.1.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in subclause 5.4.2A.1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.1.5.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.1.5.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | Mid range | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | |
| Test Parameters for CA Configurations | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **UL Allocation** | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | **SCC SRS $N_{RB}$** |
| 6 | 25 | N/A for this test | 31 | N/A for this test | 24 |
| 6 | 50 | | 56 | | 48 |
| 25 | 15 | | 40 | | 12 |
| 25 | 25 | | 50 | | 24 |
| 25 | 50 | | 75 | | 48 |
| 50 | 50 | | 100 | | 48 |
| 50 | 100 | | 150 | | 96 |
| 75 | 75 | | 150 | | 72 |
| 100 | 75 | | 175 | | 72 |
| 100 | 50 | | 150 | | 48 |
| 100 | 100 | | 200 | | 96 |
| 100 | 25 | | 125 | | 24 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.5A.1.5.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.1.5.4.3. Any PDCCH DCI format 3B sent to the UE during the configuration should have SRS TPC command 0dB.

### 6.3.5A.1.5.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for RadioResourceConfigCommonSCell-r10 are defined in clause 6.3.5A.1.5.4.3. Any PDCCH DCI format 3B sent to the UE during the configuration should have SRS TPC command 0dB.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. The SRS periodicity in SCell is set to 80ms. Measure the output power of any SRS transmission on SCC. The transient periods of 20us are excluded.

5. Repeat for the two test points as indicated in section 6.3.5A.1.5.4.3. The timing of the execution between the two test points shall be larger than 40ms.

#### 6.3.5A.1.5.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions.

**Table 6.3.5A.1.5.4.3-1: RadioResourceConfigCommonSCell-r10: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A RadioResourceConfigCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigCommonSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r14 SEQUENCE { | | | SRS-Switching |
| uplinkPowerControlCommonPUSCH-LessCell-v14xy SEQUENCE { | | | |
| p0-Nominal-PeriodicSRS-r14 | -105 | Test point 1 to verify a UE relative low initial power transmission | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.5A.1.5.4.3-2: RadioResourceConfigCommonSCell-r10: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A RadioResourceConfigCommonSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigCommonSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r14 SEQUENCE { | | | SRS-Switching |
| uplinkPowerControlCommonPUSCH-LessCell-v14xy SEQUENCE { | | | |
| p0-Nominal-PeriodicSRS-r14 | -93 | Test point 2 to verify a UE relative high initial power transmission | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.3.5A.1.5.4.3-3: PhysicalConfigDedicatedSCell-r10-DEFAULT: Test point 1 and 2**

| Derivation Path: TS 36.508 [7] Table 4.6.3-6A, condition SRS-Switching | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| soundingRS-UL-PeriodicConfigDedicatedList-r14 SEQUENCE (SIZE (1..2)) OF SEQUENCE { | | | |
| soundingRS-UL-ConfigDedicated CHOICE { | | | |
| setup SEQUENCE { | | | |
| srs-ConfigIndex | 77 | See Table 8.2-1 in TS 36.213 | FDD |
| | 86 | INTEGER (0..1023) See Table 8.2-2 in TS 36.213 | TDD |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.3.5A.1.5.5 Test requirement

The absolute power control tolerance per component carrier measured in step (4) of the test procedure is not to exceed the values specified in Table 6.3.5A.1.5.5-1 and 6.3.5A.1.5.5-2.

**Table 6.3.5A.1.5.5-1: Absolute power tolerance for SRS carrier based switching: test point 1**

| | **Channel bandwidth / expected output power (dBm)** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | | -11.8 dBm | -8.8 dBm | -5.8 dBm | -4.0 dBm | -2.8 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB |
| Expected Measured power Extreme conditions | | -11.8 dBm | -8.8 dBm | -5.8 dBm | -4.0 dBm | -2.8 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2.A.0 | | | | | | |

**Table 6.3.5A.1.5.5-2: Absolute power tolerance for SRS carrier based switching: test point 2**

| | Channel bandwidth / expected output power (dBm) | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Expected Measured power Normal conditions | | 0.2 dBm | 3.2 dBm | 6.2 dBm | 8.0 dBm | 9.2 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB |
| Expected Measured power Extreme conditions | | 0.2 dBm | 3.2 dBm | 6.2 dBm | 8.0 dBm | 9.2 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2A.0 | | | | | | |

## 6.3.5A.2 Power Control Relative power tolerance for CA

### 6.3.5A.2.0 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the relative power tolerance is specified when the power of the target and reference sub-frames on each component carrier exceed the minimum output power as defined in TS 36.101 [2] subclause 6.3.2A and the total power is limited by $P_{UMAX}$ as defined in TS 36.101 [2] subclause 6.2.5A. The requirements shall apply on each component carrier with all component carriers active. The UE transmitter shall have the capability of changing the output power independently on all component carriers in the uplink and:

a) the requirements for all combinations of PUSCH and PUCCH transitions per component carrier is given in Table 6.3.5A.2.0-1.

b) for SRS the requirements for combinations of PUSCH/PUCCH and SRS transitions between subframes given in Table 6.3.5A.2.0-1 apply per component carrier when the target and reference subframes are configured for either simultaneous SRS or simultaneous PUSCH.

c) for RACH the requirements apply for the primary cell and are given in Table 6.3.5A.2.0-1.

For component carriers with Frame Structure Type 3 the requirements for the target sub-frame relative to the power of the most recently transmitted reference sub-frame shall be met with a transmission gap $\leq$ 40 ms.

For intra-band contiguous carrier aggregation bandwidth class B and C and intra-band non-contiguous carrier aggregation, the requirements apply when the power of the target and reference sub-frames on each component carrier exceed -20 dBm and the total power is limited by $P_{UMAX}$ as defined in TS 36.101 [2] subclause 6.2.5A. For the purpose of these requirements, the power in each component carrier is specified over only the transmitted resource blocks.

The UE shall meet the following requirements for transmission on both assigned component carriers when the average transmit power per PRB is aligned across both assigned carriers in the reference sub-frame:

a) for all possible combinations of PUSCH and PUCCH transitions per component carrier, the corresponding requirements given in Table 6.3.5A.2.0-1;

b) for SRS transitions on each component carrier, the requirements for combinations of PUSCH/PUCCH and SRS transitions given in Table 6.3.5A.2.0-1 with simultaneous SRS of constant SRS bandwidth allocated in the target and reference subframes;

c) for RACH on the primary component carrier, the requirements given in Table 6.3.5A.2.0-1 for PRACH.

For a) and b) above, the power step $\Delta P$ between the reference and target subframes shall be set by a TPC command and/or an uplink scheduling grant transmitted by means of an appropriate DCI Format.

For a), b) and c) above, two exceptions are allowed for each component carrier for a power per carrier ranging from -20 dBm to $P_{UMAX,c}$ as defined in TS 36.101 [2] subclause 6.2.5. For these exceptions the power tolerance limit is ±6.0 dB in Table 6.3.5A.2.0-1.

**Table 6.3.5A.2.0-1: Relative Power Tolerance for Transmission (normal conditions)**

| Power step ΔP (Up or down) [dB] | All combinations of PUSCH and PUCCH transitions [dB] | All combinations of PUSCH/PUCCH and SRS transitions between sub-frames [dB] | PRACH [dB] |
|---|---|---|---|
| ΔP < 2 | ±2.5 (Note 3) | ±3.0 | ±2.5 |
| 2 ≤ ΔP < 3 | ±3.0 | ±4.0 | ±3.0 |
| 3 ≤ ΔP < 4 | ±3.5 | ±5.0 | ±3.5 |
| 4 ≤ ΔP ≤ 10 | ±4.0 | ±6.0 | ±4.0 |
| 10 ≤ ΔP < 15 | ±5.0 | ±8.0 | ±5.0 |
| 15 ≤ ΔP | ±6.0 | ±9.0 | ±6.0 |

Note 1: For extreme conditions an additional ± 2.0 dB relaxation is allowed

Note 2: For operating bands under Note 2 in Table 6.2.2.3-1, the relative power tolerance is relaxed by increasing the upper limit by 1.5 dB if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ - 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges; if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or FUL_high - 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges, then the tolerance is relaxed by reducing the lower limit by 1.5 dB.

Note 3: For PUSCH to PUSCH transitions with the allocated resource blocks fixed in frequency and no transmission gaps other than those generated by downlink subframes, DwPTS fields or Guard Periods for TDD: for a power step ΔP ≤ 1 dB, the relative power tolerance for transmission is ±1.0 dB.

The power step (ΔP) is defined as the difference in the calculated setting of the UE Transmit power between the target and reference sub-frames with the power setting according to Clause 5.1 of TS 36.213 [10]. The error is the difference between ΔP and the power change measured at the UE antenna port with the power of the cell-specific reference signals kept constant. The error shall be less than the relative power tolerance specified in Table 6.3.5A.2.0-1.

For sub-frames not containing an SRS symbol, the power change is defined as the relative power difference between the mean power of the original reference sub-frame and the mean power of the target subframe not including transient durations. The mean power of successive sub-frames shall be calculated according to TS 36.101 [2] Figure 6.3.4.3-1 and TS 36.101 [2] Figure 6.3.4.1-1 if there is a transmission gap between the reference and target sub-frames.

The normative reference for this requirement is TS 36.101 [2] clauses 6.3.5A.2 and 6.3.5.2.

### 6.3.5A.2.1 Power Control Relative power tolerance for CA (intra-band contiguous DL CA and UL CA)

#### 6.3.5A.2.1.1 Test purpose

To verify the ability of the UE transmitter to change the output power in both assigned component carrier in the uplink with a defined power step sizes between sub-frames on the two respective component carrier.

#### 6.3.5A.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

#### 6.3.5A.2.1.3 Minimum conformance requirement

The minimum conformance requirements are defined in clause 6.3.5A.2.0.

6.3.5A.2.1.4 Test description

6.3.5A.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.2.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.2.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 4.1 | | | Normal | | | | | |
| Test Frequencies as specified in TS 36.508 [7] clause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Mid range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in clause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations** (Note 3) **($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 50 | N/A for this test | QPSK | 6<br>13<br>2<br>16 | P_5@20<br>P_5@20<br>P_1@24<br>P_8@17 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - | - |
| 50 | 50 | | QPSK | 6<br>13<br>2<br>16 | P_5@45<br>P_5@45<br>P_1@49<br>P_8@42 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - | - |
| 75 | 75 | | QPSK | 6<br>13<br>2<br>16 | P_5@70<br>P_5@70<br>P_1@74<br>P_8@67 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - | - |
| 100 | 25 | | QPSK | 6<br>13<br>2<br>16 | P_5@95<br>P_5@95<br>P_1@99<br>P_8@92 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - | - |
| 100 | 50 | | QPSK | 6<br>13<br>2<br>16 | P_5@95<br>P_5@95<br>P_1@99<br>P_8@92 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - | - |
| 100 | 75 | | QPSK | 6<br>13<br>2<br>16 | P_5@95<br>P_5@95<br>P_1@99<br>P_8@92 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - | - |
| 100 | 100 | | QPSK | 6<br>13<br>2<br>16 | P_5@95<br>P_5@95<br>P_1@99<br>P_8@92 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested.<br>Note 3: The UL allocation is changed as part of the test procedure. The Test Configuration Table entries list the combinations used, with the sequence of usage as determined by the test procedure for each sub-test. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to table 6.3.5A.2.1.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.2.1.4.3.

### 6.3.5A.2.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clause 8.3.3.2).
4. The procedure is separated in various subtests to verify different aspects of relative power control. The power changes of the subtests are shown by diagrams in the Test Procedure. In this test case, the term $P_{CMAX_L}$ – MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } defined in TS 36.101 [2] clause 6.2.5A is used, to ensure the UE is not tested outside its power capability.
5. Sub test: SCC power increase

5.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD) on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCC with powers nearest to $PCC_{RefSet,\ 0}$ and $SCC_{RefSet,\ 0}$ respectively, as defined in Table 6.3.5A.2.1.4.2-1. The powers and allocations are chosen so the average transmit power per PRB is aligned across both assigned carriers in the reference sub-frame. Measure $PCC_{RefMeas,\ 0}$ and $SCC_{RefMeas,\ 0}$ in the Reference subframe, and after the SCC allocation is increased, measure $PCC_{TargetMeas,\ 0}$ and $SCC_{TargetMeas,\ 0}$ in the Target subframe.

**Table 6.3.5A.2.1.4.2-1: Power settings and RB allocations for SCC power increase, step n=0**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet,\ 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet,\ 0}$) +7 | $SCC_{RefSet,\ 0}$, dBm/$N_{RB\ alloc}$ | -17 |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas,\ 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas,\ 0}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet,\ 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet,\ 0}$) +7 | $SCC_{TargetSet,\ 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet,\ 0}$) +9 |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas,\ 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas,\ 0}$ |

5.2. Calculate the Total uplink power across both CCs in dBm as $10\log_{10}((PCC_{TargetMeas,\ n}$ in mW) + ($SCC_{TargetMeas,\ n}$ in mW)). If ($P_{CMAX_L}$ – MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } - Total uplink power) > 1dB, continue to step 5.3. Otherwise, go to step 5.6.

5.3. For the PCC, calculate the change in power as ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) and compare to the PCC Test requirement specified in Table 6.3.5A.2.1.5-1. If the result meets the normal Test requirement, continue to step 5.4. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the PCC exception counter by 1 and continue to step 5.4, Otherwise, fail the UE for this subtest.

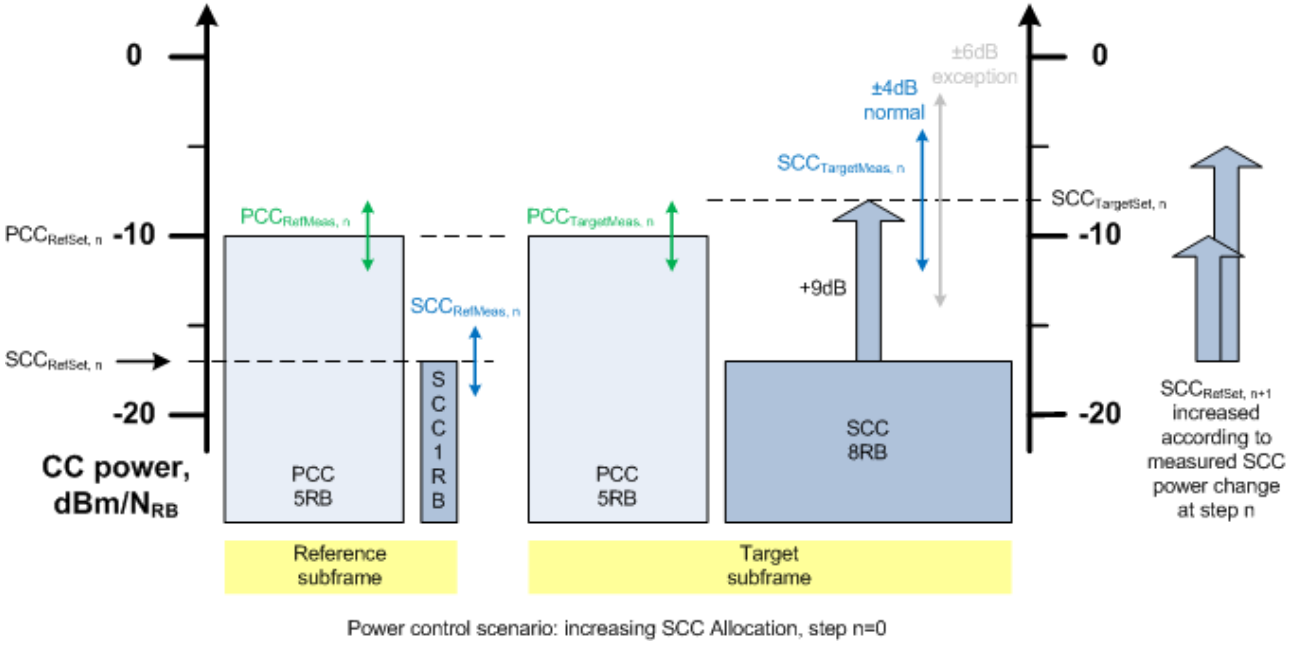
5.4. For the SCC, calculate the change in power as ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) and compare to the SCC Test requirement specified in Table 6.3.5A.2.1.5-1. If the result meets the normal Test requirement, continue to step 5.5. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the SCC exception counter by 1 and continue to step 5.5, Otherwise, fail the UE for this subtest.

5.5. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCC with powers nearest to $PCC_{RefSet, n+1}$ and $SCC_{RefSet, n+1}$ respectively, as defined in Table 6.3.5A.2.1.4.2-2. Measure $PCC_{RefMeas, n}$ and $SCC_{RefMeas, n}$.in the Reference subframe, and after the SCC allocation is increased, measure $PCC_{TargetMeas, n}$ and $SCC_{TargetMeas, n}$.in the Target subframe. Repeat steps 5.2 to 5.4.

**Table 6.3.5A.2.1.4.2-2: Power settings and RB allocations for SCC power increase, step n+1**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) +7 | $SCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, n}$ +2dB) |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas, n+1}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) +7 | $SCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) +9 |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, n+1}$ |

5.6. If the PCC exception counter is ≤ 2 and the SCC exception counter is ≤ 2, and the requirements specified in Table 6.3.5A.2.1.5-1 are all met, pass the UE for this subtest.




Power control scenario: increasing SCC Allocation, step n=0

**Figure 6.3.5A.2.1.4.2-1: SCC power increase**

6. Sub test: SCC power decrease

6.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD) on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCC with powers nearest to $PCC_{RefSet, 0}$ and $SCC_{RefSet, 0}$ respectively, as defined in Table 6.3.5A.2.1.4.2-3.The powers and allocations are chosen so the average transmit power per PRB is aligned across both assigned carriers in the reference sub-frame. Measure $PCC_{RefMeas, 0}$ and $SCC_{RefMeas, 0}$ in the Reference subframe, and after the SCC allocation is decreased, measure $PCC_{TargetMeas, 0}$ and $SCC_{TargetMeas, 0}$ in the Target subframe.

**Table 6.3.5A.2.1.4.2-3: Power settings and RB allocations for SCC power decrease, step n=0**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet, 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, 0}$) -2 | $SCC_{RefSet, 0}$, dBm/$N_{RB\ alloc}$ | $P_{CMAX_L}$ − MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } - 5 |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas, 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas, 0}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet, 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, 0}$) -2 | $SCC_{TargetSet, 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, 0}$) -9 |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas, 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, 0}$ |

6.2. If the uplink (power for each CC – (-20dBm)) is > 1dB, continue to step 6.3. Otherwise, go to step 6.6.

6.3. For the PCC, calculate the change in power as ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) and compare to the PCC Test requirement specified in Table 6.3.5A.2.1.5-2. If the result meets the normal Test requirement, continue to step 6.4. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the PCC exception counter by 1 and continue to step 6.4, Otherwise, fail the UE for this subtest.

6.4. For the SCC, calculate the change in power as ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) and compare to the SCC Test requirement specified in Table 6.3.5A.2.1.5-2. If the result meets the normal Test requirement, continue to step 6.5. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the SCC exception counter by 1 and continue to step 6.5, Otherwise, fail the UE for this subtest.

6.5. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCC with powers nearest to $PCC_{RefSet, n+1}$ and $SCC_{RefSet, n+1}$ respectively, as defined in Table 6.3.5A.2.1.4.2-4. Measure $PCC_{RefMeas, n}$ and $SCC_{RefMeas, n}$.in the Reference subframe, and after the SCC allocation is decreased, measure $PCC_{TargetMeas, n}$ and $SCC_{TargetMeas, n}$.in the Target subframe. Repeat steps 6.2 to 6.4.

**Table 6.3.5A.2.1.4.2-4: Power settings and RB allocations for SCC power decrease, step n+1**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) -2 | $SCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, n}$ -2dB |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas, n+1}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) -2 | $SCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) -9 |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, n+1}$ |

6.6. If the PCC exception counter is ≤ 2 and the SCC exception counter is ≤ 2, and the requirements specified in Table 6.3.5A.2.1.5-2 are all met, pass the UE for this subtest.

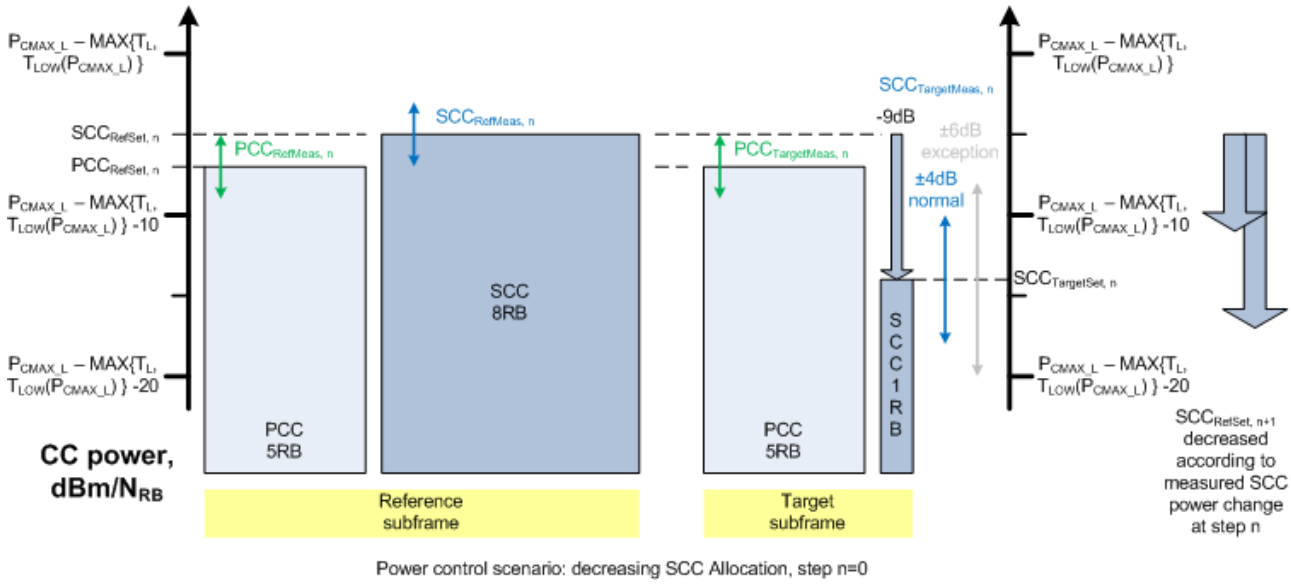



**Figure 6.3.5A.2.1.4.2-2: SCC power decrease**

7. Sub test: PCC and SCC power increase together

7.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD) on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCC with powers nearest to $PCC_{RefSet, 0}$ and $SCC_{RefSet, 0}$ respectively, as defined in Table 6.3.5A.2.1.4.2-5. The powers and allocations are chosen so the average transmit power per PRB is aligned across both assigned carriers in the reference sub-frame. Measure $PCC_{RefMeas, 0}$ and $SCC_{RefMeas, 0}$ in the Reference subframe, and after the PCC and SCC allocation are increased, measure $PCC_{TargetMeas, 0}$ and $SCC_{TargetMeas, 0}$ in the Target subframe.

**Table 6.3.5A.2.1.4.2-5: Power settings and RB allocations for PCC and SCC power increase, step n=0**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet, 0}$, dBm/$N_{RB\ alloc}$ | -17 | $SCC_{RefSet, 0}$, dBm/$N_{RB\ alloc}$ | -17 |
| PCC allocation, $N_{RB\ alloc}$ | 1 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas, 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas, 0}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet, 0}$, dBm/$N_{RB\ alloc}$ | ($PCC_{RefSet, 0}$) +9 | $SCC_{TargetSet, 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, 0}$) +9 |
| PCC allocation, $N_{RB\ alloc}$ | 8 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas, 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, 0}$ |

7.2. Calculate the Total uplink power across both CCs in dBm as $10\log_{10}((PCC_{TargetMeas, n}$ in mW) + ($SCC_{TargetMeas, n}$ in mW)). If ($P_{CMAX_L}$ – MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } - Total uplink power) > 1dB, continue to step 7.3. Otherwise, go to step 7.6.

7.3. For the PCC, calculate the change in power as ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) and compare to the PCC Test requirement specified in Table 6.3.5A.2.1.5-3. If the result meets the normal Test requirement, continue to step 7.4. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the PCC exception counter by 1 and continue to step 7.4, Otherwise, fail the UE for this subtest.

7.4. For the SCC, calculate the change in power as ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) and compare to the SCC Test requirement specified in Table 6.3.5A.2.1.5-3. If the result meets the normal Test requirement, continue to step 7.5. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the SCC exception counter by 1 and continue to step 7.5, Otherwise, fail the UE for this subtest.

7.5. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCC with powers nearest to $PCC_{RefSet, n+1}$ and $SCC_{RefSet, n+1}$ respectively, as defined in Table 6.3.5A.2.1.4.2-6. Measure $PCC_{RefMeas, n}$ and $SCC_{RefMeas, n}$.in the Reference subframe, and after the PCC and SCC allocation are increased, measure $PCC_{TargetMeas, n}$ and $SCC_{TargetMeas, n}$.in the Target subframe. Repeat steps 7.2 to 7.4.

**Table 6.3.5A.2.1.4.2-6: Power settings and RB allocations for PCC and SCC power increase, step n+1**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | (Max ($PCC_{TargetMeas, n}$, $SCC_{TargetMeas, n}$)) +2dB | $SCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | (Max ($PCC_{TargetMeas, n}$, $SCC_{TargetMeas, n}$)) +2dB |
| PCC allocation, $N_{RB\ alloc}$ | 1 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas, n+1}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) +9 | $SCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) +9 |
| PCC allocation, $N_{RB\ alloc}$ | 8 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, n+1}$ |

7.6. If the PCC exception counter is ≤ 2 and the SCC exception counter is ≤ 2, and the requirements specified in Table 6.3.5A.2.1.5-3 are all met, pass the UE for this subtest.

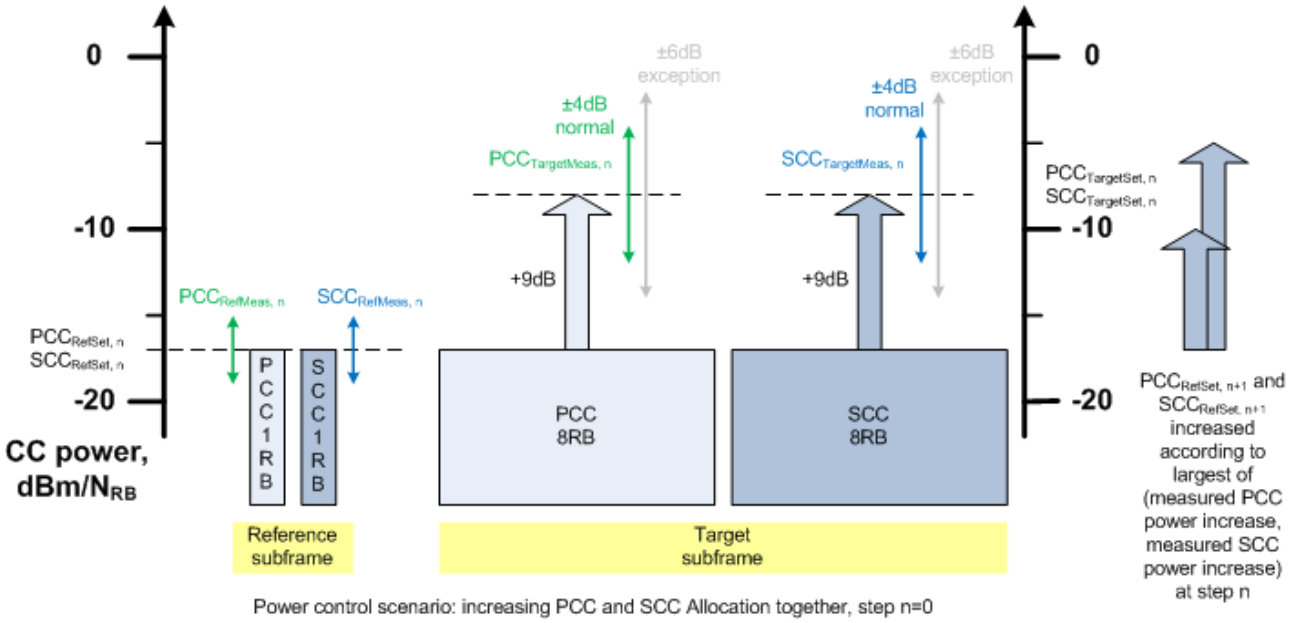



**Figure 6.3.5A.2.1.4.2-3: PCC and SCC power increase together**

8. Sub test: PCC and SCC power decrease together

8.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD) on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCC with powers nearest to $PCC_{RefSet, 0}$ and $SCC_{RefSet, 0}$ respectively, as defined in Table 6.3.5A.2.1.4.2-7. The powers and allocations are chosen so the average transmit power per PRB is aligned across both assigned carriers in the reference sub-frame. Measure $PCC_{RefMeas, 0}$ and $SCC_{RefMeas, 0}$ in the Reference subframe, and after the PCC and SCC allocation are decreased, measure $PCC_{TargetMeas, 0}$ and $SCC_{TargetMeas, 0}$ in the Target subframe.

**Table 6.3.5A.2.1.4.2-7: Power settings and RB allocations for PCC and SCC power decrease, step n=0**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet, 0}$, dBm/$N_{RB\ alloc}$ | $P_{CMAX_L}$ − MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } - 6 | $SCC_{RefSet, 0}$, dBm/$N_{RB\ alloc}$ | $P_{CMAX_L}$ − MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } - 6 |
| PCC allocation, $N_{RB\ alloc}$ | 8 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas, 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas, 0}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet, 0}$, dBm/$N_{RB\ alloc}$ | ($PCC_{RefSet, 0}$) -9 | $SCC_{TargetSet, 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, 0}$) -9 |
| PCC allocation, $N_{RB\ alloc}$ | 1 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas, 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, 0}$ |

8.2. If the uplink (power for each CC – (-20dBm)) is > 1dB, continue to step 8.3. Otherwise, go to step 8.6.

8.3. For the PCC, calculate the change in power as ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) and compare to the PCC Test requirement specified in Table 6.3.5A.2.1.5-4. If the result meets the normal Test requirement, continue to step 8.4. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the PCC exception counter by 1 and continue to step 8.4, Otherwise, fail the UE for this subtest.

8.4. For the SCC, calculate the change in power as ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) and compare to the SCC Test requirement specified in Table 6.3.5A.2.1.5-4. If the result meets the normal Test requirement, continue to step 8.5. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the SCC exception counter by 1 and continue to step 8.5, Otherwise, fail the UE for this subtest.

8.5. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCC with powers nearest to $PCC_{RefSet, n+1}$ and $SCC_{RefSet, n+1}$ respectively, as defined in Table 6.3.5A.2.1.4.2-8. Measure $PCC_{RefMeas, n}$ and $SCC_{RefMeas, n}$.in the Reference subframe, and after the PCC and SCC allocation are **decreased**, measure $PCC_{TargetMeas, n}$ and $SCC_{TargetMeas, n}$.in the Target subframe. Repeat steps 8.2 to 8.4.

**Table 6.3.5A.2.1.4.2-8: Power settings and RB allocations for PCC and SCC power decrease, step n+1**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | (Min ($PCC_{TargetMeas, n}$, $SCC_{TargetMeas, n}$)) -2dB | $SCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | (Min ($PCC_{TargetMeas, n}$, $SCC_{TargetMeas, n}$)) -2dB |
| PCC allocation, $N_{RB\ alloc}$ | 8 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas, n+1}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) -9 | $SCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) -9 |
| PCC allocation, $N_{RB\ alloc}$ | 1 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, n+1}$ |

8.6. If the PCC exception counter is $\leq 2$ and the SCC exception counter is $\leq 2$, and the requirements specified in Table 6.3.5A.2.1.5-4 are all met, pass the UE for this subtest.

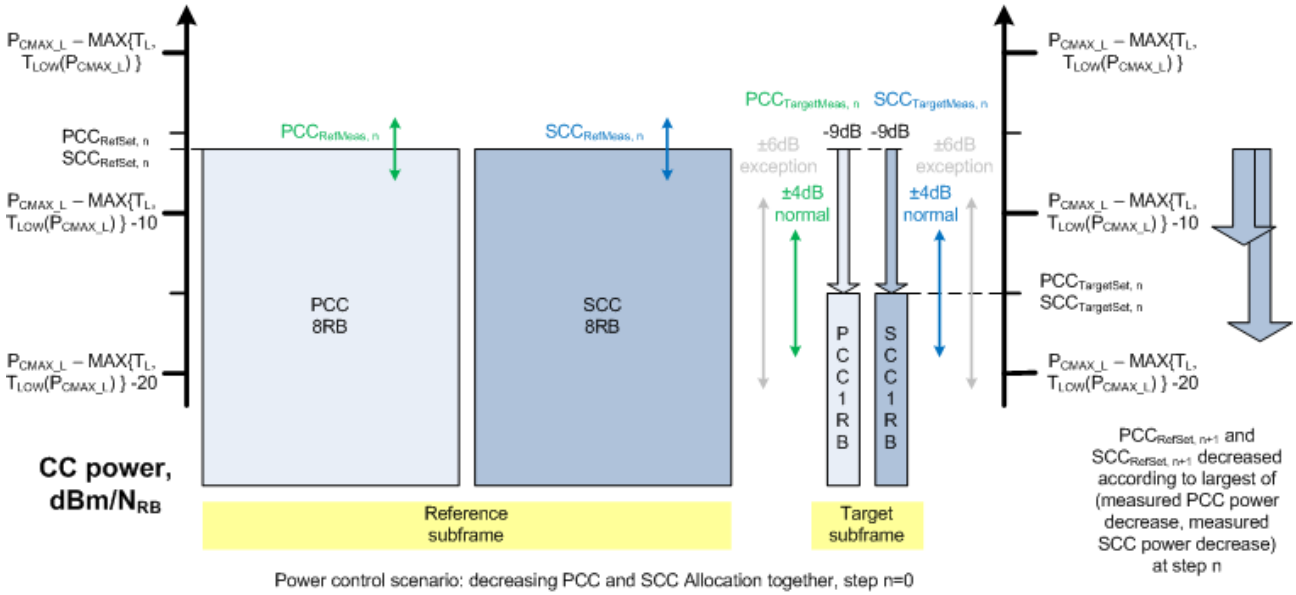



**Figure 6.3.5A.2.1.4.2-4: PCC and SCC power decrease together**

### 6.3.5A.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.5A.2.1.5 Test requirement

For intra-band contiguous carrier aggregation bandwidth class C, the relative power control tolerance per component carrier measured in steps 5, 6 , 7 and 8 of the test procedure should satisfy the applicable test requirements specified in Tables 6.3.5A.2.1.5-1 to 6.3.5A.2.1.5-4 for normal conditions.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each subtest, and are counted during the Test Procedure.

**Table 6.3.5A.2.1.5-1: Test requirements for SCC power increase**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | -1.7dB | +1.8dB |
| | Exception | dB | -6.7dB | +6.8dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | +4.2dB | +13.7dB |
| | Exception | dB | +2.2dB | +15.8dB |

**Table 6.3.5A.2.1.5-2: Test requirements for SCC power decrease**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | -1.8dB | +1.7dB |
| | Exception | dB | -6.8dB | +6.7dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | -13.8dB | -4.2dB |
| | Exception | dB | -15.8dB | -2.2dB |

**Table 6.3.5A.2.1.5-3: Test requirements for PCC and SCC power increase together**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | +4.3dB | +13.8dB |
| | Exception | dB | +2.3dB | +15.8dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | +4.3dB | +13.8dB |
| | Exception | dB | +2.3dB | +15.8dB |

**Table 6.3.5A.2.1.5-4: Test requirements for PCC and SCC power decrease together**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | -13.8dB | -4.3dB |
| | Exception | dB | -15.8dB | -2.3dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | -13.8dB | -4.3dB |
| | Exception | dB | -15.8dB | -2.3dB |

## 6.3.5A.2.2 Power Control Relative power tolerance for CA (inter-band DL CA and UL CA)

### 6.3.5A.2.2.1 Test purpose

To verify the ability of the UE transmitter to change the output power in both assigned component carrier in the uplink with a defined power step sizes between sub-frames on the two respective component carrier.

### 6.3.5A.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA.

The requirements also apply to all types of E-UTRA UE release 14 and forward that support UL eLAA.

### 6.3.5A.2.2.3 Minimum conformance requirement

The minimum conformance requirements are defined in clause 6.3.5A.2.0.

### 6.3.5A.2.2.4 Test description

#### 6.3.5A.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.1.2.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.2.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | Mid range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations(Note 3) ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/A for this test | QPSK | 31 | See table 6.3.5A.2.2.5-1 6.3.5A.2.2.5-2 | See table 6.3.5A.2.2.5-5 6.3.5A.2.2.5-6 | - | - |
| 6 | 50 | | QPSK | 56 | See table 6.3.5A.2.2.5-1 6.3.5A.2.2.5-2 | See table 6.3.5A.2.2.5-7 6.3.5A.2.2.5-8 | - | - |
| 15 | 25 | | QPSK | 40 | See table 6.3.5A.2.2.5-3 6.3.5A.2.2.5-4 | See table 6.3.5A.2.2.5-7 6.3.5A.2.2.5-8 | | |
| 25 | 6 | | QPSK | 31 | See table 6.3.5A.2.2.5-7 6.3.5A.2.2.5-8 | See table 6.3.5A.2.2.5-1 6.3.5A.2.2.5-2 | | |
| 25 | 15 | | QPSK | 40 | See table 6.3.5A.2.2.5-5 6.3.5A.2.2.5-6 | See table 6.3.5A.2.2.5-3 6.3.5A.2.2.5-4 | - | - |
| 25 | 25 | | QPSK | 50 | See table 6.3.5A.2.2.5-5 6.3.5A.2.2.5-6 | See table 6.3.5A.2.2.5-5 6.3.5A.2.2.5-6 | - | - |
| 25 | 50 | | QPSK | 75 | See table 6.3.5A.2.2.5-5 6.3.5A.2.2.5-6 | See table 6.3.5A.2.2.5-7 6.3.5A.2.2.5-8 | - | - |
| 25 | 75 | | QPSK | 100 | See table 6.3.5A.2.2.5-7 6.3.5A.2.2.5-8 | See table 6.3.5A.2.2.5-9 6.3.5A.2.2.5-10 | | |
| 50 | 50 | | QPSK | 100 | See table 6.3.5A.2.2.5-7 6.3.5A.2.2.5-8 | See table 6.3.5A.2.2.5-7 6.3.5A.2.2.5-8 | - | - |
| 50 | 100 | | QPSK | 150 | See table 6.3.5A.2.2.5-7 6.3.5A.2.2.5-8 | See table 6.3.5A.2.2.5-11 6.3.5A.2.2.5-12 | - | - |
| 75 | 75 | | QPSK | 150 | See table 6.3.5A.2.2.5-9 6.3.5A.2.2.5-10 | See table 6.3.5A.2.2.5-9 6.3.5A.2.2.5-10 | - | - |
| 75 | 25 | | QPSK | 100 | See table 6.3.5A.2.2.5-9 6.3.5A.2.2.5-10 | See table 6.3.5A.2.2.5-5 6.3.5A.2.2.5-6 | - | - |
| 100 | 75 | | QPSK | 175 | See table 6.3.5A.2.2.5-11 6.3.5A.2.2.5- | See table 6.3.5A.2.2.5-9 6.3.5A.2.2.5-10 | - | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 12 | | | |
| 100 | 100 | | QPSK | 200 | See table 6.3.5A.2.2.5-11 6.3.5A.2.2.5-12 | See table 6.3.5A.2.2.5-11 6.3.5A.2.2.5-12 | - | - |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested.
Note 3: The UL allocation is changed as part of the test procedure. The Test Configuration Table entries list the combinations used, with the sequence of usage as determined by the test procedure for each sub-test.
Note 4: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.4.1-2: Test Configuration Table for UL LAA**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | Mid range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 15 | 100 | N/A for this test | QPSK | 115 | See table 6.3.5A.2.2.5-3 6.3.5A.2.2.5-4 | See table 6.3.5A.2.2.5-13 6.3.5A.2.2.5-14 | - | - |
| 25 | 100 | | QPSK | 125 | See table 6.3.5A.2.2.5-5 6.3.5A.2.2.5-6 | See table 6.3.5A.2.2.5-13 6.3.5A.2.2.5-14 | - | - |
| 50 | 100 | | QPSK | 150 | See table 6.3.5A.2.2.5-7 6.3.5A.2.2.5-8 | See table 6.3.5A.2.2.5-13 6.3.5A.2.2.5-14 | - | - |
| 75 | 100 | | QPSK | 175 | See table 6.3.5A.2.2.5-9 6.3.5A.2.2.5-10 | See table 6.3.5A.2.2.5-13 6.3.5A.2.2.5-14 | - | - |
| 100 | 100 | | QPSK | 200 | See table 6.3.5A.2.2.5-11 6.3.5A.2.2.5-12 | See table 6.3.5A.2.2.5-13 6.3.5A.2.2.5-14 | - | - |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: Applicable only for an LAA Scell configured in Band 46.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.5A. 2.2.4.1-1 or 6.3.5A.2.2.4.1-2.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.2.2.4.3.

#### 6.3.5A.2.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clause 8.3.3.2).
4. The procedure is separated in various subtests to verify different aspects of relative power control on both PCC and SCC individually. The power patterns of the subtests are shown in figure 6.3.5A.2.2.4.2-1 to 6.3.5A.2.2.4.2-6. In this test case, the term $P_{CMAX_L} - MAX\{T_L, T_{LOW}(P_{CMAX_L})\}$ defined in TS 36.101 [2] clause 6.2.5A is used, to ensure the UE is not tested outside its power capability.

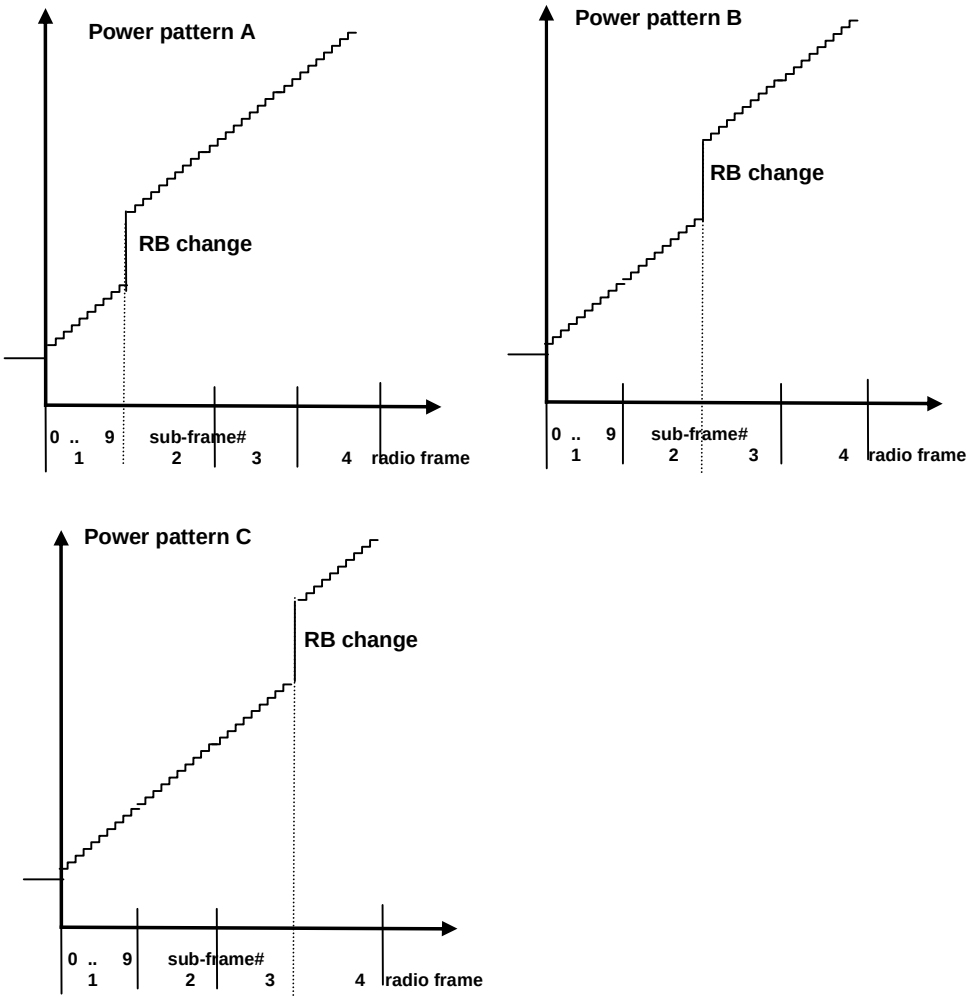



**Figure 6.3.5A.2.2.4.2-1: FDD ramping up test power patterns**

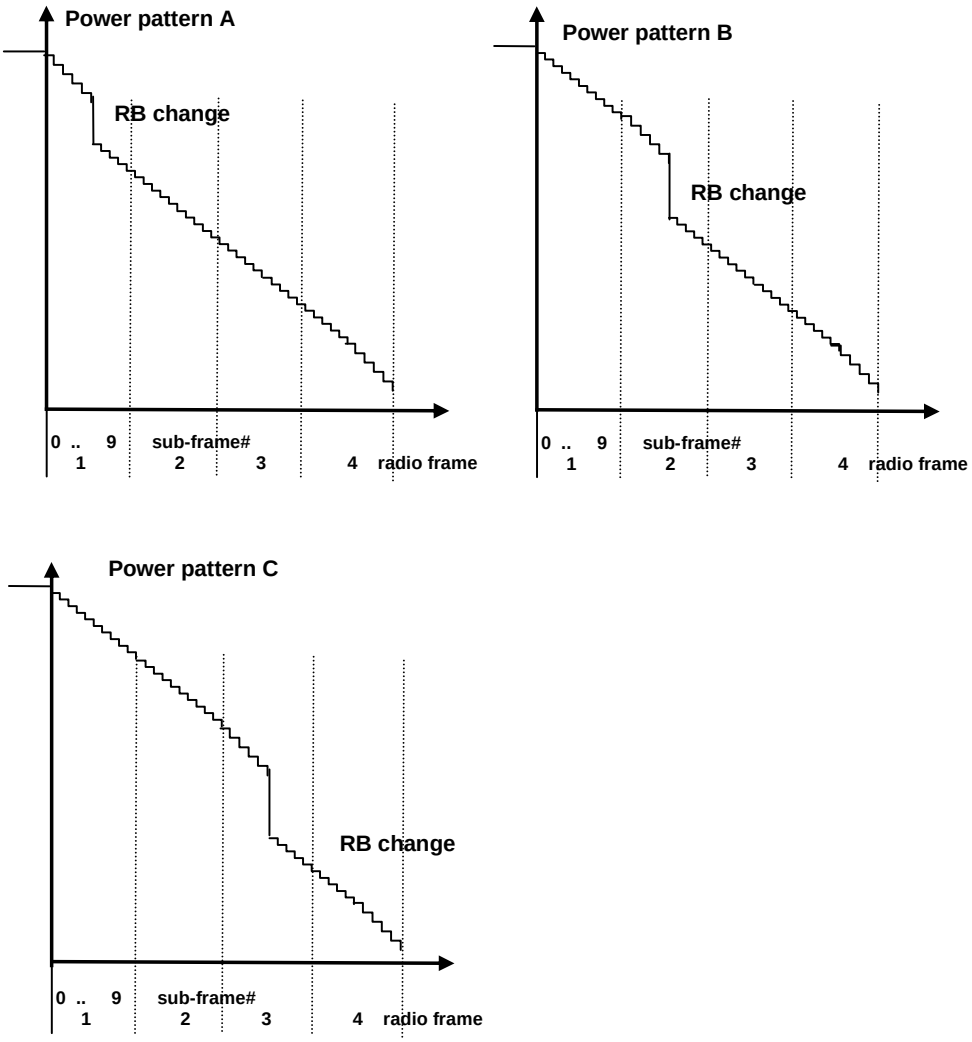



**Figure 6.3.5A.2.2.4.2-2: FDD ramping down test power patterns**

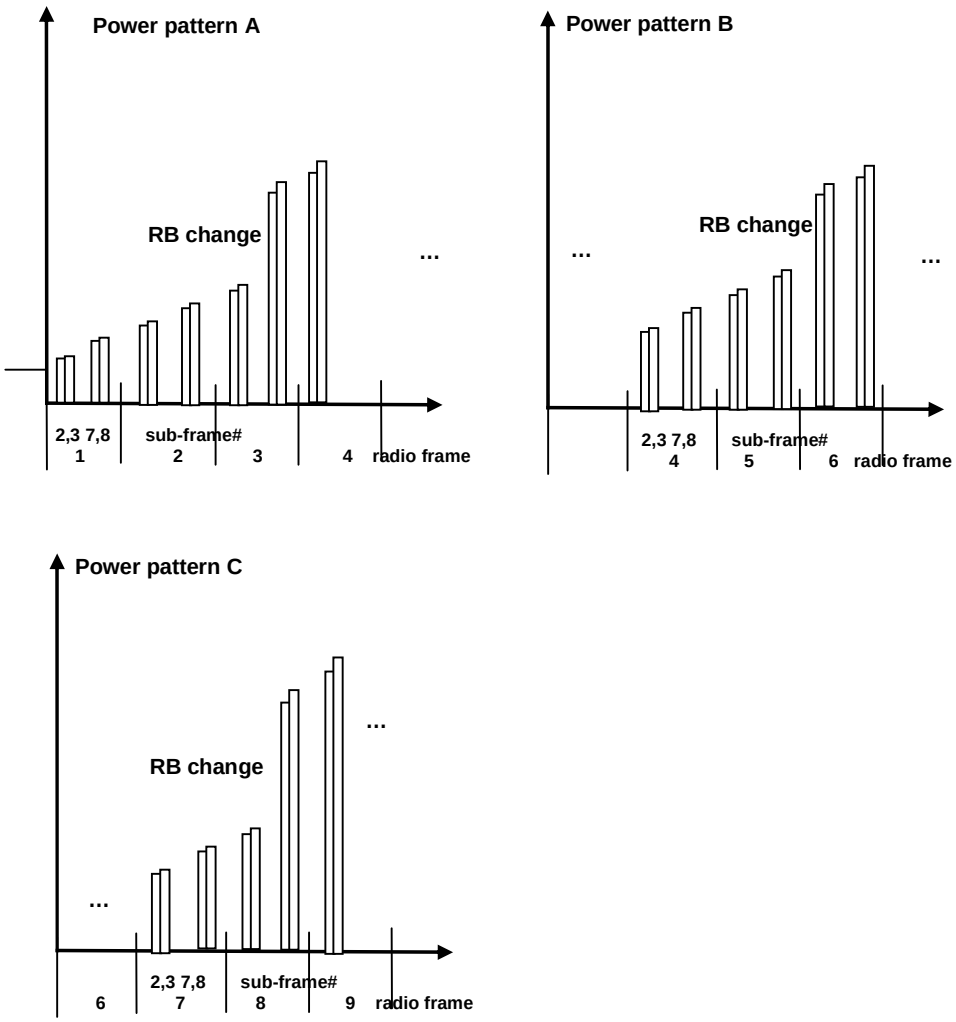



**Figure 6.3.5A.2.2.4.2-3: TDD FS2 ramping up test power patterns**

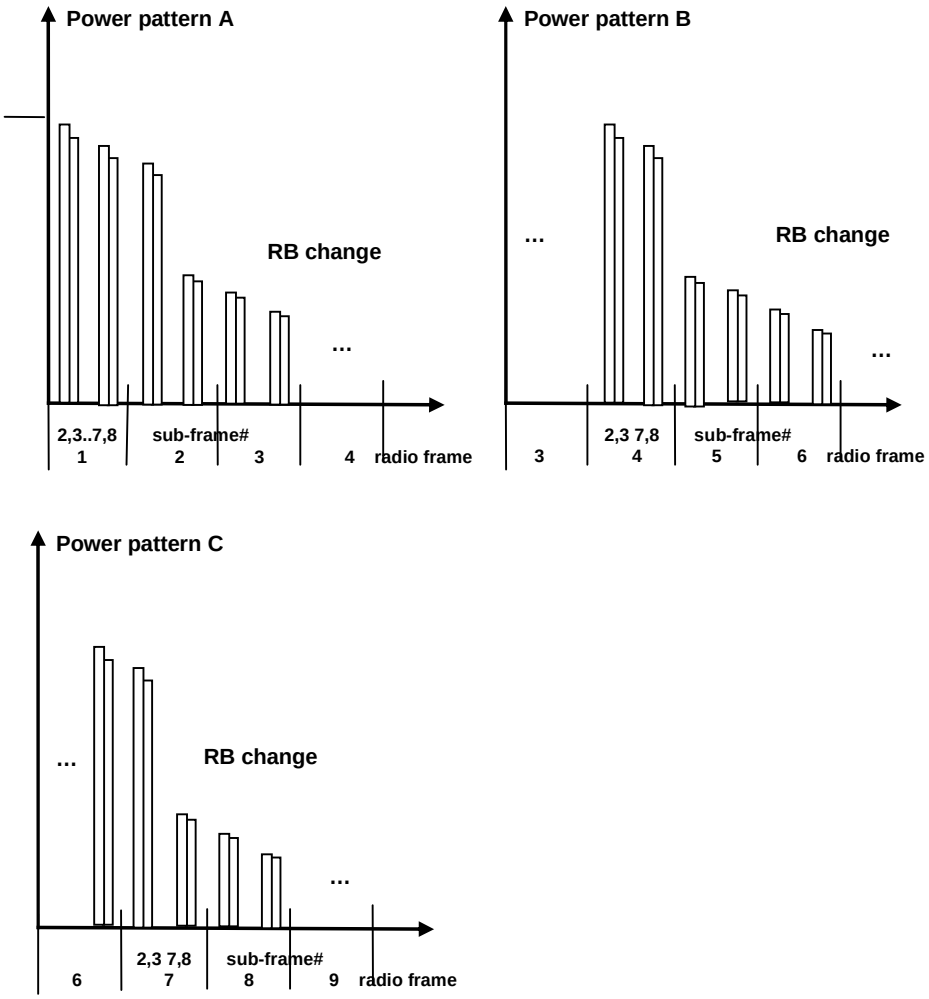



**Figure 6.3.5A.2.2.4.2-4: TDD FS2 ramping down test power patterns**

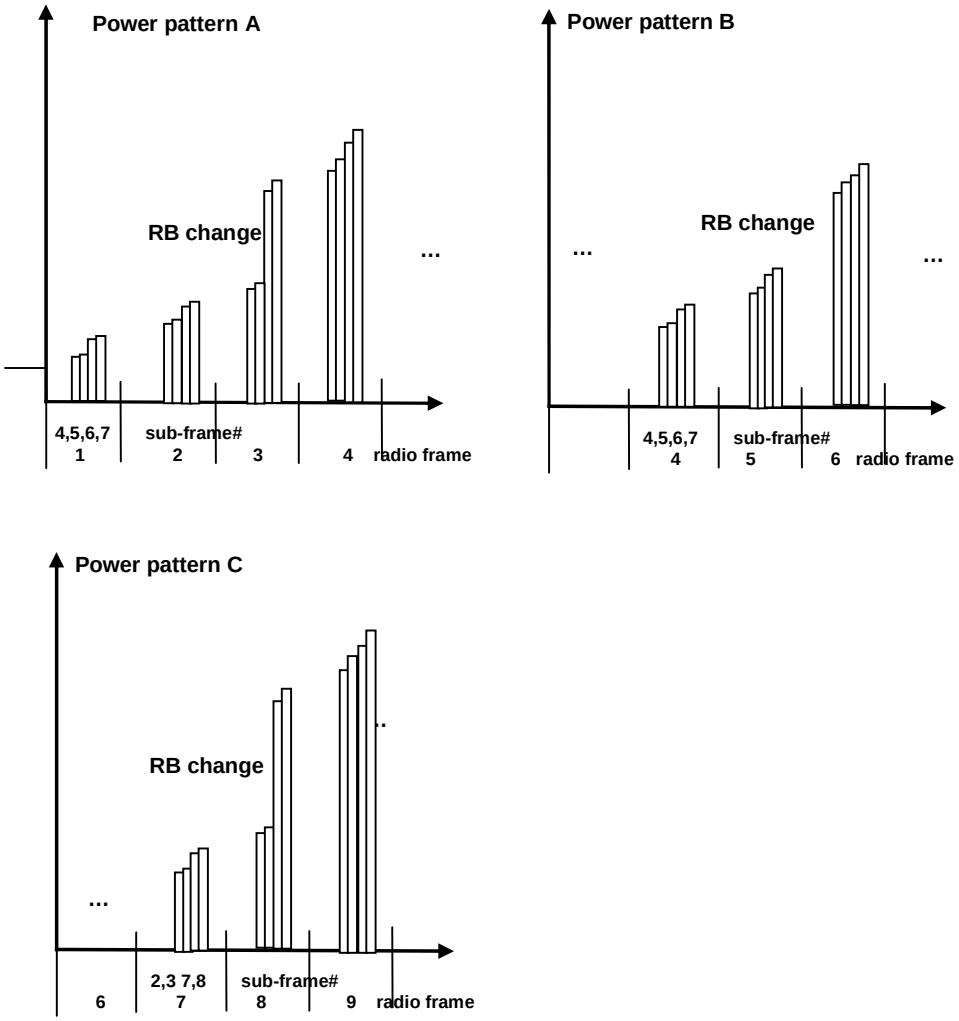



**Figure 6.3.5A.2.2.4.2-5: TDD FS3 ramping up test power patterns**

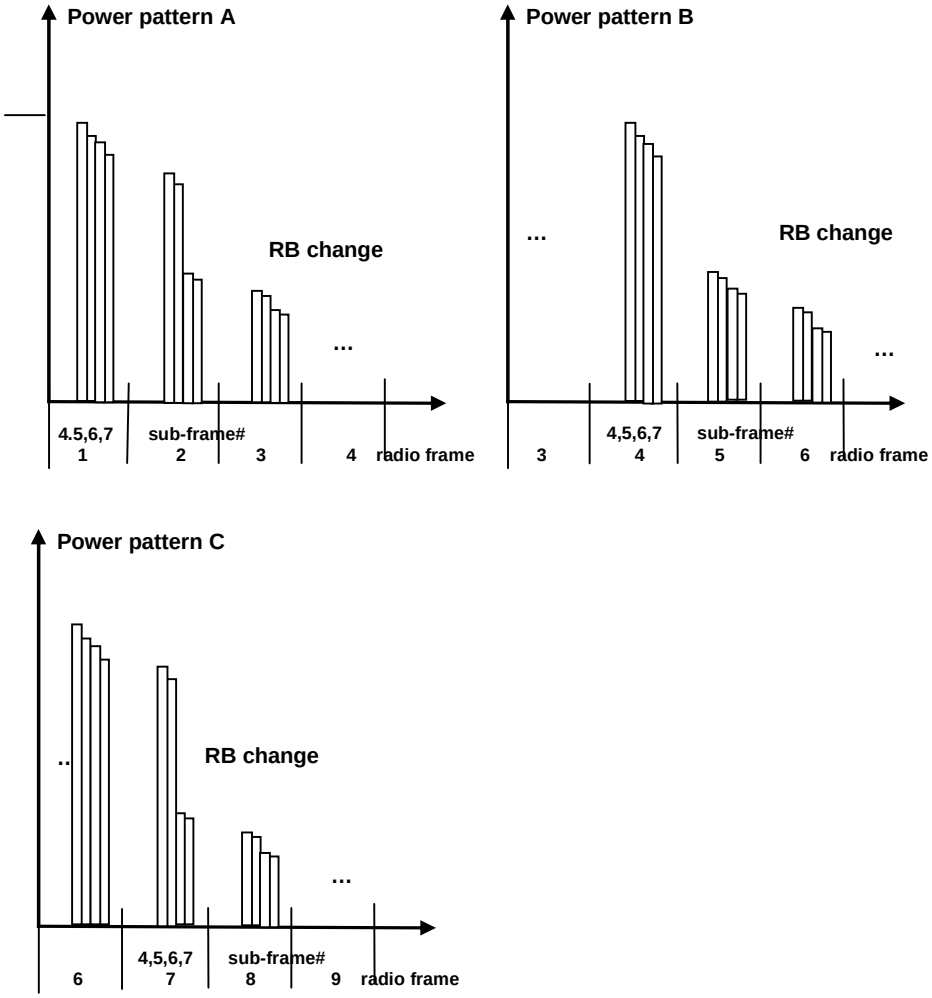



**Figure 6.3.5A.2.2.4.2-6: TDD FS3 ramping down test power patterns**

5. Sub test: ramping up pattern

5.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 or 0B (for LAA SCC) for C_RNTI to schedule the UL RMC according to Table A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD FS2) or Table A.2.5.2.1-1 (TDD FS3) on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCC at -36.8dBm +/- 3.2 dB for carrier frequency $f \leq 3.0$GHz or at -36.5dBm +/- 3.5 dB for carrier frequency 3.0GHz $< f \leq 4.2$GHz or at 36 dBm +/- 4 dB for carrier frequency 4.2GHz $< f \leq 6$GHz.

5.2. Schedule the UE's PUSCH data transmission on each component carrier as described in Figure 6.3.5A.2.2.4.2-1 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame) and Figure 6.3.5A.2.2.4.2-3 (TDD FS2 pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) and Figure 6.3.5A.2.2.4.2-5 (TDD FS3 pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) with an uplink RB allocation as defined in tables 6.3.5A.2.2.5-1 thru 6.3.5A.2.2.5-14 depending on CC combinations. On the PDCCH format 0 or 0B (for LAA SCC) for the scheduling of the PUSCH the SS will transmit a +1dB TPC command on both PCC and SCC separately. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

5.3. Measure the power of PUSCH transmissions on both PCC and SCC separately to verify the UE relative power control meet test requirements 6.3.5A.2.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded. Calculate the Total uplink power across both CCs. If ($P_{CMAX_L}$ − MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } - Total uplink power) < 0.7dB, stop ramping, exclude the last measurement and go to step 5.4.5.4. Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5A.2.2.5-1 thru Table 6.3.5A.2.2.5-14 to force bigger UE power steps at various points in the power range.

6. Sub test: ramping down pattern

6.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 or 0B (for LAA SCC) for C_RNTI to schedule the UL RMC according to Table A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD FS2) or Table A.2.5.2.1-1 (TDD FS3) on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCC at +15.0dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz or at +14.7dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz or at 14 dBm +/- 4 dB for carrier frequency 4.2GHz < f ≤ 6GHz.

6.2. Schedule the UE's PUSCH data transmission as described in Figure 6.3.5A.2.2.4.2-2 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame) and Figure 6.3.5A.2.2.4.2-4 (TDD FS2 pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) and Figure 6.3.5A.2.2.4.2-6 (TDD FS3 pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) with an uplink RB allocation as defined in tables 6.3.5A.2.2.5-1 thru 6.3.5A.2.2.5-14 depending on CC combinations. On the PDCCH format 0 or 0B (for LAA SCC) for the scheduling of the PUSCH the SS will transmit a -1dB TPC command on both PCC and SCC separately. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

6.3. Measure the power of PUSCH transmissions on both PCC and SCC separately to verify the UE relative power control meet test requirements 6.3.5.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

6.4. Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5A.2.2.5-1 thru Table 6.3.5A.2.2.5-14 to force bigger UE power steps at various points in the power range.

### 6.3.5A.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.5A.2.2.5 Test requirement

Each UE power step measured in the test procedure 6.3.5A.2.2.4.2 should satisfy the test requirements specified in Table 6.3.5A.2.2.5-1, thru 6.3.5A.2.2.5-14 for normal conditions; for extreme conditions an additional ± 2.0 dB relaxation is allowed.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each of ramping up and ramping down test patterns on both PCC and SCC separately. For these exceptions the power tolerance limit is a maximum of ±6.7 dB. If there is an exception in the power step caused by the RB change for all test patterns (A, B, C) then fail the UE.

**Table 6.3.5A.2.2.5-1: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 1.4MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 6 RBs | TPC=+1dB | 8.78 | 4 ≤ ΔP < 10 | 8.78 ± (4.7) Note 2<br>8.78 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed = 6 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.5-2: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 1.4MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 5 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 5 to 1 RBs | TPC=-1dB | 7.99 | 4 ≤ ΔP < 10 | 7.99 ± (4.7) Note 2<br>7.99 +4.7/-6.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.5-3: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 3MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 4 RBs | TPC=+1dB | 7.02 | 4 ≤ ΔP < 10 | 7.02 ± (4.7) Note 2<br>7.02 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed =4 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.5-4: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 3MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 15 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 15 to 1 RBs | TPC=-1dB | 12.76 | 10 ≤ ΔP < 15 | 12.76 ± (5.7) Note 2<br>12.76 +5.7/-7.2 Note 4 |
| Subframes after RB change | Fixed =1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern **A** the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.5-5: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 20 | TPC=+1dB | 14.01 | 10 ≤ ΔP < 15 | 14.01 ± (5.7) Note 2<br>14.01 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 20 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.5-6: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 25 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 25 to 1 | TPC=-1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± (5.7) Note 2<br>14.98 +5.7/-7.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.5-7: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 10MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 25 | TPC=+1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± (5.7) Note 2<br>14.98 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 25 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.5-8: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 10MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 50 ( UE-Categories ≥2)<br><br>Fixed = 48 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 50 to 1 ( UE-Categories ≥2)<br><br>Change from 48 to 1 (UE cat 1) | TPC=-1dB | 17.99<br><br>17.81 | 15 ≤ Δ | 17.99 ± (6.7) Note 2<br>17.99 +6.7/-8.2 Note 4<br><br>17.81 ± (6.7) Note 2<br>17.81 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.5-9: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 50 | TPC=+1dB | 17.99 | 15 ≤ ΔP | 17.99±(6.7) Note 2<br>17.99 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 50 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.5-10: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 75 ( UE-Categories ≥2)<br><br>Fixed = 50 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 75 to 1 ( UE-Categories ≥2)<br><br>Change from 50 to 1 (UE Cat 1) | TPC=-1dB | 19.75<br><br>17.99 | 15 ≤ ΔP | 19.75 ± (6.7) Note 2<br>19.75 +6.7/-8.2 Note 4<br><br>17.99 ± (6.7) Note 2<br>17.99 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.5-11: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 75 | TPC=+1dB | 19.75 | 15 ≤ ΔP | 19.75 ± (6.7) Note 2<br>19.75 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 75 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.5-12: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 100 ( UE-Categories ≥2)<br><br>Fixed = 75 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 100 to 1 ( UE-Categories ≥2)<br><br>Change from 75 to 1 (UE Cat 1) | TPC=-1dB | 21.0<br><br>19.75 | 15 ≤ ΔP | 21.0 ± (6.7) Note 2<br>21.0 +6.7/-8.2 Note 4<br><br>19.75 ± (6.7) Note 2<br>19.75 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.5-13: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 10 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 10 to 100 | TPC=+1dB | 11.0 | 10 ≤ ΔP < 15 | 11.0 ± (5.7) Note 2<br>11.0 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 100 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: Applicable only for an LAA Scell configured in Band 46.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.2.5-14: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 100 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 100 to 10 | TPC=-1dB | 11.0 | 10 ≤ ΔP < 15 | 11.0 ± (5.7) Note 2<br>11.0 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 10 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: Applicable only for an LAA Scell configured in Band 46.
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

### 6.3.5A.2.3 Power Control Relative power tolerance for CA (intra-band non-contiguous DL CA and UL CA)

#### 6.3.5A.2.3.1 Test purpose

To verify the ability of the UE transmitter to change the output power in both assigned component carrier in the uplink with a defined power step sizes between sub-frames on the two respective component carrier.

#### 6.3.5A.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

#### 6.3.5A.2.3.3 Minimum conformance requirement

The minimum conformance requirements are defined in clause 6.3.5A.2.0.

#### 6.3.5A.2.3.4 Test description

##### 6.3.5A.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.2.3.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.2.3.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: Low Wgap , Maximum Wgap |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC<br>(Note 2) |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ [MHz] | DL Allocation | | UL Allocation | | | |
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | | CC MOD | PCC & SCC RB allocation | CC MOD | NRB_alloc | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | QPSK | 6<br>13<br>2<br>16 | P_5@0<br>P_5@0<br>P_1@0<br>P_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 |
| 2 | 25 | 25 | 5 | N/A | N/A | QPSK | 6<br>13<br>2<br>16 | P_5@0<br>P_5@0<br>P_1@0<br>P_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 |
| 3[4] | 50 | 50 | 25 | N/A | N/A | QPSK | 6<br>13<br>2<br>16 | P_5@0<br>P_5@0<br>P_1@0<br>P_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 |
| 4[5] | 100 | 100 | 5 | N/A | N/A | QPSK | 6<br>13<br>2<br>16 | P_5@0<br>P_5@0<br>P_1@0<br>P_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.
Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band.
Note 3: The UL allocation is changed as part of the test procedure. The Test Configuration Table entries list the combinations used, with the sequence of usage as determined by the test procedure for each sub-test.
Note 4: Not applicable if only Bandwidth Combination Set 0 is supported by the UE for the CA Configuration
Note 5: Applicable if only Bandwidth Combination Set 0 is supported by the UE for the CA Configuration.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channel is set according to Table 6.3.5A.2.3.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.2.3.4.3.

#### 6.3.5A.2.3.4.2 Test procedure

Same test procedure as in clause 6.3.5A.2.1.4.2 with the following exceptions.

- Instead of Table 6.3.5A.2.1.4.1-1→ use Table 6.3.5A.2.3.4.1-1.
- Instead of clause 6.3.5A.2.1.4.3→ use clause 6.3.5A.2.3.4.3.

#### 6.3.5A.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.5A.2.3.5 Test requirement

For intra-band non-contiguous carrier aggregation, the relative power control tolerance per component carrier measured in steps 5, 6 , 7 and 8 of the test procedure should satisfy the applicable test requirements specified in Tables 6.3.5A.2.3.5-1 to 6.3.5A.2.3.5-4 for normal conditions.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each subtest, and are counted during the Test Procedure.

**Table 6.3.5A.2.3.5-1: Test requirements for SCC power increase**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | -1.7dB | +1.8dB |
| | Exception | dB | -6.7dB | +6.8dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | +4.2dB | +13.7dB |
| | Exception | dB | +2.2dB | +15.8dB |

**Table 6.3.5A.2.3.5-2: Test requirements for SCC power decrease**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | -1.8dB | +1.7dB |
| | Exception | dB | -6.8dB | +6.7dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | -13.8dB | -4.2dB |
| | Exception | dB | -15.8dB | -2.2dB |

**Table 6.3.5A.2.3.5-3: Test requirements for PCC and SCC power increase together**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | +4.3dB | +13.8dB |
| | Exception | dB | +2.3dB | +15.8dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | +4.3dB | +13.8dB |
| | Exception | dB | +2.3dB | +15.8dB |

**Table 6.3.5A.2.3.5-4: Test requirements for PCC and SCC power decrease together**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | -13.8dB | -4.3dB |
| | Exception | dB | -15.8dB | -2.3dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | -13.8dB | -4.3dB |
| | Exception | dB | -15.8dB | -2.3dB |

## 6.3.5A.2.4 Power Control Relative power tolerance for CA (3UL CA)

### 6.3.5A.2.4.1 Power Control Relative power tolerance for CA (intra-band contiguous 3DL CA and 3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

-The test applicability needs to be added to TS36.521-2

#### 6.3.5A.2.4.1.1 Test purpose

To verify the ability of the UE transmitter to change the output power in all assigned component carriers in the uplink with a defined power step sizes between sub-frames on the three respective component carriers.

#### 6.3.5A.2.4.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band contiguous 3DL CA and 3UL CA.

#### 6.3.5A.2.4.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.5A.2.0.

#### 6.3.5A.2.4.1.4 Test description

##### 6.3.5A.2.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.2.4.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.2.4.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Mid range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 50 | | QPSK | 7<br>21<br>3<br>24 | P_5@20<br>P_5@20<br>P_1@24<br>P_8@17 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - |
| 50 | 50 | | QPSK | 7<br>21<br>3<br>24 | P_5@45<br>P_5@45<br>P_1@49<br>P_8@42 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - |
| 75 | 75 | | QPSK | 7<br>21<br>3<br>24 | P_5@70<br>P_5@70<br>P_1@74<br>P_8@67 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - |
| 100 | 25 | | QPSK | 7<br>21<br>3<br>24 | P_5@95<br>P_5@95<br>P_1@99<br>P_8@92 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - |
| 100 | 50 | | QPSK | 7<br>21<br>3<br>24 | P_5@95<br>P_5@95<br>P_1@99<br>P_8@92 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - |
| 100 | 75 | | QPSK | 7<br>21<br>3<br>24 | P_5@95<br>P_5@95<br>P_1@99<br>P_8@92 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - |
| 100 | 100 | | QPSK | 7<br>21<br>3<br>24 | P_5@95<br>P_5@95<br>P_1@99<br>P_8@92 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , only the first of those is tested, according to the order on the Test Configuration Table list. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.5A.2.4.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.2.4.1.4.3.

#### 6.3.5A.2.4.1.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. The procedure is separated in various subtests to verify different aspects of relative power control. The power changes of the subtests are shown by diagrams in the Test Procedure. In this test case, the term $P_{CMAX_L}$ − MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } defined in TS 36.101 [2] clause 6.2.5A is used, to ensure the UE is not tested outside its power capability.

5. Sub test: SCC power increase

5.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD) on all PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCCs with powers nearest to $PCC_{RefSet,\ 0}$ and $SCC_{RefSet,\ 0}$ respectively, as defined in Table 6.3.5A.2.4.1.4.2-1. The powers and allocations are chosen so the average transmit power per PRB is aligned across both assigned carriers in the reference sub-frame. Measure $PCC_{RefMeas,\ 0}$ and $SCC_{RefMeas,\ 0}$ in the Reference subframe, and after the SCC allocation is increased, measure $PCC_{TargetMeas,\ 0}$ and $SCC_{TargetMeas,\ 0}$ in the Target subframe.

**Table 6.3.5A.2.4.1.4.2-1: Power settings and RB allocations for SCC power increase, step n=0**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet,\ 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet,\ 0}$) +7 | $SCC_{RefSet,\ 0}$, dBm/$N_{RB\ alloc}$ | -17 |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas,\ 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas,\ 0}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet,\ 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet,\ 0}$) +7 | $SCC_{TargetSet,\ 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet,\ 0}$) +9 |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas,\ 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas,\ 0}$ |

5.2. Calculate the Total uplink power across all CCs in dBm as $10\log_{10}$(($PCC_{TargetMeas,\ n}$ in mW) + ($SCC_{TargetMeas,\ n}$ in mW)). If ($P_{CMAX_L}$ − MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } - Total uplink power) > 1dB, continue to step 5.3. Otherwise, go to step 5.6.

5.3. For the PCC, calculate the change in power as ($PCC_{TargetMeas,\ n}$ - $PCC_{RefMeas,\ n}$) and compare to the PCC Test requirement specified in Table 6.3.5A.2.4.1.5-1. If the result meets the normal Test requirement, continue to step 5.4. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the PCC exception counter by 1 and continue to step 5.4, Otherwise, fail the UE for this subtest.

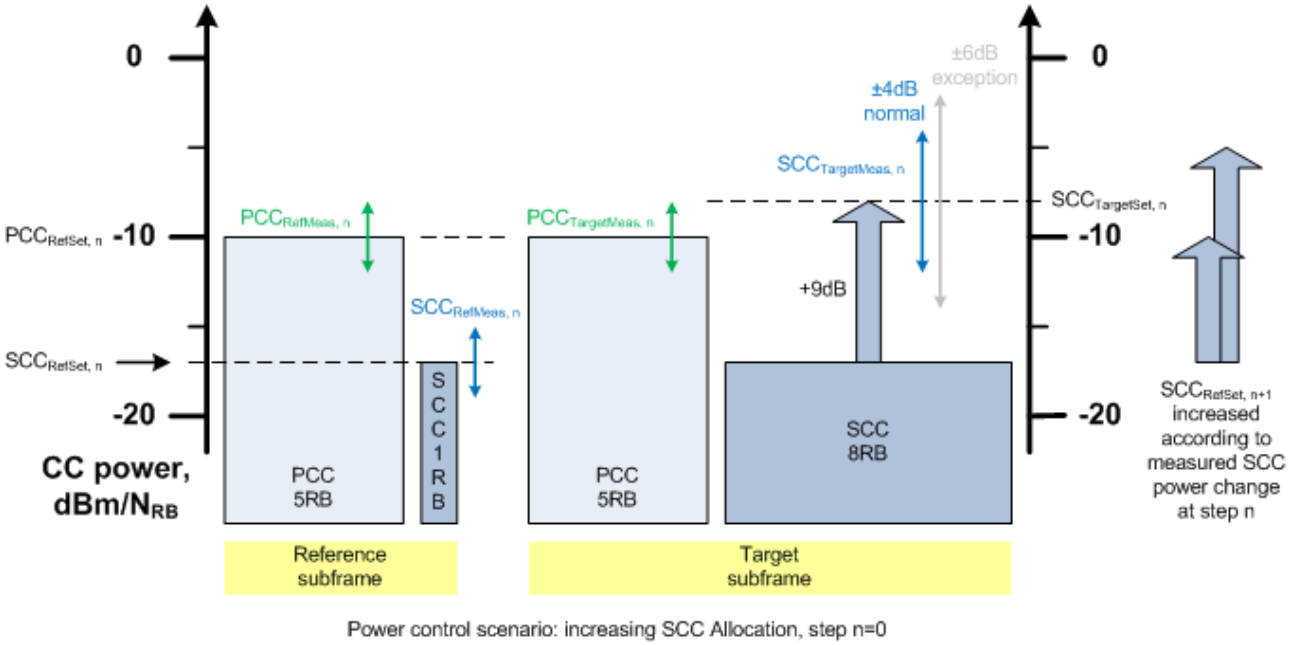
5.4. For the SCCs, calculate the change in power as ($SCC_{TargetMeas,\ n}$ - $SCC_{RefMeas,\ n}$) and compare to the SCC Test requirement specified in Table 6.3.5A.2.4.1.5-1. If the result meets the normal Test requirement, continue to step 5.5. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the SCC exception counter by 1 and continue to step 5.5, Otherwise, fail the UE for this subtest.

5.5. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCCs with powers nearest to $PCC_{RefSet,\ n+1}$ and $SCC_{RefSet,\ n+1}$ respectively, as defined in Table 6.3.5A.2.4.1.4.2-2. Measure $PCC_{RefMeas,\ n}$ and $SCC_{RefMeas,\ n}$.in the Reference subframe, and after the SCC allocation is increased, measure $PCC_{TargetMeas,\ n}$ and $SCC_{TargetMeas,\ n}$.in the Target subframe. Repeat steps 5.2 to 5.4.

**Table 6.3.5A.2.4.1.4.2-2: Power settings and RB allocations for SCC power increase, step n+1**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet,\ n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet,\ n+1}$) +7 | $SCC_{RefSet,\ n+1}$, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas,\ n}$ +2dB) |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas,\ n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas,\ n+1}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet,\ n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet,\ n+1}$) +7 | $SCC_{TargetSet,\ n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet,\ n+1}$) +9 |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas,\ n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas,\ n+1}$ |

5.6. If the PCC exception counter is ≤ 2 and the SCC exception counter is ≤ 2, and the requirements specified in Table 6.3.5A.2.4.1.5-1 are all met, pass the UE for this subtest.




Power control scenario: increasing SCC Allocation, step n=0

**Figure 6.3.5A.2.4.1.4.2-1: SCC power increase**

6. Sub test: SCC power decrease

6.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD) on all PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCCs with powers nearest to $PCC_{RefSet,\ 0}$ and $SCC_{RefSet,\ 0}$

respectively, as defined in Table 6.3.5A.2.4.1.4.2-3.The powers and allocations are chosen so the average transmit power per PRB is aligned across both assigned carriers in the reference sub-frame. Measure $PCC_{RefMeas, 0}$ and $SCC_{RefMeas, 0}$ in the Reference subframe, and after the SCC allocation is decreased, measure $PCC_{TargetMeas, 0}$ and $SCC_{TargetMeas, 0}$ in the Target subframe.

**Table 6.3.5A.2.4.1.4.2-3: Power settings and RB allocations for SCC power decrease, step n=0**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet, 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, 0}$) -2 | $SCC_{RefSet, 0}$, dBm/$N_{RB\ alloc}$ | $P_{CMAX_L}$ – MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } - 5 |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas, 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas, 0}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet, 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, 0}$) -2 | $SCC_{TargetSet, 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, 0}$) -9 |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas, 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, 0}$ |

6.2. If the uplink (power for each CC – (-20dBm)) is > 1dB, continue to step 6.3. Otherwise, go to step 6.6.

6.3. For the PCC, calculate the change in power as ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) and compare to the PCC Test requirement specified in Table 6.3.5A.2.4.1.5-2. If the result meets the normal Test requirement, continue to step 6.4. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the PCC exception counter by 1 and continue to step 6.4, Otherwise, fail the UE for this subtest.

6.4. For the SCCs, calculate the change in power as ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) and compare to the SCC Test requirement specified in Table 6.3.5A.2.4.1.5-2. If the result meets the normal Test requirement, continue to step 6.5. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the SCC exception counter by 1 and continue to step 6.5, Otherwise, fail the UE for this subtest.

6.5. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCCs with powers nearest to $PCC_{RefSet, n+1}$ and $SCC_{RefSet, n+1}$ respectively, as defined in Table 6.3.5A.2.4.1.4.2-4. Measure $PCC_{RefMeas, n}$ and $SCC_{RefMeas, n}$.in the Reference subframe, and after the SCC allocation is decreased, measure $PCC_{TargetMeas, n}$ and $SCC_{TargetMeas, n}$.in the Target subframe. Repeat steps 6.2 to 6.4.

**Table 6.3.5A.2.4.1.4.2-4: Power settings and RB allocations for SCC power decrease, step n+1**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) -2 | $SCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, n}$ -2dB |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas, n+1}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) -2 | $SCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) -9 |
| PCC allocation, $N_{RB\ alloc}$ | 5 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, n+1}$ |

6.6. If the PCC exception counter is ≤ 2 and the SCC exception counter is ≤ 2, and the requirements specified in Table 6.3.5A.2.4.1.5-2 are all met, pass the UE for this subtest.

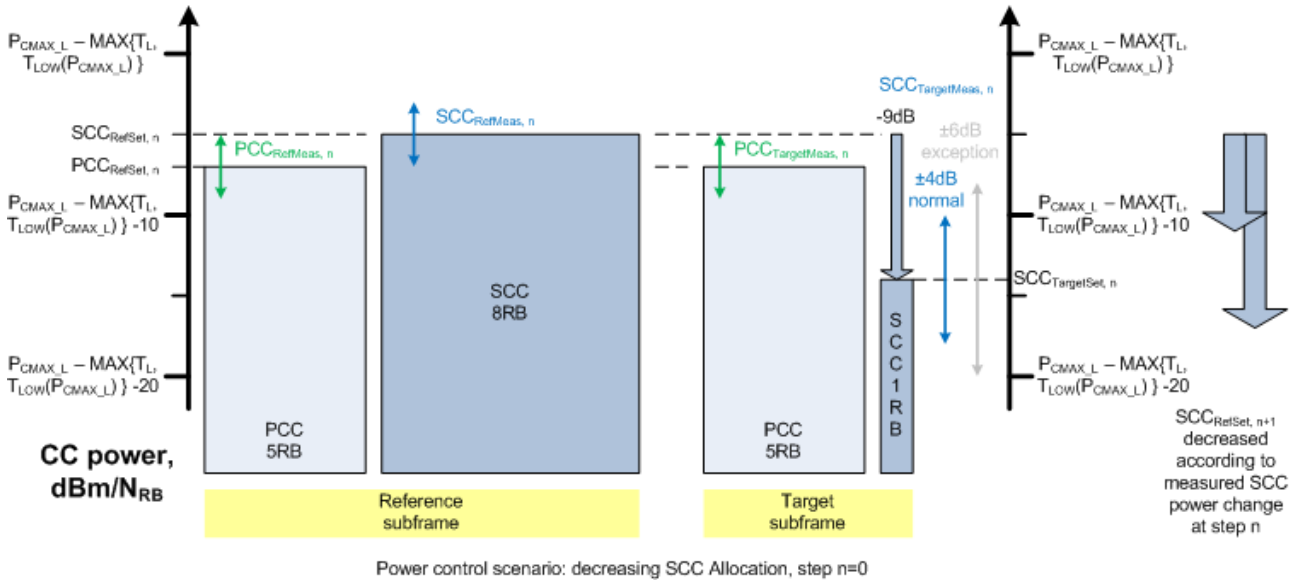



**Figure 6.3.5A.2.4.1.4.2-2: SCC power decrease7. Sub test: PCC and SCC power increase together**

7.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD) on all PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCCs with powers nearest to $PCC_{RefSet, 0}$ and $SCC_{RefSet, 0}$ respectively, as defined in Table 6.3.5A.2.4.1.4.2-5. The powers and allocations are chosen so the average transmit power per PRB is aligned across both assigned carriers in the reference sub-frame. Measure $PCC_{RefMeas, 0}$ and $SCC_{RefMeas, 0}$ in the Reference subframe, and after the PCC and SCC allocation are increased, measure $PCC_{TargetMeas, 0}$ and $SCC_{TargetMeas, 0}$ in the Target subframe.

**Table 6.3.5A.2.4.1.4.2-5: Power settings and RB allocations for PCC and SCC power increase, step n=0**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet, 0}$, dBm/$N_{RB\ alloc}$ | -17 | $SCC_{RefSet, 0}$, dBm/$N_{RB\ alloc}$ | -17 |
| PCC allocation, $N_{RB\ alloc}$ | 1 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas, 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas, 0}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet, 0}$, dBm/$N_{RB\ alloc}$ | ($PCC_{RefSet, 0}$) +9 | $SCC_{TargetSet, 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, 0}$) +9 |
| PCC allocation, $N_{RB\ alloc}$ | 8 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas, 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, 0}$ |

7.2. Calculate the Total uplink power across all CCs in dBm as $10\log_{10}((PCC_{TargetMeas, n}$ in mW) + ($SCC_{TargetMeas, n}$ in mW)). If ($P_{CMAX_L}$ – MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } - Total uplink power) > 1dB, continue to step 7.3. Otherwise, go to step 7.6.

7.3. For the PCC, calculate the change in power as ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) and compare to the PCC Test requirement specified in Table 6.3.5A.2.4.1.5-3. If the result meets the normal Test requirement, continue to step 7.4. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the PCC exception counter by 1 and continue to step 7.4, Otherwise, fail the UE for this subtest.

7.4. For the SCCs, calculate the change in power as ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) and compare to the SCC Test requirement specified in Table 6.3.5A.2.4.1.5-3. If the result meets the normal Test requirement, continue to step 7.5. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the SCC exception counter by 1 and continue to step 7.5, Otherwise, fail the UE for this subtest.

7.5. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCCs with powers nearest to $PCC_{RefSet, n+1}$ and $SCC_{RefSet, n+1}$ respectively, as defined in Table 6.3.5A.2.4.1.4.2-6. Measure $PCC_{RefMeas, n}$ and $SCC_{RefMeas, n}$.in the Reference subframe, and after the PCC and SCCs allocation are increased, measure $PCC_{TargetMeas, n}$ and $SCC_{TargetMeas, n}$.in the Target subframe. Repeat steps 7.2 to 7.4.

**Table 6.3.5A.2.4.1.4.2-6: Power settings and RB allocations for PCC and SCC power increase, step n+1**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | (Max ($PCC_{TargetMeas, n}$, $SCC_{TargetMeas, n}$)) +2dB | $SCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | (Max ($PCC_{TargetMeas, n}$, $SCC_{TargetMeas, n}$)) +2dB |
| PCC allocation, $N_{RB\ alloc}$ | 1 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas, n+1}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) +9 | $SCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) +9 |
| PCC allocation, $N_{RB\ alloc}$ | 8 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, n+1}$ |

7.6. If the PCC exception counter is ≤ 2 and the SCC exception counter is ≤ 2, and the requirements specified in Table 6.3.5A.2.4.1.5-3 are all met, pass the UE for this subtest.

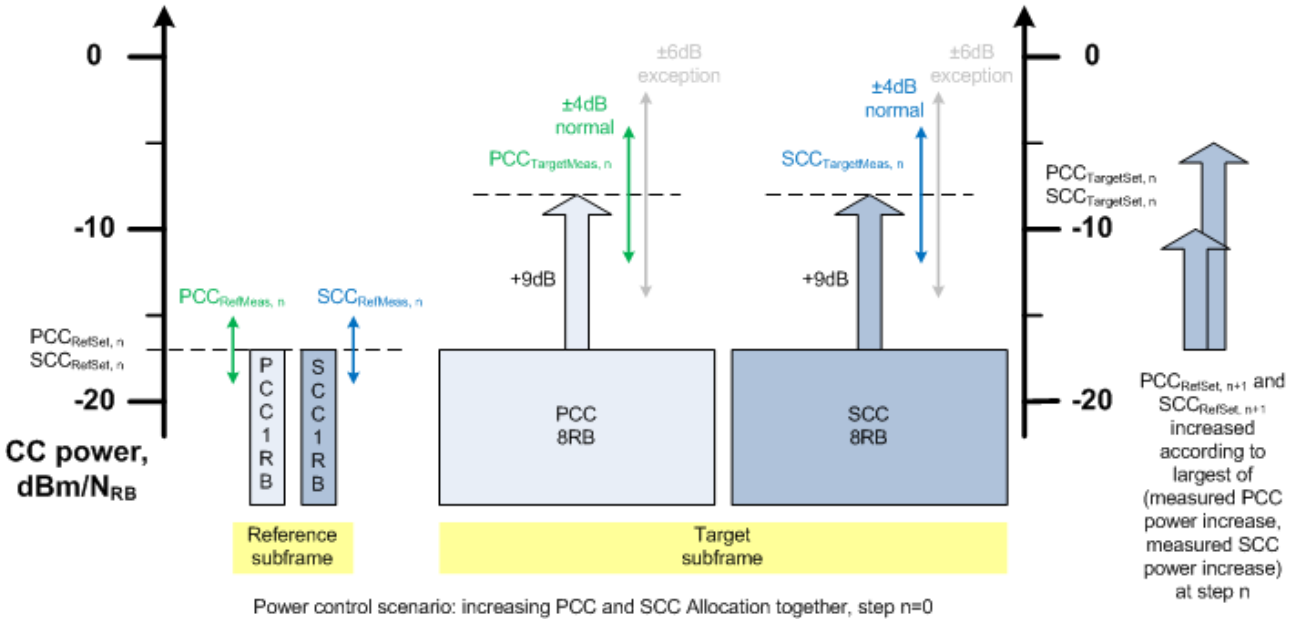



**Figure 6.3.5A.2.4.1.4.2-3: PCC and SCC power increase together**

8. Sub test: PCC and SCCs power decrease together

8.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD) on all PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCCs with powers nearest to $PCC_{RefSet, 0}$ and $SCC_{RefSet, 0}$ respectively, as defined in Table 6.3.5A.2.4.1.4.2-7. The powers and allocations are chosen so the average transmit power per PRB is aligned across both assigned carriers in the reference sub-frame. Measure $PCC_{RefMeas, 0}$ and $SCC_{RefMeas, 0}$ in the Reference subframe, and after the PCC and SCC allocation are decreased, measure $PCC_{TargetMeas, 0}$ and $SCC_{TargetMeas, 0}$ in the Target subframe.

**Table 6.3.5A.2.4.1.4.2-7: Power settings and RB allocations for PCC and SCC power decrease, step n=0**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet, 0}$, dBm/$N_{RB\ alloc}$ | $P_{CMAX_L}$ − MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } - 6 | $SCC_{RefSet, 0}$, dBm/$N_{RB\ alloc}$ | $P_{CMAX_L}$ − MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } - 6 |
| PCC allocation, $N_{RB\ alloc}$ | 8 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas, 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas, 0}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet, 0}$, dBm/$N_{RB\ alloc}$ | ($PCC_{RefSet, 0}$) -9 | $SCC_{TargetSet, 0}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, 0}$) -9 |
| PCC allocation, $N_{RB\ alloc}$ | 1 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas, 0}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, 0}$ |

8.2. If the uplink (power for each CC – (-20dBm)) is > 1dB, continue to step 8.3. Otherwise, go to step 8.6.

8.3. For the PCC, calculate the change in power as ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) and compare to the PCC Test requirement specified in Table 6.3.5A.2.4.1.5-4. If the result meets the normal Test requirement, continue to step 8.4. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the PCC exception counter by 1 and continue to step 8.4, Otherwise, fail the UE for this subtest.

8.4. For the SCCs, calculate the change in power as ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) and compare to the SCC Test requirement specified in Table 6.3.5A.2.4.1.5-4. If the result meets the normal Test requirement, continue to step 8.5. If the result does not meet the normal Test requirement but meets the exception Test requirement, increment the SCC exception counter by 1 and continue to step 8.5, Otherwise, fail the UE for this subtest.

8.5. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the PCC and on the SCCs with powers nearest to $PCC_{RefSet, n+1}$ and $SCC_{RefSet, n+1}$ respectively, as defined in Table 6.3.5A.2.4.1.4.2-8. Measure $PCC_{RefMeas, n}$ and $SCC_{RefMeas, n}$.in the Reference subframe, and after the PCC and SCC allocation are **decreased**, measure $PCC_{TargetMeas, n}$ and $SCC_{TargetMeas, n}$.in the Target subframe. Repeat steps 8.2 to 8.4.

**Table 6.3.5A.2.4.1.4.2-8: Power settings and RB allocations for PCC and SCC power decrease, step n+1**

| PCC | | SCC | |
|---|---|---|---|
| **Parameter** | **Value** | **Parameter** | **Value** |
| **Reference subframe** | | | |
| $PCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | (Min ($PCC_{TargetMeas, n}$, $SCC_{TargetMeas, n}$)) -2dB | $SCC_{RefSet, n+1}$, dBm/$N_{RB\ alloc}$ | (Min ($PCC_{TargetMeas, n}$, $SCC_{TargetMeas, n}$)) -2dB |
| PCC allocation, $N_{RB\ alloc}$ | 8 | SCC allocation, $N_{RB\ alloc}$ | 8 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{RefMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{RefMeas, n+1}$ |
| **Target subframe** | | | |
| $PCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) -9 | $SCC_{TargetSet, n+1}$, dBm/$N_{RB\ alloc}$ | ($SCC_{RefSet, n+1}$) -9 |
| PCC allocation, $N_{RB\ alloc}$ | 1 | SCC allocation, $N_{RB\ alloc}$ | 1 |
| Measured power, dBm/$N_{RB\ alloc}$ | $PCC_{TargetMeas, n+1}$ | Measured power, dBm/$N_{RB\ alloc}$ | $SCC_{TargetMeas, n+1}$ |

8.6. If the PCC exception counter is $\leq 2$ and the SCC exception counter is $\leq 2$, and the requirements specified in Table 6.3.5A.2.4.1.5-4 are all met, pass the UE for this subtest.

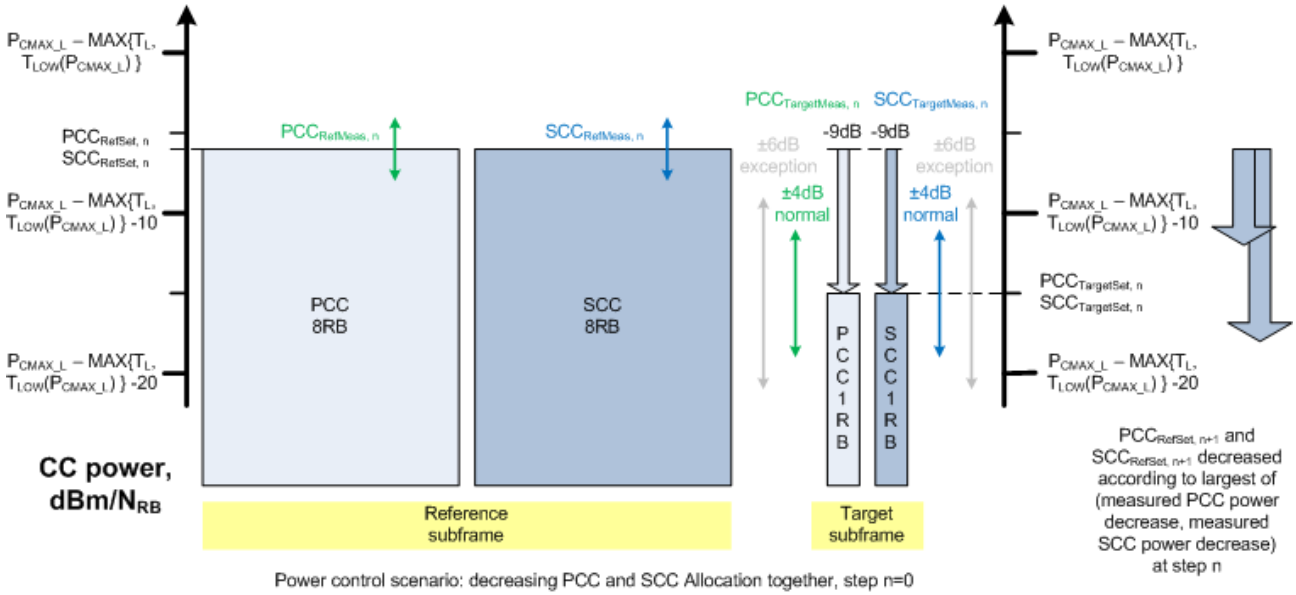



**Figure 6.3.5A.2.4.1.4.2-4: PCC and SCC power decrease together**

### 6.3.5A.2.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.5A.2.4.1.5 Test Requirements

For intra-band contiguous carrier aggregation bandwidth class D, the relative power control tolerance per component carrier measured in steps 5, 6 , 7 and 8 of the test procedure should satisfy the applicable test requirements specified in Tables 6.3.5A.2.4.1.5-1 to 6.3.5A.2.4.1.5-4 for normal conditions..

To account for RF Power amplifier mode changes 2 exceptions are allowed for each subtest, and are counted during the Test Procedure.

**Table 6.3.5A.2.4.1.5-1: Test requirements for SCC power increase**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | -1.7dB | +1.8dB |
| | Exception | dB | -6.7dB | +6.8dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | +4.2dB | +13.7dB |
| | Exception | dB | +2.2dB | +15.8dB |

**Table 6.3.5A.2.4.1.5-2: Test requirements for SCC power decrease**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | -1.8dB | +1.7dB |
| | Exception | dB | -6.8dB | +6.7dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | -13.8dB | -4.2dB |
| | Exception | dB | -15.8dB | -2.2dB |

**Table 6.3.5A.2.4.1.5-3: Test requirements for PCC and SCC power increase together**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | +4.3dB | +13.8dB |
| | Exception | dB | +2.3dB | +15.8dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | +4.3dB | +13.8dB |
| | Exception | dB | +2.3dB | +15.8dB |

**Table 6.3.5A.2.4.1.5-4: Test requirements for PCC and SCC power decrease together**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | -13.8dB | -4.3dB |
| | Exception | dB | -15.8dB | -2.3dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | -13.8dB | -4.3dB |
| | Exception | dB | -15.8dB | -2.3dB |

### 6.3.5A.2.4.2 Power Control Relative power tolerance for CA (inter-band 3DL CA and 3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

-The test applicability needs to be added to TS36.521-2

- The test configuration table is needed for FFS.

- The test procedure is needed for FFS.

#### 6.3.5A.2.4.2.1 Test purpose

To verify the ability of the UE transmitter to change the output power in both assigned component carrier in the uplink with a defined power step sizes between sub-frames on the two respective component carrier.

#### 6.3.5A.2.4.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support inter-band contiguous 3DL CA and 3UL CA.

#### 6.3.5A.2.4.2.3 Minimum conformance requirement

The minimum conformance requirements are defined in clause 6.3.5A.2.0.

#### 6.3.5A.2.4.2.4 Test description

##### 6.3.5A.2.4.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.1.2.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.2.4.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | Mid range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCC1 $N_{RB}$** | **SCC2 $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations(Note 3) ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 100 | 100 | N/A for this Test | QPSK | 225 | See table 6.3.5A.2.4.2.5-1 6.3.5A.2.4.2.5-2 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | - |
| 50 | 100 | 100 | | QPSK | 250 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | - |
| 75 | 100 | 100 | | QPSK | 275 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | - |
| 100 | 100 | 100 | | QPSK | 300 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | - |
| 100 | 25 | 100 | | QPSK | 225 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-1 6.3.5A.2.4.2.5-2 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | - |
| 100 | 50 | 100 | | QPSK | 250 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-1 6.3.5A.2.4.2.5-2 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | - |
| 100 | 75 | 100 | | QPSK | 275 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-1 6.3.5A.2.4.2.5-2 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | - |
| 50 | 50 | 100 | | QPSK | 200 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | - |
| 50 | 75 | 100 | | QPSK | 225 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 75 | 50 | 100 | QPSK | 225 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | - |
| 75 | 75 | 100 | QPSK | 250 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | - |
| 50 | 100 | 50 | QPSK | 200 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | - |
| 50 | 100 | 75 | QPSK | 225 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | - |
| 75 | 100 | 50 | QPSK | 225 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | - |
| 75 | 100 | 75 | QPSK | 250 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | - |
| 75 | 75 | 50 | QPSK | 200 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | - |
| 75 | 75 | 75 | QPSK | 225 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | - |
| 100 | 50 | 50 | QPSK | 200 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | - |
| 100 | 50 | 75 | QPSK | 225 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | - |
| 100 | 75 | 50 | QPSK | 225 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-4 | - |
| 100 | 75 | 75 | QPSK | 250 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | See table 6.3.5A.2.4.2.5-5 6.3.5A.2.4.2.5-6 | - |
| 100 | 100 | 50 | QPSK | 250 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-7 6.3.5A.2.4.2.5-8 | See table 6.3.5A.2.4.2.5-3 6.3.5A.2.4.2.5-6 | - |
| 100 | 100 | 75 | QPSK | 275 | See table 6.3.5A.2.4.2.5-7 | See table 6.3.5A.2.4.2.5-7 | See table 6.3.5A.2.4.2.5-4 | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 6.3.5A.2.4.2.5-8 | 6.3.5A.2.4.2.5-8 | 6.3.5A.2.4.2.5-6 | |
| Note 1: | CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | |
| Note 2: | If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, only the first of those is tested, according to the order in the Test Configuration Table list. | | | | | | | | |
| Note 3: | The UL allocation is changed as part of the test procedure. The Test Configuration Table entries list the combinations used, with the sequence of usage as determined by the test procedure for each sub-test. | | | | | | | | |
| Note 4: | The starting resource block shall be RB# 0. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.5A.1.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.2.4.2.4.3.

#### 6.3.5A.2.4.2.4.2 Test procedure

TBD

#### 6.3.5A.2.4.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.5A.2.4.2.5 Test requirement

Each UE power step measured in the test procedure 6.3.5A.2.4.2.4.2 should satisfy the test requirements specified in Table 6.3.5A.2.4.2.5-1, thru 6.3.5A.2.4.2.5-12 for normal conditions; for extreme conditions an additional ± 2.0 dB relaxation is allowed.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each of ramping up and ramping down test patterns on both PCC and SCC separately. For these exceptions the power tolerance limit is a maximum of ±6.7 dB. If there is an exception in the power step caused by the RB change for all test patterns (A, B, C) then fail the UE.

**Table 6.3.5A.2.4.2.5-1: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 20 | TPC=+1dB | 14.01 | 10 ≤ ΔP < 15 | 14.01 ± (5.7) Note 2<br>14.01 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 20 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.4.2.5-2: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 25 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 25 to 1 | TPC=-1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± (5.7) Note 2<br>14.98 +5.7/-7.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.4.2.5-3: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 10MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 25 | TPC=+1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± (5.7) Note 2<br>14.98 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 25 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.4.2.5-4: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 10MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 50 ( UE-Categories ≥2)<br><br>Fixed = 48 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 50 to 1 ( UE-Categories ≥2)<br><br>Change from 48 to 1 (UE cat 1) | TPC=-1dB | 17.99<br><br>17.81 | 15 ≤ Δ | 17.99 ± (6.7) Note 2<br>17.99 +6.7/-8.2 Note 4<br><br>17.81 ± (6.7) Note 2<br>17.81 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.4.2.5-5: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 50 | TPC=+1dB | 17.99 | 15 ≤ ΔP | 17.99±(6.7) Note 2<br>17.99 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 50 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.4.2.5-6: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 75 ( UE-Categories ≥2)<br><br>Fixed = 50 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 75 to 1 ( UE-Categories ≥2)<br><br>Change from 50 to 1 (UE Cat 1) | TPC=-1dB | 19.75<br><br>17.99 | 15 ≤ ΔP | 19.75 ± (6.7) Note 2<br>19.75 +6.7/-8.2 Note 4<br><br>17.99 ± (6.7) Note 2<br>17.99 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.4.2.5-7: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 75 | TPC=+1dB | 19.75 | 15 ≤ ΔP | 19.75 ± (6.7) Note 2<br>19.75 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 75 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5A.2.4.2.5-8: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 100 ( UE-Categories ≥2)<br><br>Fixed = 75 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 100 to 1 ( UE-Categories ≥2)<br><br>Change from 75 to 1 (UE Cat 1) | TPC=-1dB | 21.0<br><br>19.75 | 15 ≤ ΔP | 21.0 ± (6.7) Note 2<br>21.0 +6.7/-8.2 Note 4<br><br>19.75 ± (6.7) Note 2<br>19.75 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

## 6.3.5A.2.4.3 Power Control Relative power tolerance for CA (intra-band non-contiguous 3DL CA and 3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

-The test applicability needs to be added to TS36.521-2

### 6.3.5A.2.4.3.1 Test purpose

To verify the ability of the UE transmitter to change the output power in both assigned component carrier in the uplink with a defined power step sizes between sub-frames on the two respective component carrier.

### 6.3.5A.2.4.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band non-contiguous 3DL CA and 3UL CA.

### 6.3.5A.2.4.3.3 Minimum conformance requirement

The minimum conformance requirements are defined in clause 6.3.5A.2.0.

6.3.5A.2.4.3.4 Test description

6.3.5A.2.4.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.2.4.3.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.2.4.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: Low Wgap , Maximum Wgap |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC<br>(Note 2) |

| **Test Parameters for CA Configurations** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **NRB_alloc** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **SCCs $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | |
| 1 | 25 | 25 | 35 | N/A | N/A | QPSK | 7<br>21<br>3<br>24 | P_5@0<br>P_5@0<br>P_1@0<br>P_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 |
| 2 | 25 | 25 | 5 | N/A | N/A | QPSK | 7<br>21<br>3<br>24 | P_5@0<br>P_5@0<br>P_1@0<br>P_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 |
| 3[4] | 50 | 50 | 25 | N/A | N/A | QPSK | 7<br>21<br>3<br>24 | P_5@0<br>P_5@0<br>P_1@0<br>P_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 |
| 4[5] | 100 | 100 | 5 | N/A | N/A | QPSK | 7<br>21<br>3<br>24 | P_5@0<br>P_5@0<br>P_1@0<br>P_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 | S_1@0<br>S_8@0<br>S_1@0<br>S_8@0 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.
Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band.
Note 3: The UL allocation is changed as part of the test procedure. The Test Configuration Table entries list the combinations used, with the sequence of usage as determined by the test procedure for each sub-test.
Note 4: Not applicable if only Bandwidth Combination Set 0 is supported by the UE for the CA Configuration
Note 5: Applicable if only Bandwidth Combination Set 0 is supported by the UE for the CA Configuration.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.5A.2.4.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.2.4.3.4.3.

#### 6.3.5A.2.4.3.4.2 Test procedure

Same test procedure as in clause 6.3.5A.2.4.1.4.2 with the following exceptions.

- Instead of Table 6.3.5A.2.4.1.4.1-1→ use Table 6.3.5A.2.4.3.4.1-1.
- Instead of clause 6.3.5A.2.4.1.4.3→ use clause 6.3.5A.2.4.3.4.3.

#### 6.3.5A.2.4.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

#### 6.3.5A.2.4.3.5 Test requirement

For intra-band non-contiguous carrier aggregation, the relative power control tolerance per component carrier measured in steps 5, 6 , 7 and 8 of the test procedure should satisfy the applicable test requirements specified in Tables 6.3.5A.2.4.3.5-1 to 6.3.5A.2.4.3.5-4 for normal conditions.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each subtest, and are counted during the Test Procedure.

**Table 6.3.5A.2.4.3.5-1: Test requirements for SCC power increase**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas,\ n}$ - $PCC_{RefMeas,\ n}$) | Normal | dB | -1.7dB | +1.8dB |
| | Exception | dB | -6.7dB | +6.8dB |
| ($SCC_{TargetMeas,\ n}$ - $SCC_{RefMeas,\ n}$) | Normal | dB | +4.2dB | +13.7dB |
| | Exception | dB | +2.2dB | +15.8dB |

**Table 6.3.5A.2.4.3.5-2: Test requirements for SCC power decrease**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas,\ n}$ - $PCC_{RefMeas,\ n}$) | Normal | dB | -1.8dB | +1.7dB |
| | Exception | dB | -6.8dB | +6.7dB |
| ($SCC_{TargetMeas,\ n}$ - $SCC_{RefMeas,\ n}$) | Normal | dB | -13.8dB | -4.2dB |
| | Exception | dB | -15.8dB | -2.2dB |

**Table 6.3.5A.2.4.3.5-3: Test requirements for PCC and SCC power increase together**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | +4.3dB | +13.8dB |
| | Exception | dB | +2.3dB | +15.8dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | +4.3dB | +13.8dB |
| | Exception | dB | +2.3dB | +15.8dB |

**Table 6.3.5A.2.4.3.5-4: Test requirements for PCC and SCC power decrease together**

| Parameter | Condition | Unit | Minimum | Maximum |
|---|---|---|---|---|
| ($PCC_{TargetMeas, n}$ - $PCC_{RefMeas, n}$) | Normal | dB | -13.8dB | -4.3dB |
| | Exception | dB | -15.8dB | -2.3dB |
| ($SCC_{TargetMeas, n}$ - $SCC_{RefMeas, n}$) | Normal | dB | -13.8dB | -4.3dB |
| | Exception | dB | -15.8dB | -2.3dB |

## 6.3.5A.3 Aggregate power control tolerance for CA

### 6.3.5A.3.0 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the aggregate power tolerance is specified on each component carrier exceed the minimum output power as defined in subclause 6.3.2A and the total power is limited by maximum output power as defined in subclause 6.2.2A. The requirements defined in Table 6.3.5A.3.0-1 shall apply on each component carrier with both component carriers active. The requirements can be tested by time aligning any transmission gaps on both the component carriers.

For intra-band contiguous carrier aggregation bandwidth class B and C and intra-band non-contiguous carrier aggregation, the aggregate power tolerance per component carrier is given in Table 6.3.5A.3.0-1 with either simultaneous PUSCH or simultaneous PUCCH-PUSCH (if supported by the UE) configured. The average power per PRB shall be aligned across both assigned carriers before the start of the test. The requirement can be tested with the transmission gaps time aligned between component carriers.

**Table 6.3.5A.3.0-1: Aggregate power control tolerance**

| TPC command | UL channel | Aggregate power tolerance within 21 ms |
|---|---|---|
| 0 dB | PUCCH | ±2.5 dB |
| 0 dB | PUSCH | ±3.5 dB |
| NOTE: The UE transmission gap is 4 ms. TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission. | | |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5A.3.1.

### 6.3.5A.3.1 Aggregate power control tolerance for CA (intra-band contiguous DL CA and UL CA)

#### 6.3.5A.3.1.1 Test purpose

To verify the ability of a UE to maintain its power in non-contiguous transmission within 21 ms in response to 0 dB TPC commands with respect to the first UE transmission, when the power control parameters specified in [TS 36.213] are constant on all active component carriers.

#### 6.3.5A.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

#### 6.3.5A.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.5A.3.0

#### 6.3.5A.3.1.4 Test description

##### 6.3.5A.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.3.1.4.1-1and table 6.3.5A.3.1.4.1-2. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.3.1.4.1-1: Test Configuration Table: PUCCH sub-test**

<table>
<tr><th colspan="5">Initial Conditions</th></tr>
<tr><td colspan="3">Test Environment as specified in TS 36.508 [7] subclause 4.1</td><td colspan="2">Normal</td></tr>
<tr><td colspan="3">Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2.</td><td colspan="2">Mid range</td></tr>
<tr><td colspan="3">Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE.</td><td colspan="2">Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$</td></tr>
<tr><td colspan="5">Test Parameters for CA Configurations</td></tr>
<tr><td colspan="2">CA Configuration / $N_{RB_agg}$</td><td colspan="2">DL Allocation</td><td>Uplink Configuration</td></tr>
<tr><td>PCC $N_{RB}$</td><td>SCCs $N_{RB}$</td><td>CC Mod</td><td>PCC & SCC RB allocation</td><td rowspan="9">FDD: PUCCH format = Format 1b with channel selection/Format 3<br>TDD: PUCCH format = Format 1b with channel selection/Format 3</td></tr>
<tr><td>25</td><td>50</td><td>QPSK</td><td>25+50</td></tr>
<tr><td>50</td><td>50</td><td>QPSK</td><td>50+50</td></tr>
<tr><td>75</td><td>75</td><td>QPSK</td><td>75+75</td></tr>
<tr><td>100</td><td>25</td><td>QPSK</td><td>100+25</td></tr>
<tr><td>100</td><td>50</td><td>QPSK</td><td>100+50</td></tr>
<tr><td>100</td><td>75</td><td>QPSK</td><td>100+75</td></tr>
<tr><td>100</td><td>100</td><td>QPSK</td><td>100+100</td></tr>
<tr><td colspan="5">Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg , only the combination with the highest NRB_PCC is tested.</td></tr>
</table>

**Table 6.3.5A.3.1.4.1-2: Test Configuration Table: PUSCH sub-test**

| Initial Conditions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 4.1 | | | Normal | | | | | |
| Test Frequencies as specified in TS 36.508 [7] clause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Mid range | | | | | |
| Test CC Combination setting (NRB_agg) as specified in clause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 2575 | 75 | N/A | QPSK | 150 | P_75@0 | S_75@0 | | |
| 100 | 25 | | QPSK | 125 | P_100@0 | S_25@0 | | |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | | |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | | |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channel is set according to Table 6.3.5A.3.1.4.1-1 (PUCCH sub-test) and Table 6.3.5A.3.1.4.1-2 (PUSCH sub-test).

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.3.1.4.3.

6.3.5A.3.1.4.2 Test procedure

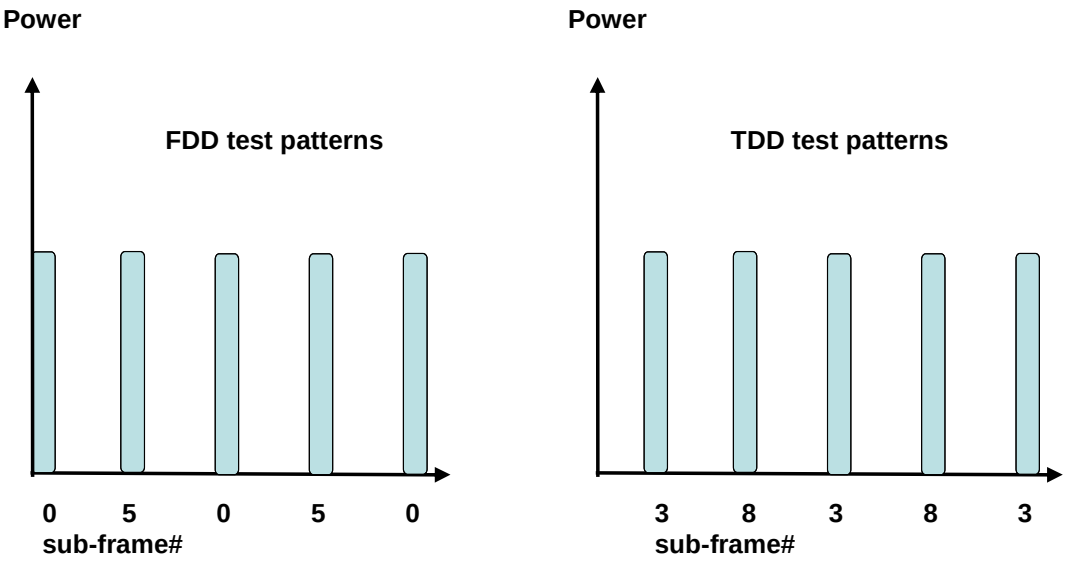



**Figure 6.3.5A.3.1.4.2-1: Test uplink transmission**

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. The procedure is separated in two subtests to verify PUCCH and PUSCH aggregate power control tolerance respectively. The uplink transmission patterns are described in figure 6.3.5A.3.1.4.2-1.
5. PUCCH sub test:

   5.1 The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.3.5A.3.1.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC. The transmission of PDSCH will make the UE send uplink ACK/NACK using PUCCH on PCC. Send the appropriate TPC commands for PUCCH to the UE to ensure that the UE transmits PUCCH at 0dBm +/- 3.2 dB for carrier frequency $f \leq 3.0$GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz $< f \leq$ 4.2GHz.

   5.2 Every 5 subframes transmit to the UE downlink PDSCH MAC padding bits as well as 0 dB TPC command for PUCCH via the PDCCH to make the UE transmit ACK/NACK on the PUCCH with transmission gap of 4 subframes. The downlink transmission is scheduled in the appropriate sub-frames to make the UE transmit PUCCH as described in figure 6.3.5A.3.1.4.2-1.

   5.3 Measure the power of 5 consecutive PUCCH transmissions on PCC to verify the UE transmitted PUCCH power is maintained within 21 ms. The transient periods of 20us are excluded from the power measurement.

6. PUSCH sub test:

   6.1 The SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.5A.3.1.4.1-2 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at 0dBm +/- 3.2.dB for carrier frequency $f \leq 3.0$GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz $< f \leq$ 4.2GHz.

   6.2 Every 5 subframes schedule the UE's PUSCH data transmission and transmit 0 dB TPC command for PUSCH via the PDCCH to make the UE transmit PUSCH with 4 subframes gap. The uplink transmission patterns are described in figure 6.3.5A.3.1.4.2-1.

6.3 Measure the power on both PCC and SCC of 5 consecutive PUSCH transmissions to verify the UE transmitted PUSCH power is maintained within 21 ms on each component carrier. The transient periods of 20us are excluded from the power measurement.

#### 6.3.5A.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

#### 6.3.5A.3.1.5 Test requirement

For intra-band contiguous carrier aggregation bandwidth class C, the aggregate power control tolerance per component carrier measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5A.3.1.5-1.

**Table 6.3.5A.3.1.5-1: Aggregate power control tolerance for intra-band contiguous CA**

| TPC command | UL channel | Aggregate power tolerance within 21 ms |
|---|---|---|
| 0 dB | PUCCH | ±3.2 dB |
| 0 dB | PUSCH | ±4.2 dB |
| NOTE: The UE transmission gap is 4 ms. TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission. | | |

### 6.3.5A.3.2 Aggregate power control tolerance for CA (inter-band DL CA and UL CA)

#### 6.3.5A.3.2.1 Test purpose

To verify the ability of a UE to maintain its power in non-contiguous transmission within 21 ms in response to 0 dB TPC commands with respect to the first UE transmission, when the power control parameters specified in TS 36.213 are constant on all active component carriers.

#### 6.3.5A.3.2.2 Test applicability

This test applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA.

#### 6.3.5A.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.5A.3.0.

#### 6.3.5A.3.2.4 Test description

##### 6.3.5A.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.3.2.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.3.2.4.1-1: Test Configuration Table: PUSCH**

| Initial Conditions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 4.1 | | | Normal | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | Mid range for PCC and SCC | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in clause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/A for this test | QPSK | 31 | P_6@0 | S_25@0 | - | - |
| 6 | 50 | | QPSK | 56 | P_6@0 | S_50@0 | - | - |
| 15 | 25 | | QPSK | 40 | S_15@0 | S_25@0 | | |
| 25 | 6 | | QPSK | 31 | S_25@0 | P_6@0 | | |
| 25 | 15 | | QPSK | 40 | P_25@0 | S_15@0 | - | - |
| 25 | 25 | | QPSK | 50 | P_25@0 | S_25@0 | - | - |
| 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | - | - |
| 25 | 75 | | QPSK | 100 | P_25@0 | S_75@0 | - | - |
| 25 | 100 | | QPSK | 125 | P_25@0 | S_100@0 | - | - |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | - | - |
| 50 | 75 | | QPSK | 125 | P_50@0 | S_75@0 | - | - |
| 50 | 100 | | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 75 | 25 | | QPSK | 100 | P_75@0 | S_25@0 | - | - |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | - | - |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channel is set according to Table 6.3.5A.3.2.4.1-1 (PUSCH).
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.3.2.4.3.

### 6.3.5A.3.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. The uplink transmission patterns are described in figure 6.3.5A.3.1.4.2-1.
5. The SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.5A.3.2.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the

appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at 0dBm +/- 3.2.dB for carrier frequency f ≤ 3.0GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

6. Every 5 subframes schedule the UE's PUSCH data transmission and transmit 0 dB TPC command for PUSCH via the PDCCH to make the UE transmit PUSCH with 4 subframes gap. The uplink transmission patterns are described in figure 6.3.5A.3.1.4.2-1.

7. Measure the power on both PCC and SCC of 5 consecutive PUSCH transmissions to verify the UE transmitted PUSCH power is maintained within 21 ms on each component carrier. The transient periods of 20us are excluded from the power measurement.

#### 6.3.5A.3.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

#### 6.3.5A.3.2.5 Test requirement

For inter-band carrier aggregation, the aggregate power control tolerance per component carrier measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5A.3.2.5-1.

**Table 6.3.5A.3.2.5-1: Aggregate power control tolerance for inter-band CA**

| TPC command | UL channel | Aggregate power tolerance within 21 ms |
|---|---|---|
| 0 dB | PUSCH | ±4.2 dB |
| NOTE: The UE transmission gap is 4 ms. TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission. | | |

### 6.3.5A.3.3 Aggregate power control tolerance for CA (intra-band non-contiguous DL CA and UL CA)

#### 6.3.5A.3.3.1 Test purpose

To verify the ability of a UE to maintain its power in non-contiguous transmission within 21 ms in response to 0 dB TPC commands with respect to the first UE transmission, when the power control parameters specified in TS 36.213 [10] are constant on all active component carriers.

#### 6.3.5A.3.3.2 Test applicability

This test applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

#### 6.3.5A.3.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.5A.3.0

#### 6.3.5A.3.3.4 Test description

#### 6.3.5A.3.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.3.3.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.3.3.4.1-1: Test Configuration Table: PUSCH**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Refer to test points<br>A: N/A (Range is not relevant),<br>Maximum Wgap | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | | QPSK | P_25@0 | QPSK | S_25@0 |
| 2 | 50 | 50 | 25 | | | QPSK | P_50@0 | QPSK | S_50@0 |
| 3 | 100 | 100 | 5 | | | QPSK | P_100@0 | QPSK | S_100@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.<br>Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band. | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channel is set according to Table 6.3.5A.3.3.4.1-1 (PUSCH).
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.3.3.4.3.

### 6.3.5A.3.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. The uplink transmission patterns are described in figure 6.3.5A.3.1.4.2-1.
5. The SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.5A.3.3.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at 0dBm +/- 3.2.dB for carrier frequency $f \leq 3.0$GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz < $f \leq 4.2$GHz.

6. Every 5 subframes schedule the UE's PUSCH data transmission and transmit 0 dB TPC command for PUSCH via the PDCCH to make the UE transmit PUSCH with 4 subframes gap. The uplink transmission patterns are described in figure 6.3.5A.3.1.4.2-1.

7. Measure the power on both PCC and SCC of 5 consecutive PUSCH transmissions to verify the UE transmitted PUSCH power is maintained within 21 ms on each component carrier. The transient periods of 20us are excluded from the power measurement.

#### 6.3.5A.3.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

#### 6.3.5A.3.3.5 Test requirement

For intra-band non-contiguous carrier aggregation, the aggregate power control tolerance per component carrier measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5A.3.3.5-1.

**Table 6.3.5A.3.3.5-1: Aggregate power control tolerance for intra-band non-contiguous CA**

| TPC command | UL channel | Aggregate power tolerance within 21 ms |
|---|---|---|
| 0 dB | PUSCH | ±4.2 dB |
| NOTE: The UE transmission gap is 4 ms. TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission. | | |

### 6.3.5A.3.4 Aggregate Power Control Tolerance for CA (3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

-The test applicability needs to be added to TS36.521-2

#### 6.3.5A.3.4.1 Test purpose

To verify the ability of a UE to maintain its power in non-contiguous transmission within 21 ms in response to 0 dB TPC commands with respect to the first UE transmission, when the power control parameters specified in [TS 36.213] are constant on all active component carriers.

#### 6.3.5A.3.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band contiguous or inter-band or intra-band non-contiguous 3DL CA and 3UL CA.

#### 6.3.5A.3.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.3.5A.3.0.

#### 6.3.5A.3.4.4 Test description

##### 6.3.5A.3.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.3.5A.3.4.4.1-1 and table 6.3.5A.3.4.4.1-2. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5A.3.4.4.1-1: Test Configuration Table: PUCCH sub-test**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | Normal |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | Mid range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) |
| Test Parameters for CA Configurations | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | FDD: PUCCH format = Format 1b with channel selection/Format 3<br>TDD: PUCCH format = Format 1b with channel selection/Format 3 |
| 6 | 25 | 6+25+25 | QPSK | |
| 6 | 50 | 6+50+50 | QPSK | |
| 25 | 15 | 25+15+15 | QPSK | |
| 25 | 25 | 25+25+25 | QPSK | |
| 25 | 50 | 25+50+50 | QPSK | |
| 50 | 50 | 50+50+50 | QPSK | |
| 75 | 75 | 75+75+75 | QPSK | |
| 100 | 25 | 100+25+25 | QPSK | |
| 100 | 50 | 100+50+50 | QPSK | |
| 100 | 75 | 100+75+75 | QPSK | |
| 100 | 100 | 100+100+100 | QPSK | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , only the first of those is tested, according to the order on the Test Configuration Table list. | | | | |

**Table 6.3.5A.3.4.4.1-2: Test Configuration Table: PUSCH sub-test**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Mid range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | | QPSK | 56 | P_6@0 | S_25@0 | S_25@0 | - |
| 6 | 50 | | QPSK | 106 | P_6@0 | S_50@0 | S_50@0 | - |
| 25 | 15 | | QPSK | 55 | P_25@0 | S_15@0 | S_15@0 | - |
| 25 | 25 | | QPSK | 75 | P_25@0 | S_25@0 | S_25@0 | - |
| 25 | 50 | | QPSK | 125 | P_25@0 | S_50@0 | S_50@0 | - |
| 50 | 50 | | QPSK | 150 | P_50@0 | S_50@0 | S_50@0 | - |
| 75 | 75 | | QPSK | 225 | P_75@0 | S_75@0 | S_75@0 | - |
| 100 | 25 | | QPSK | 150 | P_100@0 | S_25@0 | S_25@0 | - |
| 100 | 50 | | QPSK | 200 | P_100@0 | S_50@0 | S_50@0 | - |
| 100 | 75 | | QPSK | 250 | P_100@0 | S_75@0 | S_75@0 | - |
| 100 | 100 | | QPSK | 300 | P_100@0 | S_100@0 | S_100@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , only the first of those is tested, according to the order on the Test Configuration Table list. | | | | | | | | |

**Table 6.3.5A.3.4.4.1-3: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Maximum Wgap |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC<br>(Note 2) |

| Test Parameters for CA Configurations | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_XA-XA-XA Configurations** | | | | | | | | | | | | |
| 1 | All RBs | All RBs | Max | N/A | N/A | QPSK | Full RBs | QPSK | Full RBs | QPSK | Full RBs |
| 2 | All RBs | All RBs | Max | N/A | N/A | QPSK | Full RBs | QPSK | Full RBs | QPSK | Full RBs |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.
Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.5A.3.4.4.1-1 (PUCCH sub-test) and Table 6.3.5A.3.4.4.1-2 (PUSCH sub-test).
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5A.3.4.4.3.

6.3.5A.3.4.4.2 Test procedure

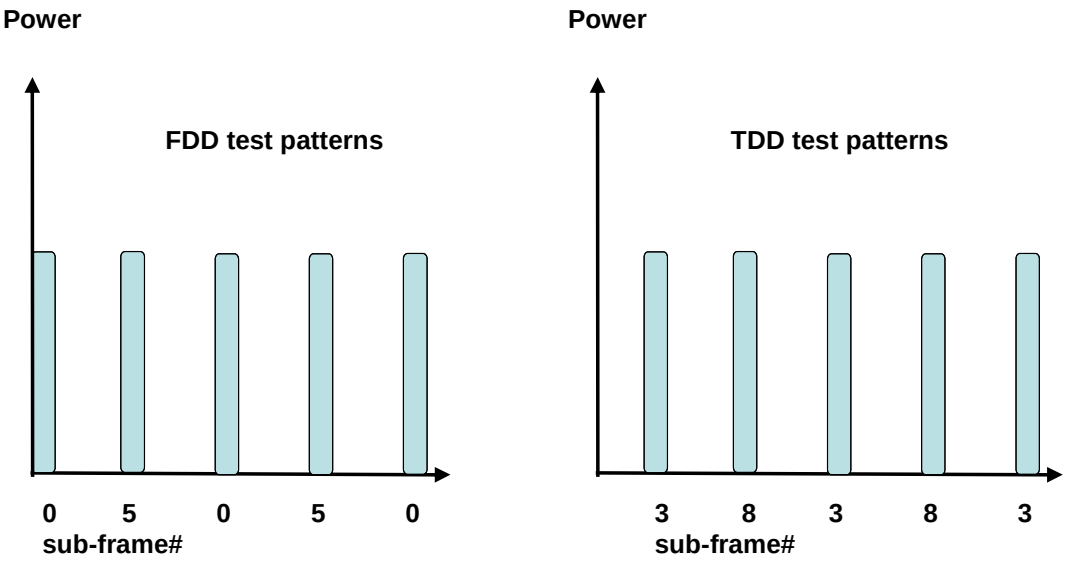



**Figure 6.3.5A.3.4.4.2-1: Test uplink transmission**

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. The procedure is separated in two subtests to verify PUCCH and PUSCH aggregate power control tolerance respectively. The uplink transmission patterns are described in figure 6.3.5A.3.4.4.2-1.
5. PUCCH sub test:

   5.1 The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.3.5A.3.4.4.1-1 on all PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC. The transmission of PDSCH will make the UE send uplink ACK/NACK using PUCCH on PCC. Send the appropriate TPC commands for PUCCH to the UE to ensure that the UE transmits PUCCH at 0dBm +/- 3.2 dB for carrier frequency $f \leq 3.0$GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz $< f \leq$ 4.2GHz.

   5.2 Every 5 subframes transmit to the UE downlink PDSCH MAC padding bits as well as 0 dB TPC command for PUCCH via the PDCCH to make the UE transmit ACK/NACK on the PUCCH with transmission gap of 4 subframes. The downlink transmission is scheduled in the appropriate sub-frames to make the UE transmit PUCCH as described in figure 6.3.5A.3.4.4.2-1.

   5.3 Measure the power of 5 consecutive PUCCH transmissions on PCC to verify the UE transmitted PUCCH power is maintained within 21 ms. The transient periods of 20us are excluded from the power measurement.

6. PUSCH sub test:

   6.1 The SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.5A.3.4.4.1-2 on all PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at 0dBm +/- 3.2.dB for carrier frequency $f \leq 3.0$GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz $< f \leq$ 4.2GHz.

   6.2 Every 5 subframes schedule the UE's PUSCH data transmission and transmit 0 dB TPC command for PUSCH via the PDCCH to make the UE transmit PUSCH with 4 subframes gap. The uplink transmission patterns are described in figure 6.3.5A.3.4.4.2-1.

6.3 Measure the power on all PCC and SCCs of 5 consecutive PUSCH transmissions to verify the UE transmitted PUSCH power is maintained within 21 ms on each component carrier. The transient periods of 20us are excluded from the power measurement.

#### 6.3.5A.3.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.5A.3.4.5 Test Requirements

For intra-band contiguous carrier aggregation bandwidth class D, the aggregate power control tolerance per component carrier measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5A.3.4.5-1.

**Table 6.3.5A.3.4.5-1: Aggregate power control tolerance for intra-band contiguous CA**

| TPC command | UL channel | Aggregate power tolerance within 21 ms |
|---|---|---|
| 0 dB | PUCCH | ±3.2 dB |
| 0 dB | PUSCH | ±4.2 dB |
| NOTE: The UE transmission gap is 4 ms. TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission. | | |

## 6.3.5B Power Control for UL- MIMO

### 6.3.5B.1 Power Control Absolute Power Tolerance for UL- MIMO

#### 6.3.5B.1.1 Test purpose

To verify the ability of the UE transmitter for UL-MIMO to set its initial output power to a specific value at the start of a contiguous transmission or non-contiguous transmission with a long transmission gap, i.e. transmission gap is larger than 20 ms.

#### 6.3.5B.1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL- MIMO.

#### 6.3.5B.1.3 Minimum conformance requirement

For UE with multiple transmit antenna connectors, the power control tolerance applies to the sum of output power at each transmit antenna connector.

The power control requirements specified in subclause 6.3.5 apply to UE with two transmit antenna connectors with UL-MIMO configurations specified in Table 6.2.2B.3-2 for closed-loop spatial multiplexing scheme, wherein

- The Maximum output power requirements for UL-MIMO are specified in subclause 6.2.2B
- The Minimum output power requirements for UL-MIMO are specified in subclause 6.3.2B

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5B.

#### 6.3.5B.1.4 Test description

##### 6.3.5B.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test

parameters for each channel bandwidth, and are shown in table 6.3.5B.1.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5B.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Power Control Absolute power tolerance test case | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 50 | 50 |
| 15MHz | | QPSK | 75 | 75 |
| 20MHz | | QPSK | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.28.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channel is set according to Table 6.3.5B.1.4.1-1.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5B.1.4.3. Note that PDCCH DCI format 4 sent after resetting uplink power with RRC Connection Reconfiguration, should have TPC command 0dB.

### 6.3.5B.1.4.2 Test procedure

1. SS sends uplink scheduling information via PDCCH DCI format 4 with TPC command 0dB for C_RNTI to schedule the UL RMC according to Table 6.3.5B.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Measure the initial sum power of the first subframe of UE PUSCH first transmission at each UE antenna connector. The transient periods of 20us are excluded.

3. Repeat for the two test points as indicated in section 6.3.5B.1.4.3. The timing of the execution between the two test points shall be larger than 20ms.

### 6.3.5B.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 6.3.5B.1.4.3-1: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.5B.1.4.3-2: UplinkPowerControlCommon: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | -93 | Test point 2 to verify a UE relative high initial power transmission | |

**Table 6.3.5B.1.4.3-3: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH | | | |
| uplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See clause 4.6.3 | SRB1 |
| | UplinkPowerControlDedicated-DEFAULT | See clause 4.6.3 | RBC |

**Table 6.3.5B.1.4.3-4: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | SRB1 |
| | 0 | | RBC |
| } | | | |

## 6.3.5B.1.5 Test requirement

The requirement for the power measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5B.1.5-1 and 6.3.5B.1.5-2.

**Table 6.3.5B.1.5-1: Absolute power tolerance: test point 1**

| | **Channel bandwidth / expected output power (dBm)** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Expected Measured power Normal conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB |
| Expected Measured power Extreme conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2B3 | | | | | | |

**Table 6.3.5B.1.5-2: Absolute power tolerance: test point 2**

| | **Channel bandwidth / expected output power (dBm)** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB |
| Expected Measured power Extreme conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2B.3 | | | | | | |

## 6.3.5B.2 Power Control Relative power tolerance for UL-MIMO

### 6.3.5B.2.1 Test purpose

To verify the ability of the UE transmitter to set its output power relatively to the power in a target sub-frame relatively to the power of the most recently transmitted reference sub-frame if the transmission gap between these sub-frames is $\leq$ 20 ms.

### 6.3.5B.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support UL MIMO.

### 6.3.5B.2.3 Minimum conformance requirement

For UE with multiple transmit antenna connectors, the power control tolerance applies to the sum of output power at each transmit antenna connector.

The power control requirements specified in clause 6.3.5 apply to UE with two transmit antenna connectors with UL-MIMO configurations specified in Table 6.2.2B.3-2 for closed-loop spatial multiplexing scheme, wherein:

- The Maximum output power requirements for UL-MIMO are specified in clause 6.2.2B
- The Minimum output power requirements for UL-MIMO are specified in clause 6.3.2B

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5B.

## 6.3.5B.2.4 Test description

### 6.3.5B.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5B.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5B.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] clause 4.3.1 | Low range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Power Control Relative power tolerance test case | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | See table 6.3.5B.2.5-1 6.3.5B.2.5-2 6.3.5B.2.5-13 | See table 6.3.5B.2.5-1 6.3.5B.2.5-2 6.3.5B.2.5-13 |
| 3MHz | | QPSK | See table 6.3.5B.2.5-3 6.3.5B.2.5-4 6.3.5B.2.5-13 | See table 6.3.5B.2.5-3 6.3.5B.2.5-4 6.3.5B.2.5-13 |
| 5MHz | | QPSK | See table 6.3.5B.2.5-5 6.3.5B.2.5-6 6.3.5B.2.5-13 | See table 6.3.5B.2.5-5 6.3.5B.2.5-6 6.3.5B.2.5-13 |
| 10MHz | | QPSK | See table 6.3.5B.2.5-7 6.3.5B.2.5-8 6.3.5B.2.5-13 | See table 6.3.5B.2.5-7 6.3.5B.2.5-8 6.3.5B.2.5-13 |
| 15MHz | | QPSK | See table 6.3.5B.2.5-9 6.3.5B.2.5-10 6.3.5B.2.5-13 | See table 6.3.5B.2.5-9 6.3.5B.2.5-10 6.3.5B.2.5-13 |
| 20MHz | | QPSK | See table 6.3.5B.2.5-11 6.3.5B.2.5-12 6.3.5B.2.5-13 | See table 6.3.5B.2.5-11 6.3.5B.2.5-12 6.3.5B.2.5-13 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1<br>Note 2: The starting resource block shall be RB# 0. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to table 6.3.5B.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5B.2.4.3.

### 6.3.5B.2.4.2 Test procedure

The procedure is separated in various subtests to verify different aspects of relative power control. The power patterns of the subtests are described in figure 6.3.5B.2.4.2-1.

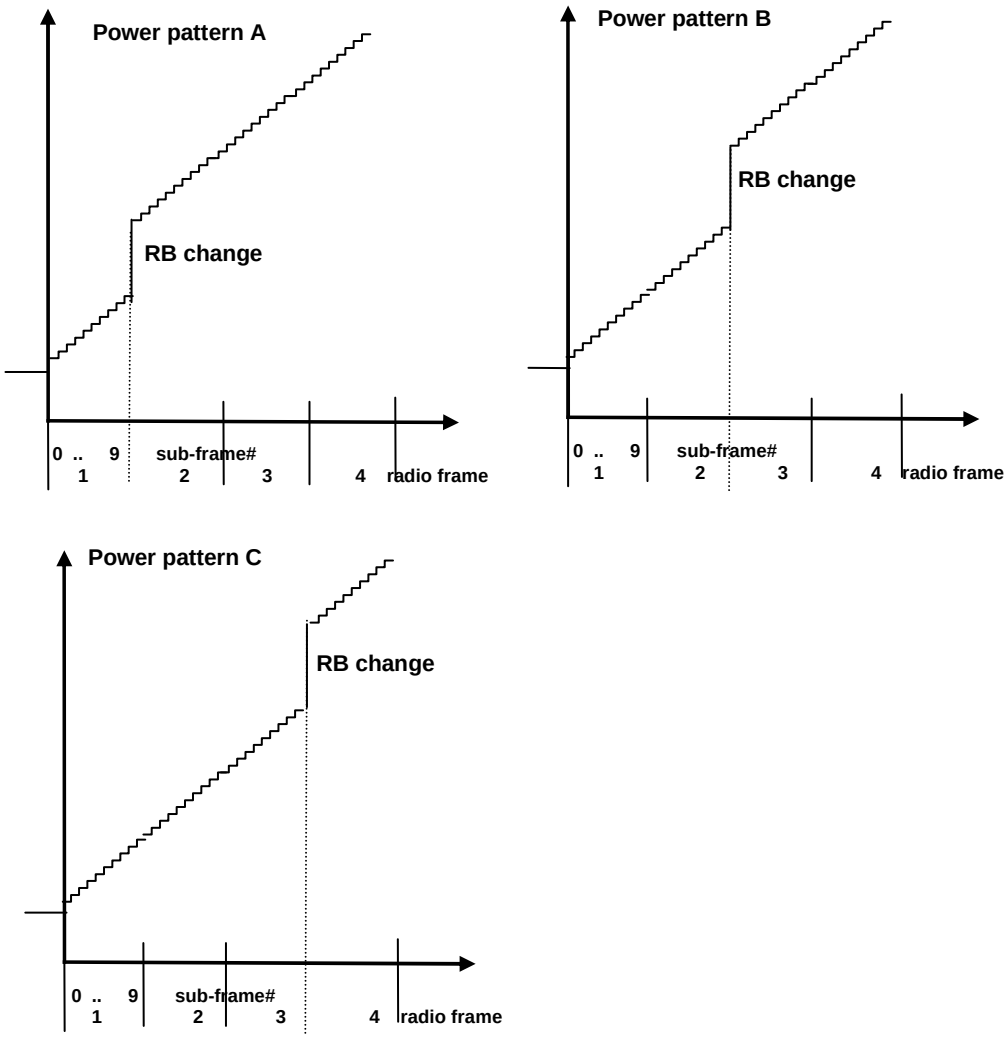



**Figure 6.3.5B.2.4.2-1: FDD ramping up test power patterns**

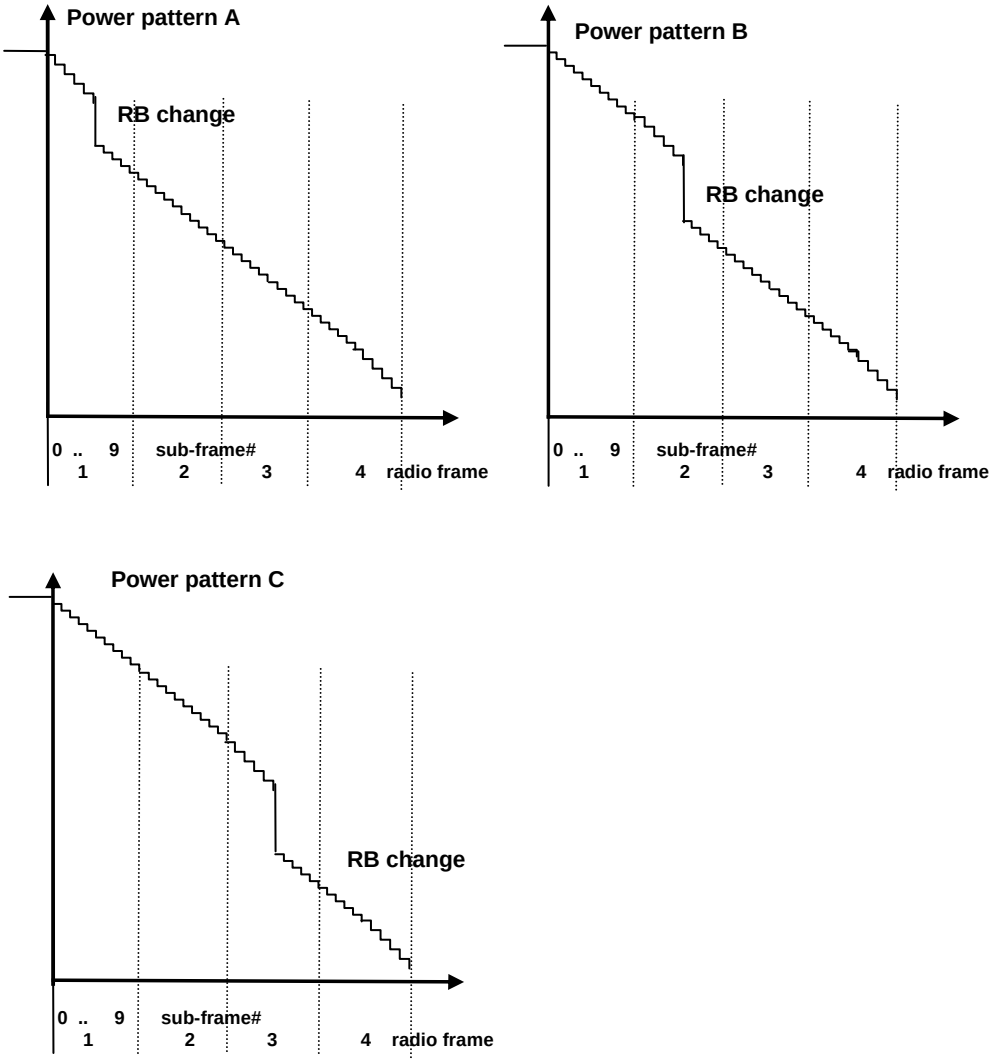



**Figure 6.3.5B.2.4.2-2: FDD ramping down test power patterns**

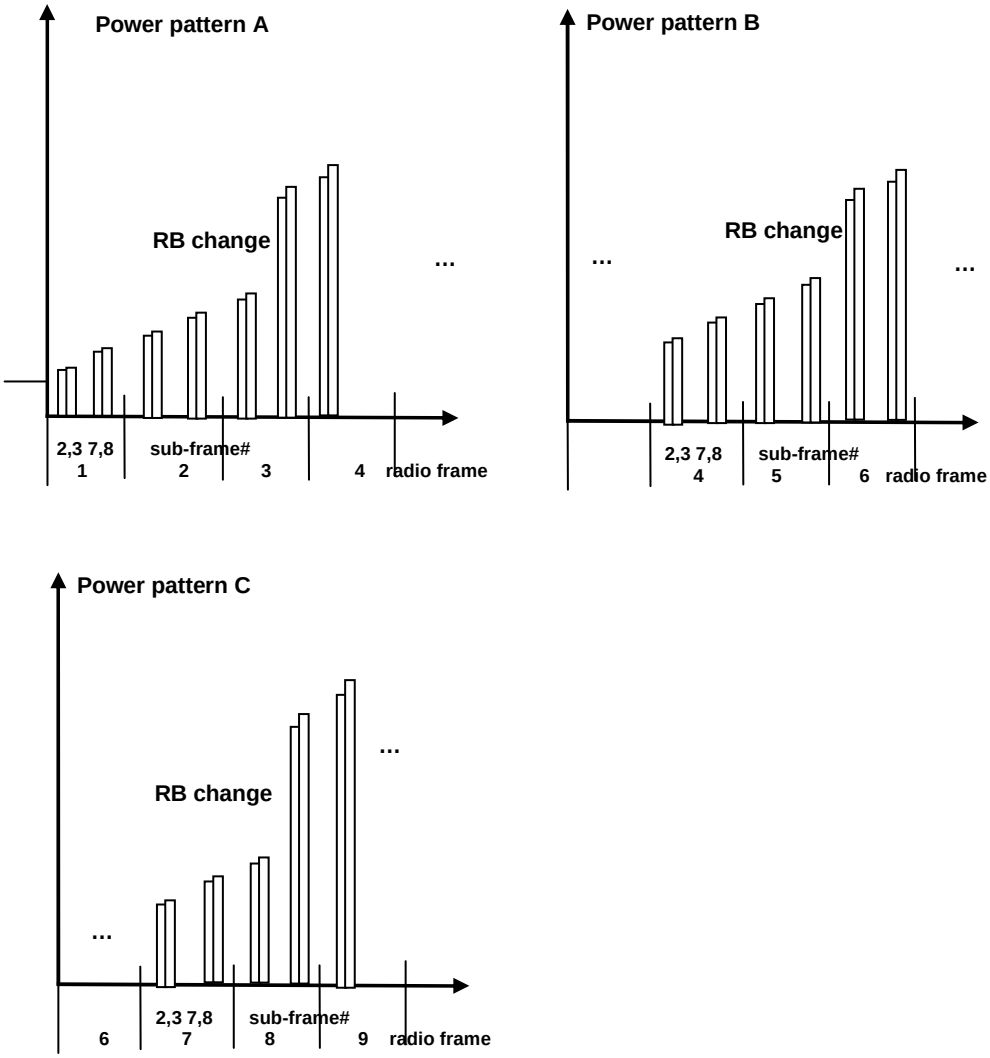



**Figure 6.3.5B.2.4.2-3: TDD ramping up test power patterns**

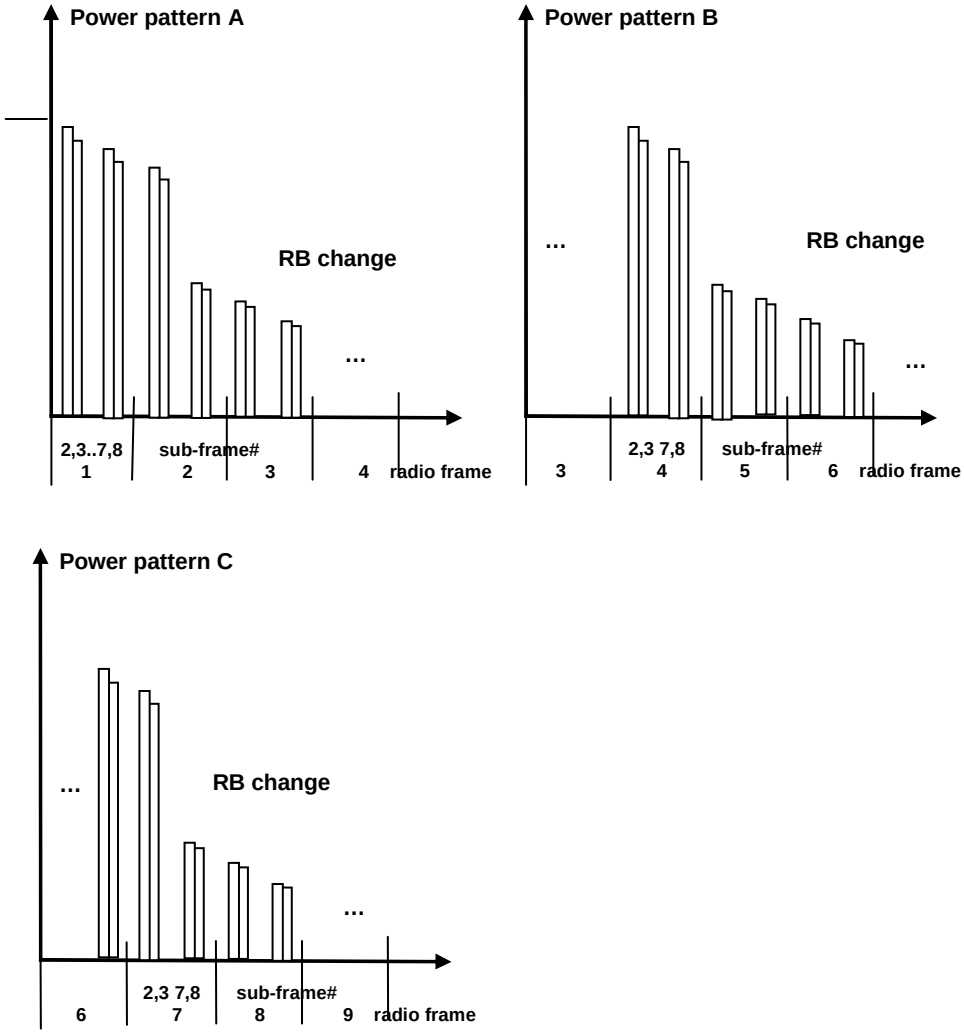



**Figure 6.3.5B.2.4.2-4: TDD ramping down test power patterns**

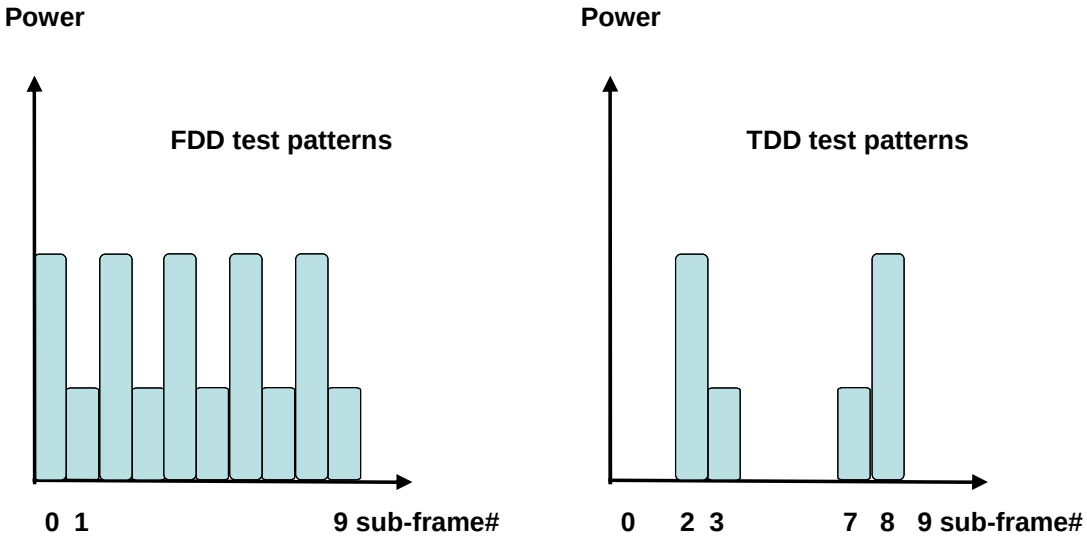



**Figure 6.3.5B.2.4.2-5: Alternating Test Power patterns**

1. Sub test: ramping up pattern

   1.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.3.5B.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at -36.8dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz or at -36.5dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

   1.2. Schedule the UE's PUSCH data transmission as described in Figure 6.3.5B.2.4.2-1 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame) and Figure 6.3.5B.2.4.2-3 (TDD pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) with an uplink RB allocation as defined in tables 6.3.5B.2.5-1 thru 6.3.5B.2.5-12 depending on channel bandwidth. On the PDCCH format 4 for the scheduling of the PUSCH the SS will transmit a +1dB TPC command. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

   1.3. Measure the mean sum power at each antenna connector for PUSCH transmissions to verify the UE relative power control meet test requirements 6.3.5B.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

   1.4. Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5B.2.5-1 thru Table 6.3.5B.2.5-12 to force bigger UE power steps at various points in the power range.

2. Sub test: ramping down pattern

   2.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.3.5B.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at +18.0dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz or at +17.7dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

   2.2. Schedule the UE's PUSCH data transmission as described in Figure 6.3.5B.2.4.2-2 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame) and Figure 6.3.5B.2.4.2-4 (TDD pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) with an uplink RB allocation as defined in tables 6.3.5B.2.5-1 thru 6.3.5B.2.5-12 depending on channel bandwidth. On the PDCCH format 4 for the scheduling of the PUSCH the SS will transmit a -1dB TPC command. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

   2.3. Measure the mean sum power at each antenna connector for PUSCH transmissions to verify the UE relative power control meet test requirements 6.3.5B.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

   2.4. Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5B.2.5-1 thru Table 6.3.5B.2.5-12 to force bigger UE power steps at various points in the power range.

3. Sub test: alternating pattern

   3.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.3.5B.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at -10dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz or at -10dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz. The initial uplink RB allocation is defined as the smaller uplink RB allocation value specified in tables 6.3.5B.2.5-13. The power level and RB allocation are reset for each sub-test.

   3.2. Schedule the UE's PUSCH data transmission as described in Figure 6.3.5B.2.4.2-5for 10 sub-frames with an uplink RB allocation alternating pattern as defined in table 6.3.5B.2.5-13 while transmitting 0dB TPC command for PUSCH via the PDCCH.

3.3. Measure the mean sum power of each antenna connector for PUSCH transmissions to verify the UE relative power control meet test requirements specified in clause 6.3.5B.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

#### 6.3.5B.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 6.3.5B.2.5 Test requirement

Each UE power step measured in the test procedure 6.3.5B.2.4.2 should satisfy the test requirements specified in Table 6.3.5B.2.5-1, thru 6.3.5B.2.5-13 for normal conditions; for extreme conditions an additional ± 2.0 dB relaxation is allowed.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each of ramping up and ramping down test patterns. For these exceptions the power tolerance limit is a maximum of ±6.7 dB. If there is an exception in the power step caused by the RB change for all test patterns (A, B, C) then fail the UE.

**Table 6.3.5B.2.5-1: Test Requirements Relative Power Tolerance for Transmission (normal conditions - Note 5) channel bandwidth 1.4MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± 1.7 |
| RB change | Change from 1 to 6 RBs | TPC=+1dB | 8.78 | 4 ≤ ΔP < 10 | 8.78 ±4.7 Note 2<br>8.78 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed = 6 | TPC=+1dB | 1 | ΔP < 2 | 1 ± 1.7 |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes.
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes.
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes.
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ - 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5B.2.5-2: Test Requirements Relative Power Tolerance for Transmission (normal conditions - Note 5) channel bandwidth 1.4MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 5 | TPC=-1dB | 1 | ΔP < 2 | 1 ± 1.7 |
| RB change | Change from 5 to 1 RBs | TPC=-1dB | 7.99 | 4 ≤ ΔP < 1 | 7.99 ± 4.7 Note 2<br>7.99 +4.7/-6.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± 1.7 |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes.
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes.
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes.
Note 2: When Note 4 does not apply.
Note 3: N/A.
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ - 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5B.2.5-3: Test Requirements Relative Power Tolerance for Transmission (normal conditions - Note 5) channel bandwidth 3MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± 1.7 |
| RB change | Change from 1 to 4 RBs | TPC=+1dB | 7.02 | 4 ≤ ΔP < 10 | 7.02 ± 4.7 Note 2<br>7.02 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed =4 | TPC=+1dB | 1 | ΔP < 2 | 1 ± 1.7 |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes.
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes.
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes.
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ - 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5B.2.5-4: Test Requirements Relative Power Tolerance for Transmission (normal conditions - Note 5) channel bandwidth 3MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 15 | TPC=-1dB | 1 | ΔP < 2 | 1 ± 1.7 |
| RB change | Change from 15 to 1 RBs | TPC=-1dB | 12.76 | 10 ≤ ΔP < 15 | 12.76 ± 5.7 Note 2<br>12.76 +5.7/-7.2 Note 4 |
| Subframes after RB change | Fixed =1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± 1.7 |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes.
Pattern A the position of RB uplink allocation change is after 16 active uplink subframes.
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes.
Note 2: When Note 4 does not apply.
Note 3: N/A.
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ - 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5B.2.5-5: Test Requirements Relative Power Tolerance for Transmission (normal conditions - Note 5) channel bandwidth 5MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± 1.7 |
| RB change | Change from 1 to 20 | TPC=+1dB | 14.01 | 10 ≤ ΔP < 15 | 14.01 ± 5.7 Note 2<br>14.01 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 20 | TPC=+1dB | 1 | ΔP < 2 | 1 ± 1.7 |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes.
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes.
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes.
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ - 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5B.2.5-6: Test Requirements Relative Power Tolerance for Transmission (normal conditions - Note 5) channel bandwidth 5MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 25 | TPC=-1dB | 1 | ΔP < 2 | 1 ± 1.7 |
| RB change | Change from 25 to 1 | TPC=-1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± 5.7 Note 2<br>14.98 +5.7/-7.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± 1.7 |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes.
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes.
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes.
Note 2: When Note 4 does not apply.
Note 3: N/A.
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ - 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5B.2.5-7: Test Requirements Relative Power Tolerance for Transmission (normal conditions - Note 5) channel bandwidth 10MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± 1.7 |
| RB change | Change from 1 to 25 | TPC=+1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± 5.7 Note 2<br>14.98 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 25 | TPC=+1dB | 1 | ΔP < 2 | 1 ± 1.7 |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes.
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes.
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes.
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ - 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5B.2.5-8: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 10MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 50 ( UE-Categories ≥2)<br><br>Fixed = 48 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± 1.7 |
| RB change | Change from 50 to 1 ( UE-Categories ≥2)<br><br>Change from 48 to 1 (UE cat 1) | TPC=-1dB | 17.99<br><br>17.81 | 15 ≤ Δ | 17.99 ± 6.7 Note 2<br>17.99 +6.7/-8.2 Note 4<br><br>17.81 ± 6.7 Note 2<br>17.81 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± 1.7 |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes.
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes.
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes.
Note 2: When Note 3 does not apply.
Note 3: N/A.
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ - 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5B.2.5-9: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± 1.7 |
| RB change | Change from 1 to 50 | TPC=+1dB | 17.99 | 15 ≤ ΔP | 17.99±6.7 Note 2<br>17.99 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 50 | TPC=+1dB | 1 | ΔP < 2 | 1 ±1.7 |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes.
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes.
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes.
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ - 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5B.2.5-10: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 75 ( UE-Categories ≥2)<br><br>Fixed = 50 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± 1.7 |
| RB change | Change from 75 to 1 ( UE-Categories ≥2)<br><br>Change from 50 to 1 (UE Cat 1) | TPC=-1dB | 19.75<br><br>17.99 | 15 ≤ ΔP | 19.75 ± 6.7 Note 2<br>19.75 +6.7/8.2 ±TT Note 4<br><br>17.99 ± 6.7 Note 2<br>17.99 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± 1.7 |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes.
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes.
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes.
Note 2: When Note 4 does not apply.
Note 3: N/A.
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ - 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5B.2.5-11: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± 1.7 |
| RB change | Change from 1 to 75 | TPC=+1dB | 19.75 | 15 ≤ ΔP | 19.75 ± 6.7 Note 2<br>19.75 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 75 | TPC=+1dB | 1 | ΔP < 2 | 1 ± 1.7 |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes.
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes.
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes.
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5B.2.5-12: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 100 ( UE-Categories ≥2)<br><br>Fixed = 75 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± 1.7 |
| RB change | Change from 100 to 1 ( UE-Categories ≥2)<br><br>Change from 75 to 1 (UE Cat 1) | TPC=-1dB | 21.0<br><br>19.75 | 15 ≤ ΔP | 21.0 ± 6.7 Note 2<br>21.0 +6.7/-8.2 Note 4<br><br>19.75 ± 6.7 Note 2<br>19.75 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± 1.7 |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes.
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes.
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes.
Note 2: When Note 4 does not apply.
Note 3: N/A.
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ - 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5B.2.5-13: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) (Alternating pattern)**

| Sub-test | Uplink RB allocation | TPC command | Expected power step size (Up or down) ΔP [dB] | Power step size range (Up or down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| 1.4 MHz | Alternating 1 and 6 | TPC=0dB | 7.78 | 4 ≤ ΔP < 10 | 7.78 ± 6.7 Note 1,2<br>7.78 +8.2/-6.7 Note 3<br>7.78 +6.7/-8.2 Note 4 |
| 3 MHz | Alternating 1 and 15 | TPC=0dB | 11.76 | 10 ≤ ΔP < 15 | 11.76 ± 6.76.7 Note 1,2<br>11.76 +8.2/-6.7 Note 3<br>11.76 +6.7/-8.2 Note 4 |
| 5 MHZ | Alternating 1 and 25 | TPC=0dB | 13.98 | 10 ≤ ΔP < 15 | 13.98 ± 6.7 Note 1<br>13.98 +8.2/-6.7 Note 2<br>13.98 +6.7/-8.2 Note 3 |
| 10 MHZ | Alternating 1 and 50 ( UE-Categories ≥2)<br><br>Alternating 1 and 48 (UE Cat 1) | TPC=0dB | 16.99<br><br>16,81 | 15 ≤ ΔP | 16.99 ± 6.7 Note 1,2<br>16.99 +8.2/-6.7 Note 3<br>16.99 +6.7/-8.2 Note 4<br><br>16.81 ± 6.7 Note 1,2<br>16.81 +8.2/-6.7 Note 3<br>16.81 +6.7/-8.2 Note 4 |
| 15 MHZ | Alternating 1 and 75 ( UE-Categories ≥2)<br><br>Alternating 1 and 50 (UE Cat 1) | TPC=0dB | 18.75<br><br>16.99 | 15 ≤ ΔP | 18.75 ± 6.7 Note 1,2<br>18.75 +8.2/-6.7 Note 3<br>18.75 +6.7/-8.2 Note 4<br><br>16.99 ± 6.7 Note 1,2<br>16.99 +8.2/-6.7 Note 3<br>16.99 +6.7/-8.2 Note 4 |
| 20 MHZ | Alternating 1 and 100 ( UE-Categories ≥2)<br><br>Alternating 1 and 75 (UE Cat 1) | TPC=0dB | 20.00<br><br>18.75 | 15 ≤ ΔP | 20.00 ± 6.7 Note 1,2<br>20.00 +8.2/-6.7 Note 3<br>20.00 +6.7/-8.2 Note 4<br><br>18.75 ± 6.7 Note 1,2<br>18.75 +8.2/-6.7 Note 3<br>18.75 +6.7/-8.2 Note 4 |

Note 1: Test tolerance +/- 6.7 dB was selected to allow PA switch possible exceptions to occur.
Note 2: When neither Note 3 nor Note 4 applies.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ - 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

## 6.3.5B.3 Aggregate power control tolerance for UL-MIMO

### 6.3.5B.3.1 Test purpose

To verify the ability of the UE with UL-MIMO to maintain its power level in non-contiguous transmission within 21 ms in response to 0 dB TPC commands with respect to the first UE transmission, when the power control parameters specified in TS 36.213 are constant.

### 6.3.5B.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support UL MIMO.

### 6.3.5B.3.3 Minimum conformance requirement

For UE with multiple transmit antenna connectors, the power control tolerance applies to the sum of output power at each transmit antenna connector.

The power control requirements specified in clause 6.3.5 apply to UE with two transmit antenna connectors with UL-MIMO configurations specified in Table 6.2.2B.3-2 for closed-loop spatial multiplexing scheme, wherein:

- The Maximum output power requirements for UL-MIMO are specified in clause 6.2.2B.
- The Minimum output power requirements for UL-MIMO are specified in clause 6.3.2B.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5B.

### 6.3.5B.3.4 Test description

#### 6.3.5B.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5B.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5B.3.4.1-1: Test Configuration Table: PUCCH sub-test**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal | |
| Test Frequencies as specified in **TS 36.508 [7] subclause 4.3.1** | | | Mid range | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | | | Lowest, 5MHz, Highest | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** |
| Ch BW | Mod'n | RB allocation | | FDD: PUCCH format = Format 1a<br>TDD: PUCCH format = Format 1a/1b |
| | | FDD | TDD | |
| 1.4MHz | QPSK | 3 | 3 | |
| 3MHz | QPSK | 4 | 4 | |
| 5MHz | QPSK | 8 | 8 | |
| 10MHz | QPSK | 16 | 16 | |
| 15MHz | QPSK | 25 | 25 | |
| 20MHz | QPSK | 30 | 30 | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

**Table 6.3.5B.3.4.1-2: Test Configuration Table: PUSCH sub-test**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal | | | |
| Test Frequencies as specified in **TS 36.508 [7] subclause 4.3.1** | Mid range | | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for PUSCH sub-test | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 1 | 1 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.3.5B.3.4.1-1 (PUCCH sub-test) and Table 6.3.5B.3.4.1-2 (PUSCH sub-test).
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5B.3.4.3.

### 6.3.5B.3.4.2 Test procedure

The procedure is separated in two subtests to verify PUCCH and PUSCH aggregate power control tolerance respectively. The uplink transmission patterns are described in figure 6.3.5B.3.4.2-1.

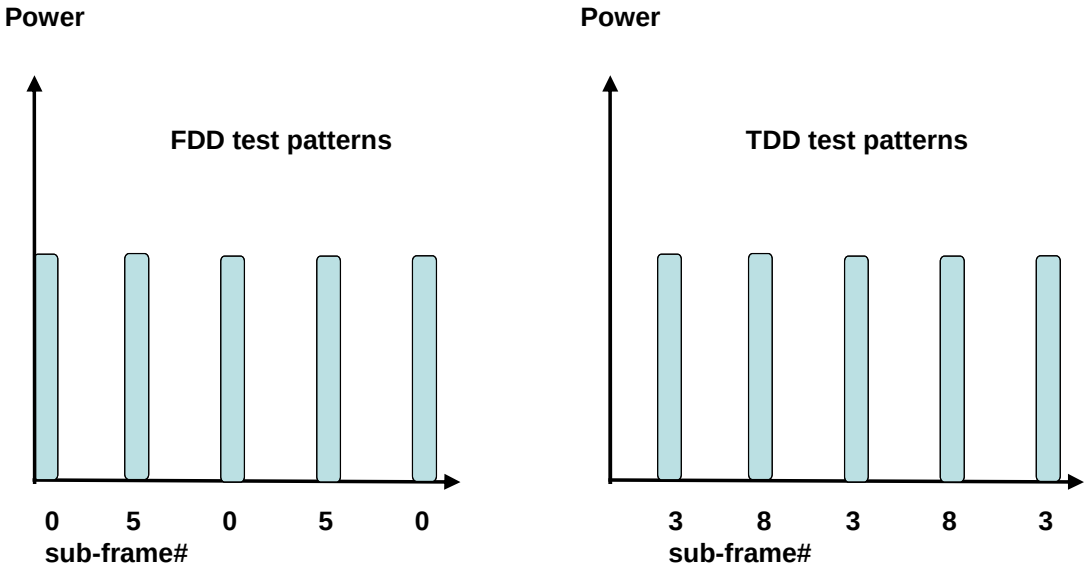



**Figure 6.3.5B.3.4.2-1 Test uplink transmission**

1. PUCCH sub test:

   1.1 The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.3.5B.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The transmission of PDSCH will make the UE send uplink ACK/NACK using PUCCH. Send the appropriate TPC commands for PUCCH to the UE to ensure that the UE transmits PUCCH at 0dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

   1.2. Every 5 subframes transmit to the UE downlink PDSCH MAC padding bits as well as 0 dB TPC command for PUCCH via the PDCCH to make the UE transmit ACK/NACK on the PUCCH with transmission gap of 4 subframes. The downlink transmission is scheduled in the appropriate sub-frames to make the UE transmit PUCCH as described in figure 6.3.5B.3.4.2-1.

   1.3. Measure the mean sum power at each antenna connector for UE of 5 consecutive PUCCH transmissions to verify the UE transmitted PUCCH power is maintained within 21 ms. The transient periods of 20us are excluded from the power measurement.

2. PUSCH sub test:

   2.1. The SS sends uplink scheduling information via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.3.5B.3.4.1-2. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at 0dBm +/- 3.2.dB for carrier frequency f ≤ 3.0GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

   2.2. Every 5 subframes schedule the UE's PUSCH data transmission and transmit 0 dB TPC command for PUSCH via the PDCCH to make the UE transmit PUSCH with 4 subframes gap. The uplink transmission patterns are described in figure 6.3.5B.3.4.2-1.

   2.3. Measure the mean sum power at each antenna connector for UE of 5 consecutive PUSCH transmissions to verify the UE transmitted PUSCH power is maintained within 21 ms. The transient periods of 20us are excluded from the power measurement.

### 6.3.5B.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 6.3.5B.3.4.3-1: PUCCH-ConfigDedicated-v1020-DEFAULT**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-9A: PUCCH-ConfigDedicated-v1020-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-v1020 ::= SEQUENCE { | | | |
| twoAntennaPortActivatedPUCCH-Format1a1b-r10 | true | | |
| } | | | |

## 6.3.5B.3.5 Test requirement

The requirement for the power measurements made in step (1.3) and (2.3) of the test procedure shall not exceed the values specified in Table 6.3.5B.3.5-1. The power measurement period shall be 1 sub-frame excluding transient periods.

***Table 6.3.5B.3.5-1: Power control tolerance***

| TPC command | UL channel | Test requirement measured power |
|---|---|---|
| 0 dB | PUCCH | Given 5 power measurements in the pattern, the 2nd, 3rd, 4th, and 5th measurements shall be within ± 3.2 dB of the 1st measurement. |
| 0 dB | PUSCH | Given 5 power measurements in the pattern, the 2nd, 3rd, 4th, and 5th measurements shall be within ± 4.2 dB of the 1st measurement. |
| Note 1: The UE transmission gap is 4 ms. TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission. | | |

# 6.3.5C Power Control for DC

## 6.3.5C.1

## 6.3.5C.2 Power Control Relative power tolerance for Dual Connectivity

### 6.3.5C.2.1 Test purpose

To verify the ability of the UE transmitter to change the output power in both assigned component carrier in the uplink with a defined power step sizes between sub-frames on the two respective component carrier in a synchronous Dual Connectivity scenario with maximum (33us) time offset between carriers.

### 6.3.5C.2.2 Test applicability

This test applies to all types of E-UTRA UE release 12 and forward that support Dual Connectivity.

### 6.3.5C.2.3 Minimum conformance requirement

The minimum conformance requirements are defined in clause 6.3.5A.2.0.

### 6.3.5C.2.4 Test description

#### 6.3.5C.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA DC configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each DC Configuration, and are shown in table 6.3.5C.2.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5C.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different DC bandwidth classes. | | Mid range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the DC Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for DC Configurations | | | | | | | | |
| **DC Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **MCG CC $N_{RB}$** | **SCG CCs $N_{RB}$** | **MCG & SCG RB allocation** | | **$N_{RB_alloc}$** | **MCG & SCG RB allocations(Note 3) ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/A for this test | QPSK | 31 | See table 6.3.5C.2.2.5-1 6.3.5C.2.2.5-2 | See table 6.3.5C.2.2.5-5 6.3.5C.2.2.5-6 | - | - |
| 6 | 50 | | QPSK | 56 | See table 6.3.5C.2.2.5-1 6.3.5C.2.2.5-2 | See table 6.3.5C.2.2.5-7 6.3.5C.2.2.5-8 | - | - |
| 25 | 15 | | QPSK | 40 | See table 6.3.5C.2.2.5-5 6.3.5C.2.2.5-6 | See table 6.3.5C.2.2.5-3 6.3.5C.2.2.5-4 | - | - |
| 25 | 25 | | QPSK | 50 | See table 6.3.5C.2.2.5-5 6.3.5C.2.2.5-6 | See table 6.3.5C.2.2.5-5 6.3.5C.2.2.5-6 | - | - |
| 25 | 50 | | QPSK | 75 | See table 6.3.5C.2.2.5-5 6.3.5C.2.2.5-6 | See table 6.3.5C.2.2.5-5 6.3.5C.2.2.5-6 | - | - |
| 50 | 50 | | QPSK | 100 | See table 6.3.5C.2.2.5-7 6.3.5C.2.2.5-8 | See table 6.3.5C.2.2.5-7 6.3.5C.2.2.5-8 | - | - |
| 50 | 100 | | QPSK | 150 | See table 6.3.5C.2.2.5-7 6.3.5C.2.2.5-8 | See table 6.3.5C.2.2.5-11 6.3.5C.2.2.5-12 | - | - |
| 75 | 75 | | QPSK | 150 | See table 6.3.5C.2.2.5-9 6.3.5C.2.2.5-10 | See table 6.3.5C.2.2.5-9 6.3.5C.2.2.5-10 | - | - |
| 100 | 75 | | QPSK | 175 | See table 6.3.5C.2.2.5-11 6.3.5C.2.2.5-12 | See table 6.3.5C.2.2.5-9 6.3.5C.2.2.5-10 | - | - |
| 100 | 100 | | QPSK | 200 | See table 6.3.5C.2.2.5-11 6.3.5C.2.2.5-12 | See table 6.3.5C.2.2.5-11 6.3.5C.2.2.5-12 | - | - |

Note 1: DC Configuration Test CC Combination settings are checked separately for each DC Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested.

Note 3: The UL allocation is changed as part of the test procedure. The Test Configuration Table entries list the combinations used, with the sequence of usage as determined by the test procedure for each sub-test.

Note 4: The starting resource block shall be RB# 0.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for MCG CC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.5A.1.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-DC1 according to TS 36.508 [7] clause 5.2A.2A. Message contents are defined in clause 6.3.5C.2.2.4.3.

### 6.3.5C.2.4.2 Test procedure

1. Configure SCG CC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels with a time offset of +33 us compared to PCC.
3. SS activates SCG CC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clause 8.3.3.2).
4. The procedure is separated in various subtests to verify different aspects of relative power control on both MCG CC and SCG CC individually. The power patterns of the subtests are shown in figure 6.3.5C.2.4.2-1 to 6.3.5C.2.4.2-4. In this test case, the term $P_{CMAX_L} - MAX\{T_L, T_{LOW}(P_{CMAX_L})\}$ defined in TS 36.101 [2] clause 6.2.5A is used, to ensure the UE is not tested outside its power capability.

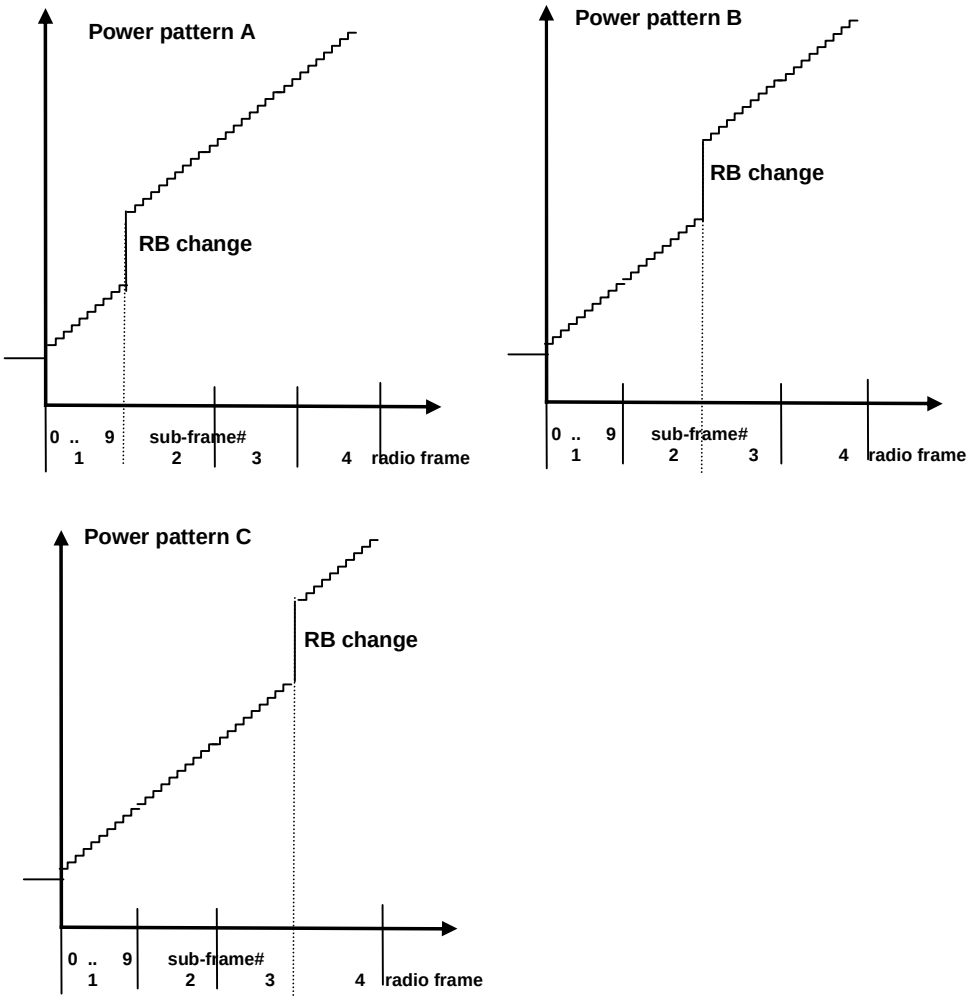



**Figure 6.3.5C.2.4.2-1: FDD ramping up test power patterns**

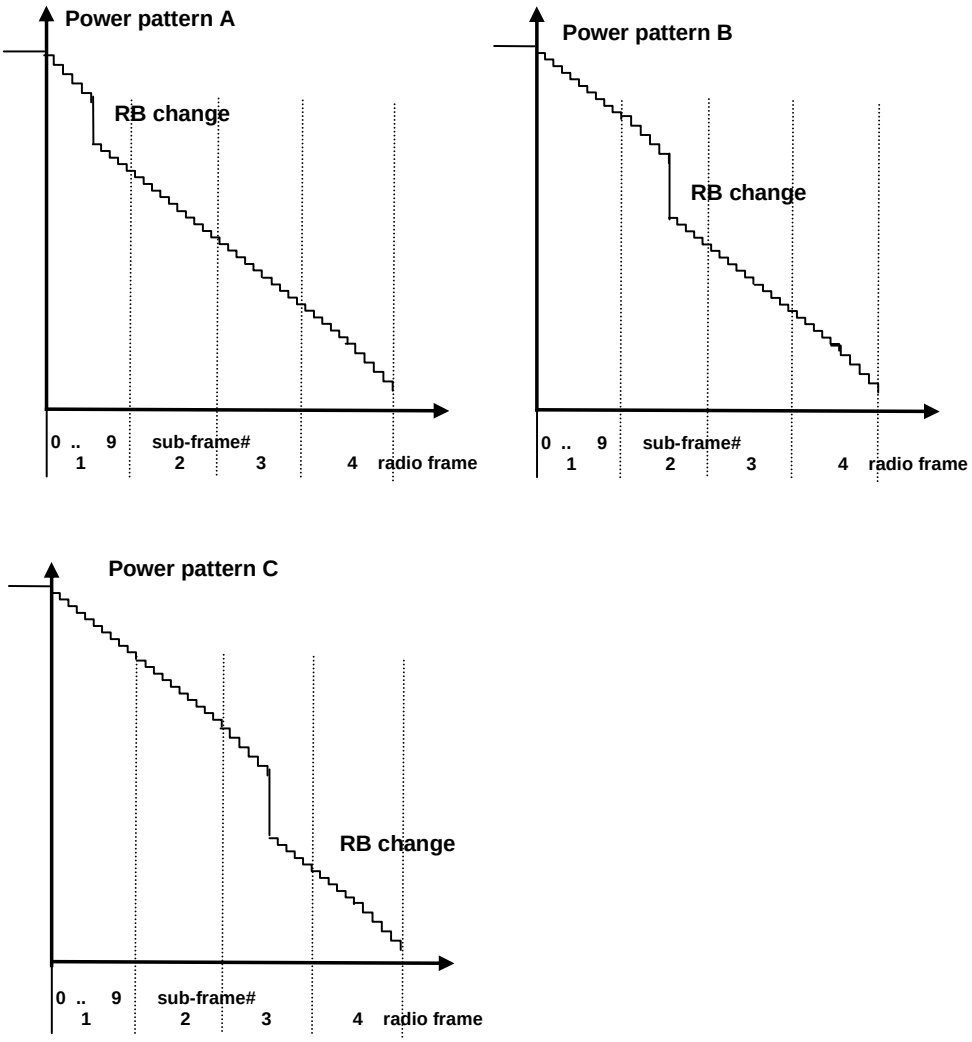



**Figure 6.3.5C.2.4.2-2: FDD ramping down test power patterns**

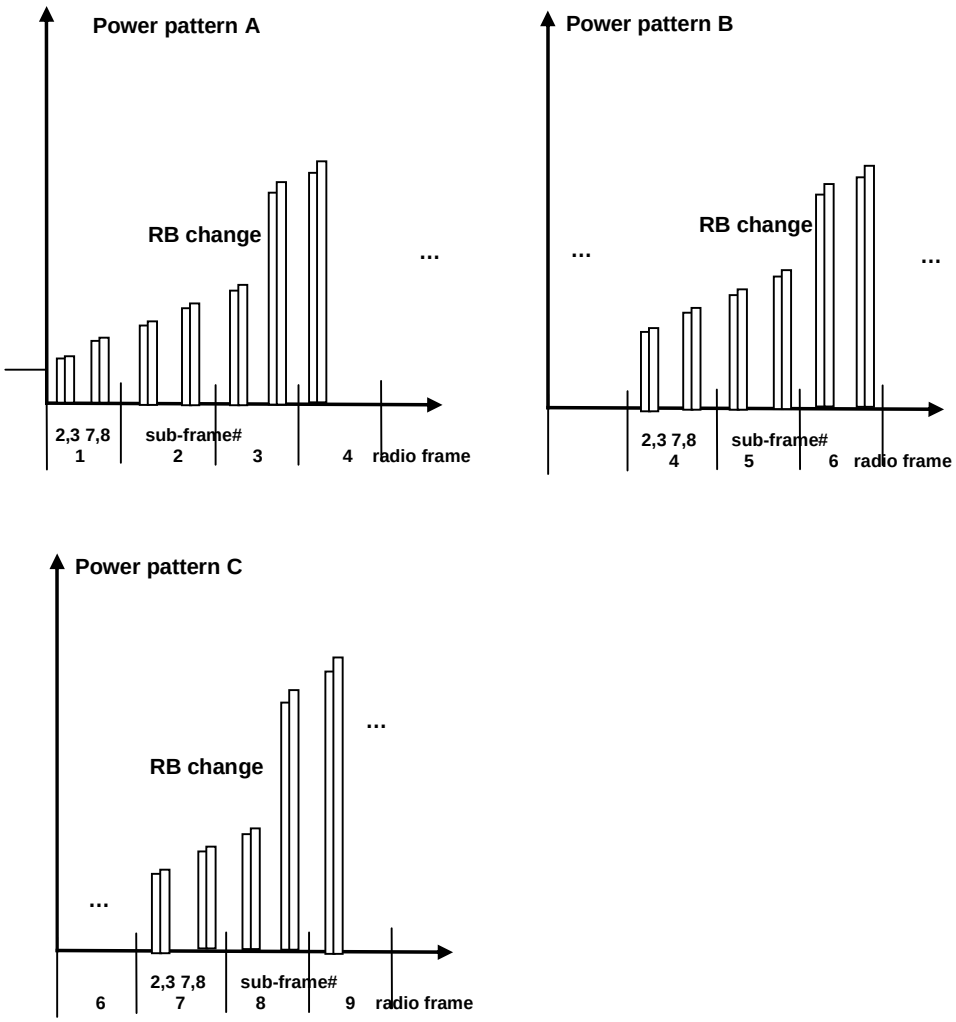



**Figure 6.3.5C.2.4.2-3: TDD ramping up test power patterns**

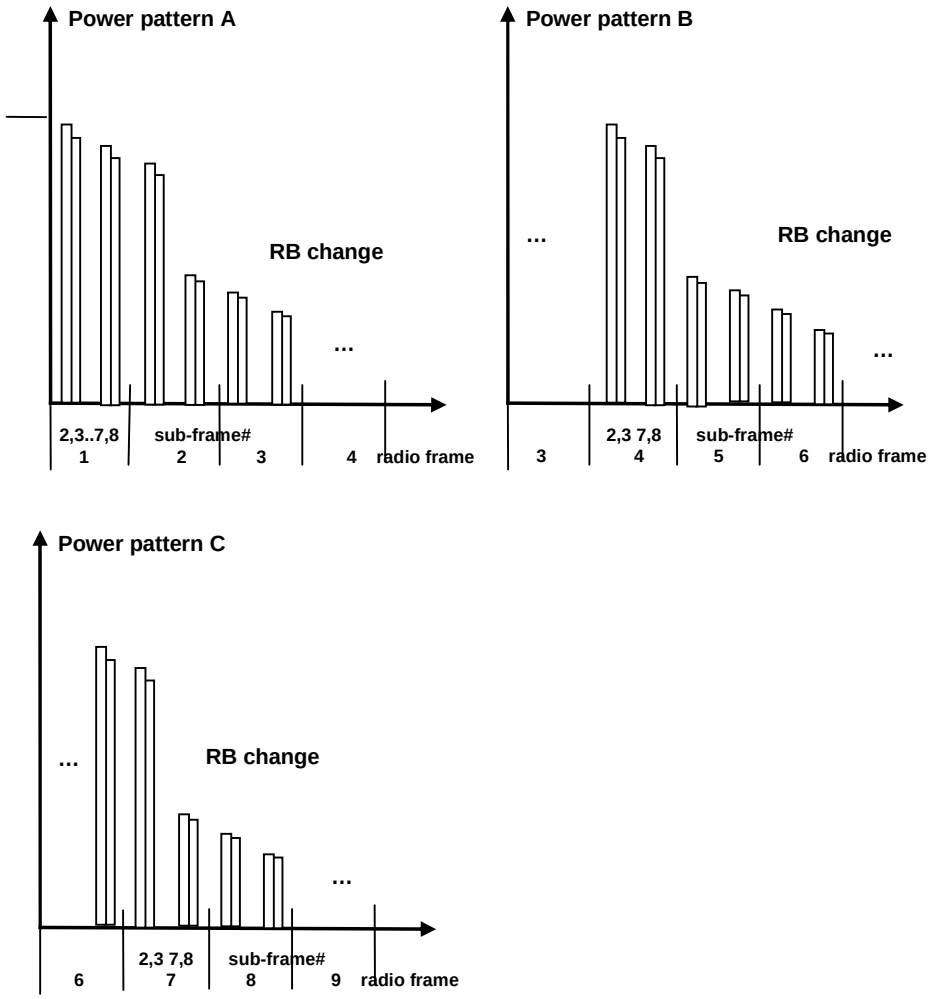



**Figure 6.3.5C.2.4.2-4: TDD ramping down test power patterns**

5. Sub test: ramping up pattern

5.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD) on both CC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the MCG CC and on the SCG CC at -36.8dBm +/- 3.2 dB for carrier frequency $f \leq 3.0$GHz or at -36.5dBm +/- 3.5 dB for carrier frequency 3.0GHz < $f \leq 4.2$GHz.

5.2. Schedule the UE's PUSCH data transmission on each component carrier as described in Figure 6.3.5C.2.4.2-1 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame) and Figure 6.3.5C.2.4.2-3 (TDD pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) with an uplink RB allocation as defined in tables 6.3.5C.2.5-1 thru 6.3.5C.2.5-12 depending on CC combinations. On the PDCCH format 0 for the scheduling of the PUSCH the SS will transmit a +1dB TPC command on both CCs separately. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

5.3. Measure the power of PUSCH transmissions on both CCs separately to verify the UE relative power control meet test requirements 6.3.5C.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded. Calculate the Total uplink power across both CCs. If ($P_{CMAX_L}$ – MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } - Total uplink power) < 0.7dB, stop ramping, exclude the last measurement and go to step 5.4.5.4. Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5C.2.5-1 thru Table 6.3.5C.2.5-12 to force bigger UE power steps at various points in the power range.

6. Sub test: ramping down pattern

6.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD) on both CCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the MCG CC and on the SCG CC at +15.0dBm +/- 3.2 dB for carrier frequency $f \leq 3.0$GHz or at +14.7dBm +/- 3.5 dB for carrier frequency 3.0GHz < $f \leq 4.2$GHz.

6.2. Schedule the UE's PUSCH data transmission as described in Figure 6.3.5C.2.4.2-2 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame) and Figure 6.3.5C.2.4.2-4 (TDD pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) with an uplink RB allocation as defined in tables 6.3.5C.2.2.5-1 thru 6.3.5C.2.5-12 depending on CC combinations. On the PDCCH format 0 for the scheduling of the PUSCH the SS will transmit a -1dB TPC command on both CCs separately. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

6.3. Measure the power of PUSCH transmissions on both CCs separately to verify the UE relative power control meet test requirements 6.3.5.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

6.4. Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5C.2.5-1 thru Table 6.3.5C.2.5-12 to force bigger UE power steps at various points in the power range.

### 6.3.5C.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.3.5C.2.4.3-1: SCG-Configuration-r12-DEFAULT**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-19F: SCG-Configuration-r12-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| | | | |
| setup SEQUENCE { | | | PSCell_Mod, PSCell_Add_Split_DRB, PSCell_Add_SCG_DRB |
| scg-ConfigPartMCG-r12 SEQUENCE { | | | |
| scg-Counter-r12 | 0 | INTEGER (0..65535) | |
| powerCoordinationInfo-r12 SEQUENCE { | | | |
| p-MeNB-r12 | 9 (50%) | INTEGER (1..16) mapped to 0..15 in Table 5.1.4.2-1 in TS 36.213 for power allocation for DC (0% - 100%) | |
| p-SeNB-r12 | 9 (50%) | INTEGER (1..16) mapped to 0..15 in Table 5.1.4.2-1 in TS 36.213 for power allocation for DC (0% - 100%) | |
| powerControlMode-r12 | 1 | DC power control mode 1 | |
| } | | | |
| } | | | |

## 6.3.5C.2.5 Test requirement

Each UE power step measured in the test procedure 6.3.5C.2.4.2 should satisfy the test requirements specified in Table 6.3.5C.2.5-1, thru 6.3.5C.2.5-12 for normal conditions.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each of ramping up and ramping down test patterns on both PCC and SCC separately. For these exceptions the power tolerance limit is a maximum of ±6.7 dB. If there is an exception in the power step caused by the RB change for all test patterns (A, B, C) then fail the UE.

**Table 6.3.5C.2.5-1: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 1.4MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 6 RBs | TPC=+1dB | 8.78 | 4 ≤ ΔP < 10 | 8.78 ± (4.7) Note 2<br>8.78 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed = 6 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2.5-2: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 1.4MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 5 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 5 to 1 RBs | TPC=-1dB | 7.99 | 4 ≤ ΔP < 10 | 7.99 ± (4.7) Note 2<br>7.99 +4.7/-6.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2.5-3: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 3MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 4 RBs | TPC=+1dB | 7.02 | 4 ≤ ΔP < 10 | 7.02 ± (4.7) Note 2<br>7.02 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed =4 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2.5-4: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 3MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 15 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 15 to 1 RBs | TPC=-1dB | 12.76 | 10 ≤ ΔP < 15 | 12.76 ± (5.7) Note 2<br>12.76 +5.7/-7.2 Note 4 |
| Subframes after RB change | Fixed =1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern **A** the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2.5-5: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 20 | TPC=+1dB | 14.01 | 10 ≤ ΔP < 15 | 14.01 ± (5.7) Note 2<br>14.01 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 20 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2.5-6: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 25 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 25 to 1 | TPC=-1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± (5.7) Note 2<br>14.98 +5.7/-7.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2.5-7: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 10MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 25 | TPC=+1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± (5.7) Note 2<br>14.98 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 25 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2.5-8: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 10MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 50 ( UE-Categories ≥2)<br><br>Fixed = 48 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 50 to 1 ( UE-Categories ≥2)<br><br>Change from 48 to 1 (UE cat 1) | TPC=-1dB | 17.99<br><br>17.81 | 15 ≤ Δ | 17.99 ± (6.7) Note 2<br>17.99 +6.7/-8.2 Note 4<br><br>17.81 ± (6.7) Note 2<br>17.81 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2.5-9: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 50 | TPC=+1dB | 17.99 | 15 ≤ ΔP | 17.99±(6.7) Note 2<br>17.99 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 50 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2.5-10: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 75 ( UE-Categories ≥2)<br><br>Fixed = 50 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 75 to 1 ( UE-Categories ≥2)<br><br>Change from 50 to 1 (UE Cat 1) | TPC=-1dB | 19.75<br><br>17.99 | 15 ≤ ΔP | 19.75 ± (6.7) Note 2<br>19.75 +6.7/-8.2 Note 4<br><br>17.99 ± (6.7) Note 2<br>17.99 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2.5-11: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 75 | TPC=+1dB | 19.75 | 15 ≤ ΔP | 19.75 ± (6.7) Note 2<br>19.75 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 75 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2.5-12: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 100 ( UE-Categories ≥2)<br><br>Fixed = 75 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 100 to 1 ( UE-Categories ≥2)<br><br>Change from 75 to 1 (UE Cat 1) | TPC=-1dB | 21.0<br><br>19.75 | 15 ≤ ΔP | 21.0 ± (6.7) Note 2<br>21.0 +6.7/-8.2 Note 4<br><br>19.75 ± (6.7) Note 2<br>19.75 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

## 6.3.5C.2_1 Power Control Relative power tolerance for asynchronous Dual Connectivity

### 6.3.5C.2_1.1 Test purpose

To verify the ability of the UE transmitter to change the output power in both assigned component carrier in the uplink with a defined power step sizes between sub-frames on the two respective component carrier in a asynchronous Dual Connectivity scenario with maximum (500 us) time offset between carriers.

### 6.3.5C.2_1.2 Test applicability

This test applies to all types of E-UTRA UE release 12 and forward that support asynchronous Dual Connectivity.

### 6.3.5C.2_1.3 Minimum conformance requirement

The minimum conformance requirements are defined in clause 6.3.5A.2.0.

## 6.3.5C.2_1.4 Test description

### 6.3.5C.2_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA DC configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each DC Configuration, and are shown in table 6.3.5C.2_1.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5C.2_1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different DC bandwidth classes. | | Mid range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the DC Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for DC Configurations | | | | | | | | |
| **DC Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **MCG CC $N_{RB}$** | **SCG CCs $N_{RB}$** | **MCG & SCG RB allocation** | | **$N_{RB_alloc}$** | **MCG & SCG RB allocations(Note 3) ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/A for this test | QPSK | 31 | See table 6.3.5C.2_1.2.5-1 6.3.5C.2_1.2.5-2 | See table 6.3.5C.2_1.2.5-5 6.3.5C.2_1.2.5-6 | - | - |
| 6 | 50 | | QPSK | 56 | See table 6.3.5C.2_1.2.5-1 6.3.5C.2_1.2.5-2 | See table 6.3.5C.2_1.2.5-7 6.3.5C.2_1.2.5-8 | - | - |
| 25 | 15 | | QPSK | 40 | See table 6.3.5C.2_1.2.5-5 6.3.5C.2_1.2.5-6 | See table 6.3.5C.2_1.2.5-3 6.3.5C.2_1.2.5-4 | - | - |
| 25 | 25 | | QPSK | 50 | See table 6.3.5C.2_1.2.5-5 6.3.5C.2_1.2.5-6 | See table 6.3.5C.2_1.2.5-5 6.3.5C.2_1.2.5-6 | - | - |
| 25 | 50 | | QPSK | 75 | See table 6.3.5C.2_1.2.5-5 6.3.5C.2_1.2.5-6 | See table 6.3.5C.2_1.2.5-5 6.3.5C.2_1.2.5-6 | - | - |
| 50 | 50 | | QPSK | 100 | See table 6.3.5C.2_1.2.5-7 6.3.5C.2_1.2.5-8 | See table 6.3.5C.2_1.2.5-7 6.3.5C.2_1.2.5-8 | - | - |
| 50 | 100 | | QPSK | 150 | See table 6.3.5C.2_1.2.5-7 6.3.5C.2_1.2.5-8 | See table 6.3.5C.2_1.2.5-11 6.3.5C.2_1.2.5-12 | - | - |
| 75 | 75 | | QPSK | 150 | See table 6.3.5C.2_1.2.5-9 6.3.5C.2_1.2.5-10 | See table 6.3.5C.2_1.2.5-9 6.3.5C.2_1.2.5-10 | - | - |
| 100 | 75 | | QPSK | 175 | See table 6.3.5C.2_1.2.5-11 6.3.5C.2_1.2.5-12 | See table 6.3.5C.2_1.2.5-9 6.3.5C.2_1.2.5-10 | - | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 100 | 100 | | QPSK | 200 | See table 6.3.5C.2_1.2.5-11 6.3.5C.2_1.2.5-12 | See table 6.3.5C.2_1.2.5-11 6.3.5C.2_1.2.5-12 | - | - |
| Note 1: DC Configuration Test CC Combination settings are checked separately for each DC Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested. | | | | | | | | |
| Note 3: The UL allocation is changed as part of the test procedure. The Test Configuration Table entries list the combinations used, with the sequence of usage as determined by the test procedure for each sub-test. | | | | | | | | |
| Note 4: The starting resource block shall be RB# 0. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for MCG CC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.3.5C.2_1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-DC1 according to TS 36.508 [7] clause 5.2A.2A. Message contents are defined in clause 6.3.5C.2_1.4.3.

### 6.3.5C.2_1.4.2 Test procedure

1. Configure SCG CC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels with a time offset of +500 us compared to PCC.
3. SS activates SCG CC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clause 8.3.3.2).
4. The procedure is separated in various subtests to verify different aspects of relative power control on both MCG CC and SCG CC individually. The power patterns of the subtests are shown in figure 6.3.5C.2_1.4.2-1 to 6.3.5C.2_1.4.2-4. In this test case, the term $P_{CMAX_L}$ – MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } defined in TS 36.101 [2] clause 6.2.5A is used, to ensure the UE is not tested outside its power capability.

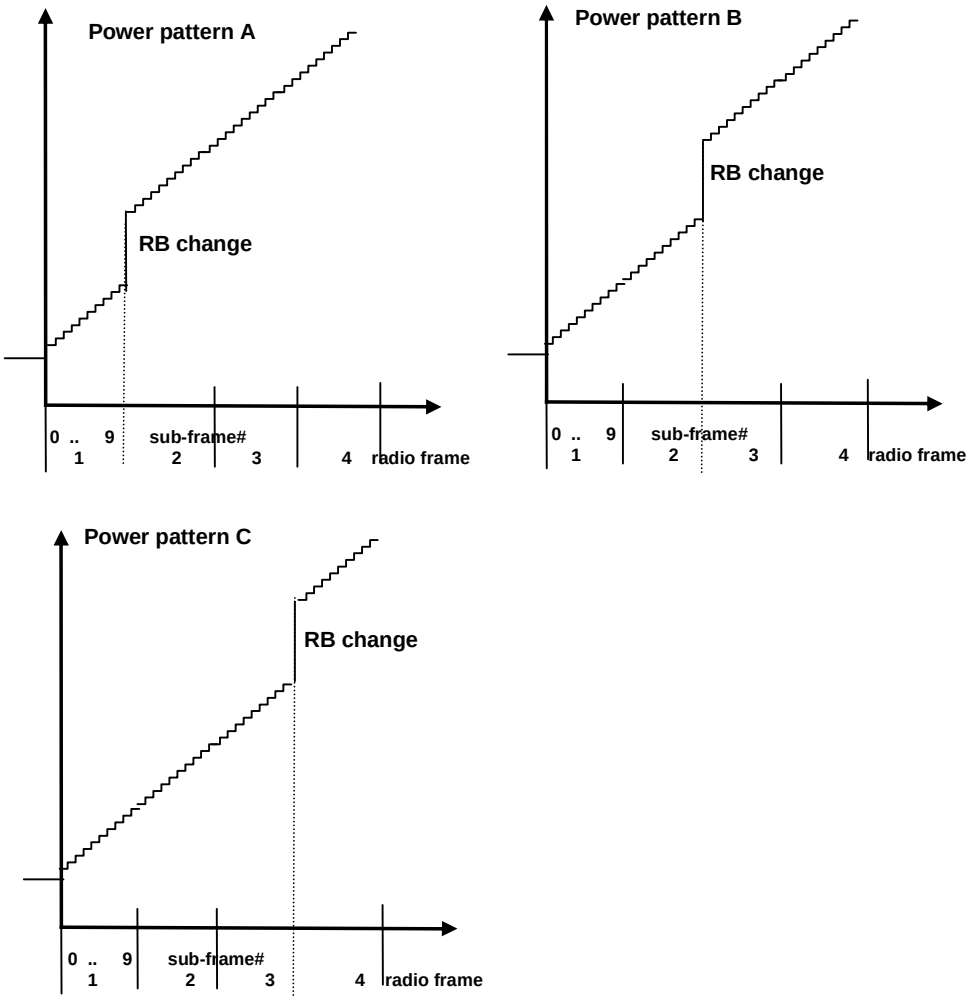



**Figure 6.3.5C.2_1.4.2-1: FDD ramping up test power patterns**

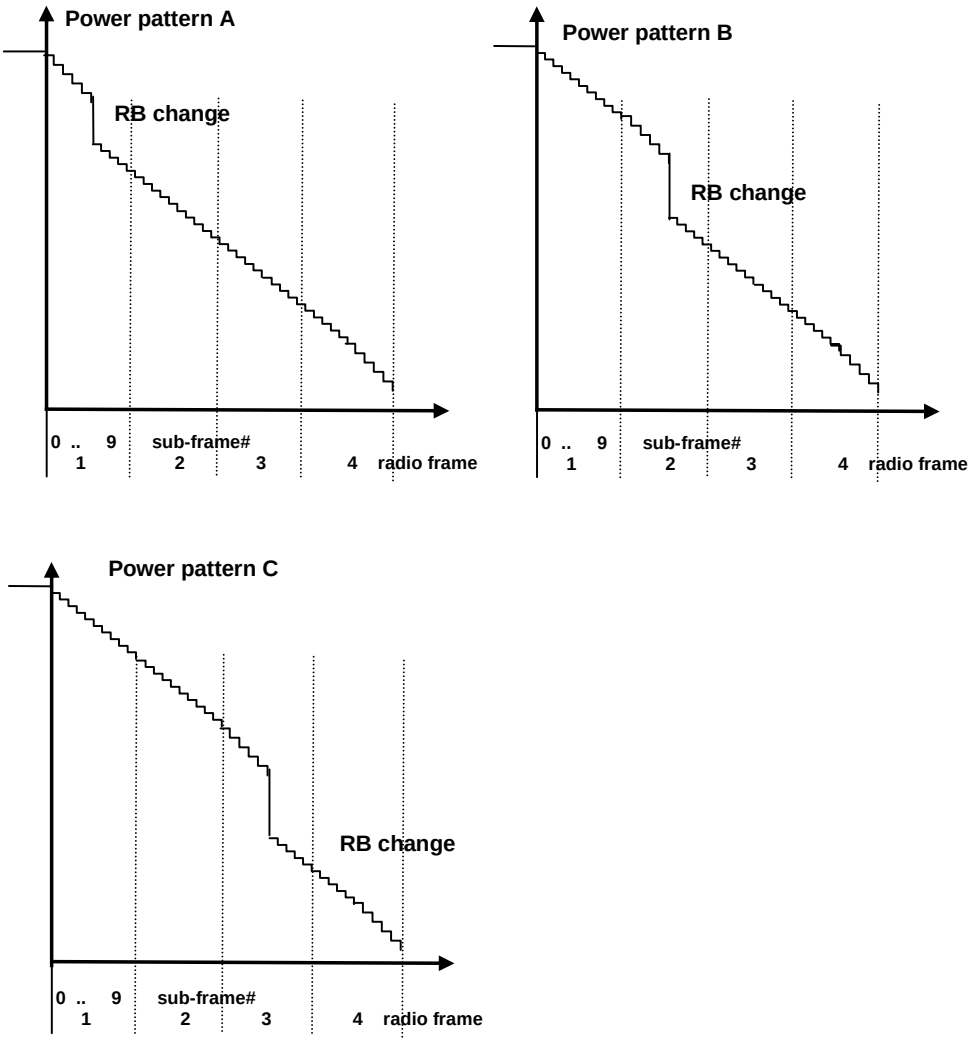



**Figure 6.3.5C.2_1.4.2-2: FDD ramping down test power patterns**

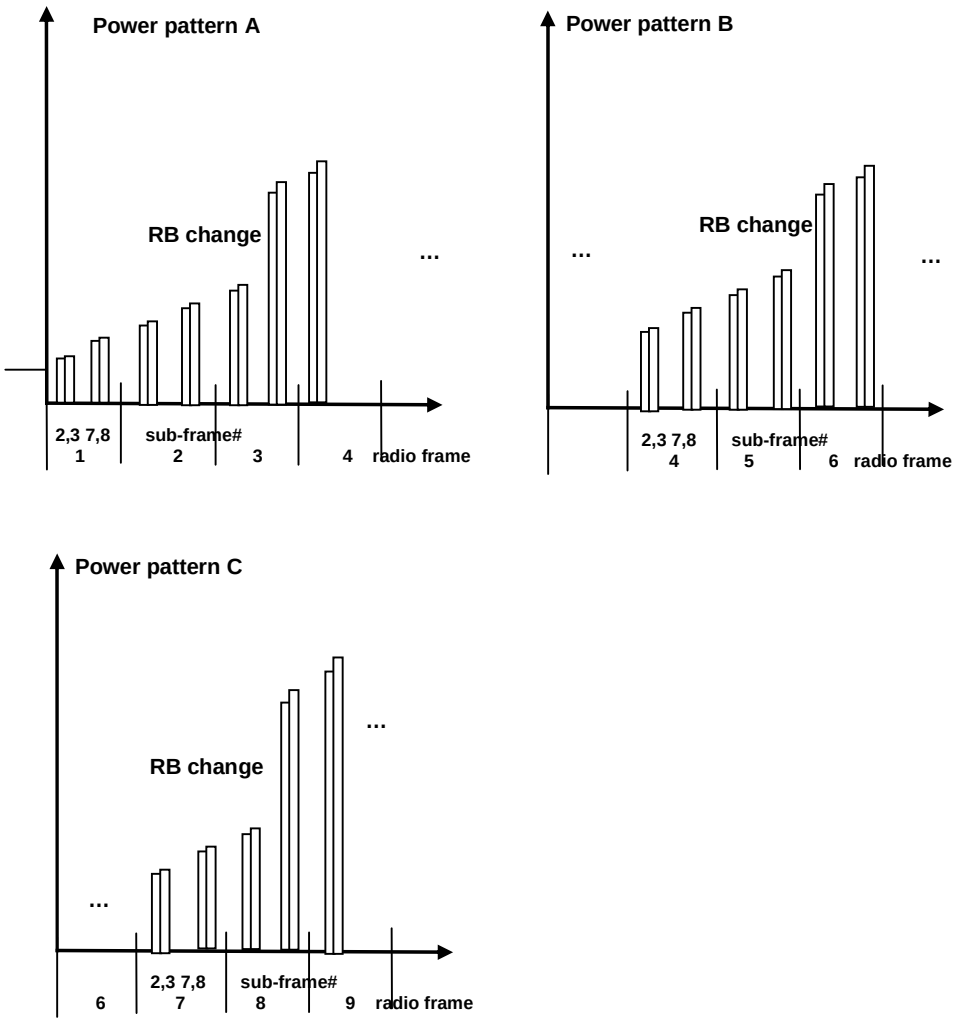



**Figure 6.3.5C.2_1.4.2-3: TDD ramping up test power patterns**

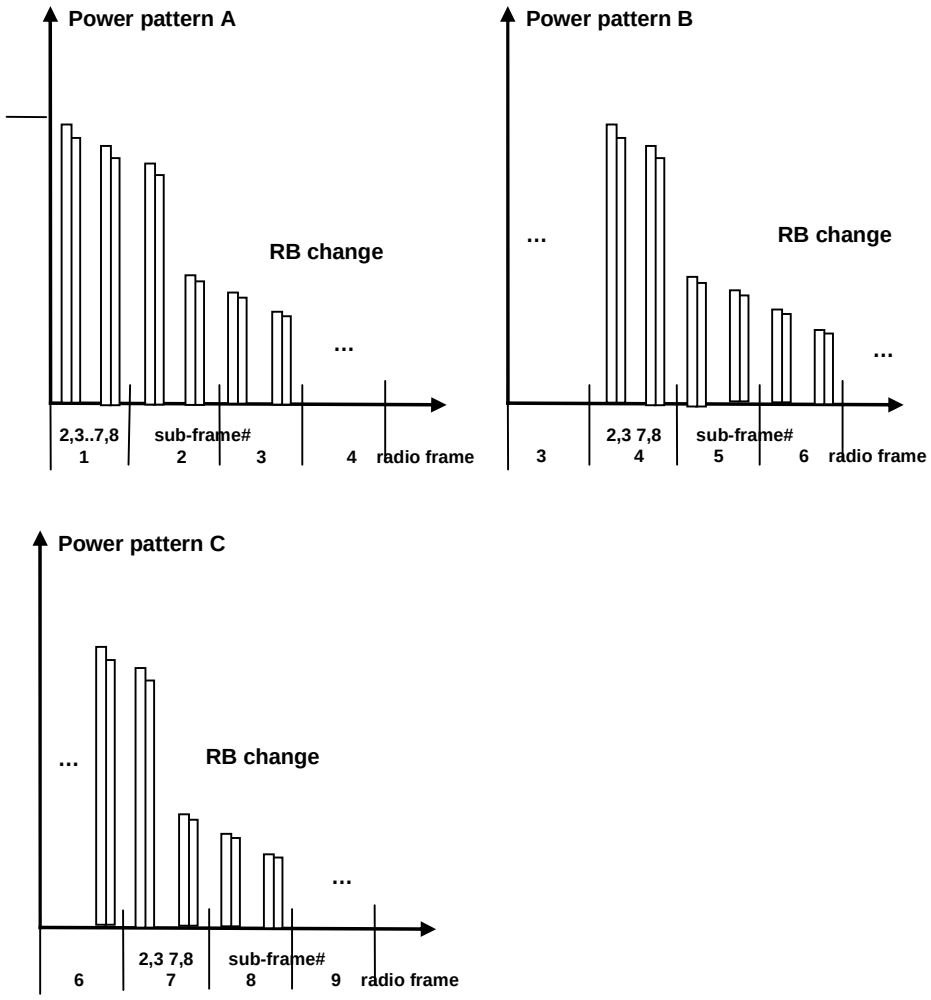



**Figure 6.3.5C.2_1.4.2-4: TDD ramping down test power patterns**

5. Sub test: ramping up pattern

5.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD) on both CC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the MCG CC and on the SCG CC at -36.8dBm +/- 3.2 dB for carrier frequency $f \leq 3.0$GHz or at -36.5dBm +/- 3.5 dB for carrier frequency 3.0GHz < $f \leq 4.2$GHz.

5.2. Schedule the UE's PUSCH data transmission on each component carrier as described in Figure 6.3.5C.2_1.4.2-1 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame) and Figure 6.3.5C.2_1.4.2-3 (TDD pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) with an uplink RB allocation as defined in tables 6.3.5C.2_1.5-1 thru 6.3.5C.2_1.5-12 depending on CC combinations. On the PDCCH format 0 for the scheduling of the PUSCH the SS will transmit a +1dB TPC command on both CCs separately. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

5.3. Measure the power of PUSCH transmissions on both CCs separately to verify the UE relative power control meet test requirements 6.3.5C.2_1.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded. Calculate the Total uplink power across both CCs. If ($P_{CMAX_L}$ – MAX{$T_L$, $T_{LOW}(P_{CMAX_L})$ } - Total uplink power) < 0.7dB, stop ramping, exclude the last measurement and go to step 5.4.5.4. Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5C.2_1.5-1 thru Table 6.3.5C.2_1.5-12 to force bigger UE power steps at various points in the power range.

6. Sub test: ramping down pattern

6.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table A.2.2.2.1-1 (FDD) or Table A.2.3.2.1-1 (TDD) on both CCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH on each component carrier to the UE to ensure that the UE transmits PUSCH on the MCG CC and on the SCG CC at +15.0dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz or at +14.7dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

6.2. Schedule the UE's PUSCH data transmission as described in Figure 6.3.5C.2_1.4.2-2 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame) and Figure 6.3.5C.2_1.4.2-4 (TDD pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) with an uplink RB allocation as defined in tables 6.3.5C.2_1.5-1 thru 6.3.5C.2_1.5-12 depending on CC combinations. On the PDCCH format 0 for the scheduling of the PUSCH the SS will transmit a -1dB TPC command on both CCs separately. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

6.3. Measure the power of PUSCH transmissions on both CCs separately to verify the UE relative power control meet test requirements 6.3.5.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

6.4. Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5C.2_1.5-1 thru Table 6.3.5C.2_1.5-12 to force bigger UE power steps at various points in the power range.

### 6.3.5C.2_1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.3.5C.2_1.4.3-1: SCG-Configuration-r12-DEFAULT**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-19F: SCG-Configuration-r12-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| | | | |
| setup SEQUENCE { | | | PSCell_Mod, PSCell_Add_Split_DRB, PSCell_Add_SCG_DRB |
| scg-ConfigPartMCG-r12 SEQUENCE { | | | |
| scg-Counter-r12 | 0 | INTEGER (0..65535) | |
| powerCoordinationInfo-r12 SEQUENCE { | | | |
| p-MeNB-r12 | 9 (50%) | INTEGER (1..16) mapped to 0..15 in Table 5.1.4.2-1 in TS 36.213 for power allocation for DC (0% - 100%) | |
| p-SeNB-r12 | 9 (50%) | INTEGER (1..16) mapped to 0..15 in Table 5.1.4.2-1 in TS 36.213 for power allocation for DC (0% - 100%) | |
| powerControlMode-r12 | 2 | DC power control mode 2 | |
| } | | | |
| } | | | |

## 6.3.5C.2_1.5 Test requirement

Each UE power step measured in the test procedure 6.3.5C.2_1.4.2 should satisfy the test requirements specified in Table 6.3.5C.2_1.5-1, thru 6.3.5C.2_1.5-12 for normal conditions.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each of ramping up and ramping down test patterns on both PCC and SCC separately. For these exceptions the power tolerance limit is a maximum of ±6.7 dB. If there is an exception in the power step caused by the RB change for all test patterns (A, B, C) then fail the UE.

**Table 6.3.5C.2_1.5-1: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 1.4MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 6 RBs | TPC=+1dB | 8.78 | 4 ≤ ΔP < 10 | 8.78 ± (4.7) Note 2<br>8.78 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed = 6 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2_1.5-2: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 1.4MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 5 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 5 to 1 RBs | TPC=-1dB | 7.99 | 4 ≤ ΔP < 10 | 7.99 ± (4.7) Note 2<br>7.99 +4.7/-6.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2_1.5-3: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 3MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 4 RBs | TPC=+1dB | 7.02 | 4 ≤ ΔP < 10 | 7.02 ± (4.7) Note 2<br>7.02 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed =4 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2_1.5-4: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 3MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 15 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 15 to 1 RBs | TPC=-1dB | 12.76 | 10 ≤ ΔP < 15 | 12.76 ± (5.7) Note 2<br>12.76 +5.7/-7.2 Note 4 |
| Subframes after RB change | Fixed =1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern **A** the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2_1.5-5: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 20 | TPC=+1dB | 14.01 | 10 ≤ ΔP < 15 | 14.01 ± (5.7) Note 2<br>14.01 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 20 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2_1.5-6: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 25 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 25 to 1 | TPC=-1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± (5.7) Note 2<br>14.98 +5.7/-7.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2_1.5-7: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 10MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 25 | TPC=+1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± (5.7) Note 2<br>14.98 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 25 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2_1.5-8: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 10MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 50 ( UE-Categories ≥2)<br><br>Fixed = 48 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 50 to 1 ( UE-Categories ≥2)<br><br>Change from 48 to 1 (UE cat 1) | TPC=-1dB | 17.99<br><br>17.81 | 15 ≤ Δ | 17.99 ± (6.7) Note 2<br>17.99 +6.7/-8.2 Note 4<br><br>17.81 ± (6.7) Note 2<br>17.81 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2_1.5-9: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 50 | TPC=+1dB | 17.99 | 15 ≤ ΔP | 17.99±(6.7) Note 2<br>17.99 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 50 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2_1.5-10: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 75 ( UE-Categories ≥2)<br><br>Fixed = 50 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 75 to 1 ( UE-Categories ≥2)<br><br>Change from 50 to 1 (UE Cat 1) | TPC=-1dB | 19.75<br><br>17.99 | 15 ≤ ΔP | 19.75 ± (6.7) Note 2<br>19.75 +6.7/-8.2 Note 4<br><br>17.99 ± (6.7) Note 2<br>17.99 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2_1.5-11: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 75 | TPC=+1dB | 19.75 | 15 ≤ ΔP | 19.75 ± (6.7) Note 2<br>19.75 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 75 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5C.2_1.5-12: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 100 ( UE-Categories ≥2)<br><br>Fixed = 75 (UE Cat 1) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 100 to 1 ( UE-Categories ≥2)<br><br>Change from 75 to 1 (UE Cat 1) | TPC=-1dB | 21.0<br><br>19.75 | 15 ≤ ΔP | 21.0 ± (6.7) Note 2<br>21.0 +6.7/-8.2 Note 4<br><br>19.75 ± (6.7) Note 2<br>19.75 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

# 6.3.5D

# 6.3.5E Power Control for UE category 0

## 6.3.5E.1 Power Control Absolute power tolerance for UE category 0

### 6.3.5E.1.1 Test purpose

Same test purpose as in clause 6.3.5.1.1.

### 6.3.5E.1.2 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.5.1.2

### 6.3.5E.1.3 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.3.5E.1.4 Test description

#### 6.3.5E.1.4.1 Initial conditions

Same initial conditions as in clause 6.3.5.1.4.1 with the following exceptions:

- Instead of Table 6.3.5.1.4.1-1 → use Table 6.3.5E.1.4.1-1.
- Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.3.5E.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in **TS 36.508 [7] subclause 4.3.1** | Mid range | | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Power Control Absolute power tolerance test case | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 36 | 36 |
| 15MHz | | QPSK | 36 | 36 |
| 20MHz | | QPSK | 36 | 36 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

#### 6.3.5E.1.4.2 Test procedure

Same test procedure as in clause 6.3.5.1.4.2.

#### 6.3.5E.1.4.3 Message contents

Same message contents as in clause 6.3.5.1.4.3.

### 6.3.5E.1.5 Test requirement

The requirement for the power measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5E.1.5-1 and 6.3.5E.1.5-2.

**Table 6.3.5E.1.5-1: Absolute power tolerance: test point 1**

| | **Channel bandwidth / expected output power (dBm)** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Expected Measured power Normal conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB |
| Expected Measured power Extreme conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2.E3 | | | | | | |

**Table 6.3.5E.1.5-2: Absolute power tolerance: test point 2**

| | **Channel bandwidth / expected output power (dBm)** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB |
| Expected Measured power Extreme conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2E.3 | | | | | | |

## 6.3.5E.2 Power Control Relative power tolerance for UE category 0

### 6.3.5E.2.1 Test purpose

Same test purpose as in clause 6.3.5.1.1.

### 6.3.5E.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.3.5E.2.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.5.2.3

### 6.3.5E.2.4 Test description

#### 6.3.5E.2.4.1 Initial conditions

Same initial conditions as in clause 6.3.5.2.4.1 with the following exceptions:

- Instead of Table 6.3.5.2.4.1-1 → use Table 6.3.5E.2.4.1-1.

- Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.3.5E.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Power Control Relative power tolerance test case | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 1.4MHz | | QPSK | See table 6.3.5E.2.5-1 6.3.5E.2.5-2 6.3.5E.2.5-13 | See table 6.3.5E.2.5-1 6.3.5E.2.5-2 6.3.5E.2.5-13 |
| 3MHz | | QPSK | See table 6.3.5E.2.5-3 6.3.5E.2.5-4 6.3.5E.2.5-13 | See table 6.3.5E.2.5-3 6.3.5E.2.5-4 6.3.5E.2.5-13 |
| 5MHz | | QPSK | See table 6.3.5E.2.5-5 6.3.5E.2.5-6 6.3.5E.2.5-13 | See table 6.3.5E.2.5-5 6.3.5E.2.5-6 6.3.5E.2.5-13 |
| 10MHz | | QPSK | See table 6.3.5E.2.5-7 6.3.5E.2.5-8 6.3.5E.2.5-13 | See table 6.3.5E.2.5-7 6.3.5E.2.5-8 6.3.5E.2.5-13 |
| 15MHz | | QPSK | See table 6.3.5E.2.5-9 6.3.5E.2.5-10 6.3.5E.2.5-13 | See table 6.3.5E.2.5-9 6.3.5E.2.5-10 6.3.5E.2.5-13 |
| 20MHz | | QPSK | See table 6.3.5E.2.5-11 6.3.5E.2.5-12 6.3.5E.2.5-13 | See table 6.3.5E.2.5-11 6.3.5E.2.5-12 6.3.5E.2.5-13 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The starting resource block shall be RB# 0. | | | | |

### 6.3.5E.2.4.2 Test procedure

The procedure is separated in various subtests to verify different aspects of relative power control. The power patterns of the subtests are described in figure 6.3.5E.2.4.2-1.

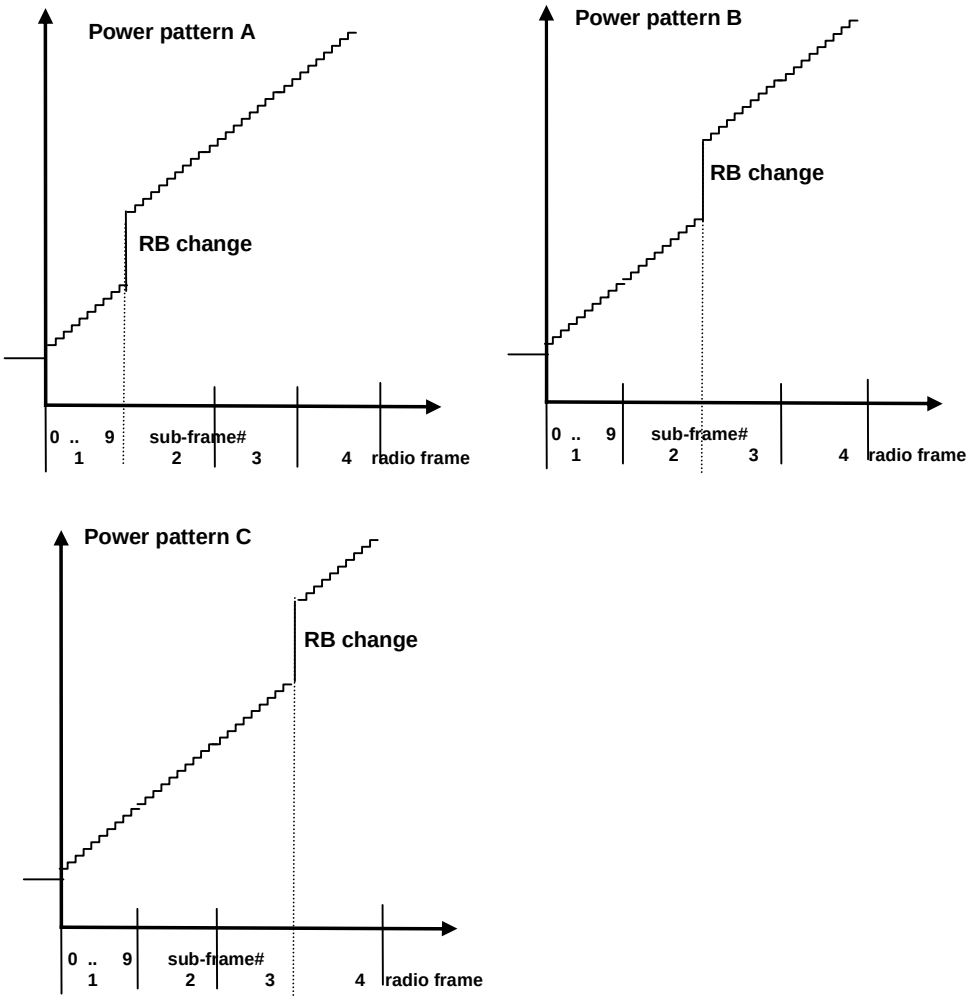



**Figure 6.3.5E.2.4.2-1: FDD ramping up test power patterns**

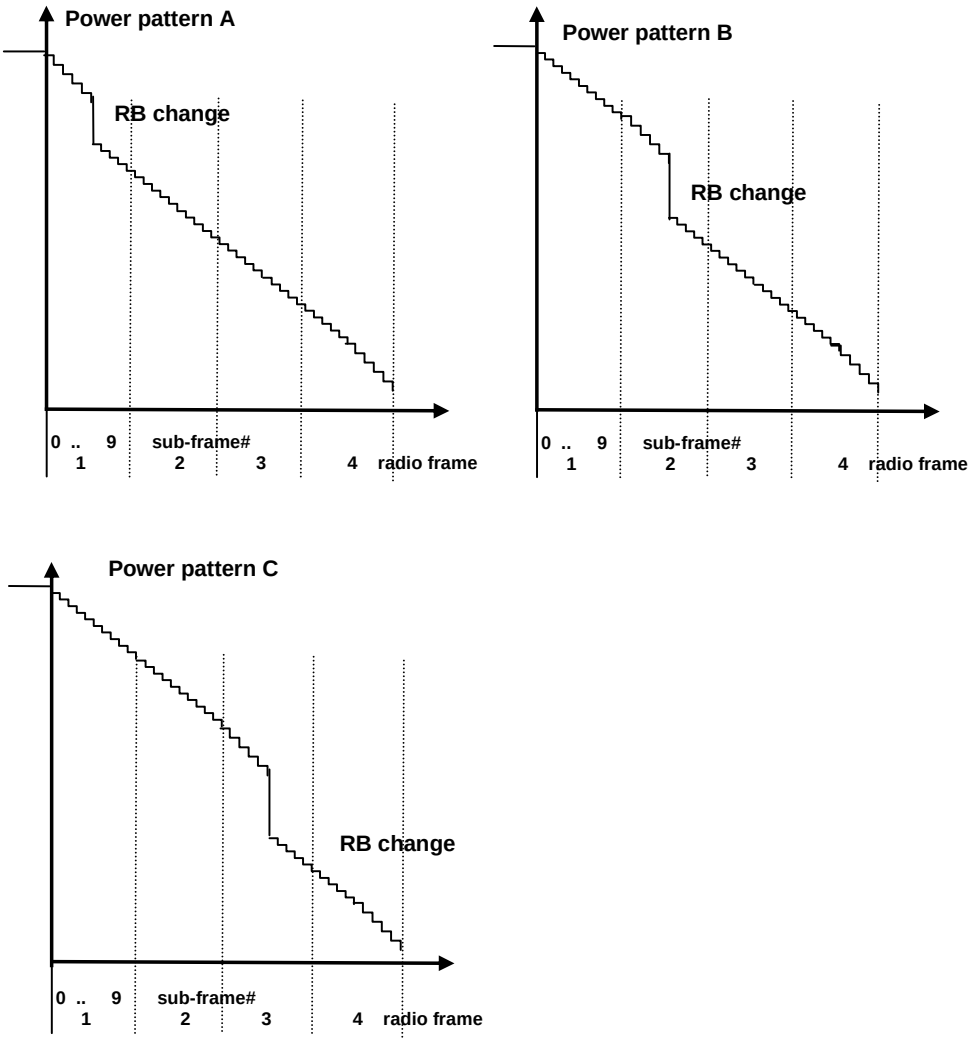



**Figure 6.3.5E.2.4.2-2: FDD ramping down test power patterns**

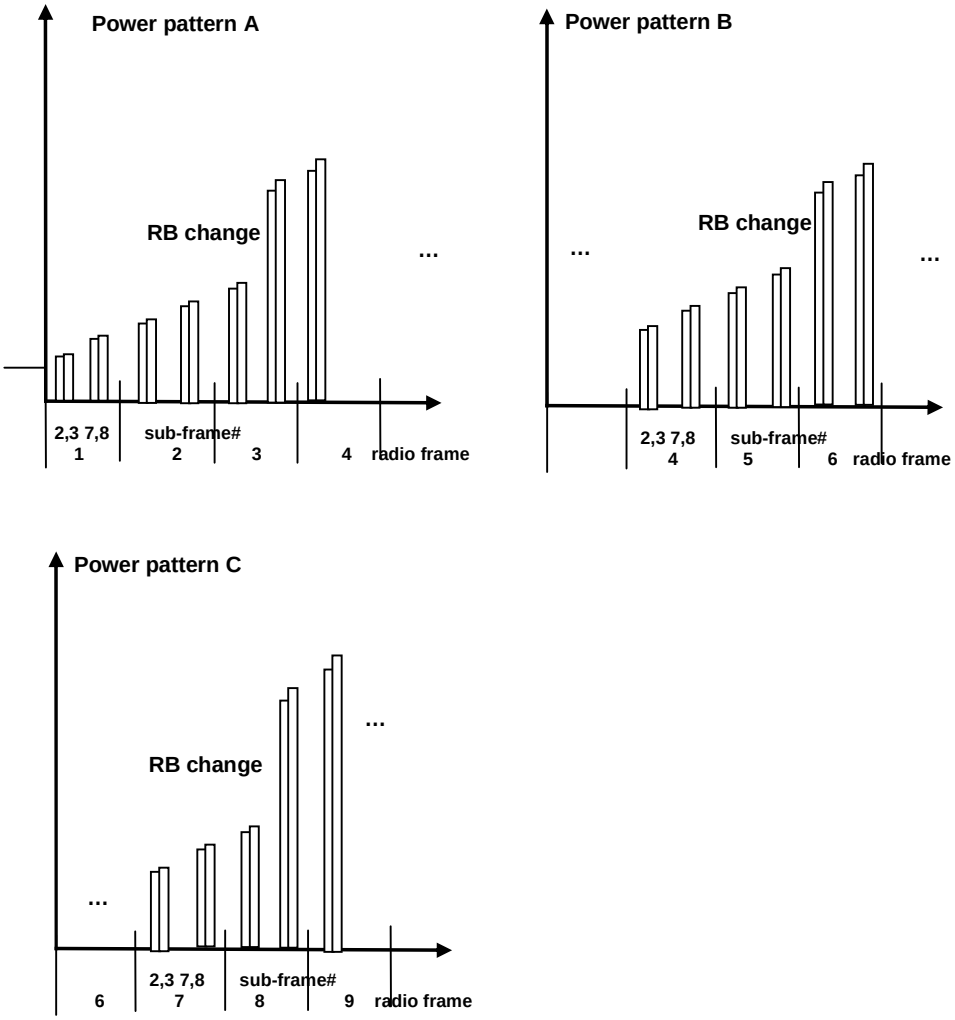



**Figure 6.3.5E.2.4.2-3: TDD ramping up test power patterns**

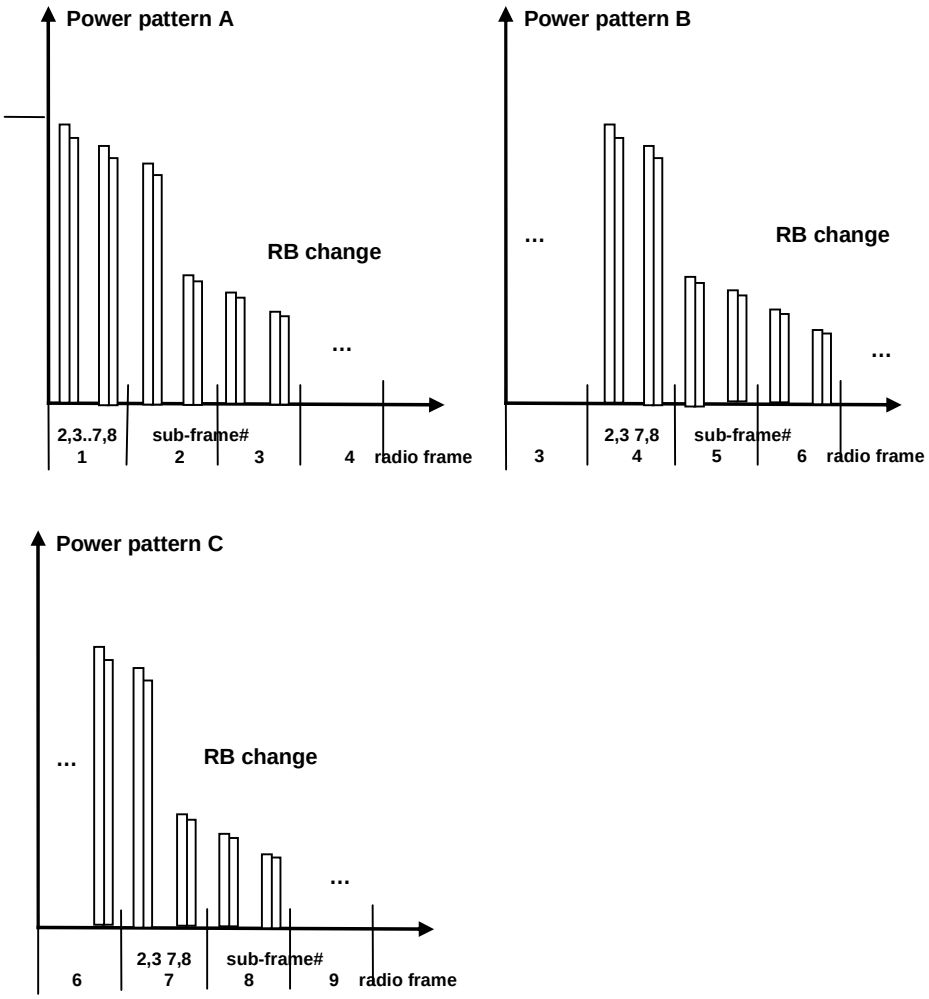



**Figure 6.3.5E.2.4.2-4: TDD ramping down test power patterns**

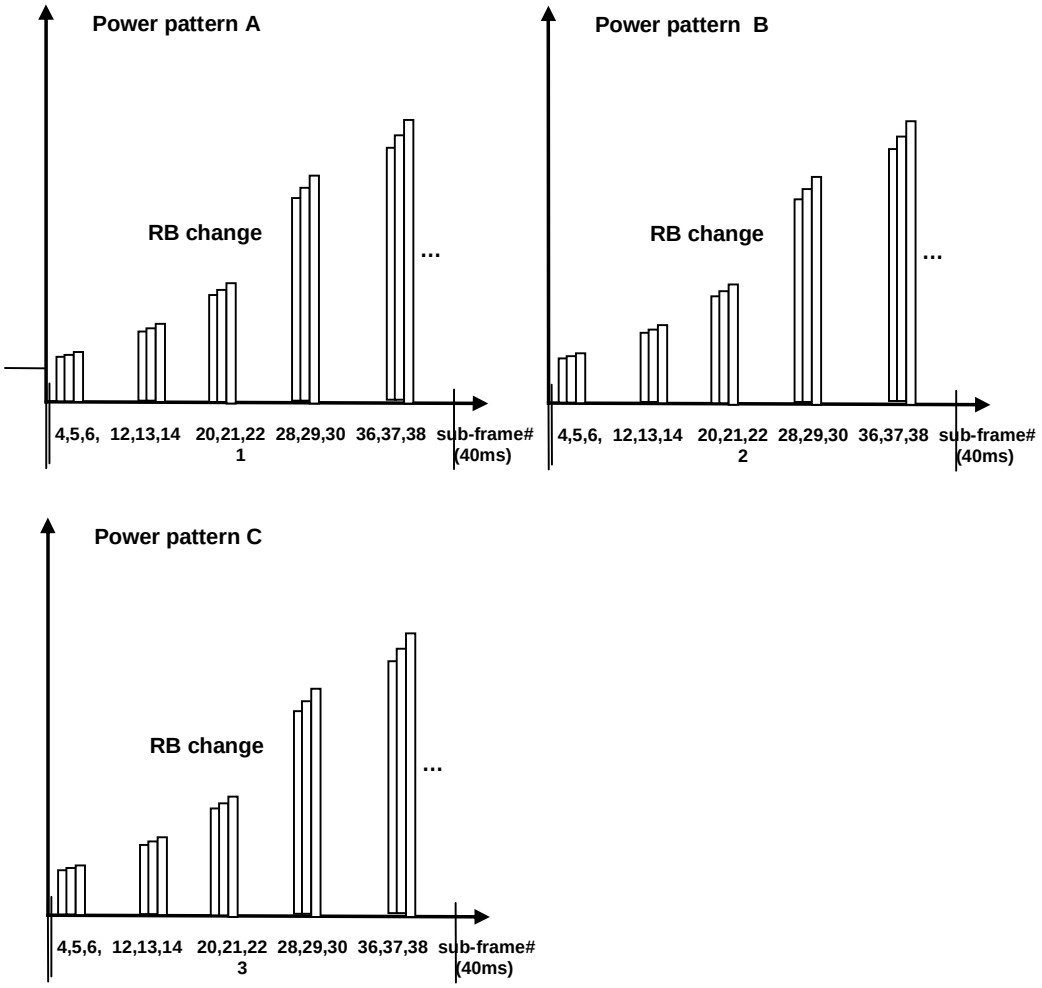



**Figure 6.3.5E.2.4.2-5: HD-FDD ramping up test power patterns**

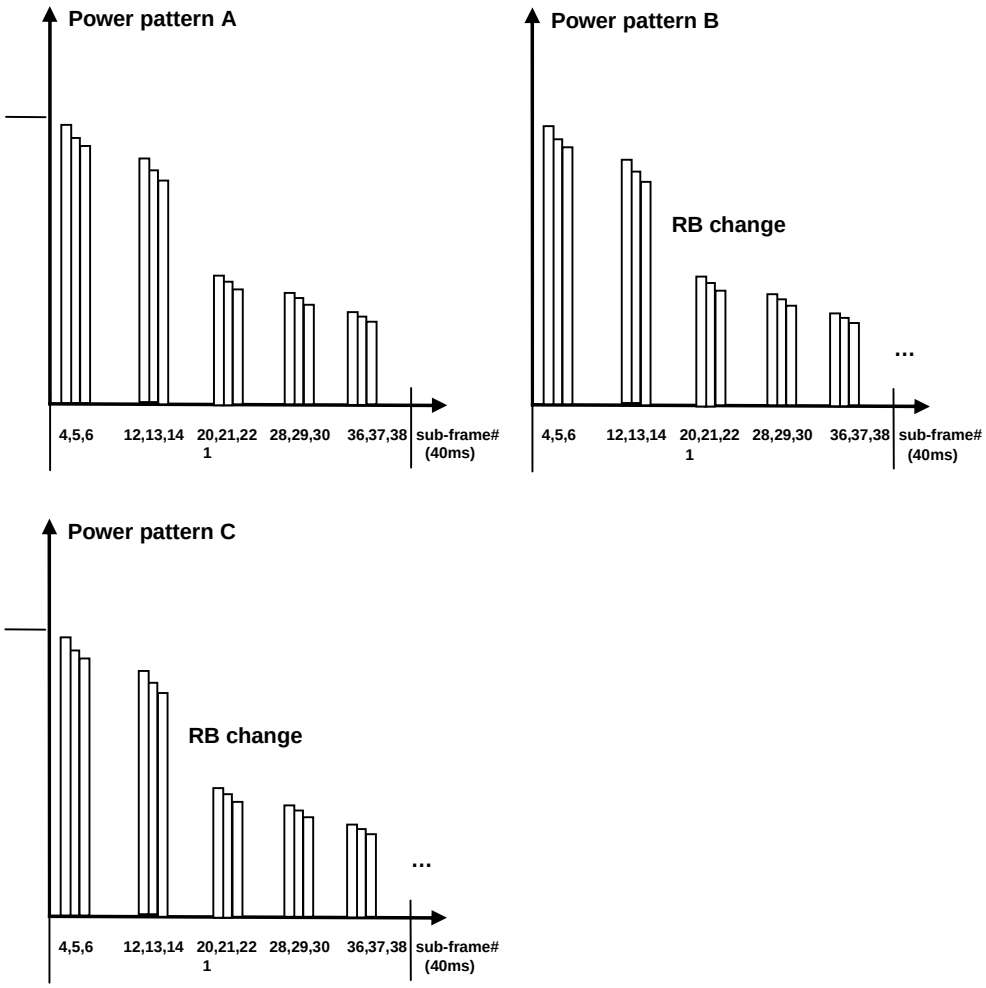



**Figure 6.3.5E.2.4.2-6: HD-FDD ramping down test power patterns**

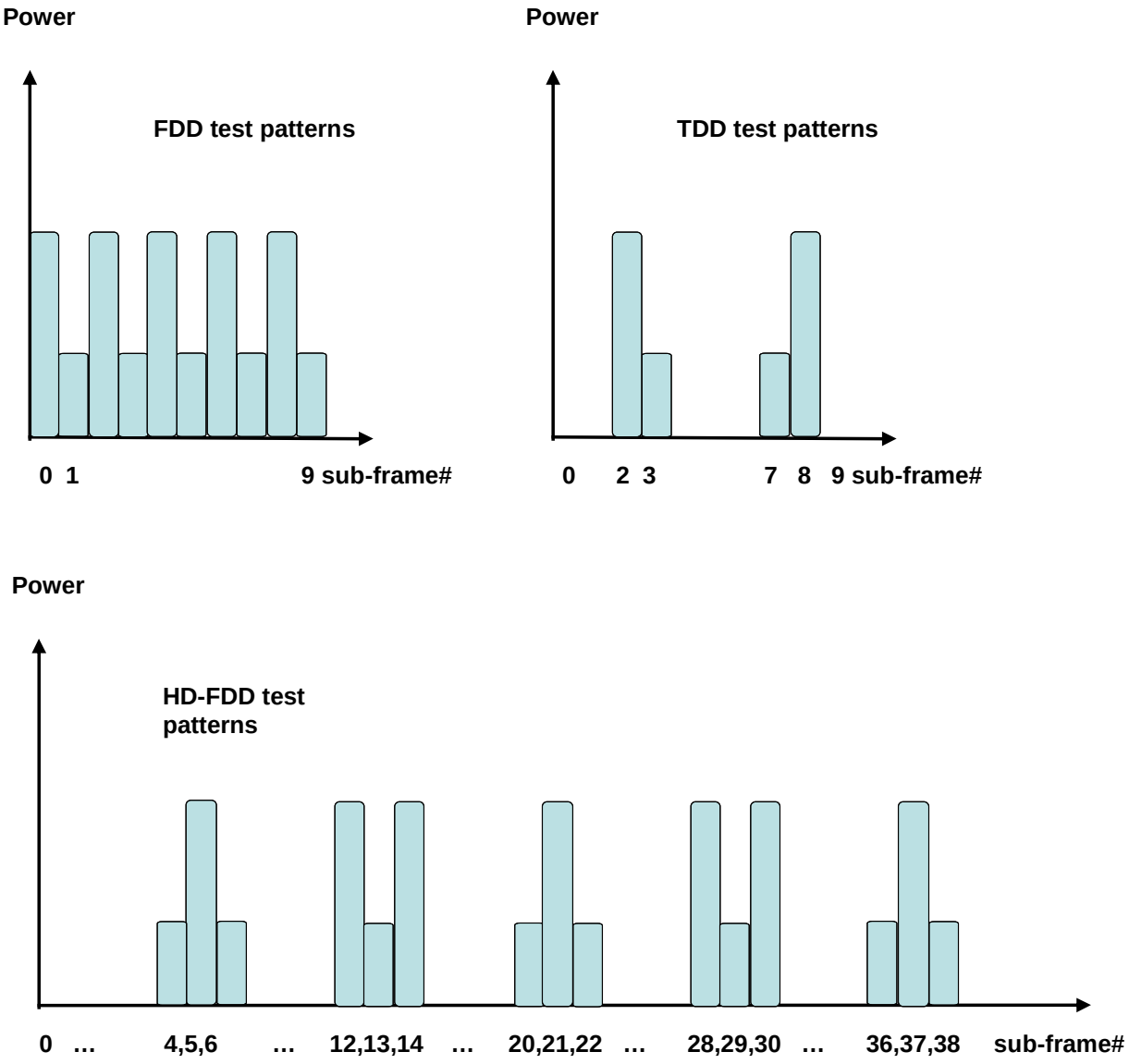



**Figure 6.3.5E.2.4.2-7: Alternating Test Power patterns**

1. Sub test: ramping up pattern

   1.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the PUSCH. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at -36.8dBm +/- 3.2 dB for carrier frequency $f \leq 3.0$GHz or at -36.5dBm +/- 3.5 dB for carrier frequency 3.0GHz < $f \leq 4.2$GHz.

   1.2. Schedule the UE's PUSCH data transmission as described in Figure 6.3.5E.2.4.2-1 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame) and Figure 6.3.5E.2.4.2-3 (TDD pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) with an uplink RB allocation as defined in tables 6.3.5E.2.5-1 thru 6.3.5E.2.5-12 depending on channel bandwidth. On the PDCCH format 0 for the scheduling of the PUSCH the SS will transmit a +1dB TPC command. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

1.3. Measure the power of PUSCH transmissions to verify the UE relative power control meet test requirements 6.3.5E.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

1.4. Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5E.2.5-1 thru Table 6.3.5E.2.5-12 to force bigger UE power steps at various points in the power range.

2. Sub test: ramping down pattern

2.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the PUSCH. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at +18.0dBm +/- 3.2 dB for carrier frequency $f \leq 3.0$GHz or at +17.7dBm +/- 3.5 dB for carrier frequency 3.0GHz $< f \leq$ 4.2GHz.

2.2. Schedule the UE's PUSCH data transmission as described in Figure 6.3.5E.2.4.2-2 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame) and Figure 6.3.5E.2.4.2-4 (TDD pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) with an uplink RB allocation as defined in tables 6.3.5E.2.5-1 thru 6.3.5E.2.5-12 depending on channel bandwidth. On the PDCCH format 0 for the scheduling of the PUSCH the SS will transmit a -1dB TPC command. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

2.3. Measure the power of PUSCH transmissions to verify the UE relative power control meet test requirements 6.3.5E.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

2.4. Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5E.2.5-1 thru Table 6.3.5E.2.5-12 to force bigger UE power steps at various points in the power range.

3. Sub test: alternating pattern

3.1 SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the PUSCH. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at -10dBm +/- 3.2 dB for carrier frequency $f \leq 3.0$GHz or at -10dBm +/- 3.5 dB for carrier frequency 3.0GHz $< f \leq$ 4.2GHz. The initial uplink RB allocation is defined as the smaller uplink RB allocation value specified in tables 6.3.5E.2.5-13. The power level and RB allocation are reset for each sub-test.

3.2. Schedule the UE's PUSCH data transmission as described in Figure 6.3.5E.2.4.2-5for 10 sub-frames with an uplink RB allocation alternating pattern as defined in table 6.3.5E.2.5-13 while transmitting 0dB TPC command for PUSCH via the PDCCH.

3.3. Measure the power of PUSCH transmissions to verify the UE relative power control meet test requirements specified in clause 6.3.5E.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

#### 6.3.5E.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.5E.2.5 Test requirement

TBD

## 6.3.5E.3 Aggregate power control tolerance for UE category 0

### 6.3.5E.3.1 Test purpose

Same test purpose as in clause 6.3.5.3.1.

### 6.3.5E.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.3.5E.3.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.5.1.2

### 6.3.5E.3.4 Test description

#### 6.3.5E.3.4.1 Initial conditions

Same initial conditions as in clause 6.3.5.3.4.1 with the following exception:

- Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.3.5E.3.4.2 Test procedure

Each UE power step measured in the test procedure 6.3.5E.2.4.2 should satisfy the test requirements specified in Table 6.3.5E.2.5-1, thru 6.3.5E.2.5-13 for normal conditions; for extreme conditions an additional ± 2.0 dB relaxation is allowed.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each of ramping up and ramping down test patterns. For these exceptions the power tolerance limit is a maximum of ±6.7 dB. If there is an exception in the power step caused by the RB change for all test patterns (A, B, C) then fail the UE.

**Table 6.3.5E.2.5-1: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 1.4MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 6 RBs | TPC=+1dB | 8.78 | 4 ≤ ΔP < 10 | 8.78 ± (4.7) Note 2<br>8.78 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed = 6 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5E.2.5-2: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 1.4MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 5 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 5 to 1 RBs | TPC=-1dB | 7.99 | 4 ≤ ΔP < 10 | 7.99 ± (4.7) Note 2<br>7.99 +4.7/-6.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5E.2.5-3: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 3MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 4 RBs | TPC=+1dB | 7.02 | 4 ≤ ΔP < 10 | 7.02 ± (4.7) Note 2<br>7.02 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed =4 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5E.2.5-4: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 3MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 15 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 15 to 1 RBs | TPC=-1dB | 12.76 | 10 ≤ ΔP < 15 | 12.76 ± (5.7) Note 2<br>12.76 +5.7/-7.2 Note 4 |
| Subframes after RB change | Fixed =1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5E.2.5-5: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 20 | TPC=+1dB | 14.01 | 10 ≤ ΔP < 15 | 14.01 ± (5.7) Note 2<br>14.01 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 20 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5E.2.5-6: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 25 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 25 to 1 | TPC=-1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± (5.7) Note 2<br>14.98 +5.7/-7.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5E.2.5-7: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 10MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 25 | TPC=+1dB | 14.98 | 10 ≤ ΔP < 15 | 14.98 ± (5.7) Note 2<br>14.98 +7.2/-5.7 Note 3 |
| Subframes after RB change | Fixed = 25 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5E.2.5-8: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 10MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 36 (UE Cat 0) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 36 to 1 (UE cat 0) | TPC=-1dB | 16.56 | 15 ≤ Δ | 16.56 ± (6.7) Note 2<br>16.56+6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5E.2.5-9: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 36 to 1 (UE Cat 0) | TPC=+1dB | 16.56 | 15 ≤ ΔP | 16.56±(6.7) Note 2<br>16.56 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 36 (UE cat 0) | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5E.2.5-10: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 15MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 36 ( UE Cat 0) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 36 to 1 (UE Cat 0) | TPC=-1dB | 16.56 | 15 ≤ ΔP | 16.56 ± (6.7) Note 2<br>16.56 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5E.2.5-11: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 36 to 1 (UE Cat 0) | TPC=+1dB | 16.56 | 15 ≤ ΔP | 16.56 ± (6.7) Note 2<br>16.56 +8.2/-6.7 Note 3 |
| Subframes after RB change | Fixed = 36 (UE cat 0) | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5E.2.5-12: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 20MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 36 (UE Cat 0) | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 36 to 1 (UE Cat 0) | TPC=-1dB | 16.56 | 15 ≤ ΔP | 16.56 ± (6.7) Note 2<br>16.56 +6.7/-8.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5E.2.5-13: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) (Alternating pattern)**

| Sub-test | Uplink RB allocation | TPC command | Expected power step size (Up or down) ΔP [dB] | Power step size range (Up or down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| 1.4 MHz | Alternating 1 and 6 | TPC=0dB | 7.78 | 4 ≤ ΔP < 10 | 7.78 ± (6.7) Note 1,2<br>7.78 +8.2/-6.7 Note 3<br>7.78 +6.7/-8.2 Note 4 |
| 3 MHz | Alternating 1 and 15 | TPC=0dB | 11.76 | 10 ≤ ΔP < 15 | 11.76 ± (6.7) Note 1,2<br>11.76 +8.2/-6.7 Note 3<br>11.76 +6.7/-8.2 Note 4 |
| 5 MHZ | Alternating 1 and 25 | TPC=0dB | 13.98 | 10 ≤ ΔP < 15 | 13.98 ± (6.7) Note 1,2<br>13.98 +8.2/-6.7 Note 3<br>13.98 +6.7/-8.2 Note 4 |
| 10 MHZ | Alternating 1 and 36 (UE Cat 0) | TPC=0dB | 15.56 | 15 ≤ ΔP | 15.56 ± (6.7) Note 1,2<br>15.56 +8.2/-6.7 Note 3<br>15.56 +6.7/-8.2 Note 4 |
| 15 MHZ | Alternating 1 and 36 (UE Cat 0) | TPC=0dB | 15.56 | 15 ≤ ΔP | 15.56 ± (6.7) Note 1,2<br>15.56 +8.2/-6.7 Note 3<br>15.56 +6.7/-8.2 Note 4 |
| 20 MHZ | Alternating 1 and 36 (UE Cat 0) | TPC=0dB | 15.56 | 15 ≤ ΔP | 15.56 ± (6.7) Note 1,2<br>15.56 +8.2/-6.7 Note 3<br>15.56 +6.7/-8.2 Note 4 |

Note 1: Test tolerance +/- 6.7 dB was selected to allow PA switch possible exceptions to occur.
Note 2: When neither Note 3 nor Note 4 applies.
Note 3: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: For operating bands under Note 2 in Table 6.2.2.3-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

The procedure is separated in two subtests to verify PUCCH and PUSCH aggregate power control tolerance respectively. The uplink transmission patterns are described in figure 6.3.5E.3.4.2-1.

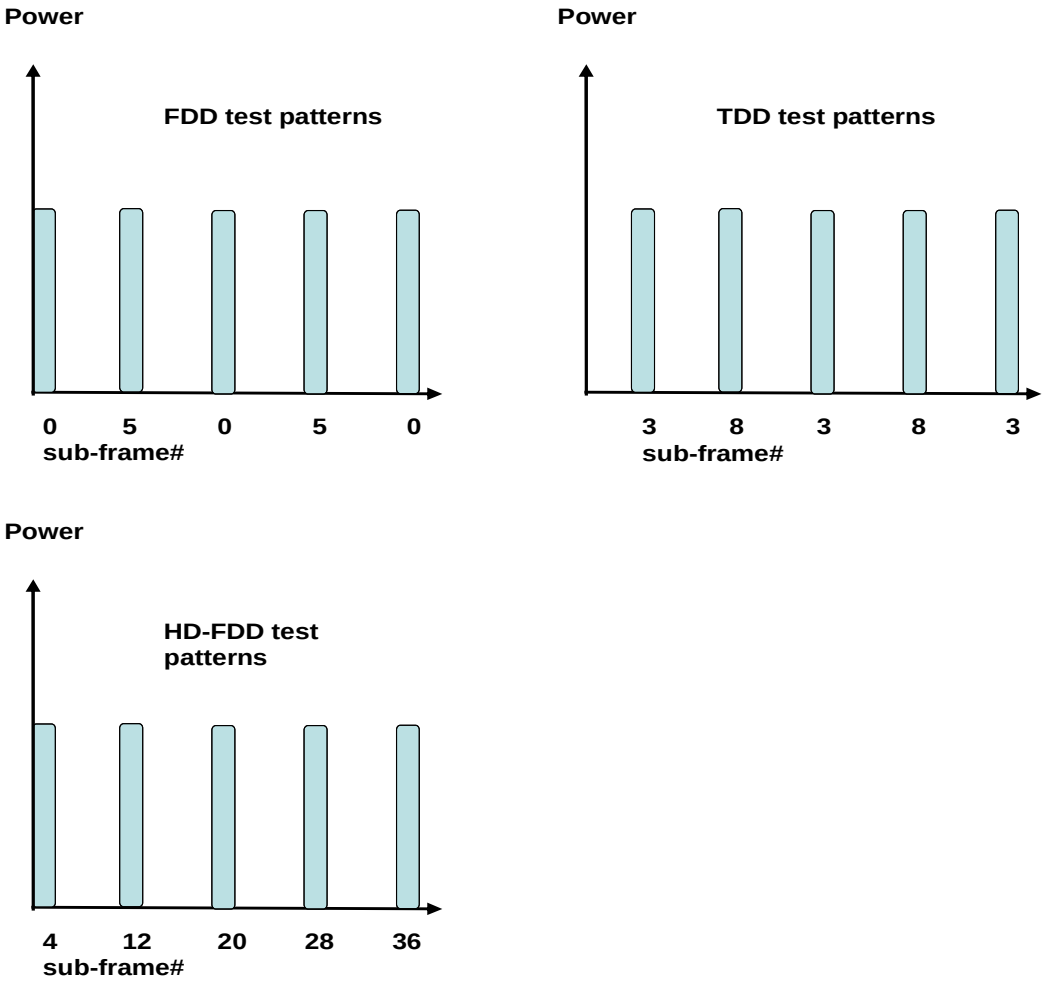



**Figure 6.3.5: E.3.4.2-1 Test uplink transmission**

1. PUCCH sub test:

1.1 The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.3.5E.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The transmission of PDSCH will make the UE send uplink ACK/NACK using PUCCH. Send the appropriate TPC commands for PUCCH to the UE to ensure that the UE transmits PUCCH at 0dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.2. Every 5 subframes transmit to the UE downlink PDSCH MAC padding bits as well as 0 dB TPC command for PUCCH via the PDCCH to make the UE transmit ACK/NACK on the PUCCH with transmission gap of 4 subframes. The downlink transmission is scheduled in the appropriate sub-frames to make the UE transmit PUCCH as described in figure 6.3.5E.3.4.2-1.

1.3. Measure the power of 5 consecutive PUCCH transmissions to verify the UE transmitted PUCCH power is maintained within 21 ms. The transient periods of 20us are excluded from the power measurement.

2. PUSCH sub test:

2.1. The SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the PUSCH. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at 0dBm +/- 3.2.dB for carrier frequency f ≤ 3.0GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.2. Every 5 subframes schedule the UE's PUSCH data transmission and transmit 0 dB TPC command for PUSCH via the PDCCH to make the UE transmit PUSCH with 4 subframes gap. The uplink transmission patterns are described in figure 6.3.5E.3.4.2-1.

2.3. Measure the power of 5 consecutive PUSCH transmissions to verify the UE transmitted PUSCH power is maintained within 21 ms. The transient periods of 20us are excluded from the power measurement.

#### 6.3.5E.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.5E.3.5 Test requirement

The requirement for the power measurements made in step (1.3) and (2.3) of the test procedure shall not exceed the values specified in Table 6.3.5E.3.5-1. The power measurement period shall be 1 sub-frame excluding transient periods.

**Table 6.3.5: E.3.5-1: Power control tolerance**

| TPC command | UL channel | Test requirement measured power |
|---|---|---|
| 0 dB | PUCCH | Given 5 power measurements in the pattern, the 2nd, 3rd, 4th, and 5th measurements shall be within ± 3.2 dB of the 1st measurement. |
| 0 dB | PUSCH | Given 5 power measurements in the pattern, the 2nd, 3rd, 4th, and 5th measurements shall be within ± 4.2 dB of the 1st measurement. |
| Note 1: The UE transmission gap is 4 ms. TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission. | | |

## 6.3.5EA Power control for UE category M1

### 6.3.5EA.1 Power Control Absolute power tolerance for UE category M1

#### 6.3.5EA.1.1 Test purpose

To verify the ability of the UE transmitter to set its initial output power to a specific value at the start of a contiguous transmission or non-contiguous transmission with a long transmission gap, i.e. transmission gap is larger than 20 ms.

#### 6.3.5EA.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

#### 6.3.5EA.1.3 Minimum conformance requirement

Absolute power tolerance is the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap larger than 20ms.

The minimum requirement on absolute power tolerance is given in Table 6.3.5EA.1.3-1 over the power range bounded by the Maximum output power as defined in sub-clause 6.2.2EA and the Minimum output power as defined in sub clause 6.3.2.

For operating bands under Note 2 in Table 6.2.2EA-1, the absolute power tolerance as specified in Table 6.5EA.1.3-1 is relaxed by reducing the lower limit by 1.5 dB when the transmission bandwidth is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$.

**Table 6.3.5EA.1.3-1: Absolute power tolerance**

| Conditions | Tolerance |
|---|---|
| Normal conditions | ± 9.0 dB |
| Extreme conditions | ± 12.0 dB |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5.1 and 6.3.5E.

## 6.3.5EA.1.4 Test description

### 6.3.5EA.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands defined for category M1 in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5EA.1.4.1-1. The details of the uplink reference measurement channel (RMCs) are specified in Annexes A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.3.5EA.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| 5MHz | | QPSK | 6 | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4 | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channel is set according to Table 6.3.5EA.1.4.1-1.

5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2 AA. Message contents are defined in clause 6.3.5EA.1.4.3. Note that MPDCCH DCI format 6-0A sent after resetting uplink power with RRC Connection Reconfiguration, should have TPC command 0dB.

### 6.3.5EA.1.4.2 Test procedure

1. SS sends uplink scheduling information via MPDCCH DCI format 6-0A with TPC command 0dB for C_RNTI to schedule the UL RMC according to Table 6.3.5EA.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Measure the initial output power of the first subframe of UE PUSCH first transmission. The transient periods of 20us are excluded.

3. Repeat for the two test points as indicated in section 6.3.5EA.1.4.3. The timing of the execution between the two test points shall be larger than 20ms.

### 6.3.5EA.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.3.5EA.1.4.3-1: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.5EA.1.4.3-2: UplinkPowerControlCommon: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH | -93 | Test point 2 to verify a UE relative high initial power transmission | |

**Table 6.3.5EA.1.4.3-3: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| uplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | SRB1 |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |

**Table 6.3.5EA.1.4.3-4: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | SRB1 |
| | 0 | | RBC |
| } | | | |

### 6.3.5EA.1.5 Test requirement

The requirement for the power measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5EA.1.5-1 and 6.3.5EA.1.5-2.

**Table 6.3.5EA.1.5-1: Absolute power tolerance: test point 1**

| ` | UE Power Class / Expected output power (dBm) | |
|---|---|---|
| | Class 3 | Class 5 |
| Expected Measured power Normal conditions | -14.8 dBm | -14.8 dBm |
| Power tolerance f ≤ 3.0GHz | ± 10.0dB | ± 10.0dB |
| Expected Measured power Extreme conditions | -14.8 dBm | -14.8 dBm |
| Power tolerance f ≤ 3.0GHz | ± 13.0dB | ± 13.0dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2EA.3 | | |

**Table 6.3.5EA.1.5-2: Absolute power tolerance: test point 2**

| | Expected output power (dBm) | |
|---|---|---|
| | Class 3 | Class 5 |
| Expected Measured power Normal conditions | -2.8 dBm | -2.8 dBm |
| Power tolerance f ≤ 3.0GHz | ± 10.0dB | ± 10.0dBm |
| Expected Measured power Extreme conditions | -2.8 dBm | -2.8 dBm |
| Power tolerance f ≤ 3.0GHz | ± 13.0dB | ± 13.0dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2EA.3 | | |

## 6.3.5EA.2 Power Control Relative power tolerance for UE category M1

### 6.3.5EA.2.1 Test purpose

To verify the ability of the UE transmitter to set its output power relatively to the power in a target sub-frame relatively to the power of the most recently transmitted reference sub-frame if the transmission gap between these sub-frames is ≤ 20 ms.

### 6.3.5EA.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

### 6.3.5EA.2.3 Minimum conformance requirement

The UE shall meet the requirements specified in Table 6.3.5EA.2.3-1.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each of two test patterns. The test patterns are a monotonically increasing power sweep and a monotonically decreasing power sweep over a range bounded by the requirements of minimum power and maximum power specified in clauses 6.3.2.3 and 6.2.2EA.3. For these exceptions the power tolerance limit is a maximum of ±6.0 dB in Table 6.3.5EA.2.3-1.

**Table 6.3.5EA.2.3-1: Relative Power Tolerance for Transmission (normal conditions)**

| Power step ΔP (Up or down) [dB] | All combinations of PUSCH and PUCCH transitions [dB] | All combinations of PUSCH/PUCCH and SRS transitions between sub-frames [dB] | PRACH [dB] |
|---|---|---|---|
| ΔP < 2 | ±2.5 (Note 3) | ±3.0 | ±2.5 |
| 2 ≤ ΔP < 3 | ±3.0 | ±4.0 | ±3.0 |
| 3 ≤ ΔP < 4 | ±3.5 | ±5.0 | ±3.5 |
| 4 ≤ ΔP ≤ 10 | ±4.0 | ±6.0 | ±4.0 |
| 10 ≤ ΔP < 15 | ±5.0 | ±8.0 | ±5.0 |
| 15 ≤ ΔP | ±6.0 | ±9.0 | ±6.0 |

Note 1: For extreme conditions an additional ± 2.0 dB relaxation is allowed

Note 2: For operating bands under Note 2 in Table 6.2.2.EA-1, the relative power tolerance is relaxed by increasing the upper limit by 1.5 dB if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges; if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges, then the tolerance is relaxed by reducing the lower limit by 1.5 dB.

Note 3: For PUSCH to PUSCH transitions with the allocated resource blocks fixed in frequency and no transmission gaps other than those generated by downlink subframes, DwPTS fields or Guard Periods for TDD: for a power step ΔP ≤ 1 dB, the relative power tolerance for transmission is ±1.0 dB.

The power step (ΔP) is defined as the difference in the calculated setting of the UE Transmit power between the target and reference sub-frames with the power setting according to Clause 5.1 of TS 36.213. The error is the difference between ΔP and the power change measured at the UE antenna port with the power of the cell-specific reference signals kept constant. The error shall be less than the relative power tolerance specified in Table 6.5EA.2.3-1.

The normative reference for this requirement is TS 36.101 clause 6.3.5.2 and 6.3.5E.

## 6.3.5EA.2.4 Test description

### 6.3.5EA.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands defined for category M1 in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5EA.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.3.5EA.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| 5MHz | | QPSK | See table 6.3.5EA.2.5-1 6.3.5EA.2.5-2 6.3.5EA.2.5-3 | See table 6.3.5EA.2.5-1 6.3.5EA.2.5-2 6.3.5EA.2.5-3 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4.<br>Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channel is set according to table 6.3.5EA.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.3EA.5.2.4.3.

### 6.3.5EA.2.4.2 Test procedure

The procedure is separated in various subtests to verify different aspects of relative power control. The power patterns of the subtests are described in figure 6.3.5EA.2.4.2-1.

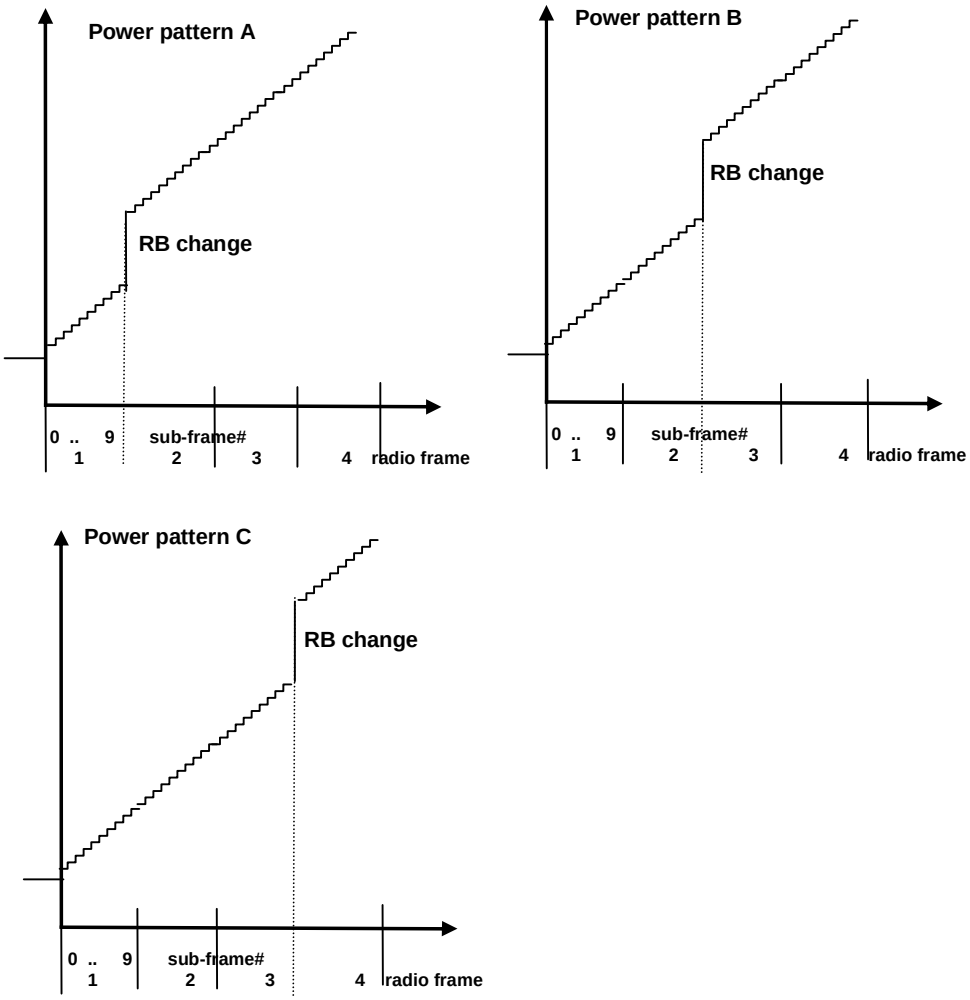



**Figure 6.3.5EA.2.4.2-1: FDD ramping up test power patterns**

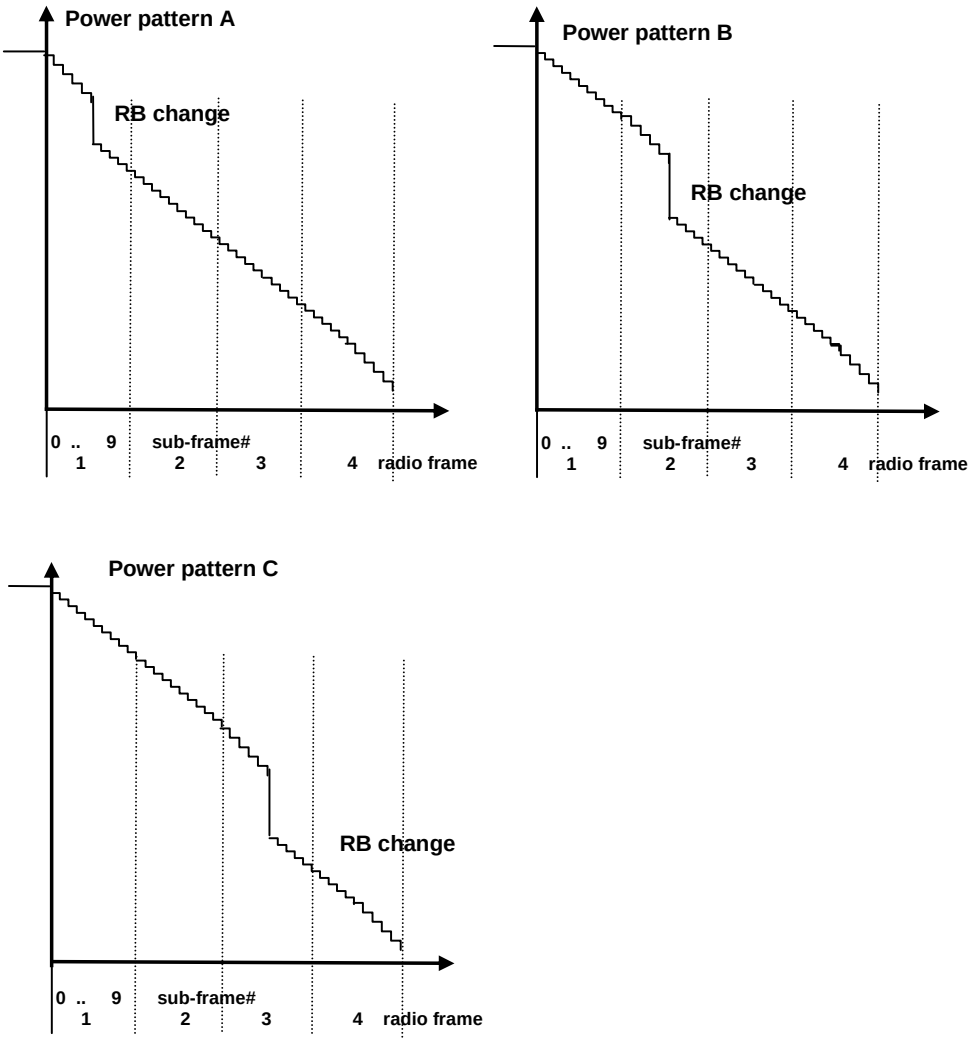



**Figure 6.3.5EA.2.4.2-2: FDD ramping down test power patterns**

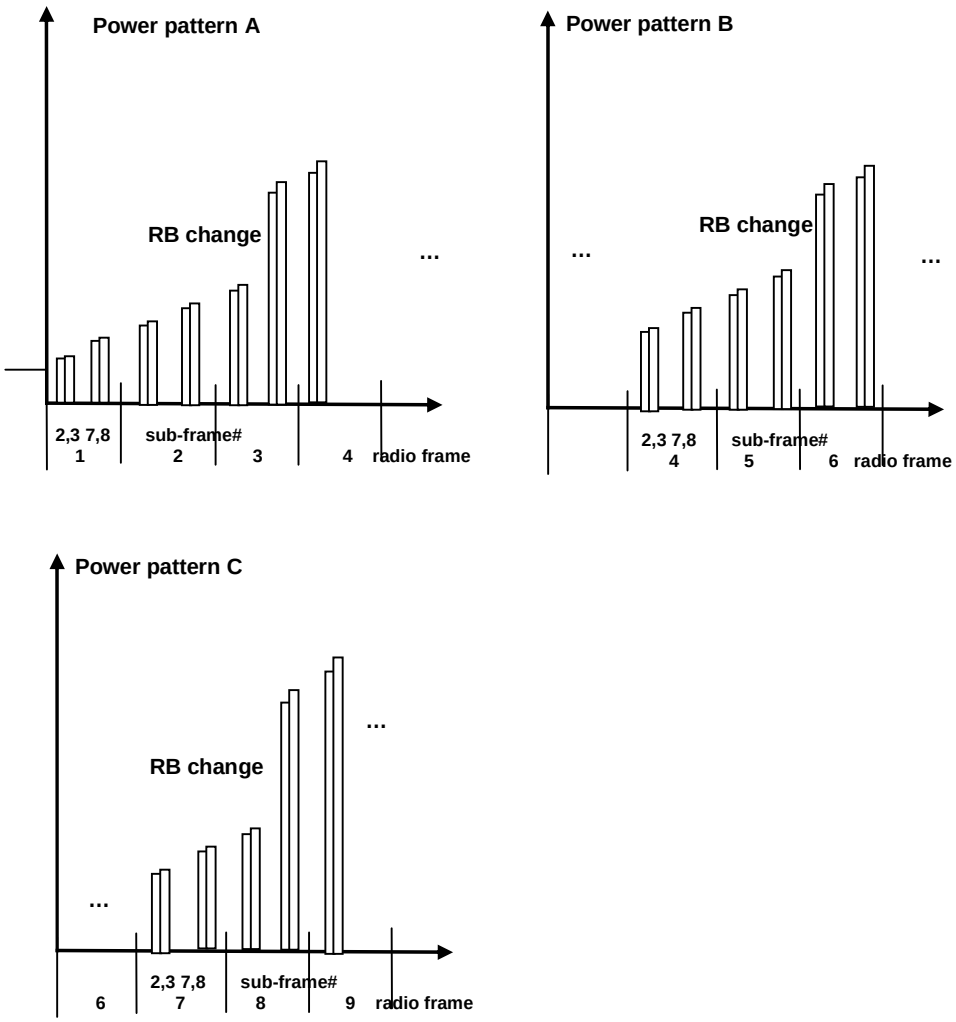



**Figure 6.3.5EA.2.4.2-3: TDD ramping up test power patterns**

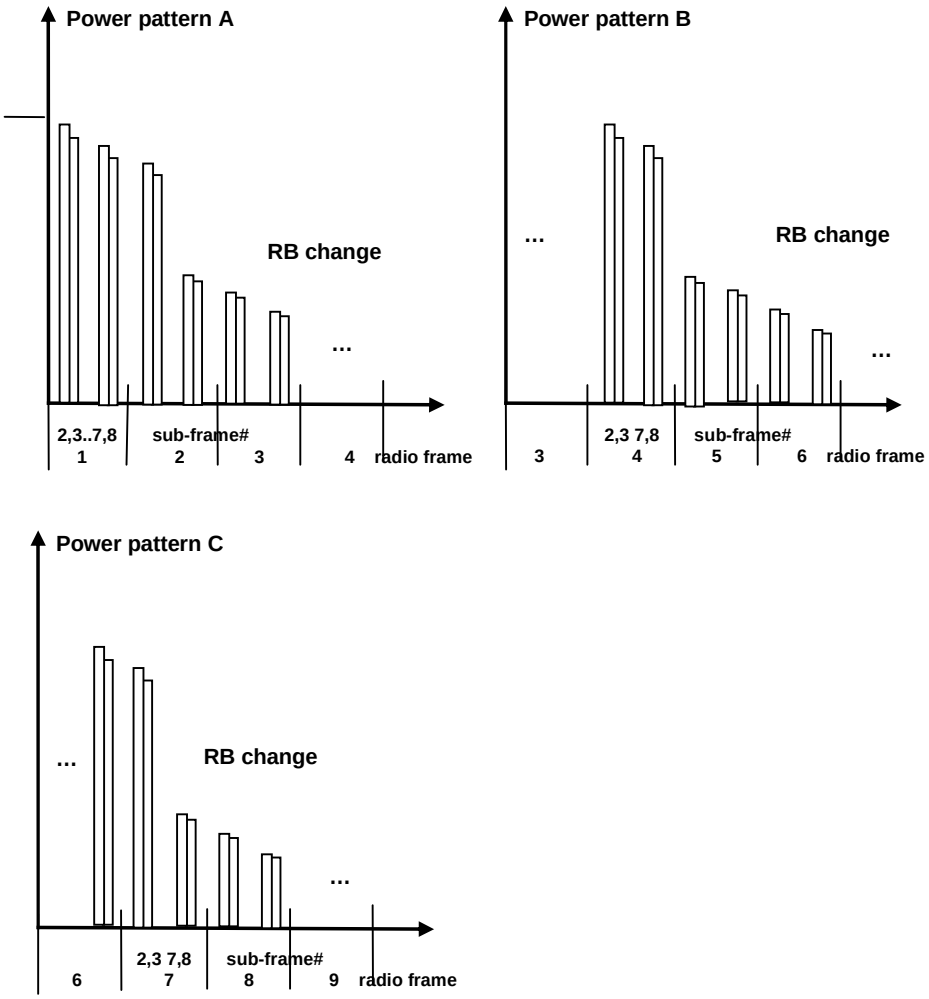



**Figure 6.3.5EA.2.4.2-4: TDD ramping down test power patterns**

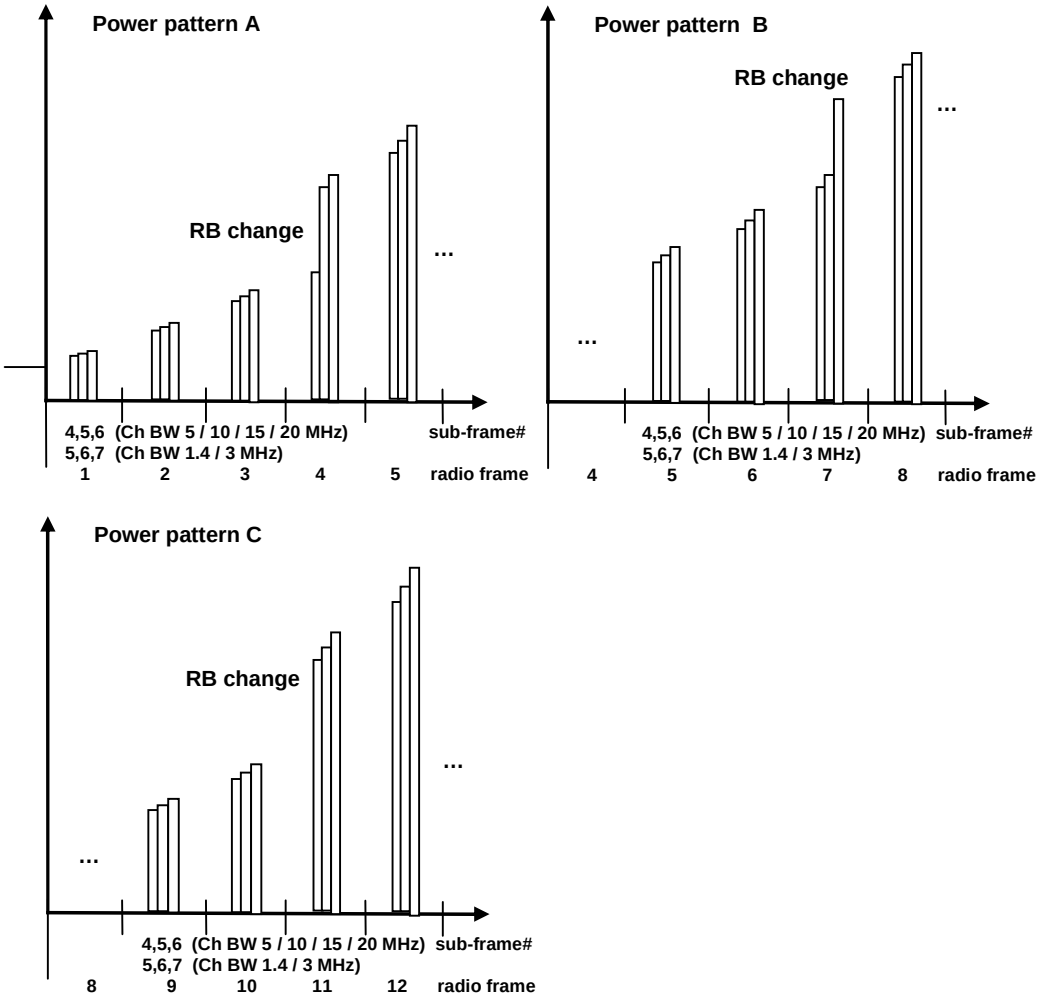



**Figure 6.3.5EA.2.4.2-5: HD-FDD ramping up test power patterns**

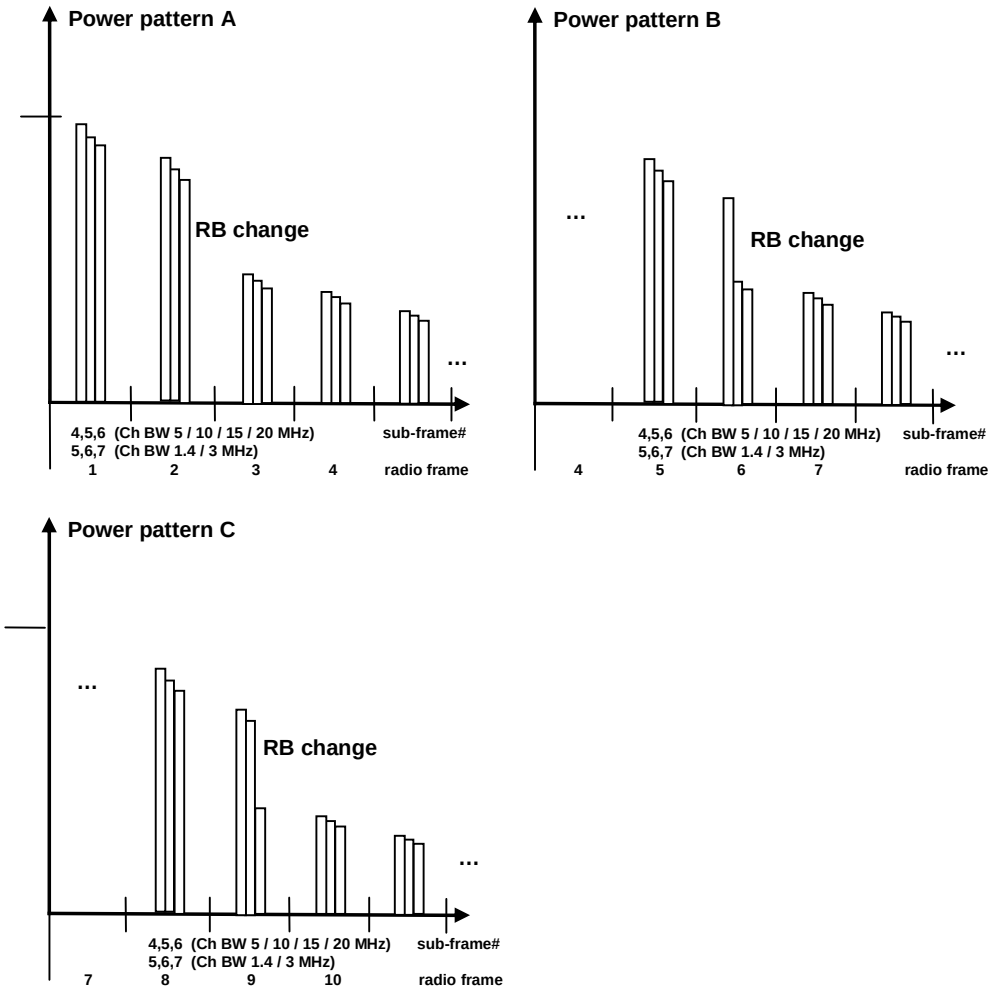



**Figure 6.3.5EA.2.4.2-6: HD-FDD ramping down test power patterns**

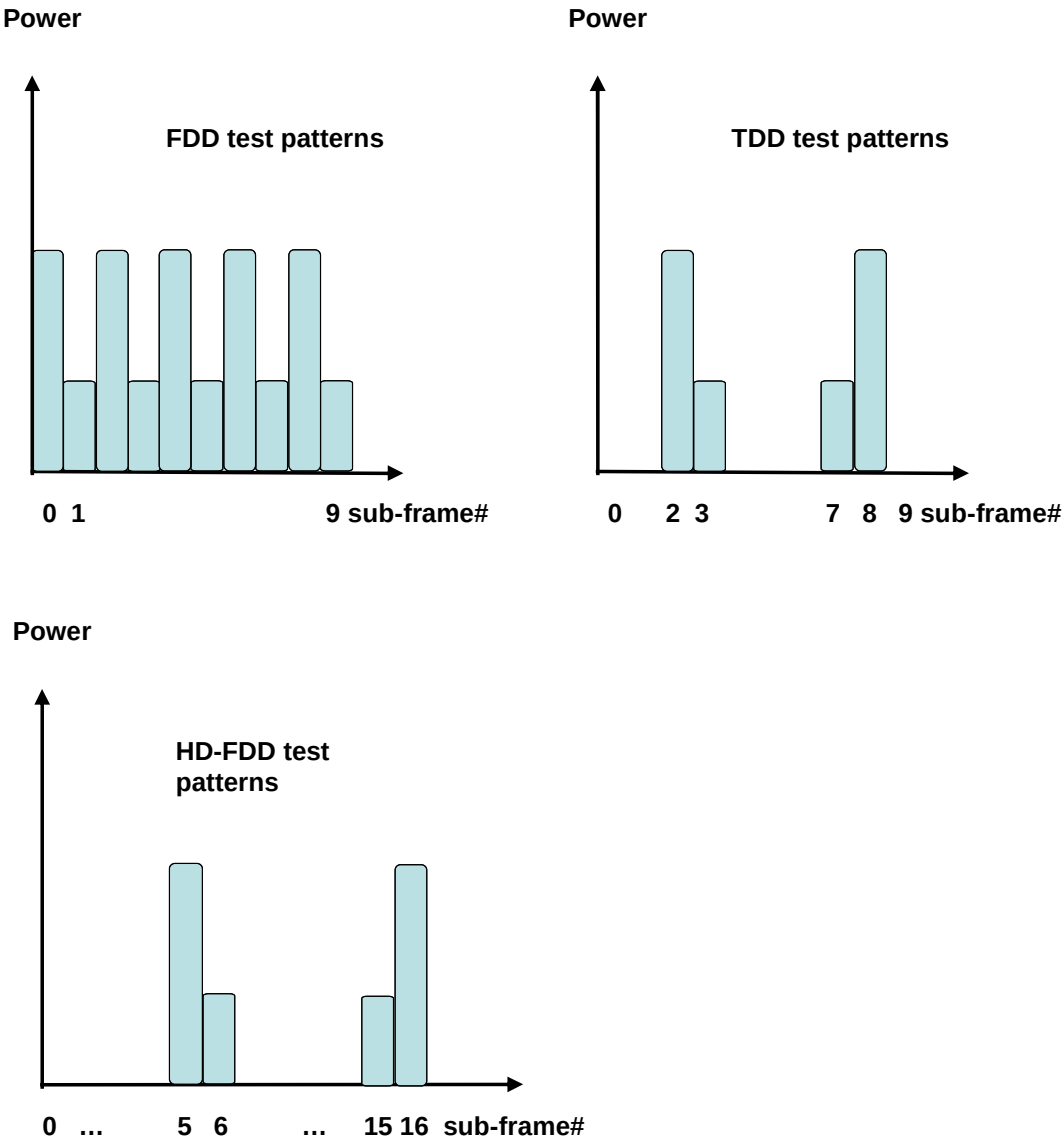



**Figure 6.3.5EA.2.4.2-7: Alternating Test Power patterns**

1. Sub test: ramping up pattern

   1.1 SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the PUSCH. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at -36.8dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz.

   1.2 Schedule the UE's PUSCH data transmission as described in Figure 6.3.5EA.2.4.2-1 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame) Figure 6.3.5EA.2.4.2-3 (TDD pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) and Figure 6.3.5EA.2.4.2-5 (HD-FDD pattern A: sub-test is divided in 14 arbitrary radio frames with 3 active uplink sub-frames per radio frame) with an uplink RB allocation as defined in tables 6.3.5EA.2.5-1. On the MPDCCH DCI format 6-0A for the scheduling of the PUSCH the SS will transmit a +1dB TPC command. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

1.3 Measure the power of PUSCH transmissions to verify the UE relative power control meet test requirements 6.3.5EA.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

1.4 Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5EA.2.5-1 to force bigger UE power steps at various points in the power range.

2. Sub test: ramping down pattern

2.1 SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the PUSCH. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at +18.0dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz with UE power class 3 or +15.0dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz with UE power class 5.

2.2 Schedule the UE's PUSCH data transmission as described in Figure 6.3.5EA.2.4.2-2 (FDD pattern A: sub-test is divided in 4 arbitrary radio frames with 10 active uplink sub-frames per radio frame), Figure 6.3.5EA.2.4.2-4 (TDD pattern A: sub-test is divided in 10 arbitrary radio frames with 4 active uplink sub-frames per radio frame) and Figure 6.3.5EA.2.4.2-6 (HD-FDD pattern A: sub-test is divided in 14 arbitrary radio frames with 3 active uplink sub-frames per radio frame)with an uplink RB allocation as defined in table 6.3.5EA.2.5-2. On the MPDCCH DCI format 6-0A for the scheduling of the PUSCH the SS will transmit a -1dB TPC command. Note that the measurement need not be done continuously, provided that interruptions are whole numbers of frames, and TPC commands of 0dB are sent during the interruption.

2.3 Measure the power of PUSCH transmissions to verify the UE relative power control meet test requirements 6.3.5EA.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

2.4 Repeat the subtest different pattern B, C to move the RB allocation change at different points in the pattern as described in Table 6.3.5EA.2.5-2 to force bigger UE power steps at various points in the power range.

3. Sub test: alternating pattern

3.1 SS sends uplink scheduling information for each UL HARQ process via P MPDCCH DCI format 6-0A for C_RNTI to schedule the PUSCH. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at -10dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz or at -10dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz. The initial uplink RB allocation is defined as the smaller uplink RB allocation value specified in table 6.3.5EA.2.5-3. The power level and RB allocation are reset for each sub-test.

3.2 Schedule the UE's PUSCH data transmission as described in Figure 6.3.5EA.2.4.2-7 for 10 sub-frames (FDD and TDD) and 20 sub-frames (HD-FDD) with an uplink RB allocation alternating pattern as defined in table 6.3.5EA.2.5-3 while transmitting 0dB TPC command for PUSCH via the MPDCCH.

3.3. Measure the power of PUSCH transmissions to verify the UE relative power control meet test requirements specified in clause 6.3.5EA.2.5. For power transients between subframes, transient periods of 40us between subframes are excluded. For ON/OFF or OFF/ON transients, transient periods of 20 us at the beginning of the subframe are excluded.

#### 6.3.5EA.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.5EA.2.5 Test requirement

Each UE power step measured in the test procedure 6.3.5EA.2.4.2 should satisfy the test requirements specified in Table 6.3.5EA.2.5-1, thru 6.3.5EA.2.5-3 for normal conditions; for extreme conditions an additional ± 2.0 dB relaxation is allowed.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each of ramping up and ramping down test patterns. For these exceptions the power tolerance limit is a maximum of ±6.7 dB. If there is an exception in the power step caused by the RB change for all test patterns (A, B, C) then fail the UE.

**Table 6.3.5EA.2.5-1: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 6 RBs | TPC=+1dB | 8.78 | 4 ≤ ΔP < 10 | 8.78 ± (4.7) Note 2<br>8.78 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed = 6 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2EA-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5EA.2.5-2: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 5 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 5 to 1 RBs | TPC=-1dB | 7.99 | 4 ≤ ΔP < 10 | 7.99 ± (4.7) Note 2<br>7.99 +4.7/-6.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2EA-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5EA.2.5-3: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) (Alternating pattern)**

| Sub-test | Uplink RB allocation | TPC command | Expected power step size (Up or down) ΔP [dB] | Power step size range (Up or down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| 5 MHz | Alternating 1 and 6 | TPC=0dB | 7.78 | 4 ≤ ΔP < 10 | 7.78 ± (6.7) Note 1,2<br>7.78 +8.2/-6.7 Note 3<br>7.78 +6.7/-8.2 Note 4 |

Note 1: Test tolerance +/- 6.7 dB was selected to allow PA switch possible exceptions to occur.
Note 2: When neither Note 3 nor Note 4 applies.
Note 3: For operating bands under Note 2 in Table 6.2.2EA.-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: For operating bands under Note 2 in Table 6.2.2EA.-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

## 6.3.5EA.3 Aggregate power control tolerance for UE category M1

### 6.3.5EA.3.1 Test purpose

To verify the ability of category M1 UE to maintain its power level in non-contiguous transmission in response to 0 dB TPC commands with respect to the first UE transmission, when the power control parameters specified in TS 36.213 are constant.

### 6.3.5EA.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

### 6.3.5EA.3.3 Minimum conformance requirement

The category M1 TDD and FD-FDD UEs shall meet the requirements specified in Table 6.3.5EA.3.3-1 for aggregate power control over the power range bounded by the minimum output power as defined in subclause 6.3.2EA, the maximum output power as defined in subclause 6.2.2EA, and the requirements for configured transmitted power are specified in subclause 6.2.5EA.

The category M1 HD-FDD UEs and for continuous uplink transmissions of duration ≤ 64 ms, shall meet the requirements specified in Table 6.3.5EA.3.3-1 for aggregate power control over the power range bounded by the minimum output power as defined in subclause 6.3.2EA, the maximum output power as defined in subclause 6.2.2EA, and the requirements for configured transmitted power are specified in subclause 6.2.5EA.

**Table 6.3.5EA.3.3-1: Aggregate power control tolerance**

| TPC command | UL channel | Aggregate power tolerance within 21 ms [2] |
|---|---|---|
| 0 dB | PUCCH | ±2.5 dB |
| 0 dB | PUSCH | ±3.5 dB |
| NOTE 1: The UE transmission gap is 4 ms for full-duplex FDD and TDD. For UE of half-duplex FDD with the channel bandwidth 5 MHz / 10 MHz / 15 MHz / 20 MHz, the transmission gap is 1 ms after subframe #4 and 7 ms after subframe #6. For UE of half-duplex FDD with the CBW 1.4 / 3 MHz, the transmission gap is 9 ms. TPC command is transmitted via MPDCCH 4 subframes preceding each PUCCH/PUSCH transmission.<br>NOTE 2: For UE of half-duplex FDD with the CBW 1.4 / 3 MHz, the test interval is 41 ms. | | |

The normative reference for this requirement is TS 36.101 [2] clauses 6.3.5E.3.1.

### 6.3.5EA.3.4 Test description

#### 6.3.5EA.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for CAT M1 in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5EA.3.4.1-1 and table 6.3.5EA.3.4.1-2. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.3.5EA.3.4.1-1: Test Configuration Table Tx test cases UE Cat-M1: PUCCH sub-test**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | Normal |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | | Mid range |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | | 5MHz |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** |
| Ch BW | Mod'n | RB allocation | | FDD: PUCCH format = Format 1a<br>TDD: PUCCH format = Format 1a/1b |
| | | FDD | TDD | |
| 5MHz | QPSK | 4 | 4 | |
| Note 1: Downlink RB position shall be $RB_{start}$ = 0 within the narrowband<br>Note 2: The Narrowband index (TS36.211, 5.2.4) shall be set to 0 for all test points. | | | | |

**Table 6.3.5EA.3.4.1-2: Test Configuration Table Tx test cases UE Cat-M1: PUSCH sub-test**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Mid range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | 5MHz | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for PUSCH sub-test | Mod'n | | RB allocation | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| **Low range** | | | | | |
| 5MHz | | QPSK | 5 | 5 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband.<br>Note 4: Mid range test point shall use Narrowband index = 0. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 6.3.5EA.3.4.1-1 (PUCCH sub-test) and Table 6.3.5EA.3.4.1-2 (PUSCH sub-test).

5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.3.5EA.3.4.3.

### 6.3.5EA.3.4.2 Test procedure

The procedure is separated in two subtests to verify PUCCH and PUSCH aggregate power control tolerance respectively. The uplink transmission patterns are described in figure 6.3.5 EA.3.4.2-1.

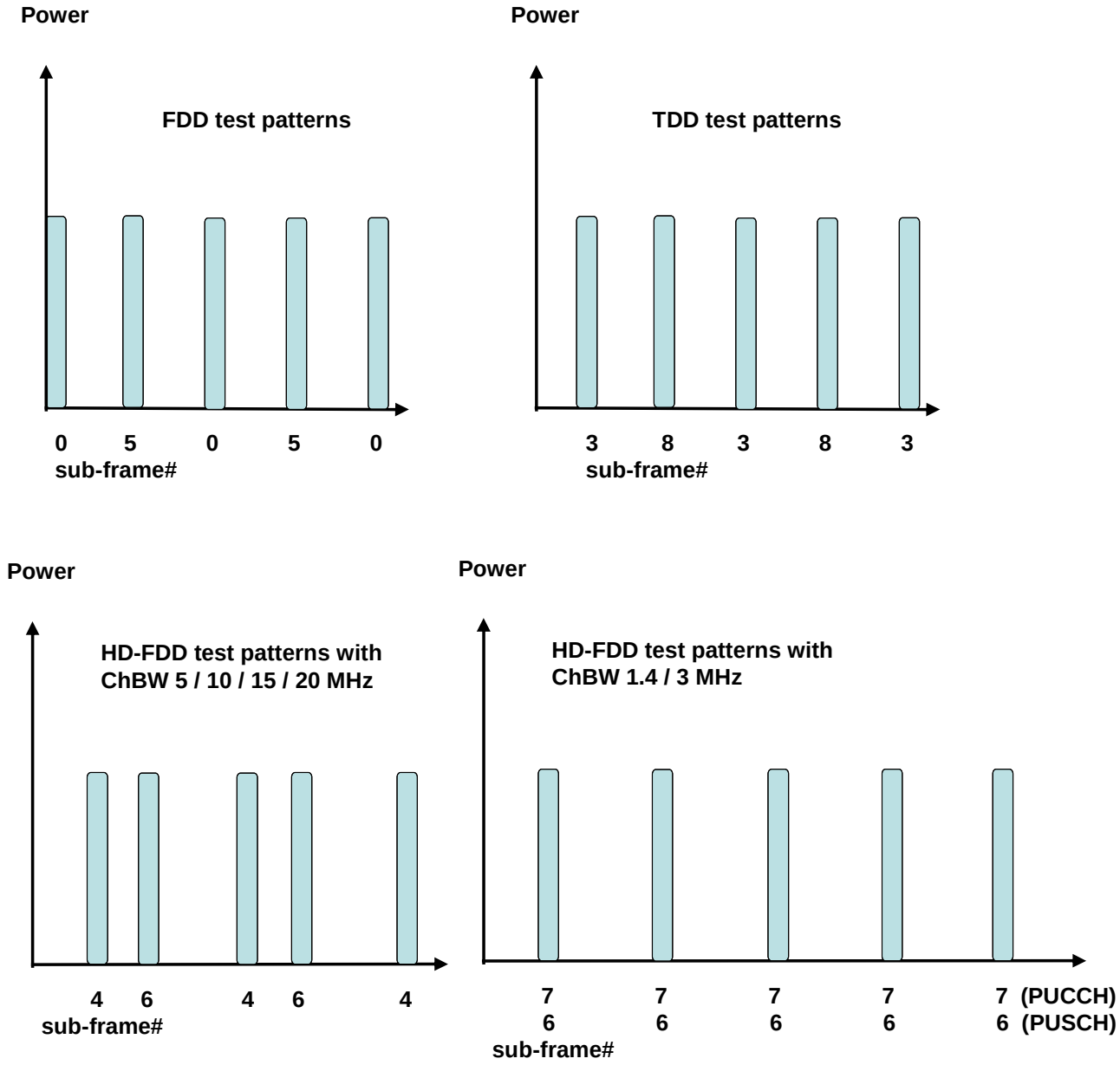



**Figure 6.3.5EA.3.4.2-1: Test uplink transmission**

1. PUCCH sub test:

1.1 The SS transmits PDSCH via M-PDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 6.3.5EA.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The transmission of PDSCH will make the UE send uplink ACK/NACK using PUCCH. Send the appropriate TPC commands for PUCCH to the UE to ensure that the UE transmits PUCCH at 0dBm +/- 3.2 dB for carrier frequency f ≤ 3.0GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.2. For FDD and TDD: Every 5 subframes transmit to the UE downlink PDSCH MAC padding bits as well as 0 dB TPC command for PUCCH via the MPDCCH to make the UE transmit ACK/NACK on the PUCCH with transmission gap of 4 subframes. For HD-FDD with the channel bandwidth 5, 10, 15 and 20 MHz: Subframes #0 and #2 every 10 subframes transmit to the UE downlink PDSCH MAC padding bits as well as 0 dB TPC command for PUCCH via the MPDCCH to make the UE transmit ACK/NACK on the PUCCH with transmission gap of 1 ms after subframe #4 and 7 ms after subframe #6. For HD-FDD with the channel bandwidth 1.4 and 3 MHz: Subframe #3 every 10 subframes transmit to the UE downlink PDSCH MAC padding bits as well as 0 dB TPC command for PUCCH via the MPDCCH to make the UE transmit ACK/NACK on the

PUCCH with transmission gap of 9 ms after subframe #7. The downlink transmission is scheduled in the appropriate sub-frames to make the UE transmit PUCCH as described in figure 6.3.5EA.3.4.2-1.

1.3. Measure the power of 5 consecutive PUCCH transmissions to verify the UE transmitted PUCCH power is maintained within 21 ms for FDD and TDD with any channel bandwidth and HD-FDD with the channel bandwidth 5, 10, 15 and 20 MHz, within 41 ms for HD-FDD with the channel bandwidth 1.4 and 3 MHz. The transient periods of 20us are excluded from the power measurement.

2. PUSCH sub test:

2.1. The SS sends uplink scheduling information via M-PDCCH DCI format 6-0A for C_RNTI to schedule the PUSCH. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at 0dBm +/- 3.2.dB for carrier frequency $f \leq 3.0$GHz or at 0dBm +/- 3.5 dB for carrier frequency 3.0GHz $< f \leq$ 4.2GHz.

2.2. For FDD and TDD: Every 5 subframes schedule the UE's PUSCH data transmission and transmit 0 dB TPC command for PUSCH via the MPDCCH to make the UE transmit PUSCH with 4 subframes gap. For HD-FDD with the channel bandwidth 5, 10, 15 and 20 MHz: Subframes #4 and #6 every 10 subframes schedule the UE's PUSCH data transmission and transmit 0 dB TPC command for PUSCH via the MPDCCH to make the UE transmit PUSCH with transmission gap of 1 ms after subframe #4 and 7 ms after subframe #6. For HD-FDD with the channel bandwidth 1.4 and 3 MHz: Subframe #6 every 10 subframes schedule the UE's PUSCH data transmission and transmit 0 dB TPC command for PUSCH via the MPDCCH to make the UE transmit PUSCH with transmission gap of 9 ms after subframe #6. The uplink transmission patterns are described in figure 6.3.5EA.3.4.2-1.

2.3. Measure the power of 5 consecutive PUSCH transmissions to verify the UE transmitted PUSCH power is maintained within 21 ms for FDD and TDD with any channel bandwidth and HD-FDD with the channel bandwidth 5, 10, 15 and 20 MHz, within 41 ms for HD-FDD with the channel bandwidth 1.4 and 3 MHz. The transient periods of 20us are excluded from the power measurement.

#### 6.3.5EA.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.5EA.3.5 Test requirement

The requirement for the power measurements made in step (1.3) and (2.3) of the test procedure shall not exceed the values specified in Table 6.3.5EA.3.5-1. The power measurement period shall be 1 sub-frame excluding transient periods.

**Table 6.3.5EA.3.5-1: Power control tolerance**

| TPC command | UL channel | Test requirement measured power within 21m [2] |
|---|---|---|
| 0 dB | PUCCH | Given 5 power measurements in the pattern, the 2nd, 3rd, 4th, and 5th measurements shall be within ± 3.2 dB of the 1st measurement. |
| 0 dB | PUSCH | Given 5 power measurements in the pattern, the 2nd, 3rd, 4th, and 5th measurements shall be within ± 4.2 dB of the 1st measurement. |
| Note 1: The UE transmission gap is 4 ms for full-duplex FDD and TDD.<br>For UE of half-duplex FDD with the channel bandwidth 5 MHz / 10 MHz / 15 MHz / 20 MHz, the transmission gap is 1 ms after subframe #4 and 7 ms after subframe #6.<br>For UE of half-duplex FDD with the CBW 1.4 / 3 MHz, the transmission gap is 9 ms TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission.<br>Note 2: For UE of half-duplex FDD with the CBW 1.4 / 3 MHz, the test interval is 41 ms. | | |

## 6.3.5EA.3_1 Aggregate power control tolerance for UE category M1 (CE Mode B)

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The RMC for CEModeB with repetitions is not defined.

### 6.3.5EA.3_1.1 Test purpose

To verify the ability of category M1 UE to maintain its power level in non-contiguous transmission with respect to the first UE transmission, when the power control parameters specified in TS 36.213 are constant.

### 6.3.5EA.3_1.2 Test applicability

This test case applies to HD-FDD E-UTRA UE release 13 and forward of UE category M1 that support operating in CEModeB.

### 6.3.5EA.3_1.3 Minimum conformance requirement

The category M1 TDD and FD-FDD UEs shall meet the requirements specified in Table 6.3.5EA.3_1.3-1 for aggregate power control over the power range bounded by the minimum output power as defined in subclause 6.3.2EA, the maximum output power as defined in subclause 6.2.2EA, and the requirements for configured transmitted power are specified in subclause 6.2.5EA.

The category M1 HD-FDD UEs and for continuous uplink transmissions of duration $\leq$ 64 ms, shall meet the requirements specified in Table 6.3.5EA.3_1.3-1 for aggregate power control over the power range bounded by the minimum output power as defined in subclause 6.3.2EA, the maximum output power as defined in subclause 6.2.2EA, and the requirements for configured transmitted power are specified in subclause 6.2.5EA.

**Table 6.3.5EA.3_1.3-1: Aggregate power control tolerance**

| TPC command | UL channel | Aggregate power tolerance within 21 ms [2] |
|---|---|---|
| 0 dB | PUCCH | ±2.5 dB |
| 0 dB | PUSCH | ±3.5 dB |
| NOTE 1: The UE transmission gap is 4 ms for full-duplex FDD and TDD. For UE of half-duplex FDD with the channel bandwidth 5 MHz / 10 MHz / 15 MHz / 20 MHz, the transmission gap is 1 ms after subframe #4 and 7 ms after subframe #6. For UE of half-duplex FDD with the CBW 1.4 / 3 MHz, the transmission gap is 9 ms. TPC command is transmitted via MPDCCH 4 subframes preceding each PUCCH/PUSCH transmission.<br>NOTE 2: For UE of half-duplex FDD with the CBW 1.4 / 3 MHz, the test interval is 41 ms. | | |

The category M1 and M2 HD-FDD UE and for continuous uplink transmissions of duration > 64 ms shall meet the requirements specified in Table 6.3.5E.3.1-2 for aggregate power control over the power range bounded by the minimum output power as defined in subclause 6.3.2EA and the maximum output power as defined in subclause 6.2.5EA.

**Table 6.3.5EA.3_1.3-2: Aggregate power control tolerance**

| TPC command | UL channel | Aggregate power tolerance within 129 ms |
|---|---|---|
| 0 dB | PUCCH | ±2.5 dB |
| 0 dB | PUSCH | ±3.5 dB |
| NOTE: The UE transmission gap is 5 ms. TPC command is transmitted via MPDCCH 4 subframes preceding each PUCCH/ PUSCH transmission. | | |

The normative reference for this requirement is TS 36.101 [2] clauses 6.3.5E.3.1.

## 6.3.5EA.3_1.4 Test description

### 6.3.5EA.3_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for CAT M1 in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5EA.3_1.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.3.5EA.3_1.4.1-1: Test Configuration Table Tx test cases UE Cat-M1**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Mid range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | 5MHz | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for PUSCH sub-test | Mod'n | | RB allocation | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| **Low range** | | | | | |
| 5MHz | | QPSK | TBD | TBD | 0 |

Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4
Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband.
Note 4: Mid range test point shall use Narrowband index = 0.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 6.3.5EA.3_1.4.1-1.
5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.3.5EA.3_1.4.3.

### 6.3.5EA.3_1.4.2 Test procedure

1. The SS sends uplink scheduling information via MPDCCH DCI format 6-0B for C_RNTI to schedule the PUSCH. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Every 133 subframes schedule the UE's PUSCH data transmission via the MPDCCH to make the UE transmit PUSCH over 128 subframes with 5 subframes gap.
3. Measure the power of the first subframe and the last subframe in one PUSCH transmission to verify the UE transmitted PUSCH power is maintained within 129 ms with any channel bandwidth. The transient periods of 20us are excluded from the power measurement.

#### 6.3.5EA.3_1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.3.5EA.3_1.5 Test requirement

The requirement for the power measurements made in step 3 and of the test procedure shall not exceed the values specified in Table 6.3.5EA.3_1.5-1. The power measurement period shall be 1 sub-frame excluding transient periods.

**Table 6.3.5EA.3_1.5-1: Power control tolerance**

| TPC command | UL channel | Test requirement measured power within 129 ms |
|---|---|---|
| 0 dB | PUSCH | Given 2 power measurements in the pattern, 2nd measurements shall be within ± 4.2 dB of the 1st measurement. |
| NOTE1: The UE transmission gap is 5 ms.<br>NOTE2: TPC command is not applicable for CEModeB.<br>NOTE3: PUCCH is not applicable due to maximum configurable PUCCH duration of 32 ms. | | |

## 6.3.5EB Power Control for UE category 1bis

### 6.3.5EB.1 Power Control Absolute power tolerance for UE category 1bis

#### 6.3.5EB.1.1 Test purpose

Same test purpose as in clause 6.3.5.1.1.

#### 6.3.5EB.1.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of category 1bis.

#### 6.3.5EB.1.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.5.1.2.

#### 6.3.5EB.1.4 Test description

##### 6.3.5EB.1.4.1 Initial conditions

Same initial conditions as in clause 6.3.5.1.4.1 with the following exceptions:

- Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

##### 6.3.5EB.1.4.2 Test procedure

Same test procedure as in clause 6.3.5.1.4.2.

##### 6.3.5EB.1.4.3 Message contents

Same message contents as in clause 6.3.5.1.4.3.

#### 6.3.5EB.1.5 Test requirements

The requirement for the power measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5EB.1.5-1 and 6.3.5EB.1.5-2.

**Table 6.3.5EB.1.5-1: Absolute power tolerance: test point 1**

| | Channel bandwidth / expected output power (dBm) | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB |
| Expected Measured power Extreme conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2EB.3 | | | | | | |

**Table 6.3.5EB.1.5-2: Absolute power tolerance: test point 2**

| | Channel bandwidth / expected output power (dBm) | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB | ± 10.0dB ± 10.4dB |
| Expected Measured power Extreme conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance f ≤ 3.0GHz 3.0GHz < f ≤ 4.2GHz | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB | ± 13.0dB ± 13.4dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2EB.3 | | | | | | |

## 6.3.5EB.2 Power Control Relative power tolerance for UE category 1bis

### 6.3.5EB.2.1 Test purpose

Same test purpose as in clause 6.3.5.2.1.

### 6.3.5EB.2.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of category 1bis.

### 6.3.5EB.2.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.5.2.3.

#### 6.3.5EB.2.4 Test description

##### 6.3.5EB.2.4.1 Initial conditions

Same initial conditions as in clause 6.3.5.2.4.1 with the following exceptions:

- Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

##### 6.3.5EB.2.4.2 Test procedure

Same test procedure as in clause 6.3.5.2.4.2.

##### 6.3.5EB.2.4.3 Message contents

Same message contents as in clause 6.3.5.2.4.3.

#### 6.3.5EB.2.5 Test requirements

Same test requirements as in clause 6.3.5.2.5.

### 6.3.5EB.3 Aggregate power control tolerance for UE category 1bis

#### 6.3.5EB.3.1 Test purpose

Same test purpose as in clause 6.3.5.3.1.

#### 6.3.5EB.3.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of category 1bis.

#### 6.3.5EB.3.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.5.3.3.

#### 6.3.5EB.3.4 Test description

##### 6.3.5EB.3.4.1 Initial conditions

Same initial conditions as in clause 6.3.5.3.4.1 with the following exceptions:

- Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

##### 6.3.5EB.3.4.2 Test procedure

Same test procedure as in clause 6.3.5.3.4.2.

##### 6.3.5EB.3.4.3 Message contents

Same message contents as in clause 6.3.5.3.4.3.

#### 6.3.5EB.3.5 Test requirements

Same test requirements as in clause 6.3.5.3.5.

# 6.3.5EC

## 6.3.5EC.1 Power Control Absolute power tolerance for UE category M2

### 6.3.5EC.1.1 Test purpose

Same test purpose as in clause 6.3.5EA.1.1.

### 6.3.5EC.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward of UE category M2.

### 6.3.5EC.1.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.5EA.1.3.

### 6.3.5EC.1.4 Test description

#### 6.3.5EC.1.4.1 Initial conditions

Same as in clause 6.3.5EA.1.4.1 with the following exceptions:

- Instead of Table 6.3.5EA.1.4.1-1-> use Table 6.3.5EC.1.4.1-1

**Table 6.3.5EC.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5 MHz | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for General On/Off Time Mask test case | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| 5MHz | | QPSK | 24 | 24 | 0 |
| Note 1: Denotes where in the channel bandwidth the wideband shall be placed. Narrowband index and Wideband are defined in TS 36.211, 5.2.4 | | | | | |

#### 6.3.5EC.1.4.2 Test procedure

Same as in clause 6.3.4EA.1.4.2 with the following exceptions:

- Instead of Table 6.3.5EA.1.4.1-1-> use Table 6.3.5EC.1.4.1-1

#### 6.3.5EC.1.4.3 Message contents

Same as in clause 6.3.4EA.1.4.3.

### 6.3.5EC.1.5 Test requirement

Same as in clause 6.3.4EA.1.5.

## 6.3.5EC.2 Power Control Relative power tolerance for UE category M2

### 6.3.5EC.2.1 Test purpose

Same test purpose as in clause 6.3.5EA.2.1.

### 6.3.5EC.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward of UE category M2.

### 6.3.5EC.2.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.5EA.2.3.

### 6.3.5EC.2.4 Test description

#### 6.3.5EC.2.4.1 Initial conditions

Same as in clause 6.3.5EA.2.4.1 with the following exceptions:

- Instead of Table 6.3.5EA.2.4.1-1-> use Table 6.3.5EC.2.4.1-1

**Table 6.3.5EC.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| 5MHz | | QPSK | See table 6.3.5EC.2.5-1 6.3.5EC.2.5-2 6.3.5EC.2.5-3 | See table 6.3.5EC.2.5-1 6.3.5EC.2.5-2 6.3.5EC.2.5-3 | 0 |
| Note 1: Denotes where in the channel bandwidth the wideband shall be placed. Narrowband index and Wideband are defined in TS 36.211, 5.2.4<br>Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0. | | | | | |

#### 6.3.5EC.2.4.2 Test procedure

Same as in clause 6.3.4EA.1.4.2.

#### 6.3.5EC.2.4.3 Message contents

Same as in clause 6.3.4EA.1.4.3.

### 6.3.5EC.2.5 Test requirement

Each UE power step measured in the test procedure 6.3.5EC.2.4.2 should satisfy the test requirements specified in Table 6.3.5EC.2.5-1, thru 6.3.5EC.2.5-3 for normal conditions; for extreme conditions an additional ± 2.0 dB relaxation is allowed.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each of ramping up and ramping down test patterns. For these exceptions the power tolerance limit is a maximum of ±6.7 dB. If there is an exception in the power step caused by the RB change for all test patterns (A, B, C) then fail the UE.

**Table 6.3.5EC.2.5-1: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping up)**

| Sub-test (ramp up) | Uplink RB allocation | TPC command | Expected power step size (Up) ΔP [dB] | Power step size range (Up) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 1 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 1 to 20 RBs | TPC=+1dB | 8.78 | 4 ≤ ΔP < 10 | 8.78 ± (4.7) Note 2<br>8.78 +6.2/-4.7 Note 3 |
| Subframes after RB change | Fixed = 20 | TPC=+1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 10 active uplink subframes
Pattern B the position of RB uplink allocation change is after 20 active uplink subframes
Pattern C the position of RB uplink allocation change is after 30 active uplink subframes
Note 2: When Note 3 does not apply.
Note 3: For operating bands under Note 2 in Table 6.2.2EA-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: N/A
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5EC.2.5-2: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) channel bandwidth 5MHz (ramping down)**

| Sub-test (ramp down) | Uplink RB allocation | TPC command | Expected power step size (down) ΔP [dB] | Power step size range (down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| Subframes before RB change | Fixed = 24 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |
| RB change | Change from 24 to 1 RBs | TPC=-1dB | 7.99 | 4 ≤ ΔP < 10 | 7.99 ± (4.7) Note 2<br>7.99 +4.7/-6.2 Note 4 |
| Subframes after RB change | Fixed = 1 | TPC=-1dB | 1 | ΔP < 2 | 1 ± (1.7) |

Note 1: Position of RB change:
Pattern A the position of RB uplink allocation change is after 6 active uplink subframes
Pattern B the position of RB uplink allocation change is after 16 active uplink subframes
Pattern C the position of RB uplink allocation change is after 26 active uplink subframes
Note 2: When Note 4 does not apply.
Note 3: N/A
Note 4: For operating bands under Note 2 in Table 6.2.2EA-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

**Table 6.3.5EC.2.5-3: Test Requirements Relative Power Tolerance for Transmission (normal conditions – Note 5) (Alternating pattern)**

| Sub-test | Uplink RB allocation | TPC command | Expected power step size (Up or down) ΔP [dB] | Power step size range (Up or down) ΔP [dB] | PUSCH [dB] |
|---|---|---|---|---|---|
| 5 MHz | Alternating 1 and 24 | TPC=0dB | 7.78 | 4 ≤ ΔP < 10 | 7.78 ± (6.7) Note 1,2<br>7.78 +8.2/-6.7 Note 3<br>7.78 +6.7/-8.2 Note 4 |

Note 1: Test tolerance +/- 6.7 dB was selected to allow PA switch possible exceptions to occur.
Note 2: When neither Note 3 nor Note 4 applies.
Note 3: For operating bands under Note 2 in Table 6.2.2EA.-1, if the transmission bandwidth of the reference sub-frames is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the target sub-frame is not confined within any one of these frequency ranges.
Note 4: For operating bands under Note 2 in Table 6.2.2EA.-1, if the transmission bandwidth of the target sub-frame is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$ and the reference sub-frame is not confined within any one of these frequency ranges.
Note 5: For extreme conditions an additional ± 2.0 dB relaxation is allowed.
Note 6: The starting resource block shall be RB# 0.

## 6.3.5EC.3 Aggregate power control tolerance for UE category M2

### 6.3.5EC.3.1 Test purpose

Same test purpose as in clause 6.3.5EA.3.1.

### 6.3.5EC.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward of UE category M2.

### 6.3.5EC.3.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.3.5EA.3.3.

### 6.3.5EC.3.4 Test description

#### 6.3.5EC.3.4.1 Initial conditions

Same as in clause 6.3.5EA.3.4.1 with the following exceptions:

- Instead of Table 6.3.5EA.3.4.1-1-> use Table 6.3.5EC.3.4.1-1
- Instead of Table 6.3.5EA.3.4.1-2-> use Table 6.3.5EC.3.4.1-2

**Table 6.3.5EC.3.4.1-1: Test Configuration Table Tx test cases UE Cat-M2: PUCCH sub-test**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | Normal |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | | Mid range |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | | 5MHz |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** |
| Ch BW | Mod'n | RB allocation | | FDD: PUCCH format = Format 1a<br>TDD: PUCCH format = Format 1a/1b |
| | | FDD | TDD | |
| 5MHz | QPSK | 16 | 16 | |
| Note 1: Downlink RB position shall be $RB_{start}$ = 0 within the narrowband<br>Note 2: The Narrowband index (TS36.211, 5.2.4) shall be set to 0 for all test points. | | | | |

**Table 6.3.5EC.3.4.1-2: Test Configuration Table Tx test cases UE Cat-M2: PUSCH sub-test**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Mid range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | 5MHz | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for PUSCH sub-test | Mod'n | | RB allocation | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| **Mid range** | | | | | |
| 5MHz | | QPSK | 24 | 24 | 0 |
| Note 1: Denotes where in the channel Bandwidth the wideband shall be placed. Narrowband, Narrowband index and Wideband are defined in TS 36.211, 5.2.4.<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |

### 6.3.5EC.3.4.2 Test procedure

Same as in clause 6.3.5EA.3.4.2.

### 6.3.5EC.3.4.3 Message contents

Same as in clause 6.3.5EA.3.4.3.

### 6.3.5EC.3.5 Test requirement

Same as in clause 6.3.5EA.3.5.

## 6.3.5F Power Control for category NB1 and NB2

### 6.3.5F.1 Power Control Absolute power tolerance for category NB1 and NB2

#### 6.3.5F.1.1 Test purpose

To verify the ability of the UE transmitter to set its initial output power to a specific value at the start of a contiguous transmission or non-contiguous transmission with a long transmission gap, i.e. transmission gap is larger than 20 ms.

### 6.3.5F.1.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

### 6.3.5F.1.3 Minimum conformance requirements

Absolute power tolerance is the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap larger than 20ms.

The minimum requirement for absolute power tolerance is given in Table 6.3.5F.1.3-1 over the power range bounded by the Maximum output power as defined in subclause 6.2.2 and the Minimum output power as defined in subclause 6.3.2.

For operating bands under NOTE 2 in Table 6.2.2-1, the absolute power tolerance as specified in Table 6.3.5F.1.3-1 is relaxed by reducing the lower limit by 1.5 dB when the transmission bandwidth is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$.

**Table 6.3.5F.1.3-1: Absolute power tolerance**

| Conditions | Tolerance |
|---|---|
| Normal | ± 9.0 dB |
| Extreme | ± 12.0 dB |

The normative reference for this requirement is TS 36.101 clause 6.3.5F.1

### 6.3.5F.1.4 Test description

#### 6.3.5F.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters, and are shown in table 6.3.5F.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 6.3.5F.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 8.1.1 | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS36.508 [7] clause 8.1.3.1 | | | Frequency ranges defined in Annex K.1.1 | | |
| **Configuration ID** | **Downlink Configuration** | | **Uplink Configuration** | | |
| | Modulation | Subcarriers | Modulation | $N_{tones}$ | Subcarrier spacing |
| 1 | N/A | | QPSK | 1@0 | 3.75 kHz |
| 2 | | | QPSK | 1@0 | 15 kHz |
| 3 (NOTE 1) | | | QPSK | 12@0 | 15 kHz |
| Note 1: Applicable to UE supporting UL multi-tone transmissions | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.2, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Table 6.3.5F.1.4.1-1.

5. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.3.5F.1.4.3.

### 6.3.5F.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.3.5F.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. The SS shall configure the UE to transmit according to Table 6.3.5F.1.4.3-1 and Table 6.3.5F.1.4.3-2.

3. Measure the initial output power of the first resource unit of UE NPUSCH first transmission. The transient periods of 20us are excluded. The period of measurement shall be at least the continuous duration of one sub-frame (1ms) for 15 kHz sub-carrier spacing or one slot (2ms) excluding the 2304Ts gap when UE is not transmitting for 3.75 kHz sub-carrier spacing. Half-Duplex guard subframes are not under test.

4. Release the connection through State 3A-NB.

5. Modify system information elements according to Table 6.3.5F.1.4.3-3 and Table 6.3.5F.1.4.3-4 and notify the UE via paging message with SystemInformationModification included.

6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the new UL power control setting.

7. SS sends uplink scheduling information for each UL HARQ process via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.3.5F.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

8. Measure the initial output power of the first resource unit of UE NPUSCH first transmission. The transient periods of 20us are excluded. The period of measurement shall be at least the continuous duration of one sub-frame (1ms) for 15 kHz sub-carrier spacing or one slot (2ms) excluding the 2304Ts gap when UE is not transmitting for 3.75 kHz sub-carrier spacing. Half-Duplex guard subframes are not under test.

NOTE 1: For configuration IDs applicable to UE depending on UE capability in Test Configuration Table with different UL sub-carrier spacing, the SS shall release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the appropriate UL subcarrier spacing in Random Access Response message.

### 6.3.5F.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 with the following exceptions:

**Table 6.3.5F.1.4.3-1: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 8.1.6.3, Table 8.1.6.3-14 UplinkPowerControlCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalNPUSCH-r13 | -124 (-124 dBm) | Test point 1 to verify a UE relative low initial power transmission | |

**Table 6.3.5F.1.4.3-2: NPDSCH-ConfigCommon-NB-DEFAULT: Test Point 1**

| Derivation Path: 36.331 clause 6.7.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPDSCH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| nrs-Power-r13 | 20 (dBm) | | |
| } | | | |

**Table 6.3.5F.1.4.3-3: UplinkPowerControlCommon: Test point 2**

| Derivation Path: TS 36.508 [7] clause 8.1.6.3, Table 8.1.6.3-14 UplinkPowerControlCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalNPUSCH-r13 | -94 (-94 dBm) | Test point 2 to verify a UE relative high initial power transmission | |

**Table 6.3.5F.1.4.3-4: NPDSCH-ConfigCommon-NB-DEFAULT: Test Point 2**

| Derivation Path: 36.331 clause 6.7.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPDSCH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| nrs-Power-r13 | 3 (dBm) | | |
| } | | | |

**Table 6.3.5F.1.4.3-5: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 8.1.8.2, Table 8.1.8.2.1.6-1 PhysicalConfigDedicated-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-NB-DEFAULT ::= SEQUENCE { | | | |
| uplinkPowerControlDedicated-r13 | UplinkPowerControlDedicated-NB-DEFAULT | See subclause 8.1.6.3 | |

**Table 6.3.5F.1.4.3-6: UplinkPowerControlDedicated-NB-DEFAULT**

| Derivation Path: TS 36.508 [7] clause 8.1.6.3, Table 8.1.6.3-15 UplinkPowerControlDedicated-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-NB-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-NPUSCH-r13 | 0 | Default | |
| } | | | |

## 6.3.5F.1.5 Test requirement

The requirement for the power measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5F.1.5-1 and 6.3.5F.1.5-2.

**Table 6.3.5F.1.5-1: Absolute power tolerance: test point 1**

| | **Channel bandwidth / expected output power (dBm)** | | |
|---|---|---|---|
| | **Configuration ID 1 3.75 kHz (1 tone)** | **Configuration ID 2 15 kHz (1 tone)** | **Configuration ID 3 15 kHz (12 tones)** |

| | | | |
|---|---|---|---|
| Expected Measured power Normal conditions | -25 dBm | -19 dBm | -8.2 dBm |
| Power tolerance f ≤ 3.0GHz | ± 10.0dB | ± 10.0dB | ± 10.0dB |
| Expected Measured power Extreme conditions | -25 dBm | -19 dBm | -8.2 dBm |
| Power tolerance f ≤ 3.0GHz | ± 13.0dB | ± 13.0dB | ± 13.0dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2F.3 | | | |

**Table 6.3.5F.1.5-2: Absolute power tolerance: test point 2**

| | Channel bandwidth / expected output power (dBm) | | |
|---|---|---|---|
| | **Configuration ID 1 3.75 kHz (1 tone)** | **Configuration ID 2 15 kHz (1 tone)** | **Configuration ID 3 15 kHz (12 tones)** |
| Expected Measured power Normal conditions | -12 dBm | -6 dBm | 4.8 dBm |
| Power tolerance f ≤ 3.0GHz | ± 10.0dB | ± 10.0dB | ± 10.0dB |
| Expected Measured power Extreme conditions | -12 dBm | -6 dBm | 4.8 dBm |
| Power tolerance f ≤ 3.0GHz | ± 13.0dB | ± 13.0dB | ± 13.0dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2F.3 | | | |

## 6.3.5F.2 Power Control Relative power tolerance for category NB1 and NB2

### 6.3.5F.2.1 Test purpose

To verify the ability of the UE transmitter to set its output power relatively to the power in a target sub-frame relatively to the power of the most recently transmitted reference sub-frame if the transmission gap between these sub-frames is ≤ 20 ms.

### 6.3.5F.2.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

### 6.3.5F.2.3 Minimum conformance requirements

Category NB1 and NB2 UE relative power control requirement is defined for NPRACH power step values of 0, 2, 4 and 6 dB. For NPRACH transmission, the relative tolerance is the ability of the UE transmitter to set its output power relatively to the power of the most recently transmitted preamble. The measurement period for the NPRACH preamble is specified in Table 6.3.4F.2.3-1.

The requirements specified in Table 6.3.5F.2.3-1 apply when the power of the target and reference sub-frames are within the power range bounded by the Minimum output power as defined in subclause 6.3.2F and the maximum output power as defined in subclause 6.2.2F.

**Table 6.3.5F.2.3-1: Relative power tolerance for category NB1 and NB2 NPRACH transmission (normal conditions)**

| Power step ΔP [dB] | NPRACH [dB] |
|---|---|
| ΔP = 0 | ±1.5 |
| ΔP = 2 | ±2.0 |
| ΔP = 4 | ±3.5 |
| ΔP = 6 | ±4.0 |
| NOTE: For extreme conditions an additional ± 2.0 dB relaxation is allowed. | |

The power step (ΔP) is defined as the difference in the calculated setting of the UE Transmit power between the target and reference sub-frames. The error is the difference between ΔP and the power change measured at the UE antenna port with the power of the cell-specific reference signals kept constant. The error shall be less than the relative power tolerance specified in Table 6.3.5F.2.3-1.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5F.2

## 6.3.5F.2.4 Test description

### 6.3.5F.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters, and are shown in table 6.3.5F.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 6.3.5F.2.4.1-1: Test Configuration Table for NPRACH**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] clause 8.1.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] clause 8.1.3.1 | Frequency ranges defined in Annex K.1.1 |
| NPRACH preamble format | 0 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.2, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.3.5F.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.3.5F.2.4.3 with NPRACH Format 0.

### 6.3.5F.2.4.2 Test procedure

1. The SS send the paging and UE shall send a preamble to the SS.
2. NPRACH is set according to Table 6.3.5F.2.4.1-1.
3. UE shall send a preamble to the SS.

4. In response to the preamble, the SS shall transmit a random access response not corresponding to the transmitted random access preamble, or send no response.

5. The UE shall consider the random access response reception not successful then re-transmit the preamble with the calculated NPRACH transmission power.

6. Measure the output power of the transmitted NPRACH preamble according to Figure 6.3.4F.2.3-1. Note that the measurement does not need to be done for overall measurement range at one time. The measurement range can be divided into few ranges. Each range needs to overlap neighbouring one.

7. Switches off and on the UE and ensure the UE is in State 3A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.3.5F.2.4.3.

8. Repeat test with step 1-6 as indicated in section 6.3.5F.2.4.3.

### 6.3.5F.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 with the following exceptions.

**Table 6.3.5F.2.4.3-1: NPDSCH-ConfigCommon-NB-DEFAULT: NPRACH measurement**

| Derivation Path: TS 36.508 [7] clause 8.1.6, Table 8.1.6.3-4 NPDSCH-ConfigCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPDSCH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| nrs-Power-r13 | -22 (dBm) | | |
| } | | | |

**Table 6.3.5F.2.4.3-2: RACH-ConfigCommon-NB-DEFAULT: NPRACH measurement (Subtest 1: power step size ΔP = 2 dB)**

| Derivation Path: TS 36.508 [7] clause 8.1.6, Table 8.1.6.3-8 RACH-ConfigCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| preambleTransMax-CE-r13 | n50 | | |
| } | | | |

**Table 6.3.5F.2.4.3-3: RACH-ConfigCommon-NB-DEFAULT: NPRACH measurement (Subtest 2: power step size ΔP = 6 dB)**

| Derivation Path: TS 36.508 [7] clause 8.1.6, Table 8.1.6.3-8 RACH-ConfigCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| preambleTransMax-CE-r13 | n10 | | |
| powerRampingParameters-r13 SEQUENCE { | | | |
| powerRampingStep | dB6 | | |
| } | | | |
| } | | | |

## 6.3.5F.2.5 Test requirement

Each UE power step measured in the test procedure 6.3.5F.2.4.2 should satisfy the test requirements specified in Table 6.3.5F.2.5-1 for normal conditions; for extreme conditions an additional ± 2.0 dB relaxation is allowed.

**Table 6.3.5F.2.5-1: Relative power tolerance for category NB1 and NB2 NPRACH transmission (normal conditions – Note 1)**

| Expected power step size (up) ΔP [dB] | NPRACH [dB] |
|---|---|
| ΔP = 2 | 2 ± (2.7) |
| ΔP = 6 | 6 ± (4.7) |
| Note 1: For extreme conditions an additional ± 2.0 dB relaxation is allowed.<br>Note 2: Only UE output power measurements within the range -39.3 to 20.3 dBm for Power Class 3, or -39.3 to 16.8 dBm for Power Class 5 shall be considered in the pass/fail criteria. | |

## 6.3.5F.3 Aggregate power control tolerance for category NB1 and NB2

### 6.3.5F.3.1 Test purpose

To verify the ability of a category NB1 and NB2 UE to maintain its output power in non-contiguous transmission with respect to the first UE transmission, when the uplink power control parameters as defined in TS 36.213 are constant and $\alpha$ is set to 0.

### 6.3.5F.3.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

### 6.3.5F.3.3 Minimum conformance requirement

The UE shall meet the requirements specified in Table 6.3.5F.3.3-1 for aggregate power control over the power range bounded by the minimum output power as defined in subclause 6.3.2F and the maximum output power as defined in subclause 6.2.2F.

**Table 6.3.5F.3.3-1: Aggregate power control tolerance**

| UL channel | Aggregate power tolerance | |
|---|---|---|
| | 15 kHz / 12 tones within 53 ms | 15 kHz / 1 tone within 104 ms |
| NPUSCH | ±3.5 dB | |
| NOTE: For five consecutive UE transmissions the transmission gaps are 12 ms for 12 tone and 16 ms for single tone transmissions. Uplink scheduling grant is transmitted via NPDCCH eight subframes before NPUSCH transmission. | | |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5F.3.

### 6.3.5F.3.4 Test description

#### 6.3.5F.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5F.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2.4. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

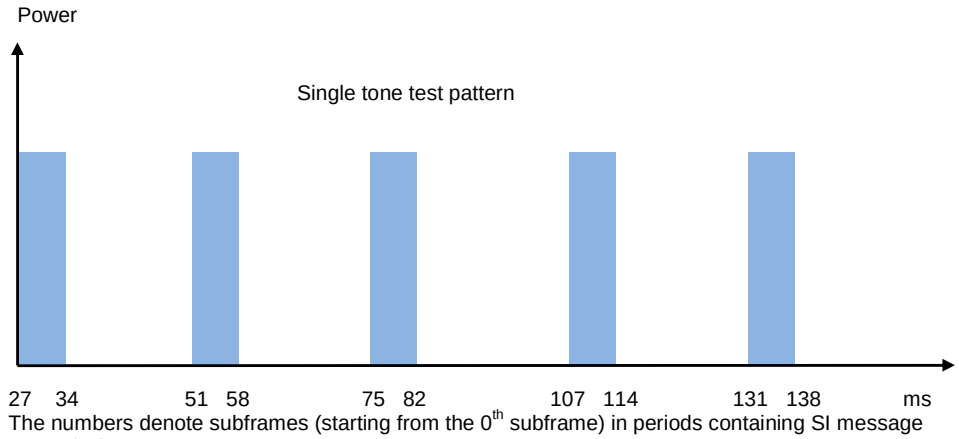
**Table 6.3.5F.3.4.1-1: Test Configuration**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 8.1.1 | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.1 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A | Modulation | $N_{tones}$, start position | Sub-carrier spacing (kHz) |
| 1 | | QPSK | 1@0 | 15 |
| 2 | | QPSK | 1@11 | 15 |
| 3 (Note 1) | | QPSK | 12@0 | 15 |
| Note 1: Applicable to UE supporting UL multi-tone transmissions | | | | |

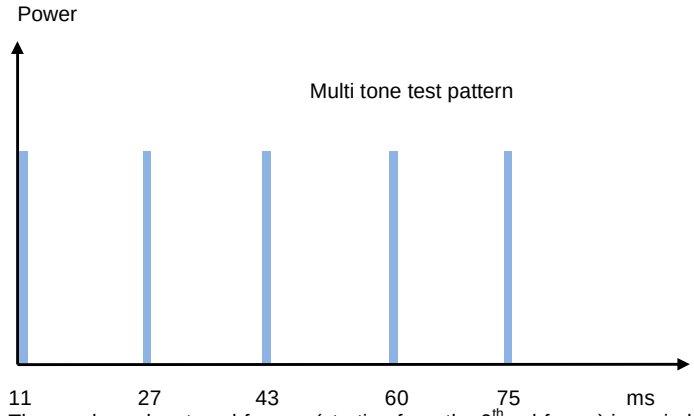
1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C, and uplink signals according to Annex H.
4. The UL Reference Measurement channels are set according to in Table 6.5.2.1F.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.5.2.1F.1.4.3.

### 6.3.5F.3.4.2 Test procedure

The procedure is separated in two subtests to verify single tone and multi tone NPUSCH aggregate power control tolerance respectively. The uplink transmission patterns are described in figure 6.3.5F.3.4.2-1.




The numbers denote subframes (starting from the 0th subframe) in periods containing SI message transmission.




The numbers denote subframes (starting from the 0th subframe) in periods where there is no transmission of SI messages.

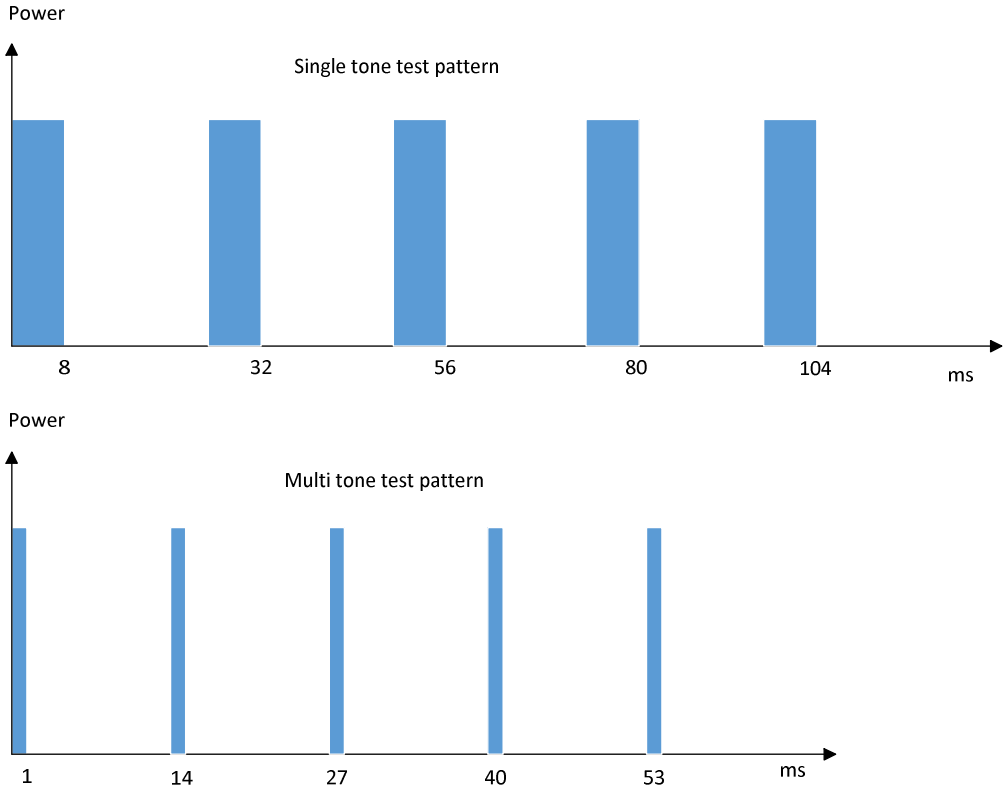



**Figure 6.3.5F.3.4.2-1 Test uplink transmission**

For single tone NPUSCH transmission scenario:

1. SS sends uplink scheduling information for each UL HARQ process via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.3.5F.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Schedule the UE's NPUSCH data transmission for period containing SI message transmission according to Annex A.2.4 and make the UE transmit NPUSCH with 32 or 48 slots (16 or 24 ms) gap. Uplink scheduling grant is transmitted via NPDCCH 9 subframes before NPUSCH transmission.

3. Measure the power of 5 consecutive NPUSCH transmissions to verify the UE transmitted NPUSCH power is maintained within 112 ms. The transient periods of 20us are excluded from the power measurement.

4. Repeat step 2 and 3 for configuration ID 2 in Table 6.3.5F.3.4.1-1.

For 12 tones NPUSCH transmission scenario:

0. SS release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 and configure the UE to the new UL power level with messages in Table 6.3.5F.3.4.3-2.

1. SS sends uplink scheduling information for each UL HARQ process via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.3.5F.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Schedule the UE's NPUSCH data transmission for period where there is no transmission of SI messages according to Annex A.2.4 and make the UE transmit NPUSCH with 28, 30 or 32 slots (14, 15 or 16 ms) gap. Uplink scheduling grant is transmitted via NPDCCH 9 subframes before NPUSCH transmission.

3. Measure the power of 5 consecutive NPUSCH transmissions to verify the UE transmitted NPUSCH power is maintained within 65 ms. The transient periods of 20us are excluded from the power measurement.

### 6.3.5F.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 with the following exceptions:

**Table 6.3.5F.3.4.3-1: P0-NominalNPUSCH-r13 configuration for single tone 15 kHz scenario**

| Derivation Path: 36.508 clause 8.1.6.3 Table 8.1.6.3-14: UplinkPowerControlCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalNPUSCH-r13 | 0 (0 dBm) | | |
| alpha-r13 | al0 (0) | | |
| deltaPreambleMsg3-r13 | 4 | | |
| } | | | |

**Table 6.3.5F.3.4.3-2: P0-NominalNPUSCH-r13 configuration for 12 tones 15 kHz scenario**

| Derivation Path: 36.508 clause 8.1.6.3 Table 8.1.6.3-14: UplinkPowerControlCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalNPUSCH-r13 | -11 (-0.2 dBm) | | |
| alpha-r13 | al0 (0) | | |
| deltaPreambleMsg3-r13 | 4 | | |
| } | | | |

#### 6.3.5F.3.5 Test requirement

The requirement for the power measurements made in step 4 of the test procedure shall not exceed the values specified in Table 6.3.5F.3.5-1. The power measurement period shall be 1 resource unit excluding transient periods.

**Table 6.3.5F.3.5-1: Power control tolerance**

| UL channel | Test requirement measured power |
|---|---|
| NPUSCH | Given 5 power measurements in the pattern, the 2nd, 3rd, 4th, and 5th measurements shall be within ± 4.2 dB of the 1st measurement. |

## 6.3.5FA Power Control for category NB1 and NB2/Power Class 6

### 6.3.5FA.1 Power Control Absolute power tolerance for category NB1 and NB2/Power Class 6

#### 6.3.5FA.1.1 Test purpose

Same as in Clause 6.3.5F.1.1

#### 6.3.5FA.1.2 Test applicability

This test case applies to all types of E-UTRA power class 6 UE release 14 and forward of UE category NB1 and NB2.

#### 6.3.5FA.1.3 Minimum conformance requirements

The minimum requirement for absolute power tolerance is given in Table 6.3.5FA.1.3-1 over the power range bounded by the Maximum output power as defined in subclause 6.2.2FA and the Minimum output power as defined in subclause 6.3.2F.

**Table 6.3.5FA.1.3-1: Absolute power tolerance - I**

| Conditions | Tolerance |
|---|---|
| Normal | ± 9.0 dB |
| Extreme | ±12.0 dB |

In case of -15 dB ≤ Ês/Iot < -6 dB, the absolute power tolerance given in Table 6.3.5FA.1.3-2 applies if the UE transmit power is not mandated to be $P_{CMAX,c}$ according to the UE uplink power control procedure or random access procedure in Section 16 of [6] (e.g. the lowest configured repetition level is used for NPRACH transmission or the number of repetitions of the allocated NPUSCH RUs is no more than 2).

**Table 6.3.5FA.1.3-2: Absolute power tolerance - II**

| Conditions | Tolerance |
|---|---|
| Normal | ± 13.3 dB |
| Extreme | ± 16.3 dB |

The normative reference for this requirement is TS 36.101 clause 6.3.5F.1

#### 6.3.5FA.1.4 Test description

##### 6.3.5FA.1.4.1 Initial conditions

Same as in Clause 6.3.5F.1.4.1.

#### 6.3.5FA.1.4.2 Test procedure

Same as in Clause 6.3.5F.1.4.2.

#### 6.3.5FA.1.4.3 Message contents

Same as in Clause 6.3.5F.1.4.3.

### 6.3.5FA.1.5 Test requirement

Same as in Clause 6.3.5F.1.5.

## 6.3.5FA.2 Power Control Relative power tolerance for category NB1 and NB2/Power Class 6

### 6.3.5FA.2.1 Test purpose

Same as in Clause 6.3.5F.2.1

### 6.3.5FA.2.2 Test applicability

This test case applies to all types of E-UTRA power class 6 UE release 14 and forward of UE category NB1 and NB2.

### 6.3.5FA.2.3 Minimum conformance requirements

Category NB1 and NB2 UE relative power control requirement is defined for NPRACH power step values of 0, 2, 4 and 6 dB. For NPRACH transmission, the relative tolerance is the ability of the UE transmitter to set its output power relatively to the power of the most recently transmitted preamble. The measurement period for the NPRACH preamble is specified in Table 6.3.4F.2-1.

The requirements specified in Table 6.3.5F.2-1 apply when the power of the target and reference sub-frames are within the power range bounded by the Minimum output power as defined in subclause 6.3.2F and the maximum output power as defined in subclause 6.2.2FA.

**Table 6.3.5FA.2.3-1: Relative power tolerance for category NB1 and NB2 NPRACH transmission (normal conditions)**

| Power step ΔP [dB] | NPRACH [dB] |
|---|---|
| ΔP = 0 | ±1.5 |
| ΔP = 2 | ±2.0 |
| ΔP = 4 | ±3.5 |
| ΔP = 6 | ±4.0 |
| NOTE: For extreme conditions an additional ± 2.0 dB relaxation is allowed. | |

The power step (ΔP) is defined as the difference in the calculated setting of the UE transmit power between the target and reference sub-frames. The error is the difference between ΔP and the power change measured at the UE antenna port with the power of the cell-specific reference signals kept constant. The error shall be less than the relative power tolerance specified in Table 6.3.5FA.2.3-1.

The normative reference for this requirement is TS 36.101 clause 6.3.5F.2

### 6.3.5FA.2.4 Test description

#### 6.3.5FA.2.4.1 Initial conditions

Same as in Clause 6.3.5F.2.4.1.

#### 6.3.5FA.2.4.2 Test procedure

Same as in Clause 6.3.5F.2.4.2.

#### 6.3.5FA.2.4.3 Message contents

Same as in Clause 6.3.5F.2.4.3.

### 6.3.5FA.2.5 Test requirement

Same as in Clause 6.3.5F.2.5.

## 6.3.5FA.3 Aggregate power control tolerance for category NB1 and NB2/Power Class 6

### 6.3.5FA.3.1 Test purpose

To verify the ability of a category NB1 and NB2 UE to maintain its output power in non-contiguous transmission with respect to the first UE transmission, when the uplink power control parameters as defined in TS 36.213 are constant and α is set to 0.

### 6.3.5FA.3.2 Test applicability

This test case applies to all types of E-UTRA power class 6 UE release 14 and forward of UE category NB1 and NB2.

### 6.3.5FA.3.3 Minimum conformance requirements

Category NB1 and NB2 aggregate power control tolerance is the ability of a UE to maintain its output power in non-contiguous transmission with respect to the first UE transmission, when the uplink power control parameters as defined in TS 36.213 are constant and α is set to 0.

The UE shall meet the requirements specified in Table 6.3.5F.3.1-1 for aggregate power control over the power range bounded by the minimum output power as defined in subclause 6.3.2F and the maximum output power as defined in subclause 6.2.2FA.

**Table 6.3.5F.3.1-1: Aggregate power control tolerance**

| UL channel | Aggregate power tolerance | |
|---|---|---|
| | **15 kHz / 12 tones within 53 ms** | **15 kHz / 1 tone within 104 ms** |
| NPUSCH | ±3.5 dB | |
| NOTE: For five consecutive UE transmissions the transmission gaps are 12 ms for 12 tone and 16 ms for single tone transmissions. Uplink scheduling grant is transmitted via NPDCCH eight subframes before NPUSCH transmission. | | |

The normative reference for this requirement is TS 36.101 clause 6.3.5F.3

### 6.3.5FA.3.4 Test description

#### 6.3.5FA.3.4.1 Initial conditions

Same as in Clause 6.3.5F.3.4.1.

#### 6.3.5FA.3.4.2 Test procedure

Same as in Clause 6.3.5F.3.4.2.

#### 6.3.5FA.3.4.3 Message contents

Same as in Clause 6.3.5F.3.4.3.

### 6.3.5FA.3.5 Test requirement

Same as in Clause 6.3.5F.3.5.

## 6.3.5G Power Control Absolute power tolerance for V2X Communication

### 6.3.5G.1 Power Control Absolute power tolerance for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

#### 6.3.5G.1.1 Test Purpose

To verify the ability of the UE transmitter to set its initial output power to a specific value at the start of a contiguous transmission or non-contiguous transmission with a long transmission gap, i.e. transmission gap is larger than 20 ms when performing V2X sidelink Communication non-concurrent with E-UTRA uplink transmissions.

#### 6.3.5G.1.2 Test applicability

This test case applies to all types of UE that support V2X Sidelink communication and Band 47.

#### 6.3.5G.1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.2G-1, the absolute power tolerance requirements is given in Table 6.3.5G.1.3-1 over the power range bounded by the Maximum output power as defined in subclause 6.2.2G and the Minimum output power as defined in subclause 6.3.2G. specified in subclause 6.3.5.1 shall apply for each V2X transmission.

For operating bands under NOTE 2 in Table 6.2.2-1, the absolute power tolerance as specified in Table 6.3.5G.1.3-1 is relaxed by reducing the lower limit by 1.5 dB when the transmission bandwidth is confined within $F_{UL_low}$ and $F_{UL_low}$ + 4 MHz or $F_{UL_high}$ – 4 MHz and $F_{UL_high}$.

**Table 6.3.5G.1.3-1: Absolute power tolerance**

| Conditions | Tolerance |
|---|---|
| Normal | ± 3.0 dB |
| Extreme | ± 6.0 dB |

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5G .

#### 6.3.5G.1.4 Test description

##### 6.3.5G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.3.5G.1.4.1-1: Test Configuration Table**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 96 |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.3.5G.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.3.5G.1.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.3.5G.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Measure the mean power of the UE in the channel bandwidth for each test point in section 6.3.5G.1.4.3 according to the test configuration from Table 6.3.5G.1.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).
3. Repeat for the two test points as indicated in section 6.3.5G.1.4.3. The timing of the execution between the two test points shall be larger than 20ms.

### 6.3.5G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 and 4.7.I with the following exceptions:

**Table 6.3.5G.1.4.3-1: SL-V2X-PreconfigCommPool-r14: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20J: SL-V2X-PreconfigCommPool-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigCommPool-r14-DEFAULT ::= SEQUENCE { | | | |
| dataTxParameters-r14 | -38 | p0-r12;<br>Test point 1 to verify a UE relative low initial power transmission | |
| } | | | |

**Table 6.3.5G.1.4.3-2: SL-V2X-PreconfigCommPool-r14: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20J: SL-V2X-PreconfigCommPool-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigCommPool-r14-DEFAULT ::= SEQUENCE { | | | |
| dataTxParameters-r14 | -5 | p0-r12;<br>Test point 1 to verify a UE relative low initial power transmission | |
| } | | | |

### 6.3.5G.1.5 Test requirement

The requirement for the power measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5G.1.5-1 and 6.3.5G.1.5-2.

**Table 6.3.5G.1.5-1: Absolute power tolerance: test point 1**

| | **Channel bandwidth / expected output power (dBm)** | |
|---|---|---|
| | **10 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -20.8 dBm | -18 dBm |
| Power tolerance | ± 5.0dB | ± 5.0dB |
| Expected Measured power Extreme conditions | -20.8 dBm | -18 dBm |
| Power tolerance | ± 8.0dB | ± 8.0dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2G.1.3 | | |

**Table 6.3.5G.1.5-2: Absolute power tolerance: test point 2**

| | **Channel bandwidth / expected output power (dBm)** | |
|---|---|---|
| | **10 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | 12.2 dBm | 15 dBm |
| Power tolerance | ± 5.0dB | ± 5.0dB |
| Expected Measured power Extreme conditions | 12.2 dBm | 15 dBm |
| Power tolerance | ± 8.0dB | ± 8.0dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2G.1.3 | | |

## 6.3.5G.2 Power Control Absolute power tolerance for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

### 6.3.5G.2.1 Test Purpose

To verify the ability of the UE transmitter to set its initial output power for each component carrier to a specific value at the start of a contiguous transmission or non-contiguous transmission with a long transmission gap, i.e. transmission gap is larger than 20 ms when being configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.5G-2.

### 6.3.5G.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.5G-2.

### 6.3.5G.2.3 Minimum conformance requirements

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in TS 36.101 [2] Table 5.5G-2, the requirements in subclause 6.3.5G.1.3 apply for V2X sidelink transmission and the requirements in subclause 6.3.5.1.3 apply for the E-UTRA uplink transmission.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5G .

### 6.3.5G.2.4 Test description

#### 6.3.5G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on Inter-band con-current V2X configurations specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5G.2.4.1-1. The details of the uplink and V2X reference measurement channels (RMCs) are specified in Annexes A.2 and A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.3.5G.2.4.1-1: Test Configuration Table**

<table>
<tr><th colspan="7">Initial Conditions</th></tr>
<tr><td colspan="4">Test Environment as specified in TS 36.508 [7] subclause 4.1</td><td colspan="3">Normal, TL/VL, TL/VH, TH/VL, TH/VH</td></tr>
<tr><td colspan="4">Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1</td><td colspan="3">Mid range</td></tr>
<tr><td colspan="4">Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1</td><td colspan="3">Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$</td></tr>
<tr><th colspan="7">Test Parameters for Channel Bandwidths</th></tr>
<tr><th></th><th>Downlink</th><th colspan="2">Uplink Configuration</th><th colspan="3">V2X Configuration</th></tr>
<tr><td>Ch BW</td><td rowspan="8">N/A for Power Control Absolute power tolerance test</td><td>Mod'n</td><td>RB allocation</td><td>Ch BW</td><td>Mod'n</td><td>RB allocation</td></tr>
<tr><td>1.4 MHz</td><td>QPSK</td><td>6</td><td>10 MHz</td><td>QPSK</td><td>48@2</td></tr>
<tr><td>3 MHz</td><td>QPSK</td><td>15</td><td>20 MHz</td><td>QPSK</td><td>96@2</td></tr>
<tr><td>5 MHz</td><td>QPSK</td><td>25</td><td colspan="3" rowspan="4"></td></tr>
<tr><td>10 MHz</td><td>QPSK</td><td>50</td></tr>
<tr><td>15 MHz</td><td>QPSK</td><td>75</td></tr>
<tr><td>20 MHz</td><td>QPSK</td><td>100</td></tr>
<tr><td colspan="7">Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.</td></tr>
</table>

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X reference measurement channels are set according to Table 6.3.5G.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 6.3.5G.2.4.3.

#### 6.3.5G.2.4.2 Test procedure

1. The SS simultaneously sends uplink scheduling information via PDCCH DCI format 0 with TPC command 0dB for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.3.5G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.

2. Measure the mean power of the UE in the channel bandwidth of E-UTRA V2X sidelink. The period of measurement shall be at least continuous duration of one sub-frame (1ms). Measure the initial output power of the first subframe of UE PUSCH first transmission of E-UTRA uplink. The transient periods of 20us are excluded.

3. Repeat for the two test points as indicated in section 6.3.5G.2.4.3. The timing of the execution between the two test points shall be larger than 20ms.

#### 6.3.5G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.3.5G.2.4.3-1: SL-CommResourcePoolV2X-r14: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20C: SL-CommResourcePoolV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResourcePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| dataTxParameters-r14 SEQUENCE { | | | COND_TX |
| alpha-r12 | al08 | | |
| p0-r12 | -120 | | |
| } | | | |
| } | | | |

**Table 6.3.5G.2.4.3-2: SL-CommResourcePoolV2X-r14: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20C: SL-CommResourcePoolV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResourcePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| dataTxParameters-r14 SEQUENCE { | | | COND_TX |
| alpha-r12 | al08 | | |
| p0-r12 | -88 | | |
| } | | | |
| } | | | |

**Table 6.3.5G.2.4.3-3: SL-InterFreqInfoV2X-r14**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20E: SL-InterFreqInfoV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-InterFreqInfoV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-SchedulingPool-r14 | SL-CommResourcePoolV2X-r14-DEFAULT using conditions BITMAP_6 and COND_TX | | SCHEDULED |
| } | | | |

**Table 6.3.5G.2.4.3-4: UplinkPowerControlCommon: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalPUSCH | -105 | Test point 1 to verify a UE relative low initial power transmission | |
| } | | | |

**Table 6.3.5G.2.4.3-5: UplinkPowerControlCommon: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalPUSCH | -93 | Test point 2 to verify a UE relative high initial power transmission | |
| } | | | |

**Table 6.3.5G.2.4.3-6: PhysicalConfigDedicated**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2.1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| uplinkPowerControlDedicated | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | SRB1 |
| | UplinkPowerControlDedicated-DEFAULT | See subclause 4.6.3 | RBC |
| } | | | |

**Table 6.3.5G.2.4.3-7: UplinkPowerControlDedicated**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-26 UplinkPowerControlDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 1 | | SRB1 |
| | 0 | | RBC |
| } | | | |

6.3.5G.2.5 Test requirement

The requirement for the power measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5G.2.5-1 to 6.3.5G.2.5-4.

**Table 6.3.5G.2.5-1: Absolute power tolerance of E-UTRA V2X sidelink: test point 1**

| | **Channel bandwidth / expected output power (dBm)** | |
|---|---|---|
| | **10 MHz** | **20 MHz** |

| | | |
|---|---|---|
| Expected Measured power Normal conditions | -20.4 dBm | -17.6 dBm |
| Power tolerance | ± 5.0dB | ± 5.0dB |
| Expected Measured power Extreme conditions | -20.4 dBm | -17.6 dBm |
| Power tolerance | ± 8.0dB | ± 8.0dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2G.2.3 | | |

**Table 6.3.5G.2.5-2: Absolute power tolerance of E-UTRA V2X sidelink: test point 2**

| | Channel bandwidth / expected output power (dBm) | |
|---|---|---|
| | **10 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | 11.6 dBm | 14.4 dBm |
| Power tolerance | ± 5.0dB | ± 5.0dB |
| Expected Measured power Extreme conditions | 11.6 dBm | 14.4 dBm |
| Power tolerance | ± 8.0dB | ± 8.0dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2G.2.3 | | |

**Table 6.3.5G.2.5-3: Absolute power tolerance of E-UTRA uplink: test point 1**

| | Channel bandwidth / expected output power (dBm) | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz | ± 10.0dB | ± 10.0dB | ± 10.0dB | ± 10.0dB | ± 10.0dB | ± 10.0dB |
| Expected Measured power Extreme conditions | -14.8 dBm | -10.8 dBm | -8.6 dBm | -5.6 dBm | -3.9 dBm | -2.6 dBm |
| Power tolerance f ≤ 3.0GHz | ± 13.0dB | ± 13.0dB | ± 13.0dB | ± 13.0dB | ± 13.0dB | ± 13.0dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2.3 | | | | | | |

**Table 6.3.5G.2.5-4: Absolute power tolerance of E-UTRA uplink: test point 2**

| | Channel bandwidth / expected output power (dBm) | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Expected Measured power Normal conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance f ≤ 3.0GHz | ± 10.0dB | ± 10.0dB | ± 10.0dB | ± 10.0dB | ± 10.0dB | ± 10.0dB |
| Expected Measured power Extreme conditions | -2.8 dBm | 1.2 dBm | 3.4 dBm | 6.4 dBm | 8.2 dBm | 9.4 dBm |
| Power tolerance f ≤ 3.0GHz | ± 13.0dB | ± 13.0dB | ± 13.0dB | ± 13.0dB | ± 13.0dB | ± 13.0dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2.3 | | | | | | |

## 6.3.5G.3 Power Control Absolute power tolerance for V2X Communication / Intra-band contiguous multi-carrier operation

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Applicability spec is left to be updated.

### 6.3.5G.3.1 Test Purpose

To verify the ability of the UE transmitter to set its initial output power for each component carrier to a specific value at the start of a contiguous transmission or non-contiguous transmission with a long transmission gap, i.e. transmission gap is larger than 20 ms when performing V2X sidelink Communication with Intra-band contiguous multi-carrier operation.

### 6.3.5G.3.2 Test applicability

This test case applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 6.3.5G.3.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions with Intra-band contiguous multi-carrier operation for V2X multi-carrier Band configuration specified in Table 5.2G-3, the absolute power tolerance requirements specified in subclause 6.3.5G.1.3 shall apply for each component carrier.

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5G .

### 6.3.5G.3.4 Test description

#### 6.3.5G.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on V2X intra-band multi-carrier configurations specified in Table 5.4.2G.1-4. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5G.3.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.3.5G.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Mid range | |
| Test Channel Bandwidths as specified in subclause 5.4.2G | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for Channel Bandwidths** | | | |
| **V2X multi-carrier Configuration** | | **V2X PSSCH Allocation** | |
| **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **CC1 and CC2 RB Allocation** |
| 10MHz | 10MHz | QPSK | 48+48 |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.89a.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] clause 6.8.2.1. Message content exceptions are defined in clause 6.3.5G.3.4.3.
3. The V2X reference measurement channel is set according to Table 6.3.5G.3.4.1-1.

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.3.5G.3.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Measure the mean power of the UE in the channel bandwidth for each component carrier and each test point in section 6.3.5G.3.4.3 according to the test configuration from Table 6.3.5G.3.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).
3. Repeat for the two test points as indicated in section 6.3.5G.3.4.3. The timing of the execution between the two test points shall be larger than 20ms.

### 6.3.5G.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 and 4.7.I with the following exceptions:

**Table 6.3.5G.3.4.3-0: +CCUTLE (Initial condition)**

| Derivation Path: 36.508 Table 4.7I-2: +CCUTLE, condition Close and Transmit |
|---|

**Table 6.3.5G.3.4.3-1: SL-V2X-PreconfigCommPool-r14: Test point 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20J: SL-V2X-PreconfigCommPool-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigCommPool-r14-DEFAULT ::= SEQUENCE { | | | |
| dataTxParameters-r14 | -38 | p0-r12;<br>Test point 1 to verify a UE relative low initial power transmission | |
| } | | | |

**Table 6.3.5G.3.4.3-2: SL-V2X-PreconfigCommPool-r14: Test point 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-20J: SL-V2X-PreconfigCommPool-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigCommPool-r14-DEFAULT ::= SEQUENCE { | | | |
| dataTxParameters-r14 | -5 | p0-r12;<br>Test point 1 to verify a UE relative low initial power transmission | |
| } | | | |

### 6.3.5G.3.5 Test requirement

The requirement for the power measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5G.3.5-1 and 6.3.5G.3.5-2.

**Table 6.3.5G.3.5-1: Absolute power tolerance: test point 1**

| | **Expected output power (dBm)** |
|---|---|
| Expected Measured power Normal conditions | -20.8 dBm |
| Power tolerance | ± 5.0dB |
| Expected Measured power Extreme conditions | -20.8 dBm |
| Power tolerance | ± 8.0dB |
| Note 1: The lower power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2G.3.3 | |

**Table 6.3.5G.3.5-2: Absolute power tolerance: test point 2**

| | **Expected output power (dBm)** |
|---|---|
| Expected Measured power Normal conditions | 12.2 dBm |
| Power tolerance | ± 5.0dB |
| Expected Measured power Extreme conditions | 12.2 dBm |
| Power tolerance | ± 8.0dB |
| Note 1: The upper power limit shall not exceed the maximum output power requirements defined in sub-clause 6.2.2G.3.3 | |

## 6.4 Void

# 6.5 Transmit signal quality

Editor's note: The test cases for transmit signal quality: frequency error, EVM, carrier leakage, IBE, EVM equalizer spectrum flatness are complete, except the following aspect is not determined:

- Reference signal EVM and PRACH EVM minimum requirements from the core specification are still in brackets.

In this clause a multitude of results are derived, all using one common algorithm returning these results: Global In-Channels TX-Test (Annex E). Each sub clause of this clause contains a procedure and test requirements described for a specific measurement. If all relevant test parameters in different sub clauses are the same, then the results, returned by the Global In-Channel TX-Test, may be used across the applicable sub clauses.

For UE category M1, carrier centre frequency can be either at the centre of channel bandwidth or the 6RB narrowband assigned for transmission. TE shall measure frequency error, EVM, carrier leakage, In-band emissions and EVM equalizer spectrum flatness using Global In-Channels TX-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency.

## 6.5.1 Frequency Error

### 6.5.1.1 Test purpose

This test verifies the ability of both, the receiver and the transmitter, to process frequency correctly.

Receiver: to extract the correct frequency from the stimulus signal, offered by the System simulator, under ideal propagation conditions and low level.

Transmitter: to derive the correct modulated carrier frequency from the results, gained by the receiver.

### 6.5.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 8 and forward.

### 6.5.1.3 Minimum conformance requirements

The UE modulated carrier frequency shall be accurate to within ±0.1 PPM observed over a period of one time slot (0.5ms) compared to the carrier frequency received from the E-UTRA Node B.

The normative reference for this requirement is TS 36.101 clause 6.5.1

### 6.5.1.4 Test description

#### 6.5.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[3] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. | | | | | | |
| Note 3: Applicable only to E-UTRA FDD Band 31. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2). | | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.5.1.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.1.4.3.

### 6.5.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.5.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.1.4.1-1, since the UE has no payload data to send, the UE transmit uplink MAC padding bits on the UL RMC
3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3.5-1. Send continuously uplink power control "up" commands to the UE in every uplink scheduling information to the UE so that the UE transmits at $P_{UMAX}$ level for the duration of the test.

4. Measure the Frequency Error using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

#### 6.5.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the exceptions in subclause 7.3.4.3 and Table 7.3.3-3.

### 6.5.1.5 Test requirement

The 20 frequency error Δf results must fulfil the test requirement:

$$|\Delta f| \leq (0.1 \text{ PPM} + 15 \text{ Hz})$$

## 6.5.1A Frequency error for CA

### 6.5.1A.0 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the frequency error requirements defined in subclause 6.5.1 shall apply on each component carrier with both component carriers active.

For intra-band contiguous carrier aggregation the UE modulated carrier frequencies per band shall be accurate to within ±0.1 PPM observed over a period of one timeslot compared to the carrier frequency of primary component carrier received from the E-UTRA in the corresponding band.

For intra-band non-contiguous carrier aggregation the requirements in Section 6.5.1 applies per component carrier.

The normative reference for this requirement is TS 36.101[2] clause 6.5.1A.

### 6.5.1A.1 Frequency error for CA (intra-band contiguous DL CA and UL CA)

#### 6.5.1A.1.1 Test purpose

This test verifies the ability of both, receiver and the transmitter, to process frequency for intra-band CA correctly.

Receiver: to extract the correct frequency from the stimulus signal, offered by the System simulator, under ideal propagation conditions and low level.

Transmitter: to derive the correct modulated carrier frequency from the results, gained by the receiver.

#### 6.5.1A.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

#### 6.5.1A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.1A.0.

#### 6.5.1A.1.4 Test description

##### 6.5.1A.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.1A.1.4.1-1. The details of the uplink reference

measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.1A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low range, High range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 3) | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **UL Allocation** | | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 50 | N/A | QPSK | 25 | P_25@0 | S_0@0 | - | - |
| 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | - | - |
| 50 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | - | - |
| 75 | 75 | | QPSK | 129 | P_75@0 | S_54@0 | - | - |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 100 | 25 | | QPSK | 125 | P_100@0 | S_25@0 | - | - |
| 100 | 25 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| 100 | 100 | | QPSK | 130 | P_100@0 | S_30@0 | - | - |
| 100 | 100 | | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 100 | 100 | | QPSK | 100 | P_100@0 | S_0@0 | - | - |
| 100 | 100 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3A.0-1 for UE supporting two uplink carriers is tested per Test CA configuration.<br>Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.<br>Note 4: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The ULReference Measurement channel is set according to Table 6.5.1A.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.1A.1.4.3.

#### 6.5.1A.1.4.2 Test procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.1A.1.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.1A.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Set the Downlink signal level for PCC and SCC to the appropriate REFSENS value defined in 7.3A.2.5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the test.
6. Measure the Frequency Error on PCC and SCC using Global In-Channel Tx-Test (Annex E) respectively. For TDD slots with transient periods are not under test.

#### 6.5.1A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.5.1A.1.5 Test Requirements

The 20 frequency error Δf results per test point must fulfil the test requirement:

$$|\Delta f| \leq (0.1 \text{ PPM} + 15 \text{ Hz}) \text{ for each test point}$$

where PPM refers to PCC UL frequency.

## 6.5.1A.2 Frequency error for CA (inter-band DL CA and UL CA)

### 6.5.1A.2.1 Test purpose

This test verifies the ability of both, receiver and the transmitter, to process frequency for inter-band CA correctly.

Receiver: to extract the correct frequency from the stimulus signal, offered by the System simulator, under ideal propagation conditions and low level.

Transmitter: to derive the correct modulated carrier frequency from the results, gained by the receiver.

### 6.5.1A.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA.

### 6.5.1A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.1A.0.

### 6.5.1A.2.4 Test description

#### 6.5.1A.2.4.1 Initial condition

Same as in clause 6.5.1A.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands.

- Instead of Table 6.5.1A.1.4.1-1 → use Table 6.5.1A.2.4.1-1.

- Instead of clause 6.5.1A.1.4.3 use clause 6.5.1A.2.4.3.

**Table 6.5.1A.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | Mid range for PCC and SCC | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | |
| Network signalling value | | | NS_01<br>Unless given by Table 7.3.3-3 for the band with active uplink carrier | | | |
| Test Parameters for CA Configurations | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 6 | 25 | NA | QPSK | 31 | P_6@0 | S_25@0 |
| 6 | 50 | | QPSK | 56 | P_6@0 | S_50@0 |
| 15 | 25 | | QPSK | 40 | P_15@0 | S_25@0 |
| 25 | 6 | | QPSK | 31 | S_25@0 | P_6@0 |
| 25 | 25 | | QPSK | 50 | P_25@0 | S_25@0 |
| 25 | 75 | | QPSK | 100 | S_25@0 | P_75@0 |
| 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 |
| 50 | 100 | | QPSK | 150 | P_50@0 | S_100@0 |
| 75 | 25 | | QPSK | 100 | P_75@0 | S_25@0 |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 |
| 75 | 100 | | QPSK | 175 | P_75@0 | S_100@0 |
| 100 | 50 | | QPSK | 100 | P_100@0 | S_50@0 |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |

### 6.5.1A.2.4.2 Test procedure

Same test procedure as in clause 6.5.1A.1.4.2.

- Instead of Table 6.5.1A.1.4.1-1 → use Table 6.5.1A.2.4.1-1.

- Instead of Table 7.3A.2.5-1 use Table 7.3A.6.5-1.

- Instead of clause 6.5.1A.1.4.3 use clause6.5.1A.2.4.3.

#### 6.5.1A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.5.1A.2.5 Test requirement

The 20 frequency error Δf results per test point must fulfil the test requirement:

$$|\Delta f| \leq (0.1 \text{ PPM} + 15 \text{ Hz}) \text{ for each test point}$$

where PPM refers to each CC UL frequency.

## 6.5.1A.3 Frequency error for CA (intra-band non-contiguous DL CA and UL CA)

### 6.5.1A.3.1 Test purpose

This test verifies the ability of both, receiver and the transmitter, to process frequency for intra-band non-contiguous CA correctly.

Receiver: to extract the correct frequency from the stimulus signal, offered by the System simulator, under ideal propagation conditions and low level.

Transmitter: to derive the correct modulated carrier frequency from the results, gained by the receiver.

### 6.5.1A.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

### 6.5.1A.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.1A.0.

### 6.5.1A.3.4 Test description

#### 6.5.1A.3.4.1 Initial condition

Same as in clause 6.5.1A.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-3 for CA configurations.
- Instead of Table 6.5.1A.1.4.1-1 → use Table 6.5.1A.3.4.1-1.
- Instead of clause 6.5.1A.1.4.3 → use clause 6.5.1A.3.4.3.

**Table 6.5.1A.3.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: N/A (Range is not relevant),<br>Maximum Wgap | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | |
| 1 | 25 | 25 | 35 | NA | QPSK | P_25@0 | QPSK | S_25@0 |
| 2 | 50 | 50 | 25 | | QPSK | P_50@0 | QPSK | S_50@0 |
| 3 | 100 | 100 | 5 | | QPSK | P_100@0 | QPSK | S_100@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.<br>Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3A.0-4 for UE supporting two uplink carriers is tested per Test CA configuration.<br>Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested.<br>Note 4: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | | | |

### 6.5.1A.3.4.2 Test procedure

Same test procedure as in clause 6.5.1A.1.4.2 with the following exceptions:

- Instead of Table 6.5.1A.1.4.1-1 → use Table 6.5.1A.3.4.1-1.
- Instead of Table 7.3A.2.5-1 → 7.3A.7.5-1.
- Instead of clause 6.5.1A.1.4.3 → use clause 6.5.1A.3.4.3.

### 6.5.1A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

## 6.5.1A.3.5 Test Requirements

The 20 frequency error Δf results per test point must fulfil the test requirement:

$$|\Delta f| \leq (0.1 \text{ PPM} + 15 \text{ Hz}) \text{ for each test point}$$

where PPM refers to each CC UL frequency.

# 6.5.1A.4 Frequency error for CA (3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

There is no intra-band non-contiguous combination for CA (3UL CA)

### 6.5.1A.4.1 Test purpose

This test verifies the ability of both receiver and the transmitter to processes frequency for 3UL CA correctly.

Receiver: to extract the correct frequency from the stimulus signal, offered by the System simulator, under ideal propagation conditions and low level.

Transmitter: to derive the correct modulated carrier frequency from the results, gained by the receiver.

### 6.5.1A.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band contiguous or inter-band and 3UL CA.

### 6.5.1A.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.1A.0.

### 6.5.1A.4.4 Test description

#### 6.5.1A.4.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested inset up and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.1A.4.4.1-1 to table 6.5.1A.4.4.1-2. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.1A.4.4.1-1: Intra Band Contiguous CA Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | Low range, High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 3) | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **UL Allocation** | | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC1 &SCC2 RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 50 | N/A | QPSK | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 25 | 50 | | QPSK | 125 | P_25@0 | S_50@0 | S_50@0 | - |
| 50 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 50 | 50 | | QPSK | 150 | P_50@0 | S_50@0 | S_50@0 | - |
| 75 | 75 | | QPSK | 183 | P_75@0 | S_54@0 | S_54@0 | - |
| 75 | 75 | | QPSK | 225 | P_75@0 | S_75@0 | S_75@0 | - |
| 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | S_0@0 | - |
| 100 | 25 | | QPSK | 150 | P_100@0 | S_25@0 | S_25@0 | - |
| 100 | 25 | | QPSK | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 100 | 50 | | QPSK | 200 | P_100@0 | S_50@0 | S_50@0 | - |
| 100 | 75 | | QPSK | 250 | P_100@0 | S_75@0 | S_75@0 | - |
| 100 | 100 | | QPSK | 300 | P_100@0 | S_100@0 | S_100@0 | - |
| 100 | 100 | | QPSK | 160 | P_100@0 | S_30@0 | S_30@0 | - |
| 100 | 100 | | QPSK | 75 | P_75@0 | S_0@0 | S_0@0 | - |
| 100 | 100 | | QPSK | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 100 | 100 | | QPSK | 50 | P_50@0 | S_0@0 | S_0@0 | - |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3A.0-1 for UE supporting two uplink carriers is tested per Test CA configuration.

Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.

Note 4: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used.

**Table 6.5.1A.4.4.1-2: Inter Band CA Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | Mid range for PCC and SCC | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | |
| Network signalling value | | NS_01<br>Unless given by Table 7.3.3-3 for the band with active uplink carrier | | | | | |
| Test Parameters for CA Configurations | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | |
| 6 | 25 | NA | QPSK | 56 | P_6@0 | S_25@0 | S_25@0 |
| 6 | 50 | | QPSK | 106 | P_6@0 | S_50@0 | S_50@0 |
| 15 | 25 | | QPSK | 65 | P_15@0 | S_25@0 | S_25@0 |
| 25 | 25 | | QPSK | 75 | P_25@0 | S_25@0 | S_25@0 |
| 25 | 50 | | QPSK | 125 | P_25@0 | S_50@0 | S_50@0 |
| 50 | 50 | | QPSK | 150 | P_50@0 | S_50@0 | S_50@0 |
| 50 | 100 | | QPSK | 250 | P_50@0 | S_100@0 | S_100@0 |
| 75 | 75 | | QPSK | 225 | P_75@0 | S_75@0 | S_75@0 |
| 75 | 100 | | QPSK | 275 | P_75@0 | S_100@0 | S_100@0 |
| 100 | 50 | | QPSK | 200 | P_100@0 | S_50@0 | S_50@0 |
| 100 | 100 | | QPSK | 300 | P_100@0 | S_100@0 | S_100@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.55 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.5.1A.4.4.1-1 to 6.5.1A.4.4.1-2.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.1A.4.4.3.

### 6.5.1A.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.1A.4.4.3

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.1A.4.4.1-1 to 6.5.1A.4.4.1-2 on both PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Set the Downlink signal level for PCC and SCCs to the appropriate REFSENS value defined in 7.3A.2.5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the test.
6. Measure the Frequency Error on PCC and SCCs using Global In-Channel Tx-Test (Annex E) respectively. For TDD slots with transient periods are not under test.

#### 6.5.1A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

### 6.5.1A.5 Test Requirements

The 20 frequency error Δf results per test point must fulfil the test requirement:

$$|\Delta f| \leq (0.1 \text{ PPM} + 15 \text{ Hz}) \text{ for each test point}$$

where PPM refers to PCC UL frequency.

## 6.5.1B Frequency Error for UL-MIMO

### 6.5.1B.1 Test purpose

This test verifies the ability of both, the receiver and the transmitter for UL-MIMO, to process frequency correctly.

Receiver: to extract the correct frequency from the stimulus signal, offered by the System simulator, under ideal propagation conditions and low level.

Transmitter: to derive the correct modulated carrier frequency for each transmitter connector from the results, gained by the receiver.

### 6.5.1B.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

### 6.5.1B.3 Minimum conformance requirements

The UE modulated carrier frequency for each transmit antenna shall be accurate to within ±0.1 PPM observed over a period of one time slot (0.5ms) compared to the carrier frequency received from the E-UTRA Node B.

The normative reference for this requirement is TS 36.101 clause 6.5.1B

### 6.5.1B.4 Test description

#### 6.5.1B.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.1B.4.1-1. The details of the uplink and downlink reference

measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.1B.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[3] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. | | | | | | |
| Note 3: Applicable only to E-UTRA FDD Band 31. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2). | | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.5.1B.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.1B.4.3.

### 6.5.1B.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.5.1B.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.5.1B.4.1-1, since the UE has no payload data to send, the UE transmit uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3B.5-1. Send continuously uplink power control "up" commands to the UE in every uplink scheduling information to the UE so that the UE transmits at PUMAX level for the duration of the test.

4. Measure the Frequency Error using Global In-Channel Tx-Test (Annex E) for each of transmit antenna of the UE. For TDD slots with transient periods are not under test.

#### 6.5.1B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the exceptions in clause 7.3.4.3 and Table 7.3.3-3.

### 6.5.1B.5 Test requirement

The requirements apply to each transmit antenna connector.

The 20 frequency error Δf results must fulfil the test requirement:

$$|\Delta f| \leq (0.1\text{PPM}+15\ \text{Hz})$$

## 6.5.1C

## 6.5.1D Frequency Error for ProSe

### 6.5.1D.0 Minimum conformance requirements

The UE modulated carrier frequency for ProSe sidelink transmissions shall be accurate to within ±0.1 PPM observed over a period of one time slot (0.5 ms) compared to the carrier frequency received from the synchronization source. The synchronization source can be E-UTRA Node B or a ProSe UE transmitting sidelink synchronization signals.

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.2D-2, the requirements in subclause 6.5.1D.0 apply for ProSe transmission and the requirements in subclause 6.5.1 apply for uplink transmission.

The normative reference for this requirement is TS 36.101 clause 6.5.1D.

### 6.5.1D.1 Frequency error for ProSe Direct Discovery

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Message exceptions content needs further investigation (some values still TBD).
- Test procedure is not defined (concurrent operation with E-UTRA uplink transmissions and the communication between SS and UE are undefined).

#### 6.5.1D.1.1 Test purpose

This test verifies the ability of both, the receiver and the transmitter for ProSe Discovery physical channels, to process frequency correctly.

Receiver: to extract the correct frequency from the stimulus signal, offered by the System simulator, under ideal propagation conditions and low level.

Transmitter: to derive the correct modulated carrier frequency for each transmitter connector from the results, gained by the receiver.

#### 6.5.1D.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Discovery, but not ProSe Direct Communication.

### 6.5.1D.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.1D.0.

### 6.5.1D.1.4 Test description

#### 6.5.1D.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA ProSe bands specified in table 5.4.2D.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.1D.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.6.

**Table 6.5.1D.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | | | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 5MHz, Highest | | | |
| | **Downlink Configuration** | | **Uplink Configuration** | | **Sidelink Configuration (PSDCH)** | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Mod'n | RB allocation |
| 5MHz | QPSK | 8 | QPSK | 8 | QPSK | 2 |
| 10MHz | QPSK | 16 | QPSK | 16 | QPSK | 2 |
| 15MHz | QPSK | 25 | QPSK | 25 | QPSK | 2 |
| 20MHz | QPSK | 30 | QPSK | 30 | QPSK | 2 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.67.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 6.5.1D.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents exceptions are defined in clause 6.5.1D.1.4.3.
7. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is closed and UE is set to announce discovery.

#### 6.5.1D.1.4.2 Test procedure

1. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions (only those marked with "…Step 1…" ) are defined in clause 6.5.1D.1.4.3.
2. The UE shall transmit RRCConnectionReconfigurationComplete message.
3. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.5.1D.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.1D.1.4.1-1, since the UE has no payload data to send, the UE transmit uplink MAC padding bits on the UL RMC.

5. SS transmits PDSCH to transmit the SL RMC according to Table 6.5.1D.1.4.1-1. Set the Sidelink signal level to the appropriate REFSENS value defined in Table 7.3D.1.5-1.

6. Measure the Frequency Error using Global In-Channel Tx-Test (Annex E) for each of transmit antenna of the UE. For TDD slots with transient periods are not under test.

### 6.5.1D.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

- Table A.7.1.1-1 for FDD
- Table A.7.1.2-1 for TDD

**Table 6.5.1D.1.4.3-1: ACTIVATE TEST MODE: Frequency Error for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 6.5.1D.1.4.3-2: CLOSE UE TEST LOOP: Frequency Error for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 6.5.1D.1.4.3-3: MAC-MainConfig-RBC: Frequency Error for ProSe Direct Discovery (applicable only for Step 1 of Test procedure)**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | TBD | | |
| periodicBSR-Timer | TBD | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | TBD | | |
| } | | | |

### 6.5.1D.1.5 Test requirement

The 20 frequency error Δf results must fulfil the test requirement:

$$|\Delta f| \leq (0.1 \text{ PPM} + 15 \text{ Hz})$$

### 6.5.1D.2 Frequency error for ProSe Direct Communication

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Many clauses are TBD.

#### 6.5.1D.2.1 Test purpose

This test verifies the ability of both, the receiver and the transmitter for ProSe Communication physical channels, to process frequency correctly.

Receiver: to extract the correct frequency from the stimulus signal, offered by the System simulator, under ideal propagation conditions and low level.

Transmitter: to derive the correct modulated carrier frequency for each transmitter connector from the results, gained by the receiver.

#### 6.5.1D.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Communication.

#### 6.5.1D.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.1D.0.

#### 6.5.1D.2.4 Test description

TBD

##### 6.5.1D.2.4.1 Initial condition

TBD

##### 6.5.1D.2.4.2 Test procedure

TBD

##### 6.5.1D.2.4.3 Message contents

TBD

#### 6.5.1D.2.5 Test requirements

The 20 frequency error $\Delta f$ results must fulfil the test requirement:

$$|\Delta f| \leq (0.1 \text{ PPM} + 15 \text{ Hz})$$

## 6.5.1E Frequency Error for UE category 0

### 6.5.1E.1 Test purpose

Same test purpose as in clause 6.5.1.1.

### 6.5.1E.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.5.1E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.5.1.3.

## 6.5.1E.4 Test description

### 6.5.1E.4.1 Initial condition

Same initial conditions as in clause 6.5.1.4.1 with following exceptions:

- Instead of Table 6.5.1.4.1-1 → use Table 6.5.1E.4.1-1.
- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.5.1E.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD and HD-FDD | TDD | | FDD and HD-FDD | TDD |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 14 | 14 | QPSK | 15 | 15 |
| 5MHz | QPSK | 14 | 14 | QPSK | 25 | 25 |
| 5MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 14 | N/A | QPSK | 15 | N/A |
| 10MHz | QPSK | 14 | 14 | QPSK | 50 | 36 |
| 10MHz | QPSK | 14 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 14 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 15MHz | QPSK | 14 | N/A | QPSK | 36 | N/A |
| 15MHz | QPSK | 14 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 20MHz | QPSK | 14 | N/A | QPSK | 36 | N/A |
| 20MHz | QPSK | 14 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. | | | | | | |

### 6.5.1E.4.2 Test procedure

Same test procedure as in clause 6.5.1.4.2 with following exception for HD-FDD:

- In step 4, slots with transient periods are not under test. Half-duplex guard sub frame are not under test.

### 6.5.1E.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the exceptions in subclause 7.3.4.3 and Table 7.3.3-3.

## 6.5.1E.5 Test requirement

The 20 frequency error Δf results must fulfil the test requirement:

$$|\Delta f| \leq (0.1 \text{ PPM} + 15 \text{ Hz})$$

# 6.5.1EA Frequency Error for UE category M1

## 6.5.1EA.1 Test purpose

Same test purpose as in clause 6.5.1.1.

## 6.5.1EA.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

## 6.5.1EA.3 Minimum conformance requirements

For category M1 TDD UEs and FD-FDD UEs, the frequency error requirements in Clause 6.5.1.3 apply.

For category M1 HD-FDD UEs and for continuous uplink transmissions of duration ≤ 64 ms, the frequency error requirements in Clause 6.5.1.3 apply.

For category M1 HD-FDD UEs and for continuous uplink transmissions of duration > 64 ms, the UE modulated carrier frequency shall be accurate to within the limits in Table 6.5.1EA.3-1 observed over a period of one time slot (0.5 ms) compared to the carrier frequency received from the E-UTRA Node B.

**Table 6.5.1EA.3-1: Frequency error requirement for HD-FDD UE category M1**

| Carrier frequency [GHz] | Frequency error [ppm] |
|---|---|
| ≤1 | ±0.2 |
| >1 | ±0.1 |

The normative reference for this requirement is TS 36.101 clause 6.5.1E

## 6.5.1EA.4 Test description

### 6.5.1EA.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.1EA.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.5.1EA.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| Ch BW | Modulation | RB allocation | | Modulation | RB allocation | | |
| | | FDD and HD-FDD | TDD | | FDD and HD-FDD | TDD | Narrowband index[1] |
| 5MHz | QPSK | 4 | 4 | QPSK | 6 | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4 | | | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.5.1EA.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.5.1EA.4.3.

### 6.5.1EA.4.2 Test procedure

1. SS transmits PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 6.5.1EA.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.5.1EA.4.1-1, since the UE has no payload data to send, the UE transmit uplink MAC padding bits on the UL RMC
3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3EA-1. Send continuously uplink power control "up" commands to the UE in every uplink scheduling information to the UE so that the UE transmits at $P_{UMAX}$ level for the duration of the test.
4. Measure the Frequency Error using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency. For TDD and HDD-FD slots with transient periods are not under test. Half-duplex guard sub frame are not under test

### 6.5.1EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA and the exceptions in subclause 7.3EA.4.3.

### 6.5.1EA.5 Test requirement

The 20 frequency error Δf results must fulfil the test requirement:

$$|\Delta f| \leq (0.1 \text{ PPM} + 15 \text{ Hz})$$

## 6.5.1EA_1 Frequency Error for UE category M1 (CEmodeB)

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The RMC for CEModeB with repetitions is not defined.

### 6.5.1EA_1.1 Test purpose

Same test purpose as in clause 6.5.1.1.

### 6.5.1EA_1.2 Test applicability

This test case applies to all types of E-UTRA HD-FDD UE release 13 and forward of UE category M1 that support operating in CEmodeB.

### 6.5.1EA_1.3 Minimum conformance requirements

For category M1 TDD UEs and FD-FDD UEs, the frequency error requirements in Clause 6.5.1.3 apply.

For category M1 HD-FDD UEs and for continuous uplink transmissions of duration ≤ 64 ms, the frequency error requirements in Clause 6.5.1.3 apply.

For category M1 HD-FDD UEs and for continuous uplink transmissions of duration > 64 ms, the UE modulated carrier frequency shall be accurate to within the limits in Table 6.5.1EA_1.3-1 observed over a period of one time slot (0.5 ms) compared to the carrier frequency received from the E-UTRA Node B.

**Table 6.5.1EA_1.3-1: Frequency error requirement for HD-FDD UE category M1**

| Carrier frequency [GHz] | Frequency error [ppm] |
|---|---|
| ≤1 | ±0.2 |
| >1 | ±0.1 |

The normative reference for this requirement is TS 36.101 clause 6.5.1E

## 6.5.1EA_1.4 Test description

### 6.5.1EA_1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.1EA_1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.5.1EA_1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | | **Uplink Configuration** | | |
| Ch BW | Modulation | RB allocation | Modulation | RB allocation | |
| | | HD-FDD | | HD-FDD | Narrowband index[1] |
| 5MHz | QPSK | TBD | QPSK | TBD | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4 | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.5.1EA_1.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.5.1EA_1.4.3.

### 6.5.1EA_1.4.2 Test procedure

1. SS transmits PDSCH via MPDCCH DCI format 6-1B for C_RNTI to transmit the DL RMC according to Table 6.5.1EA_1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information via MPDCCH DCI format 6-0B for C_RNTI to schedule the UL RMC according to Table 6.5.1EA_1.4.1-1, since the UE has no payload data to send, the UE transmit uplink MAC padding bits on the UL RMC

3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3EA-1. Send continuously uplink power control "up" commands to the UE in every uplink scheduling information to the UE so that the UE transmits at $P_{UMAX}$ level for the duration of the test.

4. Measure the Frequency Error using Global In-Channel Tx-Test (Annex E). The acquired frame for Frequency Error measurement starts at 2020ms after the start of the first scheduled PUSCH subframe (Note 1).

Note 1: 2020ms is the start of the last UL frame before the last UL compensation gap within the PUSCH repetition period of 2048ms. The same frame for measuring of Frequency Error applies irrespective of the UL compensation gap existence. UL compensation gaps exist if the UE capability, ue-CE-NeedULGaps-r13, is true. See 36.211 [8], clause 5.3.4 for UL compensating gap timing for CEmodeB UEs.

### 6.5.1EA_1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeB and the exceptions in subclause 7.3EA.4.3, Table 7.3EA.3-3 and:

**Table 6.5.1EA_1.4.3-1: PUSCH-ConfigCommon-v1310-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-10A PUSCH-ConfigCommon-v1310-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigCommon-v1310-DEFAULT ::= SEQUENCE { | | | |
| | | | |
| pusch-maxNumRepetitionCEmodeB-r13 | r2048 | Set to maximum value for CE Mode B | CEmodeB |
| } | | | |

## 6.5.1EA_1.5 Test requirement

The 20 frequency error Δf results must fulfil the test requirement:

| Carrier frequency [GHz] | Frequency error \|Δf\| [Hz] |
|---|---|
| ≤1 | ≤ (0.2ppm + 15 Hz) |
| >1 | ≤ (0.1ppm + 15 Hz) |

# 6.5.1EB Frequency Error for UE category 1bis

## 6.5.1EB.1 Test purpose

Same test purpose as in clause 6.5.1.

## 6.5.1EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

## 6.5.1EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.5.1.3.

### 6.5.1EB.4 Test description

#### 6.5.1EB.4.1 Initial conditions

Same initial conditions as in clause 6.5.1.4.1 with the following exception:

- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.5.1EB.4.2 Test procedure

Same test procedure as in clause 6.5.1.4.2.

#### 6.5.1EB.4.3 Message contents

Same message contents as in clause 6.5.1.4.3.

### 6.5.1EB.5 Test requirement

The 20 frequency error Δf results must fulfil the test requirement:

$$|\Delta f| \leq (0.1 \text{ PPM} + 15 \text{ Hz})$$

## 6.5.1F Frequency Error for category NB1 and NB2

### 6.5.1F.1 Test purpose

This test verifies the ability of both, the receiver and the transmitter, to process frequency correctly.

Receiver: to extract the correct frequency from the stimulus signal, offered by the System simulator, under ideal propagation conditions and low level.

Transmitter: to derive the correct modulated carrier frequency from the results, gained by the receiver.

### 6.5.1F.2 Test applicability

This test case applies to all types of E-UTRA release 13 and forward of category NB1.

This test case applies to all types of E-UTRA release 14 and forward of category NB2.

### 6.5.1F.3 Minimum conformance requirements

For UE category NB1 and NB2, the UE modulated carrier frequency shall be accurate to within the following limits

**Table 6.5.1F.3-1: Frequency error requirement for UE category NB1 and NB2**

| Carrier frequency [GHz] | Frequency error [ppm] |
|---|---|
| ≤1 | ±0.2 |
| >1 | ±0.1 |

Observed over a period of one time slot (0.5 ms for 15 kHz sub-carrier spacing and 2 ms excluding the 2304Ts gap for 3.75 kHz sub-carrier spacing) and averaged over $72/L_{Ctones}$ slots (where $L_{Ctones}$ = {1, 3, 6, 12} is the number of sub-carriers used for the transmission), compared to the carrier frequency received from the E-UTRA Node B.

The normative reference for this requirement is TS 36.101 clause 6.5.1F.

## 6.5.1F.4 Test description

### 6.5.1F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA bands defined for NB-IOT in clause 5.2F. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.1F.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2.4. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 6.5.1F.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 8.1.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.1 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | | Modulation | $N_{tones}$ | Subcarrier spacing |
| 1 | | QPSK | 1@0 | 3.75 |
| 2 | | QPSK | 1@0 | 15 |
| 3 (Note 1) | | QPSK | 3@0 | 15 |
| 4 (Note 1) | | QPSK | 6@0 | 15 |
| 5 (Note 1) | | QPSK | 12@0 | 15 |
| Note 1: Applicable to UE supporting UL multi-tone transmissions | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex [H.1 and H.3.0].
4. The UL Reference Measurement channel is set according to Table 6.5.1F.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.5.1F.4.3.

### 6.5.1F.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.5.1F.4.1-1, since the UE has no payload data to send, the UE transmit uplink MAC padding bits on the UL RMC. (UE should be already transmitting $P_{UMAX}$ after Initial Conditions setting).
2. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3F.1.5-1. For the DL signal, Narrowband IoT OCNG pattern 1 in Annex A.5.3.1 is used.
3. Measure the Frequency Error using Global In-Channel Tx-Test (Annex E).

NOTE 1: For configuration IDs applicable to UE depending on UE capability in Test Configuration Table with different UL sub-carrier spacing, the SS shall release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the appropriate UL subcarrier spacing in Random Access Response message.

#### 6.5.1F.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6.

### 6.5.1F.5 Test requirement

The 20 frequency error Δf results must fulfil the test requirement:

$$|\Delta f| \leq (0.1 \text{ PPM} + 15 \text{ Hz}) \text{ (Carrier frequency } > 1 \text{ GHz)}$$

$$|\Delta f| \leq (0.2 \text{ PPM} + 15 \text{ Hz}) \text{ (Carrier frequency } \leq 1 \text{ GHz)}$$

## 6.5.1G Frequency Error for V2X Communication

### 6.5.1G.1 Frequency Error for V2X Communication / Non-concurrent with E-UTRA uplink transmission

#### 6.5.1G.1.1 Test purpose

This test verifies the ability of both, the receiver and the transmitter, to process frequency correctly.

Receiver: to extract the correct frequency from the stimulus signal, offered by the System simulator, under ideal propagation conditions and low level.

Transmitter: to derive the correct modulated carrier frequency from the results, gained by the receiver.

#### 6.5.1G.1.2 Test applicability

This test case applies to all types of UE that support V2X Sidelink communication and Band 47.

#### 6.5.1G.1.3 Minimum Conformance Requirements

The UE modulated carrier frequency for V2X sidelink transmissions shall be accurate to within ±0.1 PPM observed over a period of one time slot (0.5 ms) compared to the absolute frequency in case of using GNSS synchronization source. The same requirements applied over a period of one time slot (0.5 ms) compared to the relative frequency in case of using the E-UTRA Node B or V2X UE sidelink synchronization signals.

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-1, the requirements in TS 36.101[2] subclause 6.5.1G apply for V2X sidelink transmission and the requirements in TS 36.101[2] subclause 6.5.1 apply for the E-UTRA uplink transmission.

The normative reference for this requirement is TS 36.101[2] clause 6.5.1G

#### 6.5.1G.1.4 Test description

##### 6.5.1G.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.1G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.5.1G.1.4.1-1: Test Configuration Table**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 96 |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.89.
2. The parameter settings for the V2X sidelink transmission over PC5 for both SS and UE are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.5.1G.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.5.1G.1.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 6.5.1G.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. The UE transmits at $P_{UMAX}$ level according to pre-configured parameters for the duration of the test.
3. Measure the Frequency Error using Global In-Channel Tx-Test (Annex E).

#### 6.5.1G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.7.I and 4.10.

### 6.5.1G.1.5 Test requirement

The 20 frequency error Δf results must fulfil the test requirement:

$$|\Delta f| \leq (0.1 \text{ PPM} + 36 \text{ Hz})$$

## 6.5.1G.2 Frequency error for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

### 6.5.1G.2.1 Test Purpose

This test verifies the ability of both, the receiver and the transmitter, to process frequency correctly.

Receiver: to extract the correct frequency from the stimulus signal, offered by the System simulator, under ideal propagation conditions and low level.

Transmitter: to derive the correct modulated carrier frequency from the results, gained by the receiver.

### 6.5.1G.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in TS 36.101 [2] Table 5.2G -2.

### 6.5.1G.2.3 Minimum conformance requirements

The UE modulated carrier frequency for V2X sidelink transmissions shall be accurate to within ±0.1 PPM observed over a period of one time slot (0.5 ms) compared to the absolute frequency in case of using GNSS synchronization source. The same requirements applied over a period of one time slot (0.5 ms) compared to the relative frequency in case of using the E-UTRA Node B or V2X UE sidelink synchronization signals.

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in TS 36.101 [2] Table 5. 2G -2, the requirements in subclause 6.5.1G.1.3 apply for V2X sidelink transmission and the requirements in subclause 6.5.1.3 apply for the E-UTRA uplink transmission.

The normative reference for this requirement is TS 36.101 [2] clause 6.5.1G.

### 6.5.1G.2.4 Test description

#### 6.5.1G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on Inter-band con-current V2X configurations specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.1G.2.4.1-1. The details of the uplink and V2X reference measurement channels (RMCs) are specified in Annexes A.2 and A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.1G.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in 5.4.2G | | | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink** | | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | QPSK | 6 | QPSK | 6 | 10 MHz | QPSK | 48@2 |
| 3 MHz | QPSK | 15 | QPSK | 15 | 20 MHz | QPSK | 96@2 |
| 5 MHz | QPSK | 25 | QPSK | 25 | | | |
| 10 MHz | QPSK | 50 | QPSK | 50 | | | |
| 15 MHz | QPSK | 75 | QPSK | 75 | | | |
| 20 MHz | QPSK | 100 | QPSK | 100 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X reference measurement channels are set according to Table 6.5.1G.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 6.5.1G.2.4.3.

#### 6.5.1G.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.5.1G.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.5.1G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.

3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3.5-1. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX}$ level for the duration of the test. Configure the UE to transmit PSCCH and PSSCH with the $P_{UMAX}$ level of each test points.

4. Measure the Frequency Error over all component carriers in the V2X con-current band configuration using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

#### 6.5.1G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the exceptions in subclause 7.3.4.3 and Table 7.3.3-3.

### 6.5.1G.2.5 Test requirement

The 20 frequency error Δf results for both concurrent bands must fulfil the test requirement:

$$|\Delta f| \leq (0.1\ \text{PPM} + 15\ \text{Hz}),\ f \leq 3.0\text{GHz}$$

$$|\Delta f| \leq (0.1\ \text{PPM} + 36\ \text{Hz}),\ 4.2\text{GHz} < f \leq 6.0\text{GHz}$$

## 6.5.2 Transmit modulation

Transmit modulation defines the modulation quality for expected in-channel RF transmissions from the UE. This transmit modulation limit is specified in terms of:

- Error Vector Magnitude (EVM) for the allocated resources blocks (RB),
- EVM equalizer spectrum flatness derived from the equalizer coefficients generated by the EVM measurement process
- Carrier leakage

In-band emissions for the non-allocated RB

### 6.5.2.1 Error Vector Magnitude (EVM)

#### 6.5.2.1.1 Test Purpose

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Before calculating the EVM the measured waveform is corrected by the sample timing offset and RF frequency offset. Then the carrier leakage shall be removed from the measured waveform before calculating the EVM.

The measured waveform is further modified by selecting the absolute phase and absolute amplitude of the Tx chain. The EVM result is defined after the front-end IDFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %.

The basic EVM measurement interval in the time domain is one preamble sequence for the PRACH and is one slot for the PUCCH and PUSCH in the time domain. When the PUSCH or PUCCH transmission slot is shortened due to multiplexing with SRS, the EVM measurement interval is reduced by one symbol, accordingly. Likewise, when the PUSCH starting position is modified or when second last symbol is the ending symbol of the PUSCH sub-frame for Frame Structure Type 3, the EVM measurement interval is reduced accordingly. The PUSCH or PUCCH EVM measurement interval is also reduced when the mean power, modulation or allocation between slots is expected to change. In the case of PUSCH transmission, the measurement interval is reduced by a time interval equal to the sum of 5 μs and the applicable exclusion period defined in subclause 6.3.4, adjacent to the boundary where the power change is expected to occur. The PUSCH exclusion period is applied to the signal obtained after the front-end IDFT. In the case of PUCCH transmission, the PUCCH EVM measurement interval is reduced by one symbol adjacent to the slot boundary.

#### 6.5.2.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 8 and forward.

#### 6.5.2.1.3 Minimum conformance requirements

EVM measurements are evaluated for 10 uplink sub-frames excluding any transient period for the average EVM case, and 60 subframes excluding any transient period for the reference signal EVM case, the different modulations schemes shall not exceed the values specified in Table 6.5.2.1.3-1 for the parameters defined in Table 6.5.2.1.3-2. For EVM evaluation purposes, [all PRACH preamble formats 0-4 and] all PUCCH formats 1, 1a, 1b, 2, 2a and 2b are considered to have the same EVM requirement as QPSK modulated.

**Table 6.5.2.1.3-1: Minimum requirements for Error Vector Magnitude**

| Parameter | Unit | Average EVM Level | Reference Signal EVM Level |
|---|---|---|---|
| QPSK or BPSK | % | 17.5 | 17.5 |
| 16QAM | % | 12.5 | 12.5 |

**Table 6.5.2.1.3-2: Parameters for Error Vector Magnitude**

| Parameter | Unit | Level |
|---|---|---|
| UE Output Power | dBm | ≥ -40 |
| Operating conditions | | Normal conditions |

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2.1.1.

#### 6.5.2.1.4 Test description

##### 6.5.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.1.4.1-1: Test Configuration Table for PUSCH**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | **NC** | | |
| Test Frequencies **(as specified in TS36.508 [7] subclause 4.3.1)** | | **See Table 6.5.1.4.1-1** | | |
| Test Channel Bandwidths **(as specified in TS 36.508 [7] subclause 4.3.1)** | | **See Table 6.5.1.4.1-1** | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for PUSCH EVM testing | Modulation | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 1.4MHz | | QPSK | 1 | 1 |
| 1.4MHz | | 16QAM | 6 | 6 |
| 1.4MHz | | 16QAM | 1 | 1 |
| 3MHz | | QPSK | 15 | 15 |
| 3MHz | | QPSK | 4 | 4 |
| 3MHz | | 16QAM | 15 | 15 |
| 3MHz | | 16QAM | 4 | 4 |
| 5MHz | | QPSK | 25 | 25 |
| 5MHz | | QPSK | 8 | 8 |
| 5MHz | | 16QAM | 25 | 25 |
| 5MHz | | 16QAM | 8 | 8 |
| 10MHz | | QPSK | 50 | 50 |
| 10MHz | | QPSK | 12 | 12 |
| 10MHz | | 16QAM | 50 (Note 3) | 50 (Note 3) |
| 10MHz | | 16QAM | 12 | 12 |
| 15MHz | | QPSK | 75 | 75 |
| 15MHz | | QPSK | 16 | 16 |
| 15MHz | | 16QAM | 75 (Note 3) | 75 (Note 3) |
| 15MHz | | 16QAM | 16 | 16 |
| 20MHz | | QPSK | 100 | 100 |
| 20MHz | | QPSK | 18 | 18 |
| 20MHz | | 16QAM | 100 (Note 3) | 100 (Note 3) |
| 20MHz | | 16QAM | 18 | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: For partial RB allocation, the $RB_{start}$ shall be RB #0 and RB# (max+1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories ≥2

**Table 6.5.2.1.4.1-2: Test Configuration Table for PUCCH**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | |
| Test Frequencies as specified in **TS36.508 [7] subclause 4.3.1** | See Table 6.5.1.4.1-1 | | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | See Table 6.5.1.4.1-1 | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** |
| Ch BW | Mod'n | RB allocation | | FDD: PUCCH format = Format 1a<br>TDD: PUCCH format = Format 1a / 1b |
| | | FDD | TDD | |
| 1.4MHz | QPSK | 3 | 3 | |
| 3MHz | QPSK | 4 | 4 | |
| 5MHz | QPSK | 8 | 8 | |
| 10MHz | QPSK | 16 | 16 | |
| 15MHz | QPSK | 25 | 25 | |
| 20MHz | QPSK | 30 | 30 | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

**Table 6.5.2.1.4.1-3: Test Configuration for PRACH**

| Initial Conditions | | |
|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | NC | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | See Table 6.5.1.4.1-1 | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | See Table 6.5.1.4.1-1 | |
| PRACH preamble format | | |
| | FDD | TDD |
| PRACH Configuration Index | 4 | 53 |
| RS EPRE setting for test point 1 (dBm/15kHz) | -71 | -63 |
| RS EPRE setting for test point 2 (dBm/15kHz) | -86 | -78 |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to in Table 6.5.2.1.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2.1.4.3.

### 6.5.2.1.4.2 Test procedure

Test procedure for PUSCH:

1.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

1.2 Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX\ level}$.

1.3 Measure the EVM and $\overline{EVM}_{DMRS}$ using Global In-Channel Tx-Test (Annex E).

1.4 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is –36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.5 Measure the EVM and $\overline{EVM}_{DMRS}$ using Global In-Channel Tx-Test (Annex E).

Test procedure for PUCCH:

2.1 PUCCH are set according to Table 6.5.2.1.4.1-2.

2.2 SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.5.2.1.4.1-2. The SS sends downlink MAC padding bits on the DL RMC. The transmission of PDSCH will make the UE send uplink ACK/NACK using PUCCH. There is no PUSCH transmission.

2.3 SS send appropriate TPC commands for PUCCH to the UE until the UE transmit PUCCH at $P_{UMAX}$ level.

2.4 Measure PUCCH EVM using Global In-Channel Tx-Test (Annex E).

2.5 Send the appropriate TPC commands for PUCCH to the UE until the UE transmits PUCCH at -36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.6 Measure PUCCH EVM using Global In-Channel Tx-Test (Annex E).

Test procedure for PRACH:

3.1 The SS shall set RS EPRE according to Table 6.5.2.1.4.1-3.

3.2 PRACH is set according to Table 6.5.2.1.4.1-3.

3.3 The SS shall signal a Random Access Preamble ID via a PDCCH order to the UE and initiate a Non-contention based Random Access procedure

3.4 The UE shall send the signalled preamble to the SS.

3.5 In response to the preamble, the SS shall transmit a random access response not corresponding to the transmitted random access preamble, or send no response.

3.6 The UE shall consider the random access response reception not successful then re-transmit the preamble with the calculated PRACH transmission power.

3.7 Repeat step 5 and 6 until the SS collect enough PRACH preambles (2 preambles for format 0 and 10 preambles for format 4). Measure the EVM in PRACH channel using Global In-Channel Tx-Test (Annex E).

### 6.5.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.5.2.1.4.3-1: *PRACH-ConfCommonDEFAULT*: PRACH EVM measurement for FDD**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-7 PRACH-ConfCommonDEFAULT | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| PRACH-ConfigInfo SEQUENCE { | | | |
| prach-ConfigIndex | 4 | | |

**Table 6.5.2.1.4.3-2: *PRACH-ConfCommonDEFAULT*: PRACH EVM measurement for TDD**

| Derivation Path: TS 36.508 [7] clause 5.3.1, Table 5.3.1-1 PRACH-ConfCommonDEFAULT | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| PRACH-ConfigInfo SEQUENCE { | | | |
| prach-ConfigIndex | 53 | | |

**Table 6.5.2.1.4.3-4: *RACH-ConfigCommon-DEFAULT:* PRACH EVM measurement**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-12 RACH-ConfigCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon-DEFAULT ::= SEQUENCE { | | | |
| preambleInfo SEQUENCE { | | | |
| numberOfRA-Preambles | n52 | | |
| preamblesGroupAConfig SEQUENCE {} | Not present | | |
| } | | | |
| powerRampingParameters SEQUENCE { | | | |
| powerRampingStep | dB0 | | |
| preambleInitialReceivedTargetPower | dBm-120 Test point 1<br>dBm-90 Test point 2 | | |
| } | | | |
| ra-SupervisionInfo SEQUENCE { | | | |
| preambleTransMax | n10 | | FDD |
| | n20 | | TDD |
| ra-ResponseWindowSize | Sf10 | | |
| mac-ContentionResolutionTimer | sf48 | | |
| } | | | |
| ra-SupervisionInfo SEQUENCE { | | | |

**Table 6.5.2.1.4.3-5: *TDD-Config-DEFAULT:* PRACH EVM measurement for TDD**

| Derivation Path: TS 36.508 [7] clause 5.3.1, Table 5.3.1-1: TDD-Config-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp5 | To enable two symbol UpPTS, and to have 9 symbols GP. | |
| } | | | |

### 6.5.2.1.5 Test requirement

The PUSCH EVM derived in E.4.2 shall not exceed 17,5 % for QPSK and BPSK, 12,5% for 16 QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in E.4.6.2 shall not exceed 17,5 % when embedded with data symbols of QPSK and BPSK, 12,5% for 16 QAM.

The PUCCH EVM and derived in E.5.9.2 shall not exceed 17,5 %.

The PRACH EVM derived in FFS shall not exceed 17.5%.

## 6.5.2.1_1 Error Vector Magnitude (EVM) for UL 64QAM

### 6.5.2.1_1.1 Test Purpose

Same test purpose as in clause 6.5.2.1.1

### 6.5.2.1_1.2 Test applicability

This test applies to E-UTRA UE from release 13 and forward that support UL 64QAM.

### 6.5.2.1_1.3 Minimum conformance requirements

The RMS average of the basic EVM measurements for 10 sub-frames excluding any transient period for the average EVM case, and 60 sub-frames excluding any transient period for the reference signal EVM case, for 64QAM shall not exceed the value specified in Table 6.5.2.1_1.3-1 for the parameters defined in Table 6.5.2.1_1.3-2.

**Table 6.5.2.1_1.3-1: Minimum requirements for Error Vector Magnitude**

| Parameter | Unit | Average EVM Level | Reference Signal EVM Level |
|---|---|---|---|
| 64QAM | % | 8 | 8 |

**Table 6.5.2.1_1.3-2: Parameters for Error Vector Magnitude**

| Parameter | Unit | Level |
|---|---|---|
| UE Output Power | dBm | ≥ -40 |
| Operating conditions | | Normal conditions |

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2.1.1.

### 6.5.2.1_1.4 Test description

#### 6.5.2.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.1_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.1_1.4.1-1: Test Configuration Table for PUSCH**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for PUSCH EVM testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | 64QAM | 6 | 6 |
| 1.4MHz | | 64QAM | 1 | 1 |
| 3MHz | | 64QAM | 15 | 15 |
| 3MHz | | 64QAM | 4 | 4 |
| 5MHz | | 64QAM | 25 | 25 |
| 5MHz | | 64QAM | 8 | 8 |
| 10MHz | | 64QAM | 50 | 50 |
| 10MHz | | 64QAM | 12 | 12 |
| 15MHz | | 64QAM | 75 | 75 |
| 15MHz | | 64QAM | 16 | 16 |
| 20MHz | | 64QAM | 100 | 100 |
| 20MHz | | 64QAM | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: For partial RB allocation, the $RB_{start}$ shall be RB #0 and RB# (max+1 - RB allocation) of the channel bandwidth. | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to in Table 6.5.2.1_1.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2.1_1.4.3.

#### 6.5.2.1_1.4.2 Test procedure

Same test procedure as in clause 6.5.2.1.4.2

#### 6.5.2.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6

### 6.5.2.1_1.5 Test requirement

The PUSCH EVM derived in E.4.2 shall not exceed 8% for 64QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in E.4.6.2 shall not exceed 8% for 64QAM.

## 6.5.2.1_2 Error Vector Magnitude (EVM) for UL 256QAM

### 6.5.2.1_2.1 Test Purpose

Same test purpose as in clause 6.5.2.1.1

### 6.5.2.1_2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support UL 256QAM.

### 6.5.2.1_2.3 Minimum conformance requirements

The RMS average of the basic EVM measurements for 10 sub-frames excluding any transient period for the average EVM case, and 60 sub-frames excluding any transient period for the reference signal EVM case, for 256QAM shall not exceed the value specified in Table 6.5.2.1_2.3-1 for the parameters defined in Table 6.5.2.1_2.3-2.

**Table 6.5.2.1_2.3-1: Minimum requirements for Error Vector Magnitude**

| Parameter | Unit | Average EVM Level | Reference Signal EVM Level |
|---|---|---|---|
| 256QAM | % | 3.5 | 3.5 |

**Table 6.5.2.1_2.3-2: Parameters for Error Vector Magnitude**

| Parameter | Unit | Level |
|---|---|---|
| UE Output Power for 256QAM | dBm | ≥ -30 |
| Operating conditions | | Normal conditions |

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2.1.1.

### 6.5.2.1_2.4 Test description

#### 6.5.2.1_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.1_2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.1_2.4.1-1: Test Configuration Table for PUSCH**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest, 5MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for PUSCH EVM testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | 256QAM | 6 | 6 |
| 3MHz | | 256QAM | 15 | 15 |
| 5MHz | | 256QAM | 25 | 25 |
| 10MHz | | 256QAM | 50 | 50 |
| 15MHz | | 256QAM | 75 | 75 |
| 20MHz | | 256QAM | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.

2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to in Table 6.5.2.1_2.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2.1_2.4.3.

#### 6.5.2.1_2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX\ level}$.
3. Measure the EVM and $\overline{EVM}_{DMRS}$ using Global In-Channel Tx-Test (Annex E).
4. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is –26.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
5. Measure the EVM and $\overline{EVM}_{DMRS}$ using Global In-Channel Tx-Test (Annex E).

#### 6.5.2.1_2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6

### 6.5.2.1_2.5 Test requirement

The PUSCH EVM derived in Annex E.4.2 shall not exceed the values in Table 6.5.2.1_2.5-1 for 256QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in Annex E.4.6.2 shall not exceed the values in Table 6.5.2.1_2.5-1 when embedded with data symbols of 256QAM.

**Table 6.5.2.1_2.5-1: Test requirements for 256QAM Error Vector Magnitude**

| UL Power | Unit | Average EVM Level |
|---|---|---|
| 15 dBm < $P_{UL}$ | % | 3.8 |
| -25 dBm < $P_{UL}$ ≤ 15 dBm | % | 4.3 |
| -30dBm ≤ $P_{UL}$ ≤ -25dBm | % | 4.6 |

## 6.5.2.1A PUSCH-EVM with exclusion period

### 6.5.2.1A.1 Test purpose

To verify the ability of the UE transmitter to keep the EVM minimum requirements, even in the presence of transients according to subclause 6.5.2.1.1 third paragraph:

In the case of PUSCH transmission, the measurement interval is reduced by a time interval equal to the sum of 5 μs and the applicable exclusion period defined in subclause 6.3.4, adjacent to the boundary where the power change is expected to occur. The PUSCH exclusion period is applied to the signal obtained after the front-end IDFT.

### 6.5.2.1A.2 Test applicability

This test applies to all types of E-UTRA UE release 8 and forward.

### 6.5.2.1A.3 Minimum conformance requirement

EVM measurements are evaluated for 10 uplink sub-frames in a reduced time interval due to exclusion periods for the average EVM. The different modulations schemes shall not exceed the values specified in Table 6.5.2.1.3-1 for the parameters defined in Table 6.5.2.1.3-2.

### 6.5.2.1A.4 Test description

#### 6.5.2.1A.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.1A.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.1A.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal Conditions | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 10 MHz | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 10MHz | | QPSK | Alternating 12 and 1 (as shown in Figure 6.5.2.1A.4.2-1) | Alternating 12 and 1 (as shown in Figure 6.5.2.1A.4.2-1) |
| 10MHz | | 16 QAM | Alternating 12 and 1 (as shown in Figure 6.5.2.1A.4.2-1) | Alternating 12 and 1 (as shown in Figure 6.5.2.1A.4.2-1) |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to table 6.5.2.1A.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.3.5.2.4.3.

#### 6.5.2.1A.4.2 Test procedure

The test pattern is illustrated in figure 6.5.2.1A.4.2-1.

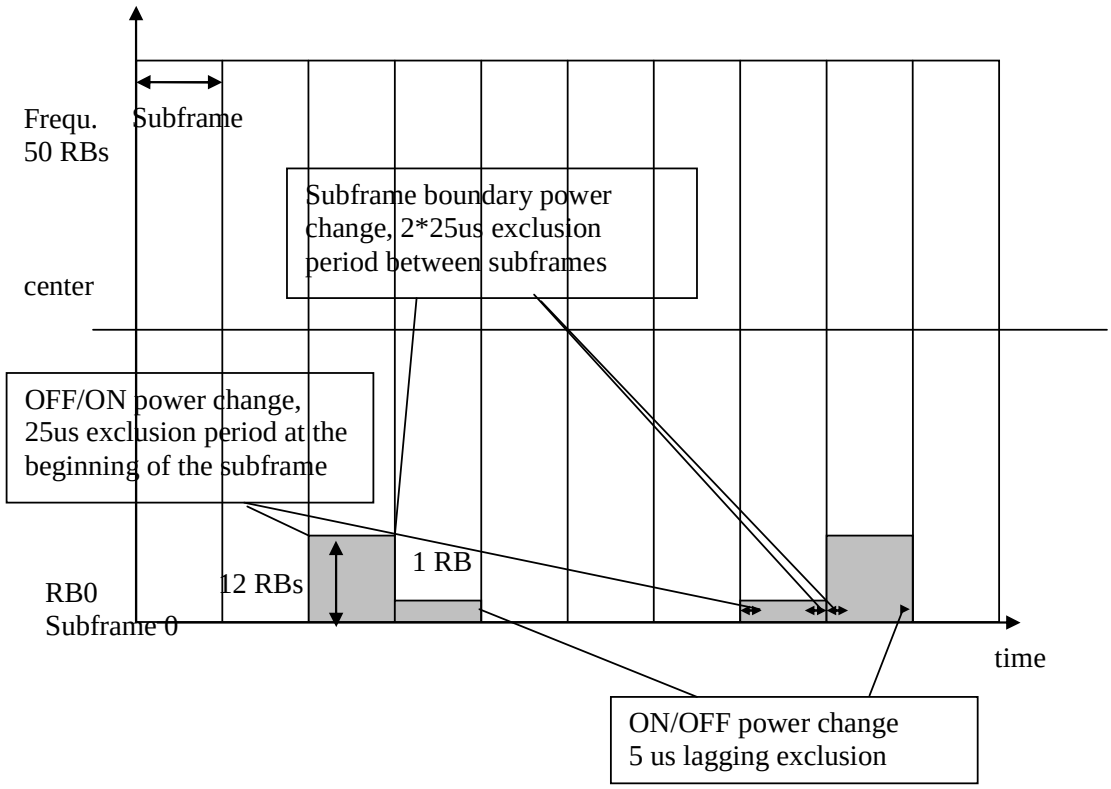



**Figure 6.5.2.1A.4.2-1: Test pattern**

NOTE 1: In TDD the free subframes are special subframes or DL, in FDD the free subframes are OFF.

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the PUSCH... Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The initial uplink RB allocation is 12. Send appropriate TPC commands for PUSCH to the UE to ensure the UE transmits PUSCH at 0dBm ±3.2dB for carrier frequency $f \leq 3.0$GHz or 0dBm ±3.5 dB for carrier frequency 3.0GHz < $f \leq 4.2$GHz.

2. Schedule the UE's PUSCH data transmission as described in Figure 6.5.2.1A.4.2-1 for 16[1)] active time slots with an uplink RB allocation alternating pattern as described in table 6.5.2.1A.4.1-1 while transmitting 0dB TPC command for PUSCH via the PDCCH.

3. Measure the EVM using Global In-Channel Tx-Test. The averaging across 16[1)] timeslots is done across mixed RB allocations, as illustrated in Figure 6.5.2.1A.4.2-1

NOTE 2: Averaging across 16 timeslots is used to represent each type of transition equally in the average.

### 6.5.2.1A.5 Test requirement

The PUSCH EVM derived in Annex E.4.2 taking into account Annex E.7 shall not exceed 17,5 % for QPSK and 12,5% for 16 QAM. The test requirements shall be fulfilled for early and late EVM window.

## 6.5.2.1E Error Vector Magnitude (EVM) for UE category 0

### 6.5.2.1E.1 Error Vector Magnitude (EVM) for UE category 0

#### 6.5.2.1E.1.1 Test Purpose

Same test purpose as in clause 6.5.2.1.1.

#### 6.5.2.1E.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

#### 6.5.2.1E.1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.5.2.1.3.

#### 6.5.2.1E.1.4 Test description

##### 6.5.2.1E.1.4.1 Initial conditions

Same initial conditions as in clause 6.5.2.1.4.1 with following exceptions:

- Instead of Table 6.5.2.1.4.1-1 to Table 6.5.2.1.4.1-3 → use Table 6.5.2.1E.4.1-1 to Table 6.5.2.1E.4.1-3.
- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.5.2.1E.1.4.1-1: Test Configuration Table for PUSCH**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | **NC** | | |
| Test Frequencies **(as specified in TS36.508 [7] subclause 4.3.1)** | | **See Table 6.5.1.4.1-1** | | |
| Test Channel Bandwidths **(as specified in TS 36.508 [7] subclause 4.3.1)** | | **See Table 6.5.1.4.1-1** | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for PUSCH EVM testing | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 1.4MHz | | QPSK | 1 | 1 |
| 1.4MHz | | 16QAM | 5 | 5 |
| 1.4MHz | | 16QAM | 1 | 1 |
| 3MHz | | QPSK | 15 | 15 |
| 3MHz | | QPSK | 4 | 4 |
| 3MHz | | 16QAM | 5 | 5 |
| 3MHz | | 16QAM | 4 | 4 |
| 5MHz | | QPSK | 25 | 25 |
| 5MHz | | QPSK | 8 | 8 |
| 5MHz | | 16QAM | 5 | 5 |
| 10MHz | | QPSK | 36 | 36 |
| 10MHz | | QPSK | 12 | 12 |
| 10MHz | | 16QAM | 5 | 5 |
| 15MHz | | QPSK | 36 | 36 |
| 15MHz | | QPSK | 16 | 16 |
| 15MHz | | 16QAM | 5 | 5 |
| 20MHz | | QPSK | 36 | 36 |
| 20MHz | | QPSK | 18 | 18 |
| 20MHz | | 16QAM | 5 | 5 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |
| Note 2: For partial RB allocation, the $RB_{start}$ shall be RB #0 and RB# (max+1 - RB allocation) of the channel bandwidth. | | | | |

**Table 6.5.2.1E.1.4.1-2: Test Configuration Table for PUCCH**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | | |
| Test Frequencies as specified in **TS36.508 [7] subclause 4.3.1** | | See Table 6.5.1.4.1-1 | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | | See Table 6.5.1.4.1-1 | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | | **Uplink Configuration** | |
| Ch BW | Mod'n | RB allocation | | FDD and HD-FDD: PUCCH format = Format 1a<br>TDD: PUCCH format = Format 1a / 1b |
| | | FDD | TDD | |
| 1.4MHz | QPSK | 3 | 3 | |
| 3MHz | QPSK | 4 | 4 | |
| 5MHz | QPSK | 8 | 8 | |
| 10MHz | QPSK | 14 | 14 | |
| 15MHz | QPSK | 14 | 14 | |
| 20MHz | QPSK | 14 | 14 | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

**Table 6.5.2.1E.1.4.1-3: Test Configuration for PRACH**

| Initial Conditions | | |
|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | NC | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | See Table 6.5.1.4.1-1 | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | See Table 6.5.1.4.1-1 | |
| PRACH preamble format | | |
| | FDD and HD-FDD | TDD |
| PRACH Configuration Index | 4 | 53 |
| RS EPRE setting for test point 1 (dBm/15kHz) | -71 | -63 |
| RS EPRE setting for test point 2 (dBm/15kHz) | -86 | -78 |

#### 6.5.2.1E.1.4.2 Test procedure

Same test procedure as in clause 6.5.2.1E.1.4.2.

#### 6.5.2.1E.1.4.3 Message contents

Same message contents as in clause 6.5.2.1E.1.4.3.

### 6.5.2.1E.1.5 Test requirement

The PUSCH EVM derived in E.4.2 shall not exceed 17,5 % for QPSK and BPSK, 12,5% for 16 QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in E.4.6.2 shall not exceed [17,5 %] when embedded with data symbols of QPSK and BPSK, [12,5%] for 16 QAM.

The PUCCH EVM and derived in E.5.9.2 shall not exceed 17,5 %.

The PRACH EVM derived in FFS shall not exceed 17.5%.

## 6.5.2.1E.2 PUSCH-EVM with exclusion period for UE category 0

### 6.5.2.1E.2.1 Test purpose

Same test purpose as in clause 6.5.2.1A.1

### 6.5.2.1E.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.5.2.1E.2.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.5.2.1A.3

### 6.5.2.1E.2.4 Test description

#### 6.5.2.1E.2.4.1 Initial conditions

Same initial conditions as in clause 6.5.2.1.2.4.1 with following exceptions for HD-FDD:

- Instead of Table 6.5.2.1.2.4.1-1 → use Table 6.5.2.1E.2.4.1-1.
- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.5.2.1E.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal Conditions | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 10 MHz | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 10MHz | | QPSK | Alternating 12 and 1 (as shown in Figure 6.5.2.1E.2.4.2-1) | Alternating 12 and 1 (as shown in Figure 6.5.2.1E.2.4.2-1) |
| 10MHz | | 16 QAM | Alternating 5 and 1 (as shown in Figure 6.5.2.1E.2.4.2-1) | Alternating 5 and 1 (as shown in Figure 6.5.2.1E.2.4.2-1) |

### 6.5.2.1E.2.4.2 Test procedure

The test pattern is illustrated in figure 6.5.2.1E.2.4.2-1.

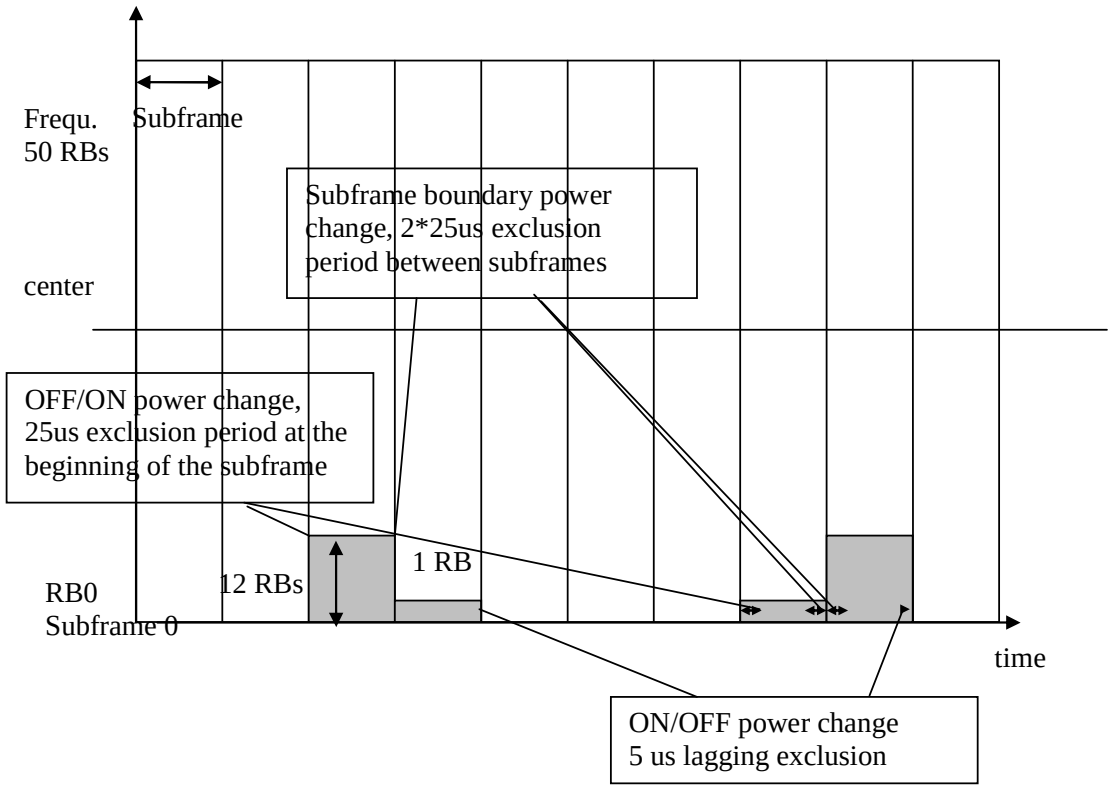



**Figure 6.5.2.1E.2.4.2-1: Test pattern**

NOTE 1: In TDD the free subframes are special subframes or DL, in FDD the free subframes are OFF.

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the PUSCH... Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The initial uplink RB allocation is 12 or 5. Send appropriate TPC commands for PUSCH to the UE to ensure the UE transmits PUSCH at 0dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 0dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2. Schedule the UE's PUSCH data transmission as described in Figure 6.5.2.1E.2.4.2-1 for 16[1)] active time slots with an uplink RB allocation alternating pattern as described in table 6.5.2.1E.2.4.1-1 while transmitting 0dB TPC command for PUSCH via the PDCCH.

3. Measure the EVM using Global In-Channel Tx-Test. The averaging across 16[1)] timeslots is done across mixed RB allocations, as illustrated in Figure 6.5.2.1E.2.4.2-1

NOTE 2: Averaging across 16 timeslots is used to represent each type of transition equally in the average.

### 6.5.2.1E.2.5 Test requirement

The PUSCH EVM derived in Annex E.4.2 taking into account Annex E.7 shall not exceed 17,5 % for QPSK and 12,5% for 16 QAM. The test requirements shall be fulfilled for early and late EVM window.

## 6.5.2.1EA Error Vector Magnitude (EVM) for UE category M1

### 6.5.2.1EA.1 Error Vector Magnitude (EVM) for UE category M1

#### 6.5.2.1EA.1.1 Test Purpose

Same test purpose as in clause 6.5.2.1.1.

#### 6.5.2.1EA.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

#### 6.5.2.1EA.1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.5.2.1.3.

#### 6.5.2.1EA.1.4 Test description

##### 6.5.2.1EA.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands . All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.1EA.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.1EA.1.4.1-1: Test Configuration Table for PUSCH**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | NC | | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | Low range, Mid range, High range | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | 5MHz | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for PUSCH EVM testing | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowb and index[1] |
| 5MHz | | QPSK | 6 | 6 | 0 |
| 5MHz | | QPSK | 1 (Note 3), 3 (Note 4) | 1 (Note 3), 3 (Note 4) | 0 |
| 5MHz | | 16QAM | 5 | 5 | 0 |
| 5MHz | | 16QAM | 1 (Note 3), 3 (Note 4) | 1 (Note 3), 3 (Note 4) | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: For partial RB allocation, the $RB_{start}$ shall be RB #0 and RB# (6 - RB allocation) of the channel bandwidth.<br>Note 3: Only applicable for Power class 3<br>Note 4: Only applicable for Power class 5 | | | | | |

**Table 6.5.2.1EA.1.4.1-2: Test Configuration Table for PUCCH**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | |
| Test Frequencies as specified in **TS36.508 [7] subclause 4.3.1** | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | 5MHz | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | **Downlink Configuration** | | | | **Uplink Configuration** |
| Ch BW | Mod'n | RB allocation | | | FDD and HD-FDD: PUCCH format = Format 1a<br>TDD: PUCCH format = Format 1a / 1b |
| | | FDD | TDD | Narrowband index[2] | |
| 5MHz | QPSK | 4 | 4 | 0 | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4.<br>Note 3: The $RB_{start}$ of partial RB allocation can be either RB#0 or RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.5.2.1EA.1.4.1-3: Test Configuration for PRACH**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | NC | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | 5MHz, 15MHz | |
| PRACH preamble format | | |
| | FDD and HD-FDD | TDD |
| PRACH Configuration Index | 4 | 53 |
| RS EPRE setting for test point 1 (dBm/15kHz) | -71 | -63 |
| RS EPRE setting for test point 2 (dBm/15kHz) | -86 | -78 |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to in Table 6.5.2.1EA.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.5.2.1EA.4.3.

### 6.5.2.1EA.1.4.2 Test procedure

Test procedure for PUSCH:

1.1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.5.2.1EA.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

1.2 Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX\ level}$.

1.3 Measure the EVM and $\overline{EVM}_{DMRS}$ using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency.

1.4 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is –36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.5 Measure the EVM and $\overline{EVM}_{DMRS}$ using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency.

Test procedure for PUCCH:

2.1 PUCCH are set according to Table 6.5.2.1EA.4.1-2.

2.2 SS transmits PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 6.5.2.1EA.4.1-2. The SS sends downlink MAC padding bits on the DL RMC. The transmission of PDSCH will make the UE send uplink ACK/NACK using PUCCH. There is no PUSCH transmission.

2.3 SS send appropriate TPC commands for PUCCH to the UE until the UE transmit PUCCH at $P_{UMAX}$ level.

2.4 Measure PUCCH EVM using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency.

2.5 Send the appropriate TPC commands for PUCCH to the UE until the UE transmits PUCCH at -36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.6 Measure PUCCH EVM using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency.

Test procedure for PRACH:

3.1 The SS shall set RS EPRE according to Table 6.5.2.1EA.4.1-3.

3.2 PRACH is set according to Table 6.5.2.1EA.4.1-3.

3.3 The SS shall signal a Random Access Preamble ID via a MPDCCH order to the UE and initiate a Non-contention based Random Access procedure

3.4 The UE shall send the signalled preamble to the SS.

3.5 In response to the preamble, the SS shall transmit a random access response not corresponding to the transmitted random access preamble, or send no response.

3.6 The UE shall consider the random access response reception not successful then re-transmit the preamble with the calculated PRACH transmission power.

3.7 Repeat step 5 and 6 until the SS collect enough PRACH preambles (2 preambles for format 0 and 10 preambles for format 4). Measure the EVM in PRACH channel using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency.

### 6.5.2.1EA.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA and the following exceptions:

**Table 6.5.2.1EA.4.3-1: *PRACH-Config-DEFAULT*: PRACH EVM measurement for FDD**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-7 PRACH-Config-DEFAULT | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| PRACH-ConfigInfo SEQUENCE { | | | |
| prach-ConfigIndex | 4 | | |

**Table 6.5.2.1EA.4.3-2: *PRACH-ConfCommonDEFAULT*: PRACH EVM measurement for TDD**

| Derivation Path: TS 36.508 [7] clause 5.3.1, Table 5.3.1-3 PRACH-Config-DEFAULT | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| PRACH-ConfigInfo SEQUENCE { | | | |
| prach-ConfigIndex | 53 | | |

**Table 6.5.2.1EA.4.3-4: *RACH-ConfigCommon-DEFAULT:* PRACH EVM measurement**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-12 RACH-ConfigCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon-DEFAULT ::= SEQUENCE { | | | |
| preambleInfo SEQUENCE { | | | |
| numberOfRA-Preambles | n52 | | |
| preamblesGroupAConfig SEQUENCE {} | Not present | | |
| } | | | |
| powerRampingParameters SEQUENCE { | | | |
| powerRampingStep | dB0 | | |
| preambleInitialReceivedTargetPower | dBm-120 Test point 1<br>dBm-90 Test point 2 | | |
| } | | | |
| ra-SupervisionInfo SEQUENCE { | | | |
| preambleTransMax | n10 | | FDD |
| | n20 | | TDD |
| ra-ResponseWindowSize | Sf10 | | |
| mac-ContentionResolutionTimer | sf48 | | |
| } | | | |
| ra-SupervisionInfo SEQUENCE { | | | |

**Table 6.5.2.1EA.4.3-5: *TDD-Config-DEFAULT:* PRACH EVM measurement for TDD**

| Derivation Path: TS 36.508 [7] clause 5.3.1, Table 5.3.1-1: TDD-Config-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp5 | To enable two symbol UpPTS, and to have 9 symbols GP. | |
| } | | | |

### 6.5.2.1EA.1.5 Test requirement

The PUSCH EVM derived in E.4.2 shall not exceed 17,5 % for QPSK and BPSK, 12,5% for 16 QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in E.4.6.2 shall not exceed [17,5 %] when embedded with data symbols of QPSK and BPSK, [12,5%] for 16 QAM.

The PUCCH EVM and derived in E.5.9.2 shall not exceed 17,5 %.

The PRACH EVM derived in FFS shall not exceed 17.5%.

## 6.5.2.1EA.2 PUSCH-EVM with exclusion period for UE category M1

### 6.5.2.1EA.2.1 Test purpose

Same test purpose as in clause 6.5.2.1A.1

### 6.5.2.1EA.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

### 6.5.2.1EA.2.3 Minimum conformance requirement

Same minimum conformance requirements as in clause 6.5.2.1A.3

### 6.5.2.1EA.2.4 Test description

#### 6.5.2.1EA.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.1EA.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.1EA.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal Conditions | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| 5MHz | | QPSK | Alternating 6 and 1 (as shown in Figure 6.5.2.1EA.2.4.2-1) and 6.5.2.1EA.2.4.2-2 | Alternating 6 and 1 (as shown in Figure 6.5.2.1EA.2.4.2-1) | 0 |
| 5MHz | | 16 QAM | Alternating 5 and 1 (as shown in Figure 6.5.2.1EA.2.4.2-1) and 6.5.2.1EA.2.4.2-2 | Alternating 5 and 1 (as shown in Figure 6.5.2.1EA.2.4.2-1) | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4 | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to in Table 6.5.2.1EA.4.1-1.
5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.5.2.1EA.4.3.

### 6.5.2.1EA.2.4.2 Test procedure

The test pattern is illustrated in figure 6.5.2.1EA.2.4.2-1 and 6.5.2.1EA.2.4.2-2.

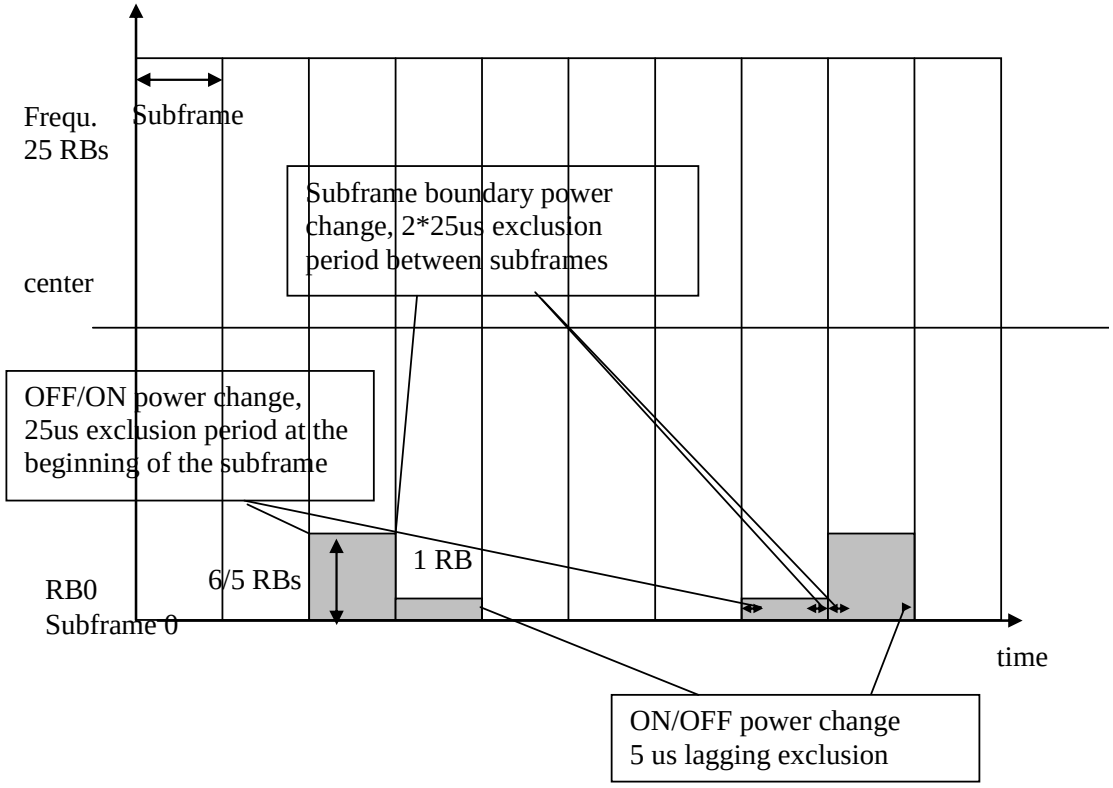



**Figure 6.5.2.1EA.2.4.2-1: Test pattern for FDD and TDD**

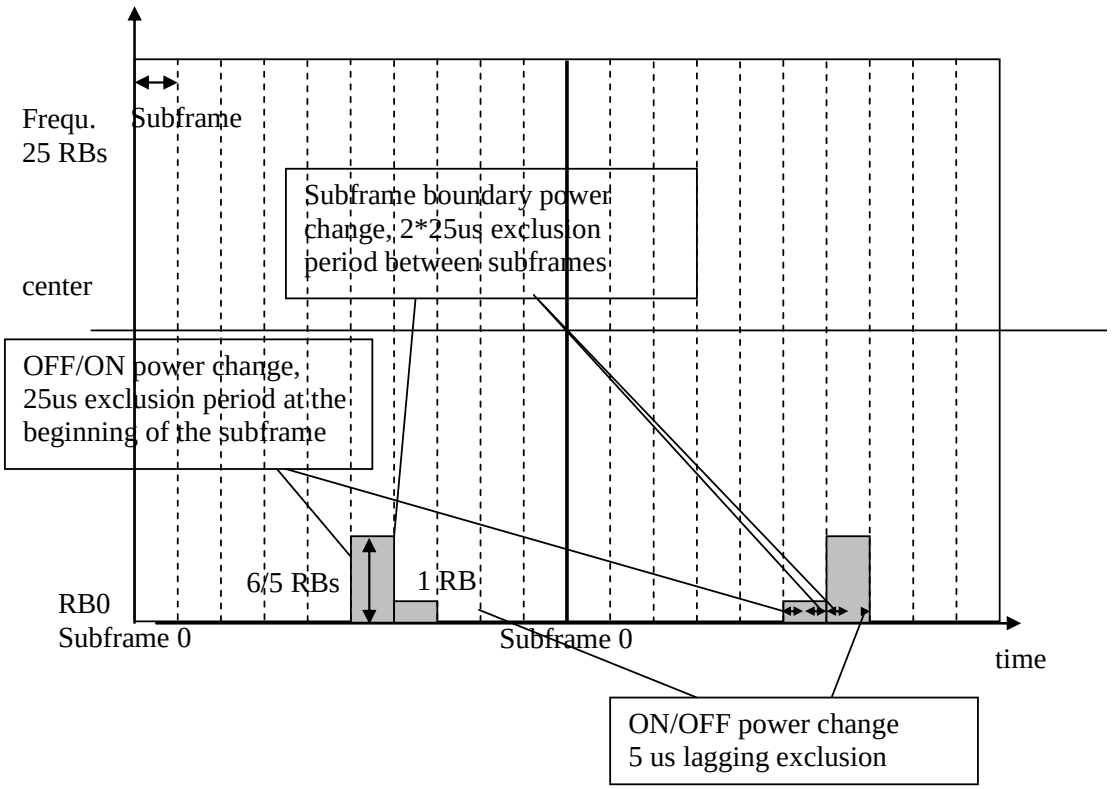



**Figure 6.5.2.1EA.2.4.2-2: Test pattern for HD-FDD**

NOTE 1: In TDD the free subframes are special subframes or DL, in FDD and HD-FDD the free subframes are OFF.

1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the PUSCH. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The initial uplink RB allocation is 6 or 5. Send appropriate TPC commands for PUSCH to the UE to ensure the UE transmits PUSCH at 0dBm ±3.2dB for carrier frequency $f \leq 3.0$GHz or 0dBm ±3.5 dB for carrier frequency 3.0GHz $< f \leq$ 4.2GHz.

2. Schedule the UE's PUSCH data transmission as described in Figure 6.5.2.1EA.2.4.2-1 and 6.5.2.1EA.2.4.2-2 for 16[1)] active time slots with an uplink RB allocation alternating pattern as described in table 6.5.2.1EA.2.4.1-1 while transmitting 0dB TPC command for PUSCH via the MPDCCH.

3. Measure the EVM using Global In-Channel Tx-Test according to the UE's declaration on the position of carrier centre frequency. The averaging across 16[1)] timeslots is done across mixed RB allocations, as illustrated in Figure 6.5.2.1EA.2.4.2-1 and 6.5.2.1EA.2.4.2-2.

NOTE 1: Averaging across 16 timeslots is used to represent each type of transition equally in the average.

### 6.5.2.1EA.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA.

#### 6.5.2.1EA.2.5 Test requirement

The PUSCH EVM derived in Annex E.4.2 taking into account Annex E.7 shall not exceed 17,5 % for QPSK and 12,5% for 16 QAM. The test requirements shall be fulfilled for early and late EVM window.

### 6.5.2.1EB Error Vector Magnitude (EVM) for UE category

### 6.5.2.1EB.1 Test purpose

Same test purpose as in clause 6.5.2.1.

### 6.5.2.1EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

### 6.5.2.1EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.5.2.1.3.

### 6.5.2.1EB.4 Test description

#### 6.5.2.1EB.4.1 Initial conditions

Same initial conditions as in clause 6.5.2.1.4.1 with the following exception:

- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.5.2.1EB.4.2 Test procedure

Same test procedure as in clause 6.5.2.1.4.2.

#### 6.5.2.1EB.4.3 Message contents

Same message contents as in clause 6.5.2.1.4.3.

### 6.5.2.1EB.5 Test requirement

The PUSCH EVM derived in E.4.2 shall not exceed 17,5 % for QPSK and BPSK, 12,5% for 16 QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in E.4.6.2 shall not exceed 17,5 % when embedded with data symbols of QPSK and BPSK, 12,5% for 16 QAM.

The PUCCH EVM and derived in E.5.9.2 shall not exceed 17,5 %.

The PRACH EVM derived in FFS shall not exceed 17.5%.

### 6.5.2.1F.1 Error Vector Magnitude (EVM) for category NB1 and NB2

#### 6.5.2.1F.1.1 Test Purpose

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Before calculating the EVM the measured waveform is corrected by the sample timing offset and RF frequency offset. Then the carrier leakage shall be removed from the measured waveform before calculating the EVM.

The measured waveform is further modified by selecting the absolute phase and absolute amplitude of the Tx chain. The EVM result is defined after the front-end IDFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %.

### 6.5.2.1F.1.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

### 6.5.2.1F.1.3 Minimum conformance requirements

The RMS average of the basic EVM measurements for $240/L_{Ctone}$ slots excluding any transient period for the average EVM case, where $L_{Ctone} = \{1, 3, 6, 12\}$ is the number of subcarriers for the NB-IoT transmission, for the different modulations schemes shall not exceed the values specified in Table 6.5.2.1F.1.3-1 for the parameters defined in Table 6.5.2.1F.1.3-2. For EVM evaluation purposes, both NPRACH formats are considered to have the same EVM requirement as QPSK modulated.

**Table 6.5.2.1F.1.3-1: Minimum requirements for Error Vector Magnitude**

| Parameter | Unit | Average EVM Level | Reference Signal EVM Level |
|---|---|---|---|
| BPSK or QPSK | % | 17.5 | 17.5 |

**Table 6.5.2.1F.1.3-2: Parameters for Error Vector Magnitude**

| Parameter | Unit | Level |
|---|---|---|
| UE Output Power | dBm | ≥ -40 |
| Operating conditions | | Normal conditions |

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2F.1.

### 6.5.2.1F.1.4 Test description

#### 6.5.2.1F.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.1F.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2.4. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex TBD.

**Table 6.5.2.1F.1.4.1-1: Test Configuration for NPUSCH**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 8.1.1 | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.1 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A | Modulation | $N_{tones}$, start position | Sub-carrier spacing (kHz) |
| 1 | | QPSK | 1@0 | 3.75 |
| 2 | | QPSK | 1@47 | 3.75 |
| 3 | | QPSK | 1@0 | 15 |
| 4 | | QPSK | 1@11 | 15 |
| 5 (Note 1) | | QPSK | 12@0 | 15 |
| Note 1: Applicable to UE supporting UL multi-tone transmissions | | | | |

**Table 6.5.2.1F.1.4.1-2: Test Configuration for NPRACH**

| Initial Conditions | |
|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 8.1.1) | Normal |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 8.1.3.1) | Frequency ranges defined in Annex K.1.1 |
| NPRACH preamble format | 1 |
| NRS EPRE setting for test point (dBm/15kHz) | -110 |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C, and uplink signals according to Annex H.
4. The UL Reference Measurement channels are set according to in Table 6.5.2.1F.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.5.2.1F.1.4.3.

### 6.5.2.1F.1.4.2 Test procedure

Test procedure for NPUSCH:

1.1. SS sends uplink scheduling information for UL HARQ process via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.1F.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

1.2 Configure the UE to transmit at $P_{UMAX\ level}$.

1.3 Measure the EVM and $\overline{EVM}_{DMRS}$ using Global In-Channel Tx-Test (Annex E). The measurement period of EVM for $240/N_{tones}$ slots should exclude any transient period for the average EVM case, where $N_{tones}$ = {1, 3, 6, 12} is the number of subcarriers for the NB-IoT transmission.

1.4 Release the connection through State 3A-NB.

1.5 Modify system information elements according to Table 6.5.2.1F.1.4.3-1 and Table 6.5.2.1F.1.4.3-2 and notify the UE via paging message with SystemInformationModification included (test point 2).

1.6 Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the new UL power control setting.

1.7 SS sends uplink scheduling information for UL HARQ process via NPDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.2F.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

1.8 Measure the EVM and $\overline{EVM}_{DMRS}$ using Global In-Channel Tx-Test (Annex E). The measurement period of EVM for $240/N_{tones}$ slots should exclude any transient period for the average EVM case, where $N_{tones}$ = {1, 3, 6, 12} is the number of subcarriers for the NB-IoT transmission.

Test procedure for NPRACH:

2.1 The SS shall set RS EPRE according to Table 6.5.2.1F.1.4.1-2.

2.2 NPRACH is set according to Table 6.5.2.1F.1.4.1-2.

2.3 The UE shall send a preamble to the SS.

2.4 In response to the preamble, the SS shall transmit a random access response not corresponding to the transmitted random access preamble, or send no response.

2.5 The UE shall consider the random access response reception not successful then re-transmit the preamble with the calculated NPRACH transmission power.

2.6 Repeat step 4 and 5 until the SS collect enough NPRACH preambles (64 preambles). Measure the EVM in NPRACH channel using Global In-Channel Tx-Test (Annex E).

NOTE 1: For configuration IDs applicable to UE depending on UE capability in Test Configuration Table with different UL sub-carrier spacing, the SS shall release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the appropriate UL subcarrier spacing in Random Access Response message.

#### 6.5.2.1F.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 with the following exceptions:

**Table 6.5.2.1F.1.4.3-1: P0-NominalNPUSCH-r13 configuration for test point 2**

| Derivation Path: 36.508 clause 8.1.6.3 Table 8.1.6.3-14: UplinkPowerControlCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalNPUSCH-r13 | -117 (dBm) | | |
| alpha-r13 | al1 (1) | | |
| deltaPreambleMsg3-r13 | 4 | | |
| } | | | |

**Table 6.5.2.1F.1.4.3-2: NPDSCH-ConfigCommon-NB-DEFAULT configuration for test point 2**

| Derivation Path: 36.508 clause 8.1.6.3 Table 8.1.6.3-4: NPDSCH-ConfigCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPDSCH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| nrs-Power-r13 | 21 (dBm) | | |
| } | | | |

**Table 6.5.2.1F.1.4.3-3: RACH-ConfigCommon-NB-DEFAULT for test point 2**

| Derivation Path: TS 36.508 [7] clause 8.1.6, Table 8.1.6.3-8 RACH-ConfigCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RACH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| powerRampingParameters-r13 SEQUENCE { | | | |
| powerRampingStep | dB0 | 0 dB | |
| } | | | |
| ) | | | |

### 6.5.2.1F.1.5 Test requirement

The NPUSCH EVM derived in E.8.1 shall not exceed 17,5% for BPSK and QPSK.

The NPUSCH $\overline{EVM}_{DMRS}$ derived in E.8.2 shall not exceed 17,5 % when embedded with data symbols of BPSK and QPSK.

The NPRACH EVM derived in E.8.3 shall not exceed 17.5%.

## 6.5.2.1G Error Vector Magnitude (EVM) for V2X Communication

### 6.5.2.1G.0 Minimum conformance requirements

For V2X physical channels PSCCH, PSSCH and PSBCH, the Error Vector Magnitude requirements shall be as specified for PUSCH in subclause 6.5.2.1 for the corresponding modulation and transmission bandwidth.

For V2X sidelink physical channels PSCCH, PSSCH and PSBCH, the Error Vector Magnitude requirements shall be as specified separately for PSSCH and PSCCH for the corresponding modulation and transmission bandwidth. The measurement period for EVM of PSSCH and PSCCH is 15 subframes. The measurement period for reference signal EVM is 30 subframes. When V2X transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the EVM measurement interval is reduced by one symbol, accordingly.

For PSBCH the duration over which EVM is averaged shall be 24 subframes.

For intra-band contiguous multi-carrier operation the EVM requirement shall apply for each component carrier.

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-2, the requirements in subclause 6.5.2.1G.0 apply for V2X sidelink transmission and the requirements in subclause 6.5.2.1.3 apply for the E-UTRA uplink transmission.

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2G and 6.5.2G.1.

### 6.5.2.1G.1 Error Vector Magnitude (EVM) for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

#### 6.5.2.1G.1.1 Test Purpose

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Before calculating the EVM the measured waveform is corrected by the sample timing offset and RF frequency offset. Then the carrier leakage shall be removed from the measured waveform before calculating the EVM.

The measured waveform is further modified by selecting the absolute phase and absolute amplitude of the Tx chain. The EVM result is defined after the front-end IDFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %.

#### 6.5.2.1G.1.2 Test applicability

This test case applies to all types of UE that supports V2X Sidelink communication and Band 47.

#### 6.5.2.1G.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2.1G.0.

#### 6.5.2.1G.1.4 Test description

##### 6.5.2.1G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies and channel bandwidth based on E-UTRAN operating bands specified in subclause 5.4.2G. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.1G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.5.2.1G.1.4.1-1: Test Configuration Table for PSSCH and PSCCH**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | PSSCH RB allocation |
| 10 MHz | QPSK | 48 |
| 10 MHz | 16QAM | 48 |
| 20 MHz | QPSK | 96 |
| 20 MHz | 16QAM | 96 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in specified in subclause 5.4.2G. | | |

**Table 6.5.2.1G.1.4.1-2: Test Configuration Table for PSBCH**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **PSBCH Configuration** | |
| Ch BW | Modulation | PSBCH RB allocation |
| 10 MHz | QPSK | 6 |
| 20 MHz | QPSK | 6 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in specified in subclause 5.4.2G. | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 for both SS and UE are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.5.2.1G.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.5.2G.1.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0;
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.5.2.1G.1.4.2 Test procedure

Test procedure for PSSCH and PSCCH:

1.1 The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.

1.2 Configure the UE to transmit at $P_{UMAX\ level}$.

1.3 Measure the EVM using Global In-Channel Tx-Test (Annex E). The measurement period is 15 subframes. When V2X transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the EVM measurement interval is reduced by one symbol, accordingly.

1.4 Modify SL-V2X-Preconfiguration to ensure the UE to transmit at a relative low power, according to Table 6.5.2.1G.1.4.3-2.

1.5 Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9 using the new UL power control setting.

1.6 The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.

1.7 Measure the EVM using Global In-Channel Tx-Test (Annex E). The measurement period is 15 subframes. When V2X transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the EVM measurement interval is reduced by one symbol, accordingly.

Test procedure for PSBCH:

2.1 The UE starts to perform the V2X PSBCH/SLSS transmission according to SL-V2X-Preconfiguration every 40 subframes. The synchronization configuration of UE is according to Table 6.5.2.1G.1.4.3-3.

2.2 Configure the UE to transmit at $P_{UMAX\ level}$.

2.3 Measure the EVM using Global In-Channel Tx-Test (Annex E) until the SS collect 24 subframes of PSBCH. When V2X transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the EVM measurement interval is reduced by one symbol, accordingly.

2.4 Modify SL-V2X-Preconfiguration to ensure the UE to transmit at a relative low power, according to Table 6.5.2.1G.1.4.3-3 and Table 6.5.2.1G.1.4.3-4.

2.5 Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9 using the new UL power control setting.

2.6 The UE starts to perform the V2X PSBCH/SLSS transmission according to SL-V2X-Preconfiguration every 40 subframes.

2.7 Measure the EVM using Global In-Channel Tx-Test (Annex E) until the SS collect 24 subframes of PSBCH. When V2X transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the EVM measurement interval is reduced by one symbol, accordingly.

### 6.5.2.1G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.5.2.1G.1.4.3-1: *SL-V2X-PreconfigCommPool-r14* configuration for PSSCH/PSCCH test point 1 and 2**

| Derivation Path: 36.508 Table 4.6.3-20J | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigCommPool-r14-DEFAULT ::= SEQUENCE { | | | |
| sizeSubchannel-r14 | n50 | | BW10 |
| | n100 | | BW20 |
| numSubchannel-r14 | n1 | | |
| } | | | |

| Condition | Explanation |
|---|---|
| BW10 | 10 MHz channel bandwidth cell environment |
| BW20 | 20 MHz channel bandwidth cell environment |

**Table 6.5.2.1G.1.4.3-2: *maxTxPower* configuration for PSSCH/PSCCH test point 2**

| Derivation Path: 36.508 Table 4.6.3-20K | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | | |
| maxTxPower-r12 | -30 | | |
| } | | | |
| } | | | |

**Table 6.5.2.1G.1.4.3-3: *synConfig* configuration for PSBCH test point 1 and 2**

| Derivation Path: 36.508 Table 4.6.3-20K | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-CommPreconfigSync-r14 SEQUENCE { | | | |
| syncOffsetIndicators-r14 SEQUENCE { | | | |
| syncOffsetIndicator1-r14 | 0 | | |
| syncOffsetIndicator2-r14 | 50 | | |
| syncOffsetIndicator3-r14 | Not present | | |
| } | | | |
| syncTxParameters-r14 | 31dBm | | |
| syncTxThreshOoC-r14 | 4 | -90dBm | |
| filterCoefficient-r14 | fc2 | | |
| syncRefMinHyst-r14 | dB6 | | |
| syncRefDiffHyst-r14 | dB6 | | |
| } | | | |
| } | | | |

**Table 6.5.2.1G.1.4.3-4: *maxTxPower* configuration for PSBCH test point 2**

| Derivation Path: 36.508 Table 4.6.3-20K | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | | |
| maxTxPower-r12 | -30 | | |
| } | | | |
| } | | | |

### 6.5.2.1G.1.5 Test requirement

The PSSCH EVM derived in E.9 shall not exceed 17.5% for QPSK, 12.5% for 16 QAM.

The PSCCH EVM and derived in E.9 shall not exceed 17.5%.

The PSBCH EVM derived in FFS shall not exceed 17.5%.

## 6.5.2.1G.2 Error Vector Magnitude (EVM) for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Applicability spec is left to be updated.

### 6.5.2.1G.2.1 Test Purpose

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Before calculating the EVM the measured waveform is corrected

by the sample timing offset and RF frequency offset. Then the carrier leakage shall be removed from the measured waveform before calculating the EVM.

The measured waveform is further modified by selecting the absolute phase and absolute amplitude of the Tx chain. The EVM result is defined after the front-end IDFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %.

#### 6.5.2.1G.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-2.

#### 6.5.2.1G.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2.1G.0.

#### 6.5.2.1G.2.4 Test description

##### 6.5.2.1G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on Inter-band con-current V2X configurations specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.5.2.1G.2.4.1-1 to Table 6.5.2.1G.2.4.1-2. The details of the uplink and V2X reference measurement channels (RMCs) are specified in Annexes A.2 and A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.1G.2.4.1-1: Test Configuration Table for PUSCH, PSSCH and PSCCH**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | NC | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in 5.4.2G | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink** | **Uplink Configuration** | | **V2X Configuration PSSCH and PSCCH** | | |
| Ch BW | N/A for EVM test case | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4MHz | | QPSK | 6 | 10 MHz | QPSK | 48@2 |
| 1.4MHz | | QPSK | 1 | 10 MHz | 16QAM | 48@2 |
| 1.4MHz | | 16QAM | 6 | 20 MHz | QPSK | 96@2 |
| 1.4MHz | | 16QAM | 1 | 20 MHz | 16QAM | 96@2 |
| 3MHz | | QPSK | 15 | | | |
| 3MHz | | QPSK | 4 | | | |
| 3MHz | | 16QAM | 15 | | | |
| 3MHz | | 16QAM | 4 | | | |
| 5MHz | | QPSK | 25 | | | |
| 5MHz | | QPSK | 8 | | | |
| 5MHz | | 16QAM | 25 | | | |
| 5MHz | | 16QAM | 8 | | | |
| 10MHz | | QPSK | 50 | | | |
| 10MHz | | QPSK | 12 | | | |
| 10MHz | | 16QAM | 50 (Note 3) | | | |
| 10MHz | | 16QAM | 12 | | | |
| 15MHz | | QPSK | 75 | | | |
| 15MHz | | QPSK | 16 | | | |
| 15MHz | | 16QAM | 75 (Note 3) | | | |
| 15MHz | | 16QAM | 16 | | | |
| 20MHz | | QPSK | 100 | | | |
| 20MHz | | QPSK | 18 | | | |
| 20MHz | | 16QAM | 100 (Note 3) | | | |
| 20MHz | | 16QAM | 18 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | |
| Note 2: For partial RB allocation of E-UTRA carrier, the $RB_{start}$ shall be RB #0 and RB# (max+1 - RB allocation) of the channel bandwidth. | | | | | | |
| Note 3: Applies only for UE-Categories ≥2 | | | | | | |

**Table 6.5.2.1G.2.4.1-2: Test Configuration Table for PSBCH**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | NC | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in 5.4.2G | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink** | **Uplink Configuration** | | **V2X Configuration PSBCH** | | |
| Ch BW | N/A for EVM test case | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4MHz | | QPSK | 6 | 10 MHz | QPSK | 6 |
| 1.4MHz | | QPSK | 1 | 20 MHz | QPSK | 6 |
| 1.4MHz | | 16QAM | 6 | | | |
| 1.4MHz | | 16QAM | 1 | | | |
| 3MHz | | QPSK | 15 | | | |
| 3MHz | | QPSK | 4 | | | |
| 3MHz | | 16QAM | 15 | | | |
| 3MHz | | 16QAM | 4 | | | |
| 5MHz | | QPSK | 25 | | | |
| 5MHz | | QPSK | 8 | | | |
| 5MHz | | 16QAM | 25 | | | |
| 5MHz | | 16QAM | 8 | | | |
| 10MHz | | QPSK | 50 | | | |
| 10MHz | | QPSK | 12 | | | |
| 10MHz | | 16QAM | 50 (Note 3) | | | |
| 10MHz | | 16QAM | 12 | | | |
| 15MHz | | QPSK | 75 | | | |
| 15MHz | | QPSK | 16 | | | |
| 15MHz | | 16QAM | 75 (Note 3) | | | |
| 15MHz | | 16QAM | 16 | | | |
| 20MHz | | QPSK | 100 | | | |
| 20MHz | | QPSK | 18 | | | |
| 20MHz | | 16QAM | 100 (Note 3) | | | |
| 20MHz | | 16QAM | 18 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | |
| Note 2: For partial RB allocation of E-UTRA carrier, the $RB_{start}$ shall be RB #0 and RB# (max+1 - RB allocation) of the channel bandwidth. | | | | | | |
| Note 3: Applies only for UE-Categories ≥2 | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X reference measurement channels are set according to Table 6.5.2.1G.2.4.1-1 to Table 6.5.2.1G.2.4.1-2.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 6.5.2.1G.2.4.3.

### 6.5.2.1G.2.4.2 Test procedure

Test procedure for PUSCH, PSSCH and PSCCH:

1.1 The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.5.2.1G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.

1.2 Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX}$ level for the duration of the test. Configure the UE to transmit PSCCH and PSSCH with the $P_{UMAX}$ level.

1.3 Measure the EVM using Global In-Channel Tx-Test (Annex E). The measurement period for EVM of PUSCH is according to 6.5.2.1. The measurement period for EVM of PSSCH and PSCCH is according to 6.5.2.1G.1.

1.4 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE uplink output power is –36.8dBm ±3.2dB for carrier frequency $f \leq 3.0$GHz. Configure the UE to transmit PSCCH and PSSCH with a relative low power according to Table 6.5.2.1G.2.4.3-2.

1.5 Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C using the new UL power control setting.

1.6 The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.5.2.1G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.

1.7Measure the EVM using Global In-Channel Tx-Test (Annex E). The measurement period for EVM of PUSCH is according to 6.5.2.1. The measurement period for EVM of PSSCH and PSCCH is according to 6.5.2.1G.1.

Test procedure for PUSCH and PSBCH:

2.1 The UE starts to perform the V2X PSBCH/SLSS transmission according to SL-V2X-Configuration every 40 subframes. The synchronization configuration of UE is according to Table 6.5.2.1G.2.4.3-3.

2.2 Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX}$ level for the duration of the test. Configure the UE to transmit PSBCH with the $P_{UMAX}$ level.

2.3 Measure the EVM using Global In-Channel Tx-Test (Annex E). The measurement period for EVM of PUSCH is according to 6.5.2.1. The measurement period for EVM of PSBCH is according to 6.5.2.1G.1.

2.4 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE uplink output power is –36.8dBm ±3.2dB for carrier frequency $f \leq 3.0$GHz. Configure the UE to transmit PSBCH with a relative low power according to Table 6.5.2.1G.2.4.3-3 and Table 6.5.2.1G.2.4.3-4.

2.5 Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C using the new UL power control setting.

2.6 The UE starts to perform the V2X PSBCH/SLSS transmission according to SL-V2X-Configuration every 40 subframes.

2.7 Measure the EVM using Global In-Channel Tx-Test (Annex E). The measurement period for EVM of PUSCH is according to 6.5.2.1. The measurement period for EVM of PSBCH is according to 6.5.2.1G.1.

#### 6.5.2.1G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.5.2.1G.2.4.3-1: *SL-CommResourcePoolV2X-r14* configuration for PSSCH/PSCCH test point 1 and 2**

| Derivation Path: 36.508 [7] Table 4.6.3-20C | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResourcePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| sizeSubchannel-r14 | n50 | | BW10 |
| | n100 | | BW20 |
| numSubchannel-r14 | n1 | | |
| } | | | |

| Condition | Explanation |
|---|---|
| BW10 | 10 MHz channel bandwidth cell environment |
| BW20 | 20 MHz channel bandwidth cell environment |

**Table 6.5.2.1G.2.4.3-2: sl-*MaxTxPower* configuration for PSSCH/PSCCH test point 2**

| Derivation Path: 36.508 [7] Table 4.6.3-20E | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-InterFreqInfoV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-MaxTxPower-r14 | -30 | | |
| } | | | |

**Table 6.5.2.1G.2.4.3-3: *synConfig* configuration for PSBCH test point 1 and 2**

| Derivation Path: 36.508 [7] Table 4.6.3-20I | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-InterFreqUE-Config-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-SyncConfig-r14 SEQUENCE { | | | |
| asyncParameters-r13 SEQUENCE { | | | |
| syncOffsetIndicator-r12 | 0 | | |
| } | | | |
| syncOffsetIndicator2-r14 | 50 | | |
| syncOffsetIndicator3-r14 | Not present | | |
| txParameters-r13 SEQUENCE { | | | |
| syncTxParameters-r13 | | | |
| alpha-r12 | al0 | | |
| p0-r12 | 31 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.2.1G.2.4.3-4: sl-*MaxTxPower* configuration for PSBCH test point 2**

| Derivation Path: 36.508 [7] Table 4.6.3-20E | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-InterFreqInfoV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-MaxTxPower-r14 | -30 | | |
| } | | | |

### 6.5.2.1G.2.5 Test requirement

The PUSCH EVM derived in E.4.2 shall not exceed 17.5 % for QPSK, 12.5% for 16 QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in E.4.6.2 shall not exceed 17.5 % when embedded with data symbols of QPSK, 12.5% for 16 QAM.

The PSSCH EVM derived in E.9.1 shall not exceed 17.5% for QPSK, 12.5% for 16 QAM.

The PSCCH EVM derived in E.9.1 shall not exceed 17.5%.

The PSBCH EVM derived in E.9.2 shall not exceed 17.5%.

### 6.5.2.1G.3 Error Vector Magnitude (EVM) for V2X Communication / Intra-band contiguous multi-carrier operation

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Applicability spec is left to be updated.

#### 6.5.2.1G.3.1 Test Purpose

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Before calculating the EVM the measured waveform is corrected by the sample timing offset and RF frequency offset. Then the carrier leakage shall be removed from the measured waveform before calculating the EVM.

The measured waveform is further modified by selecting the absolute phase and absolute amplitude of the Tx chain. The EVM result is defined after the front-end IDFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %.

#### 6.5.2.1G.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support Intra-band contiguous multi-carrier operation V2X Communication.

#### 6.5.2.1G.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2.1G.0.

#### 6.5.2.1G.3.4 Test description

##### 6.5.2.1G.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on V2X intra-band contiguous multi-carrier operation bands specified in Table 5.4.2G.1-4. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.5.2.1G.3.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annexes A.8.3 and reference GNSS configuration as defined in TS 36.508 [7] subclause 4.11.

**Table 6.5.2.1G.3.4.1-1: Test Configuration Table for PSSCH and PSCCH**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, Mid range , High range | |
| Test Channel Bandwidths as specified in subclause 5.4.2G | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for Channel Bandwidths** | | | |
| **V2X multi-carrier Configuration** | | **V2X PSSCH and PSCCH Configuration** | |
| **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **CC1 and CC2 RB Allocation** |
| 10MHz | 10MHz | QPSK | 48+48 |
| 10MHz | 10MHz | 16QAM | 48+48 |
| Note 1: Only one link has an upload RB allocation when testing EVM. | | | |

**Table 6.5.2.1G.3.4.1-2: Test Configuration Table for PSBCH**

| Initial Conditions | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, Mid range , High range | |
| Test Channel Bandwidths as specified in subclause 5.4.2G | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for Channel Bandwidths** | | | |
| **V2X multi-carrier Configuration** | | **V2X PSBCH Configuration** | |
| **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **CC1 and CC2 RB Allocation** |
| 10MHz | 10MHz | QPSK | 6+6 |
| Note 1: Only one link has an upload RB allocation when testing EVM. | | | |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, in Figure A.89a.

2. The parameter setting for the V2X sidelink transmission over PC5 is pre-configured according to TS 36.508[7] subclause 4.10.1.Message content exceptions are defined in clause 6.5.2.1G.3.4.3.

3. The V2X Reference Measurement Channels are set according to Table 6.5.2.1G.3.4.1-1

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.5.2.1G.3.4.2 Test procedure

Test procedure for PSSCH and PSCCH:

1.1 The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.

1.2 Configure the UE to transmit at $P_{UMAX\ level}$.

1.3 Measure the EVM using Global In-Channel Tx-Test (Annex E) for each component carrier. The measurement period is 15 subframes. When V2X transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the EVM measurement interval is reduced by one symbol, accordingly.

1.4 Modify SL-V2X-Preconfiguration to ensure the UE to transmit at a relative low power, according to Table 6.5.2.1G.3.4.3-2.

1.5 Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9 using the new UL power control setting.

1.6 The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.

1.7 Measure the EVM using Global In-Channel Tx-Test (Annex E) for each component carrier. The measurement period is 15 subframes. When V2X transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the EVM measurement interval is reduced by one symbol, accordingly.

Test procedure for PSBCH:

2.1 The UE starts to perform the V2X PSBCH/SLSS transmission according to SL-V2X-Preconfiguration every 40 subframes. The synchronization configuration of UE is according to Table 6.5.2.1G.3.4.3-3.

2.2 Configure the UE to transmit at $P_{UMAX}$ level.

2.3 Measure the EVM using Global In-Channel Tx-Test (Annex E) until the SS collect 24 subframes of PSBCH for each component carrier. When V2X transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the EVM measurement interval is reduced by one symbol, accordingly.

2.4 Modify SL-V2X-Preconfiguration to ensure the UE to transmit at a relative low power, according to Table 6.5.2.1G.3.4.3-3 and Table 6.5.2.1G.3.4.3-4.

2.5 Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9 using the new UL power control setting.

2.6 The UE starts to perform the V2X PSBCH/SLSS transmission according to SL-V2X-Preconfiguration every 40 subframes.

2.7 Measure the EVM using Global In-Channel Tx-Test (Annex E) until the SS collect 24 subframes of PSBCH for each component carrier. When V2X transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the EVM measurement interval is reduced by one symbol, accordingly.

### 6.5.2.1G.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.5.2.1G.3.4.3-1: *SL-V2X-PreconfigCommPool-r14* configuration for CC1 & CC2 PSSCH/PSCCH test point 1 and 2**

| Derivation Path: 36.508 [7] Table 4.6.3-20J | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigCommPool-r14-DEFAULT ::= SEQUENCE { | | | |
| sizeSubchannel-r14 | n50 | | $N_{RB_alloc} = 48$, |
| numSubchannel-r14 | n1 | | |
| syncAllowed-r14 ::= SEQUENCE { | | | |
| gnss-Sync-r14 | True | The resource of CC1 and CC2 can be used if the UE is directly or indirectly synchronized to GNSS | |
| } | | | |
| } | | | |

**Table 6.5.2.1G.3.4.3-2: *maxTxPower* configuration for CC1 & CC2 PSSCH/PSCCH test point 2**

| Derivation Path: 36.508 [7] Table 4.6.3-20K | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | | |
| maxTxPower-r12 | -30 | | |
| } | | | |
| } | | | |

**Table 6.5.2.1G.3.4.3-3: *synConfig* configuration for CC1 & CC2 PSBCH test point 1 and 2**

| Derivation Path: 36.508 [7] Table 4.6.3-20K | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-CommPreconfigSync-r14 SEQUENCE { | | | |
| syncOffsetIndicators-r14 SEQUENCE { | | | |
| syncOffsetIndicator1-r14 | 0 | | |
| syncOffsetIndicator2-r14 | 50 | | |
| syncOffsetIndicator3-r14 | Not present | | |
| } | | | |
| syncTxParameters-r14 | 31dBm | | |
| syncTxThreshOoC-r14 | 4 | -90dBm | |
| filterCoefficient-r14 | fc2 | | |
| syncRefMinHyst-r14 | dB6 | | |
| syncRefDiffHyst-r14 | dB6 | | |
| } | | | |
| } | | | |

**Table 6.5.2.1G.3.4.3-4: *maxTxPower* configuration for CC1 & CC2 PSBCH test point 2**

| Derivation Path: 36.508 [7] Table 4.6.3-20K | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | | |
| maxTxPower-r12 | -30 | | |
| } | | | |
| } | | | |

### 6.5.2.1G.3.5 Test requirement

The PSSCH EVM derived in E.9.1 shall not exceed 17.5% for QPSK, 12.5% for 16 QAM.

The PSCCH EVM and derived in E.9.1 shall not exceed 17.5%.

The PSBCH EVM derived in E.9.2 shall not exceed 17.5%.

## 6.5.2.2 Carrier leakage

### 6.5.2.2.1 Test Purpose

Carrier leakage expresses itself as unmodulated sine wave with the carrier frequency or centre frequency of aggregated transmission bandwidth configuration. It is an interference of approximately constant amplitude and independent of the amplitude of the wanted signal. Carrier leakage interferes with the centre sub carriers of the UE under test (if allocated), especially, when their amplitude is small. The measurement interval is defined over one slot in the time domain.

The purpose of this test is to exercise the UE transmitter to verify its modulation quality in terms of carrier leakage.

### 6.5.2.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 8 and forward.

### 6.5.2.2.3 Minimum conformance requirements

The relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. The relative carrier leakage power shall not exceed the values specified in Table 6.5.2.2.3-1 or 6.5.2.2.3-2.

**Table 6.5.2.2.3-1: Minimum requirements for Relative Carrier Leakage Power for UE supporting Rel-8 to Rel-10**

| LO Leakage | Parameters | Relative Limit (dBc) |
|---|---|---|
| | Output power >0 dBm | -25 |
| | -30 dBm ≤ Output power ≤0 dBm | -20 |
| | -40 dBm ≤ Output power < -30 dBm | -10 |

**Table 6.5.2.2.3-2: Minimum requirements for Relative Carrier Leakage Power for UE supporting Rel.11 and higher**

| Parameters | Relative limit (dBc) | Applicable frequencies |
|---|---|---|
| Output power >10 dBm | -28 | Carrier centre frequency < 1 GHz |
| | -25 | Carrier centre frequency ≥ 1 GHz |
| 0 dBm ≤ Output power ≤10 dBm | -25 | |
| -30 dBm ≤ Output power ≤0 dBm | -20 | |
| -40 dBm ≤ Output power < -30 dBm | -10 | |

The normative reference for this requirement is TS 36.101 clause 6.5.2.2.1

## 6.5.2.2.4 Test description

### 6.5.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | See Table 6.5.1.4.1-1 | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for carrier leakage testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 1 | 1 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: For partial RB allocation, the $RB_{start}$ shall be RB #0 and RB# (max +1- RB allocation) of the channel bandwidth. | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to in Table 6.5.2.2.4.1-1.

5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2.2.4.3.

#### 6.5.2.2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC

2. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 13.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 13.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

3. Measure carrier leakage using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

4. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

5. Measure carrier leakage using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

6. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

7. Measure carrier leakage using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test

8. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

9. Measure carrier leakage using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test

NOTE: The step 2 and 3 only apply to UE supporting Rel.11 and higher.

#### 6.5.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.5.2.2.5 Test requirement

Each of the 20 carrier leakage results, derived in Annex E.3.1, shall not exceed the values in table 6.5.2.2.5-1 or 6.5.2.2.5-2.

**Table 6.5.2.2.5-1: Test requirements for Relative Carrier Leakage Power for UE supporting Rel-8 to Rel-10**

| LO Leakage | Parameters | Relative Limit (dBc) |
|---|---|---|
| | f ≤ 3.0GHz: 3.2 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | -24.2 |
| | f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | -19.2 |

| | | |
|---|---|---|
| | f ≤ 3.0GHz: -36.8dBm±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -36.5 dBm ±3.5dB | -9.2 |

**Table 6.5.2.2.5-2: Test requirements for Relative Carrier Leakage Power for UE supporting Rel.11 and higher**

| LO Leakage | Parameters | Relative limit (dBc) | Applicable frequencies |
|---|---|---|---|
| | f ≤ 3.0GHz: 13.2 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 13.5 dBm ±3.5dB | -27.2 | Carrier centre frequency < 1 GHz |
| | | -24.2 | Carrier centre frequency ≥ 1 GHz |
| | f ≤ 3.0GHz: 3.2 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | -24.2 | |
| | f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | -19.2 | |
| | f ≤ 3.0GHz: -36.8dBm±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -36.5 dBm ±3.5dB | -9.2 | |

## 6.5.2.2E Carrier leakage for UE category 0

### 6.5.2.2E.1 Test Purpose

Same test purpose in clause 6.5.2.2.1.

### 6.5.2.2E.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.5.2.2E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.3.2.3.

### 6.5.2.2E.4 Test description

#### 6.5.2.2E.4.1 Initial conditions

Same initial conditions as in clause 6.5.2.2.4.1 with the following exceptions:

- Instead of Table 6.5.2.2.4.1-1 → use Table 6.5.2.2E.4.1-1.
- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.5.2.2E.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | See Table 6.5.1.4.1-1 | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for carrier leakage testing | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 1.4MHz | | QPSK | 1 | 1 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: For partial RB allocation, the $RB_{start}$ shall be RB #0 and RB# (max +1- RB allocation) of the channel bandwidth. | | | | |

### 6.5.2.2.4.2 Test procedure

Same test procedure as in clause 6.5.2.2.4.1 with the following exception for HD-FDD:

- Instead of Table 6.5.2.2.4.1-1 → use Table 6.5.2.2E.4.1-1.
- In step 3, slots with transient periods are not under test. Half-duplex guard subframes are not under test.

### 6.5.2.2E.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.5.2.2E.5 Test requirement

Each of the 20 IQ offset results, derived in Annex E.3.1, shall not exceed the values in table 6.5.2.2E.5-1

**Table 6.5.2.2E.5-1: Test requirements for Relative Carrier Leakage Power**

| **LO Leakage** | **Parameters** | **Relative Limit (dBc)** |
|---|---|---|
| | f ≤ 3.0GHz: 3.2 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | -24.2 |
| | f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | -19.2 |
| | f ≤ 3.0GHz: -36.8dBm±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -36.5 dBm ±3.5dB | -9.2 |

# 6.5.2.2EA Carrier leakage for UE category M1

## 6.5.2.2EA.1 Test Purpose

Same test purpose in clause 6.5.2.2.1.

### 6.5.2.2EA.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

### 6.5.2.2EA.3 Minimum conformance requirements

Carrier leakage is an additive sinusoid waveform that has the same frequency as a modulated waveform carrier frequency. For UE of UL Category M1, the sinusoid waveform may alternatively lie at the centre of the 6 RB narrowband assigned for transmission. The measurement interval is one slot in the time domain.

The relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. The relative carrier leakage power at the centre of the channel bandwidth or the 6 RB narrowband assigned for transmission shall not exceed the values specified in Table 6.5.2.2.3-2. The normative reference for this requirement is TS 36.101 [2] clause 6.5.2E.2.1.

### 6.5.2.2EA.4 Test description

#### 6.5.2.2EA.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.2EA.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.2EA.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | See Table 6.5.1.4.1-1 | | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | 5MHz | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for carrier leakage testing | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| 5MHz | | QPSK | 1 | 1 | 0 |
| 5MHz | | QPSK | 6 | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: For partial RB allocation, the $RB_{start}$ shall be RB #0 and RB# (6 - RB allocation) of the channel bandwidth. | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to in Table 6.5.2.2EA.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.5.2.2EA.4.3.

#### 6.5.2.2EA.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.5.2.2EA.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC

2. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 13.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 13.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

3. Measure carrier leakage using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency. For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods are not under test. Half-duplex guard subframes are not under test.

4. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

5. Measure carrier leakage using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency. For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods are not under test. Half-duplex guard subframes are not under test.

6. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

7. Measure carrier leakage using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency. For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods are not under test. Half-duplex guard subframes are not under test.

8. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

9. Measure carrier leakage using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency. For TDD slots with transient periods are not under test

#### 6.5.2.2EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA.

### 6.5.2.2EA.5 Test requirement

Each of the 20 IQ offset results, derived in Annex E.3.1, shall not exceed the values in table 6.5.2.2EA.5-1

**Table 6.5.2.2EA.5-1: Test requirements for Relative Carrier Leakage Power**

| LO Leakage | Parameters | Relative limit (dBc) | Applicable frequencies |
|---|---|---|---|
| | f ≤ 3.0GHz: 13.2 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 13.5 dBm ±3.5dB | -27.2 | Carrier centre frequency < 1 GHz |
| | | -24.2 | Carrier centre frequency ≥ 1 GHz |
| | f ≤ 3.0GHz: 3.2 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | -24.2 | |
| | f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | -19.2 | |
| | f ≤ 3.0GHz: -36.8dBm±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -36.5 dBm ±3.5dB | -9.2 | |

## 6.5.2.2EB Carrier leakage for UE category 1bis

### 6.5.2.2EB.1 Test purpose

Same test purpose as in clause 6.5.2.2.

### 6.5.2.2EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

### 6.5.2.2EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.5.2.2.3.

### 6.5.2.2EB.4 Test description

#### 6.5.2.2EB.4.1 Initial conditions

Same initial conditions as in clause 6.5.2.2.4.1 with the following exception:

- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.5.2.2EB.4.2 Test procedure

Same test procedure as in clause 6.5.2.2.4.2.

#### 6.5.2.2EB.4.3 Message contents

Same message contents as in clause 6.5.2.2.4.3.

### 6.5.2.2EB.5 Test requirement

Each of the 20 carrier leakage results, derived in Annex E.3.1, shall not exceed the values in Table 6.5.2.2EB.5-1.

**Table 6.5.2.2EB.5-1: Test requirements for Relative Carrier Leakage Power for UE supporting Rel.13 and higher**

| LO Leakage | Parameters | Relative limit (dBc) | Applicable frequencies |
|---|---|---|---|
| | f ≤ 3.0GHz: 13.2 dBm ±3.2dB 3.0GHz < f ≤ 4.2GHz: 13.5 dBm ±3.5dB | -27.2 | Carrier centre frequency < 1 GHz |
| | | -24.2 | Carrier centre frequency ≥ 1 GHz |
| | f ≤ 3.0GHz: 3.2 dBm ±3.2dB 3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | -24.2 | |
| | f ≤ 3.0GHz: -26.8 dBm ±3.2dB 3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | -19.2 | |
| | f ≤ 3.0GHz: -36.8dBm±3.2dB 3.0GHz < f ≤ 4.2GHz: -36.5 dBm ±3.5dB | -9.2 | |

## 6.5.2.2F Carrier leakage for category NB1 and NB2

### 6.5.2.2F.1 Test Purpose

Carrier leakage expresses itself as unmodulated sine wave with the carrier frequency or centre frequency of aggregated transmission bandwidth configuration. It is an interference of approximately constant amplitude and independent of the amplitude of the wanted signal. Carrier leakage interferes with the centre sub carriers of the UE under test (if allocated), especially, when their amplitude is small. The measurement interval is defined over one slot in the time domain.

The purpose of this test is to exercise the UE transmitter to verify its modulation quality in terms of carrier leakage.

### 6.5.2.2F.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

### 6.5.2.2F.3 Minimum conformance requirements

Carrier leakage is an additive sinusoid waveform that has the same frequency as a modulated waveform carrier frequency. The measurement interval is one slot in the time domain. The relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. The relative carrier leakage power of category NB1 and NB2 UE shall not exceed the values specified in Table 6.5.2.2F.3-1.

**Table 6.5.2.2F.3-1: Minimum requirements for relative carrier leakage power**

| Parameters | Relative limit (dBc) |
|---|---|
| 0 dBm ≤ Output power | -25 |
| -30 dBm ≤ Output power ≤ 0 dBm | -20 |
| -40 dBm ≤ Output power < -30 dBm | -10 |

The normative reference for this requirement is TS 36.101 clause 6.5.2F.2

### 6.5.2.2F.4 Test description

#### 6.5.2.2F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations in table 6.5.2.2F.4.1-1 shall be tested. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2.4. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex TBD.

**Table 6.5.2.2F.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 8.1.1 | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.1 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A | Modulation | $N_{tones}$, start position | Sub-carrier spacing (kHz) |
| 1 | | QPSK | 1@0 | 3.75 |
| 2 | | QPSK | 1@47 | 3.75 |
| 3 | | QPSK | 1@0 | 15 |
| 4 | | QPSK | 1@11 | 15 |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C, and uplink signals according to Annex H.
4. The UL Reference Measurement channels are set according to in Table 6.5.2.2F.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.5.2.2F.4.3.

### 6.5.2.2F.4.2 Test procedure

1. SS sends uplink scheduling information for UL HARQ process via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.2F.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC
2. Configure UE to transmit at $P_{UMAX}$ level.
3. Measure carrier leakage using Global In-Channel Tx-Test (Annex E).
4. Release the connection through State 3A-NB.
5. Modify system information elements according to Table 6.5.2.1F.1.4.3-1 and Table 6.5.2.1F.1.4.3-2 and notify the UE via paging message with SystemInformationModification included (test point 2).
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the new UL power control setting.
7. SS sends uplink scheduling information for UL HARQ process via NPDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.2F.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
8. Measure carrier leakage using Global In-Channel Tx-Test (Annex E).

NOTE 1: For configuration IDs applicable to UE depending on UE capability in Test Configuration Table with different UL sub-carrier spacing, the SS shall release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the appropriate UL subcarrier spacing in Random Access Response message.

### 6.5.2.2F.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 with the following exceptions:

**Table 6.5.2.1F.1.4.3-1: P0-NominalNPUSCH-r13 configuration for test point 2**

| Derivation Path: 36.508 clause 8.1.6.3 Table 8.1.6.3-14: UplinkPowerControlCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalNPUSCH-r13 | -117 (dBm) | | |
| alpha-r13 | al1 (1) | | |
| deltaPreambleMsg3-r13 | 4 | | |
| } | | | |

**Table 6.5.2.1F.1.4.3-2: NPDSCH-ConfigCommon-NB-DEFAULT configuration for test point 2**

| Derivation Path: 36.508 clause 8.1.6.3 Table 8.1.6.3-4: NPDSCH-ConfigCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPDSCH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| nrs-Power-r13 | 21 (dBm) | | |
| } | | | |

### 6.5.2.2F.5 Test requirement

Each of the carrier leakage results, derived in Annex E.3.1, shall not exceed the values in table 6.5.2.2F.5-1

**Table 6.5.2.2F.5-1: Test requirements for Relative Carrier Leakage Power**

| LO Leakage | Parameters | Relative Limit (dBc) |
|---|---|---|
| | Test point 1 | -24.2 |
| | Test point 2 | -19.2 |

## 6.5.2.2G Carrier leakage for V2X Communication

### 6.5.2.2G.0 Minimum conformance requirements

The requirements of subclause 6.5.2.2.3 shall apply for V2X transmissions.

For intra-band contiguous multi-carrier operation the carrier leakage requirement of 6.5.2A.2.0 shall apply.

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-2, the requirements in subclause 6.5.2.2G.0 apply for V2X sidelink transmission and the requirements in subclause 6.5.2.2.3 apply for the E-UTRA uplink transmission.

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2G and 6.5.2G.2.

### 6.5.2.2G.1 Carrier leakage for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

#### 6.5.2.2G.1.1 Test Purpose

Same test purpose in clause 6.5.2.2.1.

#### 6.5.2.2G.1.2 Test applicability

This test case applies to all types of UE that supports V2X Sidelink communication and Band 47.

#### 6.5.2.2G.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2.2G.0.

#### 6.5.2.2G.1.4 Test description

##### 6.5.2.2G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies and channel bandwidth based on E-UTRAN operating bands specified in table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.2G.1.4.1-1. The details of the reference

measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.5.2.2G.1.4.1-1: Test Configuration Table for PSSCH and PSCCH**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | PSSCH RB allocation |
| 10 MHz | QPSK | 12 |
| 20 MHz | QPSK | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in specified in subclause 5.4.2G. | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 for both SS and UE are pre-configured according to TS 36.508 [7] Table 4.10.1.1-1. Message content exceptions are defined in clause 6.5.2.2G.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.5.2G.1.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0;
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.5.2.2G.1.4.2 Test procedure

TP 1:

1 Set the V2X sidelink communication pre-configuration parameters for UE according to TS 36.508[7] Table 4.10.1.1-1 with the exception specified in table 6.5.2.2G.3.4.3-1 and Table 6.5.2.2G.3.4.3-2;

2 The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.

3 Measure the carrier leakage using Global In-Channel Tx-Test (Annex E).

TP 2:

4 Set the V2X sidelink communication pre-configuration parameters for UE according to TS 36.508[7] Table 4.10.1.1-1 with the exception specified in table 6.5.2.2G.3.4.3-1 and Table 6.5.2.2G.3.4.3-3;

5 The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.

6 Measure the carrier leakage using Global In-Channel Tx-Test (Annex E).

### 6.5.2.2G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.5.2.2G.1.4.3-1: *SL-V2X-PreconfigCommPool* configuration for test point 1 and 2**

| Derivation Path: 36.508 Table 4.6.3-20J | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigCommPool-r14-DEFAULT ::= SEQUENCE { | | | |
| sizeSubchannel-r14 | n15 | | BW10 |
| | n20 | | BW20 |
| numSubchannel-r14 | 1 | | |
| } | | | |

| Condition | Explanation |
|---|---|
| BW10 | 10 MHz channel bandwidth cell environment |
| BW20 | 20 MHz channel bandwidth cell environment |

**Table 6.5.2.2G.1.4.3-2: *maxTxPower* configuration for test point 1**

| Derivation Path: 36.508 Table 4.6.3-20K | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | | |
| maxTxPower-r12 | 5 | Test point 1 checks the requirement for Output power > 0dBm | |
| } | | | |
| } | | | |

**Table 6.5.2.2G.1.4.3-3: *maxTxPower* configuration for test point 2**

| Derivation Path: 36.508 Table 4.6.3-20K | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | | |
| maxTxPower-r12 | -25 | Test point 2 checks the requirement for -30dBm <= Output power < 0dBm | |
| } | | | |
| } | | | |

6.5.2.2G.1.5 Test requirement

Each of the 20 carrier leakage results, derived in Annex E.3.1, shall not exceed the values in table 6.5.2.2G.5-1.

**Table 6.5.2.2G.5-1: Test requirements for Relative Carrier Leakage Power**

| LO Leakage | Parameters | Relative Limit (dBc) |
|---|---|---|
| | Normal conditions:15 dBm ±10.5dB<br>Extreme conditions: 15 dBm ±14.5dB | -24.2 |
| | Normal conditions:-15 dBm ±10.5dB<br>Extreme conditions: -15 dBm ±14.5dB | -19.2 |

### 6.5.2.3 In-band emissions for non allocated RB

#### 6.5.2.3.1 Test Purpose

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks

The in-band emission is defined as the average across 12 sub-carrier and as a function of the RB offset from the edge of the allocated UL transmission bandwidth. The in-band emission is measured as the ratio of the UE output power in a non–allocated RB to the UE output power in an allocated RB. The basic in-band emissions measurement interval is defined over one slot in the time domain. When the PUSCH or PUCCH transmission slot is shortened due to multiplexing with SRS, the in-band emissions measurement interval is reduced by one SC-FDMA symbol, accordingly. Likewise, when the PUSCH starting position is modified or when the second last symbol is the ending symbol of the PUSCH sub-frame for Frame Structure Type 3, the in-band emissions measurement interval is reduced accordingly.

#### 6.5.2.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 8 and forward.

#### 6.5.2.3.3 Minimum conformance requirements

The relative in-band emission shall not exceed the values specified in Tables 6.5.2.3.3-1 or 6.5.2.3.3-2.

**Table 6.5.2.3.3-1: Minimum requirements for in-band emissions for UE supporting Rel-8 to Rel-10**

| Parameter Description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| General | dB | For Frame Structure Type 1 and Frame Structure Type 2: $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRB}),\ 20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRB},\ -57\ dBm/180\ kHz - P_{RB} \}$<br>For Frame Structure Type 3 and 20 MHz channel bandwidth: $\max\{ 10 - 6(\lvert\Delta_{RB}\rvert - 1),\ 57\ dBm/180\ kHz - P_{RB} \}$ | | Any non-allocated (Note 2) |
| IQ Image | dB | -25 | | Image frequencies (Notes 2, 3) |
| Carrier leakage | dBc | -25 | Output power > 0 dBm | LO frequency (Notes 4, 5) |
| | | -20 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -10 | -40 dBm ≤ Output power < -30 dBm | |

Note 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in Note 10.

Note 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs. For Frame Structure Type 3 and 20 MHz channel bandwidth, the requirement applies for QPSK, 16QAM and 64QAM modulation with $\lvert\Delta_{RB}\rvert \le 5$ for any non-allocated RB and $RIV = 1$ in the uplink scheduling grant with $RIV$ specified in [6].

Note 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs. For Frame Structure Type 3 with 20 MHz channel bandwidth, the applicable frequency is $n_{PRB} = 98$ for QPSK, 16QAM and 64QAM modulation.

Note 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs. For Frame Structure Type 3 and 20 MHz channel bandwidth, the requirement applies for QPSK, 16QAM and 64QAM modulation with $RIV = 5$ in the uplink scheduling grant.

Note 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.

Note 6: $L_{CRB}$ is the Transmission Bandwidth (see Figure 5.4.2-1).

Note 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1).

Note 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

Note 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

Note 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

**Table 6.5.2.3.3-2: Minimum requirements for in-band emissions for UE supporting Rel.11 and higher**

| Parameter description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs},$ $-57\ dBm\ /180\ kHz - P_{RB}\}$ | | Any non-allocated (Note 2) |
| **IQ Image** | dB | -28 | Image frequencies when carrier centre frequency < 1 GHz and Output power > 10 dBm | (Notes 2, 3) |
| | | -25 | Image frequencies when carrier centre frequency < 1 GHz and Output power ≤ 10 dBm | |
| | | -25 | Image frequencies when carrier centre frequency ≥ 1 GHz | |
| **Carrier leakage** | dBc | -28 | Output power > 10 dBm and carrier centre frequency < 1 GHz | Carrier frequency (Notes 4, 5) |
| | | -25 | Output power > 10 dBm and carrier centre frequency ≥ 1 GHz | |
| | | -25 | 0 dBm ≤ Output power ≤10 dBm | |
| | | -20 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -10 | -40 dBm ≤ Output power < -30 dBm | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in Note 10.

NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.

NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.

NOTE 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.

NOTE 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.

NOTE 6: $L_{CRBs}$ is the Transmission Bandwidth (see Figure 5.6-1).

NOTE 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.6-1).

NOTE 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

NOTE 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

NOTE 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2.3.1.

The in-band emission is defined as the average across 12 sub-carrier and as a function of the RB offset from the edge of the allocated UL transmission bandwidth. The in-band emission is measured as the ratio of the UE output power in a non–allocated RB to the UE output power in an allocated RB. The basic in-band emissions measurement interval is defined over one slot in the time domain.

## 6.5.2.3.4 Test description

### 6.5.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.3.4.1-1 and 6.5.2.3.4.1-2. The details of the uplink reference

measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.3.4.1-1: Test Configuration Table for PUSCH**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | See Table 6.5.1.4.1-1 | | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | See Table 6.5.1.4.1-1 | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | See Table 6.5.1.4.1-1 | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for in-band emissions testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 1 | 1 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |
| Note 2: For partial RB allocation, the starting resource block shall be RB #0 and RB# (max+1 - RB allocation) of the channel bandwidth. | | | | |

**Table 6.5.2.3.4.1-2: Test Configuration Table for PUCCH**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | See Table 6.5.1.4.1-1 | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | See Table 6.5.1.4.1-1 | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | See Table 6.5.1.4.1-1 | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | | **Uplink Configuration** | |
| Ch BW | Mod'n | RB allocation | | FDD: PUCCH format = Format 1a<br>TDD: PUCCH format = Format 1a / 1b |
| | | FDD | TDD | |
| 1.4MHz | QPSK | 3 | 3 | |
| 3MHz | QPSK | 4 | 4 | |
| 5MHz | QPSK | 8 | 8 | |
| 10MHz | QPSK | 16 | 16 | |
| 15MHz | QPSK | 25 | 25 | |
| 20MHz | QPSK | 30 | 30 | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to in Table 6.5.2.3.4.1-1 (PUSCH sub-test) and Table 6.5.2.3.4.1-2 (PUCCH sub-test).
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2.3.4.3.

6.5.2.3.4.2 Test procedure

Test procedure for PUSCH:

1.1 SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.3.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC

1.2 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 13.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 13.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.3 Measure In-band emission using Global In-Channel Tx-Test (Annex E)

1.4 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.5 Measure In-band emission using Global In-Channel Tx-Test (Annex E)

1.6 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.7 Measure In-band emission using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test

1.8 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is to -36.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.9 Measure In-band emission using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test

Test procedure for PUCCH:

2.1 PUCCH is set according to Table 6.5.2.3.4.1-2. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.5.2.3.4.1-2. The SS sends downlink MAC padding bits on the DL RMC. The transmission of PDSCH will make the UE send uplink ACK/NACK using PUCCH.

2.2 Send the appropriate TPC commands in the uplink scheduling information for PUCCH to the UE until UE output power is 13.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 13.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.3 Measure In-band emission using Global In-Channel Tx-Test (Annex E)

2.4 Send the appropriate TPC commands in the uplink scheduling information for PUCCH to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.5 Measure In-band emission using Global In-Channel Tx-Test (Annex E)

2.6 Send the appropriate TPC commands for PUCCH in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.7 Measure In-band emission using Global In-Channel Tx-Test (Annex E)

2.8 Send the appropriate TPC commands for PUCCH in the uplink scheduling information to the UE until UE output power is to -36.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.9 Measure In-band emission using Global In-Channel Tx-Test (Annex E)

NOTE: The step 1.2, 1.3, 2.2 and 2.3 only apply to UE supporting Rel.11 and higher.

6.5.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 4.6.3-8: *PUCCH-ConfigCommon*: PUCCH in-band emissions measurement**

| Derivation Path: 36.331 clause 6.3.2, Table 4.6.3-8: PUCCH-ConfigCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigCommon-DEFAULT ::= SEQUENCE { | | | |
| nRB-CQI | 0 | | |
| } | | | |

6.5.2.3.5 Test requirement

Each of the 20 In-band emissions results, derived in Annex E.4.3 shall not exceed the corresponding values in Tables 6.5.2.3.5-1 or 6.5.2.3.5-2 based on supported UE release version.

**Table 6.5.2.3.5-1: Test requirements for in-band emissions for UE supporting Rel.8 to Rel.10**

| Parameter Description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| General | dB | $\max\{-25-10\cdot\log_{10}(N_{RB}/L_{CRBs}),\ 20\cdot\log_{10} EVM -3-5\cdot(\lvert\Delta_{RB}\rvert-1)/L_{CRBs}, +0.8\ -57\ dBm/180\ kHz - P_{RB}\}$ | | Any non-allocated (Note 2) |
| IQ Image | dB | -24.2 | | Image frequencies (Notes 2, 3) |
| Carrier leakage | dBc | -24.2 | Output power<br>f ≤ 3.0GHz: 3.2dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | LO frequency (Notes 4, 5) |
| | | -19.2 | Output power<br>f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | |
| | | -9.2 | Output power<br>f ≤ 3.0GHz: -36.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -36.5 dBm ±3.5dB | |

Note 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the test requirement is calculated as the higher of $P_{RB}-29.2$ dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in Note 10.

Note 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.

Note 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.

Note 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.

Note 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.

Note 6: $L_{CRBs}$ is the Transmission Bandwidth (see Figure 5.4.2-1).

Note 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1).

Note 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

Note 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB}=1$ or $\Delta_{RB}=-1$ for the first adjacent RB outside of the allocated bandwidth.

Note 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

**Table 6.5.2.3.5-2: Test requirements for in-band emissions for UE supporting Rel.11 and higher**

| Parameter description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs}$, +0.8 $-57\ dBm / 180\ kHz - P_{RB}\}$ | | Any non-allocated (Note 2) |
| **IQ Image** | dB | -27.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power > 10 dBm | (Notes 2, 3) |
| | | -24.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power ≤ 10 dBm | |
| | | -24.2 | Image frequencies when carrier centre frequency ≥ 1 GHz | |
| **Carrier leakage** | dBc | -27.2 | Output power > 10 dBm and carrier centre frequency < 1 GHz | Carrier frequency (Notes 4, 5) |
| | | -24.2 | Output power > 10 dBm and carrier centre frequency ≥ 1 GHz | |
| | | -24.2 | 0 dBm ≤ Output power ≤10 dBm | |
| | | -19.2 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -9.2 | -40 dBm ≤ Output power < -30 dBm | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 29.2 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in Note 10.

NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.

NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.

NOTE 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.

NOTE 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.

NOTE 6: $L_{CRBs}$ is the Transmission Bandwidth (see Figure 5.4.2-1).

NOTE 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1).

NOTE 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

NOTE 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

NOTE 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

## 6.5.2.3E In-band emissions for non allocated RB for UE category 0

### 6.5.2.3E.1 Test Purpose

Same test purpose as in clause 6.5.2.3.1.

### 6.5.2.3E.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.5.2.3E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.5.2.3.3.

### 6.5.2.3E.4 Test description

#### 6.5.2.3E.4.1 Initial conditions

Same initial conditions as in clause 6.5.2.3.4.1 with following exceptions:

- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.5.2.3E.4.2 Test procedure

Same test procedure as in clause 6.5.2.3.4.2

#### 6.5.2.3E.4.3 Message contents

Same message contents as in clause 6.5.2.3.4.3.

### 6.5.2.3E.5 Test requirement

Each of the 20 In-band emissions results, derived in Annex E.4.3 shall not exceed the corresponding values in Table 6.5.2.3E.5-1

**Table 6.5.2.3E.5-1: Test requirements for in-band emissions**

| Parameter Description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| General | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs},$ $-57\ dBm\ /180\ kHz - P_{RB}\}$ +0.8 | | Any non-allocated (Note 2) |
| IQ Image | dB | -24.2 | | Image frequencies (Notes 2, 3) |
| DC | dBc | -24.2 | Output power<br>f ≤ 3.0GHz: 3.2dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | LO frequency (Notes 4, 5) |
| | | -19.2 | Output power<br>f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | |
| | | -9.2 | Output power<br>f ≤ 3.0GHz: -36.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -36.5 dBm ±3.5dB | |

Note 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the test requirement is calculated as the higher of $P_{RB} - 29.2$ dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in Note 10.

Note 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.

Note 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.

Note 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.

Note 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.

Note 6: $L_{CRBs}$ is the Transmission Bandwidth (see Figure 5.4.2-1).

Note 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1).

Note 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

Note 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

Note 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

## 6.5.2.3EA In-band emissions for non allocated RB for UE category M1

### 6.5.2.3EA.1 Test Purpose

Same test purpose as in clause 6.5.2.3.1.

### 6.5.2.3EA.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

### 6.5.2.3EA.3 Minimum conformance requirements

The relative in-band emission when centre carrier frequency is at the centre of channel bandwidth or when at the 6RB narrowband assigned for transmission shall not exceed the values specified in Table 6.5.2.3EA.3-1

**Table 6.5.2.3EA.3-1: Minimum requirements for in-band emissions**

| Parameter description | Unit | Limit (NOTE 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRB}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRB},$ $-57\ dBm\ /180\ kHz - P_{RB}\}$ | | Any non-allocated (NOTE 2) |
| **IQ Image** | dB | -28 | Image frequencies when carrier centre frequency < 1 GHz and Output power > 10 dBm | Image frequencies (NOTES 2, 3) |
| | | -25 | Image frequencies when carrier centre frequency < 1 GHz and Output power ≤ 10 dBm | |
| | | -25 | Image frequencies when carrier centre frequency ≥ 1 GHz | |
| **Carrier leakage** | dBc | -28 | Output power > 10 dBm and carrier centre frequency < 1 GHz | Carrier frequency (NOTES 4, 5) |
| | | -25 | Output power > 10 dBm and carrier centre frequency ≥ 1 GHz | |
| | | -25 | 0 dBm ≤ Output power ≤10 dBm | |
| | | -20 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -10 | -40 dBm ≤ Output power < -30 dBm | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in NOTE 10.

NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.

NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs. For UE of UL Category M1, applicable frequencies shall alternatively include those found by reflection on the centre of the assigned 6 RB narrowband, but excluding any allocated RBs.

NOTE 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.

NOTE 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB. For UE of UL Category M1, the applicable frequencies shall alternatively be the centre frequency of the supported 6RBs additionally.

NOTE 6: $L_{CRB}$ is the Transmission Bandwidth (see Figure 5.6-1).

NOTE 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.6-1).

NOTE 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

NOTE 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

NOTE 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

The in-band emission is defined as the average across 12 sub-carrier and as a function of the RB offset from the edge of the allocated UL transmission bandwidth. The in-band emission is measured as the ratio of the UE output power in a non–allocated RB to the UE output power in an allocated RB. The basic in-band emissions measurement interval is defined over one slot in the time domain.

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2E.3.1.

## 6.5.2.3EA.4 Test description

### 6.5.2.3EA.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.3EA.4.1-1 and 6.5.2.3EA.4.1-2. The details of the uplink

reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.3EA.4.1-1: Test Configuration Table for PUSCH**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | See Table 6.5.1.4.1-1 | | | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | See Table 6.5.1.4.1-1 | | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | 5MHz | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for in-band emissions testing | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| 5MHz | | QPSK | 1 | 1 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4.<br>Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.5.2.3EA.4.1-2: Test Configuration Table for PUCCH**

| | **Initial Conditions** | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | See Table 6.5.1.4.1-1 | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | See Table 6.5.1.4.1-1 | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | | | | **Uplink Configuration** |
| Ch BW | Mod'n | RB allocation | | | FDD: PUCCH format = Format 1a<br>TDD: PUCCH format = Format 1a / 1b |
| | | FDD | TDD | Narrowband index[1] | |
| 5MHz | QPSK | 4@0 | 4@0 | 0 | |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Figure A.3 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to in Table 6.5.2.3.4.1-1 (PUSCH sub-test) and Table 6.5.2.3EA.4.1-2 (PUCCH sub-test).

5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.5.2.3EA.4.3.

### 6.5.2.3EA.4.2 Test procedure

Test procedure for PUSCH:

1.1 SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.3EA.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC

1.2 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 13.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 13.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.3 Measure In-band emission using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency.

1.4 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.5 Measure In-band emission using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency.

1.6 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±2.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.7 Measure In-band emission using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency. For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods are not under test. Half-duplex guard subframes are not under test.

1.8 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is to -36.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.9 Measure In-band emission using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency. For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods are not under test. Half-duplex guard subframes are not under test.

Test procedure for PUCCH:

2.1 PUCCH is set according to Table 6.5.2.3EA.4.1-2. SS transmits PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 6.5.2.3EA.4.1-2. The SS sends downlink MAC padding bits on the DL RMC. The transmission of PDSCH will make the UE send uplink ACK/NACK using PUCCH.

2.2 Send the appropriate TPC commands in the uplink scheduling information for PUCCH to the UE until UE output power is 13.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 13.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.3 Measure In-band emission using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency.

2.4 Send the appropriate TPC commands in the uplink scheduling information for PUCCH to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.5 Measure In-band emission using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency.

2.6 Send the appropriate TPC commands for PUCCH in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.7 Measure In-band emission using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency.

2.8 Send the appropriate TPC commands for PUCCH in the uplink scheduling information to the UE until UE output power is to -36.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.9 Measure In-band emission using Global In-Channel Tx-Test (Annex E) according to the UE's declaration on the position of carrier centre frequency.

#### 6.5.2.3EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA and the following exceptions:

**Table 6.5.2.3EA.4.3-1: *PUCCH-ConfigCommon*: PUCCH in-band emissions measurement**

| Derivation Path: TS 36.508 [7] clause 6.3.2, Table 4.6.3-8: PUCCH-ConfigCommon-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigCommon-DEFAULT ::= SEQUENCE { | | | |
| nRB-CQI | 0 | | |
| } | | | |

### 6.5.2.3EA.5 Test requirement

Each of the 20 In-band emissions results, derived in Annex E.4.3 shall not exceed the corresponding values in Table 6.5.2.3EA.5-1

**Table 6.5.2.3EA.5-1: Test requirements for in-band emissions**

| Parameter description | Unit | Limit (NOTE 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRB}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRB}$, +0.8 $-57\ dBm / 180\ kHz - P_{RB}\}$ | | Any non-allocated (NOTE 2) |
| **IQ Image** | dB | -27.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power > 10 dBm | Image frequencies (NOTES 2, 3) |
| | | -24.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power ≤ 10 dBm | |
| | | -24.2 | Image frequencies when carrier centre frequency ≥ 1 GHz | |
| **Carrier leakage** | dBc | -27.2 | Output power > 10 dBm and carrier centre frequency < 1 GHz | Carrier frequency (NOTES 4, 5) |
| | | -24.2 | Output power > 10 dBm and carrier centre frequency ≥ 1 GHz | |
| | | -24.2 | 0 dBm ≤ Output power ≤10 dBm | |
| | | -19.2 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -9.2 | -40 dBm ≤ Output power < -30 dBm | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 29.2 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in NOTE 10.

NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.

NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs. For UE of UL Category M1, applicable frequencies shall alternatively include those found by reflection on the centre of the assigned 6 RB narrowband, but excluding any allocated RBs.

NOTE 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.

NOTE 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB. For UE of UL Category M1, the applicable frequencies shall alternatively be the centre frequency of the supported 6RBs additionally.

NOTE 6: $L_{CRB}$ is the Transmission Bandwidth (see Figure 5.6-1).

NOTE 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.6-1).

NOTE 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

NOTE 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

NOTE 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

## 6.5.2.3EB In-band emissions for non allocated RB for UE category 1bis

### 6.5.2.3EB.1 Test purpose

Same test purpose as in clause 6.5.2.3.

### 6.5.2.3EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

### 6.5.2.3EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.5.2.3.3.

### 6.5.2.3EB.4 Test description

#### 6.5.2.3EB.4.1 Initial conditions

Same initial conditions as in clause 6.5.2.3.4.1 with the following exception:

- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.5.2.3EB.4.2 Test procedure

Same test procedure as in clause 6.5.2.3.4.2.

#### 6.5.2.3EB.4.3 Message contents

Same message contents as in clause 6.5.2.3.4.3.

### 6.5.2.3EB.5 Test requirement

Each of the 20 In-band emissions results, derived in Annex E.4.3 shall not exceed the corresponding values in Tables 6.5.2.3EB.5-1 based on supported UE release version.

**Table 6.5.2.3EB.5-1: Test requirements for in-band emissions for UE supporting Rel.13 and higher**

| Parameter description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs}$ , +0.8 $-57\ dBm\ /180\ kHz - P_{RB}\}$ | | Any non-allocated (Note 2) |
| **IQ Image** | dB | -27.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power > 10 dBm | (Notes 2, 3) |
| | | -24.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power ≤ 10 dBm | |
| | | -24.2 | Image frequencies when carrier centre frequency ≥ 1 GHz | |
| **Carrier leakage** | dBc | -27.2 | Output power > 10 dBm and carrier centre frequency < 1 GHz | Carrier frequency (Notes 4, 5) |
| | | -24.2 | Output power > 10 dBm and carrier centre frequency ≥ 1 GHz | |
| | | -24.2 | 0 dBm ≤ Output power ≤10 dBm | |
| | | -19.2 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -9.2 | -40 dBm ≤ Output power < -30 dBm | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 29.2 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in Note 10.
NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.
NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.
NOTE 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.
NOTE 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.
NOTE 6: $L_{CRBs}$ is the Transmission Bandwidth (see Figure 5.4.2-1).
NOTE 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1).
NOTE 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.
NOTE 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.
NOTE 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

## 6.5.2.3F In-band emissions for non allocated RB for category NB1 and NB2

### 6.5.2.3F.1 Test purpose

The in-band emissions are a measure of the interference falling into the non-allocated tones.

The in-band emission is defined as a function of the tone offset from the edge of the allocated UL transmission tone(s) within the transmission bandwidth configuration. The in-band emission is measured as the ratio of the UE output power in a non–allocated tone to the UE output power in an allocated tone. The basic in-band emissions measurement interval is defined over one slot in the time domain.

### 6.5.2.3F.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

### 6.5.2.3F.3 Minimum conformance requirements

The category NB1 and NB2 UE relative in-band emission shall not exceed the values specified in Table 6.5.2.3F.3-1.

**Table 6.5.2.3F.3-1: Minimum requirements for in-band emissions**

| Parameter description | Unit | Limit (NOTE 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | $\max\{ -15 - 10 \cdot \log_{10}(N_{tone} / L_{Ctone}),$ $-18 - 5 \cdot (\lvert\Delta_{tone}\rvert - 1) / L_{Ctone},$ $-57\ dBm\ /(3.75kHz\ or\ 15kHz) - P_{tone}\}$ | | Any non-allocated (NOTE 2) |
| **IQ Image** | dB | -25 | | Image frequencies (NOTES 2, 3) |
| **Carrier leakage** | dBc | -25 | 0 dBm ≤ Output power | Carrier frequency (NOTES 4, 5) |
| | | -20 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -10 | -40 dBm ≤ Output power < -30 dBm | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated tone. For each such tone, the minimum requirement is calculated as the higher of $P_{tone}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{tone}$ is defined in NOTE 10.

NOTE 2: The measurement bandwidth is 1 tone and the limit is expressed as a ratio of measured power in one non-allocated tone to the measured average power per allocated tone, where the averaging is done across all allocated tones.

NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated tones.

NOTE 4: The measurement bandwidth is 1 tone and the limit is expressed as a ratio of measured power in one non-allocated tone to the measured total power in all allocated tones.

NOTE 5: The applicable frequencies for this limit are those that are enclosed in the tones containing the DC frequency if $N_{tone}$ is odd, or in the two tones immediately adjacent to the DC frequency if $N_{tone}$ is even, but excluding any allocated tone.

NOTE 6: $L_{Ctone}$ is the Transmission Bandwidth (tones).

NOTE 7: $N_{tone}$ is the Transmission Bandwidth Configuration (tones).

NOTE 8: $\Delta_{tone}$ is the starting frequency offset between the allocated tone and the measured non-allocated tone. (e.g. $\Delta_{tone} = 1$ or $\Delta_{tone} = -1$ for the first adjacent tone outside of the allocated bandwidth.

NOTE 9: $P_{tone}$ is the transmitted power per 3.75 kHz or 15 kHz in allocated tones, measured in dBm.

The normative reference for this requirement is TS 36.101[2] clause 6.5.2F.3.

### 6.5.2.3F.4 Test description

#### 6.5.2.3F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters shown in table 6.5.2.3F.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2.4. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.3F.4.1-1: Test Configuration Table**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 8.1.1 | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.1 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A | Modulation | $N_{tones}$ | Sub-carrier spacing (kHz) |
| 1 | | QPSK | 1@0 | 3.75kHz |
| 2 | | QPSK | 1@47 | 3.75kHz |
| 3 | | QPSK | 1@0 | 15kHz |
| 4 | | QPSK | 1@11 | 15kHz |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3 using only main Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.4.0.
4. The UL Reference Measurement channels are set according to Table 6.5.2.3F.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5.

### 6.5.2.3F.4.2 Test procedure

1. SS sends uplink scheduling information via NPDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.3F.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
2. Measure In-band emission using Global In-Channel Tx-Test (Annex E).
3. Release the connection through State 3A-NB.
4. Modify system information elements according to Table 6.5.2.3F.4.3-1 and Table 6.5.2.3F.4.3-2 and notify the UE via paging message with SystemInformationModification included.
5. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the new UL power control setting.
6. SS sends uplink scheduling information for UL HARQ process via NPDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.3F.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
7. Measure In-band emission using Global In-Channel Tx-Test (Annex E).

NOTE 1: For configuration IDs applicable to UE depending on UE capability in Test Configuration Table with different UL sub-carrier spacing, the SS shall release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the appropriate UL subcarrier spacing in Random Access Response message.

### 6.5.2.3F.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 with the following exceptions..

**Table 6.5.2.3F.4.3-1: P0-NominalNPUSCH-r13 configuration for test point 2**

| Derivation Path: 36.508 clause 8.1.6.3 Table 8.1.6.3-14: UplinkPowerControlCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| p0-NominalNPUSCH-r13 | -117 (dBm) | | |
| alpha-r13 | al1 (1) | | |
| deltaPreambleMsg3-r13 | 4 | | |
| } | | | |

**Table 6.5.2.3F.4.3-2: NPDSCH-ConfigCommon-NB-DEFAULT configuration for test point 2**

| Derivation Path: 36.508 clause 8.1.6.3 Table 8.1.6.3-4: NPDSCH-ConfigCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| NPDSCH-ConfigCommon-NB-DEFAULT ::= SEQUENCE { | | | |
| nrs-Power-r13 | 21 (dBm) | | |
| } | | | |

## 6.5.2.3F.5 Test requirement

Each of the 20 In-band emissions results, derived in [Annex E.4.3] shall not exceed the corresponding values in Table 6.5.2.3F.5-1 based on supported UE release version.

**Table 6.5.2.3F.5-1: Test requirements for in-band emissions for UE category NB1 and NB2**

| Parameter description | Test point | Unit | Limit (NOTE 1) | | Applicable Frequencies |
|---|---|---|---|---|---|
| **General** | 1, 2 | dB | $\max\{ -15 - 10 \cdot \log_{10}(N_{tone} / L_{Ctone}),$ $-18 - 5 \cdot (\lvert\Delta_{tone}\rvert - 1) / L_{Ctone},$ $-57\ dBm\ /(3.75kHz\ or\ 15kHz) - P_{tone}\}$ +0.8 | | Any non-allocated (NOTE 2) |
| **IQ Image** | | dB | -24.2 | | Image frequencies (NOTES 2, 3) |
| **Carrier leakage** | 1 | dBc | -24.2 | 0 dBm ≤ Output power<br>f ≤ 3.0GHz: 3.2dBm ±3.2dB | Carrier frequency (NOTES 4, 5) |
| | 2 | | -19.2 | -30 dBm ≤ Output power ≤ 0 dBm<br>f ≤ 3.0GHz: -26.8 dBm ±3.2dB | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated tone. For each such tone, the minimum requirement is calculated as the higher of $P_{tone}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{tone}$ is defined in NOTE 10.

NOTE 2: The measurement bandwidth is 1 tone and the limit is expressed as a ratio of measured power in one non-allocated tone to the measured average power per allocated tone, where the averaging is done across all allocated tones.

NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated tones.

NOTE 4: The measurement bandwidth is 1 tone and the limit is expressed as a ratio of measured power in one non-allocated tone to the measured total power in all allocated tones.

NOTE 5: The applicable frequencies for this limit are those that are enclosed in the tones containing the DC frequency if $N_{tone}$ is odd, or in the two tones immediately adjacent to the DC frequency if $N_{tone}$ is even, but excluding any allocated tone.

NOTE 6: $L_{Ctone}$ is the Transmission Bandwidth (tones).

NOTE 7: $N_{tone}$ is the Transmission Bandwidth Configuration (tones).

NOTE 8: $\Delta_{tone}$ is the starting frequency offset between the allocated tone and the measured non-allocated tone. (e.g. $\Delta_{tone} = 1$ or $\Delta_{tone} = -1$ for the first adjacent tone outside of the allocated bandwidth.

NOTE 9: $P_{tone}$ is the transmitted power per 3.75 kHz or 15 kHz in allocated tones, measured in dBm.

## 6.5.2.3G In-band emissions for non-allocated RB for V2X Communication

### 6.5.2.3G.1 In-band emissions for non-allocated RB for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

#### 6.5.2.3G.1.1 Test Purpose

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks, this is to verify that the inband emissions of V2X sidelink non-concurrent with E-UTRAN uplink transmissions satisfy the minimum requirements listed in 6.5.2.3G.1.3.

#### 6.5.2.3G.1.2 Test applicability

This test case applies to all types of UE that supports V2X Sidelink communication and Band 47.

#### 6.5.2.3G.1.3 Minimum conformance requirements

The in-band emission is defined as the average across 12 sub-carrier and as a function of the RB offset from the edge of the allocated sidelink transmission bandwidth. The in-band emission is measured as the ratio of the UE output power in a non–allocated RB to the UE output power in an allocated RB.

The basic in-band emissions measurement interval is defined over one slot in the time domain When V2X transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the In-band emissions measurement interval is reduced by one symbol, accordingly.

For V2X sidelink physical channels PSCCH, PSSCH and PSBCH, the In-band emissions requirements shall be as specified for PUSCH in subclause 36.101[2] 6.5.2.3 for the corresponding modulation and transmission bandwidth. For intra-band contiguous multi-carrier operation the in-band emission requirement of subclause 36.101 [2] 6.5.2.3 shall apply for each component carrier.

Consequently, the relative in-band emission of each sidelink physical channel shall not exceed the values specified in Tables 6.5.2.3G.1.3.

**Table 6.5.2.3G.1.3-1: Minimum requirements for in-band emissions**

| Parameter description | Unit | Limit (NOTE 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | For Frame Structure Type 1 and Frame Structure Type 2: $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRB}),\ 20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRB},\ -57\ dBm/180\ kHz - P_{RB} \}$ For Frame Structure Type 3 and 20 MHz channel bandwidth: $\max\{ -10 - 6(\lvert\Delta_{RB}\rvert - 1),\ -57\ dBm/180\ kHz - P_{RB} \}$ | | Any non-allocated (NOTE 2) |
| **IQ Image** | dB | -28 | Image frequencies when carrier centre frequency < 1 GHz and Output power > 10 dBm | Image frequencies (NOTES 2, 3) |
| | | -25 | Image frequencies when carrier centre frequency < 1 GHz and Output power ≤ 10 dBm | |
| | | -25 | Image frequencies when carrier centre frequency ≥ 1 GHz | |
| **Carrier leakage** | dBc | -28 | Output power > 10 dBm and carrier centre frequency < 1 GHz | Carrier frequency (NOTES 4, 5) |
| | | -25 | Output power > 10 dBm and carrier centre frequency ≥ 1 GHz | |
| | | -25 | 0 dBm ≤ Output power ≤10 dBm | |
| | | -20 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -10 | -40 dBm ≤ Output power < -30 dBm | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in NOTE 10.

NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs. For Frame Structure Type 3 and 20 MHz channel bandwidth, the requirement applies with $|\Delta_{RB}| \le 5$ for any non-allocated RB and $RIV = 1$ in the uplink scheduling grant with $RIV$ specified in [6].

NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs. For Frame Structure Type 3 with 20 MHz channel bandwidth, the applicable frequency is $n_{PRB} = 98$.

NOTE 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs. For Frame Structure Type 3 and 20 MHz channel bandwidth, the requirement applies with $RIV = 5$ in the uplink scheduling grant.

NOTE 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.

NOTE 6: $L_{CRB}$ is the Transmission Bandwidth (see Figure 5.6-1).

NOTE 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.6-1).

NOTE 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

NOTE 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

NOTE 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

[NOTE 11: For V2V-V2X waveforms, the requirements are applied when PSSCH and PSCCH are adjacent in frequency. The limit values (General, IQ Image or Carrier leakage) of each channel is calculated separately as $P_{general,\ PSSCH}$, $P_{IQ,\ PSSCH}$, $P_{LO,\ PSSCH}$, $P_{general,\ PSCCH}$, $P_{IQ,\ PSCCH}$, $P_{LO,\ PSCCH}$ ,respectively. In-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB,\ PSSCH}$ - 30 dB and the $P_{sumIBE.SSCH}$, where $P_{sumIBE.SSCH}$ is the linear sum of $P_{general,\ PSSCH}$, $P_{IQ,\ PSSCH}$, $P_{LO,\ PSSCH}$, $P_{general,\ PSCCH}$, $P_{IQ,\ PSCCH}$, $P_{LO,\ PSCCH}$.]

NOTE12: The requirement in this power range is not applicable for V2X sidelink transmission for E-UTRA V2X operating bands specified in Table 5.5G-1.

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2G.3.

### 6.5.2.3G.1.4 Test description

#### 6.5.2.3G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2G. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.3G.1.4.1-1 and 6.5.2.3G.1.4.1-2. The details of the V2X reference measurement channels (RMCs) are specified in sub-clause A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.5.2.3G.1.4.1-1: Test Configuration Table for PSSCH and PSCCH**

| Initial Conditions | | |
|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | NC, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in subclause 5.4.2G) | Lowest, Mid, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X sidelink transmission** | |
| Ch BW | Mod'n | RB Allocation |
| 10MHz | QPSK | 12 |
| 20MHz | QPSK | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in specified in subclause 5.4.2G.<br>Note 2: The starting resource block shall be RB #0 and RB# (max+1 - RB allocation) of the channel bandwidth. | | |

**Table 6.5.2.3G.1.4.1-2: Test Configuration Table for PSBCH**

| Initial Conditions | | |
|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | NC, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in subclause 5.4.2G) | Lowest, Mid, Highest | |
| Test parameters for channel bandwidths | | |
| **PSBCH Configuration** | | |
| Ch BW | Mod'n | RB allocation |
| 10MHz | QPSK | 6 |
| 20MHz | QPSK | 6 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in subclause 5.4.2G. | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508[7] Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 for both SS and UE are pre-configured according to TS 36.508 [7] subclause 4.10.1 with the exception specified in clause 6.5.2.3G.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.5.2.3G.1.4.1-1
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0;
6. Ensure the UE is in Side link State 5A-V2X in Transmit Mode, according to TS 36.508 [7] clause 4.5.9;
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.5.2.3G.1.4.2 Test procedure

Test procedure for PSCCH+PSSCH:

[TP1: V2X UE output power > 0dBm]

1. Set the V2X sidelink communication parameters for both the V2X sidelink capable UE (hereinafter referred to as V2X UE) and SS according to *SL-V2X-Preconfiguration* in TS36.508[7] subclause 4.10.1 with the exception specified in table 6.5.2.3G.1.4.3-1;

2. V2X UE schedules the V2X RMC according to *SL-V2X-Preconfiguration* which is in line with the test configuration in Table 6.5.2.3G.1.4.1-1;

3. Measure the V2X UE output power to make sure V2X UE transmission power to be 4.3dBm+/-4.3dB for carrier frequency f > 5GHz;

4. Measure In-band emission using Global In-Channel Tx-Test (Annex E)

[TP2: V2X UE output power within (0 -30) dBm]

Repeat the above steps 1~4 with the exception that making sure V2X UE transmission power to be -25.5dBm+/-4.5dB for carrier frequency f > 5GHz in step3.

Test procedure for PSBCH

[TP1: V2X UE output power > 0dBm]

1. Set the V2X sidelink communication parameters for both the V2X sidelink capable UE (hereinafter referred to as V2X UE) and SS according to SL-V2X-Preconfiguration in TS36.508[7] subclause 4.10.1 with the exception specified in table 6.5.2.3G.1.4.3-3;

2. V2X UE schedules the SLSS/PSBCH according to SL-V2X-Preconfiguration which is in line with the test configuration in Table 6.5.2.3G.1.4.1-2;

3. Measure the V2X UE output power to make sure V2X UE transmission power to be 4.3dBm+/-4.3dB for carrier frequency f > 5GHz;

4. Measure In-band emission using Global In-Channel Tx-Test (Annex E)

[TP2: V2X UE output power within (0 -30) dBm]

Repeat the above steps 1~4 with the exception that making sure V2X UE transmission power to be -25.5dBm+/-4.5 dB for carrier frequency f > 5GHz in step3.

### 6.5.2.3G.1.4.3 Message contents

SL-V2X-Preconfiguration is according to TS 36.508 [7] Table 4.10.1.1-1 with the exceptions specified in Table 6.5.2.3G.1.4.3-1, Table 6.5.2.3G.1.4.3-2 and Table 6.5.2.3G.1.4.3-3:

**Table 6.5.2.3G.1.4.3-1: SL-V2X-PreconfigFreqInfo-r14-DEFAULT**

| Derivation Path: 36.508 table 4.6.3-20K | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | SL-PreconfigGeneral-r12 | |
| maxTxPower-r12 | 5 | | PSSCH+PSCCH TP1 |
| | -25 | | PSSCH+PSCCH TP2, |
| sl-bandwidth-r12 | n50 | 10Mhz | |
| | n100 | 20Mhz | |
| } | | | |
| } | | | |
| v2x-CommPreconfigSync-r14 SEQUENCE { | | SL-PreconfigSync-r12 | |
| syncOffsetIndicators-r14 SEQUENCE { | | | |
| syncOffsetIndicator1-r14 | Not Present | Double synchronization signal transmission | |
| } | | | |
| } | | | |
| v2x-CommRxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry | | |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14-DEFAULT using condition BITMAP_6 and exception listed in Table Table 6.5.2.3G.1.4.3-2 | | |
| } | | | |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | | | |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14-DEFAULT using condition BITMAP_6 and exception listed in Table 6.5.2.3G.1.4.3-2 | | |
| } | | | |
| } | | | |

**Table 6.5.2.3G.1.4.3-2: SL-V2X-PreconfigCommPool-r14-DEFAULT**

| Derivation Path: 36.508 clause Table 4.6.3-20J | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResroucePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-Subframe-r14 CHOICE { | | | |
| bs20-r14 | 11111111111111111111 | | BITMAP_6 |
| } | | | |
| sizeSubchannel-r14 | n15 | | BW10 |
| | n20 | | BW20 |
| numSubchannel-r14 | n1 | | |
| startRB-Subchannel-r14 | As required in the test configuration tables in subclause 6.5.2.3G.1.4.1 | The starting resource block shall be RB #0 and RB# (max+1 - RB allocation) of the channel bandwidth. | |
| dataTxParameters-r14 SEQUENCE { | | | |
| p0-r12 | 31 | It's set to the maximum value to disable its effect on transmission power. | |
| } | | | |
| } | | | |

**Table 6.5.2.3G.1.4.3-3: SL-V2X-PreconfigFreqInfo-r14-DEFAULT for PSBCH test**

| **Derivation Path: 36.508 table 4.6.3-20K** | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | SL-PreconfigGeneral-r12 | |
| | 5 | | PSBCH TP1 |
| | -25 | | PSBCH TP2, |
| sl-bandwidth-r12 | n50 | 10Mhz | |
| | n100 | 20Mhz | |
| } | | | |
| v2x-CommPreconfigSync-r14 SEQUENCE { | | SL-PreconfigSync-r12 | |
| syncOffsetIndicators-r14 SEQUENCE { | | | |
| syncOffsetIndicator1-r14 | 0 | | |
| syncOffsetIndicator2-r14 | 1 | | |
| } | | | |
| syncTxParameters-r14 | 31 | It's set to the maximum value to disable its effect on transmission power. | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| BW10 | 10 MHz channel bandwidth cell environment |
| BW20 | 20 MHz channel bandwidth cell environment |
| PSSCH+PSCCH TPn | Test point n for PSCCH+PSSCH defined in the section of test procedure, n = 1,2 |
| PSBCH TPn | Test point n for PSBCH defined in the section of test procedure, n = 1,2 |

6.5.2.3G.1.5 Test requirement

Each of the 20 In-band emissions results, derived in Annex E.4.3 shall not exceed the corresponding values in Tables 6.5.2.3G.1.5-1.

**Table 6.5.2.3G.1.5-1: Test requirements for in-band emissions for UE in V2X sidelink communication**

| Parameter description | Unit | Limit (NOTE 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | For Frame Structure Type 1 and Frame Structure Type 2: $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRB}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRB}$, +0.8 $-57\ dBm/180\ kHz - P_{RB}\}$ | | Any non-allocated (NOTE 2) |
| **IQ Image** | dB | -24.2 | Image frequencies when carrier centre frequency ≥ 1 GHz | Image frequencies (NOTES 2, 3) |
| **Carrier leakage** | | -24.2 | Output power >10 dBm | Carrier frequency (NOTE 4,5) |
| | | -19.2 | -30 dBm ≤ Output power ≤ 0 dBm | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in NOTE 10.

NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs. For Frame Structure Type 3 and 20 MHz channel bandwidth, the requirement applies with $\lvert\Delta_{RB}\rvert \le 5$ for any non-allocated RB and $RIV = 1$ in the uplink scheduling grant with $RIV$ specified in [6].

NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs. For Frame Structure Type 3 with 20 MHz channel bandwidth, the applicable frequency is $n_{PRB} = 98$.

NOTE 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs. For Frame Structure Type 3 and 20 MHz channel bandwidth, the requirement applies with $RIV = 5$ in the uplink scheduling grant.

NOTE 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.

NOTE 6: $L_{CRB}$ is the Transmission Bandwidth (see Figure 5.6-1).

NOTE 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.6-1).

NOTE 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

NOTE 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

NOTE 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

[NOTE 11: For V2V-V2X waveforms, the requirements are applied when PSSCH and PSCCH are adjacent in frequency. The limit values (General, IQ Image or Carrier leakage) of each channel is calculated separately as $P_{general,\ PSSCH}$, $P_{IQ,\ PSSCH}$, $P_{LO,\ PSSCH}$, $P_{general,\ PSCCH}$, $P_{IQ,\ PSCCH}$, $P_{LO,\ PSCCH}$ ,respectively. In-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB,\ PSSCH}$ - 30 dB and the $P_{sumIBE.SSCH}$, where $P_{sumIBE.SSCH}$ is the linear sum of $P_{general,\ PSSCH}$, $P_{IQ,\ PSSCH}$, $P_{LO,\ PSSCH}$, $P_{general,\ PSCCH}$, $P_{IQ,\ PSCCH}$, $P_{LO,\ PSCCH}$.]

NOTE12: The requirement in this power range is not applicable for V2X sidelink transmission for E-UTRA V2X operating bands specified in Table 5.5G-1.

## 6.5.2.3G.2 In-band emissions for non-allocated RB for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

6.5.2.3G.2.1 Test purpose

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks, this is to verify that the inband emissions of V2X sidelink communication simultaneous with E-UTRA uplink/downlink satisfy the minimum requirements listed in 6.5.2.3G.2.3.

### 6.5.2.3G.2.2 Test Applicability

This test case applies to all types of E-UTRA UE release 14 and forward that supports V2X communication and is capable of V2X sidelink communication simultaneous with E-UTRA uplink/downlink.

### 6.5.2.3G.2.3 Minimum conformance requirements

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in 36.101[2] Table 5.5G-2, the requirements in 36.101[2] subclause 6.5.2G apply for V2X sidelink transmission and the requirements in 36.101[2] subclause 6.5.2 apply for the E-UTRA uplink transmission.

For V2X sidelink physical channels PSCCH, PSSCH and PSBCH, the In-band emissions requirements shall be as specified for PUSCH in 36.101[2] subclause 6.5.2.3 for the corresponding modulation and transmission bandwidth. When V2X transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the In-band emissions measurement interval is reduced by one symbol, accordingly.

Consequently, the relative in-band emission of each sidelink physical channel shall not exceed the values specified in Tables 6.5.2.3G.2.3-1.

**Table 6.5.2.3G.2.3-1: Minimum requirements for in-band emissions**

| Parameter description | Unit | Limit (NOTE 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | For Frame Structure Type 1 and Frame Structure Type 2: $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRB}),\ 20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRB},\ -57\ dBm/180\ kHz - P_{RB} \}$ For Frame Structure Type 3 and 20 MHz channel bandwidth: $\max\{ -10 - 6(\lvert\Delta_{RB}\rvert - 1),\ -57\ dBm/180\ kHz - P_{RB} \}$ | | Any non-allocated (NOTE 2) |
| **IQ Image** | dB | -28 | Image frequencies when carrier centre frequency < 1 GHz and Output power > 10 dBm | Image frequencies (NOTES 2, 3) |
| | | -25 | Image frequencies when carrier centre frequency < 1 GHz and Output power ≤ 10 dBm | |
| | | -25 | Image frequencies when carrier centre frequency ≥ 1 GHz | |
| **Carrier leakage** | dBc | -28 | Output power > 10 dBm and carrier centre frequency < 1 GHz | Carrier frequency (NOTES 4, 5) |
| | | -25 | Output power > 10 dBm and carrier centre frequency ≥ 1 GHz | |
| | | -25 | 0 dBm ≤ Output power ≤10 dBm | |
| | | -20 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -10 | -40 dBm ≤ Output power < -30 dBm(NOTE 12) | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in NOTE 10.

NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs. For Frame Structure Type 3 and 20 MHz channel bandwidth, the requirement applies with $|\Delta_{RB}| \le 5$ for any non-allocated RB and $RIV = 1$ in the uplink scheduling grant with $RIV$ specified in [6].

NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs. For Frame Structure Type 3 with 20 MHz channel bandwidth, the applicable frequency is $n_{PRB} = 98$.

NOTE 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs. For Frame Structure Type 3 and 20 MHz channel bandwidth, the requirement applies with $RIV = 5$ in the uplink scheduling grant.

NOTE 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.

NOTE 6: $L_{CRB}$ is the Transmission Bandwidth (see Figure 5.6-1).

NOTE 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.6-1).

NOTE 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

NOTE 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

NOTE 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

[NOTE 11: For V2V-V2X waveforms, the requirements are applied when PSSCH and PSCCH are adjacent in frequency. The limit values (General, IQ Image or Carrier leakage) of each channel is calculated separately as $P_{general,\ PSSCH}$, $P_{IQ,\ PSSCH}$, $P_{LO,\ PSSCH}$, $P_{general,\ PSCCH}$, $P_{IQ,\ PSCCH}$, $P_{LO,\ PSCCH}$ ,respectively. In-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB,\ PSSCH}$ - 30 dB and the $P_{sumIBE.SSCH}$, where $P_{sumIBE.SSCH}$ is the linear sum of $P_{general,\ PSSCH}$, $P_{IQ,\ PSSCH}$, $P_{LO,\ PSSCH}$, $P_{general,\ PSCCH}$, $P_{IQ,\ PSCCH}$, $P_{LO,\ PSCCH}$.]

NOTE 12 The requirement in this power range is not applicable for V2X sidelink transmission for E-UTRA V2X operating bands specified in Table 5.5G-1.

The normative reference for this requirement is TS 36.101 [2] clause6.5.2G and 6.5.2G.3.

### 6.5.2.3G.2.4 Test description

#### 6.5.2.3G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on Inter-band con-current V2X configurations specified in table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.3G.2.4.1-1 and 6.5.2.3G.2.4.1-2. The details of the uplink and V2X reference measurement channels (RMCs) are specified in sub-clause A.2 and A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.3G.2.4.1-1: Test Configuration Table for PSSCH and PSCCH**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range for Uplink and V2X Sidelink<br>High range for Uplink and V2X Sidelink | | | | |
| Test Channel Bandwidths as specified in 5.4.2G | | Lowest $N_{RB_agg}$,<br>Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| **E-UTRA** | **Downlink** | **Uplink Configuration** | | **V2X Configuration PSSCH and PSCCH** | | |
| Ch BW | N/A for In-band emission test case | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | | QPSK | 1 | 10 MHz | QPSK | 12 |
| 3 MHz | | QPSK | 4 | 20 MHz | QPSK | 18 |
| 5 MHz | | QPSK | 8 | | | |
| 10 MHz | | QPSK | 12 | | | |
| 15 MHz | | QPSK | 16 | | | |
| 20 MHz | | QPSK | 18 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2.<br>Note 2: The starting resource block for E-UTRA carrier and V2X carrier shall be RB #0+RB #0 and RB# (max+1 - RB allocation)+RB# (max+1 - RB allocation) of the channel bandwidth.<br>Note 3: The Inter-band con-current V2X configurations and bandwidth combination sets in Table 5.4.2G.1-2, which UE supports, are tested across the uplink and v2x sidelink allocation combinations as above. | | | | | | |

**Table 6.5.2.3G.2.4.1-2: Test Configuration Table for PSBCH**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range for Uplink and V2X Sidelink<br>High range for Uplink and V2X Sidelink | | | | |
| Test Channel Bandwidths as specified in 5.4.2G | | Lowest $N_{RB_agg}$,<br>Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink** | **Uplink Configuration** | | **V2X Configuration PSBCH** | | |
| Ch BW | N/A for In-band emission test case | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | | QPSK | 1 | 10 MHz | QPSK | 6 |
| 3 MHz | | QPSK | 4 | 20 MHz | QPSK | 6 |
| 5 MHz | | QPSK | 8 | | | |
| 10 MHz | | QPSK | 12 | | | |
| 15 MHz | | QPSK | 16 | | | |
| 20 MHz | | QPSK | 18 | | | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2G.1-2.<br>Note 2: The starting resource block for E-UTRA carrier shall be RB #0 and RB# (max+1 - RB allocation) of the channel bandwidth.<br>Note 3: The Inter-band con-current V2X configurations and bandwidth combination sets in Table 5.4.2G.1-2, which UE supports, are tested across the uplink and v2x sidelink allocation combinations as above | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.5.2.3G.2.4.3
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to subclause 6.5.2.3G.2.4.1.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in the state 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C.

### 6.5.2.3G.2.4.2 Test procedure

Test procedure for PSCCH+PSSCH:

[TP1: V2X UE output power > 10dBm]

1. The SS configure the PSCCH and PSSCH transmission at the $P_{CMAX,c,V2X}$ level of the corresponding test point to enable V2X sidelink transmission power at 4.3dBm+/-4.3dB for carrier frequency f > 5GHz.2. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.5.2.3G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.

3. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE E-UTRA uplink output power is 3.2 dBm+/-3.2dB for carrier frequency f ≤ 3.0GHz or 13.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

4. Measure In-band emission using Global In-Channel Tx-Test (Annex E) on all the uplink and V2X sidelink carriers with PRB allocated.

[TP2: V2X UE output power within (0,-30) dBm]

Repeat the above steps 1~4 with the exception in step3 that making sure UE E-UTRA uplink output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz and the exception in step 1 that V2X sidelink transmission power is -25.5dBm+/-4.5 dB for carrier frequency f > 5GHz.

Test procedure for PSBCH

[TP1: V2X UE output power > 0dBm]

1. The SS configures PSBCH transmission at the $P_{CMAX,c,V2X}$ level of the corresponding test point to enable V2X sidelink transmission power at 4.3dBm+/-4.3dB for carrier frequency f > 5GHz according to table 6.5.2.3G.2.4.3-3.

2. The SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC, Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL.

3. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE E-UTRA uplink output power is 3.2 dBm+/-3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz

4. Measure In-band emission using Global In-Channel Tx-Test (Annex E) on the uplink and V2X sidelink carrier with PRB allocated.

[TP2: V2X UE output power within (0,-30) dBm]

Repeat the above steps 1~4 with the exception in step 3 that making sure UE E-UTRA uplink output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz and the exception in step 1 that V2X UE transmission power is -25.5dBm+/-4.5 dB for carrier frequency f > 5GHz.

### 6.5.2.3G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.5.2.3G.2.4.3-1: SL-PSSCH-TxConfig-r14-DEFAULT**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20F SL-PSSCH-TxConfig-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| maxTxPower-r14 | 0 | | PSSCH+PSCCH TP1 |
| | -30 | | PSSCH+PSCCH TP2 |

**Table 6.5.2.3G.2.4.3-2: SL-CommResourcePoolV2X-r14-DEFAULT**

| Derivation Path: TS 36.508 [7] clause 4.6, Table 4.6.3-20C: SL-CommResourcePoolV2X-r14-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| dataTxParameters-r14 SEQUENCE { | | | |
| alpha-r12 | a0 | | |
| p0-r12 | 31 | | |
| } | | | |

**Table 6.5.2.3G.2.4.3-3: RRCConnectionReconfiguration (SideLink) for PSBCH test**

| Derivation Path: 36.508 table 4.6.1-8B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| sl-SyncTxControl-r12 SEQUENCE { | | | |
| networkControlledSyncTx-r12 | on | This field indicates the UE shall transmit synchronisation information | |
| } | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension { | | | |
| sl-V2X-ConfigDedicated-r14 SEQUENCE { | | | |
| v2x-InterFreqInfoList-r14 SEQUENCE (SIZE (0..maxFreqV2X-1-r14)) OF SL-InterFreqInfoV2X-r14 { | | | |
| sl-MaxTxPower-r14 | 0 | | PSBCH TP1 |
| | -30 | | PSBCH TP2 |
| v2x-UE-ConfigList-r14 SEQUENCE (SIZE (1.. maxCellIntra)) OF SL-V2X-InterFreqUE-Config-r14 { | | | |
| v2x-SyncConfig-r14 SEQUENCE (SIZE (1..maxSL-V2X-SyncConfig-r14)) OF SL-SyncConfigNFreq-r13 { | | | |
| txParameters-r13 SEQUENCE { | | | |
| syncTxParameters-r13 SEQUENCE { | | | |
| alpha-r12 | 0 | | |
| p0-r12 | 31 | | |
| } | | | |
| syncTxPeriodic-r13 | true | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

6.5.2.3G.2.5 Test requirement

For E-UTRA uplink and V2X sidelink, each of the In-band emissions results, derived in Annex E.4.3 shall not exceed the corresponding values in Tables 6.5.2.3G.2.5-1.

**Table 6.5.2.3G.2.5-1: Test requirements for in-band emissions for UE in V2X sidelink communication**

| Parameter description | Unit | Limit (NOTE 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | For Frame Structure Type 1 and Frame Structure Type 2: $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRB}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRB}$, +0.8 $-57\ dBm/180\ kHz - P_{RB}\}$ For Frame Structure Type 3 and 20 MHz channel bandwidth: $\max\{-10 - 6(\lvert\Delta_{RB}\rvert - 1),\ -57\ dBm/180\ kHz - P_{RB}\}$ | | Any non-allocated (NOTE 2) |
| **IQ Image** | dB | -27.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power > 10 dBm | Image frequencies (NOTES 2, 3) |
| | | -24.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power ≤ 10 dBm | |
| | | -24.2 | Image frequencies when carrier centre frequency ≥ 1 GHz | |
| **Carrier leakage** | dBc | -27.2 | Output power > 10 dBm and carrier centre frequency < 1 GHz | Carrier frequency (NOTES 4, 5) |
| | | -24.2 | Output power > 10 dBm and carrier centre frequency ≥ 1 GHz | |
| | | -24.2 | 0 dBm ≤ Output power ≤10 dBm | |
| | | -19.2 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -9.2 | -40 dBm ≤ Output power < -30 dBm(NOTE 12) | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in NOTE 10.

NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs. For Frame Structure Type 3 and 20 MHz channel bandwidth, the requirement applies with $\lvert\Delta_{RB}\rvert \le 5$ for any non-allocated RB and $RIV = 1$ in the uplink scheduling grant with $RIV$ specified in [6].

NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs. For Frame Structure Type 3 with 20 MHz channel bandwidth, the applicable frequency is $n_{PRB} = 98$.

NOTE 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs. For Frame Structure Type 3 and 20 MHz channel bandwidth, the requirement applies with $RIV = 5$ in the uplink scheduling grant.

NOTE 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.

NOTE 6: $L_{CRB}$ is the Transmission Bandwidth (see Figure 5.6-1).

NOTE 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.6-1).

NOTE 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

NOTE 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

NOTE 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

[NOTE 11: For V2V-V2X waveforms, the requirements are applied when PSSCH and PSCCH are adjacent in frequency. The limit values (General, IQ Image or Carrier leakage) of each channel is calculated separately as $P_{general,\ PSSCH}$, $P_{IQ,\ PSSCH}$, $P_{LO,\ PSSCH}$, $P_{general,\ PSCCH}$, $P_{IQ,\ PSCCH}$, $P_{LO,\ PSCCH}$ ,respectively. In-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB,\ PSSCH}$ - 30 dB and the $P_{sumIBE.SSCH}$, where $P_{sumIBE.SSCH}$ is the linear sum of $P_{general,\ PSSCH}$, $P_{IQ,\ PSSCH}$, $P_{LO,\ PSSCH}$, $P_{general,\ PSCCH}$, $P_{IQ,\ PSCCH}$, $P_{LO,\ PSCCH}$.]

NOTE 12: The requirement in this power range is not applicable for V2X sidelink transmission for E-UTRA V2X operating bands specified in Table 5.5G-1.

### 6.5.2.3G.3 In-band emissions for non-allocated RB for V2X Communication / Intra-band contiguous MCC operation

#### 6.5.2.3G.3.1 Test purpose

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks, this is to verify that the inband emissions of V2X sidelink with intra-band contiguous MCC satisfy the minimum requirements listed in 6.5.2.3G.3.3.

#### 6.5.2.3G.3.2 Test Applicability

This test case applies to all types of UE that supports Intra-band contiguous multi-carrier operation V2X Sidelink communication and Band 47.

#### 6.5.2.3G.3.3 Minimum conformance requirements

For intra-band contiguous carrier aggregation bandwidth class B, the requirements in Table 6.5.2.3G.3.3-1 and 6.5.2.3G.3.3-2 apply within the aggregated transmission bandwidth configuration with both component carrier (s) active and one single contiguous PRB allocation of bandwidth $L_{CRB}$ at the edge of the aggregated transmission bandwidth configuration.

**Table 6.5.2.3G.3.3-1: Minimum requirements for in-band emissions (allocated component carrier)**

| Parameter | Unit | Limit | | Applicable Frequencies |
|---|---|---|---|---|
| General | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRB}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRB},$ $-57\ dBm / 180\ kHz - P_{RB}\}$ | | Any non-allocated (NOTE 2) |
| IQ Image | dB | -25 | | Exception for IQ image (NOTE 3) |
| Carrier leakage | dBc | -25 | Output power > 0 dBm | Exception for Carrier frequency (NOTE 4) |
| | | -20 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -10 | -40 dBm ≤ Output power < -30 dBm | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in NOTE 9. The limit is evaluated in each non-allocated RB.

NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs

NOTE 3: Exceptions to the general limit are allowed for up to $L_{CRBs}$ +1 RBs within a contiguous width of $L_{CRBs}$ +1 non-allocated RBs. The measurement bandwidth is 1 RB.

NOTE 4: Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs. The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in the non-allocated RB to the measured total power in all allocated RBs.

NOTE 5: $L_{CRB}$ is the Transmission Bandwidth (see Figure 5.4.2-1) not exceeding $\lfloor N_{RB} / 2 - 1 \rfloor$

NOTE 6: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1) of the component carrier with RBs allocated.

NOTE 7: $EVM$ is the limit specified in Table 6.5.2.1G.3-1 for the modulation format used in the allocated RBs.

NOTE 8: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth).

NOTE 9: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

NOTE 10: For V2X intra-band contiguous multi-carrier operation the in-band emission requirement (General, IQ Image or Carrier leakage) of each channel is calculated separately as $P_{general,\ PSSCH,c(i)}$, $P_{IQ,\ PSSCH,c(i)}$, $P_{LO,\ PSSCH,c(i)}$, $P_{general,\ PSCCH,c(i)}$, $P_{IQ,\ PSCCH,c(i)}$, $P_{LO,\ PSCCH,c(i)}$ for each carrier respectively. In-band emissions combined limit for the aggregated bandwidth is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the $P_{sumIBE.CA}$, where $P_{sumIBE.CA}$ is the linear sum of $P_{general,\ PSSCH,c(i)}$, $P_{IQ,\ PSSCH,c(i)}$, $P_{LO,\ PSSCH,c(i)}$, $P_{general,\ PSCCH,c(i)}$, $P_{IQ,\ PSCCH,c(i)}$, $P_{LO,\ PSCCH,c(i)}$ for all carriers.

**Table 6.5.2.3G.3.3-2: Minimum requirements for in-band emissions (not allocated component carrier)**

| Para-meter | Unit | Meas BW NOTE 1 | Limit | | remark | Applicable Frequencies |
|---|---|---|---|---|---|---|
| General | dB | BW of 1 RB (180KHz rectangular) | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRB}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRB},$ $-57\ dBm\ /180\ kHz - P_{RB}\}$ | | The reference value is the average power per allocated RB in the allocated component carrier | Any RB in the non allocated component carrier. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| IQ Image | dB | BW of 1 RB (180KHz rectangular) | -25 (NOTE 2) | | The reference value is the average power per allocated RB in the allocated component carrier | The frequencies of the $L_{CRB}$ contiguous non-allocated RBs are unknown. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| Carrier leakage | dBc | BW of 1 RB (180KHz rectangular) | NOTE 3 | | The reference value is the total power of the allocated RBs in the allocated component carrier | The frequencies of the up to 2 non-allocated RBs are unknown. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| | | | -25 | Output power > 0 dBm | | |
| | | | -20 | -30 dBm ≤ Output power ≤ 0 dBm | | |
| | | | -10 | -40 dBm ≤ Output power < -30 dBm | | |

NOTE1: Resolution BWs smaller than the measurement BW may be integrated to achieve the measurement bandwidth.

NOTE 2: Exceptions to the general limit are allowed for up to $L_{CRB}$ +1 RBs within a contiguous width of $L_{CRB}$ +1 non-allocated RBs.

NOTE 3: Two Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs

NOTE 4: NOTES 1, 5, 6, 7, 8, 9 from Table 6.5.2.3G.3.3-1 apply for Table 6.5.2.3G.3.3-2 as well.

NOTE 5: $\Delta_{RB}$ for measured non-allocated RB in the non allocated component carrier may take non-integer values when the carrier spacing between the CCs is not a multiple of RB.

NOTE 6: For V2X intra-band contiguous multi-carrier operation the in-band emission requirement (General, IQ Image or Carrier leakage) of each channel is calculated separately as $P_{general,\ PSSCH,c(i)}$, $P_{IQ,\ PSSCH,c(i)}$, $P_{LO,\ PSSCH,c(i)}$, $P_{general,\ PSCCH,c(i)}$, $P_{IQ,\ PSCCH,c(i)}$, $P_{LO,\ PSCCH,c(i)}$ for each carrier respectively. In-band emissions combined limit for the aggregated bandwidth is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the $P_{sumIBE.CA}$, where $P_{sumIBE.CA}$ is the linear sum of $P_{general,\ PSSCH,c(i)}$, $P_{IQ,\ PSSCH,c(i)}$, $P_{LO,\ PSSCH,c(i)}$, $P_{general,\ PSCCH,c(i)}$, $P_{IQ,\ PSCCH,c(i)}$, $P_{LO,\ PSCCH,c(i)}$ for all carriers.

The normative reference for this requirement is TS 36.101 [2] subclause 6.5.2G.3 and subclause 6.5.2A.3

### 6.5.2.3G.3.4 Test Description

#### 6.5.2.3G.3.4.1 Initial Conditions

Initial conditions specify the set of UE parameters that UE needs be test in and the steps that SS should take with UE to reach the correct measurement state.

The initial test conditions consist of environment conditions, test frequencies and channel bandwidth based on E-UTRAN operating bands specified in table 5.4.2G.1-4 and propagation conditions. All these configurations shall be tested with applicable parameters for each channel bandwidth, and are shown in table 6.5.2.3G.3.4.1-1, the details of reference channel are specified in sub-clause A.8.3 and the reference GNSS configuration in TS 36.508 [7] subclause 4.11.

**6.5.2.3G.3.4.1-1: Table Initial Conditions for PSCCH+PSSCH**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low range, High range | | | |
| Test CC Combination setting($N_{RB_agg}$) as specified in subclause 5.4.2G | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | |
| **Test Parameters for V2X MCC Configuration** | | | | | | |
| **V2X MCC Channel Bandwidth** | | | **V2X Sidelink Configuration** | | | |
| **Configuration ID** | **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **$N_{RB_agg}$** | **CC1 and CC2 RB Allocation (LCRB @ RBstart)** | |
| 1 | 50 | 50 | QPSK | 12 | CC1_12@0 | CC2_0@0 |
| 2 | 50 | 50 | QPSK | 12 | CC1_0@0 | CC2_12@38 |
| Note1: The starting resource block shall be RB #0 and RB# (max+1 - RB allocation) of the aggregated channel bandwidth, each correspond to configuration ID 1 or 2. | | | | | | |

**6.5.2.3G.3.4.1-2: Table Initial Conditions for PSBCH**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low range, Mid range , High range | |
| Test CC Combination setting($N_{RB_agg}$) as specified in subclause 5.4.2G | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for V2X MCC Configuration** | | | | |
| **V2X MCC Channel Bandwidth** | | | **V2X Sidelink PSBCH Configuration** | |
| **Configuration ID** | **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **RB allocation** |
| 1 | 50 | 50 | QPSK | 6 |

1. Connect the SS and GNSS simulator to UE antenna connectors according to the figure A.89a in TS 36.508 [7] Annex A.

1a. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

2. Propagation conditions are set according to Annex B.0.

3. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)

4. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 6.5.2.3G.3.4.2 Test Procedure

Test procedure for PSCCH+PSSCH:

[TP1: V2X UE output power > 0dBm]

1. Set the V2X sidelink communication parameters for both the V2X sidelink capable UE (hereinafter referred to as V2X UE) and SS according to *SL-V2X-Preconfiguration* in TS 36.508[7] subclause 4.10.1 with the exception specified in clause 6.5.2.3G.3.4.3-1;
2. Ensure the UE is in the Side link State 5A-V2X in Transmit Mode, according to TS 36.508 [7] clause 4.5.9. Message contents are defined in clause 6.5.2.3G.3.4.3
3. V2X UE schedules the V2X RMC according to *SL-V2X-Preconfiguration* in line with the test configuration in Table 6.5.2.3G.3.4.1-1;
4. Measure the V2X UE output power to make sure V2X UE transmission power to be 4.3dBm+/-4.3dB for carrier frequency f > 5GHz;
5. Measure In-band emission using Global In-Channel Tx-Test (Annex E) on the component carrier with PRB allocated, and measure the power spectrum density on the component carrier without PRB allocated.

[TP2: V2X UE output power within (0 -30) dBm]

Repeat the above steps 1~4 with the exception that making sure V2X UE transmission power to be -25.5dBm+/-4.5dB for carrier frequency f > 5GHz in step4.

Test procedure for PSBCH

[TP1: V2X UE output power > 0dBm]

1. Set the V2X sidelink communication parameters for both the V2X sidelink capable UE (hereinafter referred to as V2X UE) and SS according to SL-V2X-Preconfiguration in TS 36.508[7] subclause 4.10.1 with the exception specified in clause 6.5.2.3G.3.4.3;
2. V2X UE schedules the SLSS/PSBCH according to SL-V2X-Preconfiguration which is in line with the test configuration in Table 6.5.2.3G.3.4.1-2;
3. Measure the V2X UE output power to make sure V2X UE transmission power to be 4.3dBm+/-4.3dB for carrier frequency f > 5GHz;
4. Measure In-band emission using Global In-Channel Tx-Test (Annex E)

[TP2: V2X UE output power within (0 -30) dBm]

Repeat the above steps 1~4 with the exception that making sure V2X UE transmission power to be -25.5dBm+/-4.5 dB for carrier frequency f > 5GHz in step3.

### 6.5.2.3G.3.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.10 Table Table 4.10.1.1-2 with the exceptions defined in clause 6.5.2.3G.1.4.3.:

### 6.5.2.3G.3.5 Test Requirement

Each of the 20 In-band emissions results, derived in Annex E.4.3 shall not exceed the corresponding values in Table 6.5.2.3G.3.5-1.

**Table 6.5.2.3G.3.5-1: Test requirements for in-band emissions (allocated component carrier)**

| Parameter Description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| General | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs}, +0.8$ $-57\ dBm/180\ kHz - P_{RB}\}$ | | Any non-allocated (Note 2) |
| IQ Image | dB | -24.2 | | Image frequencies (Note 3) |
| Carrier leakage | dBc | -24.2 | Output power<br>f ≤ 3.0GHz: 3.2dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB<br>4.2GHz < f ≤ 6GHz: 4.3 dBm ±4.3dB | LO frequency (Note 4) |
| | | -19.2 | Output power<br>f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB<br>4.2GHz < f ≤ 6GHz: -25.5dBm±4.5dB | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in NOTE 9. The limit is evaluated in each non-allocated RB.

NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs

NOTE 3: Exceptions to the general limit are allowed for up to $L_{CRBs}$ +1 RBs within a contiguous width of $L_{CRBs}$ +1 non-allocated RBs. The measurement bandwidth is 1 RB.

NOTE 4: Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs. The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in the non-allocated RB to the measured total power in all allocated RBs.

NOTE 5: $L_{CRB}$ is the Transmission Bandwidth (see Figure 5.4.2-1) not exceeding $\lfloor N_{RB}/2 - 1 \rfloor$

NOTE 6: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1) of the component carrier with RBs allocated.

NOTE 7: $EVM$ is the limit specified in Table 6.5.2.1G.3-1 for the modulation format used in the allocated RBs.

NOTE 8: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth).

NOTE 9: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

NOTE 10: For V2X intra-band contiguous multi-carrier operation the in-band emission requirement (General, IQ Image or Carrier leakage) of each channel is calculated separately as $P_{general,\ PSSCH,c(i)}$, $P_{IQ,\ PSSCH,c(i)}$, $P_{LO,\ PSSCH,c(i)}$, $P_{general,\ PSCCH,c(i)}$, $P_{IQ,\ PSCCH,c(i)}$, $P_{LO,\ PSCCH,c(i)}$ for each carrier respectively. In-band emissions combined limit for the aggregated bandwidth is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the $P_{sumIBE.CA}$, where $P_{sumIBE.CA}$ is the linear sum of $P_{general,\ PSSCH,c(i)}$, $P_{IQ,\ PSSCH,c(i)}$, $P_{LO,\ PSSCH,c(i)}$, $P_{general,\ PSCCH,c(i)}$, $P_{IQ,\ PSCCH,c(i)}$, $P_{LO,\ PSCCH,c(i)}$ for all carriers.

The in-band emissions results, measured with the spectral test shall not exceed the corresponding values in Table 6.5.2.3G.3.5-2

**Table 6.5.2.3G.3.5-2: Test requirements for in-band emissions (not allocated component carrier)**

| Para-meter | Unit | Meas BW Note 1 | Limit | | remark | Applicable Frequencies |
|---|---|---|---|---|---|---|
| General | dB | BW of 1 RB (180KHz rectangular) | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs}$ $-57\ dBm\ /180\ kHz - P_{RB}\}$ +0.8 | | The reference value is the average power per allocated RB in the allocated component carrier | Any RB in the non allocated component carrier. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| IQ Image | dB | BW of 1 RB (180KHz rectangular) | -24.2 Note 2 | | The reference value is the average power per allocated RB in the allocated component carrier | The frequencies of the $L_{CRB}$ contiguous non-allocated RBs are unknown. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| Carrier leakage | dBc | BW of 1 RB (180KHz rectangular) | Note 3 | | The reference value is the total power of the allocated RBs in the allocated component carrier | The frequencies of the up to 2 non-allocated RBs are unknown. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| | | | -24.2 | Output power > 0 dBm | | |
| | | | -19.2 | -30 dBm ≤ Output power ≤ 0 dBm | | |

Note1: Resolution BWs smaller than the measurement BW may be integrated to achieve the measurement bandwidth.

Note 2: Exceptions to the general limit are allowed for up to $L_{CRB}$ +1 RBs within a contiguous width of $L_{CRB}$ +1 non-allocated RBs.

Note 3: Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs.

Note 4: Note s1, 6, 7, 8, 9, 10 from Table 6.5.2A.3.0-1 apply for Table 6.5.2A.3.0-2 as well.

Note 5: $\Delta_{RB}$ for measured non-allocated RB in the non allocated component carrier may take non-integer values when the carrier spacing between the CCs is not a multiple of RB.

NOTE 6: For V2X intra-band contiguous multi-carrier operation the in-band emission requirement (General, IQ Image or Carrier leakage) of each channel is calculated separately as $P_{general,\ PSSCH,c(i)}$, $P_{IQ,\ PSSCH,c(i)}$, $P_{LO,\ PSSCH,c(i)}$, $P_{general,\ PSCCH,c(i)}$, $P_{IQ,\ PSCCH,c(i)}$, $P_{LO,\ PSCCH,c(i)}$ for each carrier respectively. In-band emissions combined limit for the aggregated bandwidth is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the $P_{sumIBE,CA}$, where $P_{sumIBE,CA}$ is the linear sum of $P_{general,\ PSSCH,c(i)}$, $P_{IQ,\ PSSCH,c(i)}$, $P_{LO,\ PSSCH,c(i)}$, $P_{general,\ PSCCH,c(i)}$, $P_{IQ,\ PSCCH,c(i)}$, $P_{LO,\ PSCCH,c(i)}$ for all carriers.

## 6.5.2.4 EVM equalizer spectrum flatness

### 6.5.2.4.1 Test Purpose

The zero-forcing equalizer correction applied in the EVM measurement process (as described in Annex E) must meet a spectrum flatness requirement for the EVM measurement to be valid. The EVM equalizer spectrum flatness is defined in terms of the maximum peak-to-peak ripple of the equalizer coefficients (dB) across the allocated uplink block variation in dB of the equalizer coefficients generated by the EVM measurement process. The EVM equalizer spectrum flatness requirement does not limit the correction applied to the signal in the EVM measurement process but for the EVM result to be valid, the equalizer correction that was applied must meet the EVM equalizer spectrum flatness minimum requirements. The basic measurement interval is the same as for EVM.

### 6.5.2.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 8 and forward.

### 6.5.2.4.3 Minimum conformance requirements

The peak-to-peak variation of the EVM equalizer coefficients contained within the frequency range of the uplink allocation shall not exceed the maximum ripple. The EVM equalizer spectrum flatness shall not exceed the values specified in Table 6.5.2.4.3-1 for normal conditions. For uplink allocations contained within both Range 1 and Range 2, the coefficients evaluated within each of these frequency ranges shall meet the corresponding ripple requirement and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 5 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 7 dB (see Figure 6.5.2.4.3-1).

The EVM equalizer spectrum flatness shall not exceed the values specified in Table 6.5.2.4.3-2 for extreme conditions. For uplink allocations contained within both Range 1 and Range 2, the coefficients evaluated within each of these frequency ranges shall meet the corresponding ripple requirement and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 6 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 10 dB (see Figure 6.5.2.4.3-1).

**Table 6.5.2.4.3-1: Minimum requirements for EVM equalizer spectrum flatness (normal conditions)**

| Frequency Range | Maximum Ripple [dB] |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 3$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 3$ MHz (Range 1) | 4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 3$ MHz or $F_{UL_High} - F_{UL_Meas} < 3$ MHz (Range 2) | 8 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

**Table 6.5.2.4.3-2: Minimum requirements for EVM equalizer spectrum flatness (extreme conditions)**

| | |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 5$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 5$ MHz (Range 1) | 4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 5$ MHz or $F_{UL_High} - F_{UL_Meas} < 5$ MHz (Range 2) | 12 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

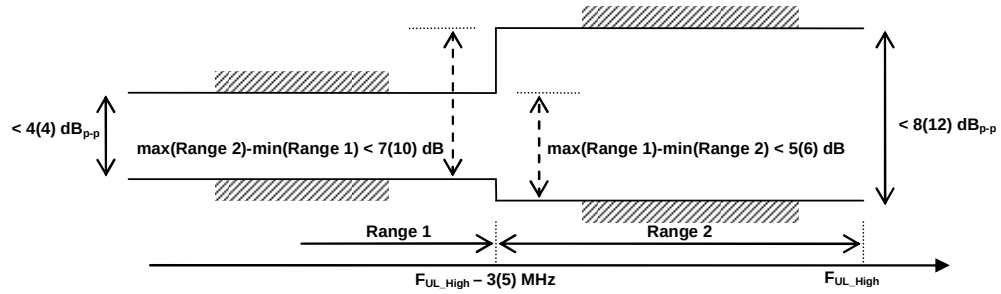



**Figure 6.5.2.4.3-1: The limits for EVM equalizer spectrum flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement within brackets)**

The normative reference for this requirement is TS 36.101 clause 6.5.2.4.1.

## 6.5.2.4.4 Test description

### 6.5.2.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.4.2.4.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.4.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | See Table 6.5.1.4.1-1 | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for EVM equalizer spectrum flatness testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 50 | 50 |
| 15MHz | | QPSK | 75 | 75 |
| 20MHz | | QPSK | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to in Table 6.5.2.4.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2.4.4.3.

#### 6.5.2.4.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.4.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure spectrum flatness using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

#### 6.5.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.5.2.4.5 Test requirement

Each of the 20 spectrum flatness functions, shall derive four ripple results in Annex E.4.4, The derived results shall not exceed the values in Figure 6.5.2.4.5-1:

For normal conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2.4.5-1 and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 6.4 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 8.4 dB (see Figure 6.5.2.4.5-1).

For extreme conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2.4.5-2 and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 7.4 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 11.4 dB (see Figure 6.5.2.4.5-1).

**Table 6.5.2.4.5-1: Test requirements for EVM equalizer spectrum flatness (normal conditions)**

| Frequency Range | Maximum Ripple [dB] |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 3$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 3$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 3$ MHz or $F_{UL_High} - F_{UL_Meas} < 3$ MHz (Range 2) | 9.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

**Table 6.5.2.4.5-2: Test requirements for spectrum flatness (extreme conditions)**

| Frequency Range | Maximum Ripple [dB] |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 5$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 5$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 5$ MHz or $F_{UL_High} - F_{UL_Meas} < 5$ MHz (Range 2) | 13.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

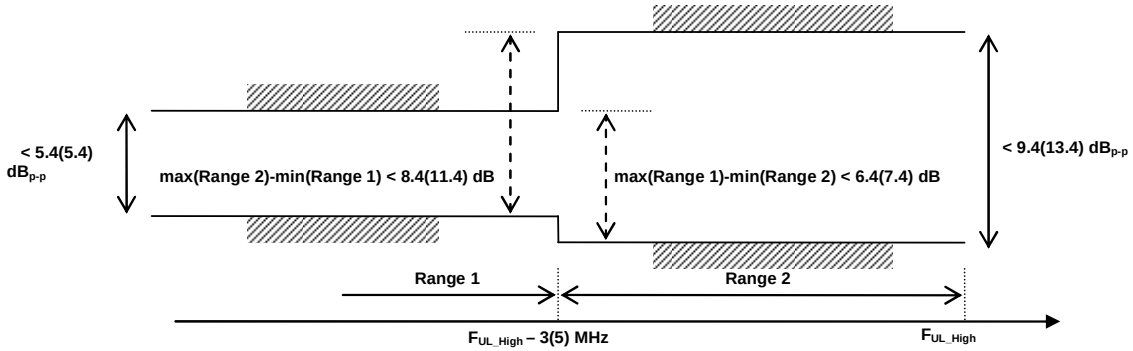



**Figure 6.5.2.4.5-1: The limits for EVM equalizer spectrum flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement within brackets)**

## 6.5.2.4E EVM equalizer spectrum flatness for UE category 0

### 6.5.2.4E.1 Test Purpose

Same test purpose as in clause 6.5.2.4.1.

### 6.5.2.4E.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.5.2.4E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.5.2.4.3.

### 6.5.2.4E.4 Test description

#### 6.5.2.4E.4.1 Initial conditions

Same initial conditions as in clause 6.5.2.4.4.1 with following exceptions:

- Instead of Table 6.5.2.4.4.1-1 → use Table 6.5.2.4E.4.1-1.
- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.5.2.4E.4.1-1: Test Configuration Table**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | See Table 6.5.1.4.1-1 | | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | See Table 6.5.1.4.1-1 | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | See Table 6.5.1.4.1-1 | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for EVM equalizer spectrum flatness testing | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 36 | 36 |
| 15MHz | | QPSK | 36 | 36 |
| 20MHz | | QPSK | 36 | 36 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

### 6.5.2.4E.4.2 Test procedure

Same test procedure as in clause 6.5.2.4.4.2 with following exception for HD-FDD:

- In step 3, slots with transient periods are not under test. Half-duplex guard sub frame are not under test.

### 6.5.2.4E.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.5.2.4E.5 Test requirement

Each of the 20 spectrum flatness functions, shall derive four ripple results in Annex E.4.4, The derived results shall not exceed the values in Figure 6.5.2.4E.5-1:

For normal conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2.4E.5-1 and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 6.4 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 8.4 dB (see Figure 6.5.2.4E.5-1).

For extreme conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2.4E.5-2 and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 7.4 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 11.4 dB (see Figure 6.5.2.4E.5-1).

**Table 6.5.2.4E.5-1: Test requirements for EVM equalizer spectrum flatness (normal conditions)**

| Frequency Range | Maximum Ripple [dB] |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 3$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 3$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 3$ MHz or $F_{UL_High} - F_{UL_Meas} < 3$ MHz (Range 2) | 9.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

**Table 6.5.2.4E.5-2: Test requirements for spectrum flatness (extreme conditions)**

| Frequency Range | Maximum Ripple [dB] |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 5$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 5$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 5$ MHz or $F_{UL_High} - F_{UL_Meas} < 5$ MHz (Range 2) | 13.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

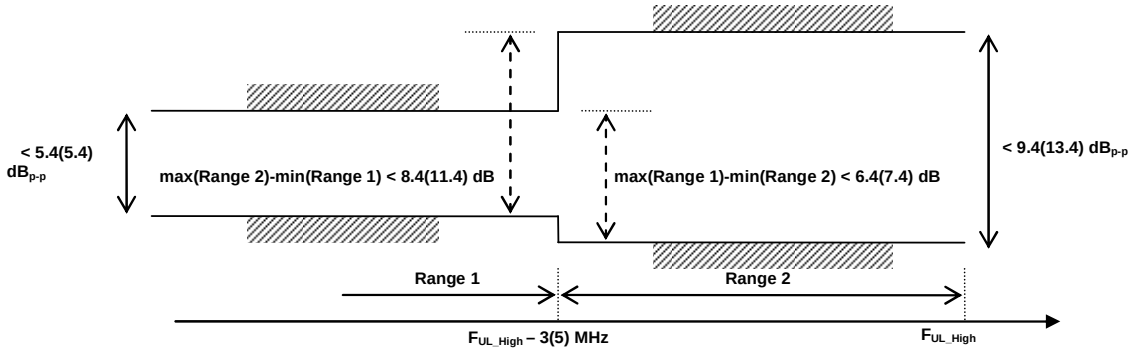



**Figure 6.5.2.4E.5-1: The limits for EVM equalizer spectrum flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement within brackets)**

## 6.5.2.4EA EVM equalizer spectrum flatness for UE category M1

### 6.5.2.4EA.1 Test Purpose

Same test purpose as in clause 6.5.2.4.1.

### 6.5.2.4EA.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

### 6.5.2.4EA.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.5.2.4.3.

### 6.5.2.4EA.4 Test description

#### 6.5.2.4EA.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.4.2.4EA.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2

**Table 6.5.2.4EA.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | See Table 6.5.1.4.1-1 | | | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | See Table 6.5.1.4.1-1 | | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | 5MHz | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for EVM equalizer spectrum flatness testing | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| 5MHz | | QPSK | 6 | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4 | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to in Table 6.5.2.4EA.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.5.2.4EA.4.3.

### 6.5.2.4EA.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.5.2.4EA.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure spectrum flatness using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods are not under test. Half-duplex guard sub frame are not under test.

### 6.5.2.4EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA.

## 6.5.2.4EA.5 Test requirement

Each of the 20 spectrum flatness functions, shall derive four ripple results in Annex E.4.4, The derived results shall not exceed the values in Figure 6.5.2.4EA.5-1:

For normal conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2.4EA.5-1 and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 6.4 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 8.4 dB (see Figure 6.5.2.4EA.5-1).

For extreme conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2.4EA.5-2 and the following additional requirement: the relative difference between the maximum coefficient in

Range 1 and the minimum coefficient in Range 2 must not be larger than 7.4 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 11.4 dB (see Figure 6.5.2.4EA.5-1).

**Table 6.5.2.4EA.5-1: Test requirements for EVM equalizer spectrum flatness (normal conditions)**

| Frequency Range | Maximum Ripple [dB] |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 3$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 3$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 3$ MHz or $F_{UL_High} - F_{UL_Meas} < 3$ MHz (Range 2) | 9.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

**Table 6.5.2.4EA.5-2: Test requirements for spectrum flatness (extreme conditions)**

| Frequency Range | Maximum Ripple [dB] |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 5$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 5$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 5$ MHz or $F_{UL_High} - F_{UL_Meas} < 5$ MHz (Range 2) | 13.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

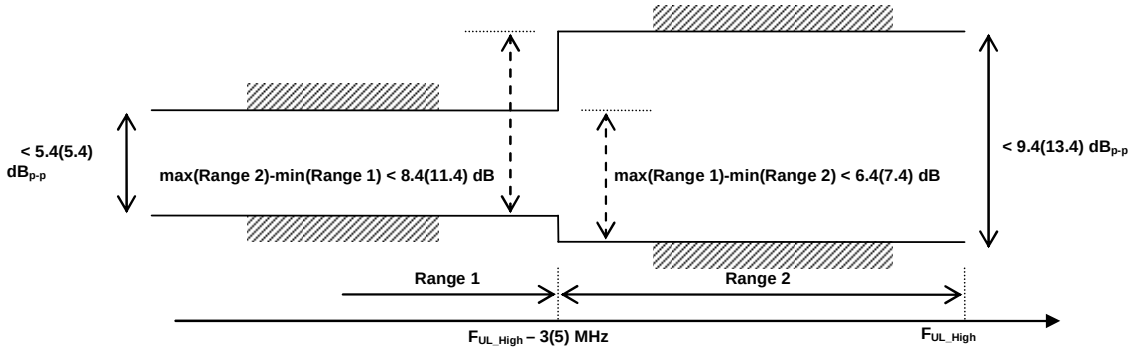



**Figure 6.5.2.4EA.5-1: The limits for EVM equalizer spectrum flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement within brackets)**

## 6.5.2.4EB EVM equalizer spectrum flatness for UE category 1bis

### 6.5.2.4EB.1 Test purpose

Same test purpose as in clause 6.5.2.4.

### 6.5.2.4EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

### 6.5.2.4EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.5.2.4.3.

### 6.5.2.4EB.4 Test description

#### 6.5.2.4EB.4.1 Initial conditions

Same initial conditions as in clause 6.5.2.4.4.1 with the following exception:

- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.5.2.4EB.4.2 Test procedure

Same test procedure as in clause 6.5.2.4.4.2.

#### 6.5.2.4EB.4.3 Message contents

Same message contents as in clause 6.5.2.4.4.3.

### 6.5.2.4EB.5 Test requirement

Each of the 20 spectrum flatness functions, shall derive four ripple results in Annex E.4.4, The derived results shall not exceed the values in Figure 6.5.2.4EB.5-1:

For normal conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2.4EB.5-1 and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 6.4 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 8.4 dB (see Figure 6.5.2.4EB.5-1).

For extreme conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2.4EB.5-2 and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 7.4 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 11.4 dB (see Figure 6.5.2.4EB.5-1).

**Table 6.5.2.4EB.5-1: Test requirements for EVM equalizer spectrum flatness (normal conditions)**

| Frequency Range | Maximum Ripple [dB] |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 3$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 3$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 3$ MHz or $F_{UL_High} - F_{UL_Meas} < 3$ MHz (Range 2) | 9.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

**Table 6.5.2.4EB.5-2: Test requirements for spectrum flatness (extreme conditions)**

| Frequency Range | Maximum Ripple [dB] |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 5$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 5$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 5$ MHz or $F_{UL_High} - F_{UL_Meas} < 5$ MHz (Range 2) | 13.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

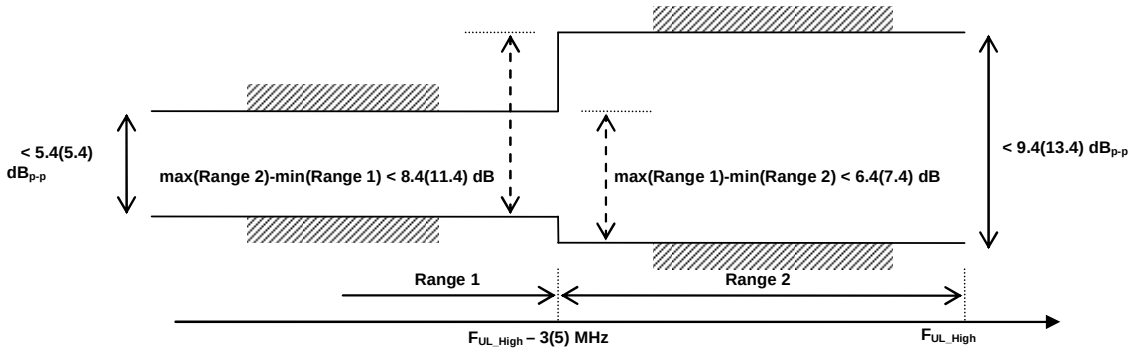



**Figure 6.5.2.4EB.5-1: The limits for EVM equalizer spectrum flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement within brackets)**

## 6.5.2.4G EVM equalizer spectrum flatness for V2X transmission

### 6.5.2.4G.1 EVM equalizer spectrum flatness for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

#### 6.5.2.4G.1.1 Test Purpose

The zero-forcing equalizer correction applied in the EVM measurement process (as described in Annex E) must meet a spectrum flatness requirement for the EVM measurement to be valid. The EVM equalizer spectrum flatness is defined in terms of the maximum peak-to-peak ripple of the equalizer coefficients (dB) across the V2X sidelink allocated block variation in dB of the equalizer coefficients generated by the EVM measurement process. The EVM equalizer spectrum flatness requirement does not limit the correction applied to the signal in the EVM measurement process but for the EVM result to be valid, the equalizer correction that was applied must meet the EVM equalizer spectrum flatness minimum requirements. The basic measurement interval is the same as for EVM.

#### 6.5.2.4G.1.2 Test applicability

This test case applies to all types of UE that supports V2X Sidelink communication and Band 47.

#### 6.5.2.4G.1.3 Minimum conformance requirements

The peak-to-peak variation of the EVM equalizer coefficients contained within the frequency range of the V2X sidelink allocation shall not exceed the maximum ripple. The EVM equalizer spectrum flatness shall not exceed the values specified in Table 6.5.2.4G.1.3-1 for normal conditions. For V2X sidelink allocations contained within both Range 1 and Range 2, the coefficients evaluated within each of these frequency ranges shall meet the corresponding ripple requirement and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 5 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 7 dB (see Figure 6.5.2.4G.1.3-1).

The EVM equalizer spectrum flatness shall not exceed the values specified in Table 6.5.2.4G.1.3-2 for extreme conditions. For uplink allocations contained within both Range 1 and Range 2, the coefficients evaluated within each of these frequency ranges shall meet the corresponding ripple requirement and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 6 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 10 dB (see Figure 6.5.2.4G.1.3-1).

For intra-band contiguous multi-carrier operation the above EVM equalizer spectrum flatness requirement shall apply for each component carrier.

**Table 6.5.2.4G.1.3-1: Minimum requirements for EVM equalizer spectrum flatness (normal conditions)**

| Frequency Range | Maximum Ripple [dB] |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 3$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 3$ MHz (Range 1) | 4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 3$ MHz or $F_{UL_High} - F_{UL_Meas} < 3$ MHz (Range 2) | 8 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2G-1 | |

**Table 6.5.2.4G.1.3-2: Minimum requirements for EVM equalizer spectrum flatness (extreme conditions)**

| | |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 5$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 5$ MHz (Range 1) | 4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 5$ MHz or $F_{UL_High} - F_{UL_Meas} < 5$ MHz (Range 2) | 12 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2G-1 | |

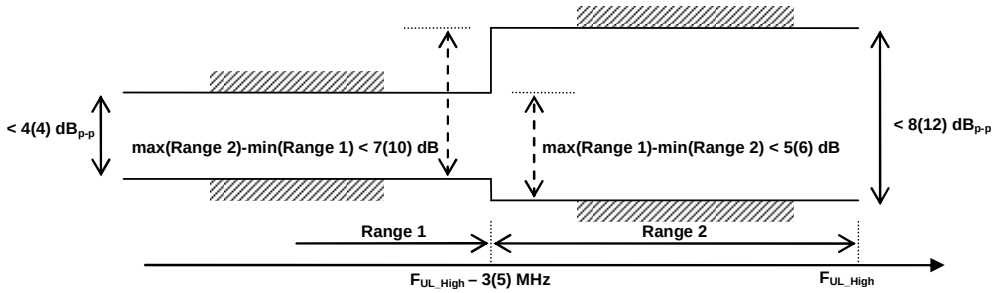



**Figure 6.5.2.4G.1.3-1: The limits for EVM equalizer spectrum flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement within brackets)**

The normative reference for this requirement is TS 36.101 clause 6.5.2.4.1.

### 6.5.2.4G.1.4 Test description

#### 6.5.2.4G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2G. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.4G.1.4.1-1 the details of the sidelink reference measurement channels (RMCs) are specified in A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.5.2.4G.1.4.1-1: Test Configuration Table for PSSCH and PSCCH**

| Initial Conditions | | |
|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | Low range, Mid range, High range |
| Test Channel Bandwidths (as specified in subclause 5.4.2G) | | Lowest, Mid, Highest |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X sidelink transmission** | |
| Ch BW | Mod'n | RB Allocation |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 96 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in specified in subclause 5.4.2G. | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508[7] Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 for both SS and UE are pre-configured according to TS 36.508 [7] subclause 4.10.1 with the exception specified in clause 6.5.2.4G.1.4.3-1.
3. The V2X reference measurement channel is set according to Table 6.5.2.4G.1.4.1-1
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0;
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.5.2.4G.1.4.2 Test procedure

1. The V2X UE schedules the V2X RMC with transmission power at $P_{UMAX}$ level according to *SL-V2X-Preconfiguration* which is in line with the test configuration in Table 6.5.2.4G.1.4.1-1;
2. Measure spectrum flatness using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

### 6.5.2.4G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause Table 6.8.2.1-1with the following exceptions:

**Table 6.5.2.4G.1.4.3-1: SL-V2X-Preconfiguration-r14**

| Derivation Path: 36.508 Table 4.10.1.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-Preconfiguration-r14 ::= SEQUENCE { | | | |
| v2x-PreconfigFreqList-r14 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | One entry of v2x-PreconfigFreqInfo | | |
| SL-V2X-PreconfigFreqInfo-r14[1] ::= SEQUENCE { | | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | SL-PreconfigGeneral-r12 | |
| maxTxPower-r12 | 23 | | Power class3 |
| | 26 | | Power class2 |
| sl-bandwidth-r12 | n50 | 10Mhz | |
| | n100 | 20Mhz | |
| } | | | |
| v2x-CommPreconfigSync-r14 SEQUENCE { | | SL-PreconfigSync-r12 | |
| syncOffsetIndicators-r14 SEQUENCE { | | | |
| syncOffsetIndicator1-r14 | Not Present | Double synchronization signal transmission | |
| } | | | |
| } | | | |
| v2x-CommRxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry | | |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14-DEFAULT using condition BITMAP_6 and exception listed in Table 6.5.2.4G.1.4.3-2 | | |
| } | | | |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | | | |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14-DEFAULT using condition BITMAP_6 and exception listed in Table 6.5.2.4G.1.4.3-2 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 6.5.2.4G.1.4.3-2: SL-V2X-PreconfigCommPool-r14-DEFAULT**

| Derivation Path: 36.508 Table 4.6.3-20J | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResroucePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-Subframe-r14 CHOICE { | | | |
| bs20-r14 | 11111111111111111111 | | BITMAP_6 |
| } | | | |
| sizeSubchannel-r14 | N48 | | BW10 |
| | N96 | | BW20 |
| numSubchannel-r14 | n1 | | |
| dataTxParameters-r14 SEQUENCE { | | | |
| p0-r12 | 31 | It's set to the maximum value to disable its effect on transmission power. | |
| } | | | |
| } | | | |

6.5.2.4G.1.5 Test requirement

Each of the 20 spectrum flatness functions, shall derive four ripple results in Annex E.4.4, The derived results shall not exceed the values in Figure 6.5.2.4G.5-1:

For normal conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2.4G.5-1and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 6.4 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 8.4 dB (see Figure 6.5.2.4G.5-1).

For extreme conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2.4G.5-2 and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 7.4dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 11.4 dB (see Figure 6.5.2.4G.1.5-1).

**Table 6.5.2.4G.5-1: Test requirements for EVM equalizer spectrum flatness (normal conditions)**

| **Frequency Range** | **Maximum Ripple [dB]** |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 3$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 3$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 3$ MHz or $F_{UL_High} - F_{UL_Meas} < 3$ MHz (Range 2) | 9.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

**Table 6.5.2.4G.5-2: Test requirements for spectrum flatness (extreme conditions)**

| **Frequency Range** | **Maximum Ripple [dB]** |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 5$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 5$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 5$ MHz or $F_{UL_High} - F_{UL_Meas} < 5$ MHz (Range 2) | 13.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

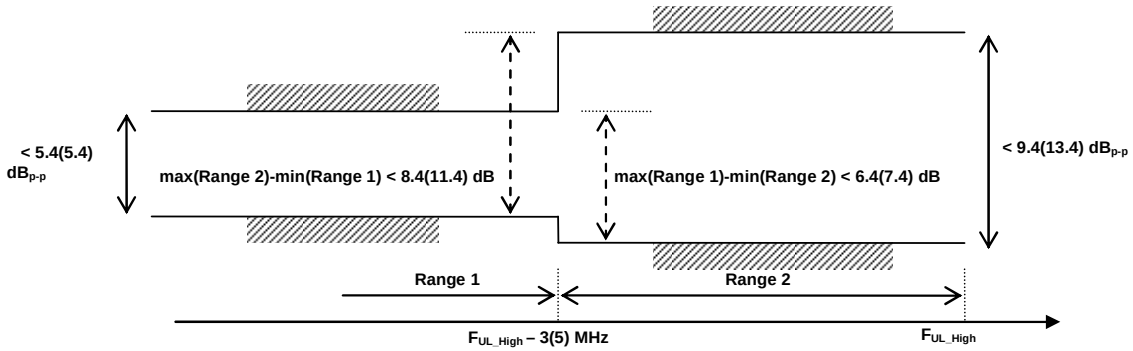



**Figure 6.5.2.4G.5-1: The limits for EVM equalizer spectrum flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement within brackets)**

## 6.5.2.4G.3 EVM equalizer spectrum flatness for V2X Communication / Intra-band contiguous multi-carrier operation

Editor's note: The test case is incomplete for the following item is missing:

- Test applicability is missing in 38.521-2.

### 6.5.2.4G.3.1 Test purpose

The zero-forcing equalizer correction applied in the EVM measurement process (as described in Annex E) must meet a spectrum flatness requirement for the EVM measurement to be valid. The EVM equalizer spectrum flatness is defined in terms of the maximum peak-to-peak ripple of the equalizer coefficients (dB) across the V2X sidelink allocated block variation in dB of the equalizer coefficients generated by the EVM measurement process. The EVM equalizer spectrum flatness requirement does not limit the correction applied to the signal in the EVM measurement process but for the EVM result to be valid, the equalizer correction that was applied must meet the EVM equalizer spectrum flatness minimum requirements. The basic measurement interval is the same as for EVM.

### 6.5.2.4G.3.2 Test Applicability

This test case applies to all types of UE that supports Intra-band contiguous multi-carrier operation V2X Sidelink communication and Band 47.

### 6.5.2.4G.3.3 Minimum conformance requirements

The requirements of subclause 6.5.2.4.3 shall apply for V2X transmissions.

For intra-band contiguous multi-carrier operation the EVM equalizer spectrum flatness requirement of subclause 6.5.2.4.3 shall apply for each component carrier.

The normative reference for this requirement is TS 36.101 [2] subclause 6.5.2G.3 and subclause 6.5.2G.4

### 6.5.2.4G.3.4 Test Description

#### 6.5.2.4G.3.4.1 Initial Conditions

Initial conditions specify the set of UE parameters that UE needs be test in and the steps that SS should take with UE to reach the correct measurement state.

The initial test conditions consist of environment conditions, test frequencies and channel bandwidth based on E-UTRAN operating bands specified in subclauses 5.2G and 5.4.2G and propagation conditions. All these configurations shall be tested with applicable parameters for each channel bandwidth, and are shown in table 6.5.2.4G.3.4.1-1; the

details of reference channel are specified in sub-clause A.8.3 and the reference GNSS configuration in TS 36.508 [7] subclause 4.11.

**6.5.2.4G.3.4.1-1: Table Initial Conditions for PSCCH+PSSCH**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | NC,TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | | Low range, Mid range, High range | | |
| Test CC Combination setting($N_{RB_agg}$) as specified in subclause 5.4.2G | | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | |
| **Test Parameters for V2X MCC Configuration** | | | | | | |
| **V2X MCC Channel Bandwidth** | | | **V2X Sidelink Configuration** | | | |
| **Configuration ID** | **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **$N_{RB_agg}$** | **CC1 and CC2 RB Allocation (LCRB @ RBstart)** | |
| 1 | 50 | 50 | QPSK | 96 | CC1_48@0 | CC2_48@0 |

1. Connect the SS and GNSS simulator to UE antenna connectors according to the figure A.89ain TS 36.508 [7] Annex A.

2. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

3. Propagation conditions are set according to Annex B.0.

4. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)

5. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

6. Ensure the UE is in the Side link State 5A-V2X in Transmit Mode, according to TS 36.508 [7] clause4.5.9. Message contents are defined in clause 6.5.2.4G.3.4.3

### 6.5.2.4G.3.4.2 Test Procedure

1. The V2X UE schedules the V2X RMC with transmission power at $P_{UMAX}$ level according to *SL-V2X-Preconfiguration* which reflects the test configuration in Table 6.5.2.4G.3.4.1-1;

2. Measure spectrum flatness for each component carrier using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

### 6.5.2.4G.3.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.10 Table 4.10.1.1-2 with the exceptions defined in clause 6.5.2.4G.1.4.3.

### 6.5.2.4G.3.5 Test requirement

Each of the 20 spectrum flatness functions, shall derive four ripple results in Annex E.9.1, The derived results for each component carrier shall not exceed the values in Figure 6.5.2.4G.3.5-1:

For normal conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2.4G.3.5-1and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 6.4 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 8.4 dB (see Figure 6.5.2.4G.3.5-1).

For extreme conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2.4G.3.5-2 and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 7.4dB, and the relative difference between the

maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 11.4 dB (see Figure 6.5.2.4G.3.5-1).

**Table 6.5.2.4G.3.5-1: Test requirements for EVM equalizer spectrum flatness (normal conditions)**

| Frequency Range | Maximum Ripple [dB] |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 3$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 3$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 3$ MHz or $F_{UL_High} - F_{UL_Meas} < 3$ MHz (Range 2) | 9.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

**Table 6.5.2.4G.3.5-2: Test requirements for spectrum flatness (extreme conditions)**

| Frequency Range | Maximum Ripple [dB] |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 5$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 5$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 5$ MHz or $F_{UL_High} - F_{UL_Meas} < 5$ MHz (Range 2) | 13.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

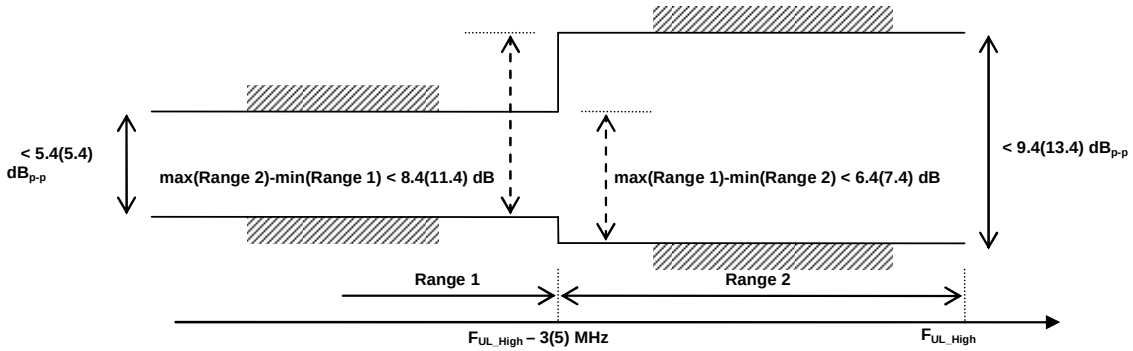



**Figure 6.5.2.4G.3.5-1: The limits for EVM equalizer spectrum flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement within brackets)**

## 6.5.2A Transmit modulation for CA

The requirements in this clause apply with PCC and SCC in the UL configured and activated: PCC with PRB allocation and SCC without PRB allocation and without CSI reporting and SRS configured.

### 6.5.2A.1 Error Vector Magnitude (EVM) for CA

#### 6.5.2A.1.0 Minimum conformance requirements

For inter-band carrier aggregation, EVM measurements are evaluated for each component carrier, and for the different modulations schemes, the EVM requirements shall not exceed the values specified in Table 6.5.2.1.3-1, if CA is configured in uplink.

For the intra-band non-contiguous carrier aggregation, EVM measurements are evaluated for each component carrier, and for the different modulations schemes, the EVM requirements shall not exceed the values specified in Table 6.5.2A.1.0-1, if CA is configured in uplink.

For the intra-band contiguous carrier aggregation, EVM measurements are evaluated for each component carrier, and for the different modulations schemes, the EVM requirements shall not exceed the values specified in Table 6.5.2A.1.0-1, if CA is configured in uplink.

When a single component carrier is configured Table 6.5.2.1.3-1 apply.

The EVM requirements are according to Table 6.5.2A.1.0-1 if CA is configured in uplink with the parameters defined in Table 6.5.2.1.3-2 and 6.5.2.1_2.3-2 for 256QAM.

**Table 6.5.2A.1.0-1: Minimum requirements for Error Vector Magnitude**

| Parameter | Unit | Average EVM Level per CC | Reference Signal EVM Level |
|---|---|---|---|
| QPSK or BPSK | % | 17.5 | 17.5 |
| 16QAM | % | 12.5 | 12.5 |
| 64 QAM | % | 8 | 8 |
| 256 QAM | % | 3.5 | 3.5 |

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2A.1.

## 6.5.2A.1.1 Error Vector Magnitude (EVM) for CA (intra-band contiguous DL CA and UL CA)

### 6.5.2A.1.1.1 Test Purpose

For the intra-band contiguous carrier aggregation, the Error Vector Magnitude requirement should be defined for each component carrier. Requirement applies for the allocated component carrier, when all other component carriers are activated, but not allocated.

Similar transmitter impairment removal procedures are applied for CA waveform before EVM calculation as is specified for non-CA waveform in sub-section 6.5.2.1.

### 6.5.2A.1.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 6.5.2A.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.1.0.

### 6.5.2A.1.1.4 Test description

#### 6.5.2A.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.1.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.1.1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. PCC and SCC mapped onto component carriers CC according to the notation: PCC-SCC: CCi-CCj, which means PCC on CCi and SCC on CCj, with CCi/j frequencies defined in the corresponding intra-band contiguous CA band in TS36.508 [7] as above. | | | See Table 6.5.1A.1.4.1-1: PCC-SCC: CC1-CC2 and CC2-CC1 | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | See Table 6.5.1A.1.4.1-1: | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **Config ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$ Note 1** | **SCCs $N_{RB}$ Note 1** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 50 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 2 | 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 3 | 50 | 50 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 4 | 50 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | - | - |
| 5 | 50 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | - | - |
| 6 | 50 | 50 | | 16QAM | 12 | P_12@38 | S_0@0 | - | - |
| 7 | 50 | 25 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 8 | 50 | 25 | | QPSK | 25 | P_25@0 | S_0@0 | - | - |
| 9 | 50 | 25 | | QPSK | 25 | P_25@25 | S_0@0 | - | - |
| 10 | 50 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 11 | 50 | 25 | | QPSK | 8 | P_8@42 | S_0@0 | - | - |
| 12 | 50 | 25 | | 16QAM | 50 | P_50@0 | S_0@0 | - | - |
| 13 | 50 | 25 | | 16QAM | 25 | P_25@0 | S_0@0 | - | - |
| 14 | 50 | 25 | | 16QAM | 25 | P_25@25 | S_0@0 | - | - |
| 15 | 50 | 25 | | 16QAM | 8 | P_8@0 | S_0@0 | - | - |
| 16 | 50 | 25 | | 16QAM | 8 | P_8@42 | S_0@0 | - | - |
| 17 | 25 | 50 | | QPSK | 25 | P_25@0 | S_0@0 | - | - |
| 18 | 25 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 19 | 25 | 50 | | QPSK | 12 | P_12@13 | S_0@0 | - | - |
| 20 | 25 | 50 | | 16QAM | 25 | P_25@0 | S_0@0 | - | - |
| 21 | 25 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | - | - |
| 22 | 25 | 50 | | 16QAM | 12 | P_12@13 | S_0@0 | - | - |
| 23 | 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 24 | 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 25 | 75 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| 26 | 75 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | - | - |
| 27 | 75 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | - | - |
| 28 | 75 | 75 | | 16QAM | 16 | P_16@59 | S_0@0 | - | - |
| 29 | 100 | 25 | | QPSK | 100 | P_100@0 | S_0@0 | - | - |
| 30 | 100 | 25 | | QPSK | 25 | P_25@0 | S_0@0 | - | - |
| 31 | 100 | 25 | | QPSK | 25 | P_25@75 | S_0@0 | - | - |
| 320 | 100 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 33 | 100 | 25 | | QPSK | 8 | P_8@92 | S_0@0 | - | - |
| 34 | 100 | 25 | N.A. | 16QAM | 100 | P_100@0 | S_0@0 | - | - |
| 35 | 100 | 25 | | 16QAM | 25 | P_25@0 | S_0@0 | - | - |
| 36 | 100 | 25 | | 16QAM | 25 | P_25@75 | S_0@0 | - | - |
| 37 | 100 | 25 | | 16QAM | 8 | P_8@0 | S_0@0 | - | - |
| 38 | 100 | 25 | | 16QAM | 8 | P_8@92 | S_0@0 | - | - |
| 39 | 25 | 100 | | QPSK | 25 | P_25@0 | S_0@0 | - | - |
| 40 | 25 | 100 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 41 | 25 | 100 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 42 | 25 | 100 | | 16QAM | 25 | P_25@0 | S_0@0 | - | - |
| 43 | 25 | 100 | | 16QAM | 8 | P_8@0 | S_0@0 | - | - |
| 44 | 25 | 100 | | 16QAM | 8 | P_8@17 | S_0@0 | - | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 453 | 100 | 50 | | QPSK | 100 | P_100@0 | S_0@0 | - | - |
| 46 | 100 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 47 | 100 | 50 | | QPSK | 50 | P_50@50 | S_0@0 | - | - |
| 48 | 100 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 49 | 100 | 50 | | QPSK | 12 | P_12@88 | S_0@0 | - | - |
| 50 | 100 | 50 | | 16QAM | 100 | P_100@0 | S_0@0 | - | - |
| 51 | 100 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | - | - |
| 52 | 100 | 50 | | 16QAM | 50 | P_50@50 | S_0@0 | - | - |
| 53 | 100 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | - | - |
| 54 | 100 | 50 | | 16QAM | 12 | P_12@88 | S_0@0 | - | - |
| 55 | 50 | 100 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 56 | 50 | 100 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 57 | 50 | 100 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 58 | 50 | 100 | | 16QAM | 50 | P_50@0 | S_0@0 | - | - |
| 59 | 50 | 100 | | 16QAM | 12 | P_12@0 | S_0@0 | - | - |
| 60 | 50 | 100 | | 16QAM | 12 | P_12@38 | S_0@0 | - | - |
| 61 | 100 | 75 | | QPSK | 100 | P_100@0 | S_0@0 | - | - |
| 62 | 100 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 63 | 100 | 75 | | QPSK | 75 | P_75@25 | S_0@0 | - | - |
| 64 | 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 65 | 100 | 75 | | QPSK | 16 | P_16@84 | S_0@0 | - | - |
| 66 | 100 | 75 | | 16QAM | 100 | P_100@0 | S_0@0 | - | - |
| 67 | 100 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | - | - |
| 68 | 100 | 75 | | 16QAM | 75 | P_75@25 | S_0@0 | - | - |
| 69 | 100 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | - | - |
| 70 | 100 | 75 | | 16QAM | 16 | P_16@84 | S_0@0 | - | - |
| 71 | 75 | 100 | | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 72 | 75 | 100 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 73 | 75 | 100 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| 74 | 75 | 100 | | 16QAM | 75 | P_75@0 | S_0@0 | - | - |
| 75 | 75 | 100 | | 16QAM | 16 | P_16@0 | S_0@0 | - | - |
| 76 | 75 | 100 | | 16QAM | 16 | P_16@59 | S_0@0 | - | - |
| 77 | 100 | 100 | | QPSK | 100 | P_100@0 | S_0@0 | - | - |
| 78 | 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| 79 | 100 | 100 | | QPSK | 18 | P_18@82 | S_0@0 | - | - |
| 80 | 100 | 100 | | 16QAM | 100 | P_100@0 | S_0@0 | - | - |
| 81 | 100 | 100 | | 16QAM | 18 | P_18@0 | S_0@0 | - | - |
| 82 | 100 | 100 | | 16QAM | 18 | P_18@82 | S_0@0 | - | - |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg,}$ only the combination with the highest NRB_PCC is tested.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.5.2A.1.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause [5.2A.2]. Message contents are defined in clause 6.5.2A.1.1.4.3.

#### 6.5.2A.1.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.2A.3.2.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2A.1.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX\ level}$.
6. Measure the EVM and $\overline{EVM}_{DMRS}$ on PCC using Global In-Channel Tx-Test (Annex E).
7. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is –36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
8. Measure the EVM and $\overline{EVM}_{DMRS}$ on PCC using Global In-Channel Tx-Test (Annex E).

#### 6.5.2A.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.5.2A.1.1.5 Test requirement

The PUSCH EVM derived in E.4.2 shall not exceed 17,5 % for QPSK and BPSK, 12,5% for 16 QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in E.4.6.2 shall not exceed 17,5 % when embedded with data symbols of QPSK and BPSK, 12,5% for 16 QAM.

## 6.5.2A.1.1_1 EVM for CA (intra-band contiguous DL CA and UL CA) with UL 64QAM

### 6.5.2A.1.1_1.1 Test Purpose

Same test purpose as in clause 6.5.2A.1.1.1

### 6.5.2A.1.1_1.2 Test applicability

This test applies to E-UTRA UE from release 13 and forward that support intra-band contiguous DL CA and UL CA and UL 64QAM.

### 6.5.2A.1.1_1.3 Minimum conformance requirements

The EVM requirement for 64QAM is according to Table 6.5.2A.1.1_1.3-1 if CA is configured in uplink.

**Table 6.5.2A.1.1_1.3-1: Minimum requirements for Error Vector Magnitude**

| Parameter | Unit | Average EVM Level per CC | Reference Signal EVM Level |
|---|---|---|---|
| 64QAM | % | 8 | 8 |

### 6.5.2A.1.1_1.4 Test description

#### 6.5.2A.1.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test

parameters for each CA Configuration, and are shown in table 6.5.2A.1.1_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.1.1_1.4.1-1: Test Configuration Table**

<table>
<tr><th colspan="7">Initial Conditions</th></tr>
<tr><td colspan="5">Test Environment as specified in<br>TS 36.508[7] subclause 4.1</td><td colspan="2">NC</td></tr>
<tr><td colspan="5">Test Frequencies as specified in<br>TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes.<br>PCC and SCC mapped onto component carriers CC according to the notation: PCC-SCC: CCi-CCj, which means PCC on CCi and SCC on CCj, with CCi/j frequencies defined in the corresponding intra-band contiguous CA band in TS36.508 [7] as above.</td><td colspan="2">See Table 6.5.1A.1.4.1-1:<br>PCC-SCC: CC1-CC2 and CC2-CC1</td></tr>
<tr><td colspan="5">Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration</td><td colspan="2">See Table 6.5.1A.1.4.1-1:</td></tr>
<tr><th colspan="7">Test Parameters for CA Configurations</th></tr>
<tr><th rowspan="2">Config ID</th><th colspan="2">CA Configuration / $N_{RB_agg}$</th><th rowspan="2">DL Allocation (PDCCH on PCC)</th><th rowspan="2">CC MOD</th><th colspan="2">UL Allocation</th></tr>
<tr><th>PCC $N_{RB}$ Note 1</th><th>SCCs $N_{RB}$ Note 1</th><th>$N_{RB_alloc}$</th><th>PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)</th></tr>
</table>

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 50 | 50 | | 64QAM | 50 | P_50@0 | S_0@0 | | |
| 2 | 50 | 50 | | 64QAM | 12 | P_12@0 | S_0@0 | | |
| 3 | 50 | 50 | | 64QAM | 12 | P_12@38 | S_0@0 | | |
| 4 | 50 | 25 | | 64QAM | 50 | P_50@0 | S_0@0 | | |
| 5 | 50 | 25 | | 64QAM | 25 | P_25@0 | S_0@0 | | |
| 6 | 50 | 25 | | 64QAM | 25 | P_25@25 | S_0@0 | | |
| 7 | 50 | 25 | | 64QAM | 8 | P_8@0 | S_0@0 | | |
| 8 | 50 | 25 | | 64QAM | 8 | P_8@42 | S_0@0 | | |
| 9 | 25 | 50 | | 64QAM | 25 | P_25@0 | S_0@0 | | |
| 10 | 25 | 50 | | 64QAM | 12 | P_12@0 | S_0@0 | | |
| 11 | 25 | 50 | | 64QAM | 12 | P_12@13 | S_0@0 | | |
| 12 | 50 | 75 | | 64QAM | 75 | P_75@0 | S_0@0 | - | - |
| 13 | 50 | 75 | | 64QAM | 16 | P_16@0 | S_0@0 | - | - |
| 14 | 50 | 75 | | 64QAM | 16 | P_16@59 | S_0@0 | - | - |
| 15 | 50 | 25 | | 64QAM | 100 | P_100@0 | S_0@0 | - | - |
| 16 | 50 | 25 | | 64QAM | 25 | P_25@0 | S_0@0 | - | - |
| 17 | 50 | 25 | | 64QAM | 25 | P_25@75 | S_0@0 | - | - |
| 18 | 50 | 25 | | 64QAM | 8 | P_8@0 | S_0@0 | - | - |
| 19 | 50 | 25 | | 64QAM | 8 | P_8@92 | S_0@0 | - | - |
| 20 | 25 | 100 | | 64QAM | 25 | P_25@0 | S_0@0 | - | - |
| 21 | 25 | 100 | | 64QAM | 8 | P_8@0 | S_0@0 | - | - |
| 22 | 25 | 100 | | 64QAM | 8 | P_8@17 | S_0@0 | - | - |
| 23 | 75 | 50 | | 64QAM | 100 | P_100@0 | S_0@0 | - | - |
| 24 | 100 | 50 | | 64QAM | 50 | P_50@0 | S_0@0 | - | - |
| 25 | 100 | 50 | | 64QAM | 50 | P_50@50 | S_0@0 | - | - |
| 26 | 100 | 50 | | 64QAM | 12 | P_12@0 | S_0@0 | - | - |
| 27 | 100 | 50 | | 64QAM | 12 | P_12@88 | S_0@0 | - | - |
| 28 | 50 | 100 | | 64QAM | 50 | P_50@0 | S_0@0 | - | - |
| 29 | 50 | 100 | | 64QAM | 12 | P_12@0 | S_0@0 | - | - |
| 30 | 50 | 100 | | 64QAM | 12 | P_12@38 | S_0@0 | - | - |
| 31 | 100 | 75 | | 64QAM | 100 | P_100@0 | S_0@0 | - | - |
| 32 | 100 | 75 | | 64QAM | 75 | P_75@0 | S_0@0 | - | - |
| 33 | 100 | 75 | | 64QAM | 75 | P_75@25 | S_0@0 | - | - |
| 34 | 100 | 75 | | 64QAM | 16 | P_16@0 | S_0@0 | - | - |
| 35 | 100 | 75 | | 64QAM | 16 | P_16@84 | S_0@0 | - | - |
| 36 | 75 | 100 | | 64QAM | 75 | P_75@0 | S_0@0 | - | - |
| 37 | 75 | 100 | | 64QAM | 16 | P_16@0 | S_0@0 | - | - |
| 38 | 75 | 100 | | 64QAM | 16 | P_16@59 | S_0@0 | - | - |
| 39 | 100 | 100 | | 64QAM | 100 | P_100@0 | S_0@0 | - | - |
| 40 | 100 | 100 | | 64QAM | 18 | P_18@0 | S_0@0 | - | - |
| 41 | 100 | 100 | | 64QAM | 18 | P_18@82 | S_0@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.5.2A.1.1_1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause [5.2A.2]. Message contents are defined in clause 6.5.2A.1.1_1.4.3.

### 6.5.2A.1.1_1.4.2 Test procedure

Same test procedure as in clause 6.5.2A.1.1.4.2

#### 6.5.2A.1.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. For SCC configuration there are no additional message contents.

#### 6.5.2A.1.1_1.5 Test requirement

The PUSCH EVM derived in E.4.2 shall not exceed 8% for 64QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in E.4.6.2 shall not exceed [8%] for 64QAM.

### 6.5.2A.1.1_2 EVM for CA (intra-band contiguous DL CA and UL CA) with UL 256QAM

#### 6.5.2A.1.1_2.1 Test Purpose

Same test purpose as in clause 6.5.2A.1.1.1

#### 6.5.2A.1.1_2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support intra-band contiguous DL CA and UL CA and UL 256QAM.

#### 6.5.2A.1.1_2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.1.0

#### 6.5.2A.1.1_2.4 Test description

##### 6.5.2A.1.1_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.1.1_2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.1.1_2.4.1-1: Test Configuration Table**

<table>
<tr><th colspan="7">Initial Conditions</th></tr>
<tr><td colspan="4">Test Environment as specified in<br>TS 36.508[7] subclause 4.1</td><td colspan="3">NC</td></tr>
<tr><td colspan="4">Test Frequencies as specified in<br>TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes.<br>PCC and SCC mapped onto component carriers CC according to the notation: PCC-SCC: CCi-CCj, which means PCC on CCi and SCC on CCj, with CCi/j frequencies defined in the corresponding intra-band contiguous CA band in TS36.508 [7] as above.</td><td colspan="3">See Table 6.5.1A.1.4.1-1:<br>PCC-SCC: CC1-CC2 and CC2-CC1</td></tr>
<tr><td colspan="4">Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration</td><td colspan="3">See Table 6.5.1A.1.4.1-1:</td></tr>
<tr><th colspan="7">Test Parameters for CA Configurations</th></tr>
<tr><th rowspan="2">Config ID</th><th colspan="2">CA Configuration / $N_{RB_agg}$</th><th rowspan="2">DL Allocation (PDCCH on PCC)</th><th rowspan="2">CC MOD</th><th colspan="2">UL Allocation</th></tr>
<tr><th>PCC $N_{RB}$ Note 1</th><th>SCCs $N_{RB}$ Note 1</th><th>$N_{RB_alloc}$</th><th>PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)</th></tr>
</table>

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 50 | 50 | N/A for this test | 256QAM | 50 | P_50@0 | S_0@0 | - | - |
| 2 | 50 | 25 | | 256QAM | 50 | P_50@0 | S_0@0 | - | - |
| 3 | 25 | 50 | | 256QAM | 25 | P_25@0 | S_0@0 | - | - |
| 4 | 50 | 75 | | 256QAM | 75 | P_75@0 | S_0@0 | - | - |
| 5 | 75 | 75 | | 256QAM | 75 | P_75@0 | S_0@0 | - | - |
| 6 | 100 | 25 | | 256QAM | 100 | P_100@0 | S_0@0 | - | - |
| 7 | 25 | 100 | | 256QAM | 25 | P_25@0 | S_0@0 | - | - |
| 8 | 75 | 50 | | 256QAM | 75 | P_75@0 | S_0@0 | - | - |
| 9 | 100 | 50 | | 256QAM | 100 | P_100@0 | S_0@0 | - | - |
| 10 | 50 | 100 | | 256QAM | 50 | P_50@0 | S_0@0 | - | - |
| 11 | 100 | 75 | | 256QAM | 100 | P_100@0 | S_0@0 | - | - |
| 12 | 75 | 100 | | 256QAM | 75 | P_75@0 | S_0@0 | - | - |
| 13 | 100 | 100 | | 256QAM | 100 | P_100@0 | S_0@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |
| Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg,}$ only the first of those is tested, according to the order on the Test Configuration Table list. | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.5.2A.1.1_2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2A.1.1_2.4.3.

#### 6.5.2A.1.1_2.4.2 Test procedure

Same as in clause 6.5.2A.1.1.4.2 with the following exceptions:

- Instead of Table 6.5.2A.1.1.4.1-1 → use Table 6.5.2A.1.1_2.4.1-1.
- Instead of UE output power -36.8dBm ±3.2dB → -26.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz.
- Instead of UE output power -36.5dBm ±3.5dB → -26.5dBm ±3.5dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

#### 6.5.2A.1.1_2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. For SCC configuration there are no additional message contents.

#### 6.5.2A.1.1_2.5 Test requirement

The PUSCH EVM derived in Annex E.4.2 shall not exceed the values in Table 6.5.2.1_2.5-1 for 256QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in Annex E.4.6.2 shall not exceed the values in Table 6.5.2.1_2.5-1 when embedded with data symbols of 256QAM.

### 6.5.2A.1.2 Error Vector Magnitude (EVM) for CA (inter-band DL CA and UL CA)

#### 6.5.2A.1.2.1 Test Purpose

For the inter-band carrier aggregation, the Error Vector Magnitude requirement should be defined for each component carrier. Requirement applies for the allocated component carrier, when all other component carriers are activated, but not allocated.

Similar transmitter impairment removal procedures are applied for CA waveform before EVM calculation as is specified for non-CA waveform in sub-section 6.5.2.1.

#### 6.5.2A.1.2.2 Test applicability

This test case applies to all types of E-UTRA UE Release 11 and forward that support inter-band DL CA and UL CA.

This test case also applies to all types of E-UTRA UE release 14 and forward that supports uplink LAA.

#### 6.5.2A.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.1.0.

#### 6.5.2A.1.2.4 Test description

##### 6.5.2A.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.1.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.1.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | | | Low range for PCC and SCC<br>High range for PCC and SCC | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **Config ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$ Note 1** | **SCCs $N_{RB}$ Note 1** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 6 | 25 | N.A. | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 2 | 6 | 25 | | QPSK | 1 | P_1@5 | S_0@0 | - | - |
| 3 | 6 | 25 | | QPSK | 6 | P_6@0 | S_0@0 | - | - |
| 4 | 6 | 25 | | 16QAM | 1 | P_1@0 | S_0@0 | - | - |
| 5 | 6 | 25 | | 16QAM | 1 | P_1@5 | S_0@0 | - | - |
| 6 | 6 | 25 | | 16QAM | 6 | P_6@0 | S_0@0 | - | - |
| 7 | 6 | 50 | | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 8 | 6 | 50 | | QPSK | 1 | P_1@5 | S_0@0 | - | - |
| 9 | 6 | 50 | | QPSK | 6 | P_6@0 | S_0@0 | - | - |
| 10 | 6 | 50 | | 16QAM | 1 | P_1@0 | S_0@0 | - | - |
| 11 | 6 | 50 | | 16QAM | 1 | P_1@5 | S_0@0 | - | - |
| 12 | 6 | 50 | | 16QAM | 6 | P_6@0 | S_0@0 | - | - |
| 13 | 15 | 25 | | QPSK | 4 | P_4@0 | S_0@0 | - | - |
| 14 | 15 | 25 | | QPSK | 4 | P_4@11 | S_0@0 | - | - |
| 15 | 15 | 25 | | QPSK | 15 | P_15@0 | S_0@0 | - | - |
| 16 | 15 | 25 | | 16QAM | 4 | P_4@0 | S_0@0 | - | - |
| 17 | 15 | 25 | | 16QAM | 4 | P_4@11 | S_0@0 | - | - |
| 18 | 15 | 25 | | 16QAM | 15 | P_15@0 | S_0@0 | - | - |
| 19 | 25 | 6 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 20 | 25 | 6 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 21 | 25 | 6 | | QPSK | 25 | P_25@0 | S_0@0 | - | - |
| 22 | 25 | 6 | | 16QAM | 8 | P_8@0 | S_0@0 | - | - |
| 23 | 25 | 6 | | 16QAM | 8 | P_8@17 | S_0@0 | - | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 24 | 25 | 6 | | 16QAM | 25 | P_25@0 | S_0@0 | - | - |
| 25 | 25 | 15 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 26 | 25 | 15 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 27 | 25 | 15 | | QPSK | 25 | P_25@0 | S_0@0 | - | - |
| 28 | 25 | 15 | | 16QAM | 8 | P_8@0 | S_0@0 | - | - |
| 29 | 25 | 15 | | 16QAM | 8 | P_8@17 | S_0@0 | - | - |
| 30 | 25 | 15 | | 16QAM | 25 | P_25@0 | S_0@0 | - | - |
| 31 | 25 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 32 | 25 | 25 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 33 | 25 | 25 | | QPSK | 25 | P_25@0 | S_0@0 | - | - |
| 34 | 25 | 25 | | 16QAM | 8 | P_8@0 | S_0@0 | - | - |
| 35 | 25 | 25 | | 16QAM | 8 | P_8@17 | S_0@0 | - | - |
| 36 | 25 | 25 | | 16QAM | 25 | P_25@0 | S_0@0 | - | - |
| 37 | 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 38 | 25 | 50 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 39 | 25 | 50 | | QPSK | 25 | P_25@0 | S_0@0 | - | - |
| 40 | 25 | 50 | | 16QAM | 8 | P_8@0 | S_0@0 | - | - |
| 41 | 25 | 50 | | 16QAM | 8 | P_8@17 | S_0@0 | - | - |
| 42 | 25 | 50 | | 16QAM | 25 | P_25@0 | S_0@0 | - | - |
| 43 | 50 | 6 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 44 | 50 | 6 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 45 | 50 | 6 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 46 | 50 | 6 | | 16QAM | 12 | P_12@0 | S_0@0 | - | - |
| 47 | 50 | 6 | | 16QAM | 12 | P_12@38 | S_0@0 | - | - |
| 48 | 50 | 6 | | 16QAM | 50 | P_50@0 | S_0@0 | - | - |
| 49 | 50 | 25 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 50 | 50 | 25 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 51 | 50 | 25 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 52 | 50 | 25 | | 16QAM | 12 | P_12@0 | S_0@0 | - | - |
| 53 | 50 | 25 | | 16QAM | 12 | P_12@38 | S_0@0 | - | - |
| 54 | 50 | 25 | | 16QAM | 50 | P_50@0 | S_0@0 | - | - |
| 55 | 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 56 | 50 | 50 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 57 | 50 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 58 | 50 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | - | - |
| 59 | 50 | 50 | | 16QAM | 12 | P_12@38 | S_0@0 | - | - |
| 60 | 50 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | - | - |
| 61 | 50 | 100 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 62 | 50 | 100 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 63 | 50 | 100 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 64 | 50 | 100 | | 16QAM | 12 | P_12@0 | S_0@0 | - | - |
| 65 | 50 | 100 | | 16QAM | 12 | P_12@38 | S_0@0 | - | - |
| 66 | 50 | 100 | | 16QAM | 50 | P_50@0 | S_0@0 | - | - |
| 67 | 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 68 | 75 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| 69 | 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 70 | 75 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | - | - |
| 71 | 75 | 75 | | 16QAM | 16 | P_16@59 | S_0@0 | - | - |
| 72 | 75 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | - | - |
| 73 | 75 | 100 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 74 | 75 | 100 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| 75 | 75 | 100 | | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 76 | 75 | 100 | | 16QAM | 16 | P_16@0 | S_0@0 | - | - |
| 77 | 75 | 100 | | 16QAM | 16 | P_16@59 | S_0@0 | - | - |
| 78 | 75 | 100 | | 16QAM | 75 | P_75@0 | S_0@0 | - | - |
| 79 | 100 | 50 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| 80 | 100 | 50 | | QPSK | 18 | P_18@82 | S_0@0 | - | - |
| 81 | 100 | 50 | | QPSK | 100 | P_100@0 | S_0@0 | - | - |
| 82 | 100 | 50 | | 16QAM | 18 | P_18@0 | S_0@0 | - | - |
| 83 | 100 | 50 | | 16QAM | 18 | P_18@82 | S_0@0 | - | - |
| 84 | 100 | 50 | | 16QAM | 100 | P_100@0 | S_0@0 | - | - |
| 85 | 100 | 75 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| 86 | 100 | 75 | | QPSK | 18 | P_18@82 | S_0@0 | - | - |
| 87 | 100 | 75 | | QPSK | 100 | P_100@0 | S_0@0 | - | - |
| 88 | 100 | 75 | | 16QAM | 18 | P_18@0 | S_0@0 | - | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 89 | 100 | 75 | | 16QAM | 18 | P_18@82 | S_0@0 | - | - |
| 90 | 100 | 75 | | 16QAM | 100 | P_100@0 | S_0@0 | - | - |
| 91 | 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| 92 | 100 | 100 | | QPSK | 18 | P_18@82 | S_0@0 | - | - |
| 93 | 100 | 100 | | QPSK | 100 | P_100@0 | S_0@0 | - | - |
| 94 | 100 | 100 | | 16QAM | 18 | P_18@0 | S_0@0 | - | - |
| 95 | 100 | 100 | | 16QAM | 18 | P_18@82 | S_0@0 | - | - |
| 96 | 100 | 100 | | 16QAM | 100 | P_100@0 | S_0@0 | - | - |
| 97 | 25 | 75 | | QPSK | 8 | P_8@0 | S_0@0 | | |
| 98 | 25 | 75 | | QPSK | 8 | P_8@17 | S_0@0 | | |
| 99 | 25 | 75 | | QPSK | 25 | P_25@0 | S_0@0 | | |
| 100 | 25 | 75 | | 16QAM | 8 | P_8@0 | S_0@0 | | |
| 101 | 25 | 75 | | 16QfAM | 8 | P_8@17 | S_0@0 | | |
| 102 | 25 | 75 | | 16QAM | 25 | P_25@0 | S_0@0 | | |
| X+1 | 75 | 25 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| X+2 | 75 | 25 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| X+3 | 75 | 25 | | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| X+4 | 75 | 25 | | 16QAM | 16 | P_16@0 | S_0@0 | - | - |
| X+5 | 75 | 25 | | 16QAM | 16 | P_16@59 | S_0@0 | - | - |
| X+6 | 75 | 25 | | 16QAM | 75 | P_75@0 | S_0@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | | |
| Note 2: The frequencies of PCC and SCC shall be switched and tested in each configuration. | | | | | | | | | |

**Table 6.5.2A.1.2.4.1-2: Test Configuration Table for Uplink LAA CA**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | Low range for PCC and SCC<br>High range for PCC and SCC | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | |
| **Test Parameters for the uplink LAA CA Configurations** | | | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC NRB Note 1** | **SCCs NRB Note 1** | **PCC & SCC RB allocation** | | **NRB_alloc** | **PCC RB Allocation ($L_{CRB}$ @ RBstart) SCC RB Allocations(L@ RBstart) Note2** | | | |
| 1 | 25 | 100 | NA | QPSK | 10 | P_0@0 | S_1@0 | | |
| 2 | 25 | 100 | | QPSK | 10 | P_0@0 | S_1@9 | | |
| 3 | 25 | 100 | | QPSK | 100 | P_0@0 | S_10@0 | | |
| 4 | 25 | 100 | | 16QAM | 10 | P_0@0 | S_1@0 | | |
| 5 | 25 | 100 | | 16QAM | 10 | P_0@0 | S_1@9 | | |
| 6 | 25 | 100 | | 16QAM | 100 | P_0@0 | S_10@0 | | |
| 7 | 50 | 100 | | QPSK | 10 | P_0@0 | S_1@0 | | |
| 8 | 50 | 100 | | QPSK | 10 | P_0@0 | S_1@9 | | |
| 9 | 50 | 100 | | QPSK | 100 | P_0@0 | S_10@0 | | |
| 10 | 50 | 100 | | 16QAM | 10 | P_0@0 | S_1@0 | | |
| 11 | 50 | 100 | | 16QAM | 10 | P_0@0 | S_1@9 | | |
| 12 | 50 | 100 | | 16QAM | 100 | P_0@0 | S_10@0 | | |
| 13 | 75 | 100 | | QPSK | 10 | P_0@0 | S_1@0 | | |
| 14 | 75 | 100 | | QPSK | 10 | P_0@0 | S_1@9 | | |
| 15 | 75 | 100 | | QPSK | 100 | P_0@0 | S_10@0 | | |
| 16 | 75 | 100 | | 16QAM | 10 | P_0@0 | S_1@0 | | |
| 17 | 75 | 100 | | 16QAM | 10 | P_0@0 | S_1@9 | | |
| 18 | 75 | 100 | | 16QAM | 100 | P_0@0 | S_10@0 | | |
| 19 | 100 | 100 | | QPSK | 10 | P_0@0 | S_1@0 | | |
| 20 | 100 | 100 | | QPSK | 10 | P_0@0 | S_1@9 | | |
| 21 | 100 | 100 | | QPSK | 100 | P_0@0 | S_10@0 | | |
| 22 | 100 | 100 | | 16QAM | 10 | P_0@0 | S_1@0 | | |
| 23 | 100 | 100 | | 16QAM | 10 | P_0@0 | S_1@9 | | |
| 24 | 100 | 100 | | 16QAM | 100 | P_0@0 | S_10@0 | | |
| Note 1: CA Configuration, Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths for uplink LAA are specified in Table 5.4.2A.1-2.<br>Note 2: For eLAA SCC, the RBstart and L are defined in TS 36.213[10] clause 8.1.4. | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL RMC is set according to Table 6.5.2A.1.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2A.1.2.4.3.

#### 6.5.2A.1.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.2A.3.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 (or DCI format 0A for SCC in the case of uplink LAA) for C_RNTI to schedule the UL RMC according to Table 6.5.2A.1.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX\ level}$.
6. Measure the EVM and $\overline{EVM}_{DMRS}$ on PCC using Global In-Channel Tx-Test (Annex E).
7. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is –36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
8. Measure the EVM and $\overline{EVM}_{DMRS}$ on PCC using Global In-Channel Tx-Test (Annex E).

#### 6.5.2A.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

For SCC in the case of uplink LAA, message contents are according to TS 36.508[7] subclause4.6 with the following exceptions specified in Tables 6.5.2A.1.2.4.3-1 and 6.5.2A.1.2.4.3-2.

**Table 6.5.2A.1.2.4.3-1 LogicalChannelConfig-DRB (Initial Condition, step 14, Table 4.5.2.3-1)**

| Derivation Path: 36.508 Table 4.8.2.1.4-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LogicalChannelConfig-DRB ::= SEQUENCE { | | | |
| ul-SpecificParameters SEQUENCE { | | | |
| laa-UL-Allowed-r14 | true | | |
| } | | | |
| } | | | |

**Table 6.5.2A.1.2.4.3-2 PhysicalConfigDedicatedSCell (Step 2, test procedure)**

| Derivation Path: 36.508 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| laa-SCellConfiguration-v1430 ::= SEQUENCE { | | | |
| | NULL | | |
| } | | | |
| } | | | |

#### 6.5.2A.1.2.5 Test requirement

The PUSCH EVM derived in Annex E.4.2 shall not exceed 17,5 % for QPSK and BPSK, 12,5% for 16 QAM. The PUSCH $\overline{EVM}_{DMRS}$ derived in Annex E.4.6.2 shall not exceed 17,5 % when embedded with data symbols of QPSK and BPSK, 12,5% for 16 QAM.

## 6.5.2A.1.2_1 Error Vector Magnitude (EVM) for CA (inter-band DL CA and UL CA) for UL 64QAM

### 6.5.2A.1.2_1.1 Test Purpose

For the inter-band carrier aggregation, the Error Vector Magnitude requirement should be defined for each component carrier. Requirement applies for the allocated component carrier, when all other component carriers are activated, but not allocated.

Similar transmitter impairment removal procedures are applied for CA waveform before EVM calculation as is specified for non-CA waveform in sub-section 6.5.2.1.

### 6.5.2A.1.2_1.2 Test applicability

This test case applies to all types of E-UTRA UE Release 13 and forward that support inter-band DL CA and UL CA and UL 64QAM.

This test case also applies to all types of E-UTRA UE release 14 and forward that support uplink LAA.

### 6.5.2A.1.2_1.3 Minimum conformance requirements

The EVM requirement for 64QAM is according to Table 6.5.2A.1.1_1.3-1 if CA is configured in uplink.

**Table 6.5.2A.1.2_1.3-1: Minimum requirements for Error Vector Magnitude**

| Parameter | Unit | Average EVM Level | Reference Signal EVM Level |
|---|---|---|---|
| 64QAM | % | 8 | 8 |

### 6.5.2A.1.2_1.4 Test description

#### 6.5.2A.1.2_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.1.2_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.1.2_1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | | | Mid range for PCC and SCC | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **Config ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$ Note 1** | **SCCs $N_{RB}$ Note 1** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 6 | 25 | N/A for this | 64QAM | 1 | P_1@0 | S_0@0 | - | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 6 | 25 | test | 64QAM | 1 | P_1@5 | S_0@0 | - | - |
| 3 | 6 | 25 | | 64QAM | 6 | P_6@0 | S_0@0 | - | - |
| 4 | 6 | 50 | | 64QAM | 1 | P_1@0 | S_0@0 | - | - |
| 5 | 6 | 50 | | 64QAM | 1 | P_1@5 | S_0@0 | - | - |
| 6 | 6 | 50 | | 64QAM | 6 | P_6@0 | S_0@0 | - | - |
| 7 | 15 | 25 | | 64QAM | 4 | P_4@0 | S_0@0 | - | - |
| 8 | 15 | 25 | | 64QAM | 4 | P_4@11 | S_0@0 | - | - |
| 9 | 15 | 25 | | 64QAM | 15 | P_15@0 | S_0@0 | - | - |
| 10 | 25 | 6 | | 64QAM | 8 | P_8@0 | S_0@0 | - | - |
| 11 | 25 | 6 | | 64QAM | 8 | P_8@17 | S_0@0 | - | - |
| 12 | 25 | 6 | | 64QAM | 25 | P_25@0 | S_0@0 | - | - |
| 13 | 25 | 15 | | 64QAM | 8 | P_8@0 | S_0@0 | - | - |
| 14 | 25 | 15 | | 64QAM | 8 | P_8@17 | S_0@0 | - | - |
| 15 | 25 | 15 | | 64QAM | 25 | P_25@0 | S_0@0 | - | - |
| 16 | 25 | 25 | | 64QAM | 8 | P_8@0 | S_0@0 | - | - |
| 17 | 25 | 25 | | 64QAM | 8 | P_8@17 | S_0@0 | - | - |
| 18 | 25 | 25 | | 64QAM | 25 | P_25@0 | S_0@0 | - | - |
| 19 | 25 | 50 | | 64QAM | 8 | P_8@0 | S_0@0 | - | - |
| 20 | 25 | 50 | | 64QAM | 8 | P_8@17 | S_0@0 | - | - |
| 21 | 25 | 50 | | 64QAM | 25 | P_25@0 | S_0@0 | - | - |
| 22 | 50 | 6 | | 64QAM | 12 | P_12@0 | S_0@0 | - | - |
| 23 | 50 | 6 | | 64QAM | 12 | P_12@38 | S_0@0 | - | - |
| 24 | 50 | 6 | | 64QAM | 50 | P_50@0 | S_0@0 | - | - |
| 25 | 50 | 25 | | 64QAM | 12 | P_12@0 | S_0@0 | - | - |
| 26 | 50 | 25 | | 64QAM | 12 | P_12@38 | S_0@0 | - | - |
| 27 | 50 | 25 | | 64QAM | 50 | P_50@0 | S_0@0 | - | - |
| 28 | 50 | 50 | | 64QAM | 12 | P_12@0 | S_0@0 | - | - |
| 29 | 50 | 50 | | 64QAM | 12 | P_12@38 | S_0@0 | - | - |
| 30 | 50 | 50 | | 64QAM | 50 | P_50@0 | S_0@0 | - | - |
| 31 | 50 | 100 | | 64QAM | 12 | P_12@0 | S_0@0 | - | - |
| 32 | 50 | 100 | | 64QAM | 12 | P_12@38 | S_0@0 | - | - |
| 33 | 50 | 100 | | 64QAM | 50 | P_50@0 | S_0@0 | - | - |
| 34 | 75 | 75 | | 64QAM | 16 | P_16@0 | S_0@0 | - | - |
| 35 | 75 | 75 | | 64QAM | 16 | P_16@59 | S_0@0 | - | - |
| 36 | 75 | 75 | | 64QAM | 75 | P_75@0 | S_0@0 | - | - |
| 37 | 75 | 100 | | 64QAM | 16 | P_16@0 | S_0@0 | - | - |
| 38 | 75 | 100 | | 64QAM | 16 | P_16@59 | S_0@0 | - | - |
| 39 | 75 | 100 | | 64QAM | 75 | P_75@0 | S_0@0 | - | - |
| 40 | 100 | 50 | | 64QAM | 18 | P_18@0 | S_0@0 | - | - |
| 41 | 100 | 50 | | 64QAM | 18 | P_18@82 | S_0@0 | - | - |
| 42 | 100 | 50 | | 64QAM | 100 | P_100@0 | S_0@0 | - | - |
| 43 | 100 | 75 | | 64QAM | 18 | P_18@0 | S_0@0 | - | - |
| 44 | 100 | 75 | | 64QAM | 18 | P_18@82 | S_0@0 | - | - |
| 45 | 100 | 75 | | 64QAM | 100 | P_100@0 | S_0@0 | - | - |
| 46 | 100 | 100 | | 64QAM | 18 | P_18@0 | S_0@0 | - | - |
| 47 | 100 | 100 | | 64QAM | 18 | P_18@82 | S_0@0 | - | - |
| 48 | 100 | 100 | | 64QAM | 100 | P_100@0 | S_0@0 | - | - |
| X+1 | 75 | 25 | | 64QAM | 16 | P_16@0 | S_0@0 | - | - |
| X+2 | 75 | 25 | | 64QAM | 16 | P_16@0 | S_0@0 | - | - |
| X+3 | 75 | 25 | | 64QAM | 75 | P_16@59 | S_0@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | | |
| Note 2: The frequencies of PCC and SCC shall be switched and tested in each configuration. | | | | | | | | | |

**Table 6.5.2A.1.2_1.4.1-2: Test Configuration Table for Uplink LAA CA**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | | Mid range for PCC and SCC | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC NRB Note 1** | **SCCs NRB Note 1** | **PCC & SCC RB allocation** | | **NRB_alloc** | **PCC RB Allocation (LCRB @ RBstart)<br>SCC RB Allocations(L@ RBstart) Note2** | | | |
| 1 | 25 | 100 | | 64QAM | 10 | P_0@0 | S_1@0 | | |
| 2 | 25 | 100 | | 64QAM | 10 | P_0@0 | S_1@9 | | |
| 3 | 25 | 100 | | 64QAM | 100 | P_0@0 | S_10@0 | | |
| 4 | 50 | 100 | | 64QAM | 10 | P_0@0 | S_1@0 | | |
| 5 | 50 | 100 | | 64QAM | 10 | P_0@0 | S_1@9 | | |
| 6 | 50 | 100 | | 64QAM | 100 | P_0@0 | S_10@0 | | |
| 7 | 75 | 100 | | 64QAM | 10 | P_0@0 | S_1@0 | | |
| 8 | 75 | 100 | | 64QAM | 10 | P_0@0 | S_1@9 | | |
| 9 | 75 | 100 | | 64QAM | 100 | P_0@0 | S_10@0 | | |
| 10 | 100 | 100 | | 64QAM | 10 | P_0@0 | S_1@0 | | |
| 11 | 100 | 100 | | 64QAM | 10 | P_0@0 | S_1@9 | | |
| 12 | 100 | 100 | | 64QAM | 100 | P_0@0 | S_10@0 | | |
| Note 1: CA Configuration, Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths for uplink LAA are specified in Table 5.4.2A.1-2.<br>Note 2: For eLAA SCC, the RBstart and L are defined in TS 36.213[10] clause 8.1.4. | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL RMC is set according to Table 6.5.2A.1.2_1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2A.1.2_1.4.3.

### 6.5.2A.1.2_1.4.2 Test procedure

Same test procedure as in clause 6.5.2A.1.2.4.2.

### 6.5.2A.1.2_1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

For SCC in the case of uplink LAA, message contents are according to TS 36.508[7] subclause4.6 with the exceptions specified in Tables 6.5.2A.1.2.4.3-1 and 6.5.2A.1.2.4.3-2.

#### 6.5.2A.1.2_1.5 Test requirement

The PUSCH EVM derived in Annex E.4.2 shall not exceed 8% for 64QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in Annex E.4.6.2 shall not exceed 8% when embedded with data symbols of 64QAM.

### 6.5.2A.1.2_2 Error Vector Magnitude (EVM) for CA (inter-band DL CA and UL CA) for UL 256QAM

#### 6.5.2A.1.2_2.1 Test Purpose

For the inter-band carrier aggregation, the Error Vector Magnitude requirement should be defined for each component carrier. Requirement applies for the allocated component carrier, when all other component carriers are activated, but not allocated.

Similar transmitter impairment removal procedures are applied for CA waveform before EVM calculation as is specified for non-CA waveform in sub-section 6.5.2.1.

#### 6.5.2A.1.2_2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support inter-band DL CA and UL CA and UL 256QAM.

#### 6.5.2A.1.2_2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.1.0

#### 6.5.2A.1.2_2.4 Test description

##### 6.5.2A.1.2_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.1.2_2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.1.2_2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | | Mid range for PCC and SCC | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **Config ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$ Note 1** | **SCCs $N_{RB}$ Note 1** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 6 | 25 | N/A for this test | 256QAM | 6 | P_6@0 | S_0@0 | - | - |
| 2 | 6 | 50 | | 256QAM | 6 | P_6@0 | S_0@0 | - | - |
| 3 | 15 | 25 | | 256QAM | 15 | P_15@0 | S_0@0 | - | - |
| 4 | 25 | 6 | | 256QAM | 25 | P_25@0 | S_0@0 | - | - |
| 5 | 25 | 15 | | 256QAM | 25 | P_25@0 | S_0@0 | - | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6 | 25 | 25 | | 256QAM | 25 | P_25@0 | S_0@0 | - | - |
| 7 | 25 | 50 | | 256QAM | 25 | P_25@0 | S_0@0 | - | - |
| 8 | 50 | 6 | | 256QAM | 50 | P_50@0 | S_0@0 | - | - |
| 9 | 50 | 25 | | 256QAM | 50 | P_50@0 | S_0@0 | - | - |
| 10 | 50 | 50 | | 256QAM | 50 | P_50@0 | S_0@0 | - | - |
| 11 | 50 | 100 | | 256QAM | 50 | P_50@0 | S_0@0 | - | - |
| 12 | 75 | 75 | | 256QAM | 75 | P_75@0 | S_0@0 | - | - |
| 13 | 75 | 100 | | 256QAM | 75 | P_75@0 | S_0@0 | - | - |
| 14 | 100 | 50 | | 256QAM | 100 | P_100@0 | S_0@0 | - | - |
| 15 | 100 | 75 | | 256QAM | 100 | P_100@0 | S_0@0 | - | - |
| 16 | 100 | 100 | | 256QAM | 100 | P_100@0 | S_0@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | | |
| Note 2: The frequencies of PCC and SCC shall be switched and tested in each configuration. | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL RMC is set according to Table 6.5.2A.1.2_2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2A.1.2_2.4.3.

#### 6.5.2A.1.2_2.4.2 Test procedure

Same as in clause 6.5.2A.1.2.4.2 with the following exceptions:

- Instead of Table 6.5.2A.1.2.4.1-1 → use Table 6.5.2A.1.2_2.4.1-1.
- Instead of UE output power -36.8dBm ±3.2dB → -26.8dBm ±3.2dB for carrier frequency $f \leq 3.0$GHz.
- Instead of UE output power -36.5dBm ±3.5dB → -26.5dBm ±3.5dB for carrier frequency $3.0\text{GHz} < f \leq 4.2$GHz.

#### 6.5.2A.1.2_2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

#### 6.5.2A.1.2_2.5 Test requirement

The PUSCH EVM derived in Annex E.4.2 shall not exceed the values in Table 6.5.2.1_2.5-1 for 256QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in Annex E.4.6.2 shall not exceed the values in Table 6.5.2.1_2.5-1 when embedded with data symbols of 256QAM.

### 6.5.2A.1.3 Error Vector Magnitude (EVM) for CA (intra-band non-contiguous DL CA and UL CA)

#### 6.5.2A.1.3.1 Test Purpose

For the intra-band non-contiguous carrier aggregation, the Error Vector Magnitude requirement should be defined for each component carrier. Requirement applies for the allocated component carrier, when all other component carriers are activated, but not allocated.

Similar transmitter impairment removal procedures are applied for CA waveform before EVM calculation as is specified for non-CA waveform in sub-section 6.5.2.1.

#### 6.5.2A.1.3.2 Test applicability

This test case applies to all types of E-UTRA UE Release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

#### 6.5.2A.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.1.0.

#### 6.5.2A.1.3.4 Test description

##### 6.5.2A.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.1.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.1.3.4.1-1: Test Configuration**

| Table Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | NC | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | Low Range for CC1; High Range for CC2<br>PCC-SCC: CC1-CC2 and CC2-CC1 | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | QPSK | N/A | QPSK | P_8@0 | QPSK | S_0@0 |
| 2 | 25 | 25 | 35 | QPSK | | QPSK | P_8@17 | QPSK | S_0@0 |
| 3 | 25 | 25 | 35 | QPSK | | QPSK | P_25@0 | QPSK | S_0@0 |
| 4 | 25 | 25 | 35 | 16QAM | | 16QAM | P_8@0 | 16QAM | S_0@0 |
| 5 | 25 | 25 | 35 | 16QAM | | 16QAM | P_8@17 | 16QAM | S_0@0 |
| 6 | 25 | 25 | 35 | 16QAM | | 16QAM | P_25@0 | 16QAM | S_0@0 |
| 7 | 50 | 50 | 25 | QPSK | | QPSK | P_12@0 | QPSK | S_0@0 |
| 8 | 50 | 50 | 25 | QPSK | | QPSK | P_12@38 | QPSK | S_0@0 |
| 9 | 50 | 50 | 25 | QPSK | | QPSK | P_50@0 | QPSK | S_0@0 |
| 10 | 50 | 50 | 25 | 16QAM | | 16QAM | P_12@0 | 16QAM | S_0@0 |
| 11 | 50 | 50 | 25 | 16QAM | | 16QAM | P_12@38 | 16QAM | S_0@0 |
| 12 | 50 | 50 | 25 | 16QAM | | 16QAM | P_50@0 | 16QAM | S_0@0 |
| 13 | 75 | 75 | 15 | QPSK | | QPSK | P_16@0 | QPSK | S_0@0 |
| 14 | 75 | 75 | 15 | QPSK | | QPSK | P_16@59 | QPSK | S_0@0 |
| 15 | 75 | 75 | 15 | QPSK | | QPSK | P_75@0 | QPSK | S_0@0 |
| 16 | 75 | 75 | 15 | 16QAM | | 16QAM | P_16@0 | 16QAM | S_0@0 |
| 17 | 75 | 75 | 15 | 16QAM | | 16QAM | P_16@59 | 16QAM | S_0@0 |
| 18 | 75 | 75 | 15 | 16QAM | | 16QAM | P_75@0 | 16QAM | S_0@0 |
| 19 | 100 | 100 | 5 | QPSK | | QPSK | P_18@0 | QPSK | S_0@0 |
| 20 | 100 | 100 | 5 | QPSK | | QPSK | P_18@82 | QPSK | S_0@0 |
| 21 | 100 | 100 | 5 | QPSK | | QPSK | P_100@0 | QPSK | S_0@0 |
| 22 | 100 | 100 | 5 | 16QAM | | 16QAM | P_18@0 | 16QAM | S_0@0 |
| 23 | 100 | 100 | 5 | 16QAM | | 16QAM | P_18@82 | 16QAM | S_0@0 |
| 24 | 100 | 100 | 5 | 16QAM | | 16QAM | P_100@0 | 16QAM | S_0@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL RMC is set according to Table 6.5.2A.1.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2A.1.3.4.3.

#### 6.5.2A.1.3.4.2 Test procedure

Test procedures should be as follows:

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.2A.3.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2A.1.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX\ level}$.
6. Measure the EVM and $\overline{EVM}_{DMRS}$ on PCC using Global In-Channel Tx-Test (Annex E).
7. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is –36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
8. Measure the EVM and $\overline{EVM}_{DMRS}$ on PCC using Global In-Channel Tx-Test (Annex E).

#### 6.5.2A.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

#### 6.5.2A.1.3.5 Test requirement

The PUSCH EVM derived in Annex E.4.2 shall not exceed 17,5 % for QPSK and BPSK, 12,5% for 16 QAM. The PUSCH $\overline{EVM}_{DMRS}$ derived in Annex E.4.6.2 shall not exceed 17,5 % when embedded with data symbols of QPSK and BPSK, 12,5% for 16 QAM.

### 6.5.2A.1.3_1 Error Vector Magnitude (EVM) for CA (intra-band non-contiguous DL CA and UL CA) for UL 64QAM

#### 6.5.2A.1.3_1.1 Test Purpose

For the intra-band non-contiguous carrier aggregation, the Error Vector Magnitude requirement should be defined for each component carrier. Requirement applies for the allocated component carrier, when all other component carriers are activated, but not allocated.

Similar transmitter impairment removal procedures are applied for CA waveform before EVM calculation as is specified for non-CA waveform in sub-section 6.5.2.1.

#### 6.5.2A.1.3_1.2 Test applicability

This test case applies to all types of E-UTRA UE Release 13 and forward that support intra-band non-contiguous DL CA and UL CA and UL 64QAM.

#### 6.5.2A.1.3_1.3 Minimum conformance requirements

The EVM requirement for 64QAM is according to Table 6.5.2A.1.1_1.3-1 if CA is configured in uplink.

**Table 6.5.2A.1.1_1.3-1: Minimum requirements for Error Vector Magnitude**

| Parameter | Unit | Average EVM Level per CC | Reference Signal EVM Level |
|---|---|---|---|
| 64QAM | % | 8 | 8 |

#### 6.5.2A.1.3_1.4 Test description

##### 6.5.2A.1.3_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.1.3_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.1.3_1.4.1-1: Test Configuration**

| Table Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Low Range for CC1; High Range for CC2<br>PCC-SCC: CC1-CC2 and CC2-CC1 |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

**Test Parameters for CA Configurations**

| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ [MHz] | DL Allocation | | UL Allocation | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | | CC MOD | PCC & SCC RB allocation | CC MOD | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) |
| 1 | 25 | 25 | 35 | 64QAM | N/A | 64QAM | P_8@0 | 64QAM | S_0@0 |
| 2 | 25 | 25 | 35 | 64QAM | | 64QAM | P_8@17 | 64QAM | S_0@0 |
| 3 | 25 | 25 | 35 | 64QAM | | 64QAM | P_25@0 | 64QAM | S_0@0 |
| 4 | 50 | 50 | 25 | 64QAM | | 64QAM | P_12@0 | 64QAM | S_0@0 |
| 5 | 50 | 50 | 25 | 64QAM | | 64QAM | P_12@38 | 64QAM | S_0@0 |
| 6 | 50 | 50 | 25 | 64QAM | | 64QAM | P_50@0 | 64QAM | S_0@0 |
| 7 | 75 | 75 | 15 | 64QAM | | 64QAM | P_16@0 | 64QAM | S_0@0 |
| 8 | 75 | 75 | 15 | 64QAM | | 64QAM | P_16@59 | 64QAM | S_0@0 |
| 9 | 75 | 75 | 15 | 64QAM | | 64QAM | P_75@0 | 64QAM | S_0@0 |
| 10 | 100 | 100 | 5 | 64QAM | | 64QAM | P_18@0 | 64QAM | S_0@0 |
| 11 | 100 | 100 | 5 | 64QAM | | 64QAM | P_18@82 | 64QAM | S_0@0 |
| 12 | 100 | 100 | 5 | 64QAM | | 64QAM | P_100@0 | 64QAM | S_0@0 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.
Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL RMC is set according to Table 6.5.2A.1.3_1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2A.1.3_1.4.3.

### 6.5.2A.1.3_1.4.2 Test procedure

Same test procedure as in clause 6.5.2A.1.3.4.2.

#### 6.5.2A.1.3_1.4.3 Message contents

Same message contents as in clause 6.5.2A.1.3.4.3.

#### 6.5.2A.1.3_1.5 Test requirement

The PUSCH EVM derived in Annex E.4.2 shall not exceed 8 % for 64QAM. The PUSCH $\overline{EVM}_{DMRS}$ derived in Annex E.4.6.2 shall not exceed 8 % when embedded with data symbols of 64QAM.

### 6.5.2A.1.3_2 Error Vector Magnitude (EVM) for CA (intra-band non-contiguous DL CA and UL CA) for UL 256QAM

#### 6.5.2A.1.3_2.1 Test Purpose

For the intra-band non-contiguous carrier aggregation, the Error Vector Magnitude requirement should be defined for each component carrier. Requirement applies for the allocated component carrier, when all other component carriers are activated, but not allocated.

Similar transmitter impairment removal procedures are applied for CA waveform before EVM calculation as is specified for non-CA waveform in sub-section 6.5.2.1.

#### 6.5.2A.1.3_2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support intra-band non-contiguous DL CA and UL CA and UL 256QAM.

#### 6.5.2A.1.3_2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.1.0

#### 6.5.2A.1.3_2.4 Test description

##### 6.5.2A.1.3_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.1.3_2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.1.3_2.4.1-1: Test Configuration**

| Table Initial Conditions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Low Range for CC1; High Range for CC2<br>PCC-SCC: CC1-CC2 and CC2-CC1 | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | **UL Allocation** | | | |
| | **PCC $N_{RB}$ Note 1** | **SCCs $N_{RB}$ Note 1** | | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | 256QAM | P_25@0 | 256QAM | S_0@0 |
| 2 | 50 | 50 | 25 | | 256QAM | P_50@0 | 256QAM | S_0@0 |
| 3 | 75 | 75 | 15 | | 256QAM | P_75@0 | 256QAM | S_0@0 |
| 4 | 100 | 100 | 5 | | 256QAM | P_100@0 | 256QAM | S_0@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL RMC is set according to Table 6.5.2A.1.3_2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2A.1.3_2.4.3.

### 6.5.2A.1.3_2.4.2 Test procedure

Same as in clause 6.5.2A.1.3.4.2 with the following exceptions:

- Instead of Table 6.5.2A.1.3.4.1-1 → use Table 6.5.2A.1.3_2.4.1-1.
- Instead of UE output power -36.8dBm ±3.2dB → -26.8dBm ±3.2dB for carrier frequency $f \leq 3.0$GHz.
- Instead of UE output power -36.5dBm ±3.5dB → -26.5dBm ±3.5dB for carrier frequency $3.0\text{GHz} < f \leq 4.2$GHz.

### 6.5.2A.1.3_2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

6.5.2A.1.3_2.5 Test requirement

The PUSCH EVM derived in Annex E.4.2 shall not exceed the values in Table 6.5.2.1_2.5-1 for 256QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in Annex E.4.6.2 shall not exceed the values in Table 6.5.2.1_2.5-1 when embedded with data symbols of 256QAM.

## 6.5.2A.1.4 Error Vector Magnitude (EVM) for CA (3UL CA)

### 6.5.2A.1.4.1 Test Purpose

The Error Vector Magnitude requirement should be defined for each component carrier. Requirement applies for the allocated component carrier, when all other component carriers are activated, but not allocated.

Similar transmitter impairment removal procedures are applied for CA waveform before EVM calculation as is specified for non-CA waveform in sub-section 6.5.2.1.

### 6.5.2A.1.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band contiguous or inter-band or intra-band non-contiguous 3DL CA and 3UL CA.

### 6.5.2A.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.1.0.

### 6.5.2A.1.4.4 Test description

#### 6.5.2A.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2 for CA configurations with two bands. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.1.4.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.1.4.4.1-1: Test Configuration Table for intra-band contiguous CA**

| 1. **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | Low range, High range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **Config ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$ Note 1** | **SCCs $N_{RB}$ Note 1** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC1 & SCC2 RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 50 | 50 | N/A | QPSK | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 2 | 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 3 | 50 | 50 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 4 | 50 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 5 | 50 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 6 | 50 | 50 | | 16QAM | 12 | P_12@38 | S_0@0 | S_0@0 | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 7 | 50 | 25 | | QPSK | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 8 | 50 | 25 | | QPSK | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 9 | 50 | 25 | | QPSK | 25 | P_25@25 | S_0@0 | S_0@0 | - |
| 10 | 50 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 11 | 50 | 25 | | QPSK | 8 | P_8@42 | S_0@0 | S_0@0 | - |
| 12 | 50 | 25 | | 16QAM | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 13 | 50 | 25 | | 16QAM | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 14 | 50 | 25 | | 16QAM | 25 | P_25@25 | S_0@0 | S_0@0 | - |
| 15 | 50 | 25 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 16 | 50 | 25 | | 16QAM | 8 | P_8@42 | S_0@0 | S_0@0 | - |
| 17 | 25 | 50 | | QPSK | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 18 | 25 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 19 | 25 | 50 | | QPSK | 12 | P_12@13 | S_0@0 | S_0@0 | - |
| 20 | 25 | 50 | | 16QAM | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 21 | 25 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 22 | 25 | 50 | | 16QAM | 12 | P_12@13 | S_0@0 | S_0@0 | - |
| 23 | 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | S_0@0 | - |
| 24 | 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 25 | 75 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 26 | 75 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | S_0@0 | - |
| 27 | 75 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 28 | 75 | 75 | | 16QAM | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 29 | 100 | 25 | | QPSK | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 30 | 100 | 25 | | QPSK | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 31 | 100 | 25 | | QPSK | 25 | P_25@75 | S_0@0 | S_0@0 | - |
| 32 | 100 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 33 | 100 | 25 | | QPSK | 8 | P_8@92 | S_0@0 | S_0@0 | - |
| 34 | 100 | 25 | | 16QAM | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 35 | 100 | 25 | | 16QAM | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 36 | 100 | 25 | | 16QAM | 25 | P_25@75 | S_0@0 | S_0@0 | - |
| 37 | 100 | 25 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 38 | 100 | 25 | | 16QAM | 8 | P_8@92 | S_0@0 | S_0@0 | - |
| 39 | 25 | 100 | | QPSK | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 40 | 25 | 100 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 41 | 25 | 100 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 42 | 25 | 100 | | 16QAM | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 43 | 25 | 100 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 44 | 25 | 100 | | 16QAM | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 45 | 100 | 50 | | QPSK | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 46 | 100 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 47 | 100 | 50 | | QPSK | 50 | P_50@50 | S_0@0 | S_0@0 | - |
| 48 | 100 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 49 | 100 | 50 | | QPSK | 12 | P_12@88 | S_0@0 | S_0@0 | - |
| 50 | 100 | 50 | | 16QAM | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 51 | 100 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 52 | 100 | 50 | | 16QAM | 50 | P_50@50 | S_0@0 | S_0@0 | - |
| 53 | 100 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 54 | 100 | 50 | | 16QAM | 12 | P_12@88 | S_0@0 | S_0@0 | - |
| 55 | 50 | 100 | | QPSK | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 56 | 50 | 100 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 57 | 50 | 100 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 58 | 50 | 100 | | 16QAM | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 59 | 50 | 100 | | 16QAM | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 60 | 50 | 100 | | 16QAM | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 61 | 100 | 75 | | QPSK | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 62 | 100 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | S_0@0 | - |
| 63 | 100 | 75 | | QPSK | 75 | P_75@25 | S_0@0 | S_0@0 | - |
| 64 | 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 65 | 100 | 75 | | QPSK | 16 | P_16@84 | S_0@0 | S_0@0 | - |
| 66 | 100 | 75 | | 16QAM | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 67 | 100 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | S_0@0 | - |
| 68 | 100 | 75 | | 16QAM | 75 | P_75@25 | S_0@0 | S_0@0 | - |
| 69 | 100 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 70 | 100 | 75 | | 16QAM | 16 | P_16@84 | S_0@0 | S_0@0 | - |
| 71 | 75 | 100 | | QPSK | 75 | P_75@0 | S_0@0 | S_0@0 | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 72 | 75 | 100 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 73 | 75 | 100 | | QPSK | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 74 | 75 | 100 | | 16QAM | 75 | P_75@0 | S_0@0 | S_0@0 | - |
| 75 | 75 | 100 | | 16QAM | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 76 | 75 | 100 | | 16QAM | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 77 | 100 | 100 | | QPSK | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 78 | 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 79 | 100 | 100 | | QPSK | 18 | P_18@82 | S_0@0 | S_0@0 | - |
| 80 | 100 | 100 | | 16QAM | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 81 | 100 | 100 | | 16QAM | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 82 | 100 | 100 | | 16QAM | 18 | P_18@82 | S_0@0 | S_0@0 | - |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.

**Table 6.5.2A.1.4.4.1-2: Test Configuration Table for inter-band CA**

| 2. **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | Low range for PCC and SCC<br>High range for PCC and SCC |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

**Test Parameters for CA Configurations**

| **Config ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **PCC $N_{RB}$ Note 1** | **SCCs $N_{RB}$ Note 1** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC1 & SCC2 RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 6 | 25 | N/A | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 2 | 6 | 25 | | QPSK | 1 | P_1@5 | S_0@0 | S_0@0 | - |
| 3 | 6 | 25 | | QPSK | 6 | P_6@0 | S_0@0 | S_0@0 | - |
| 4 | 6 | 25 | | 16QAM | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 5 | 6 | 25 | | 16QAM | 1 | P_1@5 | S_0@0 | S_0@0 | - |
| 6 | 6 | 25 | | 16QAM | 6 | P_6@0 | S_0@0 | S_0@0 | - |
| 7 | 6 | 50 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 8 | 6 | 50 | | QPSK | 1 | P_1@5 | S_0@0 | S_0@0 | - |
| 9 | 6 | 50 | | QPSK | 6 | P_6@0 | S_0@0 | S_0@0 | - |
| 10 | 6 | 50 | | 16QAM | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 11 | 6 | 50 | | 16QAM | 1 | P_1@5 | S_0@0 | S_0@0 | - |
| 12 | 6 | 50 | | 16QAM | 6 | P_6@0 | S_0@0 | S_0@0 | - |
| 13 | 15 | 25 | | QPSK | 4 | P_4@0 | S_0@0 | S_0@0 | - |
| 14 | 15 | 25 | | QPSK | 4 | P_4@11 | S_0@0 | S_0@0 | - |
| 15 | 15 | 25 | | QPSK | 15 | P_15@0 | S_0@0 | S_0@0 | - |
| 16 | 15 | 25 | | 16QAM | 4 | P_4@0 | S_0@0 | S_0@0 | - |
| 17 | 15 | 25 | | 16QAM | 4 | P_4@11 | S_0@0 | S_0@0 | - |
| 18 | 15 | 25 | | 16QAM | 15 | P_15@0 | S_0@0 | S_0@0 | - |
| 19 | 25 | 6 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 20 | 25 | 6 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 21 | 25 | 6 | | QPSK | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 22 | 25 | 6 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 23 | 25 | 6 | | 16QAM | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 24 | 25 | 6 | | 16QAM | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 25 | 25 | 15 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 26 | 25 | 15 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 27 | 25 | 15 | | QPSK | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 28 | 25 | 15 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 29 | 25 | 15 | | 16QAM | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 30 | 25 | 15 | | 16QAM | 25 | P_25@0 | S_0@0 | S_0@0 | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 31 | 25 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 32 | 25 | 25 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 33 | 25 | 25 | | QPSK | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 34 | 25 | 25 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 35 | 25 | 25 | | 16QAM | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 36 | 25 | 25 | | 16QAM | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 37 | 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 38 | 25 | 50 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 39 | 25 | 50 | | QPSK | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 40 | 25 | 50 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 41 | 25 | 50 | | 16QAM | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 42 | 25 | 50 | | 16QAM | 25 | P_25@0 | S_0@0 | S_0@0 | - |
| 43 | 50 | 6 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 44 | 50 | 6 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 45 | 50 | 6 | | QPSK | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 46 | 50 | 6 | | 16QAM | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 47 | 50 | 6 | | 16QAM | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 48 | 50 | 6 | | 16QAM | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 49 | 50 | 25 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 50 | 50 | 25 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 51 | 50 | 25 | | QPSK | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 52 | 50 | 25 | | 16QAM | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 53 | 50 | 25 | | 16QAM | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 54 | 50 | 25 | | 16QAM | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 55 | 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 56 | 50 | 50 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 57 | 50 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 58 | 50 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 59 | 50 | 50 | | 16QAM | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 60 | 50 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 61 | 50 | 100 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 62 | 50 | 100 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 63 | 50 | 100 | | QPSK | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 64 | 50 | 100 | | 16QAM | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 65 | 50 | 100 | | 16QAM | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 66 | 50 | 100 | | 16QAM | 50 | P_50@0 | S_0@0 | S_0@0 | - |
| 67 | 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 68 | 75 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 69 | 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | S_0@0 | - |
| 70 | 75 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 71 | 75 | 75 | | 16QAM | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 72 | 75 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | S_0@0 | - |
| 73 | 75 | 100 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 74 | 75 | 100 | | QPSK | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 75 | 75 | 100 | | QPSK | 75 | P_75@0 | S_0@0 | S_0@0 | - |
| 76 | 75 | 100 | | 16QAM | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 77 | 75 | 100 | | 16QAM | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 78 | 75 | 100 | | 16QAM | 75 | P_75@0 | S_0@0 | S_0@0 | - |
| 79 | 100 | 50 | | QPSK | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 80 | 100 | 50 | | QPSK | 18 | P_18@82 | S_0@0 | S_0@0 | - |
| 81 | 100 | 50 | | QPSK | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 82 | 100 | 50 | | 16QAM | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 83 | 100 | 50 | | 16QAM | 18 | P_18@82 | S_0@0 | S_0@0 | - |
| 84 | 100 | 50 | | 16QAM | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 85 | 100 | 75 | | QPSK | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 86 | 100 | 75 | | QPSK | 18 | P_18@82 | S_0@0 | S_0@0 | - |
| 87 | 100 | 75 | | QPSK | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 88 | 100 | 75 | | 16QAM | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 89 | 100 | 75 | | 16QAM | 18 | P_18@82 | S_0@0 | S_0@0 | - |
| 90 | 100 | 75 | | 16QAM | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 91 | 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 92 | 100 | 100 | | QPSK | 18 | P_18@82 | S_0@0 | S_0@0 | - |
| 93 | 100 | 100 | | QPSK | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| 94 | 100 | 100 | | 16QAM | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 95 | 100 | 100 | | 16QAM | 18 | P_18@82 | S_0@0 | S_0@0 | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 96 | 100 | 100 | | 16QAM | 100 | P_100@0 | S_0@0 | S_0@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | | |
| Note 2: The frequencies of PCC and SCCs shall be switched and tested in each configuration. | | | | | | | | | |

**Table 6.5.2A.1.4.4.1-3: Test Configuration Table with Wgap**

| Table Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Maximum Wgap |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

| Test Parameters for CA Configurations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ [MHz] | DL Allocation | | UL Allocation | | | | |
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | | CC MOD | PCC & SCC RB allocation | CC MOD | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | |
| **Test Parameters for CA_XA-XA-XA Configurations** | | | | | | | | | | |
| 1 | 25 | 25 | 35 | QPSK | N/A | QPSK | P_8@0 | QPSK | S_0@0 | S_0@0 |
| 2 | 25 | 25 | 35 | QPSK | | QPSK | P_8@17 | QPSK | S_0@0 | S_0@0 |
| 3 | 25 | 25 | 35 | QPSK | | QPSK | P_25@0 | QPSK | S_0@0 | S_0@0 |
| 4 | 25 | 25 | 35 | 16QAM | | 16QAM | P_8@0 | 16QAM | S_0@0 | S_0@0 |
| 5 | 25 | 25 | 35 | 16QAM | | 16QAM | P_8@17 | 16QAM | S_0@0 | S_0@0 |
| 6 | 25 | 25 | 35 | 16QAM | | 16QAM | P_25@0 | 16QAM | S_0@0 | S_0@0 |
| 7 | 50 | 50 | 25 | QPSK | | QPSK | P_12@0 | QPSK | S_0@0 | S_0@0 |
| 8 | 50 | 50 | 25 | QPSK | | QPSK | P_12@38 | QPSK | S_0@0 | S_0@0 |
| 9 | 50 | 50 | 25 | QPSK | | QPSK | P_50@0 | QPSK | S_0@0 | S_0@0 |
| 10 | 50 | 50 | 25 | 16QAM | | 16QAM | P_12@0 | 16QAM | S_0@0 | S_0@0 |
| 11 | 50 | 50 | 25 | 16QAM | | 16QAM | P_12@38 | 16QAM | S_0@0 | S_0@0 |
| 12 | 50 | 50 | 25 | 16QAM | | 16QAM | P_50@0 | 16QAM | S_0@0 | S_0@0 |
| 13 | 75 | 75 | 15 | QPSK | | QPSK | P_16@0 | QPSK | S_0@0 | S_0@0 |
| 14 | 75 | 75 | 15 | QPSK | | QPSK | P_16@59 | QPSK | S_0@0 | S_0@0 |
| 15 | 75 | 75 | 15 | QPSK | | QPSK | P_75@0 | QPSK | S_0@0 | S_0@0 |
| 16 | 75 | 75 | 15 | 16QAM | | 16QAM | P_16@0 | 16QAM | S_0@0 | S_0@0 |
| 17 | 75 | 75 | 15 | 16QAM | | 16QAM | P_16@59 | 16QAM | S_0@0 | S_0@0 |
| 18 | 75 | 75 | 15 | 16QAM | | 16QAM | P_75@0 | 16QAM | S_0@0 | S_0@0 |
| 19 | 100 | 100 | 5 | QPSK | | QPSK | P_18@0 | QPSK | S_0@0 | S_0@0 |
| 20 | 100 | 100 | 5 | QPSK | | QPSK | P_18@82 | QPSK | S_0@0 | S_0@0 |
| 21 | 100 | 100 | 5 | QPSK | | QPSK | P_100@0 | QPSK | S_0@0 | S_0@0 |
| 22 | 100 | 100 | 5 | 16QAM | | 16QAM | P_18@0 | 16QAM | S_0@0 | S_0@0 |
| 23 | 100 | 100 | 5 | 16QAM | | 16QAM | P_18@82 | 16QAM | S_0@0 | S_0@0 |
| 24 | 100 | 100 | 5 | 16QAM | | 16QAM | P_100@0 | 16QAM | S_0@0 | S_0@0 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A, Figure A.55 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.5.2A.1.4.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2A.1.4.4.3.

#### 6.5.2A.1.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.2A.1.4.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2A.1.4.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX\ level}$.
6. Measure the EVM and $\overline{EVM}_{DMRS}$ on PCC using Global In-Channel Tx-Test (Annex E).
7. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is –36.8dBm ±3.2dB for carrier frequency $f \leq 3.0$GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < $f \leq$ 4.2GHz.
8. Measure the EVM and $\overline{EVM}_{DMRS}$ on PCC using Global In-Channel Tx-Test (Annex E).

#### 6.5.2A.1.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

### 6.5.2A.1.4.5 Test requirement

The PUSCH EVM derived in E.4.2 shall not exceed 17,5 % for QPSK and BPSK, 12,5% for 16 QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in E.4.6.2 shall not exceed 17,5 % when embedded with data symbols of QPSK and BPSK, 12,5% for 16 QAM.

## 6.5.2A.2 Carrier leakage for CA

### 6.5.2A.2.0 Minimum conformance requirements

For inter-band carrier aggregation, the relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. The relative carrier leakage power shall not exceed the values specified in Table 6.5.2A.2.0-1.

For the intra-band non-contiguous carrier aggregation, the relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. The relative carrier leakage power shall not exceed the values specified in Table 6.5.2A.2.0-1.

For the intra-band contiguous carrier aggregation, the relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. The relative carrier leakage power shall not exceed the values specified in Table 6.5.2A.2.0-1.

**Table 6.5.2A.2.0-1: Minimum requirements for Relative Carrier Leakage Power**

| Carrier Leakage | Parameters | Relative Limit (dBc) |
|---|---|---|
| | Output power >0 dBm | -25 |
| | -30 dBm ≤ Output power ≤0 dBm | -20 |
| | -40 dBm ≤ Output power < -30 dBm | -10 |

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2A.2.

## 6.5.2A.2.1 Carrier leakage for CA (intra-band contiguous DL CA and UL CA)

### 6.5.2A.2.1.1 Test Purpose

Carrier leakage is an additive sinusoid waveform that is confined within the aggregated transmission bandwidth configuration. The carrier leakage requirement is defined for each component carrier and is measured on the component carrier with PRBs allocated. The measurement interval is one slot in the time domain.

### 6.5.2A.2.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 6.5.2A.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.2.0

### 6.5.2A.2.1.4 Test description

#### 6.5.2A.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.2.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.2.1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause [4.3.1] for different CA bandwidth classes. PCC and SCC mapped onto component carriers CC according to the notation: PCC-SCC: CCi-CCj, which means PCC on CCi and SCC on CCj, with CCi/j frequencies defined in the corresponding intra-band contiguous CA band in TS36.508 [7] as above. | | | | See Table 6.5.1A.1.4.1-1: PCC-SCC: CC1-CC2 and CC2-CC1 | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | See Table 6.5.1A.1.4.1-1: | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **Config ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$ Note 1** | **SCCs $N_{RB}$ Note 1** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | | |
| 2 | 50 | 50 | | QPSK | 12 | P_12@38 | S_0@0 | | |
| 3 | 50 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | | |
| 4 | 50 | 25 | | QPSK | 8 | P_8@42 | S_0@0 | | |
| 5 | 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | | |
| 6 | 25 | 50 | | QPSK | 8 | P_8@17 | S_0@0 | | |
| 7 | 75 | 75 | NA | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 8 | 75 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| 9 | 100 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 10 | 100 | 25 | | QPSK | 8 | P_8@92 | S_0@0 | - | - |
| 11 | 25 | 100 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 12 | 25 | 100 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 13 | 100 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 14 | 100 | 50 | | QPSK | 12 | P_12@88 | S_0@0 | - | - |
| 15 | 50 | 100 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 16 | 50 | 100 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 17 | 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 18 | 100 | 75 | | QPSK | 16 | P_16@84 | S_0@0 | - | - |
| 19 | 75 | 100 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 20 | 75 | 100 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| 21 | 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| 22 | 100 | 100 | | QPSK | 18 | P_18@82 | S_0@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to in Table 6.5.2A.2.1.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2A.2.1.4.3.

#### 6.5.2A.2.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.2A.2.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2A.2.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
6. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.
7. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
8. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.
9. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
10. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

#### 6.5.2A.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.5.2A.2.1.5 Test requirement

Each of the 20 carrier leakage results, derived in Annex E.3.1, shall not exceed the values in table 6.5.2A.2.1.5-1.

**Table 6.5.2A.2.1.5-1: Test requirements for Relative Carrier Leakage Power**

| Carrier Leakage | Parameters | Relative Limit (dBc) |
|---|---|---|
| | f ≤ 3.0GHz: 3.2 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | -24.2 |
| | f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | -19.2 |
| | f ≤ 3.0GHz: -36.8dBm±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -36.5 dBm ±3.5dB | -9.2 |

## 6.5.2A.2.2 Carrier leakage for CA (inter-band DL CA and UL CA)

### 6.5.2A.2.2.1 Test Purpose

Carrier leakage is an additive sinusoid waveform that is confined within the aggregated transmission bandwidth configuration. The carrier leakage requirement is defined for each component carrier and is measured on the component carrier with PRBs allocated. The measurement interval is one slot in the time domain.

#### 6.5.2A.2.2.2 Test applicability

This test case applies to all types of E-UTRA UE Release 11 and forward that support inter-band DL CA and UL CA.

#### 6.5.2A.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.2.0.

#### 6.5.2A.2.2.4 Test description

##### 6.5.2A.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.2.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.2.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | | | Low range for PCC and SCC<br>High range for PCC and SCC | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | |
| **Test Parameters for CA Configurations** | | | | | | |
| **Config ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | |
| | **PCC $N_{RB}$ Note 1** | **SCCs $N_{RB}$ Note 1** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 6 | 25 | | QPSK | 5 | P_5@0 | S_0@0 | - | - |
| 2 | 6 | 25 | | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 3 | 6 | 25 | | QPSK | 1 | P_1@5 | S_0@0 | - | - |
| 4 | 15 | 25 | | QPSK | 4 | P_4@0 | S_0@0 | - | - |
| 5 | 15 | 25 | | QPSK | 4 | P_4@11 | S_0@0 | - | - |
| 6 | 15 | 50 | | QPSK | 4 | P_4@0 | S_0@0 | - | - |
| 7 | 15 | 50 | | QPSK | 4 | P_4@11 | S_0@0 | - | - |
| 8 | 25 | 6 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 9 | 25 | 6 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 10 | 25 | 15 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 11 | 25 | 15 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 12 | 25 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 13 | 25 | 25 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 14 | 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 15 | 25 | 50 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 16 | 50 | 15 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 17 | 50 | 15 | NA | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 18 | 50 | 25 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 19 | 50 | 25 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 20 | 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 21 | 50 | 50 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 22 | 50 | 100 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 23 | 50 | 100 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 24 | 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | | |
| 25 | 75 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| 26 | 100 | 50 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| 27 | 100 | 50 | | QPSK | 18 | P_18@82 | S_0@0 | - | - |
| 28 | 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| 29 | 100 | 100 | | QPSK | 18 | P_18@82 | S_0@0 | - | - |
| 30 | 25 | 75 | | QPSK | 8 | P_8@0 | S_0@0 | | |
| 31 | 25 | 75 | | QPSK | 8 | P_8@17 | S_0@0 | | |
| X+1 | 75 | 25 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| X+2 | 75 | 25 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | | |
| Note 2: The frequencies of PCC and SCC shall be switched and tested in each configuration. | | | | | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL RMCs are set according to in Table 6.5.2A.2.2.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2A.2.2.4.3.

### 6.5.2A.2.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.2A.3.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2A.2.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

6. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

7. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

8. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

9. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

10. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

#### 6.5.2A.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.5.2A.2.2.5 Test requirement

Each of the 20 carrier leakage results, derived in Annex E.3.1, shall not exceed the values in table 6.5.2A.2.2.5-1.

**Table 6.5.2A.2.2.5-1: Test requirements for Relative Carrier Leakage Power**

| Carrier Leakage | Parameters | Relative Limit (dBc) |
|---|---|---|
| | f ≤ 3.0GHz: 3.2 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | -24.2 |
| | f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | -19.2 |
| | f ≤ 3.0GHz: -36.8dBm±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -36.5 dBm ±3.5dB | -9.2 |

## 6.5.2A.2.3 Carrier leakage for CA (intra-band non-contiguous DL CA and UL CA)

### 6.5.2A.2.3.1 Test Purpose

Carrier leakage is an additive sinusoid waveform that is confined within the aggregated transmission bandwidth configuration. The carrier leakage requirement is defined for each component carrier and is measured on the component carrier with PRBs allocated. The measurement interval is one slot in the time domain.

### 6.5.2A.2.3.2 Test applicability

This test case applies to all types of E-UTRA UE Release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

#### 6.5.2A.2.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.2.0.

#### 6.5.2A.2.3.4 Test description

##### 6.5.2A.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.2.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.2.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC | | | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Low Range for CC1; High Range for CC2<br>PCC-SCC: CC1-CC2 and CC2-CC1 | | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | QPSK | N/A | QPSK | P_8@0 | QPSK | S_0@0 |
| 2 | 25 | 25 | 35 | QPSK | | QPSK | P_8@17 | QPSK | S_0@0 |
| 3 | 50 | 50 | 25 | QPSK | | QPSK | P_12@0 | QPSK | S_0@0 |
| 4 | 50 | 50 | 25 | QPSK | | QPSK | P_12@38 | QPSK | S_0@0 |
| 5 | 75 | 75 | 15 | QPSK | | QPSK | P_16@0 | QPSK | S_0@0 |
| 6 | 75 | 75 | 15 | QPSK | | QPSK | P_16@59 | QPSK | S_0@0 |
| 7 | 100 | 100 | 5 | QPSK | | QPSK | P_18@0 | QPSK | S_0@0 |
| 8 | 100 | 100 | 5 | QPSK | | QPSK | P_18@82 | QPSK | S_0@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL RMCs are set according to in Table 6.5.2A.2.3.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2A.2.3.4.3.

#### 6.5.2A.2.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.2A.3.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2A.2.3.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
5. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.
6. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
7. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.
8. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
9. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

#### 6.5.2A.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.5.2A.2.3.5 Test requirement

Each of the 20 carrier leakage results, derived in Annex E.3.1, shall not exceed the values in table 6.5.2A.2.3.5-1.

**Table 6.5.2A.2.3.5-1: Test requirements for Relative Carrier Leakage Power**

| Carrier Leakage | Parameters | Relative Limit (dBc) |
|---|---|---|
| | f ≤ 3.0GHz: 3.2 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | -24.2 |
| | f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | -19.2 |
| | f ≤ 3.0GHz: -36.8dBm±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -36.5 dBm | -9.2 |

| | | |
|---|---|---|
| | ±3.5dB | |

### 6.5.2A.2.4 Carrier leakage for CA (3UL CA)

#### 6.5.2A.2.4.1 Test Purpose

Carrier leakage is an additive sinusoid waveform that is confined within the aggregated transmission bandwidth configuration. The carrier leakage requirement is defined for each component carrier and is measured on the component carrier with PRBs allocated. The measurement interval is one slot in the time domain.

#### 6.5.2A.2.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band contiguous or inter-band or intra-band non-contiguous 3DL CA and 3UL CA.

#### 6.5.2A.2.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.2.0.

#### 6.5.2A.2.4.4 Test description

##### 6.5.2A.2.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2 for CA configurations with two bands. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.2.4.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.2.4.4.1-1: Test Configuration Table for intra-band contiguous CA**

| 3. **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | Low range, High range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **Config ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$ Note 1** | **SCCs $N_{RB}$ Note 1** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC1 & SCC2 RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 50 | 50 | N/A | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 2 | 50 | 50 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 3 | 50 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 4 | 50 | 25 | | QPSK | 8 | P_8@42 | S_0@0 | S_0@0 | - |
| 5 | 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 6 | 25 | 50 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 7 | 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 8 | 75 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 9 | 100 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 10 | 100 | 25 | | QPSK | 8 | P_8@92 | S_0@0 | S_0@0 | - |
| 11 | 25 | 100 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 12 | 25 | 100 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 13 | 100 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 14 | 100 | 50 | | QPSK | 12 | P_12@88 | S_0@0 | S_0@0 | - |
| 15 | 50 | 100 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 16 | 50 | 100 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 17 | 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 18 | 100 | 75 | | QPSK | 16 | P_16@84 | S_0@0 | S_0@0 | - |
| 19 | 75 | 100 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 20 | 75 | 100 | | QPSK | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 21 | 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 22 | 100 | 100 | | QPSK | 18 | P_18@82 | S_0@0 | S_0@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | | |

**Table 6.5.2A.2.4.4.1-2: Test Configuration Table for inter-band CA**

| 4. **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | Low range for PCC and SCC<br>High range for PCC and SCC |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

**Test Parameters for CA Configurations**

| **Config ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **PCC $N_{RB}$ Note 1** | **SCCs $N_{RB}$ Note 1** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC1 & SCC2 RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 6 | 25 | | QPSK | 5 | P_5@0 | S_0@0 | S_0@0 | - |
| 2 | 6 | 25 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 3 | 6 | 25 | | QPSK | 1 | P_1@5 | S_0@0 | S_0@0 | - |
| 4 | 6 | 25 | | QPSK | 4 | P_4@0 | S_0@0 | S_0@0 | - |
| 5 | 15 | 25 | | QPSK | 4 | P_4@11 | S_0@0 | S_0@0 | - |
| 6 | 15 | 25 | | QPSK | 4 | P_4@0 | S_0@0 | S_0@0 | - |
| 7 | 15 | 50 | | QPSK | 4 | P_4@11 | S_0@0 | S_0@0 | - |
| 8 | 15 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 9 | 25 | 6 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 10 | 25 | 6 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 11 | 25 | 15 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 12 | 25 | 15 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 13 | 25 | 25 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 14 | 25 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 15 | 25 | 50 | N/A | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 16 | 25 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 17 | 50 | 15 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 18 | 50 | 15 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 19 | 50 | 25 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 20 | 50 | 25 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 21 | 50 | 50 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 22 | 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 23 | 50 | 100 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 24 | 50 | 100 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 25 | 75 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 26 | 75 | 75 | | QPSK | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 27 | 100 | 50 | | QPSK | 18 | P_18@82 | S_0@0 | S_0@0 | - |
| 28 | 100 | 50 | | QPSK | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 29 | 100 | 100 | | QPSK | 18 | P_18@82 | S_0@0 | S_0@0 | - |

| | |
|---|---|
| Note 1: | CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. |
| Note 2: | The frequencies of PCC and SCC shall be switched and tested in each configuration. |

**Table 6.5.2A.2.4.4.1-3: Test Configuration Table with Wgap**

| **Table Initial Conditions** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Maximum Wgap | | | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | |
| **Test Parameters for CA_XA-XA-XA Configurations** | | | | | | | | | | |
| 1 | 25 | 25 | 35 | QPSK | N/A | QPSK | P_8@0 | QPSK | S_0@0 | S_0@0 |
| 2 | 25 | 25 | 35 | QPSK | | QPSK | P_8@17 | QPSK | S_0@0 | S_0@0 |
| 3 | 50 | 50 | 25 | QPSK | | QPSK | P_12@0 | QPSK | S_0@0 | S_0@0 |
| 4 | 50 | 50 | 25 | QPSK | | QPSK | P_12@38 | QPSK | S_0@0 | S_0@0 |
| 5 | 75 | 75 | 15 | QPSK | | QPSK | P_16@0 | QPSK | S_0@0 | S_0@0 |
| 6 | 75 | 75 | 15 | QPSK | | QPSK | P_16@59 | QPSK | S_0@0 | S_0@0 |
| 7 | 100 | 100 | 5 | QPSK | | QPSK | P_18@0 | QPSK | S_0@0 | S_0@0 |
| 8 | 100 | 100 | 5 | QPSK | | QPSK | P_18@82 | QPSK | S_0@0 | S_0@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A, Figure A.55 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.5.2A.2.4.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2A.2.4.4.3.

### 6.5.2A.2.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.2A.2.4.4.3.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2A.2.4.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

6. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

7. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

8. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

9. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

10. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

#### 6.5.2A.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

#### 6.5.2A.2.4.5 Test requirement

Each of the 20 carrier leakage results, derived in Annex E.3.1, shall not exceed the values in table 6.5.2A.2.3.5-1.

**Table 6.5.2A.2.4.5-1: Test requirements for Relative Carrier Leakage Power**

| Carrier Leakage | Parameters | Relative Limit (dBc) |
|---|---|---|
| | f ≤ 3.0GHz: 3.2 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | -24.2 |
| | f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | -19.2 |
| | f ≤ 3.0GHz: -36.8dBm±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -36.5 dBm ±3.5dB | -9.2 |

### 6.5.2A.3 In-band emissions for non allocated RB for CA

#### 6.5.2A.3.0 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the requirements shall apply on each component carrier as defined in clause 6.5.2 with all component carriers active. If two contiguous component carriers are assigned to one E-UTRA band, the requirements in subclauses 6.5.2A.1, 6.5.2A.2, and 6.5.2A.3 apply for those component carriers.

The requirements in this clause apply with PCC and SCC in the UL configured and activated: PCC with PRB allocation and SCC without PRB allocation and without CSI reporting and SRS configured.

For intra-band contiguous carrier aggregation bandwidth class B and C, the requirements in Table 6.5.2A.3.0-1 and 6.5.2A.3.0-2 apply within the aggregated transmission bandwidth configuration with both component carrier (s) active and one single contiguous PRB allocation of bandwidth $L_{CRB}$ at the edge of the aggregated transmission bandwidth configuration.

The inband emission is defined as the interference falling into the non allocated resource blocks for all component carriers. The measurement method for the inband emissions in the component carrier with PRB allocation is specified in annex F. For a non allocated component carrier a spectral measurement is specified.

For intra-band non-contiguous carrier aggregation the requirements for in-band emissions should be defined for each component carrier. Requirements only apply with PRB allocation in one of the component carriers according to Table 6.5.2.3.3.

**Table 6.5.2A.3.0-1: Minimum requirements for in-band emissions (allocated component carrier)**

| Parameter | Unit | Limit | | Applicable Frequencies |
|---|---|---|---|---|
| General | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRB}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRB},$ $-57\ dBm / 180\ kHz - P_{RB}\}$ | | Any non-allocated (NOTE 2) |
| IQ Image | dB | -25 | | Exception for IQ image (NOTE 3) |
| Carrier leakage | dBc | -25 | Output power > 0 dBm | Exception for Carrier frequency (NOTE 4) |
| | | -20 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -10 | -40 dBm ≤ Output power < -30 dBm | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in NOTE 9. The limit is evaluated in each non-allocated RB.

NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs

NOTE 3: Exceptions to the general limit are allowed for up to $L_{CRBs}$ +1 RBs within a contiguous width of $L_{CRBs}$ +1 non-allocated RBs. The measurement bandwidth is 1 RB.

NOTE 4: Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs. The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in the non-allocated RB to the measured total power in all allocated RBs.

NOTE 5: $L_{CRB}$ is the Transmission Bandwidth (see Figure 5.4.2-1) not exceeding $\lfloor N_{RB} / 2 - 1 \rfloor$

NOTE 6: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1) of the component carrier with RBs allocated.

NOTE 7: $EVM$ is the limit specified in Table 6.5.2.1.3-1 for the modulation format used in the allocated RBs.

NOTE 8: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth).

NOTE 9: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

**Table 6.5.2A.3.0-2: Minimum requirements for in-band emissions (not allocated component carrier)**

| Para-meter | Unit | Meas BW NOTE 1 | Limit | | remark | Applicable Frequencies |
|---|---|---|---|---|---|---|
| General | dB | BW of 1 RB (180KHz rectangular) | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRB}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRB},$ $-57\ dBm\ /\ 180\ kHz - P_{RB}\}$ | | The reference value is the average power per allocated RB in the allocated component carrier | Any RB in the non allocated component carrier. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| IQ Image | dB | BW of 1 RB (180KHz rectangular) | -25 (NOTE 2) | | The reference value is the average power per allocated RB in the allocated component carrier | The frequencies of the $L_{CRB}$ contiguous non-allocated RBs are unknown. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| Carrier leakage | dBc | BW of 1 RB (180KHz rectangular) | NOTE 3 | | The reference value is the total power of the allocated RBs in the allocated component carrier | The frequencies of the up to 2 non-allocated RBs are unknown. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| | | | -25 | Output power > 0 dBm | | |
| | | | -20 | -30 dBm ≤ Output power ≤ 0 dBm | | |
| | | | -10 | -40 dBm ≤ Output power < -30 dBm | | |

NOTE1: Resolution BWs smaller than the measurement BW may be integrated to achieve the measurement bandwidth.

NOTE 2: Exceptions to the general limit are allowed for up to $L_{CRB}$ +1 RBs within a contiguous width of $L_{CRB}$ +1 non-allocated RBs.

NOTE 3: Two Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs

NOTE 4: NOTES 1, 5, 6, 7, 8, 9 from Table 6.5.2A.3.0-1 apply for Table 6.5.2A.3.0-2 as well.

NOTE 5: $\Delta_{RB}$ for measured non-allocated RB in the non allocated component carrier may take non-integer values when the carrier spacing between the CCs is not a multiple of RB.

The normative reference for this requirement is TS 36.101[2] clause 6.5.2A.3.

## 6.5.2A.3.1 In-band emissions for non allocated RB for CA (intra-band contiguous DL CA and UL CA)

### 6.5.2A.3.1.1 Test Purpose

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks.

For an allocated component carrier, the in-band emission is defined as the average across 12 sub-carrier and as a function of the RB offset from the edge of the allocated UL transmission bandwidth. The in-band emission is measured as the ratio of the UE output power in a non–allocated RB to the UE output power in an allocated RB. The basic in-band emissions measurement interval is defined over one slot in the time domain. When the PUSCH or PUCCH transmission slot is shortened due to multiplexing with SRS, the in-band emissions measurement interval is reduced by one SC-FDMA symbol, accordingly.

For a non allocated component carrier a spectral measurement is specified.

#### 6.5.2A.3.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

#### 6.5.2A.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.3.0.

#### 6.5.2A.3.1.4 Test description

##### 6.5.2A.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.2A.3.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2A.3.1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. PCC and SCC mapped onto component carriers CC according to the notation: PCC-SCC: CCi-CCj, which means PCC on CCi and SCC on CCj, with CCi/j frequencies defined in the corresponding intra-band contiguous CA band in TS36.508 [7] as above. | | | See Table 6.5.1A.1.4.1-1: PCC-SCC: CC1-CC2, CC2-CC1 | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | See Table 6.5.1A.1.4.1-1: | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | |
| **Config ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCC $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 Note 2 | 75 | 75 | N.A. | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 2 Note 3 | 75 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| 3 Note 2 | 100 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 4 Note 3 | 100 | 25 | | QPSK | 8 | P_8@92 | S_0@0 | - | - |
| 5 Note 2 | 25 | 100 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 6 Note 3 | 25 | 100 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 7 Note 2 | 100 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 8 Note 3 | 100 | 50 | | QPSK | 12 | P_12@88 | S_0@0 | - | - |
| 9 Note 2 | 50 | 100 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 10 Note 3 | 50 | 100 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 11 Note 2 | 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 12 Note 3 | 100 | 75 | | QPSK | 16 | P_16@84 | S_0@0 | - | - |
| 13 Note 2 | 75 | 100 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 14 Note 3 | 75 | 100 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| 15 Note 2 | 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| 16 Note 3 | 100 | 100 | | QPSK | 18 | P_18@82 | S_0@0 | - | - |
| 17 Note 2 | 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 18 Note 3 | 50 | 50 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 19 Note 2 | 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 20 Note 3 | 25 | 50 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 21 Note 2 | 50 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 22 Note 3 | 50 | 25 | | QPSK | 8 | P_8@42 | S_0@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

| | |
|---|---|
| Note 2: | Applicable only for PCC-SCC: CC1-CC2. |
| Note 3: | Applicable only for PCC-SCC: CC2-CC1. |
| Note 4: | If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested. |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to in Table 6.5.2A.3.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2A.3.1.4.3.

#### 6.5.2A.3.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.2A.3.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2A.3.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
6. Measure In-band emission on PCC using Global In-Channel Tx-Test (Annex E). Measure power spectral density on the SCC. For TDD slots with transient periods are not under test.
7. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
8. Measure In-band emission on PCC using Global In-Channel Tx-Test (Annex E). Measure power spectral density on the SCC. For TDD slots with transient periods are not under test.
9. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is to -36.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
10. Measure In-band emission on PCC using Global In-Channel Tx-Test (Annex E). Measure power spectral density on the SCC. For TDD slots with transient periods are not under test.

#### 6.5.2A.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.5.2A.3.1.5 Test requirement

Each of the 20 In-band emissions results, derived in Annex E.4.3 shall not exceed the corresponding values in Table 6.5.2A.3.1.5-1.

**Table 6.5.2A.3.1.5-1: Test requirements for in-band emissions (allocated component carrier)**

| Parameter Description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| General | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs},$ $-57\ dBm\ /180\ kHz - P_{RB}\}$ +0.8 | | Any non-allocated (Note 2) |
| IQ Image | dB | -24.2 | | Image frequencies (Notes 2, 3) |
| Carrier leakage | dBc | -24.2 | Output power<br>f ≤ 3.0GHz: 3.2dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | LO frequency (Notes 4, 5) |
| | | -19.2 | Output power<br>f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | |
| | | -9.2 | Output power<br>f ≤ 3.0GHz: -36.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -36.5 dBm ±3.5dB | |

Note 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the test requirement is calculated as the higher of $P_{RB} - 29.2$ dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in Note 10.

Note 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.

Note 3: The applicable frequencies for this limit are not known due to unknown LO frequency. See Note 3 in Table 6.5.2A.3.0-1.

Note 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.

Note 5: The applicable frequencies for this limit are not known due to unknown LO frequency. See Note 4 in Table 6.5.2A.3.0-1.

Note 6: $L_{CRB}$ is the Transmission Bandwidth (see Figure 5.4.2-1).

Note 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1) of the component carrier with RBs allocated.

Note 8: $EVM$ is the limit specified in Table 6.5.2.1.3-1 for the modulation format used in the allocated RBs.

Note 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth).

Note 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

The in-band emissions results, measured with the spectral test shall not exceed the corresponding values in Table 6.5.2A.3.1.5-2

**Table 6.5.2A.3.1.5-2: Test requirements for in-band emissions (not allocated component carrier)**

| Para-meter | Unit | Meas BW Note 1 | Limit | | remark | Applicable Frequencies |
|---|---|---|---|---|---|---|
| General | dB | BW of 1 RB (180KHz rectangular) | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs}$ $-57\ dBm\ /180\ kHz - P_{RB}\}$ | | The reference value is the average power per allocated RB in the allocated component carrier | Any RB in the non allocated component carrier. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| IQ Image | dB | BW of 1 RB (180KHz rectangular) | -24.2 Note 2 | | The reference value is the average power per allocated RB in the allocated component carrier | The frequencies of the $L_{CRB}$ contig uous non-allocated RBs are unknown. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| Carrier leakage | dBc | BW of 1 RB (180KHz rectangular) | Note 3 | | The reference value is the total power of the allocated RBs in the allocated component carrier | The frequencies of the up to 2 non-allocated RBs are unknown. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| | | | -24.2 | Output power > 0 dBm | | |
| | | | -19.2 | -30 dBm ≤ Output power ≤ 0 dBm | | |
| | | | -9.2 | -40 dBm ≤ Output power < -30 dBm | | |

Note1: Resolution BWs smaller than the measurement BW may be integrated to achieve the measurement bandwidth.

Note 2: Exceptions to the general limit are allowed for up to $L_{CRB}$ +1 RBs within a contiguous width of $L_{CRB}$ +1 non-allocated RBs.

Note 3: Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs.

Note 4: Note s1, 6, 7, 8, 9, 10 from Table 6.5.2A.3.0-1 apply for Table 6.5.2A.3.0-2 as well.

Note 5: $\Delta_{RB}$ for measured non-allocated RB in the non allocated component carrier may take non-integer values when the carrier spacing between the CCs is not a multiple of RB.

## 6.5.2A.3.2 In-band emissions for non allocated RB for CA (inter-band DL CA and UL CA)

### 6.5.2A.3.2.1 Test Purpose

Same test purpose as in clause 6.5.2A.3.1.1.

### 6.5.2A.3.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA.

This test case also applies to all types of E-UTRA UE release 14 and forward that supports uplink LAA.

#### 6.5.2A.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.3.0.

#### 6.5.2A.3.2.4 Test description

##### 6.5.2A.3.2.4.1 Initial conditions

Same as in clause 6.5.2A.3.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands.
- Instead of Table 6.5.2A.3.1.4.1-1 → use Table 6.5.2A.3.2.4.1-1.
- Instead of clause 6.5.2A.3.1.4.3 → use clause 6.5.2A.3.2.4.3.

**Table 6.5.2A.3.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | Low range for PCC and SCC<br>High range for PCC and SCC | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/A for this test | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 6 | 25 | | QPSK | 1 | P_1@5 | S_0@0 | - | - |
| 6 | 50 | | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 6 | 50 | | QPSK | 1 | P_1@5 | S_0@0 | - | - |
| 15 | 25 | | QPSK | 4 | P_4@0 | S_0@0 | - | - |
| 15 | 25 | | QPSK | 4 | P_4@11 | S_0@0 | - | - |
| 25 | 6 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 25 | 6 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 25 | 15 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 25 | 15 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 25 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 25 | 25 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 25 | 50 | | QPSK | 8 | P_8@17 | S_0@0 | - | - |
| 50 | 6 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 50 | 25 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 50 | 25 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 50 | 50 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 50 | 100 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 50 | 100 | | QPSK | 12 | P_12@38 | S_0@0 | - | - |
| 75 | 25 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 75 | 25 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 75 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| 75 | 100 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 75 | 100 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| 100 | 50 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| 100 | 50 | | QPSK | 18 | P_18@82 | S_0@0 | - | - |
| 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 100 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | - | - |
| 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| 100 | 100 | | QPSK | 18 | P_18@82 | S_0@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested.<br>Note 3: The frequencies of PCC and SCC shall be switched and tested in each configuration. | | | | | | | | |

**Table 6.5.2A.3.2.4.1-2: Test Configuration Table for Uplink LAA CA**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | Low range for PCC and SCC<br>High range for PCC and SCC | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 1) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC RB Allocation ($L_{CRB}$ @ $RB_{start}$) SCC RB Allocation(L@ $RB_{start}$) Note2** | | | |
| 1 | 100 | N/A for this test | QPSK | 10 | P_0@0 | S_1@1 | | |
| 2 | 100 | | 16QAM | 10 | P_0@0 | S_1@1 | | |
| 3 | 100 | | 64QAM | 10 | P_0@0 | S_1@1 | | |
| 4 | 100 | | QPSK | 10 | P_0@0 | S_1@1 | | |
| 5 | 100 | | 16QAM | 10 | P_0@0 | S_1@1 | | |
| 6 | 100 | | 64QAM | 10 | P_0@0 | S_1@1 | | |
| 7 | 100 | | QPSK | 10 | P_0@0 | S_1@1 | | |
| 8 | 100 | | 16QAM | 10 | P_0@0 | S_1@1 | | |
| 9 | 100 | | 64QAM | 10 | P_0@0 | S_1@1 | | |
| 10 | 100 | | QPSK | 10 | P_0@0 | S_1@1 | | |
| 11 | 100 | | 16QAM | 10 | P_0@0 | S_1@1 | | |
| 12 | 100 | | 64QAM | 10 | P_0@0 | S_1@1 | | |
| 13 | 100 | | QPSK | 10 | P_0@0 | S_1@5 | | |
| 14 | 100 | | 16QAM | 10 | P_0@0 | S_1@5 | | |
| 15 | 100 | | 64QAM | 10 | P_0@0 | S_1@5 | | |
| 16 | 100 | | QPSK | 10 | P_0@0 | S_1@5 | | |
| 17 | 100 | | 16QAM | 10 | P_0@0 | S_1@5 | | |
| 18 | 100 | | 64QAM | 10 | P_0@0 | S_1@5 | | |
| 19 | 100 | | QPSK | 10 | P_0@0 | S_1@5 | | |
| 20 | 100 | | 16QAM | 10 | P_0@0 | S_1@5 | | |
| 21 | 100 | | 64QAM | 10 | P_0@0 | S_1@5 | | |
| 22 | 100 | | QPSK | 10 | P_0@0 | S_1@5 | | |
| 23 | 100 | | 16QAM | 10 | P_0@0 | S_1@5 | | |
| 24 | 100 | | 64QAM | 10 | P_0@0 | S_1@5 | | |
| Note 1: CA Configuration, Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths for uplink LAA are specified in Table 5.4.2A.1-2.<br>Note 2: For eLAA SCC, the RBstart and L are defined in TS 36.213[10] clause 8.1.4. | | | | | | | | |

6.5.2A.3.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.

2 The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.2A.3.2.4.3.

3 SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 (or DCI format 0A for SCC in the case of uplink LAA) for C_RNTI to schedule the UL RMC according to Table 6.5.2A.3.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

6. Measure In-band emission on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

7. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

8. Measure In-band emission on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

9. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is to -36.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

10. Measure In-band emission on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

#### 6.5.2A.3.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

For SCC in the case of uplink LAA, message contents are according to TS 36.508 [7] subclause4.6 with the exceptions specified in Tables 6.5.2A.1.2.4.3-1 and 6.5.2A.1.2.4.3-2.

### 6.5.2A.3.2.5 Test requirement

Each of the 20 In-band emissions results, derived in Annex E.4.3 shall not exceed the corresponding values in Table 6.5.2A.3.2.5-1.

**Table 6.5.2A.3.2.5-1: Test requirements for in-band emissions**

| Parameter description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs}, +0.8$ $-57\ dBm\ /180\ kHz - P_{RB}\}$ | | Any non-allocated (Note 2) |
| **IQ Image** | dB | -27.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power > 10 dBm | Image frequencies (Notes 2, 3) |
| | | -24.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power ≤ 10 dBm | |
| | | -24.2 | Image frequencies when carrier centre frequency ≥ 1 GHz | |
| **Carrier leakage** | dBc | -27.2 | Output power > 10 dBm and carrier centre frequency < 1 GHz | Carrier frequency (Notes 4, 5) |
| | | -24.2 | Output power > 10 dBm and carrier centre frequency ≥ 1 GHz | |
| | | -24.2 | 0 dBm ≤ Output power ≤10 dBm | |
| | | -19.2 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -9.2 | -40 dBm ≤ Output power < -30 dBm | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 29.2 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in Note 10.
NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.
NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.
NOTE 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.
NOTE 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.
NOTE 6: $L_{CRBs}$ is the Transmission Bandwidth (see Figure 5.4.2-1).
NOTE 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1).
NOTE 8: $EVM$ is the limit specified in Table 6.5.2.1.3-1 for the modulation format used in the allocated RBs.
NOTE 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.
NOTE 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

### 6.5.2A.3.3 In-band emissions for non allocated RB for CA (intra-band non-contiguous DL CA and UL CA)

#### 6.5.2A.3.3.1 Test Purpose

Same test purpose as in clause 6.5.2A.3.1.1.

#### 6.5.2A.3.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

#### 6.5.2A.3.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.3.0.

#### 6.5.2A.3.3.4 Test description

##### 6.5.2A.3.3.4.1 Initial conditions

Same as in clause 6.5.2A.3.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-3 for CA configurations.
- Instead of Table 6.5.2A.3.1.4.1-1 → use Table 6.5.2A.3.3.4.1-1.
- Instead of clause 6.5.2A.3.1.4.3 → use clause 6.5.2A.3.3.4.3.

**Table 6.5.2A.3.3.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | Normal | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | Refer to test points<br>A: N/A (Range is not relevant),<br>Maximum Wgap | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | | QPSK | P_8@0 | QPSK | S_0@0 |
| 2 | 25 | 25 | 35 | | | QPSK | P_8@17 | QPSK | S_0@0 |
| 3 | 50 | 50 | 25 | | | QPSK | P_12@0 | QPSK | S_0@0 |
| 4 | 50 | 50 | 25 | | | QPSK | P_12@38 | QPSK | S_0@0 |
| 5 | 100 | 100 | 5 | | | QPSK | P_18@0 | QPSK | S_0@0 |
| 6 | 100 | 100 | 5 | | | QPSK | P_18@82 | QPSK | S_0@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.<br>Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band. | | | | | | | | | |

6.5.2A.3.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.2A.3.3.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2A.3.3.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.
6. Measure In-band emission on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.
7. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

8. Measure In-band emission on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

9. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is to -36.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

10. Measure In-band emission on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

#### 6.5.2A.3.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.5.2A.3.3.5 Test requirement

Each of the 20 In-band emissions results, derived in Annex E.4.3 shall not exceed the corresponding values in Table 6.5.2A.3.3.5-1.

**Table 6.5.2A.3.3.5-1: Test requirements for in-band emissions**

| Parameter description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs}$, +0.8 $-57\ dBm\ /180\ kHz - P_{RB}\}$ | | Any non-allocated (Note 2) |
| **IQ Image** | dB | -27.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power > 10 dBm | Image frequencies (Notes 2, 3) |
| | | -24.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power ≤ 10 dBm | |
| | | -24.2 | Image frequencies when carrier centre frequency ≥ 1 GHz | |
| **Carrier leakage** | dBc | -27.2 | Output power > 10 dBm and carrier centre frequency < 1 GHz | Carrier frequency (Notes 4, 5) |
| | | -24.2 | Output power > 10 dBm and carrier centre frequency ≥ 1 GHz | |
| | | -24.2 | 0 dBm ≤ Output power ≤10 dBm | |
| | | -19.2 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -9.2 | -40 dBm ≤ Output power < -30 dBm | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 29.2 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in Note 10.

NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.

NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.

NOTE 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.

NOTE 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.

NOTE 6: $L_{CRBs}$ is the Transmission Bandwidth (see Figure 5.4.2-1).

NOTE 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1).

NOTE 8: $EVM$ is the limit specified in Table 6.5.2.1.3-1 for the modulation format used in the allocated RBs.

NOTE 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

NOTE 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

## 6.5.2A.3.4 In-band emissions for non allocated RB for CA (3UL CA)

### 6.5.2A.3.4.1 Test Purpose

Same test purpose as in clause 6.5.2A.3.1.1.

### 6.5.2A.3.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band contiguous or inter-band or intra-band non-contiguous 3DL CA and 3UL CA.

### 6.5.2A.3.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2A.3.0.

6.5.2A.3.4.4 Test description

6.5.2A.3.4.4.1 Initial conditions

Same as in clause 6.5.2A.3.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands.
- Instead of Table 6.5.2A.3.1.4.1-1 → use Table 6.5.2A.3.4.4.1-1.
- Instead of clause 6.5.2A.3.1.4.3 → use clause 6.5.2A.3.4.4.3

**Table 6.5.2A.3.4.4.1-1: Test Configuration Table for intra-band contiguous CA**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | Low range, High range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **Config ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$ Note 1** | **SCCs $N_{RB}$ Note 1** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC1 & SCC2 RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 50 | 50 | N/A | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 2 | 50 | 50 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 3 | 50 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 4 | 50 | 25 | | QPSK | 8 | P_8@42 | S_0@0 | S_0@0 | - |
| 5 | 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 6 | 25 | 50 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 7 | 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 8 | 75 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 9 | 100 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 10 | 100 | 25 | | QPSK | 8 | P_8@92 | S_0@0 | S_0@0 | - |
| 11 | 25 | 100 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 12 | 25 | 100 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 13 | 100 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 14 | 100 | 50 | | QPSK | 12 | P_12@88 | S_0@0 | S_0@0 | - |
| 15 | 50 | 100 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 16 | 50 | 100 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 17 | 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 18 | 100 | 75 | | QPSK | 16 | P_16@84 | S_0@0 | S_0@0 | - |
| 19 | 75 | 100 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 20 | 75 | 100 | | QPSK | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 21 | 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 22 | 100 | 100 | | QPSK | 18 | P_18@82 | S_0@0 | S_0@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | | |

**Table 6.5.2A.3.4.4.1-1: Test Configuration Table for inter-band CA**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | Low range for PCC and SCC<br>High range for PCC and SCC | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **Config ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$ Note 1** | **SCCs $N_{RB}$ Note 1** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC1 & SCC2 RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 6 | 25 | N/A | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 2 | 6 | 25 | | QPSK | 1 | P_1@5 | S_0@0 | S_0@0 | - |
| 3 | 6 | 50 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 4 | 6 | 50 | | QPSK | 1 | P_1@5 | S_0@0 | S_0@0 | - |
| 5 | 15 | 25 | | QPSK | 4 | P_4@0 | S_0@0 | S_0@0 | - |
| 6 | 15 | 25 | | QPSK | 4 | P_4@11 | S_0@0 | S_0@0 | - |
| 7 | 25 | 6 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 8 | 25 | 6 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 9 | 25 | 15 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 10 | 25 | 15 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 11 | 25 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 12 | 25 | 25 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 13 | 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 14 | 25 | 50 | | QPSK | 8 | P_8@17 | S_0@0 | S_0@0 | - |
| 15 | 50 | 6 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 16 | 50 | 25 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 17 | 50 | 25 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 18 | 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 19 | 50 | 50 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 20 | 50 | 100 | | QPSK | 12 | P_12@0 | S_0@0 | S_0@0 | - |
| 21 | 50 | 100 | | QPSK | 12 | P_12@38 | S_0@0 | S_0@0 | - |
| 22 | 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 23 | 75 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 24 | 75 | 100 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 25 | 75 | 100 | | QPSK | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 26 | 100 | 50 | | QPSK | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 27 | 100 | 50 | | QPSK | 18 | P_18@82 | S_0@0 | S_0@0 | - |
| 28 | 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | S_0@0 | - |
| 29 | 100 | 75 | | QPSK | 16 | P_16@59 | S_0@0 | S_0@0 | - |
| 30 | 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | S_0@0 | - |
| 31 | 100 | 100 | | QPSK | 18 | P_18@82 | S_0@0 | S_0@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: The frequencies of PCC and SCC shall be switched and tested in each configuration. | | | | | | | | | |

**Table 6.5.2A.3.4.4.1-1: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Maximum Wgap |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

| Test Parameters for CA Configurations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ [MHz] | DL Allocation | | UL Allocation | | | | |
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | | CC MOD | PCC & SCC RB allocation | CC MOD | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | |
| Test Parameters for CA_XA-XA-XA Configurations | | | | | | | | | | |
| 1 | 25 | 25 | 35 | QPSK | N/A | QPSK | P_8@0 | QPSK | S_0@0 | S_0@0 |
| 2 | 25 | 25 | 35 | QPSK | | QPSK | P_8@17 | QPSK | S_0@0 | S_0@0 |
| 3 | 50 | 50 | 25 | QPSK | | QPSK | P_12@0 | QPSK | S_0@0 | S_0@0 |
| 4 | 50 | 50 | 25 | QPSK | | QPSK | P_12@38 | QPSK | S_0@0 | S_0@0 |
| 5 | 75 | 75 | 15 | QPSK | | QPSK | P_16@0 | QPSK | S_0@0 | S_0@0 |
| 6 | 75 | 75 | 15 | QPSK | | QPSK | P_16@59 | QPSK | S_0@0 | S_0@0 |
| 7 | 100 | 100 | 5 | QPSK | | QPSK | P_18@0 | QPSK | S_0@0 | S_0@0 |
| 8 | 100 | 100 | 5 | QPSK | | QPSK | P_18@82 | QPSK | S_0@0 | S_0@0 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.
Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.

### 6.5.2A.3.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.5.2A.3.4.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2A.3.4.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency $f \leq 3.0$GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz $< f \leq$ 4.2GHz.
6. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

7. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

8. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

9. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

10. Measure carrier leakage on PCC using Global In-Channel Tx-Test (Annex E). For TDD slots with transient periods are not under test.

#### 6.5.2A.3.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

#### 6.5.2A.3.4.5 Test requirement

Each of the 20 In-band emissions results, derived in Annex E.4.3 shall not exceed the corresponding values in Table 6.5.2A.3.4.5-1.

**Table 6.5.2A.3.4.5-1: Test requirements for in-band emissions (allocated component carrier) – intra-band contiguous CA**

| Parameter description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs},$ $-57\ dBm\ /180\ kHz - P_{RB}\}$ +0.8 | | Any non-allocated (Note 2) |
| **IQ Image** | dB | -24.2 | | Image frequencies (Notes 2, 3) |
| **Carrier leakage** | dBc | -24.2 | Output power<br>f ≤ 3.0GHz: 3.2dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | Carrier frequency (Notes 4, 5) |
| | | -19.2 | Output power<br>f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | |
| | | -9.2 | Output power<br>f ≤ 3.0GHz: -36.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -36.5 dBm ±3.5dB | |

Note 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the test requirement is calculated as the higher of $P_{RB} - 29.2$ dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in Note 10.

Note 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.

Note 3: The applicable frequencies for this limit are not known due to unknown LO frequency. See Note 3 in Table 6.5.2A.3.0-1.

Note 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.

Note 5: The applicable frequencies for this limit are not known due to unknown LO frequency. See Note 4 in Table 6.5.2A.3.0-1.

Note 6: $L_{CRB}$ is the Transmission Bandwidth (see Figure 5.4.2-1).

Note 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1) of the component carrier with RBs allocated.

Note 8: $EVM$ is the limit specified in Table 6.5.2.1.3-1 for the modulation format used in the allocated RBs.

Note 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth).

Note 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

**Table 6.5.2A.3.4.5-2: Test requirements for in-band emissions (not allocated component carrier) – intra-band contiguous CA**

| Para-meter | Unit | Meas BW Note 1 | Limit | | remark | Applicable Frequencies |
|---|---|---|---|---|---|---|
| General | dB | BW of 1 RB (180KHz rectangular) | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs}$ $-57\ dBm\ /180\ kHz - P_{RB}\}$ | | The reference value is the average power per allocated RB in the allocated component carrier | Any RB in the non allocated component carrier. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| IQ Image | dB | BW of 1 RB (180KHz rectangular) | -24.2 Note 2 | | The reference value is the average power per allocated RB in the allocated component carrier | The frequencies of the $L_{CRB}$ contiguous non-allocated RBs are unknown. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| Carrier leakage | dBc | BW of 1 RB (180KHz rectangular) | Note 3 | | The reference value is the total power of the allocated RBs in the allocated component carrier | The frequencies of the up to 2 non-allocated RBs are unknown. The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| | | | -24.2 | Output power > 0 dBm | | |
| | | | -19.2 | -30 dBm ≤ Output power ≤ 0 dBm | | |
| | | | -9.2 | -40 dBm ≤ Output power < -30 dBm | | |

Note1: Resolution BWs smaller than the measurement BW may be integrated to achieve the measurement bandwidth.

Note 2: Exceptions to the general limit are allowed for up to $L_{CRB}$ +1 RBs within a contiguous width of $L_{CRB}$ +1 non-allocated RBs.

Note 3: Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs.

Note 4: Note s1, 6, 7, 8, 9, 10 from Table 6.5.2A.3.0-1 apply for Table 6.5.2A.3.0-2 as well.

Note 5: $\Delta_{RB}$ for measured non-allocated RB in the non allocated component carrier may take non-integer values when the carrier spacing between the CCs is not a multiple of RB.

**Table 6.5.2A.3.4.5-3: Test requirements for in-band emissions – inter-band CA**

| Parameter description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| **General** | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs}$, +0.8 $-57\ dBm\ /180\ kHz - P_{RB}\}$ | | Any non-allocated (Note 2) |
| **IQ Image** | dB | -27.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power > 10 dBm | Image frequencies (Notes 2, 3) |
| | | -24.2 | Image frequencies when carrier centre frequency < 1 GHz and Output power ≤ 10 dBm | |
| | | -24.2 | Image frequencies when carrier centre frequency ≥ 1 GHz | |
| **Carrier leakage** | dBc | -27.2 | Output power > 10 dBm and carrier centre frequency < 1 GHz | Carrier frequency (Notes 4, 5) |
| | | -24.2 | Output power > 10 dBm and carrier centre frequency ≥ 1 GHz | |
| | | -24.2 | 0 dBm ≤ Output power ≤10 dBm | |
| | | -19.2 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -9.2 | -40 dBm ≤ Output power < -30 dBm | |

NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 29.2 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in Note 10.

NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.

NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.

NOTE 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.

NOTE 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.

NOTE 6: $L_{CRBs}$ is the Transmission Bandwidth (see Figure 5.4.2-1).

NOTE 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1).

NOTE 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

NOTE 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

NOTE 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

# 6.5.2B Transmit modulation for UL- MIMO

## 6.5.2B.1 Error Vector Magnitude (EVM) for UL- MIMO

### 6.5.2B.1.1 Test Purpose

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Before calculating the EVM the measured waveform is corrected by the sample timing offset and RF frequency offset. Then the carrier leakage shall be removed from the measured waveform before calculating the EVM.

The measured waveform is further modified by selecting the absolute phase and absolute amplitude of the Tx chain. The EVM result is defined after the front-end IDFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %.

When the PUSCH or PUCCH transmission slot is shortened due to multiplexing with SRS, the EVM measurement interval is reduced by one symbol, accordingly. The PUSCH or PUCCH EVM measurement interval is also reduced

when the mean power, modulation or allocation between slots is expected to change. In the case of PUSCH transmission, the measurement interval is reduced by a time interval equal to the sum of 5 μs and the applicable exclusion period defined in subclause 6.3.4, adjacent to the boundary where the power change is expected to occur. The PUSCH exclusion period is applied to the signal obtained after the front-end IDFT. In the case of PUCCH transmission, the PUCCH EVM measurement interval is reduced by one symbol adjacent to the slot boundary.

### 6.5.2B.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

### 6.5.2B.1.3 Minimum conformance requirements

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the Error Vector Magnitude requirements specified in Table 6.5.2.1.1-1 which is defined in sub-clause 6.5.2.1 apply to each transmit antenna connector with the UL-MIMO configurations specified in Table 6.2.2B-2.

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2B.1.1.

### 6.5.2B.1.4 Test description

#### 6.5.2B.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2B.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2B.1.4.1-1: Test Configuration Table for PUSCH**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | NC | | |
| Test Frequencies<br>**(as specified in TS36.508 [7] subclause 4.3.1)** | | See Table 6.5.1.4.1-1 | | |
| Test Channel Bandwidths<br>**(as specified in TS 36.508 [7] subclause 4.3.1)** | | See Table 6.5.1.4.1-1 | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for PUSCH EVM testing | Mod'n | RB allocation | |
| | | | FDD | TDD |

| | | | | |
|---|---|---|---|---|
| 1.4MHz | | QPSK | 6 | 6 |
| 1.4MHz | | QPSK | 1 | 1 |
| 1.4MHz | | 16QAM | 6 | 6 |
| 1.4MHz | | 16QAM | 1 | 1 |
| 3MHz | | QPSK | 15 | 15 |
| 3MHz | | QPSK | 4 | 4 |
| 3MHz | | 16QAM | 15 | 15 |
| 3MHz | | 16QAM | 4 | 4 |
| 5MHz | | QPSK | 25 | 25 |
| 5MHz | | QPSK | 8 | 8 |
| 5MHz | | 16QAM | 25 | 25 |
| 5MHz | | 16QAM | 8 | 8 |
| 10MHz | | QPSK | 50 | 50 |
| 10MHz | | QPSK | 12 | 12 |
| 10MHz | | 16QAM | 50 (Note 3) | 50 (Note 3) |
| 10MHz | | 16QAM | 12 | 12 |
| 15MHz | | QPSK | 75 | 75 |
| 15MHz | | QPSK | 16 | 16 |
| 15MHz | | 16QAM | 75 (Note 3) | 75 (Note 3) |
| 15MHz | | 16QAM | 16 | 16 |
| 20MHz | | QPSK | 100 | 100 |
| 20MHz | | QPSK | 18 | 18 |
| 20MHz | | 16QAM | 100 (Note 3) | 100 (Note 3) |
| 20MHz | | 16QAM | 18 | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: For partial RB allocation, the $RB_{start}$ shall be RB #0 and RB# (max+1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories [FFS].

**Table 6.5.2B.1.4.1-2: Test Configuration Table for PUCCH**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | |
| Test Frequencies as specified in **TS36.508 [7] subclause 4.3.1** | | | See Table 6.5.1.4.1-1 | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | | | See Table 6.5.1.4.1-1 | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** |
| Ch BW | Mod'n | RB allocation | | FDD: PUCCH format = Format 1a<br>TDD: PUCCH format = Format 1a / 1b |
| | | FDD | TDD | |
| 1.4MHz | QPSK | 3 | 3 | |
| 3MHz | QPSK | 4 | 4 | |
| 5MHz | QPSK | 8 | 8 | |
| 10MHz | QPSK | 16 | 16 | |
| 15MHz | QPSK | 25 | 25 | |
| 20MHz | QPSK | 30 | 30 | |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to in Table 6.5.2B.1.4.1-1.

5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2B.1.4.3.

#### 6.5.2B.1.4.2 Test procedure

Test procedure for PUSCH:

1.1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.5.2B.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

1.2 Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX\ level}$.

1.3 Measure the EVM and $\overline{EVM}_{DMRS}$ using Global In-Channel Tx-Test (Annex E) for each of transmit antenna of the UE.

1.4 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is –36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.5 Measure the EVM and $\overline{EVM}_{DMRS}$ using Global In-Channel Tx-Test (Annex E) for each of transmit antenna of the UE.

Test procedure for PUCCH:

2.1 PUCCH is set according to Table 6.5.2B.1.4.1-2.

2.2 SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.5.2B.1.4.1-2. The SS sends downlink MAC padding bits on the DL RMC. The transmission of PDSCH will make the UE send uplink ACK/NACK using PUCCH. There is no PUSCH transmission.

2.3 SS send appropriate TPC commands for PUCCH to the UE until the UE transmit PUCCH at $P_{UMAX}$ level.

2.4 Measure PUCCH EVM using Global In-Channel Tx-Test (Annex E) for each of transmit antenna of the UE.

2.5 Send the appropriate TPC commands for PUCCH to the UE until the UE transmits PUCCH at -36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.6 Measure PUCCH EVM using Global In-Channel Tx-Test (Annex E) for each of transmit antenna of the UE.

#### 6.5.2B.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 6.5.2B.1.4.3-1: PUCCH-ConfigDedicated-v1020-DEFAULT**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-9A: PUCCH-ConfigDedicated-v1020-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-v1020 ::= SEQUENCE { | | | |
| twoAntennaPortActivatedPUCCH-Format1a1b-r10 | true | | |
| } | | | |

### 6.5.2B.1.5 Test requirement

The requirements apply to each transmit antenna connector.

The PUSCH EVM derived in E.4.2 shall not exceed 17.5 % for QPSK and BPSK, 12.5% for 16 QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in E.4.6.2 shall not exceed [17.5 %] when embedded with data symbols of QPSK and BPSK, [12,5%] for 16 QAM.

The PUCCH EVM and derived in E.5.9.2 shall not exceed 17.5 %.

## 6.5.2B.2 Carrier leakage for UL-MIMO

### 6.5.2B.2.1 Test Purpose

The purpose of this test is to exercise the transmitter of UE that support UL-MIMO to verify its modulation quality in terms of carrier leakage for UL-MIMO.

### 6.5.2B.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

### 6.5.2B.2.3 Minimum conformance requirements

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the Relative Carrier Leakage Power requirements specified in Table 6.5.2.2.3-1 which is defined in subclause 6.5.2.2 apply to each transmit antenna connector with the UL-MIMO configurations specified in Table 6.2.2B.3-2.

The normative reference for this requirement is TS 36.101 clause 6.5.2B.2

### 6.5.2B.2.4 Test description

#### 6.5.2B.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.2B.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2.2B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | See Table 6.5.1.4.1-1 | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for carrier leakage testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 1 | 1 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |
| Note 2: For partial RB allocation, the $RB_{start}$ shall be RB #0 and RB# (max +1- RB allocation) of the channel bandwidth. | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to in Table 6.5.2B.2.4.1-1.

5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2B.2.4.3.

#### 6.5.2B.2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.5.2B.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC

2. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

3. Measure carrier leakage using Global In-Channel Tx-Test (Annex E) for each of transmit antenna of the UE. For TDD slots with transient periods are not under test.

4. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

5. Measure carrier leakage using Global In-Channel Tx-Test (Annex E) for each of transmit antenna of the UE. For TDD slots with transient periods are not under test.

6. Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -36.8dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

7. Measure carrier leakage using Global In-Channel Tx-Test (Annex E) for each of transmit antenna of the UE. For TDD slots with transient periods are not under test

#### 6.5.2B.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 6.5.2B.2.5 Test requirement

The requirements apply to each transmit antenna connector.

Each of the 20 carrier leakage results, derived in Annex E.3.1, shall not exceed the values in table 6.5.2B.2.5-1

**Table 6.5.2B.2.5-1: Test requirements for Relative Carrier Leakage Power**

| LO Leakage | Parameters | Relative Limit (dBc) |
|---|---|---|
| | f ≤ 3.0GHz: 3.2 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: 3.5 dBm ±3.5dB | 24.2 |
| | f ≤ 3.0GHz: -26.8 dBm ±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -26.5 dBm ±3.5dB | 19.2 |
| | f ≤ 3.0GHz: -36.8dBm±3.2dB<br>3.0GHz < f ≤ 4.2GHz: -36.5 dBm ±3.5dB | 9.2 |

## 6.5.2B.3 In-band emissions for non allocated RB for UL-MIMO

### 6.5.2B.3.1 Test Purpose

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks.

The in-band emission is defined as the average across 12 sub-carrier and as a function of the RB offset from the edge of the allocated UL transmission bandwidth. The in-band emission for UL-MIMO is measured as the ratio of the output power of UE that support UL-MIMO in a non–allocated RB to the output power of UE that support UL-MIMO in an allocated RB. The basic in-band emissions measurement interval is defined over one slot in the time domain. When the PUSCH or PUCCH transmission slot is shortened due to multiplexing with SRS, the in-band emissions measurement interval is reduced by one SC-FDMA symbol, accordingly.

### 6.5.2B.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

### 6.5.2B.3.3 Minimum conformance requirements

The relative in-band emission shall not exceed the values specified in Table 6.5.2B.3.3-1.

**Table 6.5.2B.3.3-1: Minimum requirements for in-band emissions**

| Parameter Description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| General | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs},$ $-57\ dBm/180\ kHz - P_{RB}\}$ | | Any non-allocated (Note 2) |
| IQ Image | dB | -25 | | Image frequencies (Notes 2, 3) |
| Carrier leakage | dBc | -25 | Output power > 0 dBm | LO frequency (Notes 4, 5) |
| | | -20 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -10 | -40 dBm ≤ Output power < -30 dBm | |

Note 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in Note 10.

Note 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.

Note 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.

Note 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.

Note 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.

Note 6: $L_{CRBs}$ is the Transmission Bandwidth (see Figure 5.4.2-1).

Note 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1).

Note 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

Note 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

Note 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2B.3.

The in-band emission is defined as the average across 12 sub-carrier and as a function of the RB offset from the edge of the allocated UL transmission bandwidth. The in-band emission is measured as the ratio of the UE output power in a non–allocated RB to the UE output power in an allocated RB. The basic in-band emissions measurement interval is defined over one slot in the time domain.

### 6.5.2B.3.4 Test description

#### 6.5.2B.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2B.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2B.3.4.1-1: Test Configuration Table for PUSCH**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | See Table 6.5.1.4.1-1 | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for in-band emissions testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 1 | 1 |
| 3MHz | | QPSK | 4 | 4 |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |
| Note 2: For partial RB allocation, the starting resource block shall be RB #0 and RB# (max+1 - RB allocation) of the channel bandwidth. | | | | |

**Table 6.5.2B.3.4.1-2: Test Configuration Table for PUCCH**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | See Table 6.5.1.4.1-1 | | | |
| Test Frequencies as specified in **TS36.508 [7] subclause 4.3.1** | See Table 6.5.1.4.1-1 | | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | See Table 6.5.1.4.1-1 | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** |
| Ch BW | Mod'n | RB allocation | | FDD: PUCCH format = Format 1a<br>TDD: PUCCH format = Format 1a / 1b |
| | | FDD | TDD | |
| 1.4MHz | QPSK | 3 | 3 | |
| 3MHz | QPSK | 4 | 4 | |
| 5MHz | QPSK | 8 | 8 | |
| 10MHz | QPSK | 16 | 16 | |
| 15MHz | QPSK | 25 | 25 | |
| 20MHz | QPSK | 30 | 30 | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to in Table 6.5.2B.3.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2B.3.4.3.

### 6.5.2B.3.4.2 Test procedure

Test procedure for PUSCH:

1.1 SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.5.2B.3.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

1.2 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.3 Measure In-band emission using Global In-Channel Tx-Test (Annex E) for each of transmit antennas of the UE.

1.4 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1.5 Measure In-band emission using Global In-Channel Tx-Test (Annex E) for each of transmit antennas of the UE. For TDD slots with transient periods are not under test.

1.6 Send the appropriate TPC commands in the uplink scheduling information to the UE until UE output power is to -36.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

1,7 Measure In-band emission using Global In-Channel Tx-Test (Annex E) for each of transmit antennas of the UE. For TDD slots with transient periods are not under test.

Test procedure for PUCCH:

2.1 PUCCH is set according to Table 6.5.2B.3.4.1-2. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.5.2B.3.4.1-2. The SS sends downlink MAC padding bits on the DL RMC. The transmission of PDSCH will make the UE send uplink ACK/NACK using PUCCH.

2.2 Send the appropriate TPC commands in the uplink scheduling information for PUCCH to the UE until UE output power is 3.2 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or 3.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.3 Measure In-band emission using Global In-Channel Tx-Test (Annex E) for each of transmit antennas of the UE.

2.4 Send the appropriate TPC commands for PUCCH in the uplink scheduling information to the UE until UE output power is -26.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -26.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.5 Measure In-band emission using Global In-Channel Tx-Test (Annex E) for each of transmit antennas of the UE.

2.6 Send the appropriate TPC commands for PUCCH in the uplink scheduling information to the UE until UE output power is to -36.8 dBm ±3.2dB for carrier frequency f ≤ 3.0GHz or -36.5dBm ±3.5 dB for carrier frequency 3.0GHz < f ≤ 4.2GHz.

2.7 Measure In-band emission using Global In-Channel Tx-Test (Annex E) for each of transmit antennas of the UE.

#### 6.5.2B.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 6.5.2B.3.4.3-1: PUCCH-ConfigDedicated-v1020-DEFAULT**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-9A: PUCCH-ConfigDedicated-v1020-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-v1020 ::= SEQUENCE { | | | |
| twoAntennaPortActivatedPUCCH-Format1a1b-r10 | true | | |
| } | | | |

### 6.5.2B.3.5 Test requirement

The requirements apply to each transmit antenna connector.

Each of the 20 In-band emissions results, derived in Annex E.4.3 shall not exceed the corresponding values in Table 6.5.2B.3.5-1.

**Table 6.5.2B.3.5-1: Test requirements for in-band emissions**

| Parameter Description | Unit | Limit (Note 1) | | Applicable Frequencies |
|---|---|---|---|---|
| General | dB | $\max\{ -25 - 10 \cdot \log_{10}(N_{RB} / L_{CRBs}),$ $20 \cdot \log_{10} EVM - 3 - 5 \cdot (\lvert\Delta_{RB}\rvert - 1) / L_{CRBs}$, $-57\ dBm\ /180\ kHz - P_{RB}\}$ | +0.8 | Any non-allocated (Note 2) |
| IQ Image | dB | -24.2 | | Image frequencies (Notes 2, 3) |
| Carrier leakage | dBc | -24.2 | Output power > 0 dBm | LO frequency (Notes 4, 5) |
| | | -19.2 | -30 dBm ≤ Output power ≤ 0 dBm | |
| | | -9.2 | -40 dBm ≤ Output power < -30 dBm | |

Note 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 29.2 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $P_{RB}$ is defined in Note 10.

Note 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.

Note 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.

Note 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.

Note 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if $N_{RB}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{RB}$ is even, but excluding any allocated RB.

Note 6: $L_{CRBs}$ is the Transmission Bandwidth (see Figure 5.4.2-1).

Note 7: $N_{RB}$ is the Transmission Bandwidth Configuration (see Figure 5.4.2-1).

Note 8: $EVM$ is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.

Note 9: $\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth.

Note 10: $P_{RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

## 6.5.2B.4 EVM equalizer spectrum flatness for UL-MIMO

### 6.5.2B.4.1 Test Purpose

The zero-forcing equalizer correction applied in the EVM measurement process (as described in Annex E) must meet a spectrum flatness requirement for the EVM measurement to be valid. The EVM equalizer spectrum flatness is defined in terms of the maximum peak-to-peak ripple of the equalizer coefficients (dB) across the allocated uplink block variation in dB of the equalizer coefficients generated by the EVM measurement process. The EVM equalizer spectrum flatness requirement does not limit the correction applied to the signal in the EVM measurement process but for the EVM result to be valid, the equalizer correction that was applied must meet the EVM equalizer spectrum flatness minimum requirements. The basic measurement interval is the same as for EVM.

### 6.5.2B.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

### 6.5.2B.4.3 Minimum conformance requirements

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the EVM Equalizer Spectrum Flatness requirements specified in Table 6.5.2B.4.3-1 and Table 6.5.2B.4.3-2 which are defined in sub-clause 6.5.2B.4 apply to each transmit antenna connector with the UL-MIMO configurations specified in Table 6.2.2B.3-2.

The normative reference for this requirement is TS 36.101 clause 6.5.2B.4.

### 6.5.2B.4.4 Test description

#### 6.5.2B.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2B.4.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.5.2B.4.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | See Table 6.5.1.4.1-1 | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | See Table 6.5.1.4.1-1 | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for EVM equalizer spectrum flatness testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 50 | 50 |
| 15MHz | | QPSK | 75 | 75 |
| 20MHz | | QPSK | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to in Table 6.5.2B.4.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.5.2B.4.4.3.

#### 6.5.2B.4.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.5.2B.4.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure spectrum flatness using Global In-Channel Tx-Test (Annex E) for each of transmit antennas of the UE. For TDD slots with transient periods are not under test.

#### 6.5.2B.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 6.5.2B.4.5 Test requirement

The requirements apply to each transmit antenna connector.

Each of the 20 spectrum flatness functions, shall derive four ripple results in Annex E.4.4, The derived results shall not exceed the values in Figure 6.5.2B.4.5-1:

For normal conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2B.4.5-1 and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 6.4 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 8.4 dB (see Figure 6.5.2B.4.5-1).

For extreme conditions, the maximum ripple in Range 1 and Range 2 shall not exceed the values specified in Table 6.5.2B.4.5-2 and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 7.4 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 11.4 dB (see Figure 6.5.2B.4.5-1).

**Table 6.5.2B.4.5-1: Test requirements for EVM equalizer spectrum flatness (normal conditions)**

| Frequency Range | Maximum Ripple [dB] |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 3$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 3$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 3$ MHz or $F_{UL_High} - F_{UL_Meas} < 3$ MHz (Range 2) | 9.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

**Table 6.5.2B.4.5-2: Test requirements for spectrum flatness (extreme conditions)**

| | |
|---|---|
| $F_{UL_Meas} - F_{UL_Low} \geq 5$ MHz and $F_{UL_High} - F_{UL_Meas} \geq 5$ MHz (Range 1) | 5.4 (p-p) |
| $F_{UL_Meas} - F_{UL_Low} < 5$ MHz or $F_{UL_High} - F_{UL_Meas} < 5$ MHz (Range 2) | 13.4 (p-p) |
| Note 1: $F_{UL_Meas}$ refers to the sub-carrier frequency for which the equalizer coefficient is evaluated<br>Note 2: $F_{UL_Low}$ and $F_{UL_High}$ refer to each E-UTRA frequency band specified in Table 5.2-1 | |

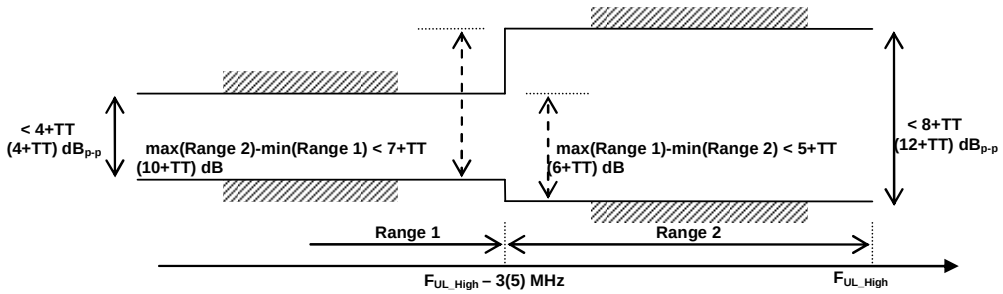



**Figure 6.5.2B.4.5-1: The limits for EVM equalizer spectrum flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement within brackets)**

# 6.6 Output RF spectrum emissions

Unwanted emissions are divided into "Out-of-band emission" and "Spurious emissions" in 3GPP RF specifications. This notation is in line with ITU-R recommendations such as SM.329 [2] and the Radio Regulations [3].

ITU defines:

Out-of-band emission = Emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions.

Spurious emission = Emission on a frequency, or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out-of-band emissions.

Unwanted emissions = Consist of spurious emissions and out-of-band emissions.

The UE transmitter spectrum emission consists of the three components; the occupied bandwidth (channel bandwidth), the Out Of Band (OOB) emissions and the far out spurious emission domain.

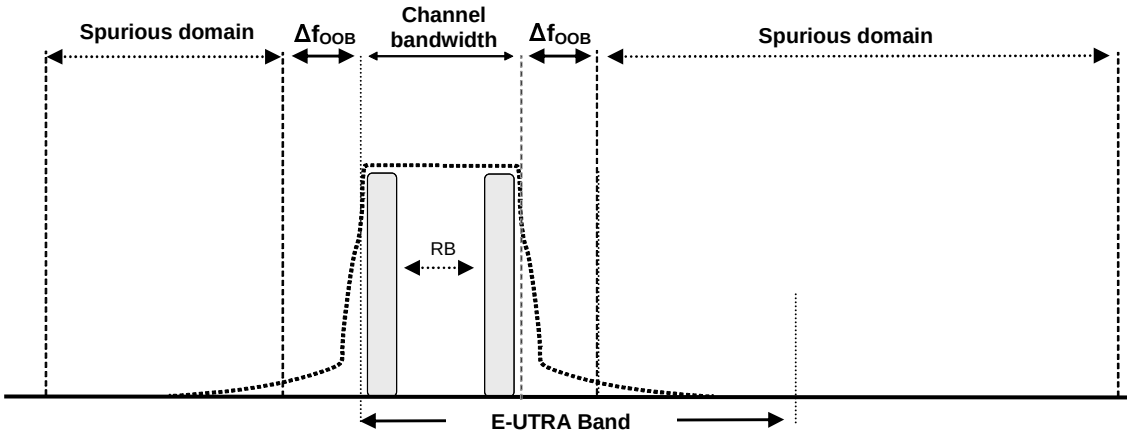



**Figure 6.6-1: Transmitter RF spectrum**

## 6.6.1 Occupied bandwidth

### 6.6.1.1 Test purpose

To verify that the UE occupied bandwidth for all transmission bandwidth configurations supported by the UE are less than their specific limits

### 6.6.1.2 Test applicability

This test applies to all types of E-UTRA UE release 8 and forward.

### 6.6.1.2 Minimum conformance requirements

Occupied bandwidth is a measure of the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel. The occupied channel bandwidth for all transmission bandwidth configurations (Resources Blocks) should be less than the channel bandwidth specified in Table 6.6.1.2-1

**Table 6.6.1.2-1: Occupied channel bandwidth**

| | Occupied channel bandwidth / channel bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |

| Channel bandwidth [MHz] | 1.4 | 3 | 5 | 10 | 15 | 20 |
|---|---|---|---|---|---|---|

The normative reference for this requirement is TS 36.101 [2] clause 6.6.1.

## 6.6.1.4 Test description

### 6.6.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | |
| Test Frequencies as specified in **TS36.508 [7] subclause 4.3.1** | Mid range | | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | All | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Occupied bandwidth | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 50 | 50 |
| 15MHz | | QPSK | 75 | 75 |
| 20MHz | | QPSK | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.1.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.1.4.3

### 6.6.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Send continuously power control "up" commands to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the power spectrum distribution within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is one active uplink subframe. For TDD slots with transient periods are not under test.

4. Calculate the total power within the range of all frequencies measured in '3)' and save this value as "Total Power".

5. Sum up the power upward from the lower boundary of the measured frequency range in '3)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Lower Frequency".

6. Sum up the power downward from the upper boundary of the measured frequency range in '3)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Upper Frequency".

7. Calculate the difference ("Upper Frequency" – "Lower Frequency" = "Occupied Bandwidth") between two limit frequencies obtained in '5)' and '6)'.

#### 6.6.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6

### 6.6.1.5 Test requirement

The measured Occupied Bandwidth shall not exceed values in Table 6.6.1.5-1.

**Table 6.6.1.5-1: Occupied channel bandwidth**

| | **Occupied channel bandwidth / channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **Channel bandwidth [MHz]** | 1.4 | 3 | 5 | 10 | 15 | 20 |

## 6.6.1A Occupied bandwidth for CA

### 6.6.1A.0 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands the occupied bandwidth is defined per component carrier. Occupied bandwidth is the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on assigned channel bandwidth on the component carrier. The occupied bandwidth shall be less than the channel bandwidth specified in Table 6.6.1.2-1.

For intra-band contiguous carrier aggregation the occupied bandwidth is a measure of the bandwidth containing 99 % of the total integrated power of the transmitted spectrum. The OBW shall be less than the aggregated channel bandwidth defined in subclause 5.4.2A.

For intra-band non-contiguous carrier aggregation sub-block occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the sub-block. In case the sub-block consists of one component carrier the occupied bandwidth of the sub-block shall be less than the channel bandwidth specified in Table 6.6.1.2-1.

The normative reference for this requirement is TS 36.101[2] clause 6.6.1A.

### 6.6.1A.1 Occupied bandwidth for CA (intra-band contiguous DL CA and UL CA)

#### 6.6.1A.1.1 Test purpose

To verify that the UE occupied bandwidth for intra-band contiguous CA for all transmission bandwidth configurations supported by the UE are less than their specific limits

### 6.6.1A.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 6.6.1A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.1A.0.

### 6.6.1A.1.4 Test description

#### 6.6.1A.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA configuration, and are shown in table 6.6.1A.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.1A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | Mid range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | All | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 50 | N/A for this test | QPSK | 75 | P_25@0 | P_50@0 | | |
| 25 | 100 | | QPSK | 125 | P_25@0 | S_100@0 | - | - |
| 50 | 50 | | QPSK | 100 | P_50@0 | P_50@0 | | |
| 50 | 75 | | QPSK | 125 | P_50@0 | S_75@0 | - | - |
| 50 | 100 | | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 75 | 50 | | QPSK | 125 | P_75@0 | S_50@0 | - | - |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 75 | 100 | | QPSK | 175 | P_75@0 | S_100@0 | - | - |
| 100 | 25 | | QPSK | 125 | P_100@0 | S_25@0 | - | - |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.6.1A.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.1A.1.4.3.

### 6.6.1A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.1A.1.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.1A.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands to the UE until the UE transmits at $P_{UMAX}$ level.
6. Measure the power spectrum distribution over all component carriers within two times or more range over the requirement for Occupied Bandwidth for CA specification centring on the current carrier frequency in CA configuration. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is one active uplink subframe. For TDD slots with transient periods are not under test.
7. Calculate the total power for the total integrated power of the transmitted spectrum within the range of all frequencies measured in '6)' and save this values as "Total Power".
8. Sum up the power upward from the lower boundary of the measured frequency range in '6)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Lower Frequency".
9. Sum up the power downward from the upper boundary of the measured frequency range in '6)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Upper Frequency".
10. Calculate the difference ("Upper Frequency" – "Lower Frequency" = "Occupied Bandwidth") between two limit frequencies obtained in '8)' and '9)'.

#### 6.6.1A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.1A.1.5 Test Requirements

The measured Occupied Bandwidth shall not exceed values of aggregated channel bandwidth as defined in section 5.4.2A for intra-band contiguous carrier aggregation.

## 6.6.1A.2 Occupied bandwidth for CA (inter-band DL CA and UL CA)

Editor's note: This test case is not complete for UL LAA. Following aspects are either missing or not yet determined:

- UL RMC is missing in Annex A.

### 6.6.1A.2.1 Test purpose

To verify that the UE occupied bandwidth for inter-band CA for all transmission bandwidth configurations supported by the UE are less than their specific limits

### 6.6.1A.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support inter-band CA and UL CA.

The requirements also apply to all types of E-UTRA UE release 14 and forward that support uplink LAA.

### 6.6.1A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.1A.0.

### 6.6.1A.2.4 Test description

#### 6.6.1A.2.4.1 Initial condition

Same as in clause 6.6.1A.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands.
- Instead of Table 6.6.1A.1.4.1-1 → use Table 6.6.1A.2.4.1-1 or Table 6.6.1A.2.4.1-2.
- Instead of clause 6.6.1A.1.4.3 use clause 6.6.1A.2.4.3.

**Table 6.6.1A.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | Mid range for PCC and SCC | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/Afor this test | QPSK | 31 | P_6@0 | S_25@0 | - | - |
| 6 | 50 | | QPSK | 56 | P_6@0 | S_50@0 | - | - |
| 15 | 25 | | QPSK | 40 | P_15@0 | S_25@0 | - | - |
| 25 | 6 | | QPSK | | S_25@0 | P_6@0 | | |
| 25 | 25 | | QPSK | 50 | P_25@0 | S_25@0 | - | - |
| 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | - | - |
| 25 | 75 | | QPSK | | S_25@0 | P_75@0 | | |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | - | - |
| 50 | 100 | | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 75 | 25 | | QPSK | 100 | P_75@0 | S_25@0 | - | - |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 75 | 100 | | QPSK | 175 | P_75@0 | S_100@0 | - | - |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | |

**Table 6.6.1A.2.4.1-2: Test Configuration Table for UL LAA**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | Mid range for PCC and SCC | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 15 | 100 | | QPSK | 115 | P_15@0 | S_100@0 | - | - |
| 25 | 100 | | QPSK | 125 | P_25@0 | S_100@0 | - | - |
| 50 | 100 | | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each LAA CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | |

### 6.6.1A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.1A.2.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 (or DCI format 0A for SCC in the case of uplink LAA) for C_RNTI to schedule the UL RMC according to Table 6.6.1A.2.4.1-1 or Table 6.6.1A.2.4.1-2 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands to the UE until the UE transmits at $P_{UMAX}$ level.
6. Measure the power spectrum distribution of both PCC and SCC within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequencies respectively. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is one active uplink subframe. For TDD slots with transient periods are not under test.
7. Calculate the total power for the total integrated power of the transmitted spectrum within the range of all frequencies measured in '6)' and save this values as "Total Power" for both PCC and SCC.
8. Sum up the power upward from the lower boundary of the measured frequency range in '6)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Lower Frequency" for both PCC and SCC.
9. Sum up the power downward from the upper boundary of the measured frequency range in '3)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Upper Frequency" for both PCC and SCC.

10. Calculate the difference ("Upper Frequency" – "Lower Frequency" = "Occupied Bandwidth") between two limit frequencies obtained in '8)' and '9)' for both PCC and SCC.

#### 6.6.1A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.1A.2.5 Test Requirements

The measured Occupied Bandwidth for each component carrier shall not exceed values in Table 6.6.1A.2.5-1.

**Table 6.6.1A.2.5-1: Occupied channel bandwidth**

| | Occupied channel bandwidth / channel bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **Channel bandwidth [MHz]** | 1.4 | 3 | 5 | 10 | 15 | 20 |

## 6.6.1A.3 Occupied bandwidth for CA (intra-band non-contiguous DL CA and UL CA)

### 6.6.1A.3.1 Test purpose

To verify that the UE occupied bandwidth for intra-band non-contiguous CA for all transmission bandwidth configurations supported by the UE are less than their specific limits

### 6.6.1A.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

### 6.6.1A.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.1A.0.

### 6.6.1A.3.4 Test description

#### 6.6.1A.3.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each CA configuration, and are shown in table 6.6.1A.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.1A.3.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: Low Wgap, Maximum Wgap |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test points<br>All PCC $N_{RB}$ = SCC $N_{RB}$ test points |

| Test Parameters for CA Configurations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | |
| 1 | 25 | 25 | 5 | NA | QPSK | P_25@0 | QPSK | S_25@0 |
| 2 | 50 | 50 | 25 | | QPSK | P_50@0 | QPSK | S_50@0 |
| 3 | 75 | 75 | 15 | | QPSK | P_75@0 | QPSK | S_100@0 |
| 4 | 100 | 100 | 5 | | QPSK | P_100@0 | QPSK | S_100@0 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.
Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.6.1A.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.1A.3.4.3.

### 6.6.1A.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels except PHICH.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.1A.3.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.1A.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the power spectrum distribution of each sub-block over all component carriers within the requirement for Occupied Bandwidth for CA specification + 5MHz, centring on the carrier frequency of each sub-block in CA configuration. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is one active uplink subframe. For TDD slots with transient periods are not under test.

7. Calculate the total power for the total integrated power of the transmitted spectrum within the range of all frequencies measured for each sub-block in '6)' and save this values as "Total Power".

8. Sum up the power upward from the lower boundary of the measured frequency range in '3)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Lower Frequency".

9. Sum up the power downward from the upper boundary of the measured frequency range in '3)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Upper Frequency".

10. Calculate the difference ("Upper Frequency" – "Lower Frequency" = "Occupied Bandwidth") between two limit frequencies obtained in '8)' and '9')' for each sub-block.

#### 6.6.1A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.1A.3.5 Test Requirements

The measured Occupied Bandwidth shall not exceed values of channel bandwidth as defined in section 5.4.2A for intra-band non-contiguous carrier aggregation.

## 6.6.1A.4 Occupied bandwidth for CA (3DL CA and 3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Table 6.6.1A.4.4.1-1 needs to be updated for Inter-band contiguous CA and Intra-band contiguous CA configuration. This issue is under investigation.

-The test applicability needs to be added to TS36.521-2

### 6.6.1A.4.1 Test purpose

To verify that the UE occupied bandwidth for CA in all transmission bandwidth configurations supported by the UE are less than their specific limits

### 6.6.1A.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support 3DL CA and 3UL CA.

### 6.6.1A.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.1A.0.

### 6.6.1A.4.4 Test description

#### 6.6.1A.4.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E UTRA CA configurations specified in table 5.4.2A.1-1, 5.4.2A.1-2 and 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.5.1A.1.4.1-1. The details of

the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.1A.4.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | Mid range for PCC and SCC | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | Lowest $N_{RB}$ for PCC and SCCs<br>Highest $N_{RB}$ for PCC and SCCs | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | TBD | N/A for this test | QPSK | 56 | P_6@0 | S_25@0 | S_25@0 | - |
| 6 | TBD | | QPSK | 106 | P_6@0 | S_50@0 | S_50@0 | - |
| 15 | TBD | | QPSK | 65 | P_15@0 | S_25@0 | S_25@0 | - |
| 25 | TBD | | QPSK | 75 | P_25@0 | S_25@0 | S_25@0 | - |
| 25 | TBD | | QPSK | 125 | P_25@0 | S_50@0 | S_50@0 | - |
| 50 | TBD | | QPSK | 150 | P_50@0 | S_50@0 | S_50@0 | - |
| 50 | 100 | | QPSK | 250 | P_50@0 | S_100@0 | S_100@0 | - |
| 75 | 75 | | QPSK | 225 | P_75@0 | S_75@0 | S_75@0 | - |
| 75 | 100 | | QPSK | 275 | P_75@0 | S_100@0 | S_100@0 | - |
| 100 | 50 | | QPSK | 200 | P_100@0 | S_50@0 | S_50@0 | - |
| 100 | 100 | | QPSK | 300 | P_100@0 | S_100@0 | S_100@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1, 5.4.2A.1-2 and 5.4.2A.1-2a. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.6.1A.4.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.1A.4.1.4.3.

### 6.6.1A.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.1A.4.1.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.1A.4.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the power spectrum distribution over all component carriers within two times or more range over the requirement for Occupied Bandwidth for CA specification centring on the current carrier frequency in CA configuration. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is one active uplink subframe. For TDD slots with transient periods are not under test.

7. Calculate the total power for the total integrated power of the transmitted spectrum within the range of all frequencies measured in '6)' and save this value as "Total Power".

8. Sum up the power upward from the lower boundary of the measured frequency range in '6)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Lower Frequency".

9. Sum up the power downward from the upper boundary of the measured frequency range in '6)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Upper Frequency".

10. Calculate the difference ("Upper Frequency" – "Lower Frequency" = "Occupied Bandwidth") between two limit frequencies obtained in '8)' and '9)'.

#### 6.6.1A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.1A.4.5 Test Requirements

The measured Occupied Bandwidth shall not exceed values of aggregated channel bandwidth as defined in section 5.4.2A.

## 6.6.1B Occupied bandwidth for UL-MIMO

### 6.6.1B.1 Test purpose

To verify that the UE occupied bandwidth for all transmission bandwidth configurations supported by each of transmit antenna of the UE are less than their specific limits.

### 6.6.1B.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

### 6.6.1B.3 Minimum conformance requirements

For UE with multiple transmit antenna connectors, the requirements for occupied bandwidth is specified at each transmit antenna connector. The occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel at each transmit antenna connector.

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the occupied bandwidth at each transmitter antenna shall be less than the channel bandwidth specified in Table 6.6.1B.3-1 with the UL-MIMO configurations specified in Table 6.2.2B.3-2.

**Table 6.6.1B.3-1: Occupied channel bandwidth**

| | Occupied channel bandwidth / Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Channel bandwidth (MHz) | 1.4 | 3 | 5 | 10 | 15 | 20 |

The normative reference for this requirement is TS 36.101 [2] clause 6.6.1B.

## 6.6.1B.4 Test description

### 6.6.1B.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.1B.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.1B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | |
| Test Frequencies as specified in **TS36.508 [7] subclause 4.3.1** | Mid range | | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | All | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Occupied bandwidth | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 50 | 50 |
| 15MHz | | QPSK | 75 | 75 |
| 20MHz | | QPSK | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.1B.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.1B.4.3.

### 6.6.1B.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.6.1B.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Send continuously power control "up" commands to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure the power spectrum distribution within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is one active uplink subframe. For TDD slots with transient periods are not under test.
4. Calculate the total power within the range of all frequencies measured in '3)' and save this value as "Total Power".
5. Sum up the power upward from the lower boundary of the measured frequency range in '3)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Lower Frequency".
6. Sum up the power downward from the upper boundary of the measured frequency range in '3)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Upper Frequency".
7. Calculate the difference ("Upper Frequency" – "Lower Frequency" = "Occupied Bandwidth") between two limit frequencies obtained in '5)' and '6)'.
8. Repeat step 3) until 7) for each of transmit antenna of the UE.

### 6.6.1B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.6.6.1B.5 Test requirement

The measured Occupied Bandwidth at each transmit antenna of UE shall not exceed values in Table 6.6.1B.5-1.

**Table 6.6.1B.5-1: Occupied channel bandwidth**

| | **Occupied channel bandwidth / channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Channel bandwidth [MHz] | 1.4 | 3 | 5 | 10 | 15 | 20 |

## 6.6.1E Occupied bandwidth for UE category 0

### 6.6.1E.1 Test purpose

Same test purpose as in clause 6.6.1.1.

### 6.6.1E.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.6.1E.2 Minimum conformance requirements

Occupied bandwidth is a measure of the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel. The occupied channel bandwidth for all transmission bandwidth configurations (Resources Blocks) should be less than the channel bandwidth specified in Table 6.6.1E.2-1

**Table 6.6.1E.2-1: Occupied channel bandwidth**

| | Occupied channel bandwidth / channel bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **Channel bandwidth [MHz]** | 1.4 | 3 | 5 | 10 | 15 | 20 |

The normative reference for this requirement is TS 36.101 [2] clause 6.6.1.

## 6.6.1E.4 Test description

### 6.6.1E.4.1 Initial conditions

Same initial conditions as in clause 6.6.1.4.1 with the following exceptions:

- Instead of Table 6.6.1.4.1-1 → use Table 6.6.1E.4.1-1.
- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.6.1E.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | |
| Test Frequencies as specified in **TS36.508 [7] subclause 4.3.1** | Mid range | | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | All | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Occupied bandwidth | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

### 6.6.1E.4.2 Test procedure

Same test procedure as in clause 6.6.1.4.2 with the following exception for HD-FDD:

- In step 3, slots with transient periods are not under test. Half-duplex guard subframes are not under test.

### 6.6.1E.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6

## 6.6.1E.5 Test requirement

The measured Occupied Bandwidth shall not exceed values in Table 6.6.1E.5-1.

**Table 6.6.1E.5-1: Occupied channel bandwidth**

| | Occupied channel bandwidth / channel bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Channel bandwidth [MHz] | 1.4 | 3 | 5 | NA | NA | NA |

# 6.6.1EA Occupied bandwidth for UE category M1

## 6.6.1EA.1 Test purpose

Same test purpose as in clause 6.6.1.1.

## 6.6.1EA.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

## 6.6.1EA.2 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.1.2.

## 6.6.1EA.4 Test description

### 6.6.1E.4A.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.1EA.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.6.1EA.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5 MHz | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for Occupied bandwidth | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| 5MHz | | QPSK | 6 | 6 | 0 |
| Note 1: Denote where in the channel bandwidth the narrowband shall be placed. Narrowband and narrowband index are defined in TS 36.211, 5.2.4. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Table 6.6.1EA.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.6.1EA.4.3.

### 6.6.1EA.4.2 Test procedure

1. The SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.6.1EA.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Send continuously power control "up" commands to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure the power spectrum distribution within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is one active uplink subframe. For TDD slots with transient periods are not under test For HD-FDD slots with transient periods and Half-duplex guard subframe are not under test.
4. Calculate the total power within the range of all frequencies measured in '3)' and save this value as "Total Power".
5. Sum up the power upward from the lower boundary of the measured frequency range in '3)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Lower Frequency".
6. Sum up the power downward from the upper boundary of the measured frequency range in '3)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Upper Frequency".
7. Calculate the difference ("Upper Frequency" – "Lower Frequency" = "Occupied Bandwidth") between two limit frequencies obtained in '5)' and '6)'.

### 6.6.1EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA.

### 6.6.1EA.5 Test requirement

The measured Occupied Bandwidth shall not exceed values in Table 6.6.1EA.5-1.

**Table 6.6.1EA.5-1: Occupied channel bandwidth**

| | Occupied channel bandwidth / channel bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Channel bandwidth [MHz] | N/A | N/A | 1.4 | N/A | N/A | N/A |

## 6.6.1EB Occupied bandwidth for UE category 1bis

### 6.6.1EB.1 Test purpose

Same test purpose as in clause 6.6.1.1.

### 6.6.1EB.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

### 6.6.1EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.1.3.

### 6.6.1EB.4 Test description

#### 6.6.1EB.4.1 Initial conditions

Same initial conditions as in clause 6.6.1.4.1 with the following exceptions:

- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.6.1EB.4.2 Test procedure

Same test procedure as in clause 6.6.1.4.2

#### 6.6.1EB.4.3 Message contents

Same message contents as in clause 6.6.1.4.3

### 6.6.1EB.5 Test requirement

The measured Occupied Bandwidth shall not exceed values in Table 6.6.1EB.5-1.

**Table 6.6.1E.5-1: Occupied channel bandwidth**

| | **Occupied channel bandwidth / channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **Channel bandwidth [MHz]** | 1.4 | 3 | 5 | 10 | 15 | 20 |

## 6.6.1F Occupied bandwidth for category NB1 and NB2

### 6.6.1F.1 Test purpose

To verify that the UE occupied bandwidth for all transmission bandwidth configurations supported by the UE are less than their specific limits.

### 6.6.1F.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

### 6.6.1F.3 Minimum conformance requirements

The occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel at the transmit antenna connector. Occupied bandwidth shall be less than the channel bandwidth of category NB1 and NB2 that is 200 kHz.

The normative reference for this requirement is TS 36.101[2] clause 6.6.1F.

## 6.6.1F.4 Test description

### 6.6.1F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters shown in table 6.6.1F.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2.4. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 6.6.1F.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 8.1.1 | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.1 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A | Modulation | $N_{tones}$ | Sub-carrier spacing (kHz) |
| 1 | | QPSK | 1@0 | 3.75kHz |
| 2 | | QPSK | 1@0 | 15kHz |
| 3 (Note 1) | | QPSK | 12@0 | 15kHz |
| Note 1: Applicable to UE supporting UL multi-tone transmissions | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3 using only main Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.4.0.
4. The UL Reference Measurement channels are set according to Table 6.6.1F.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.6.1F.4.3

### 6.6.1F.4.2 Test procedure

1. SS sends uplink scheduling information via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.6.1F.4.1-1. Since the UE has no payload and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC. (UE should be already transmitting $P_{UMAX}$ after Initial Conditions setting).
2. Measure the power spectrum distribution within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). Other methods to measure the power spectrum distribution are allowed. The measurement duration is at least one sub-frame **(**1ms) for 15 KHz channel spacing, and at least a 2ms slot (excluding the 2304Ts gap when UE is not transmitting) respectively for the 3.75 KHz channel spacing.
3. Calculate the total power within the range of all frequencies measured in '2)' and save this value as "Total Power".
4. Sum up the power upward from the lower boundary of the measured frequency range in '2)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Lower Frequency".

5. Sum up the power downward from the upper boundary of the measured frequency range in '2)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Upper Frequency".

6. Calculate the difference ("Upper Frequency " – "Lower Frequency" = "Occupied Bandwidth") using the limit frequencies obtained in '4)' or '5)'.

NOTE 1: For configuration IDs applicable to UE depending on UE capability in Test Configuration Table with different UL sub-carrier spacing, the SS shall release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the appropriate UL subcarrier spacing in Random Access Response message.

#### 6.6.1F.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6.

### 6.6.1F.5 Test requirement

The measured Occupied Bandwidth shall not exceed 200kHz.

## 6.6.1G Occupied bandwidth for V2X Communication

### 6.6.1G.1 Occupied bandwidth for V2X Communication / Non-concurrent with E-UTRA uplink transmission

#### 6.6.1G.1.1 Test purpose

Same test purpose as in clause 6.6.1.1.

#### 6.6.1G.1.2 Test applicability

This test case applies to all types of UE that support V2X Sidelink communication and Band 47.

#### 6.6.1G.1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in TS 36.101 [2] Table 5.5G-1, the requirements in subclause 6.6.1 apply for E-UTRA V2X sidelink transmission.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.1G.

#### 6.6.1G.1.4 Test description

##### 6.6.1G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.1G.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annexes A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.6.1G.1.4.1-1: Test Configuration Table**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | All | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 96 |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.92.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 6.8.2. Message content exceptions are defined in clause 6.6.1G.1.4.3.

3. The V2X reference measurement channel is set according to Table 6.6.1G.1.4.1-1.

3a. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.

6. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.6.1G.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.

2. Measure the power spectrum distribution within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is one active uplink subframe. For TDD slots with transient periods are not under test.

3. Calculate the total power within the range of all frequencies measured in '2)' and save this value as "Total Power".

4. Sum up the power upward from the lower boundary of the measured frequency range in '2)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Lower Frequency".

5. Sum up the power downward from the upper boundary of the measured frequency range in '2)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Upper Frequency".

6. Calculate the difference ("Upper Frequency" – "Lower Frequency" = "Occupied Bandwidth") between two limit frequencies obtained in '4)' and '5)'.

### 6.6.1G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, 4.7.I and 4.10:

## 6.6.1G.1.5 Test requirements

The measured Occupied Bandwidth shall not exceed values in Table 6.6.1G.1.5-1.

**Table 6.6.1G.1.5-1: Occupied channel bandwidth for EUTRA band 47**

| | Occupied channel bandwidth / channel bandwidth | |
|---|---|---|
| | 10 MHz | 20 MHz |
| Channel bandwidth [MHz] | 10 | 20 |

## 6.6.1G.2 Occupied bandwidth for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

### 6.6.1G.2.1 Test purpose

Same test purpose as in clause 6.6.1.1.

### 6.6.1G.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support V2X communication.

### 6.6.1G.2.3 Minimum conformance requirements

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in TS 36.101 [2] Table 5.5G-2, the requirements in subclause 6.6.1 apply for V2X sidelink transmission and the E-UTRA uplink transmission.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.1G.

### 6.6.1G.2.4 Test description

#### 6.6.1G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.1G.2.4.1-1. The details of the uplink and V2X reference measurement channels (RMCs) are specified in Annexes A.2 and A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.1G.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | Normal | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Mid range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink** | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | N/A for Occupied bandwidth | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | | QPSK | 6 | 10 MHz | QPSK | 48 |
| 3 MHz | | QPSK | 15 | 20 MHz | QPSK | 96 |
| 5 MHz | | QPSK | 25 | | | |
| 10 MHz | | QPSK | 50 | | | |
| 15 MHz | | QPSK | 75 | | | |
| 20 MHz | | QPSK | 100 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to Table 6.6.1G.2.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 6.6.1G.2.4.3.

### 6.6.1G.2.4.2 Test procedure

1. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.6.1G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.
2. Send continuously power control "up" commands to the UE until the UE transmits at $P_{UMAX}$ level. Configure the UE to transmit PSCCH and PSSCH with the $P_{UMAX}$ level of each test points.
3. Measure the power spectrum distribution of both concurrent bands within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is one active uplink subframe. For TDD slots with transient periods are not under test.
4. Calculate the total power within the range of all frequencies measured in '3)' and save this value as "Total Power" for both concurrent bands.
5. Sum up the power upward from the lower boundary of the measured frequency range in '3)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Lower Frequency" for both concurrent bands.
6. Sum up the power downward from the upper boundary of the measured frequency range in '3)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Upper Frequency" for both concurrent bands.
7. Calculate the difference ("Upper Frequency" – "Lower Frequency" = "Occupied Bandwidth") between two limit frequencies obtained in '5)' and '6)' for both concurrent bands.

#### 6.6.1G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.1G.2.5 Test requirements

The measured Occupied Bandwidth for both concurrent bands shall not exceed values in Table 6.6.1G.2.5-1.

**Table 6.6.1G.2.5-1: Occupied channel bandwidth**

| | Occupied channel bandwidth / channel bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Channel bandwidth [MHz] | 1.4 | 3 | 5 | 10 | 15 | 20 |

## 6.6.1G.3 Occupied bandwidth for V2X Communication / Intra-band contiguous multi-carrier operation

### 6.6.1G.3.1 Test purpose

Same test purpose as in clause 6.6.1.1.

### 6.6.1G.3.2 Test applicability

This test case applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink communication and Band 47.

### 6.6.1G.3.3 Minimum conformance requirements

For intra-band contiguous multi-carrier operation, the occupied bandwidth is a measure of the bandwidth containing 99 % of the total integrated power of the transmitted spectrum. The OBW shall be less than the aggregated channel bandwidth defined in TS 36.101 [2] subclause 5.6A.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.1G.

### 6.6.1G.3.4 Test description

#### 6.6.1G.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-4. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.1G.3.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annexes A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.6.1G.3.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Mid range | | | |
| Test Channel Bandwidths as specified in subclause 5.4.2G | | | ALL | | | |
| **Test Parameters for V2X MCC Configuration** | | | | | | |
| **V2X MCC Channel Bandwidth** | | | **V2X Sidelink Configuration** | | | |
| **Configuration ID** | **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **$N_{RB_agg}$** | **CC1 and CC2 RB Allocation (LCRB @ RBstart)** | |
| 1 | 50 | 50 | QPSK | 48 | CC1_48@0 | CC2_0@0 |
| 2 | 50 | 50 | QPSK | 96 | CC1_48@0 | CC2_48@2 |
| Note1: The starting resource block shall be RB #0 and RB# (max+1 - RB allocation) of the aggregated channel bandwidth, each correspond to configuration ID 1 or 2. | | | | | | |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, in Figure A.89a.

2. The parameter setting for the V2X sidelink transmission over PC5 is pre-configured according to TS 36.508[7] subclause 4.10.1. Message content exceptions are defined in clause 6.6.1G.3.4.3.

3. The V2X Reference Measurement Channels are set according to Table 6.6.1G.3.4.1-1.

3a The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 5A-V2X according to TS 36.508 [7] clause 4.5.9.

6. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.6.1G.3.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMCs.

2. Measure the power spectrum distribution within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is one active uplink subframe. For TDD slots with transient periods are not under test.

3. Calculate the total power within the range of all frequencies measured in '2)' and save this value as "Total Power".

4. Sum up the power upward from the lower boundary of the measured frequency range in '2)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Lower Frequency".

5. Sum up the power downward from the upper boundary of the measured frequency range in '2)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Upper Frequency".

6. Calculate the difference ("Upper Frequency" – "Lower Frequency" = "Occupied Bandwidth") between two limit frequencies obtained in '4)' and '5)'.

### 6.6.1G.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.6.1G.3.4.3-0: +CCUTLE (Initial condition)**

| Derivation Path: 36.508 Table 4.7I-2: +CCUTLE, condition Close and Transmit |
|---|

### 6.6.1G.3.5 Test requirements

The measured Occupied Bandwidth shall not exceed values in Table 6.6.1G.3.5-1.

**Table 6.6.1G.3.5-1: Occupied channel bandwidth**

| | Occupied channel bandwidth / channel bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Channel bandwidth [MHz] | 1.4 | 3 | 5 | 10 | 15 | 20 |

## 6.6.2 Out of band emission

Out of band emissions are unwanted emissions immediately outside the nominal channel resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a Spectrum Emission Mask and Adjacent Channel Leakage power Ratio.

### 6.6.2.1 Spectrum Emission Mask

#### 6.6.2.1.1 Test purpose

To verify that the power of any UE emission shall not exceed specified lever for the specified channel bandwidth.

#### 6.6.2.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 8 and forward.

#### 6.6.2.1.3 Minimum conformance requirements

The spectrum emission mask of the UE applies to frequencies ($\Delta f_{OOB}$) starting from the edge of the assigned E-UTRA channel bandwidth. For frequencies greater than ($\Delta f_{OOB}$) as specified in Table 6.6.2.1.3-1 the spurious requirements in clause 6.6.3 are applicable.

The power of any UE emission shall not exceed the levels specified in Table 6.6.2.1.3-1 for the specified channel bandwidth.

**Table 6.6.2.1.3-1: General E-UTRA spectrum emission mask**

| Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| ± 0-1 | -10 | -13 | -15 | -18 | -20 | -21 | 30 kHz |
| ± 1-2.5 | -10 | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.5-2.8 | -25 | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.8-5 | | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 5-6 | | -25 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 6-10 | | | -25 | -13 | -13 | -13 | 1 MHz |
| ± 10-15 | | | | -25 | -13 | -13 | 1 MHz |
| ± 15-20 | | | | | -25 | -13 | 1 MHz |
| ± 20-25 | | | | | | -25 | 1 MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2.1.

### 6.6.2.1.4 Test description

#### 6.6.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for SEM testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 1.4MHz | | QPSK | 5 | 5 |
| 1.4MHz | | 16QAM | 5 | 5 |
| 1.4MHz | | 16QAM | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 3MHz | | QPSK | 4 | 4 |
| 3MHz | | 16QAM | 4 | 4 |
| 3MHz | | 16QAM | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 5MHz | | QPSK | 8 | 8 |
| 5MHz | | 16QAM | 8 | 8 |
| 5MHz | | 16QAM | 25 | 25 |
| 10MHz | | QPSK | 50 | 50 |
| 10MHz | | QPSK | 12 | 12 |
| 10MHz | | 16QAM | 12 | 12 |
| 10MHz | | 16QAM | 50 (Note 4) | 50 (Note 4) |
| 15MHz | | QPSK | 75 | 75 |
| 15MHz | | QPSK | 16 | 16 |
| 15MHz | | 16QAM | 16 | 16 |
| 15MHz | | 16QAM | 75 (Note 4) | 75 (Note 4) |
| 20MHz | | QPSK | 100 | 100 |
| 20MHz | | QPSK | 18 | 18 |
| 20MHz | | 16QAM | 18 | 18 |
| 20MHz | | 16QAM | 100 (Note 4) | 100 (Note 4) |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: The allowed MPR for maximum output power UE might apply is described in clause 6.2.3.3.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max+1 - RB allocation) of the channel bandwidth.
Note 4: Applies only for UE-Categories ≥2

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.1.4.3.

#### 6.6.2.1.4.2 Test procedure

SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3.5-1 for Power Class 3 UEs or in 6.2.3_1.5-1 for HPUE (Power Class 1 or Power Class 2 UEs). The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.2.1.5-1 or 6.6.2.1.5-2, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

#### 6.6.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.2.1.5 Test requirements

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-1 as appropriate, and the power of any UE emission shall fulfil requirements in Table.6.6.2.1.5-1 or Table.6.6.2.1.5-2, as applicable.

**Table 6.6.2.1.5-1: General E-UTRA spectrum emission mask, E-UTRA bands ≤ 3GHz**

| | **Spectrum emission limit (dBm)/ Channel bandwidth** | | | | | | |
|---|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |
| Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz. | | | | | | | |
| Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively. | | | | | | | |
| Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel | | | | | | | |
| Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz. | | | | | | | |

**Table 6.6.2.1.5-2: General E-UTRA spectrum emission mask, 3GHz < E-UTRA bands ≤ 4.2GHz**

| | **Spectrum emission limit (dBm)/ Channel bandwidth** |
|---|---|

| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
|---|---|---|---|---|---|---|---|
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.1_1 Spectrum Emission Mask for Multi-Cluster PUSCH

### 6.6.2.1_1.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth for Multi-Cluster PUSCH transmission.

### 6.6.2.1_1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support multi cluster PUSCH within a component carrier for the tested band.

### 6.6.2.1_1.3 Minimum conformance requirements

The spectrum emission mask of the UE applies to frequencies ($\Delta f_{OOB}$) starting from the edge of the assigned E-UTRA channel bandwidth. For frequencies greater than ($\Delta f_{OOB}$) as specified in Table 6.6.2.1_1.3-1 the spurious requirements in clause 6.6.3 are applicable.

The power of any UE emission shall not exceed the levels specified in Table 6.6.2.1_1.3-1 for the specified channel bandwidth.

**Table 6.6.2.1_1.3-1: General E-UTRA spectrum emission mask**

| Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| ± 0-1 | -10 | -13 | -15 | -18 | -20 | -21 | 30 kHz |
| ± 1-2.5 | -10 | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.5-2.8 | -25 | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.8-5 | | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 5-6 | | -25 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 6-10 | | | -25 | -13 | -13 | -13 | 1 MHz |
| ± 10-15 | | | | -25 | -13 | -13 | 1 MHz |
| ± 15-20 | | | | | -25 | -13 | 1 MHz |
| ± 20-25 | | | | | | -25 | 1 MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2.1.

## 6.6.2.1_1.4 Test description

### 6.6.2.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.1_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.1_1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| **Configuration ID** | **Downlink Configuration** | | **Uplink Configuration** | | |
| | Ch BW | N/A for SEM testing | Mod'n | Cluster1 RB allocations ($L_{CRB}$ @ $RB_{start}$) | Cluster2 RB allocations ($L_{CRB}$ @ $RB_{start}$) |
| 1 | 5MHz | | 16QAM | 2@0 | 1@24 |
| 2 | 5MHz | | 16QAM | 18@0 | 2@22 |
| 3 | 5MHz | | 16QAM | 2@0 | 18@6 |
| 4 | 10MHz | | 16QAM | 3@0 | 2@48 |
| 5 | 10MHz | | 16QAM | 42@0 | 3@45 |
| 6 | 10MHz | | 16QAM | 3@0 | 42@6 |
| 7 | 15MHz | | 16QAM | 8@0 | 7@68 |
| 8 | 15MHz | | 16QAM | 60@0 | 4@68 |
| 9 | 15MHz | | 16QAM | 4@0 | 60@12 |
| 10 | 20MHz | | 16QAM | 4@0 | 4@96 |
| 11 | 20MHz | | 16QAM | 92@0 | 4@96 |
| 12 | 20MHz | | 16QAM | 4@0 | 92@8 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Table 6.6.2.1_1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.1.4.3.

### 6.6.2.1_1.4.2 Test procedure

1. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.1_1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3_2.5-1. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.2.1_1.5-1 or 6.6.2.1_1.5-2, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

### 6.6.2.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.6.2.1_1.5 Test requirements

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3_2.5-1 as appropriate, and the power of any UE emission shall fulfil requirements in Table 6.6.2.1_1.5-1 or Table 6.6.2.1_1.5-2, as applicable.

**Table 6.6.2.1_1.5-1: General E-UTRA spectrum emission mask, E-UTRA bands ≤ 3GHz**

| | **Spectrum emission limit (dBm)/ Channel bandwidth** | | | | | | |
|---|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -8.5 | | | | | | 1 MHz |
| 2.5-2.8 | -23.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |
| Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz. | | | | | | | |
| Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively. | | | | | | | |
| Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel | | | | | | | |
| Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz. | | | | | | | |

**Table 6.6.2.1_1.5-2: General E-UTRA spectrum emission mask, 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.1A Spectrum emission mask for CA

### 6.6.2.1A.0 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the spectrum emission mask of the UE is defined per component carrier while both component carriers are active and the requirements are specified in subclauses 6.6.2.1.3 and 6.6.2.2.3. If for some frequency spectrum emission masks of component carriers overlap then spectrum emission mask allowing higher power spectral density applies for that frequency. If for some frequency a component carrier spectrum emission mask overlaps with the channel bandwidth of another component carrier, then the emission mask does not apply for that frequency.

For intra-band contiguous carrier aggregation the spectrum emission mask of the UE applies to frequencies ($\Delta f_{OOB}$) starting from the ± edge of the aggregated channel bandwidth (Table 5.4.2A-1) For intra-band contiguous carrier aggregation the bandwidth class B and C, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.1A.0-1 and Table 6.6.2.1A.0-2 for the specified channel bandwidth.

**Table 6.6.2.1A.0-1: General E-UTRA CA spectrum emission mask for Bandwidth Class B**

| Spectrum emission limit [dBm]/$BW_{Channel_CA}$ | | | |
|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 25RB+50RB (14.95 MHz) | 50RB+50RB (19.9 MHz) | Measurement bandwidth |
| ± 0-1 | -20 | -21 | 30 kHz |
| ± 1-5 | -10 | -10 | 1 MHz |
| ± 5-14.95 | -13 | -13 | 1 MHz |
| ± 14.95-19.90 | -25 | -13 | 1 MHz |
| ± 19.90-19.95 | -25 | -25 | 1 MHz |
| ± 19.95-24.90 | | -25 | 1 MHz |

**Table 6.6.2.1A.0-2: General E-UTRA CA spectrum emission mask for Bandwidth Class C**

| Spectrum emission limit [dBm]/$BW_{Channel_CA}$ | | | | | | |
|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 25RB+100RB (24.95MHz) | 50RB+100RB (29.9 MHz) | 75RB+75RB (30 MHz) | 75RB+100RB (34.85 MHz) | 100RB+100RB (39.8 MHz) | Measurement bandwidth |
| ± 0-1 | -22 | -22.5 | -22.5 | -23.5 | -24 | 30 kHz |
| ± 1-5 | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 5-24.95 | -13 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 24.95-29.9 | -25 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 29.9-29.95 | -25 | -25 | -13 | -13 | -13 | 1 MHz |
| ± 29.95-30 | | -25 | -13 | -13 | -13 | 1 MHz |
| ± 30-34.85 | | -25 | -25 | -13 | -13 | 1 MHz |
| ± 34.85-34.9 | | -25 | -25 | -25 | -13 | 1 MHz |
| ± 34.9-35 | | | -25 | -25 | -13 | 1 MHz |
| ± 35-39.8 | | | | -25 | -13 | 1 MHz |
| ± 39.8-39.85 | | | | -25 | -25 | 1 MHz |
| ± 39.85-44.8 | | | | | -25 | 1 MHz |

For intra-band non-contiguous carrier aggregation transmission the spectrum emission mask requirement is defined as a composite spectrum emissions mask. Composite spectrum emission mask applies to frequencies up to ± $\Delta f_{OOB}$ starting from the edges of the sub-blocks. Composite spectrum emission mask is defined as follows

a) Composite spectrum emission mask is a combination of individual sub-block spectrum emissions masks

b) In case the sub-block consist of one component carrier the sub-lock general spectrum emission mask is defined in subclause 6.6.2.1.3

c) If for some frequency sub-block spectrum emission masks overlap then spectrum emission mask allowing higher power spectral density applies for that frequency

d) If for some frequency a sub-block spectrum emission mask overlaps with the sub-block bandwidth of another sub-block, then the emission mask does not apply for that frequency.

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.2.1A.

## 6.6.2.1A.1 Spectrum emission mask for CA (intra-band contiguous DL CA and UL CA)

### 6.6.2.1A.1.1 Test purpose

To verify that the power of any UE emission shall not exceed specified lever for the specified channel bandwidth for CA.

### 6.6.2.1A.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 6.6.2.1A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.1A.0.

### 6.6.2.1A.1.4 Test description

#### 6.6.2.1A.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.1A.1.4.1-1. The details of the uplink reference

measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.1A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low and High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| ID | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 100 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | | |
| 2 | 100 | 25 | | QPSK | 25 | P_25@0 | S_0@0 | | |
| 3 | 100 | 25 | | QPSK | 125 | P_100@0 | S_25@0 | | |
| 4 | 100 | 25 | | 16QAM | 8 | P_8@0 | S_0@0 | | |
| 5 | 100 | 25 | | 16QAM | 25 | P_25@0 | S_0@0 | | |
| 6 | 100 | 25 | | 16QAM | 125 | P_100@0 | S_25@0 | | |
| 7 | 100 | 25 | | QPSK | 2 | P_1@0 | S_1@24 | | |
| 8 | 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | | |
| 9 | 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | | |
| 10 | 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | | |
| 11 | 75 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | | |
| 12 | 75 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | | |
| 13 | 75 | 75 | | 16QAM | 150 | P_75@0 | S_75@0 | | |
| 14 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 15 | 100 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | | |
| 16 | 100 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | | |
| 17 | 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | | |
| 18 | 100 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | | |
| 19 | 100 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | | |
| 20 | 100 | 50 | | 16QAM | 150 | P_100@0 | S_50@0 | | |
| 21 | 100 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |
| 22 | 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | | |
| 23 | 100 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | | |
| 24 | 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | | |
| 25 | 100 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | | |
| 26 | 100 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | | |
| 27 | 100 | 75 | | 16QAM | 175 | P_100@0 | S_75@0 | | |
| 28 | 100 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 29 | 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | | |
| 30 | 100 | 100 | | QPSK | 100 | P_100@0 | S_0@0 | | |
| 31 | 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 32 | 100 | 100 | | 16QAM | 18 | P_18@0 | S_0@0 | | |
| 33 | 100 | 100 | | 16QAM | 100 | P_100@0 | S_0@0 | | |
| 34 | 100 | 100 | | 16QAM | 200 | P_100@0 | S_100@0 | | |
| 35 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| 36 | 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | | |
| 37 | 25 | 50 | | QPSK | 25 | P_25@0 | S_0@0 | | |
| 38 | 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | | |
| 39 | 25 | 50 | | 16QAM | 8 | P_8@0 | S_0@0 | | |
| 40 | 25 | 50 | | 16QAM | 25 | P_25@0 | S_0@0 | | |
| 41 | 25 | 50 | | 16QAM | 75 | P_25@0 | S_50@0 | | |
| 42 | 25 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |
| 43 | 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | | |
| 44 | 50 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | | |
| 45 | 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | | |
| 46 | 50 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | | |
| 47 | 50 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | | |
| 48 | 50 | 50 | | 16QAM | 100 | P_50@0 | S_50@0 | | |
| 49 | 50 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.1A.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.1A.1.4.3.

#### 6.6.2.1A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.2.1A.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.1.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the mean power over all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in Table 6.2.3A.1.5-1. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

7. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.2.1A.1.5-1 or 6.6.2.1A.1.5-2, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

### 6.6.2.1A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.2.1A.1.5 Test Requirements

The measured UE mean power with the aggregated channel bandwidth as specified in clause 5.4.2A, derived in step 6, shall fulfil requirements in Table 6.2.3A.1.5-1 as appropriate,

and

the power of any UE emission shall fulfil requirements in Table.6.6.2.1A.1.5-1 or Table.6.6.2.1A.1.5-2 for Bandwidth Class C and Table.6.6.2.1A.1.5-3 or Table.6.6.2.1A.1.5-4 for Bandwidth Class B, as applicable.

**Table 6.6.2.1A.1.5-1: General E-UTRA spectrum emission mask for CA Bandwidth Class C, E-UTRA bands ≤ 3GHz**

<table>
<tr><th></th><th colspan="6">Spectrum emission limit [dBm]/BWChannel_CA</th></tr>
<tr><th>$\Delta f_{OOB}$ (MHz)</th><th>25RB+100RB (24.95 MHz)</th><th>50RB+100RB (29.9 MHz)</th><th>75RB+75RB (30 MHz)</th><th>75RB+100RB (34.85 MHz)</th><th>100RB+100RB (39.8 MHz)</th><th>Measurement bandwidth</th></tr>
<tr><td>± 0-1</td><td>-20.5</td><td>-21</td><td>-21</td><td>-22</td><td>-22.5</td><td>30 kHz</td></tr>
<tr><td>± 1-5</td><td>-8.5</td><td>-8.5</td><td>-8.5</td><td>-8.5</td><td>-8.5</td><td>1 MHz</td></tr>
<tr><td>± 5-24.95</td><td>-11.5</td><td rowspan="2">-11.5</td><td rowspan="4">-11.5</td><td rowspan="5">-11.5</td><td rowspan="10">-11.5</td><td>1 MHz</td></tr>
<tr><td>± 24.95-29.9</td><td rowspan="2">-23.5</td><td>1 MHz</td></tr>
<tr><td>± 29.9-29.95</td><td rowspan="5">-23.5</td><td>1 MHz</td></tr>
<tr><td>± 29.95-30</td><td></td><td>1 MHz</td></tr>
<tr><td>± 30-34.85</td><td></td><td rowspan="3">-23.5</td><td>1 MHz</td></tr>
<tr><td>± 34.85-34.9</td><td></td><td rowspan="4">-23.5</td><td>1 MHz</td></tr>
<tr><td>± 34.9-35</td><td></td><td></td><td>1 MHz</td></tr>
<tr><td>± 35-39.8</td><td></td><td></td><td></td><td>1 MHz</td></tr>
<tr><td>±39.8-39.85</td><td></td><td></td><td></td><td rowspan="2">-23.5</td><td>1 MHz</td></tr>
<tr><td>± 39.85-44.8</td><td></td><td></td><td></td><td></td><td>1 MHz</td></tr>
<tr><td colspan="7">Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.<br>Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.<br>Note 3: The measurements are to be performed above the upper edge of the aggregated channel bandwidth and below the lower edge of the aggregated channel bandwidth.</td></tr>
</table>

**Table 6.6.2.1A.1.5-2: General E-UTRA spectrum emission mask for CA Bandwidth Class C, 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit [dBm]/BWChannel_CA | | | | | |
|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **25RB+100RB (24.95 MHz)** | **50RB+100RB (29.9 MHz)** | **75RB+75RB (30 MHz)** | **75RB+100RB (34.85 MHz)** | **100RB+100RB (39.8 MHz)** | **Measurement bandwidth** |
| ± 0-1 | -20.2 | -20.7 | -20.7 | -21.7 | -22.2 | 30 kHz |
| ± 1-5 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | 1 MHz |
| ± 5-24.95 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| ± 24.95-29.9 | -23.2 | | | | | 1 MHz |
| ± 29.9-29.95 | | -23.2 | | | | 1 MHz |
| ± 29.95-30 | | | | | | 1 MHz |
| ± 30-34.85 | | | -23.2 | | | 1 MHz |
| ± 34.85-34.9 | | | | -23.2 | | 1 MHz |
| ± 34.9-35 | | | | | | 1 MHz |
| ± 35-39.8 | | | | | | 1 MHz |
| ±39.8-39.85 | | | | | -23.2 | 1 MHz |
| ± 39.85-44.8 | | | | | | 1 MHz |
| Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz. | | | | | | |
| Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively. | | | | | | |
| Note 3: The measurements are to be performed above the upper edge of the aggregated channel bandwidth and below the lower edge of the aggregated channel bandwidth. | | | | | | |

**Table 6.6.2.1A.1.5-3: General E-UTRA spectrum emission mask for CA Bandwidth Class B, E-UTRA bands ≤ 3GHz**

| **Spectrum emission limit [dBm]/$BW_{Channel_CA}$** | | | |
|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **25RB+50RB (14.95 MHz)** | **50RB+50RB (19.9 MHz)** | **Measurement bandwidth** |
| ± 0-1 | -20 | -21 | 30 kHz |
| ± 1-5 | -10 | -10 | 1 MHz |
| ± 5-14.95 | -13 | -13 | 1 MHz |
| ± 14.95-19.90 | -25 | -13 | 1 MHz |
| ± 19.90-19.95 | -25 | -25 | 1 MHz |
| ± 19.95-24.90 | | -25 | 1 MHz |

**Table 6.6.2.1A.1.5-4: General E-UTRA spectrum emission mask for CA Bandwidth Class B, 3GHz < E-UTRA bands ≤ 4.2GHz**

| **Spectrum emission limit [dBm]/$BW_{Channel_CA}$** | | | |
|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **25RB+50RB (14.95 MHz)** | **50RB+50RB (19.9 MHz)** | **Measurement bandwidth** |
| ± 0-1 | -20 | -21 | 30 kHz |
| ± 1-5 | -10 | -10 | 1 MHz |
| ± 5-14.95 | -13 | -13 | 1 MHz |
| ± 14.95-19.90 | -25 | -13 | 1 MHz |
| ± 19.90-19.95 | -25 | -25 | 1 MHz |
| ± 19.95-24.90 | | -25 | 1 MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

### 6.6.2.1A.2 Spectrum emission mask for CA (inter-band DL CA and UL CA)

#### 6.6.2.1A.2.1 Test purpose

To verify that the power of any UE emission shall not exceed specified lever for the specified channel bandwidth for CA.

#### 6.6.2.1A.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA.

#### 6.6.2.1A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.1A.0.

#### 6.6.2.1A.2.4 Test description

##### 6.6.2.1A.2.4.1 Initial condition

Same as in clause 6.6.2.1A.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands.
- Instead of Table 6.6.2.1A.1.4.1-1 → use Table 6.6.2.1A.2.4.1-1.
- Instead of clause 6.6.2.1A.1.4.3 use clause 6.6.2.1A.2.4.3.

**Table 6.6.2.1A.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | Low range for PCC and SCC<br>High range for PCC and SCC | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/Afor this test | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 6 | 25 | | QPSK | 2 | P_1@5 | S_1@24 | - | - |
| 6 | 25 | | QPSK | 13 | P_5@0 | S_8@0 | - | - |
| 6 | 25 | | QPSK | 13 | P_5@1 | S_8@17 | - | - |
| 6 | 25 | | 16QAM | 2 | P_1@0 | S_1@0 | | |
| 6 | 25 | | 16QAM | 2 | P_1@5 | S_1@24 | | |
| 6 | 25 | | 16QAM | 13 | P_5@0 | S_8@0 | | |
| 6 | 25 | | 16QAM | 13 | P_5@1 | S_8@17 | | |
| 6 | 50 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 6 | 50 | | QPSK | 2 | P_1@5 | S_1@49 | - | - |
| 6 | 50 | | QPSK | 17 | P_5@0 | S_12@0 | - | - |
| 6 | 50 | | QPSK | 17 | P_5@1 | S_12@38 | - | - |
| 6 | 50 | | 16QAM | 2 | P_1@0 | S_1@0 | - | - |
| 6 | 50 | | 16QAM | 2 | P_1@5 | S_1@49 | - | - |
| 6 | 50 | | 16QAM | 17 | P_5@0 | S_12@0 | - | - |
| 6 | 50 | | 16QAM | 17 | P_5@1 | S_12@38 | - | - |
| 15 | 25 | | QPSK | 2 | S_1@0 | S_1@0 | | |
| 15 | 25 | | QPSK | 2 | S_1@14 | S_1@24 | | |
| 15 | 25 | | QPSK | 12 | S_4@0 | S_8@0 | | |
| 15 | 25 | | QPSK | 12 | S_4@11 | S_8@17 | | |
| 15 | 25 | | 16QAM | 2 | S_1@0 | S_1@0 | | |
| 15 | 25 | | 16QAM | 2 | S_1@14 | S_1@24 | | |
| 15 | 25 | | 16QAM | 12 | S_4@0 | S_8@0 | | |
| 15 | 25 | | 16QAM | 12 | S_4@11 | S_8@17 | | |
| 25 | 6 | | QPSK | 2 | S_1@0 | P_1@0 | | |
| 25 | 6 | | QPSK | 2 | S_1@24 | P_1@5 | | |
| 25 | 6 | | QPSK | 13 | S_8@0 | P_5@0 | | |
| 25 | 6 | | QPSK | 13 | S_8@17 | P_5@1 | | |
| 25 | 6 | | 16QAM | 2 | S_1@0 | P_1@0 | | |
| 25 | 6 | | 16QAM | 2 | S_1@24 | P_1@5 | | |
| 25 | 6 | | 16QAM | 13 | S_8@0 | P_5@0 | | |
| 25 | 6 | | 16QAM | 13 | S_8@17 | P_5@1 | | |
| 25 | 15 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 25 | 15 | | QPSK | 2 | P_1@24 | S_1@14 | - | - |
| 25 | 15 | | QPSK | 12 | P_8@0 | S_4@0 | - | - |
| 25 | 15 | | QPSK | 12 | P_8@17 | S_4@11 | - | - |
| 25 | 15 | | 16QAM | 2 | P_1@0 | S_1@0 | - | - |
| 25 | 15 | | 16QAM | 2 | P_1@24 | S_1@14 | - | - |
| 25 | 15 | | 16QAM | 12 | P_8@0 | S_4@0 | - | - |
| 25 | 15 | | 16QAM | 12 | P_8@17 | S_4@11 | - | - |
| 25 | 25 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 25 | 25 | | QPSK | 2 | P_1@24 | S_1@24 | - | - |
| 25 | 25 | | QPSK | 16 | P_8@0 | S_8@0 | - | - |
| 25 | 25 | | QPSK | 16 | P_8@17 | S_8@17 | - | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 25 | 25 | 16QAM | 2 | P_1@0 | S_1@0 | - | - |
| 25 | 25 | 16QAM | 2 | P_1@24 | S_1@24 | - | - |
| 25 | 25 | 16QAM | 16 | P_8@0 | S_8@0 | - | - |
| 25 | 25 | 16QAM | 16 | P_8@17 | S_8@17 | - | - |
| 25 | 50 | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 25 | 50 | QPSK | 2 | P_1@24 | S_1@49 | - | - |
| 25 | 50 | QPSK | 20 | P_8@0 | S_12@0 | - | - |
| 25 | 50 | QPSK | 20 | P_8@17 | S_12@38 | - | - |
| 25 | 50 | 16QAM | 2 | P_1@0 | S_1@0 | - | - |
| 25 | 50 | 16QAM | 2 | P_1@24 | S_1@49 | - | - |
| 25 | 50 | 16QAM | 20 | P_8@0 | S_12@0 | - | - |
| 25 | 50 | 16QAM | 20 | P_8@17 | S_12@38 | - | - |
| 50 | 50 | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 50 | 50 | QPSK | 2 | P_1@49 | S_1@49 | - | - |
| 50 | 50 | QPSK | 24 | P_12@0 | S_12@0 | - | - |
| 50 | 50 | QPSK | 24 | P_12@38 | S_12@38 | - | - |
| 50 | 50 | 16QAM | 2 | P_1@0 | S_1@0 | - | - |
| 50 | 50 | 16QAM | 2 | P_1@49 | S_1@49 | - | - |
| 50 | 50 | 16QAM | 24 | P_12@0 | S_12@0 | - | - |
| 50 | 50 | 16QAM | 24 | P_12@38 | S_12@38 | - | - |
| 50 | 100 | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 50 | 100 | QPSK | 2 | P_1@49 | S_1@99 | - | - |
| 50 | 100 | QPSK | 30 | P_12@0 | S_18@0 | - | - |
| 50 | 100 | QPSK | 30 | P_12@38 | S_18@82 | - | - |
| 50 | 100 | 16QAM | 2 | P_1@0 | S_1@0 | - | - |
| 50 | 100 | 16QAM | 2 | P_1@49 | S_1@99 | - | - |
| 50 | 100 | 16QAM | 30 | P_12@0 | S_18@0 | - | - |
| 50 | 100 | 16QAM | 30 | P_12@38 | S_18@82 | - | - |
| 75 | 25 | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 75 | 25 | QPSK | 2 | P_1@74 | S_1@24 | - | - |
| 75 | 25 | QPSK | 24 | P_16@0 | S_8@0 | - | - |
| 75 | 25 | QPSK | 24 | P_16@59 | S_8@17 | - | - |
| 75 | 25 | 16QAM | 2 | P_1@0 | S_1@0 | - | - |
| 75 | 25 | 16QAM | 2 | P_1@74 | S_1@24 | - | - |
| 75 | 25 | 16QAM | 24 | P_16@0 | S_8@0 | - | - |
| 75 | 25 | 16QAM | 24 | P_16@59 | S_8@17 | - | - |
| 75 | 75 | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 75 | 75 | QPSK | 2 | P_1@74 | S_1@74 | - | - |
| 75 | 75 | QPSK | 32 | P_16@0 | S_16@0 | - | - |
| 75 | 75 | QPSK | 32 | P_16@59 | S_16@59 | - | - |
| 75 | 75 | 16QAM | 2 | P_1@0 | S_1@0 | - | - |
| 75 | 75 | 16QAM | 2 | P_1@74 | S_1@74 | - | - |
| 75 | 75 | 16QAM | 32 | P_16@0 | S_16@0 | - | - |
| 75 | 75 | 16QAM | 32 | P_16@59 | S_16@59 | - | - |
| 100 | 50 | QPSK | 2 | P_1@0 | S_1@0 | | |
| 100 | 50 | QPSK | 2 | P_1@99 | S_1@49 | | |
| 100 | 50 | QPSK | 30 | P_18@0 | S_12@0 | | |
| 100 | 50 | QPSK | 30 | P_18@82 | S_12@38 | | |
| 100 | 50 | 16QAM | 2 | P_1@0 | S_1@0 | | |
| 100 | 50 | 16QAM | 2 | P_1@99 | S_1@49 | | |
| 100 | 50 | 16QAM | 30 | P_18@0 | S_12@0 | | |
| 100 | 50 | 16QAM | 30 | P_18@82 | S_12@38 | | |
| 100 | 75 | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 100 | 75 | QPSK | 2 | P_1@99 | S_1@74 | - | - |
| 100 | 75 | QPSK | 34 | P_18@0 | S_16@0 | - | - |
| 100 | 75 | QPSK | 34 | P_18@82 | S_16@59 | - | - |
| 100 | 75 | 16QAM | 2 | P_1@0 | S_1@0 | - | - |
| 100 | 75 | 16QAM | 2 | P_1@99 | S_1@74 | - | - |
| 100 | 75 | 16QAM | 34 | P_18@0 | S_16@0 | - | - |
| 100 | 75 | 16QAM | 34 | P_18@82 | S_16@59 | - | - |
| 100 | 100 | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 100 | 100 | QPSK | 2 | P_1@99 | S_1@99 | - | - |
| 100 | 100 | QPSK | 36 | P_18@0 | S_18@0 | - | - |
| 100 | 100 | QPSK | 36 | P_18@82 | S_18@82 | - | - |
| 100 | 100 | 16QAM | 2 | P_1@0 | S_1@0 | - | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 100 | 100 | | 16QAM | 2 | P_1@99 | S_1@99 | - | - |
| 100 | 100 | | 16QAM | 36 | P_18@0 | S_18@0 | - | - |
| 100 | 100 | | 16QAM | 36 | P_18@82 | S_18@82 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested. | | | | | | | | |

### 6.6.2.1A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.2.1A.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.1.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
6. Measure the mean power for each CC, which shall meet the requirements described in Table 6.2.3A.2.5-1. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.
7. Measure the power of the transmitted signal for PCC with a measurement filter of bandwidths according to table 6.6.2.1A.2.5-1 or 6.6.2.1A.2.5-2, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.
8. Measure the power of the transmitted signal for SCC with a measurement filter of bandwidths according to table 6.6.2.1A.2.5-1 or 6.6.2.1A.2.5-2, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

### 6.6.2.1A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.2.1A.2.5 Test Requirements

Editor's note: Need further investigation for test requirements in case some frequency spectrum emission masks of component carriers overlap for future coming inter-band UL CA combinations

The measured UE mean power in the channel bandwidth for each CC, derived in step 6, shall fulfil requirements in Table 6.2.3A.2.5-1 as appropriate, and the power of any UE emission per component carrier derived in step 7 and 8 shall fulfil requirements in Table.6.6.2.1A.2.5-1 or Table.6.6.2.1A.2.5-2, as applicable.

**Table 6.6.2.1A.2.5-1: General E-UTRA spectrum emission mask, E-UTRA bands ≤ 3GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth |
|---|---|

| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
|---|---|---|---|---|---|---|---|
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.1A.2.5-2: General E-UTRA spectrum emission mask, 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

### 6.6.2.1A.3 Spectrum emission mask for CA (intra-band non-contiguous DL CA and UL CA)

#### 6.6.2.1A.3.1 Test purpose

To verify that the power of any UE emission shall not exceed specified lever for the specified channel bandwidth for CA.

#### 6.6.2.1A.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

6.6.2.1A.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.1A.0.

6.6.2.1A.3.4 Test description

6.6.2.1A.3.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.1A.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.1A.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: Low Wgap, Maximum Wgap | | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@24 |
| 2 | 25 | 25 | 35 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@0 |
| 3 | 25 | 25 | 5 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@24 |
| 4 | 25 | 25 | 5 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@0 |
| 5 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@99 |
| 6 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@75 |
| 7 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_100@0 | 16QAM | S_100@0 |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.1A.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.1A.3.4.3.

#### 6.6.2.1A.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels except PHICH.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.2.1A.3.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.1.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
6. Measure the mean power over all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in Table 6.2.3A.1.5-1. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.
7. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.2.1A.3.5-1 or 6.6.2.1A.3.5-2, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

#### 6.6.2.1A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.2.1A.3.5 Test Requirements

The measured UE mean power with the aggregated channel bandwidth as specified in clause 5.4.2A, derived in step 6, shall fulfil requirements in Table 6.2.3A.1.5-1 as appropriate,

and

the power of any UE emission shall fulfil requirements in Table.6.6.2.1A.3.5-1.

**Table 6.6.2.1A.3.5-1: E-UTRA spectrum emission mask for CA_4A-4A**

| Spectrum emission limit [dBm]/BWChannel_CA | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 25RB+25RB (Max Gap) | | | 25RB+25RB (Mid range) | | | 100RB+100RB | | |
| Frequency ranges[MHz] | Limit [dBm] | MBW [MHz] | Frequency ranges[MHz] | Limit [dBm] | MBW | Frequency ranges[MHz] | Limit [dBm] | MBW [MHz] |
| 1700-1704 | -23.5 | 1 | 1715-1719 | -23.5 | 1 | 1685-1690 | -23.5 | 1 |
| 1704-1705 | -11.5 | 1 | 1719-1720 | -11.5 | 1 | 1690-1705 | -11.5 | 1 |
| 1705-1709 | -8.5 | 1 | 1720-1724 | -8.5 | 1 | 1705-1709 | -8.5 | 1 |
| 1709-1710 | -13.5 | 0.03 | 1724-1725 | -13.5 | 0.03 | 1709-1710 | -19.5 | 0.03 |
| - | - | - | - | - | - | - | - | - |
| 1715-1716 | -13.5 | 0.03 | 1730-1731 | -13.5 | 0.03 | 1730-1731 | -19.5 | 0.03 |
| 1716-1720 | -8.5 | 1 | 1732-1734 | -8.5 | 1 | 1731-1734 | -8.5 | 1 |
| 1720-1721 | -11.5 | 1 | 1734-1735 | -13.5 | 0.03 | 1734-1735 | -19.5 | 0.03 |
| 1721-1725 | -23.5 | 1 | - | - | - | - | - | - |
| 1740-1744 | -23.5 | 1 | 1741-1745 | -8.5 | 1 | 1756-1760 | -8.5 | 1 |
| 1744-1745 | -11.5 | 1 | 1745-1746 | -11.5 | 1 | 1760-1775 | -11.5 | 1 |
| 1745-1749 | -8.5 | 1 | 1746-1750 | -23.5 | 1 | 1775-1780 | -23.5 | 1 |
| 1749-1750 | -13.5 | 0.03 | | | | | | |
| - | - | - | | | | | | |
| 1755-1756 | -13.5 | 0.03 | | | | | | |
| 1756-1760 | -8.5 | 1 | | | | | | |
| 1760-1761 | -11.5 | 1 | | | | | | |
| 1761-1765 | -23.5 | 1 | | | | | | |
| Note 1: At the boundary of spectrum emission limit, the first and last measurement position with a 30kHz filter is the inside of +0.015MHz and -0.015MHz, respectively. | | | | | | | | |
| Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively. | | | | | | | | |
| Note 3: MBW denotes Measurement Bandwidth with which the requirement has to be met. | | | | | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

### 6.6.2.1A.4 Spectrum emission mask for CA (3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

-Test Configuration Table is incomplete

-The Test applicability needs to be added to TS36.521-2

-Test Requirements Table is incomplete

#### 6.6.2.1A.4.1 Test purpose

To verify that the power of any UE emission shall not exceed specified lever for the specified channel bandwidth for CA.

#### 6.6.2.1A.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support 3UL with Intra-band contiguous CA or with Intra-band contiguous and Inter-band CA.

#### 6.6.2.1A.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.1A.0.

### 6.6.2.1A.4.4 Test description

#### 6.6.2.1A.4.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each channel bandwidth and are shown in table 6.6.2.1A.4.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.1A.4.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: Low Wgap, Maximum Wgap |
| Test CC Combination setting ($N_{RB}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

| Test Parameters for CA Configurations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ [MHz] | DL Allocation | | UL Allocation | | | | | |
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | | CC MOD | PCC & SCC RB allocation | CC MOD | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) |
| Test Parameters for CA_4A-4A Configurations | | | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@24 | 16QAM | S_1@24 |
| 2 | 25 | 25 | 35 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@0 | 16QAM | S_25@0 |
| 3 | 25 | 25 | 5 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@24 | 16QAM | S_1@24 |
| 4 | 25 | 25 | 5 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@0 | 16QAM | S_25@0 |
| 5 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@99 | 16QAM | S_1@99 |
| 6 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@75 | 16QAM | S_25@75 |
| 7 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_100@0 | 16QAM | S_100@0 | 16QAM | S_100@0 |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.1A.4.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.1A.4.4.3.

#### 6.6.2.1A.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels except PHICH.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.2.1A.4.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.1.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
6. Measure the mean power over all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in Table 6.2.3A.1.5-1. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.
7. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.2.1A.4.5-1 or 6.6.2.1A.4.5-2, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

#### 6.6.2.1A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.2.1A.4.5 Test Requirements

The measured UE mean power with the aggregated channel bandwidth as specified in clause 5.4.2A, derived in step 6, shall fulfil requirements in Table 6.2.3A.1.5-1 as appropriate, and the power of any UE emission shall fulfil requirements in Table.6.6.2.1A.4.5-1.

**Table 6.6.2.1A.4.5-1: E-UTRA spectrum emission mask for CA**

FFS

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.1B Spectrum Emission Mask for UL-MIMO

### 6.6.2.1B.1 Test purpose

To verify that the power of any UE emission at each transmit antenna shall not exceed specified lever for the specified channel bandwidth.

### 6.6.2.1B.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

### 6.6.2.1B.3 Minimum conformance requirements

For UE with multiple transmit antenna connectors, the requirements for the spectrum emission mask are specified at each transmit antenna connector. The spectrum emission mask of the UE applies to frequencies ($\Delta f_{OOB}$) starting from the edge of the assigned E-UTRA channel bandwidth. For frequencies greater than ($\Delta f_{OOB}$) as specified in Table 6.6.2.1B.3-1.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme , the requirements in Table 6.6.2.1B.3-1 apply to each transmit antenna connector with the UL-MIMO configurations specified in Table 6.2.2B.3-2.

**Table 6.6.2.1B.3-1: General E-UTRA spectrum emission mask**

| Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| ± 0-1 | -10 | -13 | -15 | -18 | -20 | -21 | 30 kHz |
| ± 1-2.5 | -10 | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.5-2.8 | -25 | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.8-5 | | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 5-6 | | -25 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 6-10 | | | -25 | -13 | -13 | -13 | 1 MHz |
| ± 10-15 | | | | -25 | -13 | -13 | 1 MHz |
| ± 15-20 | | | | | -25 | -13 | 1 MHz |
| ± 20-25 | | | | | | -25 | 1 MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The normative reference for this requirement is TS 36.101 clause 6.6.2B.

### 6.6.2.1B.4 Test description

#### 6.6.2.1B.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.1B.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.1B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] clause 4.1) | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] clause 4.3.1) | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] clause 4.3.1) | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| **Downlink Configuration** | | **Uplink Configuration** | | |
| Ch BW | N/A for SEM testing | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 1.4MHz | | QPSK | 5 | 5 |
| 1.4MHz | | 16QAM | 5 | 5 |
| 1.4MHz | | 16QAM | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 3MHz | | QPSK | 4 | 4 |
| 3MHz | | 16QAM | 4 | 4 |
| 3MHz | | 16QAM | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 5MHz | | QPSK | 8 | 8 |
| 5MHz | | 16QAM | 8 | 8 |
| 5MHz | | 16QAM | 25 | 25 |
| 10MHz | | QPSK | 50 | 50 |
| 10MHz | | QPSK | 12 | 12 |
| 10MHz | | 16QAM | 12 | 12 |
| 10MHz | | 16QAM | 50 (Note 4) | 50 (Note 4) |
| 15MHz | | QPSK | 75 | 75 |
| 15MHz | | QPSK | 16 | 16 |
| 15MHz | | 16QAM | 16 | 16 |
| 15MHz | | 16QAM | 75 (Note 4) | 75 (Note 4) |
| 20MHz | | QPSK | 100 | 100 |
| 20MHz | | QPSK | 18 | 18 |
| 20MHz | | 16QAM | 18 | 18 |
| 20MHz | | 16QAM | 100 (Note 4) | 100 (Note 4) |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: The allowed MPR for maximum output power UE might apply is described in clause 6.2.3B.3.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max+1 - RB allocation) of the channel bandwidth.
Note 4: Applies only for UE-Categories [FFS].

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.1B.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.1B.4.3.

#### 6.6.2.1B.4.2 Test procedure

1. SS sends uplink scheduling information via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.6.2.1B.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the sum of the mean power at each antenna connector of UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in clause 6.2.3B.5. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

4. Measure the power of the transmitted signal at each antenna connector of UE with a measurement filter of bandwidths according to table 6.6.2.1B.5-1 or 6.6.2.1B.5-2 as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

#### 6.6.2.1B.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.2.1B.5 Test requirements

The measured sum of mean power at each antenna connector of UE in the channel bandwidth, derived in step 3, shall fulfil requirements in clause 6.2.3B.5 as appropriate,

And the power of any UE emission at each transmit antenna connector shall fulfil requirements in Table.6.6.2.1B.5-1 or Table.6.6.2.1B.5-2 as applicable.

**Table 6.6.2.1B.5-1: General E-UTRA spectrum emission mask, E UTRA bands ≤ 3GHz**

| Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.1B.5-2: General E-UTRA spectrum emission mask, 3GHz < E UTRA bands ≤ 4.2GHz**

| Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.1E Spectrum Emission Mask for UE category 0

### 6.6.2.1E.1 Test purpose

Same test purpose as in clause 6.6.2.1.1.

### 6.6.2.1E.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.6.2.1E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.1.3.

### 6.6.2.1E.4 Test description

#### 6.6.2.1E.4.1 Initial conditions

Same initial conditions as in clause 6.6.2.1.4.1 with following exceptions:

- Instead of Table 6.6.2.1.4.1-1 → use Table 6.6.2.1E.4.1-1.
- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.6.2.1E.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | Low range, Mid range, High range | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for SEM testing | Mod'n | RB allocation | |
| | | | FDD and HD-FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 1.4MHz | | QPSK | 5 | 5 |
| 1.4MHz | | 16QAM | 5 | 5 |
| 3MHz | | QPSK | 15 | 15 |
| 3MHz | | QPSK | 4 | 4 |
| 3MHz | | 16QAM | 4 | 4 |
| 3MHz | | 16QAM | 5 | 5 |
| 5MHz | | QPSK | 25 | 25 |
| 5MHz | | QPSK | 8 | 8 |
| 5MHz | | 16QAM | 5 | 5 |
| 10MHz | | QPSK | 36 | 36 |
| 10MHz | | QPSK | 12 | 12 |
| 10MHz | | 16QAM | 5 | 5 |
| 15MHz | | QPSK | 36 | 36 |
| 15MHz | | QPSK | 16 | 16 |
| 15MHz | | 16QAM | 5 | 5 |
| 20MHz | | QPSK | 36 | 36 |
| 20MHz | | QPSK | 18 | 18 |
| 20MHz | | 16QAM | 5 | 5 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The allowed MPR for maximum output power UE might apply is described in clause 6.2.3.3.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max+1 - RB allocation) of the channel bandwidth. | | | | |

### 6.6.2.1E.4.2 Test procedure

Same test procedure as in clause 6.6.2.1.4.2 with following exception:

- Instead of Table 6.6.2.1.4.1-1 → use Table 6.6.2.1E.4.1-1.

### 6.6.2.1E.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.6.2.1E.5 Test requirements

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3E.5-1 as appropriate, and the power of any UE emission shall fulfil requirements in Table.6.6.2.1E.5-1 or Table.6.6.2.1E.5-2, as applicable.

**Table 6.6.2.1E.5-1: General E-UTRA spectrum emission mask, E-UTRA bands ≤ 3GHz**

| | **Spectrum emission limit (dBm)/ Channel bandwidth** |
|---|---|

| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
|---|---|---|---|---|---|---|---|
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.1E.5-2: General E-UTRA spectrum emission mask, 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.1EA Spectrum Emission Mask for UE category M1

### 6.6.2.1EA.1 Test purpose

To verify that the power of any UE emission shall not exceed specified lever for the specified channel bandwidth.

### 6.6.2.1EA.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

### 6.6.2.1EA.3 Minimum conformance requirements

The spectrum emission mask of the UE applies to frequencies ($\Delta f_{OOB}$) starting from the edge of the assigned E-UTRA channel bandwidth. For frequencies greater than ($\Delta f_{OOB}$) as specified in Table 6.6.2.1.3EA -1 the spurious requirements in clause 6.6.3EA are applicable.

The power of any UE emission shall not exceed the levels specified in Table 6.6.2.1.3EA -1 for the specified channel bandwidth.

**Table 6.6.2.1EA.3-1: General E-UTRA spectrum emission mask**

| Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| ± 0-1 | -10 | -13 | -15 | -18 | -20 | -21 | 30 kHz |
| ± 1-2.5 | -10 | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.5-2.8 | -25 | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.8-5 | | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 5-6 | | -25 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 6-10 | | | -25 | -13 | -13 | -13 | 1 MHz |
| ± 10-15 | | | | -25 | -13 | -13 | 1 MHz |
| ± 15-20 | | | | | -25 | -13 | 1 MHz |
| ± 20-25 | | | | | | -25 | 1 MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2.1.

### 6.6.2.1EA.4 Test description

#### 6.6.2.1EA.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.1EA.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2 respectively. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.1EA.4.1-1: Test Configuration mask**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, 10MHz, 15 MHz | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index (Note 1) |
| **Low range, Mid range** | | | | | |
| 1.4MHz | | QPSK | 2 | 2 | 0 |
| 1.4MHz | | QPSK | 5 | 5 | 0 |
| 1.4MHz | | QPSK | 6 | 6 | 0 |
| 1.4MHz | | 16QAM | 2 | 2 | 0 |
| 1.4MHz | | 16QAM | 5 | 5 | 0 |
| 3MHz | | QPSK | 2 | 2 | 0 |
| 3MHz | | QPSK | 5 | 5 | 0 |
| 3MHz | | QPSK | 6 | 6 | 0 |
| 3MHz | | 16QAM | 2 | 2 | 0 |
| 3MHz | | 16QAM | 5 | 5 | 0 |
| 5MHz | | QPSK | 6 | 6 | 0 |
| 5MHz (Note 4) | | 16QAM | 1 | 1 | 0 |
| 5MHz | | 16QAM | 3 | 3 | 0 |
| 5MHz | | 16QAM | 5 | 5 | 0 |
| 10MHz (Note 4) | | QPSK | 4 | 4 | 0 |
| 10MHz | | QPSK | 6 | 6 | 0 |
| 10MHz (Note 4) | | 16QAM | 3 | 3 | 0 |
| 10MHz | | 16QAM | 5 | 5 | 0 |
| 15MHz | | QPSK | 6 | 6 | 0 |
| 15MHz | | 16QAM | 5 | 5 | 0 |
| | | | | | |
| **High range** | | | | | |
| 1.4MHz | | QPSK | 2 | 2 | 0 |
| 1.4MHz | | QPSK | 5 | 5 | 0 |
| 1.4MHz | | QPSK | 6 | 6 | 0 |
| 1.4MHz | | 16QAM | 2 | 2 | 0 |
| 1.4MHz | | 16QAM | 5 | 5 | 0 |
| 3MHz | | QPSK | 2 | 2 | 1 |
| 3MHz | | QPSK | 5 | 5 | 1 |
| 3MHz | | QPSK | 6 | 6 | 1 |
| 3MHz | | 16QAM | 2 | 2 | 1 |
| 3MHz | | 16QAM | 5 | 5 | 1 |
| 5MHz | | QPSK | 6 | 6 | 3 |
| 5MHz (Note 4) | | 16QAM | 1 | 1 | 3 |
| 5MHz | | 16QAM | 3 | 3 | 3 |
| 5MHz | | 16QAM | 5 | 5 | 3 |
| 10MHz (Note 4) | | QPSK | 4 | 4 | 7 |
| 10MHz | | QPSK | 6 | 6 | 7 |
| 10MHz (Note 4) | | 16QAM | 3 | 3 | 7 |
| 10MHz | | 16QAM | 5 | 5 | 7 |
| 15MHz | | QPSK | 6 | 6 | 11 |
| 15MHz | | 16QAM | 5 | 5 | 11 |
| | | | | | |

| | |
|---|---|
| Note 1: | Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4 |
| Note 2: | Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. |
| Note 3: | The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. |
| Note 4: | Only for power class 3 UE. |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.1EA.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.6.2.1EA.4.3.

### 6.6.2.1EA.4.2 Test procedure

1. SS sends uplink scheduling information via PDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.6.2.1EA.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Tables 6.2.3EA.5-1 to 6.2.3EA.5-3. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods are not under test. Half-duplex guard sub frame are not under test.
4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.2.1EA.5-1, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

### 6.6.2.1EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA.

## 6.6.2.1EA.5 Test requirements

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Tables 6.2.3EA.5-1 to 6.2.3EA.5-3 as appropriate, and the power of any UE emission shall fulfil requirements in Table.6.6.2.1EA.5-1, as applicable.

**Table 6.6.2.1EA.5-1: General E-UTRA spectrum emission mask**

| | Spectrum emission limit (dBm)/ Channel bandwidth |
|---|---|

| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
|---|---|---|---|---|---|---|---|
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.1EB Spectrum Emission Mask for UE category 1bis

### 6.6.2.1EB.1 Test purpose

Same test purpose as in clause 6.6.2.1.1.

### 6.6.2.1EB.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category 1bis

### 6.6.2.1EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.1.3.

### 6.6.2.1EB.4 Test description

#### 6.6.2.1EB.4.1 Initial conditions

Same initial conditions as in clause 6.6.2.1.4.1 with following exceptions:

- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.6.2.1EB.4.2 Test procedure

Same test procedure as in clause 6.6.2.1.4.2 with following exception:

- Instead of Table 6.6.2.1.4.1-1 → use Table 6.6.2.1E.4.1-1.

#### 6.6.2.1EB.4.3 Message contents

Message contents same as in clause 6.6.2.1.4.3.

### 6.6.2.1EB.5 Test requirements

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3EB.5-1 as appropriate, and the power of any UE emission shall fulfil requirements in Table.6.6.2.1EB.5-1 or Table.6.6.2.1EB.5-2, as applicable.

**Table 6.6.2.1EB.5-1: General E-UTRA spectrum emission mask, E-UTRA bands ≤ 3GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.1EB.5-2: General E-UTRA spectrum emission mask, 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.1F Spectrum Emission Mask for category NB1 and NB2

### 6.6.2.1F.1 Test purpose

To verify that the power of the category NB1 and NB2 UE emission shall not exceed specified level for the specified channel bandwidth.

### 6.6.2.1F.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

### 6.6.2.1F.3 Minimum conformance requirements

The spectrum emission mask of the category NB1 and NB2 UE applies to frequencies ($\Delta f_{OOB}$) starting from the ± edge of the assigned category NB1 or NB2 channel bandwidth. For frequencies greater than ($\Delta f_{OOB}$) as specified in Table 6.6.2.1F.3-1 the spurious requirements in subclause 6.6.3 are applicable.

The power of any category NB1 or NB2 UE emission shall not exceed the levels specified in Table 6.6.2.1F.3-1.

**Table 6.6.2.1F.3-1: category NB1 and NB2 UE spectrum emission mask**

| $\Delta f_{OOB}$ (kHz) | Emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| ± 0 | 26 | 30 kHz |
| ± 100 | -5 | 30 kHz |
| ± 150 | -8 | 30 kHz |
| ± 300 | -29 | 30 kHz |
| ± 500-1700 | -35 | 30 kHz |

In addition to the spectrum emission mask requirement in Table 6.6.2.1F.3-1 a category NB1 or NB2 UE shall also meet the applicable E-UTRA spectrum emission mask requirement in sub-clause 6.6.2. E-UTRA spectrum emission requirement applies for frequencies that are Foffset away from edge of NB1 or NB2 channel edge as defined in Table 6.6.2.1F.3-2.

**Table 6.6.2.1F.3-2: Foffset for category NB1 and NB2 UE spectrum emission mask**

| Channel BW (MHz) | Foffset [kHz] |
|---|---|
| 1.4 | 165 |
| 3 | 190 |
| 5 | 200 |
| 10 | 225 |
| 15 | 240 |
| 20 | 245 |

NOTE: Foffset in Table 6.6.2.1F.3-2 is used to guarantee co-existence for guard-band operation.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2F.1.

### 6.6.2.1F.4 Test description

#### 6.6.2.1F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test

parameters shown in table 6.6.2.1F.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.1F.4.1-1: Test Configuration Table**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 8.1.1 | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.2 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A | Modulation | $N_{tones}$ | Sub-carrier spacing (kHz) |
| 1 | | QPSK | 1@0 | 3.75kHz |
| 2 | | QPSK | 1@47 | 3.75kHz |
| 3 | | QPSK | 1@0 | 15kHz |
| 4 | | QPSK | 1@11 | 15kHz |
| 5 (Note 1) | | QPSK | 3@0 | 15kHz |
| 6 (Note 1) | | QPSK | 3@3 | 15kHz |
| 7 (Note 1) | | QPSK | 3@9 | 15kHz |
| 8 (Note 1) | | QPSK | 6@0 | 15kHz |
| 9 (Note 1) | | QPSK | 6@6 | 15kHz |
| 10 (Note 1) | | QPSK | 12@0 | 15kHz |
| Note 1: The allowed MPR for maximum output power UE might apply is described in clause [6.2.3F.3]. | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3 using only main Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1.1 and H.4.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.1F.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.6.2.1F.4.3.

### 6.6.2.1F.4.2 Test procedure

1. SS sends uplink scheduling information via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.1F.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. (UE should be already transmitting $P_{UMAX}$ after Initial Conditions setting).
2. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3F.5-1. The measurement duration is at least one sub-frame **(**1ms) for 15 KHz channel spacing, and at least a 2ms slot (excluding the 2304Ts gap when UE is not transmitting) respectively for the 3.75 KHz channel spacing.
3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.2.1F.5-1 as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

NOTE 1: For configuration IDs applicable to UE depending on UE capability in Test Configuration Table with different UL sub-carrier spacing, the SS shall release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the appropriate UL subcarrier spacing in Random Access Response message.

#### 6.6.2.1F.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6.

### 6.6.2.1F.5 Test requirements

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3F.5-1 as appropriate, and the power of any UE emission shall fulfil requirements in 6.6.2.1F.5-1 as applicable.

**Table 6.6.2.1F.5-1: category NB1 and NB2 UE spectrum emission mask, category NB1/NB2 bands ≤ 3GHz**

| $\Delta f_{OOB}$ (kHz) | Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| 0 -100 | $(27.5 + (F - 0) \times \frac{-3.5 - 27.5}{100 - 0})$ | 30 kHz |
| 100 - 150 | $(-3.5 + (F - 100) \times \frac{-6.5 - (-3.5)}{150 - 100})$ | 30 kHz |
| 150 - 300 | $(-6.5 + (F - 150) \times \frac{-27.5 - (-6.5)}{300 - 150})$ | 30 kHz |
| 300 - 500 | $(-27.5 + (F - 300) \times \frac{-33.5 - (-27.5)}{500 - 300})$ | 30 kHz |
| 500 - 1700 | -33.5 | 30 kHz |
| Note 1: The limit shall be calculated for the measurement frequency F given in kHz, cantered in the measurement bandwidth. | | |
| Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 30 kHz filter is the inside of +15 kHz and -15 kHz, respectively. The filter shall be stepped to cover the whole range. | | |

**Table 6.6.2.1F.5-2: Void**

NOTE 1: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 2: The minimum requirements in clause 6.6.2.1F.3 have been combined into table 6.6.2.1F.5-1 to reduce testing complexity and test time.

## 6.6.2.1G Spectrum Emission Mask for V2X Communication

### 6.6.2.1G.1 Spectrum Emission Mask for V2X Communication Non-concurrent with E-UTRA uplink transmissions

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

#### 6.6.2.1G.1.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth when UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands.

#### 6.6.2.1G.1.2 Test applicability

This test case applies to UE which support V2X Sidelink communication and Band 47.

### 6.6.2.1G.1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in TS 36.101 [2] Table 5.5G-1, the requirements in TS 36.101[2] subclause 6.6.2 apply except for the ACLR requirements for power class 2 V2X UE.

The spectrum emission mask of the UE applies to frequencies (ΔfOOB) starting from the edge of the assigned E-UTRA channel bandwidth. The power of any UE emission shall not exceed the levels specified in Table 6.6.2.1G.1.3-1.

**Table 6.6.2.1G.1.3-1: General E-UTRA spectrum emission mask**

| Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| ± 0-1 | -10 | -13 | -15 | -18 | -20 | -21 | 30 kHz |
| ± 1-2.5 | -10 | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.5-2.8 | -25 | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.8-5 | | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 5-6 | | -25 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 6-10 | | | -25 | -13 | -13 | -13 | 1 MHz |
| ± 10-15 | | | | -25 | -13 | -13 | 1 MHz |
| ± 15-20 | | | | | -25 | -13 | 1 MHz |
| ± 20-25 | | | | | | -25 | 1 MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2G.

### 6.6.2.1G.1.4 Test description

#### 6.6.2.1G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2G. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.1G.1.4.1-1 the details of the V2X reference measurement channels (RMCs) are specified in sub-clause A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.6.2.1G.1.4.1-1: Test Configuration for V2X sidelink transmission**

| Initial Conditions | | |
|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | Low range, Mid range, High range |
| Test Channel Bandwidths (as specified in subclause 5.4.2G) | | Lowest, Mid, Highest |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X sidelink transmission** | |
| Ch BW | Mod'n | RB Allocation |
| 10MHz | QPSK | 12 |
| 10MHz | QPSK | 48 |
| 10MHz | 16QAM | 12 |
| 10MHz | 16QAM | 48 |
| 20MHz | QPSK | 18 |
| 20MHz | QPSK | 96 |
| 20MHz | 16QAM | 18 |
| 20MHz | 16QAM | 96 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in specified in subclause 5.4.2G. Note 2: The allowed MPR for maximum output power UE might apply is described in clause 36.101[2] subclause 6.2.3G. Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max+1 - RB allocation) of the channel bandwidth. | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 for both SS and UE are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.6.2.1G.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.6.2.1G.1.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE
5. Propagation conditions are set according to Annex B.0;
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9 , Message contents are defined in clause 6.6.2.1G.1.4.3
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.6.2.1G.1.4.2 Test procedure

1. The V2X UE schedules the V2X RMC with transmission power at $P_{UMAX}$ level according to *SL-V2X-Preconfiguration* which is in line with the test configuration in Table 6.6.2.1G.1.4.1-1;
2. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3G.1.1.5-1for Power Class 3 UEs or in [6.2.3G.2.1.5-1] for Power Class 2 UEs. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.
3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.2.1G.1.5-1. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

### 6.6.2.1G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with following exceptions listed in the Table 6.6.2.1G.1.4.3-1 and Table 6.6.2.1G.1.4.3-2.

**Table 6.6.2.1G.1.4.3-1: SL-V2X-Preconfiguration**

| Derivation Path: 36.331 clause 9.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-Preconfiguration-r14 ::= SEQUENCE { | | | |
| v2x-PreconfigFreqList-r14 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | SL-PreconfigGeneral-r12 | |
| maxTxPower-r12 | 23 | | Power class3 |
| | 26 | | Power class2 |
| sl-bandwidth-r12 | n50 | 10Mhz | |
| | n100 | 20Mhz | |
| } | | | |
| } | | | |
| v2x-CommPreconfigSync-r14 SEQUENCE { | | SL-PreconfigSync-r12 | |
| syncOffsetIndicators-r14 SEQUENCE { | | | |
| syncOffsetIndicator1-r14 | Not Present | Double synchronization signal transmission | |
| } | | | |
| } | | | |
| v2x-CommRxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry | | |
| SL-V2X-PreconfigCommPool-r14[1] | SL-CommResourcePoolV2X-r14-DEFAULT with exception listed in Table 6.6.2.1G.1.4.3-2 | | |
| } | | | |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | | | |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14-DEFAULT with exception listed in Table 6.6.2.1G.1.4.3-2 | | |
| } | | | |
| v2x-ResourceSelectionConfig | SL-CommTxPoolSensingConfig-r14-DEFAULT with exception listed in Table 6.6.2.1G.1.4.3-3 | | |
| } | | | |

**Table 6.6.2.1G.1.4.3-2: SL-V2X-PreconfigCommPool-r14-DEFAULT**

| Derivation Path: 36.331 clause 6.3.8 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResroucePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-Subframe-r14 CHOICE { | | | |
| bs20-r14 | 11111111111111111111 | | BITMAP_6 |
| } | | | |
| sizeSubchannel-r14 | N12 | | BW10 |
| | N48 | | BW10 |
| | N18 | | BW20 |
| | N96 | | BW20 |
| numSubchannel-r14 | n1 | | |
| dataTxParameters-r14 SEQUENCE { | | | |
| p0-r12 | 31 | It's set to the maximum value to disable its effect on transmission power. | |
| | | | |
| } | | | |
| } | | | |

**Table 6.6.2.1G.1.4.3-2: SL-PSSCH-TxParameters-r14**

| Derivation Path: 36.331 clause 6.3.8 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-PSSCH-TxParameters-r14 ::= SEQUENCE { | | | |
| minMCS-PSSCH-r14 | 0 | | QPSK |
| | 11 | | 16QAM |
| maxMCS-PSSCH-r14 | 10 | | QPSK |
| | 19 | | 16QAM |
| } | | | |

### 6.6.2.1G.1.5 Test requirements

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3G.1.1.5-1as appropriate, and the power of any UE emission shall fulfil requirements in Table.6.6.2.1G.1.5-1.

**Table 6.6.2.1G.1.5-1: General E-UTRA spectrum emission mask, E-UTRA bands ≥ 5GHz**

| **Spectrum emission limit (dBm)/ Channel bandwidth** | | | |
|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **10 MHz** | **20 MHz** | **Measurement bandwidth** |
| ± 0-1 | -16 | -19 | 30 kHz |
| ± 1-2.5 | -8 | -8 | 1 MHz |
| ± 2.5-2.8 | -8 | -8 | 1 MHz |
| ± 2.8-5 | -8 | -8 | 1 MHz |
| ± 5-6 | -12 | -11 | 1 MHz |
| ± 6-10 | -12 | -11 | 1 MHz |
| ± 10-15 | -23 | -11 | 1 MHz |
| ± 15-20 | | -11 | 1 MHz |
| ± 20-25 | | -23 | 1 MHz |
| Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.<br>Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.<br>Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

### 6.6.2.1G.2 Spectrum Emission Mask for V2X Communication /Sidelink simultaneous with E-UTRA uplink transmissions

#### 6.6.2.1G.2.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth when UE is configured for configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA band

#### 6.6.2.1G.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that supports V2X communication and is capable of V2X sidelink communication simultaneous with E-UTRA uplink/downlink.

#### 6.6.2.1G.2.3 Minimum conformance requirements

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in TS 36.101 [2] Table 5.5G-2, the requirements in TS 36.101 [2] subclause 6.6.2 apply per V2X sidelink transmission and E-UTRA uplink transmission as specified for the corresponding inter-band con-current operation with uplink assigned to two bands.

Consequently, the emission power of the V2X UE per sidelink and E-UTRA link shall not exceed the values specified in Tables 6.6.2.1G.2.2-1

**Table 6.6.2.1G.2.2-1 General E-UTRA spectrum emission mask**

| Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| ± 0-1 | -10 | -13 | -15 | -18 | -20 | -21 | 30 kHz |
| ± 1-2.5 | -10 | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.5-2.8 | -25 | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.8-5 | | -10 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 5-6 | | -25 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 6-10 | | | -25 | -13 | -13 | -13 | 1 MHz |
| ± 10-15 | | | | -25 | -13 | -13 | 1 MHz |
| ± 15-20 | | | | | -25 | -13 | 1 MHz |
| ± 20-25 | | | | | | -25 | 1 MHz |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.2G and subclause 6.6.2.

#### 6.6.2.1G.2.4 Test description

##### 6.6.2.1G.2.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on Inter-band con-current V2X configurations specified in table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.1G.2.1.4.1-1. The details of the uplink and V2X reference measurement channels (RMCs) are specified in sub-clause A.2 and A.8.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.1G.2.4.1-1: Test Configuration**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | Normal | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range for uplink and Low range for V2X, High range for uplink and High range for V2X | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink** | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4MHz | | QPSK | 5 | 10 MHz | QPSK | 48@2 |
| 1.4MHz | | QPSK | 6 | 10 MHz | 16QAM | 48@2 |
| 1.4MHz | | 16QAM | 5 | 20 MHz | QPSK | 96@2 |
| 1.4MHz | | 16QAM | 6 | 20 MHz | 16QAM | 96@2 |
| 3MHz | | QPSK | 4 | | | |
| 3MHz | | QPSK | 15 | | | |
| 3MHz | | 16QAM | 4 | | | |
| 3MHz | | 16QAM | 15 | | | |
| 5MHz | | QPSK | 8 | | | |
| 5MHz | | QPSK | 25 | | | |
| 5MHz | | 16QAM | 8 | | | |
| 5MHz | | 16QAM | 25 | | | |
| 10MHz | | QPSK | 12 | | | |
| 10MHz | | QPSK | 50 | | | |
| 10MHz | | 16QAM | 12 | | | |
| 10MHz | | 16QAM | 50 (Note 3) | | | |
| 15MHz | | QPSK | 16 | | | |
| 15MHz | | QPSK | 75 | | | |
| 15MHz | | 16QAM | 16 | | | |
| 15MHz | | 16QAM | 75 (Note 3) | | | |
| 20MHz | | QPSK | 18 | | | |
| 20MHz | | QPSK | 100 | | | |
| 20MHz | | 16QAM | 18 | | | |
| 20MHz | | 16QAM | 100 (Note 3) | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | |
| Note 2: For Low range the E-UTRA carrier uses only test points with RBstart=0. For High range the E-UTRA carrier uses only test points with RBstart=RBmax-LCRB+1. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.6.2.1G.2.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to table 6.6.2.1G.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 6.2.3G.1.3.4.3.

### 6.6.2.1G.2.4.2 Test procedure

SS sends RRC reconfiguration message specified in clause 6.6.2.1G.2.4.3 to enable PSCCH and PSSCH transmission at the $P_{UMAX}$ level.;

1. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.6.2.1G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.

2. SS sends continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX}$ level.

3. Measure the power of the transmitted signal for E-UTRA uplink with a measurement filter of bandwidths according to table 6.6.2.1G.2.5-1or 6.6.2.1G.2.5-2, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

4. Measure the power of the transmitted signal for V2X sidelink with a measurement filter of bandwidths according to table 6.6.2.1G.2.5-3, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

### 6.6.2.1G.2.4.3 Message content

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.2.1G.2.5 Test requirements

The measured UE mean power in the channel bandwidth, derived in step 3 and step 4 shall fulfil requirements in Table 6.2.3G.1.3.5-1, and the power of any UE emission shall fulfil requirements in Table 6.6.2.1G.1.5-1~ Table 6.6.2.1G.2.5-3.

**Table 6.6.2.1G.2.5-1: General E-UTRA spectrum emission mask, E-UTRA bands ≤ 3GHz**

| | **Spectrum emission limit (dBm)/ Channel bandwidth** | | | | | | |
|---|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |
| Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz. | | | | | | | |
| Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively. | | | | | | | |
| Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel | | | | | | | |
| Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz. | | | | | | | |

**Table 6.6.2.1G.2.5-2: General E-UTRA spectrum emission mask, 3GHz < E-UTRA bands ≤ 4.2GHz**

| | **Spectrum emission limit (dBm)/ Channel bandwidth** |
|---|---|

| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
|---|---|---|---|---|---|---|---|
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.1G.2.5-3: General E-UTRA V2X spectrum emission mask, E-UTRA bands ≥ 5GHz**

| Spectrum emission limit (dBm)/ Channel bandwidth | | | |
|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 10 MHz | 20 MHz | Measurement bandwidth |
| ± 0-1 | -16 | -19 | 30 kHz |
| ± 1-2.5 | -8 | -8 | 1 MHz |
| ± 2.5-2.8 | -8 | -8 | 1 MHz |
| ± 2.8-5 | -8 | -8 | 1 MHz |
| ± 5-6 | -12 | -11 | 1 MHz |
| ± 6-10 | -12 | -11 | 1 MHz |
| ± 10-15 | -23 | -11 | 1 MHz |
| ± 15-20 | | -11 | 1 MHz |
| ± 20-25 | | -23 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.1G.3 Spectrum Emission Mask for V2X Communication / Intra-band contiguous MCC operation

### 6.6.2.1G.3.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth when UE is configured for Intra-band contiguous MCC operation V2X sidelink transmissions.

### 6.6.2.1G.3.2 Test Applicability

This test case applies to UE which support Intra-band contiguous multi-carrier operation V2X Sidelink communication and Band 47.

#### 6.6.2.1G.3.3 Minimum conformance requirements

For intra-band contiguous multi-carrier operation, the general CA spectrum emission mask for Bandwidth Class B shall apply, which refers to the minimum conformance requirements defined in clause 6.6.2.1A.0.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2G.

#### 6.6.2.1G.3.4 Test Description

##### 6.6.2.1G.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2G. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.1G.3.4.1-1 the details of the V2X reference measurement channels (RMCs) are specified in sub-clause A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.6.2.1G.3.4.1-1: Test Configuration Table for PSSCH and PSCCH**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | | | Low range, Mid range , High range | |
| Test Channel Bandwidths as specified in subclause 5.4.2G | | | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for V2X MCC Configuration** | | | | | | |
| **V2X MCC Channel Bandwidth** | | | **V2X Sidelink Configuration** | | | |
| **Configuration ID** | **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **$N_{RB_alloc}$** | **CC1 and CC2 RB Allocation (LCRB @ RBstart)** | |
| 1 | 50 | 50 | QPSK | 12 | CC1_12@0 | CC2_0@0 |
| 1a | 50 | 50 | QPSK | 12 | CC1_0@0 | CC2_12@38 |
| 2 | 50 | 50 | QPSK | 48 | CC1_48@0 | CC2_0@0 |
| 2a | 50 | 50 | QPSK | 48 | CC1_0@0 | CC2_48@2 |
| 3 | 50 | 50 | QPSK | 96 | CC1_48@0 | CC2_48@2 |
| 4 | 50 | 50 | 16QAM | 12 | CC1_12@0 | CC2_0@0 |
| 4a | 50 | 50 | 16QAM | 12 | CC1_0@0 | CC2_12@38 |
| 5 | 50 | 50 | 16QAM | 48 | CC1_48@0 | CC2_0@0 |
| 5a | 50 | 50 | 16QAM | 48 | CC1_0@0 | CC2_48@2 |
| 6 | 50 | 50 | 16QAM | 96 | CC1_48@0 | CC2_48@2 |
| 7 | 50 | 50 | QPSK | 2 | CC1_1@0 | CC2_1@49 |
| Note1: The starting resource block shall be RB #0 and RB# (max+1 - RB allocation) of the aggregated channel bandwidth, each correspond to configuration ID n or na, n = 1,2,4,5. | | | | | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Figure A.89a.

2. Propagation conditions are set according to Annex B.0.

2a The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

3. Ensure the UE is in test state 5A-V2X, according to TS 36.508 [7] clause 4.5.9. Message contents are defined in clause 6.6.2.1G.3.4.3.

4. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

##### 6.6.2.1G.3.4.2 Test procedure

1. Set the V2X sidelink communication parameters for both the V2X sidelink capable UE (hereinafter referred to as V2X UE) and SS according to *SL-V2X-Preconfiguration* in TS36.508[7] Table subclause 4.10 with the exception specified in table 6.6.2.1G.3.4.3-1;

2. The V2X UE schedules the V2X RMC with transmission power at $P_{UMAX}$ level according to *SL-V2X-Preconfiguration* which is in line with the test configuration in Table 6.6.2.1G.3.4.1-1;

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3G.1.1.5-1 for Power Class 3 UEs or in [6.2.3G.2.1.5-1] for Power Class 2 UEs. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.2.1G.3.5-1. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

### 6.6.2.1G.3.4.3 Message Contents

Message content are according to 36.508[7] subclause 4.10 Table 4.10.1.1-2 with the exception listed in table 6.6.2.1G.3.4.3-1, 6.6.2.1G.3.4.3-2 and 6.6.2.1G.3.4.3-3

**Table 6.6.2.1G.3.4.3-1: SL-V2X-PreconfigFreqInfo-r14-DEFAULT for CC1 & CC2**

| Derivation Path: 36.331 clause 9.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigFreqInfo-r14-DEFAULT ::= SEQUENCE { | | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | SL-PreconfigGeneral-r12 | |
| maxTxPower-r12 | 23 | | Power class 3 |
| sl-bandwidth-r12 | n50 | 10Mhz | V2X_47B |
| } | | | |
| } | | | |
| v2x-CommRxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry | | |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14-DEFAULT using condition BITMAP_6 and exception listed in Table 6.6.2.1G.3.4.3-2 | SL-V2X-PreconfigCommPool-r14 | |
| } | | | |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | | | |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14-DEFAULT using condition BITMAP_6 and exception listed in Table 6.6.2.1G.3.4.3-2 | | |
| } | | | |
| v2x-ResourceSelectionConfig | SL-CommTxPoolSensingConfig-r14-DEFAULT with exception listed in Table 6.6.2.1G.3.4.3-3 | | |
| syncPriority-r14 | GNSS | | |
| } | | | |

**Table 6.6.2.1G.3.4.3-2: SL-V2X-PreconfigCommPool-r14-DEFAULT**

| Derivation Path: 36.331 clause 6.3.8 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResroucePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-Subframe-r14 CHOICE { | | | |
| bs20-r14 | 1111111111111111111 | | BITMAP_6 |
| } | | | |
| sizeSubchannel-r14 | n1 | | $N_{RB_alloc} = 1$ |
| | n12 | | $N_{RB_alloc} = 12$ |
| | n48 | | $N_{RB_alloc} = 48$, $N_{RB_alloc} = 96$ |
| numSubchannel-r14 | n1 | | |
| startRB-Subchannel-r14 | According to the test configuration in table 6.6.2.1G.3.4.1-1 | | |
| dataTxParameters-r14 SEQUENCE { | | | |
| p0-r12 | 31 | It's set to the maximum value to disable its effect on transmission power. | |
| } | | | |
| syncAllowed-r14 ::= SEQUENCE { | | | |
| gnss-Sync-r14 | True | The resource of CC1 can be used if the UE is directly or indirectly synchronized to GNSS | CC with LCRB >0 |
| enb-Sync-r14 | True | The resource of CC1 can be used if the UE is directly or indirectly synchronized to enb | CC with LCRB =0 |
| } | | | |
| } | | | |

**Table 6.6.2.1G.3.4.3-3: SL-PSSCH-TxParameters-r14**

| Derivation Path: 36.331 clause 6.3.8 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-PSSCH-TxParameters-r14 ::= SEQUENCE { | | | |
| minMCS-PSSCH-r14 | 0 | | QPSK |
| | 11 | | 16QAM |
| maxMCS-PSSCH-r14 | 10 | | QPSK |
| | 19 | | 16QAM |
| } | | | |

#### 6.6.2.1G.3.5 Test Requirement

The power of any UE emission shall fulfil requirements in Table 6.6.2.1G.3.5-1 Bandwidth Class B.

**Table 6.6.2.1G.3.5-1: General E-UTRA spectrum emission mask for CA Bandwidth Class B, E-UTRA bands > 5GHz**

| Spectrum emission limit [dBm]/$BW_{Channel_CA}$ | | |
|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 50RB+50RB (19.9 MHz) | Measurement bandwidth |
| ± 0-1 | 19 | 30 kHz |
| ± 1-5 | 8 | 1 MHz |
| ± 5-14.95 | 11 | 1 MHz |
| ± 14.95-19.90 | 11 | 1 MHz |
| ± 19.90-19.95 | 23 | 1 MHz |
| ± 19.95-24.90 | 23 | 1 MHz |

## 6.6.2.2 Additional Spectrum Emission Mask

### 6.6.2.2.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth under the deployment scenarios where additional requirements are specified.

### 6.6.2.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 8 and forward.

### 6.6.2.2.3 Minimum conformance requirements

#### 6.6.2.2.3.1 Minimum requirement (network signalled value "NS_03", “NS_11”, “NS_20” and “NS_21”)

When "NS_03", “NS_11”, “NS_20” or “NS_21” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.3.1-1.

**Table 6.6.2.2.3.1-1: Additional requirements (network signalled value "NS_03", “NS_11”, “NS_20” and “NS_21”)**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| ± 0-1 | -10 | -13 | -15 | -18 | -20 | -21 | 30 kHz |
| ± 1-2.5 | -13 | -13 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 2.5-2.8 | -25 | -13 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 2.8-5 | | -13 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 5-6 | | -25 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 6-10 | | | -25 | -13 | -13 | -13 | 1 MHz |
| ± 10-15 | | | | -25 | -13 | -13 | 1 MHz |
| ± 15-20 | | | | | -25 | -13 | 1 MHz |
| ± 20-25 | | | | | | -25 | 1 MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2.2.1.

6.6.2.2.3.2 Minimum requirement (network signalled value "NS_04")

When "NS_04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.3.2-1. or Table 6.6.2.2.3.2-2

**Table 6.6.2.2.3.2-1: Additional requirements (network signalled value "NS_04") (Rel-11 and earlier)**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| ± 0-1 | -10 | -13 | -15 | -18 | -20 | -21 | 30 kHz |
| ± 1-2.5 | -13 | -13 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 2.5-2.8 | -25 | -13 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 2.8-5 | | -13 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 5-6 | | -25 | -25 | -25 | -25 | -25 | 1 MHz |
| ± 6-10 | | | -25 | -25 | -25 | -25 | 1 MHz |
| ± 10-15 | | | | -25 | -25 | -25 | 1 MHz |
| ± 15-20 | | | | | -25 | -25 | 1 MHz |
| ± 20-25 | | | | | | -25 | 1 MHz |

**Table 6.6.2.2.3.2-2: Additional requirements (network signalled value "NS_04") (Rel-12 and onwards)**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| ± 0-1 | -15 | -18 | -20 | -21 | 30 kHz |
| ± 1-2.5 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.5-2.8 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 2.8-5 | -10 | -10 | -10 | -10 | 1 MHz |
| ± 5-6 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 6-9 | -25 | -13 | -13 | -13 | 1 MHz |
| ± 9-10 | -25 | -25 | -13 | -13 | 1 MHz |
| ± 10-13.5 | | -25 | -13 | -13 | 1 MHz |
| ± 13.5-15 | | -25 | -25 | -13 | 1 MHz |
| ± 15-18 | | | -25 | -13 | 1 MHz |
| ± 18-20 | | | -25 | -25 | 1 MHz |
| ± 20-25 | | | | -25 | 1 MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2.2.2.

6.6.2.2.3.3 Minimum requirement (network signalled value "NS_06" or NS_07)

When "NS_06" or "NS_07" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.3.3-1.

**Table 6.6.2.2.3.3-1: Additional requirements (network signalled value "NS_06" or "NS_07")**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | Measurement bandwidth |
| ± 0-0.1 | -13 | -13 | -15 | -18 | 30 kHz |
| ± 0.1-1 | -13 | -13 | -13 | -13 | 100 kHz |
| ± 1-2.5 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 2.5-2.8 | -25 | -13 | -13 | -13 | 1 MHz |
| ± 2.8-5 | | -13 | -13 | -13 | 1 MHz |
| ± 5-6 | | -25 | -13 | -13 | 1 MHz |
| ± 6-10 | | | -25 | -13 | 1 MHz |
| ± 10-15 | | | | -25 | 1 MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2.2.3.

### 6.6.2.2.3.4 Minimum requirement (network signalled value “NS_27”)

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When “NS_27” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.3.4-1.

**Table 6.6.2.2.3.4-1: Additional requirements (network signalled value "NS_27")**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| ± 0-1 | -13 | -13 | -13 | -13 | Note 1 |
| ± 1-10 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 10-15 | | -25 | -25 | -25 | 1 MHz |
| ± 15-20 | | | -25 | -25 | 1 MHz |
| ± 20-25 | | | | -25 | 1 MHz |
| Note 1: The measurement bandwidth is 1% of the applicable E-UTRA channel bandwidth. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2.2.5.

### 6.6.2.2.3.5 Minimum requirement (network signalled value “NS_35”)

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_35" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.3.5-1.

**Table 6.6.2.2.3.5-1: Additional requirements (network signalled value "NS_35")**

| $\Delta f_{OOB}$ (MHz) | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth (unless otherwise stated) |
|---|---|---|---|---|---|
| ± 0-0.1 | -15 | -18 | -20 | -21 | 30 kHz |
| ± 0.1-6 | -13 | -13 | -13 | -13 | 100 kHz |
| ± 6-10 | -25[1] | -13 | -13 | -13 | 100 kHz |
| ± 10-15 | | -25[1] | -13 | -13 | 100 kHz |
| ± 15-20 | | | -25[1] | -13 | 100 kHz |
| ± 20-25 | | | | -25 | 1 MHz |
| Note 1: The measurement bandwidth shall be 1 MHz | | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.2.4 Test description

### 6.6.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Tables 6.6.2.2.4.1-1 through 6.6.2.2.4.1-11. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.2.4.1-1: Test Configuration Table (network signalled value "NS_03")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | N/A for Additional Spectrum Emission Mask testing. | | | QPSK | 6 | 6 |
| 1.4MHz | | | | QPSK | 5 | 5 |
| 1.4MHz | | | | 16QAM (Note 4) | 5 | 5 |
| 3MHz | | | | QPSK | 15 | 15 |
| 3MHz | | | | QPSK | 4 | 4 |
| 3MHz | | | | 16QAM (Note 4) | 15 | 15 |
| 3MHz | | | | 16QAM (Note 4) | 4 | 4 |
| 5MHz | | | | QPSK | 25 | 25 |
| 5MHz | | | | QPSK | 8 | 8 |
| 5MHz | | | | QPSK | 6 | 6 |
| 5MHz | | | | 16QAM (Note 4) | 25 | 25 |
| 5MHz | | | | 16QAM (Note 4) | 8 | 8 |
| 10MHz | | | | QPSK | 50 | 50 |
| 10MHz | | | | QPSK | 12 | 12 |
| 10MHz | | | | QPSK | 6 | 6 |
| 10MHz | | | | 16QAM (Note 4) | 50 (Note 3) | 50 (Note 3) |
| 10MHz | | | | 16QAM (Note 4) | 12 | 12 |
| 15MHz | | | | QPSK | 75 | 75 |
| 15MHz | | | | QPSK | 16 | 16 |
| 15MHz | | | | QPSK | 8 | 8 |
| 15MHz | | | | 16QAM (Note 4) | 75 (Note 3) | 75 (Note 3) |
| 15MHz | | | | 16QAM (Note 4) | 16 | 16 |
| 20MHz | | | | QPSK | 100 | 100 |
| 20MHz | | | | QPSK | 18 | 18 |
| 20MHz | | | | QPSK | 10 | 10 |
| 20MHz | | | | 16QAM (Note 4) | 100 (Note 3) | 100 (Note 3) |
| 20MHz | | | | 16QAM (Note 4) | 18 | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

Note 3: Applies only for UE-Categories ≥2.

Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.2.2.4.1-2: Test Configuration Table (network signalled value "NS_04", Power Class 2)**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range<br>Additional test frequencies:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866 | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_04 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation TDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 (Note 1) | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 (Note 1) | 5MHz | | | QPSK | 16 | 9 |
| 3 (Note 2) | 5MHz | | | QPSK | 25 | 0 |
| 4 (Note 1) | 5MHz | | | 16QAM | 16 | 9 |
| 5 (Note 2) | 5MHz | | | 16QAM | 25 | 0 |
| 6 (Note 1) | 10MHz | | | QPSK | 1 | 0 |
| 7 (Note 1) | 10MHz | | | QPSK | 1 | 49 |
| 8 (Note 1) | 10MHz | | | QPSK | 24 | 0 |
| 9 (Note 1) | 10MHz | | | QPSK | 40 | 10 |
| 10 | 10MHz | | | QPSK | 50 | 0 |
| 11 | 10MHz | | | 16QAM | 50 | 0 |
| 12 (Note 1) | 15MHz | | | QPSK | 1 | 0 |
| 13 (Note 1) | 15MHz | | | QPSK | 1 | 74 |
| 14 (Note 1) | 15MHz | | | QPSK | 32 | 0 |
| 15 (Note 1) | 15MHz | | | QPSK | 60 | 15 |
| 16 | 15MHz | | | QPSK | 75 | 0 |
| 17 | 15MHz | | | 16QAM | 75 | 0 |
| 18 (Note 1) | 20MHz | | | QPSK | 1 | 0 |
| 19 (Note 1) | 20MHz | | | QPSK | 1 | 99 |
| 20 (Note 1) | 20MHz | | | QPSK | 36 | 0 |
| 21 (Note 1) | 20MHz | | | QPSK | 75 | 25 |
| 22 | 20MHz | | | QPSK | 100 | 0 |
| 23 | 20MHz | | | 16QAM | 100 | 0 |
| Note 1: Only applicable for Low Range.<br>Note 2: Only applicable for Mid, High Range and additional test frequencies. | | | | | | |

**Table 6.6.2.2.4.1-3: Test Configuration Table (network signalled value "NS_04", Power Class 3)**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range<br><br>Additional test frequencies for Rel-12 to Rel-13 and bit 2 of modifiedMPRbehavior = 0:<br><br>For 5 MHz bandwidth:<br>2499.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866<br><br>Additional test frequencies for Rel-12 and later and bit 2 of modifiedMPRbehavior = 1:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39686<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866 | | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10 MHz, 15 MHz, 20MHz | | |
| **Test Parameters for NS_04 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation TDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 (Note 6) | 5MHz | N/A for A-MPR testing | | QPSK | 25 | 0 |
| 2 (Note 6) | 5MHz | | | QPSK | 8 | Note 3 |
| 3(Note 6) | 5MHz | | | QPSK | 6 | Note 3 |
| 4 (Note 6) | 5MHz | | | 16QAM (Note 5) | 25 | 0 |
| 5 (Note 6) | 5MHz | | | 16QAM (Note 5) | 8 | Note 3 |
| 6 (Note 6) | 10MHz | | | QPSK | 1 | 0 |
| 7 (Note 6) | 10MHz | | | QPSK | 12 | 0 |
| 8 (Note 6) | 10MHz | | | QPSK | 50 | 0 |
| 9 Note 6) | 10MHz | | | 16QAM (Note 5) | 50 (Note 4) | 0 |
| 10 (Note 6) | 10MHz | | | QPSK | 24 | 13 |
| 11 (Note 6) | 10MHz | | | 16QAM (Note 5) | 24 | 13 |
| 12 (Note 6) | 10MHz | | | QPSK | 36 | 13 |
| 13 (Note 6) | 10MHz | | | QPSK | 12 | 37 |
| 14 (Note 6) | 10MHz | | | QPSK | 1 | 49 |
| 15 (Note 6) | 15MHz | | | QPSK | 1 | 0 |
| 16 (Note 6) | 15MHz | | | QPSK | 16 | 0 |
| 17 (Note 6) | 15MHz | | | QPSK | 75 | 0 |
| 18 (Note 6) | 15MHz | | | 16QAM | 75 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| | | | (Note 5) | (Note 4) | |
| 19 (Note 6) | 15MHz | | QPSK | 36 | 19 |
| 20 (Note 6) | 15MHz | | 16QAM (Note 5) | 36 (Note 4) | 19 |
| 21 (Note 6) | 15MHz | | QPSK | 50 | 19 |
| 22 (Note 6) | 15MHz | | QPSK | 18 | 56 |
| 23 (Note 6) | 15MHz | | QPSK | 1 | 74 |
| 24 (Note 6) | 20MHz | | QPSK | 1 | 0 |
| 25 (Note 6) | 20MHz | | QPSK | 18 | 0 |
| 26 (Note 6) | 20MHz | | QPSK | 100 | 0 |
| 27 (Note 6) | 20MHz | | 16QAM (Note 5) | 100 (Note 4) | 0 |
| 28 (Note 6) | 20MHz | | QPSK | 50 | 25 |
| 29 (Note 6) | 20MHz | | 16QAM (Note 5) | 50 (Note 4) | 25 |
| 30 (Note 6) | 20MHz | | QPSK | 75 | 25 |
| 31 (Note 6) | 20MHz | | QPSK | 25 | 75 |
| 32 (Note 6) | 20MHz | | QPSK | 1 | 99 |
| 33 (Note 8) | 5MHz | | QPSK | 1 | 0 |
| 34 (Note 8) | 5MHz | | QPSK | 16 | 9 |
| 35 (Note 9) | 5MHz | | QPSK | 25 | 0 |
| 36 (Note 8) | 5MHz | | 16QAM (Note 5) | 16 | 9 |
| 37 (Note 9) | 5MHz | | 16QAM (Note 5) | 25 | 0 |
| 38 (Note 8) | 10MHz | | QPSK | 1 | 0 |
| 39 (Note 8) | 10MHz | | QPSK | 1 | 49 |
| 40 (Note 8) | 10MHz | | QPSK | 24 | 0 |
| 41 (Note 8) | 10MHz | | QPSK | 40 | 10 |
| 42 (Note 7) | 10MHz | | QPSK | 50 | 0 |
| 43 (Note 7) | 10MHz | | 16QAM (Note 5) | 50 | 0 |
| 44 (Note 8) | 15MHz | | QPSK | 1 | 0 |
| 45 (Note 8) | 15MHz | | QPSK | 1 | 74 |
| 46 (Note 8) | 15MHz | | QPSK | 32 | 0 |
| 47 (Note 8) | 15MHz | | QPSK | 60 | 15 |
| 48 (Note 7) | 15MHz | | QPSK | 75 | 0 |
| 49 (Note 7) | 15MHz | | 16QAM (Note 5) | 75 | 0 |
| 50 (Note 8) | 20MHz | | QPSK | 1 | 0 |
| 51 (Note 8) | 20MHz | | QPSK | 1 | 99 |
| 52 (Note 8) | 20MHz | | QPSK | 36 | 0 |
| 53 (Note 8) | 20MHz | | QPSK | 75 | 25 |
| 54 (Note 7) | 20MHz | | QPSK | 100 | 0 |
| 55 (Note 7) | 20MHz | | 16QAM (Note 5) | 100 | 0 |

Note 1: Test Channel Bandwidths are checked separately for E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: The configuration ID will be used to map the applicable Test Configuration to be corresponding Test Requirement in subclause 6.2.4 as not all combinations are necessarily required based on the applicability of the UE.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 4: Applies only for UE-Categories ≥2.
Note 5: The 16QAM configurations shall not apply to UEs which support UL 64QAM.
Note 6: Applies only for Rel-11 and earlier.
Note 7: Applies only for Rel-12 and later.
Note 8: Applies only for Rel-12 and later and Low Range.
Note 9: Applies only for Rel-12 and later and Mid, High Range and additional test frequencies.

**Table 6.6.2.2.4.1-4: Test Configuration Table (network signalled value "NS_06", Power Class 1)**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | |
| **Test Parameters for NS_06 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| Configuration ID | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 25 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | 16QAM | 8 |
| 4 | 10MHz | | | QPSK | 50 |
| 5 | 10MHz | | | QPSK | 12 |
| 6 | 10MHz | | | 16QAM | 12 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_1.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

**Table 6.6.2.2.4.1-5: Test Configuration Table (network signalled value "NS_06", Power Class 3)**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | N/A for Additional Spectrum Emission Mask testing. | | | QPSK | 6 | NA |
| 1.4MHz | | | | QPSK | 5 | |
| 1.4MHz | | | | 16QAM (Note 3) | 5 | |
| 3MHz | | | | QPSK | 15 | |
| 3MHz | | | | QPSK | 4 | |
| 3MHz | | | | 16QAM (Note 3) | 4 | |
| 5MHz | | | | QPSK | 25 | |
| 5MHz | | | | QPSK | 8 | |
| 5MHz | | | | 16QAM (Note 3) | 8 | |
| 10MHz | | | | QPSK | 50 | |
| 10MHz | | | | QPSK | 12 | |
| 10MHz | | | | 16QAM (Note 3) | 12 | |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.2.2.4.1-6: Test Configuration Table (network signalled value "NS_07")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Mid range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD | $RB_{start}$ |
| 1 | 10MHz | N/A for Additional Spectrum Emission Mask testing. | | QPSK | 1 | 0 |
| 2 | 10MHz | | | QPSK | 8 | 0 |
| 3 | 10MHz | | | QPSK | 6 | 13 |
| 4 | 10MHz | | | QPSK | 20 | 13 |
| 5 | 10MHz | | | QPSK | 12 | 13 |
| 6 | 10MHz | | | 16QAM (Note 2) | 36 (Note 1) | 13 |
| 7 | 10MHz | | | QPSK | 16 | 19 |
| 8 | 10MHz | | | QPSK | 12 | 19 |
| 9 | 10MHz | | | 16QAM (Note 2) | 16 | 19 |
| 10 | 10MHz | | | QPSK | 30 | 19 |
| 11 | 10MHz | | | 16QAM (Note 2) | 30 (Note 1) | 19 |
| 12 | 10MHz | | | QPSK | 6 | 43 |
| 13 | 10MHz | | | QPSK | 2 | 48 |
| 14 | 10MHz | | | QPSK | 50 | 0 |
| 15 | 10MHz | | | QPSK | 12 | 0 |
| 16 | 10MHz | | | 16QAM (Note 2) | 50 (Note 1) | 0 |
| Note 1: Applies only for UE-Categories 2-5.<br>Note 2: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | |

**Table 6.6.2.2.4.1-7: Test Configuration Table (network signalled value "NS_11")**

| Initial Conditions | |
|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | Normal |

| | |
|---|---|
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | Low range, Mid range, High range<br><br>For 3 MHz Channel Bandwidth:<br>a. 2001.5 MHz ($N_{UL}$ = 25515)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br><br>For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br>c. 2007.5 MHz ($N_{UL}$ = 25575)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2005.5 MHz ($N_{UL}$ = 25555)<br>c. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2007.5 MHz ($N_{UL}$ = 25575)<br>b. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | 3MHz, 5MHz, 10MHz, 15MHz, 20MHz |

| Test Parameters for NS_11 A-MPR | | | | | |
|---|---|---|---|---|---|
| | | Downlink Configuration | | Uplink Configuration | |
| Configuration ID | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD |
| 1 | 3MHz | N/A for A-MPR testing | | QPSK | 6 |
| 2 | 3MHz | | | QPSK | 15 |
| 3 | 3MHz | | | 16QAM (Note 4) | 6 |
| 4 | 3MHz | | | 16QAM (Note 4) | 15 |
| 5 | 5MHz | | | QPSK | 1 |
| 6 | 5MHz | | | QPSK | 8 |
| 7 | 5MHz | | | QPSK | 25 |
| 8 | 5MHz | | | 16QAM (Note 4) | 8 |
| 9 | 5MHz | | | 16QAM (Note 4) | 25 |
| 10 | 10MHz | | | QPSK | 1 |
| 11 | 10MHz | | | QPSK | 12 |
| 12 | 10MHz | | | QPSK | 50 |
| 13 | 10MHz | | | 16QAM (Note 4) | 12 |
| 14 | 10MHz | | | 16QAM (Note 4) | 50<br>(Note 3) |
| 15 | 15MHz | | | QPSK | 1 |
| 16 | 15MHz | | | QPSK | 8 |
| 17 | 15MHz | | | QPSK | 25 |
| 18 | 15MHz | | | QPSK | 30 |
| 19 | 15MHz | | | QPSK | 75 |
| 20 | 15MHz | | | 16QAM (Note 4) | 8 |
| 21 | 15MHz | | | 16QAM (Note 4) | 25 |
| 22 | 15MHz | | | 16QAM (Note 4) | 30 |
| 23 | 15MHz | | | 16QAM (Note 4) | 75 |
| 24 | 20MHz | | | QPSK | 1 |
| 25 | 20MHz | | | QPSK | 10 |
| 26 | 20MHz | | | QPSK | 25 |
| 27 | 20MHz | | | QPSK | 100 |
| 28 | 20MHz | | | 16QAM (Note 4) | 10 |
| 29 | 20MHz | | | 16QAM (Note 4) | 25 |
| 30 | 20MHz | | | 16QAM (Note 4) | 100 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories ≥2.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.2.2.4.1-8: Test Configuration Table (network signalled value "NS_20")**

| Initial Conditions | |
|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | Normal |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | Low range, Mid range, High range<br><br>For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2007.5 MHz ($N_{UL}$ = 25575)<br>c. 2012.5 MHz ($N_{UL}$ = 25625)<br>d. 2017.5 MHz ($N_{UL}$ = 25675)<br><br>For 10 MHz Channel Bandwidth<br><br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | 5MHz, 10MHz, 15MHz, 20MHz |

| Test Parameters for NS_20 A-MPR | | | | | |
|---|---|---|---|---|---|
| | | Downlink Configuration | | Uplink Configuration | |
| Configuration ID | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 8 |
| 2 | 5MHz | | | QPSK | 15 |
| 3 | 5MHz | | | QPSK | 25 |
| 4 | 5MHz | | | 16QAM (Note 4) | 15 |
| 5 | 5MHz | | | 16QAM (Note 4) | 25 |
| 6 | 10MHz | | | QPSK | 8 |
| 7 | 10MHz | | | QPSK | 12 |
| 8 | 10MHz | | | QPSK | 50 |
| 9 | 10MHz | | | 16QAM (Note 4) | 12 |
| 10 | 10MHz | | | 16QAM (Note 4) | 50<br>(Note 3) |
| 11 | 15MHz | | | QPSK | 6 |
| 12 | 15MHz | | | QPSK | 25 |
| 13 | 15MHz | | | QPSK | 36 |
| 14 | 15MHz | | | QPSK | 75 |
| 15 | 15MHz | | | 16QAM (Note 4) | 25 |
| 16 | 15MHz | | | 16QAM (Note 4) | 36 |
| 17 | 15MHz | | | 16QAM (Note 4) | 75 |
| 18 | 20MHz | | | QPSK | 8 |
| 19 | 20MHz | | | QPSK | 18 |
| 20 | 20MHz | | | QPSK | 25 |
| 21 | 20MHz | | | QPSK | 75 |
| 22 | 20MHz | | | QPSK | 100 |
| 23 | 20MHz | | | 16QAM (Note 4) | 18 |
| 24 | 20MHz | | | 16QAM (Note 4) | 25 |
| 25 | 20MHz | | | 16QAM (Note 4) | 75 |
| 26 | 20MHz | | | 16QAM (Note 4) | 100 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories ≥2.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.2.2.4.1-9: Test Configuration Table (network signalled value "NS_21")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range or High range | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5 MHz, 10 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 (note 2) | 5 MHz | | | QPSK | 1 | 0 |
| 2 (note 2) | 5 MHz | | | QPSK | 25 | 0 |
| 3 (note 2) | 10 MHz | | | QPSK | 1 | 0 |
| 4 (note 3) | 10 MHz | | | QPSK | 1 | 49 |
| 5 (note 2) | 10 MHz | | | QPSK | 15 | 0 |
| 6 (note 3) | 10 MHz | | | QPSK | 3 | 47 |
| 7 (note 3) | 10 MHz | | | QPSK | 50 | 0 |
| 8 (note 1, 3) | 10 MHz | | | 16QAM (Note 4) | 50 | 0 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: Applicable only to low range frequency testing.
Note 3: Applicable only to high range frequency testing.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.2.2.4.1-10: Test Configuration Table (network signalled value "NS_27")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to Frequency column in test parameters | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_27 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Frequency** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | Low/Mid | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | High | 5MHz | | | QPSK | 1 | 24 |
| 3 | Low/Mid/High | 5MHz | | | QPSK | 25 | 0 |
| 4 | Low/Mid/High | 5MHz | | | 16QAM | 25 | 0 |
| 5 | Low/Mid | 10MHz | | | QPSK | 1 | 0 |
| 6 | High | 10MHz | | | QPSK | 1 | 49 |
| 7 | Low/Mid/High | 10MHz | | | QPSK | 50 | 0 |
| 8 (Note 2) | Low/Mid/High | 10MHz | | | 16QAM | 50 | 0 |
| 9 | Low/Mid | 15MHz | | | QPSK | 1 | 0 |
| 10 | Low | 15MHz | | | QPSK | 1 | 7 |
| 11 | Low/Mid | 15MHz | | | QPSK | 16 | 0 |
| 12 | High | 15MHz | | | QPSK | 1 | 74 |
| 13 | High | 15MHz | | | QPSK | 1 | 67 |
| 14 | High | 15MHz | | | QPSK | 16 | 74 |
| 15 | Low/Mid/High | 15MHz | | | QPSK | 75 | 0 |
| 16 (Note 2) | Low/Mid/High | 15MHz | | | 16QAM | 75 | 0 |
| 17 | Low/Mid | 20MHz | | | QPSK | 1 | 0 |
| 18 | Low | 20MHz | | | QPSK | 1 | 13 |
| 19 | Low | 20MHz | | | QPSK | 1 | 16 |
| 20 | Low/Mid | 20MHz | | | QPSK | 21 | 0 |
| 21 | High | 20MHz | | | QPSK | 1 | 99 |
| 22 | High | 20MHz | | | QPSK | 1 | 86 |
| 23 | High | 20MHz | | | QPSK | 1 | 83 |
| 24 | High | 20MHz | | | QPSK | 21 | 0 |
| 25 | Low/Mid/High | 20MHz | | | QPSK | 100 | 0 |
| 26 (Note 2) | Low/Mid/High | 20MHz | | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: Applies only for UE-Categories ≥2.
Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.2.2.4.1-11: Test Configuration Table (network signalled value "NS_35")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 5MHz | N/A for Additional Spectrum Emission Mask testing. | | | QPSK | 25 | NA |
| 5MHz | | | | QPSK | 8 | |
| 5MHz | | | | 16QAM (Note 3) | 8 | |
| 10MHz | | | | QPSK | 50 | |
| 10MHz | | | | QPSK | 12 | |
| 10MHz | | | | 16QAM (Note 3) | 12 | |
| 15MHz | | | | QPSK | 75 | |
| 15MHz | | | | QPSK | 16 | |
| 15MHz | | | | 16QAM (Note 3) | 16 | |
| 20MHz | | | | QPSK | 100 | |
| 20MHz | | | | QPSK | 18 | |
| 20MHz | | | | 16QAM (Note 3) | 18 | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | | |
| Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The DL Reference Measurement channels are set according to Tables 6.6.2.2.4.1-1 to 6.6.2.2.4.1-11.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.2.4.3.

### 6.6.2.2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to applicable table from Table 6.6.2.2.4.1-1 to 6.6.2.2.4.1-11. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.4.5-1 to 6.2.4.5-28 or 6.2.4_1.5-1 as appropriate. The period of the measurement shall be at least one sub-frame (1ms).
4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.6.2.2.5.1-1, 6.6.2.2.5.2-1, 6.6.2.2.5.3-1 or Table 6.6.2.2.5.1-2, 6.6.2.2.5.2-2, 6.6.2.2.5.3-2, or 6.6.2.2.5.4-1, 6.6.2.2.5.5-1 as applicable. The centre frequency of the filter shall be stepped in continuous steps according to

the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

#### 6.6.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exceptions for each network signalled value.

##### 6.6.2.2.4.3.1 Message contents exceptions (network signalled value "NS_03")

1. Information element additionalSpectrumEmission is set to NS_03. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.2.2.4.3.1-1: *SystemInformationBlockType2*: Additional spurious emissions requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 3 (NS_03) | | |

##### 6.6.2.2.4.3.2 Message contents exceptions (network signalled value "NS_04")

1. Information element additionalSpectrumEmission is set to NS_04. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.2.2.4.3.2-1: *SystemInformationBlockType2*: Additional spurious emissions requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 4 (NS_04) | | |

##### 6.6.2.2.4.3.3 Message contents exceptions (network signalled value "NS_06")

1. Information element additionalSpectrumEmission is set to NS_06. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.2.2.4.3.3-1: *SystemInformationBlockType2*: Additional spurious emissions requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 6 (NS_06) | | |

##### 6.6.2.2.4.3.4 Message contents exceptions (network signalled value "NS_07")

1. Information element additionalSpectrumEmission is set to NS_07. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.2.2.4.3.4-1: *SystemInformationBlockType2*: Additional spurious emissions requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 7 (NS_07) | | |

6.6.2.2.4.3.5 Message contents exceptions (network signalled value "NS_11")

1. Information element additionalSpectrumEmission is set to NS_11. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.2.2.4.3.5-1: *SystemInformationBlockType2*: Additional spurious emissions requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 11 (NS_11) | | |

6.6.2.2.4.3.6 Message contents exceptions (network signalled value "NS_20")

1. Information element additionalSpectrumEmission is set to NS_20. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.2.2.4.3.6-1: *SystemInformationBlockType2*: Additional spurious emissions requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 20 (NS_20) | | |

6.6.2.2.4.3.7 Message contents exceptions (network signalled value "NS_21")

1. Information element additionalSpectrumEmission is set to NS_21. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.2.2.4.3.7-1: *SystemInformationBlockType2*: Additional spurious emissions requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 21 (NS_21) | | |

6.6.2.2.4.3.8 Message contents exceptions (network signalled value "NS_27")

1. Information element additionalSpectrumEmission is set to NS_27. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.2.2.4.3.8-1: *SystemInformationBlockType2*: Additional spurious emissions requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 27 (NS_27) | | |

6.6.2.2.4.3.9 Message contents exceptions (network signalled value "NS_35")

1. Information element additionalSpectrumEmission is set to NS_35. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.2.2.4.3.8-1: *SystemInformationBlockType2*: Additional spurious emissions requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 32 | | |
| additionalSpectrumEmission-v10l0 | 35 (NS_35) | | |

## 6.6.2.2.5 Test requirements

### 6.6.2.2.5.1 Test requirements (network signalled value "NS_03", “NS_11”, “NS_20” and “NS_21”)

When "NS_03" or “NS_11” or “NS_20” or “NS_21” is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-1 and 6.2.4.5-2 as appropriate,

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2.5.1-1 or 6.6.2.2.5.1-2, as applicable.

**Table 6.6.2.2.5.1-1: Additional requirements (network signalled value "NS_03", “NS_11”, “NS_20” and “NS_21”), E-UTRA bands ≤ 3GHz**

| | **Spectrum emission limit (dBm)/ Channel bandwidth** | | | | | | |
|---|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | | | | | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2.5.1-2: Additional requirements (network signalled value "NS_03", “NS_11”, “NS_20” and “NS_21”), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | **Spectrum emission limit (dBm)/ Channel bandwidth** |
|---|---|

| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
|---|---|---|---|---|---|---|---|
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | | | | | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.6.2.2.5.2 Test requirements (network signalled value "NS_04")

When "NS_04" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-3 for a Power Class 3 UE or 6.2.4_1.5-2 for a Power Class 2 UE as appropriate,

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2.5.2-1 or Table.6.6.2.2.5.2-3, as applicable.

**Table 6.6.2.2.5.2-1: Additional requirements (network signalled value "NS_04") (Rel-11 and earlier)**

| | Spectrum emission limit (dBm)/ Channel bandwidth |
|---|---|

| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
|---|---|---|---|---|---|---|---|
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -23.5 | -23.5 | -23.5 | -23.5 | 1 MHz |
| 6-10 | | | | | | | 1 MHz |
| 10-15 | | | | | | | 1 MHz |
| 15-20 | | | | | | | 1 MHz |
| 20-25 | | | | | | | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_04 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2.5.2-2: Void**

**Table 6.6.2.2.3.2-3: Additional requirements (network signalled value "NS_04") (Rel-12 and onwards)**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| ± 0-1 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| ± 1-2.5 | -8.5 | --8.5 | -8.5 | -8.5 | 1 MHz |
| ± 2.5-2.8 | | | | | 1 MHz |
| ± 2.8-5 | | | | | 1 MHz |
| ± 5-6 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| ± 6-9 | -23.5 | | | | 1 MHz |
| ± 9-10 | | -23.5 | | | 1 MHz |
| ± 10-13.5 | | | | | 1 MHz |
| ± 13.5-15 | | | -23.5 | | 1 MHz |
| ± 15-18 | | | | | 1 MHz |
| ± 18-20 | | | | -23.5 | 1 MHz |
| ± 20-25 | | | | | 1 MHz |

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

### 6.6.2.2.5.3 Test requirements (network signalled value "NS_06" or "NS_07")

When "NS_06" or "NS_07" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-5, 6.2.4.5-6 and 6.2.4.5-7 as appropriate for a Power Class 3 UE or in Table 6.2.4_1.5-1 for a Power Class 1 UE,

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2.5.3-1 or Table.6.6.2.2.5.3-2, as applicable.

**Table 6.6.2.2.5.3-1: Additional requirements (network signalled value "NS_06" or "NS_07"), E-UTRA bands ≤ 3GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | Measurement bandwidth |
| 0-0.1 | -11.5 | -11.5 | -13.5 | -16.5 | 30 kHz |
| 0.1-1 | -11.5 | -11.5 | -11.5 | -11.5 | 100 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | 1 MHz |
| 2.8-5 | | | | | 1 MHz |
| 5-6 | | -23.5 | | | 1 MHz |
| 6-10 | | | -23.5 | | 1 MHz |
| 10-15 | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.085 MHz. The first and last measurement position with a 100 kHz filter is at ΔfOOB equals to 0.15 MHz and 0.95 MHz.

Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.

Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel

Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_06 and NS_07 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.

Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2.5.3-2: Additional requirements (network signalled value "NS_06" or "NS_07"), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | Measurement bandwidth |
| 0-0.1 | -11.2 | -11.2 | -13.2 | -16.2 | 30 kHz |
| 0.1-1 | -11.2 | -11.2 | -11.2 | -11.2 | 100 kHz |
| 1-2.5 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | 1 MHz |
| 2.8-5 | | | | | 1 MHz |
| 5-6 | | -23.2 | | | 1 MHz |
| 6-10 | | | -23.2 | | 1 MHz |
| 10-15 | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.085 MHz. The first and last measurement position with a 100 kHz filter is at ΔfOOB equals to 0.15 MHz and 0.95 MHz.

Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.

Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel

Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_06 and NS_07 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.

Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.6.2.2.5.4 Test requirements (network signalled value "NS_27")

When "NS_27" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-27 as appropriate for a Power Class 3 UE

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2.5.4-1, as applicable.

**Table 6.6.2.2.5.4-1: Additional requirements (network signalled value "NS_27")**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| ± 0-1 | -11.2 | -11.2 | -11.2 | -11.2 | Note 1 |
| ± 1-10 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| ± 10-15 | | -23.2 | -23.2 | -23.2 | 1 MHz |
| ± 15-20 | | | -23.2 | -23.2 | 1 MHz |
| ± 20-25 | | | | -23.2 | 1 MHz |
| Note 1: The measurement bandwidth is 1% of the applicable E-UTRA channel bandwidth. | | | | | |

#### 6.6.2.2.5.5 Test requirements (network signalled value "NS_35")

When "NS_35" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-28 as appropriate for a Power Class 3 UE

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2.5.5-1, as applicable.

**Table 6.6.2.2.5.5-1: Additional requirements (network signalled value "NS_35")**

| **$\Delta f_{OOB}$ (MHz)** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth (unless otherwise stated)** |
|---|---|---|---|---|---|
| ± 0-0.1 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| ± 0.1-6 | -11.5 | -11.5 | -11.5 | -11.5 | 100 kHz |
| ± 6-10 | -23.5[1] | -11.5 | -11.5 | -11.5 | 100 kHz |
| ± 10-15 | | -23.5[1] | -11.5 | -11.5 | 100 kHz |
| ± 15-20 | | | -23.5[1] | -11.5 | 100 kHz |
| ± 20-25 | | | | -23.5 | 1 MHz |
| Note 1: The measurement bandwidth shall be 1 MHz | | | | | |

## 6.6.2.2_1 Additional Spectrum Emission Mask for UL 64QAM

### 6.6.2.2_1.1 Test purpose

Same test purpose as in clause 6.6.2.2.1

### 6.6.2.2_1.2 Test applicability

This test case applies to all types of E-UTRA UE from release 13 and forward that support UL 64QAM.

### 6.6.2.2_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.2.3

### 6.6.2.2_1.4 Test description

#### 6.6.2.2_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Tables 6.6.2.2_1.4.1-1 through 6.6.2.2_1.4.1-9. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.2_1.4.1-1: Test Configuration Table (network signalled value "NS_03")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | N/A for Additional Spectrum Emission Mask testing. | | | 64QAM | 5 | 5 |
| 3MHz | | | | 64QAM | 15 (Note 3) | 15 |
| 3MHz | | | | 64QAM | 4 | 4 |
| 5MHz | | | | 64QAM | 25 (Note 3) | 25 |
| 5MHz | | | | 64QAM | 8 | 8 |
| 10MHz | | | | 64QAM | 50 (Note 3) | 50 |
| 10MHz | | | | 64QAM | 12 | 12 |
| 15MHz | | | | 64QAM | 75 (Note 3) | 75 |
| 15MHz | | | | 64QAM | 16 | 16 |
| 20MHz | | | | 64QAM | 100 (Note 3) | 100 |
| 20MHz | | | | 64QAM | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | | |
| Note 3: The 64QAM configurations shall not apply to UEs for which TC 6.6.2.2_2 is executed with network signalled value NS_03. | | | | | | |

**Table 6.6.2.2_1.4.1-2: Test Configuration Table (network signalled value "NS_04")**

<table>
<tr><th colspan="7">Initial Conditions</th></tr>
<tr><td colspan="4">Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1)</td><td colspan="3">Normal</td></tr>
<tr><td colspan="4">Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="3">Low Range, Mid Range, High Range<br>Additional test frequencies for Rel-12 to Rel-13 and bit 2 of modifiedMPRbehavior = 0:<br><br>For 5 MHz bandwidth:<br>2499.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866<br><br>Additional test frequencies for Rel-12 and later and bit 2 of modifiedMPRbehavior = 1:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39686<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866</td></tr>
<tr><td colspan="4">Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="3">5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><th colspan="7">Test Parameters for NS_04 A-MPR</th></tr>
<tr><th></th><th></th><th colspan="2">Downlink Configuration</th><th colspan="3">Uplink Configuration</th></tr>
<tr><th>Configuration ID</th><th>Ch BW</th><th>Mod'n</th><th>RB allocation FDD</th><th>Mod'n</th><th>RB allocation FDD</th><th>$RB_{start}$ FDD</th></tr>
<tr><td>1 (Note 1)</td><td>5MHz</td><td colspan="2" rowspan="5">N/A for A-MPR testing</td><td>64QAM</td><td>16</td><td>9</td></tr>
<tr><td>2 (Note 2)</td><td>5MHz</td><td>64QAM</td><td>25</td><td>0</td></tr>
<tr><td>3</td><td>10MHz</td><td>64QAM</td><td>50</td><td>0</td></tr>
<tr><td>4</td><td>15MHz</td><td>64QAM</td><td>75</td><td>0</td></tr>
<tr><td>5</td><td>20MHz</td><td>64QAM</td><td>100</td><td>0</td></tr>
<tr><td colspan="7">Note 1: Only applicable for Low Range.<br>Note 2: Only applicable for Mid, High Range and additional test frequencies.<br>Note 3: The 64QAM configurations shall not apply to UEs for which TC 6.6.2.2_2 is executed with network signalled value NS_04.</td></tr>
</table>

**Table 6.6.2.2_1.4.1-3: Test Configuration Table (network signalled value "NS_06")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 1.4MHz | N/A for Additional Spectrum Emission Mask testing | | | 64QAM | 5 | NA |
| 5MHz | | | | 64QAM | 8 | |
| 10MHz | | | | 64QAM | 12 | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | | |
| Note 3: The 64QAM configurations shall not apply to UEs for which TC 6.6.2.2_2 is executed with network signalled value NS_06. | | | | | | |

**Table 6.6.2.2_1.4.1-4: Test Configuration Table (network signalled value "NS_07")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Mid range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD | $RB_{start}$ |
| 1 | 10MHz | N/A for Additional Spectrum Emission Mask testing. | | 64QAM | 36 | 13 |
| 2 | 10MHz | | | 64QAM | 16 | 19 |
| 3 | 10MHz | | | 64QAM | 30 | 19 |
| 4 | 10MHz | | | 64QAM | 50 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.2.2_2 is executed with network signalled value NS_07. | | | | | | |

**Table 6.6.2.2_1.4.1-5: Test Configuration Table (network signalled value "NS_11")**

| **Initial Conditions** | |
|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | Normal |

| | |
|---|---|
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | Low range, Mid range, High range<br><br>For 3 MHz Channel Bandwidth:<br>a. 2001.5 MHz ($N_{UL}$ = 25515)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br><br>For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br>c. 2007.5 MHz ($N_{UL}$ = 25575)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2005.5 MHz ($N_{UL}$ = 25555)<br>c. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2007.5 MHz ($N_{UL}$ = 25575)<br>b. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | 3MHz, 5MHz, 10MHz, 15MHz, 20MHz |

**Test Parameters for NS_11 A-MPR**

| | | Downlink Configuration | | Uplink Configuration | |
|---|---|---|---|---|---|
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 3MHz | N/A for Additional Spectrum Emission Mask testing. | | 64QAM | 6 |
| 2 | 3MHz | | | 64QAM (Note 3) | 15 |
| 3 | 5MHz | | | 64QAM | 8 |
| 4 | 5MHz | | | 64QAM (Note 3) | 25 |
| 5 | 10MHz | | | 64QAM | 12 |
| 6 | 10MHz | | | 64QAM (Note 3) | 50 |
| 7 | 15MHz | | | 64QAM (Note 3) | 8 |
| 8 | 15MHz | | | 64QAM (Note 3) | 25 |
| 9 | 15MHz | | | 64QAM (Note 3) | 30 |
| 10 | 15MHz | | | 64QAM (Note 3) | 75 |
| 11 | 20MHz | | | 64QAM (Note 3) | 10 |
| 12 | 20MHz | | | 64QAM (Note 3) | 25 |
| 13 | 20MHz | | | 64QAM (Note 3) | 100 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

Note 3: The 64QAM configurations shall not apply to UEs for which TC 6.6.2.2_2 is executed with network signalled value NS_11.

**Table 6.6.2.2_1.4.1-6: Test Configuration Table (network signalled value "NS_20")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range<br><br>For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2007.5 MHz ($N_{UL}$ = 25575)<br>c. 2012.5 MHz ($N_{UL}$ = 25625)<br>d. 2017.5 MHz ($N_{UL}$ = 25675)<br><br>For 10 MHz Channel Bandwidth<br><br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_20 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spectrum Emission Mask testing. | | 64QAM (Note 3) | 15 |
| 2 | 5MHz | | | 64QAM (Note 3) | 25 |
| 3 | 10MHz | | | 64QAM | 12 |
| 4 | 10MHz | | | 64QAM (Note 3) | 50 |
| 5 | 15MHz | | | 64QAM (Note 3) | 25 |
| 6 | 15MHz | | | 64QAM (Note 3) | 36 |
| 7 | 15MHz | | | 64QAM (Note 3) | 75 |
| 8 | 20MHz | | | 64QAM | 18 |
| 9 | 20MHz | | | 64QAM (Note 3) | 25 |
| 10 | 20MHz | | | 64QAM (Note 3) | 75 |
| 11 | 20MHz | | | 64QAM (Note 3) | 100 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

Note 3: The 64QAM configurations shall not apply to UEs for which TC 6.6.2.2_2 is executed with network signalled value NS_20.

**Table 6.6.2.2_1.4.1-7: Test Configuration Table (network signalled value "NS_21")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | NC | | | | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | High range | | | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | 10 MHz | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 10 MHz | N/A for Additional Spectrum Emission Mask testing. | | 64QAM | 50 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.2.2_2 is executed with network signalled value NS_21. | | | | | | |

**Table 6.6.2.2_1.4.1-8: Test Configuration Table (network signalled value "NS_27")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | Normal | | | | | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | Refer to Frequency column in test parameters | | | | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | 5MHz, 10MHz, 15MHz, 20MHz | | | | | | |
| **Test Parameters for NS_27 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Frequency** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | Low/Mid/High | 5MHz | | | 64QAM | 25 | 0 |
| 2 | Low/Mid/High | 10MHz | | | 64QAM | 50 | 0 |
| 3 | Low/Mid/High | 15MHz | | | 64QAM | 75 | 0 |
| 4 | Low/Mid/High | 20MHz | | | 64QAM | 100 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.2.2_2 is executed with network signalled value NS_27. | | | | | | | |

**Table 6.6.2.2_1.4.1-9: Test Configuration Table (network signalled value "NS_35")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | NC | | | | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | Low range, Mid range, High range | | | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | 5MHz, 10MHz, 15MHz, 20MHz | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 5MHz | N/A for Additional Spectrum Emission Mask testing. | | | 64QAM | 8 | NA |
| 10MHz | | | | 64QAM | 12 | |
| 15MHz | | | | 64QAM | 16 | |
| 20MHz | | | | 64QAM | 18 | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.<br>Note 3: The 64QAM configurations shall not apply to UEs for which TC 6.6.2.2_2 is executed with network signalled value NS_35. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The DL Reference Measurement channels are set according to Tables 6.6.2.2_1.4.1-1 to 6.6.2.2_1.4.1-9.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.2_1.4.3.

#### 6.6.2.2_1.4.2 Test procedure

Same test procedure as in clause 6.6.2.2.4.2

#### 6.6.2.2_1.4.3 Message contents

Same message contents as in clause 6.6.2.2.4.3

### 6.6.2.2_1.5 Test requirements

Same test requirements as in clause 6.6.2.2.5

## 6.6.2.2_2 Additional Spectrum Emission Mask with PUSCH frequency hopping

Following aspects missing or not yet determined:

- Annex F is not updated
- HARQ configuration for re-transmissions is missing

### 6.6.2.2_2.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth under the deployment scenarios where additional requirements are specified.

### 6.6.2.2_2.2 Test applicability

This test case applies to all types of E-UTRA UE release 8 and forward.

### 6.6.2.2_2.3 Minimum conformance requirements

Same minimum conformance requirements as section 6.6.2.2.3

### 6.6.2.2_2.4 Test description

#### 6.6.2.2_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.2.2_2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.2_2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Mid range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Test dependant | |
| **Test Parameters** | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | |
| Configuration ID | NS-value | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD |
| 1 | NS_07 | 10 MHz | N/A for A-MPR testing | | QPSK | 1 |
| 3 (Note 3) | NS_11 | 15 MHz | | | QPSK | 1 |
| 10 (Note 4) | NS_20 | 10 MHz | | | QPSK | 1 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4_3.5 as not all combinations are necessarily required based on the applicability of the UE. | | | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 of the channel bandwidth. | | | | | | |
| Note 3: High range test frequency to be used. | | | | | | |
| Note 4: Low range test frequency to be used. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The DL Reference Measurement channels are set according to Table 6.6.2.2_2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.2.4.3.

#### 6.6.2.2_2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 with hopping bit(s) set to 1 (PUSCH type 2 hopping) for C_RNTI to schedule the UL RMC according to the applicable Table

6.6.2.2_2.4.1-1. SS sends always NACK on PHICH to trigger UE retransmissions needed for mirroring of RBs. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode in a TTI. The period of measurement shall be one sub-frame (1ms) excluding the 20 us transient periods in beginning and end of the subframe.

4. Measure the mean power of the UE in the channel bandwidth of the radio access mode in the next TTI of the same HARQ process. The period of measurement shall be one sub-frame (1ms) excluding the 20 us transient periods in beginning and end of the subframe.

5. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Tables 6.6.2.2.5-1 to 6.6.2.2.5-6, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs excluding the 20 us transient periods in beginning and end of the subframe. The measurement period shall include at least two consecutive UL TTI's.

### 6.6.2.2_2.4.3 Message contents

Message content is the same as in section 6.6.2.2.4.2

## 6.6.2.2_2.5 Test requirements

- the measured UE mean power in the channel bandwidth, derived in step 3 and 4, shall fulfil requirements in Table 6.2.4_3.5-1 and 6.2.4_3.5-2 as appropriate,

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2_2.5-1 to 6.6.2.2_2.5-6, as applicable.

**Table 6.6.2.2_2.5-1: Additional requirements (network signalled value "NS_03", "NS_11", "NS_20" and "NS_21"), E-UTRA bands ≤ 3GHz**

| | **Spectrum emission limit (dBm)/ Channel bandwidth** | | | | | | |
|---|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | | | | | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2_2.5-2: Additional requirements (network signalled value "NS_03", “NS_11”, “NS_20” and “NS_21”), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | | | | | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

**Table 6.6.2.2_2.5-3: Additional requirements (network signalled value "NS_04"), E-UTRA bands ≤ 3GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -23.5 | -23.5 | -23.5 | -23.5 | 1 MHz |
| 6-10 | | | | | | | 1 MHz |
| 10-15 | | | | | | | 1 MHz |
| 15-20 | | | | | | | 1 MHz |
| 20-25 | | | | | | | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_04 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2_2.5-4: Additional requirements (network signalled value "NS_04"), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | -23.2 | -23.2 | -23.2 | -23.2 | 1 MHz |
| 6-10 | | | | | | | 1 MHz |
| 10-15 | | | | | | | 1 MHz |
| 15-20 | | | | | | | 1 MHz |
| 20-25 | | | | | | | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_04 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

**Table 6.6.2.2_2.5-5: Additional requirements (network signalled value "NS_06" or "NS_07"), E-UTRA bands ≤ 3GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | Measurement bandwidth |
| 0-0.1 | -11.5 | -11.5 | -13.5 | -16.5 | 30 kHz |
| 0.1-1 | -11.5 | -11.5 | -11.5 | -11.5 | 100 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | 1 MHz |
| 2.8-5 | | | | | 1 MHz |
| 5-6 | | -23.5 | | | 1 MHz |
| 6-10 | | | -23.5 | | 1 MHz |
| 10-15 | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.085 MHz. The first and last measurement position with a 100 kHz filter is at ΔfOOB equals to 0.15 MHz and 0.95 MHz.

Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.

Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel

Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_06 and NS_07 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.

Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2_2.5-6: Additional requirements (network signalled value "NS_06" or "NS_07"), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | Measurement bandwidth |
| 0-0.1 | -11.2 | -11.2 | -13.2 | -16.2 | 30 kHz |
| 0.1-1 | -11.2 | -11.2 | -11.2 | -11.2 | 100 kHz |
| 1-2.5 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | 1 MHz |
| 2.8-5 | | | | | 1 MHz |
| 5-6 | | -23.2 | | | 1 MHz |
| 6-10 | | | -23.2 | | 1 MHz |
| 10-15 | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.085 MHz. The first and last measurement position with a 100 kHz filter is at ΔfOOB equals to 0.15 MHz and 0.95 MHz.

Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.

Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel

Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_06 and NS_07 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.

Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.2_2 Additional Spectrum Emission Mask for UL 256QAM

MCC note: Subclause number 6.6.2.2_2 is duplicated. The issue needs to be resolved with CR authors.

### 6.6.2.2_2.1 Test purpose

Same test purpose as in clause 6.6.2.2.1

### 6.6.2.2_2.2 Test applicability

This test case applies to all types of E-UTRA UE from release 14 and forward that support UL 256QAM.

### 6.6.2.2_2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.2.3

### 6.6.2.2_2.4 Test description

#### 6.6.2.2_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Tables 6.6.2.2_2.4.1-1 through 6.6.2.2_2.4.1-9. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.2_2.4.1-1: Test Configuration Table (network signalled value "NS_03")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | NC | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Lowest, 5MHz, 10MHz, Highest | |
| **Test Parameters for NS_03 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** |
| | | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1 | 3MHz | N/A for Additional Spectrum Emission Mask testing | | | 256QAM | 15 | 15 |
| 2 | 5MHz | | | | 256QAM | 25 | 25 |
| 3 | 10MHz | | | | 256QAM | 50 | 50 |
| 4 | 15MHz | | | | 256QAM | 75 | 75 |
| 5 | 20MHz | | | | 256QAM | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | | |

**Table 6.6.2.2_2.4.1-2: Test Configuration Table (network signalled value "NS_04")**

<table>
<tr><th colspan="7">Initial Conditions</th></tr>
<tr><td colspan="4">Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1)</td><td colspan="3">Normal</td></tr>
<tr><td colspan="4">Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="3">Low Range, Mid Range, High Range<br>Additional test frequencies for Rel-12 to Rel-13 and bit 2 of modifiedMPRbehavior = 0:<br><br>For 5 MHz bandwidth:<br>2499.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866<br><br>Additional test frequencies for Rel-12 and later and bit 2 of modifiedMPRbehavior = 1:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39686<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866</td></tr>
<tr><td colspan="4">Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="3">5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><th colspan="7">Test Parameters for NS_04 A-MPR</th></tr>
<tr><th></th><th></th><th colspan="2">Downlink Configuration</th><th colspan="3">Uplink Configuration</th></tr>
<tr><th>Configuration ID</th><th>Ch BW</th><th>Mod'n</th><th>RB allocation FDD</th><th>Mod'n</th><th>RB allocation FDD</th><th>$RB_{start}$ FDD</th></tr>
<tr><td>1 (Note 1)</td><td>5MHz</td><td colspan="2" rowspan="5">N/A for Additional Spectrum Emission Mask testing</td><td>256QAM</td><td>16</td><td>9</td></tr>
<tr><td>2 (Note 2)</td><td>5MHz</td><td>256QAM</td><td>25</td><td>0</td></tr>
<tr><td>3</td><td>10MHz</td><td>256QAM</td><td>50</td><td>0</td></tr>
<tr><td>4</td><td>15MHz</td><td>256QAM</td><td>75</td><td>0</td></tr>
<tr><td>5</td><td>20MHz</td><td>256QAM</td><td>100</td><td>0</td></tr>
<tr><td colspan="7">Note 1: Only applicable for Low Range.<br>Note 2: Only applicable for Mid, High Range and additional test frequencies.</td></tr>
</table>

**Table 6.6.2.2_2.4.1-3: Test Configuration Table (network signalled value "NS_06")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | |
| **Test Parameters for NS_06 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 1.4MHz | N/A for Additional Spectrum Emission Mask testing | | 256QAM | 6 |
| 2 | 5MHz | | | 256QAM | 25 |
| 3 | 10MHz | | | 256QAM | 50 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |

**Table 6.6.2.2_2.4.1-4: Test Configuration Table (network signalled value "NS_07")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Mid range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10MHz | | |
| **Test Parameters for NS_07 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 10MHz | N/A for Additional Spectrum Emission Mask testing | | 256QAM | 36 | 13 |
| 2 | 10MHz | | | 256QAM | 16 | 19 |
| 3 | 10MHz | | | 256QAM | 30 | 19 |
| 4 | 10MHz | | | 256QAM | 50 | 0 |

**Table 6.6.2.2_2.4.1-5: Test Configuration Table (network signalled value "NS_11")**

| **Initial Conditions** | |
|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | Normal |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | For 3 MHz Channel Bandwidth:<br>a. 2001.5 MHz ($N_{UL}$ = 25515)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br><br>For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br>c. 2007.5 MHz ($N_{UL}$ = 25575)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2005.5 MHz ($N_{UL}$ = 25555)<br>c. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2007.5 MHz ($N_{UL}$ = 25575)<br>b. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | 3MHz, 5MHz, 10MHz, 15MHz, 20MHz |

**Test Parameters for NS_11 A-MPR**

| | | **Downlink Configuration** | | **Uplink Configuration** | |
|---|---|---|---|---|---|
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 3MHz | N/A for Additional Spectrum Emission Mask testing | | 256QAM | 15 |
| 2 | 5MHz | | | 256QAM | 25 |
| 3 | 10MHz | | | 256QAM | 50 |
| 4 | 15MHz | | | 256QAM | 8 |
| 5 | 15MHz | | | 256QAM | 25 |
| 6 | 15MHz | | | 256QAM | 30 |
| 7 | 15MHz | | | 256QAM | 75 |
| 8 | 20MHz | | | 256QAM | 10 |
| 9 | 20MHz | | | 256QAM | 25 |
| 10 | 20MHz | | | 256QAM | 100 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.6.2.2_2.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

**Table 6.6.2.2_2.4.1-6: Test Configuration Table (network signalled value "NS_20")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2007.5 MHz ($N_{UL}$ = 25575)<br>c. 2012.5 MHz ($N_{UL}$ = 25625)<br>d. 2017.5 MHz ($N_{UL}$ = 25675)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_20 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spectrum Emission Mask testing | | 256QAM | 15 |
| 2 | 5MHz | | | 256QAM | 25 |
| 3 | 10MHz | | | 256QAM | 50 |
| 4 | 15MHz | | | 256QAM | 25 |
| 5 | 15MHz | | | 256QAM | 36 |
| 6 | 15MHz | | | 256QAM | 75 |
| 7 | 20MHz | | | 256QAM | 25 |
| 8 | 20MHz | | | 256QAM | 75 |
| 9 | 20MHz | | | 256QAM | 100 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.6.2.2_2.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | |

**Table 6.6.2.2_2.4.1-7: Test Configuration Table (network signalled value "NS_21")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10 MHz | | |
| **Test Parameters for NS_21 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 10 MHz | N/A for Additional Spectrum Emission Mask testing | | 256QAM | 50 | 0 |

**Table 6.6.2.2_2.4.1-8: Test Configuration Table (network signalled value "NS_27")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to Frequency column in test parameters | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_27 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Frequency** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | Low/Mid/High | 5MHz | N/A for Additional Spectrum Emission Mask testing | | 256QAM | 25 | 0 |
| 2 | Low/Mid/High | 10MHz | | | 256QAM | 50 | 0 |
| 3 | Low/Mid/High | 15MHz | | | 256QAM | 75 | 0 |
| 4 | Low/Mid/High | 20MHz | | | 256QAM | 100 | 0 |

**Table 6.6.2.2_2.4.1-9: Test Configuration Table (network signalled value "NS_35")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_35 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spectrum Emission Mask testing | | 256QAM | 25 |
| 2 | 10MHz | | | 256QAM | 50 |
| 3 | 15MHz | | | 256QAM | 75 |
| 4 | 20MHz | | | 256QAM | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The DL Reference Measurement channels are set according to Tables 6.6.2.2_2.4.1-1 to 6.6.2.2_2.4.1-9.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.2_2.4.3.

#### 6.6.2.2_2.4.2 Test procedure

Same test procedure as in clause 6.6.2.2.4.2

#### 6.6.2.2_2.4.3 Message contents

Same message contents as in clause 6.6.2.2.4.3

### 6.6.2.2_2.5 Test requirements

Same test requirements as in clause 6.6.2.2.5

## 6.6.2.2A Additional Spectrum Emission Mask for CA

### 6.6.2.2A.1 Additional Spectrum Emission Mask for CA (intra-band contiguous DL CA and UL CA)

#### 6.6.2.2A.1.1 Test purpose

To verify that the power of any UE emission shall not exceed specified lever for the specified channel bandwidth for CA under the deployment scenarios where additional requirements are specified.

#### 6.6.2.2A.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA but do not support UL 64QAM or UL 256QAM.

6.6.2.2A.1.3 Minimum conformance requirements

6.6.2.2A.1.3.1 Minimum requirements (network signalled value "CA_NS_04")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "CA_NS_04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2A.1.3.1-1.

**Table 6.6.2.2A.1.3.1-1: Additional requirements**

| Spectrum emission limit [dBm]/$BW_{Channel_CA}$ | | | | | |
|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **50+100RB (29.9 MHz)** | **75+75B (30 MHz)** | **75+100RB (34.85 MHz)** | **100+100RB (39.8 MHz)** | **Measurement bandwidth** |
| ± 0-1 | -22.5 | -22.5 | -23.5 | -24 | 30 kHz |
| ± 1-5.5 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 5.5-34.9 | -25 | -25 | -25 | -25 | 1 MHz |
| ± 34.9-35 | | -25 | -25 | -25 | 1 MHz |
| ± 35-39.85 | | | -25 | -25 | 1 MHz |
| ± 39.85-44.8 | | | | -25 | 1 MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The normative reference for this requirement is TS 36.101[2] subclause 6.6.2.2A.

6.6.2.2A.1.4 Test description

6.6.2.2A.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.2A.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.2A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | NC | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | C: Low and High range | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | As in Table 6.6.2.2A.1.3.1-1 | | |
| **Test Parameters for CA Configurations** | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 100 | 50 | N/A | QPSK | 10 | P_10@20 | S_0@0 | | |
| 2 | 100 | 50 | | QPSK | 60 | P_50@50 | S_10@0 | | |
| 3 | 100 | 50 | | 16QAM | 15 | P_0@0 | S_15@0 | | |
| 4 | 100 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |
| 5 | 75 | 75 | | QPSK | 10 | P_10@20 | S_0@0 | | |
| 6 | 75 | 75 | | QPSK | 75 | P_30@45 | S_45@0 | | |
| 7 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 8 | 100 | 75 | | QPSK | 10 | P_10@20 | S_0@0 | | |
| 9 | 100 | 75 | | QPSK | 80 | P_50@50 | S_30@0 | | |
| 10 | 100 | 75 | | 16QAM | 20 | P_0@0 | S_20@15 | | |
| 11 | 100 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 12 | 100 | 100 | | QPSK | 10 | P_10@25 | S_0@0 | | |
| 13 | 100 | 100 | | QPSK | 90 | P_40@60 | S_50@0 | | |
| 14 | 100 | 100 | | 16QAM | 15 | P_0@0 | S_15@40 | | |
| 15 | 100 | 100 | | 16QAM | 20 | P_0@0 | S_20@30 | | |
| 16 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.2A.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.2A.1.4.3.

### 6.6.2.2A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.2.2A.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.2A.1.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
6. Measure the mean power over all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in Table 6.2.4A.1.5-4. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.
7. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.2.2A.1.5.1-1. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

### 6.6.2.2A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. The following exceptions apply for each network signalled value.

6.6.2.2A.1.4.3.1 Message contents exceptions (network signalled value "CA_NS_04")

1. Information element additionalSpectrumEmissionSCell-r10 is set to CA_NS_04. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spectrum emission requirement for a specific deployment scenario.

**Table 6.6.2.2A.1.4.3.1-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NS_04"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 4 (CA_NS_04) | | |

6.6.2.2A.1.5 Test Requirements

6.6.2.2A.1.5.1 Test requirement for CA (network signalled value "CA_NS_04")

When "CA_NS_04" is indicated in the cell

- the measured UE mean power with the aggregated channel bandwidth as specified in clause 5.4.2A, derived in step 6 , shall fulfil requirements in Table 6.2.4A.1.5-4 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2A.1.5.1-1.

**Table 6.6.2.2A.1.5.1-1: Additional requirements**

| **Spectrum emission limit [dBm]/$BW_{Channel_CA}$** | | | | | |
|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **50+100RB (29.9 MHz)** | **75+75B (30 MHz)** | **75+100RB (34.85 MHz)** | **100+100RB (39.8 MHz)** | **Measurement bandwidth** |
| ± 0-1 | -21 | -21 | -22 | -22.5 | 30 kHz |
| ± 1-5.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| ± 5.5-34.9 | -23.5 | -23.5 | -23.5 | -23.5 | 1 MHz |
| ± 34.9-35 | | -23.5 | -23.5 | -23.5 | 1 MHz |
| ± 35-39.85 | | | -23.5 | -23.5 | 1 MHz |
| ± 39.85-44.8 | | | | -23.5 | 1 MHz |
| Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz. | | | | | |
| Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively. | | | | | |
| Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel | | | | | |
| Note 4: Above SEM requirement applies to bands corresponding to network signalling value CA_NS_04 as defined in TS 36.101 [2] subclause 6.6.2.2A Table 6.2.2.2A-1. | | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.2A.1_1 Additional Spectrum Emission Mask for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM

Editor's note: For a transition period until RAN5#83, this test case in version 15.3.1 of 36.521-1 shall be used. This is to ensure no test coverage is lost before the UL 256QAM test case becomes available.

### 6.6.2.2A.1_1.1 Test purpose

Same test purpose as in clause 6.6.2.2A.1.1.

### 6.6.2.2A.1_1.2 Test applicability

This test case applies to all types of E-UTRA UE from release 13 and forward that support intra-band contiguous DL CA, UL CA and UL 64QAM but do not support UL 256QAM.

### 6.6.2.2A.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.2.A.1.3.

### 6.6.2.2A.1_1.4 Test description

#### 6.6.2.2A.1_1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.2A.1_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.2A.1_1.4.1-1: Test Configuration Table for CA_NS_04**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | C: Low and High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | As in Table 6.6.2.2A.1.3.1-1 | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 100 | 50 | N/A | 64QAM | 10 | P_10@20 | S_0@0 | | |
| 2 | 100 | 50 | | 64QAM | 60 | P_50@50 | S_10@0 | | |
| 3 | 100 | 50 | | 64QAM | 15 | P_0@0 | S_15@0 | | |
| 4 | 100 | 50 | | 64QAM | 2 | P_1@0 | S_1@49 | | |
| 5 | 75 | 75 | | 64QAM | 10 | P_10@20 | S_0@0 | | |
| 6 | 75 | 75 | | 64QAM | 75 | P_30@45 | S_45@0 | | |
| 7 | 75 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 8 | 100 | 75 | | 64QAM | 10 | P_10@20 | S_0@0 | | |
| 9 | 100 | 75 | | 64QAM | 80 | P_50@50 | S_30@0 | | |
| 10 | 100 | 75 | | 64QAM | 20 | P_0@0 | S_20@15 | | |
| 11 | 100 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 12 | 100 | 100 | | 64QAM | 10 | P_10@25 | S_0@0 | | |
| 13 | 100 | 100 | | 64QAM | 90 | P_40@60 | S_50@0 | | |
| 14 | 100 | 100 | | 64QAM | 15 | P_0@0 | S_15@40 | | |
| 15 | 100 | 100 | | 64QAM | 20 | P_0@0 | S_20@30 | | |
| 16 | 100 | 100 | | 64QAM | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.2A.1_1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.2A.1_1.4.3.

#### 6.6.2.2A.1_1.4.2 Test procedure

Same test procedure as in clause 6.6.2.2A.1.4.2 with following exceptions:

- Instead of Table 6.2.4A.1.5-4→ use Table 6.2.4A.1_1.5-4.

#### 6.6.2.2A.1_1.4.3 Message contents

Same message contents as in clause 6.6.2.2A.1.4.3.

### 6.6.2.2A.1_1.5 Test Requirements

Same test requirements as in clause 6.6.2.2A.1.5 with following exceptions:

- Instead of Table 6.2.4A.1.5-4→ use Table 6.2.4A.1_1.5-4.

## 6.6.2.2A.1_2 Additional Spectrum Emission Mask for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM

### 6.6.2.2A.1_2.1 Test purpose

Same test purpose as in clause 6.6.2.2A.1.1.

### 6.6.2.2A.1_2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support intra-band contiguous DL CA and UL CA and UL 256QAM.

### 6.6.2.2A.1_2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.2A.1.3.

### 6.6.2.2A.1_2.4 Test description

#### 6.6.2.2A.1_2.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.2A.1_2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.2A.1_2.4.1-1: Test Configuration Table for CA_NS_04**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | As in Table 6.6.2.2A.1.3.1-1 |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 100 | 50 | N/A | 256QAM | 10 | P_10@20 | S_0@0 | | |
| 2 | 100 | 50 | | 256QAM | 60 | P_50@50 | S_10@0 | | |
| 3 | 100 | 50 | | 256QAM | 15 | P_0@0 | S_15@0 | | |
| 4 | 100 | 50 | | 256QAM | 2 | P_1@0 | S_1@49 | | |
| 5 | 75 | 75 | | 256QAM | 10 | P_10@20 | S_0@0 | | |
| 6 | 75 | 75 | | 256QAM | 75 | P_30@45 | S_45@0 | | |
| 7 | 75 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 | | |
| 8 | 100 | 75 | | 256QAM | 10 | P_10@20 | S_0@0 | | |
| 9 | 100 | 75 | | 256QAM | 80 | P_50@50 | S_30@0 | | |
| 10 | 100 | 75 | | 256QAM | 20 | P_0@0 | S_20@15 | | |
| 11 | 100 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 | | |
| 12 | 100 | 100 | | 256QAM | 10 | P_10@25 | S_0@0 | | |
| 13 | 100 | 100 | | 256QAM | 90 | P_40@60 | S_50@0 | | |
| 14 | 100 | 100 | | 256QAM | 15 | P_0@0 | S_15@40 | | |
| 15 | 100 | 100 | | 256QAM | 20 | P_0@0 | S_20@30 | | |
| 16 | 100 | 100 | | 256QAM | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.2A.1_2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.2A.1_2.4.3.

### 6.6.2.2A.1_2.4.2 Test procedure

Same test procedure as in clause 6.6.2.2A.1.4.2 with following exceptions:

- Instead of Table 6.2.4A.1.5-4→ use Table 6.2.4A.1_2.5-4.

### 6.6.2.2A.1_2.4.3 Message contents

Same message contents as in clause 6.6.2.2A.1.4.3.

### 6.6.2.2A.1_2.5 Test Requirements

Same test requirements as in clause 6.6.2.2A.1.5 with following exceptions:

- Instead of Table 6.2.4A.1.5-4→ use Table 6.2.4A.1_2.5-4.

## 6.6.2.2A.2 Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA)

### 6.6.2.2A.2.1 Test purpose

To verify that the power of any UE emission shall not exceed specified lever for the specified channel bandwidth for CA under the deployment scenarios where additional requirements are specified.

### 6.6.2.2A.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA but do not support UL 64QAM or UL 256QAM.

### 6.6.2.2A.2.3 Minimum conformance requirements

The minimum requirements are the same as in section 6.6.2.2.3 per component carrier.

### 6.6.2.2A.2.4 Test description

#### 6.6.2.2A.2.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state. For Uplink CA Configurations listed in table 6.6.2.2A.2.4.1-1, Additional Spectrum emission requirements are tested.

**Table 6.6.2.2A.2.4.1-1: Additional Spectrum Emission mask for inter-band CA**

| Uplink CA Configuration | NS-value per CC (in same order as UL CA Configuration column) | | Applicable spectrum emission requirements (in same order as UL CA Configuration column) | |
|---|---|---|---|---|
| CA_1A-3A<br>CA_1A-5A<br>CA_1A-7A<br>CA_1A-8A<br>CA_1A-18A<br>CA_1A-26A<br>CA_1A-42A | NS_05 | NS_01 | N/A | N/A |
| CA_1A-19A | NS_05 | NS_08 | N/A | N/A |
| CA_1A-21A | NS_05 | NS_09 | N/A | N/A |
| CA_1A-28A | NS_05 | NS_17 | N/A | N/A |
| CA_2A-4A,<br>CA_2A-66A | NS_03 | NS_03 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.1-1 |
| CA_2A-12A,<br>CA_2A-13A,<br>CA_4A-12A,<br>CA_4A-13A,<br>CA_4A-17A | NS_03 | NS_06 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.3-1 |
| CA_2A-30A | NS_03 | NS_21 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.1-1 |
| CA_3A-5A<br>CA_3A-7A<br>CA_3A-8A<br>CA_5A-7A<br>CA_39A-41A<br>CA_41A-42A | NS_01 | NS_01 | N/A | N/A |
| CA_3A-19A | NS_01 | NS_08 | N/A | N/A |
| CA_3A-20A<br>CA_7A-20A | NS_01 | NS_10 | N/A | N/A |
| CA_2A-13A,<br>CA_4A-13A | NS_03 | NS_07 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.3-1 |
| CA_2A-5A<br>CA_2A-7A,<br>CA_4A-5A,<br>CA_4A-7A | NS_03 | NS_01 | Table 6.6.2.2.3.1-1 | N/A |
| CA_5A-66A[Note 5] | NS_01 | NS_03 | N/A | Table 6.6.2.2.3.1-1 |
| CA_5A-12A<br>CA_5A-17A | NS_01 | NS_06 | N/A | Table 6.6.2.2.3.3-1 |
| CA_5A-30A | NS_01 | NS_21 | N/A | Table 6.6.2.2.3.1-1 |
| CA_7A-28A<br>CA_18A-28A | NS_01 | NS_17 | N/A | N/A |
| CA_7A-28A | NS_01 | NS_18 | N/A | N/A |
| CA_12A-30A | NS_06 | NS_21 | Table 6.6.2.2.3.3-1 | Table 6.6.2.2.3.3-1 |
| CA_12A-66A | NS_06 | NS_03 | Table 6.6.2.2.3.3-1 | Table 6.6.2.2.3.1-1 |
| CA_19A-21A | NS_08 | NS_09 | N/A | N/A |

Note 1: For CCs with NS_01, there are no additional requirements defined in 36.101. Only CCs with NS-value different than NS_01 needs to be tested.
Note 2: A-MPR values for NS-values in this table are the same as in section 6.2.4.3.
Note 3: Selection of CA configurations and NS-values to test is derived in TR 36.905 [19].
Note 4: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column.
Note 5: As an exception to note 4, PCC is mapped to the second band of the combination as listed in Uplink CA Configuration column.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands. All of these configurations shall be tested with applicable test parameters for

each channel bandwidth, and are shown in tables 6.6.2.2A.2.4.1-2 to 6.6.2.2A.1.4.1-9. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.2A.2.4.1-2: Test Configuration Table (network signalled value NS_01/NS_03 or network signalled value NS_03/NS_01)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and high range for PCC<br>Mid range for SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **NS_03 CC** | **NS_01 CC** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 8 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 3 | 25 | 25 | | 16QAM | QPSK | 25 | 8 |
| 4 | 50 | 50 | | QPSK | QPSK | 6 | 12 |
| 5 | 50 | 50 | | 16QAM | 16QAM | 50 | 50 |
| 6 | 50 | 50 | | 16QAM | QPSK | 50 | 12 |
| 7 | 50 | 100 | | QPSK | QPSK | 6 | 18 |
| 8 | 50 | 100 | | 16QAM | 16QAM | 50 | 100 |
| 9 | 50 | 100 | | 16QAM | QPSK | 50 | 18 |
| 10 | 100 | 50 | | QPSK | QPSK | 10 | 12 |
| 11 | 100 | 50 | | 16QAM | 16QAM | 100 | 50 |
| 12 | 100 | 50 | | 16QAM | QPSK | 100 | 12 |
| 13 | 100 | 100 | | QPSK | QPSK | 10 | 18 |
| 14 | 100 | 100 | | 16QAM | 16QAM | 100 | 100 |
| 15 | 100 | 100 | | 16QAM | QPSK | 100 | 18 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

Note 4: Mapping of NS-value per CC and PCC/SCC selection are specified in Table 6.6.2.2A.2.4.1-1.

**Table 6.6.2.2A.2.4.1-3: Test Configuration Table (network signalled value NS_01/NS_06)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_07) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 6 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 25 | 9 |
| 3 | 25 | 25 | | QPSK | 16QAM | 6 | 9 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12 |
| 5 | 50 | 50 | | 16QAM | 16QAM | 50 | 15 |
| 6 | 50 | 50 | | QPSK | 16QAM | 12 | 15 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested. | | | | | | | |
| Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.6.2.2A.2.4.1-4: Test Configuration Table (network signalled value NS_01/NS_21)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | NC | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | Low and High range for both PCC and SCC | | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest and Highest $N_{RBagg}$ | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_21) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 3 | 25 | 25 | | QPSK | 16QAM | 8 | 25 |
| 4 (Note 4) | 50 | 50 | | QPSK | QPSK | 12 | 12@7 |
| 5 (Note 5) | 50 | 50 | | QPSK | QPSK | 12 | 12@31 |
| 6 | 50 | 50 | | 16QAM | 16QAM | 50 | 1 |
| 7 | 50 | 50 | | QPSK | 16QAM | 12 | 1 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.6.2.2A.2.4.1-1.
Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.
Note 4: Applicable only to Low range frequency testing.
Note 5: Applicable only to High range frequency testing.

**Table 6.6.2.2A.2.4.1-5: Test Configuration Table (network signalled value NS_03/NS_03)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$ (Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_03) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 15 | 25 | N/A for this test | QPSK | QPSK | 4 | 6 |
| 2 | 15 | 25 | | 16QAM | 16QAM | 15 | 25 |
| 3 | 15 | 25 | | 16QAM | QPSK | 15 | 6 |
| 4 | 25 | 25 | | QPSK | QPSK | 6 | 6 |
| 5 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 6 | 25 | 25 | | 16QAM | QPSK | 25 | 6 |
| 7 | 50 | 50 | | QPSK | QPSK | 6 | 6 |
| 8 | 50 | 50 | | 16QAM | 16QAM | 50 | 50 |
| 9 | 50 | 50 | | 16QAM | QPSK | 50 | 6 |
| 10 | 100 | 100 | | QPSK | QPSK | 10 | 10 |
| 11 | 100 | 100 | | 16QAM | 16QAM | 100 | 100 |
| 12 | 100 | 100 | | 16QAM | QPSK | 100 | 10 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested. | | | | | | | |
| Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.6.2.2A.2.4.1-6: Test Configuration Table (network signalled value NS_03/NS_06)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03)** | **SCC (NS_06)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 15 | 25 | N/A for this test | QPSK | QPSK | 4 | 8 |
| 2 | 15 | 25 | | 16QAM | 16QAM | 15 | 25 |
| 3 | 15 | 25 | | 16QAM | QPSK | 15 | 8 |
| 4 | 25 | 15 | | QPSK | QPSK | 6 | 4 |
| 5 | 25 | 15 | | 16QAM | 16QAM | 25 | 15 |
| 6 | 25 | 15 | | 16QAM | QPSK | 25 | 4 |
| 7 | 25 | 25 | | QPSK | QPSK | 6 | 8 |
| 8 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 9 | 25 | 25 | | 16QAM | QPSK | 25 | 8 |
| 10 | 25 | 50 | | QPSK | QPSK | 6 | 12 |
| 11 | 25 | 50 | | 16QAM | 16QAM | 25 | 50 |
| 12 | 25 | 50 | | 16QAM | QPSK | 25 | 12 |
| 13 | 50 | 50 | | QPSK | QPSK | 6 | 12 |
| 14 | 50 | 50 | | 16QAM | 16QAM | 50 | 50 |
| 15 | 50 | 50 | | 16QAM | QPSK | 50 | 12 |
| 16 | 100 | 50 | | QPSK | QPSK | 10 | 12 |
| 17 | 100 | 50 | | 16QAM | 16QAM | 100 | 50 |
| 18 | 100 | 50 | | 16QAM | QPSK | 100 | 12 |
| X+1 | 75 | 25 | | QPSK | QPSK | 8 | 8 |
| X+2 | 75 | 25 | | 16QAM | 16QAM | 75 | 25 |
| X+3 | 75 | 25 | | 16QAM | QPSK | 75 | 8 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.6.2.2A.2.4.1-7: Test Configuration Table (network signalled value NS_03/NS_07)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_07) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 50 | N/A for this test | QPSK | QPSK | 6 | 7@13 |
| 2 | 25 | 50 | | 16QAM | 16QAM | 25 | 50 |
| 3 | 25 | 50 | | QPSK | 16QAM | 6 | 50 |
| 4 | 50 | 50 | | QPSK | QPSK | 6 | 7@13 |
| 5 | 50 | 50 | | 16QAM | 16QAM | 50 | 50 |
| 6 | 50 | 50 | | QPSK | 16QAM | 6 | 50 |
| 7 | 100 | 50 | | QPSK | QPSK | 10 | 7@13 |
| 8 | 100 | 50 | | 16QAM | 16QAM | 100 | 50 |
| 9 | 100 | 50 | | QPSK | 16QAM | 10 | 50 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.
Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.6.2.2A.2.4.1-8: Test Configuration Table (network signalled value NS_03/NS_21)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$ | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_21) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 8 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 3 | 25 | 25 | | 16QAM | QPSK | 25 | 8 |
| 4 (Note 4) | 100 | 50 | | QPSK | QPSK | 10 | 12@7 |
| 5 (Note 5) | 100 | 50 | | QPSK | QPSK | 10 | 12@31 |
| 6 | 100 | 50 | | 16QAM | 16QAM | 100 | 1 |
| 7 | 100 | 50 | | QPSK | 16QAM | 10 | 1 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.6.2.2A.2.4.1-1.
Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.
Note 4: Applicable only to Low range frequency testing.
Note 5: Applicable only to High range frequency testing.

**Table 6.6.2.2A.2.4.1-9: Test Configuration Table (network signalled value NS_06/NS_21)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for both PCC and SCC |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06) NRB** | **SCC (NS_21) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 3 | 25 | 25 | | 16QAM | QPSK | 25 | 8 |
| 4 (Note 4) | 50 | 50 | | QPSK | QPSK | 12 | 12@7 |
| 5 (Note 5) | 50 | 50 | | QPSK | QPSK | 12 | 12@31 |
| 6 | 50 | 50 | | 16QAM | 16QAM | 50 | 1 |
| 7 | 50 | 50 | | QPSK | 16QAM | 12 | 1 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.6.2.2A.2.4.1-1.
Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.
Note 4: Applicable only to Low range frequency testing.
Note 5: Applicable only to High range frequency testing.

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.2A.2.4.1-2 to 6.6.2.2A.2.4.1-9.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.2A.2.4.3.

### 6.6.2.2A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.2.2A.2.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.2A.2.4.1-2 to 6.6.2.2A.2.4.1-9 on both PCC and SCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the mean power over all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in Tables 6.2.4A.2.5-2 to 6.2.4A.2.5-12. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

7. Measure the power of the transmitted signal for PCC if NS-value other than NS_01 with a measurement filter of bandwidths according to tables 6.6.2.2A.2.5.1-1 to 6.6.2.2A.2.5.1-4 as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

8. Measure the power of the transmitted signal for SCC if NS-value other than NS_01 with a measurement filter of bandwidths according to tables 6.6.2.2A.2.5.1-1 to 6.6.2.2A.2.5.1-4 as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

#### 6.6.2.2A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. The following exceptions apply for each network signalled value. These exceptions indicate that the UE shall meet the additional spectrum emission requirement for a specific deployment scenario.

##### 6.6.2.2A.2.4.3.1 Message contents exceptions (network signalled value " NS_03" on PCC)

1. Information element additionalSpectrumEmission is set to NS_03 for PCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.6.2.2A.2.4.3.1-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_03" on PCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 3 (NS_03) | | |

##### 6.6.2.2A.2.4.3.2 Message contents exceptions (network signalled value " NS_03" on SCC)

1. Information element additionalSpectrumEmissionSCell-r10 is set to NS_03 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.6.2.2A.2.4.3.2-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_03" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 3 (NS_03) | | |

##### 6.6.2.2A.2.4.3.3 Message contents exceptions (network signalled value " NS_06" on SCC)

1. Information element additionalSpectrumEmissionSCell-r10 is set to NS_06 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.6.2.2A.2.4.3.3-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_06" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 6 (NS_06) | | |

6.6.2.2A.2.4.3.4 Message contents exceptions (network signalled value " NS_07" on SCC)

1. Information element additionalSpectrumEmissionSCell-r10 is set to NS_07 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.6.2.2A.1.4.3.4-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_07" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 7 (NS_07) | | |

6.6.2.2A.2.4.3.5 Message contents exceptions (network signalled value " NS_21" on SCC)

1. Information element additionalSpectrumEmission is set to NS_21 for SCC. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message.

**Table 6.6.2.2A.2.4.3.5-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_21" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 21 (NS_21) | | |

2. Information element additionalSpectrumEmissionSCell-r10 is set to NS_21 for SCC. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.6.2.2A.2.4.3.5-2: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "NS_21" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 21 (NS_21) | | |

6.6.2.2A.2.5 Test Requirements

The measured UE mean power with the aggregated channel bandwidth as specified in clause 5.4.2A, derived in step 6 , shall fulfil requirements in Tables 6.2.4A.2.5-1 to 6.2.4A.2.5-12 as appropriate,

and

The power of any UE emission per component carrier derived in step 7 and 8 shall not exceed the levels specified in Tables 6.6.2.2A.2.5.1-1 to 6.6.2.2A.2.5.1-4.

**Table 6.6.2.2A.2.5-1: Additional requirements (network signalled value "NS_03", “NS_11”, “NS_20” and “NS_21”), E-UTRA bands ≤ 3GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | | | | | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2A.2.5-2: Additional requirements (network signalled value "NS_03", “NS_11”, “NS_20” and “NS_21”), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | | | | | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2A.2.5-3: Additional requirements (network signalled value "NS_06" or "NS_07"), E-UTRA bands ≤ 3GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | Measurement bandwidth |
| 0-0.1 | -11.5 | -11.5 | -13.5 | -16.5 | 30 kHz |
| 0.1-1 | -11.5 | -11.5 | -11.5 | -11.5 | 100 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | 1 MHz |
| 2.8-5 | | | | | 1 MHz |
| 5-6 | | -23.5 | | | 1 MHz |
| 6-10 | | | -23.5 | | 1 MHz |
| 10-15 | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.085 MHz.
The first and last measurement position with a 100 kHz filter is at ΔfOOB equals to 0.15 MHz and 0.95 MHz.

Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.

Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel

Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_06 and NS_07 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.

Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2A.2.5-4: Additional requirements (network signalled value "NS_06" or "NS_07"), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | Measurement bandwidth |
| 0-0.1 | -11.2 | -11.2 | -13.2 | -16.2 | 30 kHz |
| 0.1-1 | -11.2 | -11.2 | -11.2 | -11.2 | 100 kHz |
| 1-2.5 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | 1 MHz |
| 2.8-5 | | | | | 1 MHz |
| 5-6 | | -23.2 | | | 1 MHz |
| 6-10 | | | -23.2 | | 1 MHz |
| 10-15 | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.085 MHz.
The first and last measurement position with a 100 kHz filter is at ΔfOOB equals to 0.15 MHz and 0.95 MHz.

Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.

Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel.

Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_06 and NS_07 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.

Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

### 6.6.2.2A.2_1 Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA) for UL 64QAM

Editor's note: For a transition period until RAN5#83, this test case in version 15.3.1 of 36.521-1 shall be used. This is to ensure no test coverage is lost before the UL 256QAM test case becomes available.

#### 6.6.2.2A.2_1.1 Test purpose

To verify that the power of any UE emission shall not exceed specified lever for the specified channel bandwidth for CA under the deployment scenarios where additional requirements are specified.

#### 6.6.2.2A.2_1.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support inter-band DL CA and UL CA and UL 64QAM but do not support UL 256QAM.

#### 6.6.2.2A.2_1.3 Minimum conformance requirements

The minimum requirements are the same as in section 6.6.2.2A.2.3.

#### 6.6.2.2A.2_1.4 Test description

##### 6.6.2.2A.2_1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state. For Uplink CA Configurations listed in table 6.6.2.2A.2_1.4.1-1, Additional Spectrum emission requirements are tested.

**Table 6.6.2.2A.2_1.4.1-1: Additional Spectrum Emission mask for inter-band CA**

| Uplink CA Configuration | NS-value per CC (in same order as UL CA Configuration column) | | Applicable spectrum emission requirements (in same order as UL CA Configuration column) | |
|---|---|---|---|---|
| CA_2A-4A, CA_2A-66A | NS_03 | NS_03 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.1-1 |
| CA_2A-12A, CA_2A-13A, CA_4A-12A, CA_4A-13A, CA_4A-17A | NS_03 | NS_06 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.3-1 |
| CA_2A-13A, CA_4A-13A | NS_03 | NS_07 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.3-1 |
| CA_2A-5A, CA_2A-7A, CA_4A-5A, CA_4A-7A | NS_03 | NS_01 | Table 6.6.2.2.3.1-1 | N/A |
| CA_5A-66A[Note5] | NS_01 | NS_03 | N/A | Table 6.6.2.2.3.1-1 |
| CA_2A-30A | NS_03 | NS_21 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.1-1 |
| CA_5A-12A | NS_01 | NS_06 | N/A | Table 6.6.2.2.3.3-1 |
| CA_5A-30A | NS_01 | NS_21 | N/A | Table 6.6.2.2.3.1-1 |
| CA_12A-30A | NS_06 | NS_21 | Table 6.6.2.2.3.3-1 | Table 6.6.2.2.3.3-1 |
| CA_1A-3A | NS_05 | NS_01 | N/A | N/A |
| CA_1A-19A | NS_05 | NS_08 | N/A | N/A |
| CA_1A-21A | NS_05 | NS_09 | N/A | N/A |
| CA_3A-19A | NS_01 | NS_08 | N/A | N/A |
| CA_19A-21A | NS_08 | NS_09 | N/A | N/A |

Note 1: For CCs with NS_01, there are no additional requirements defined in 36.101. Only CCs with NS-value different than NS_01 needs to be tested.
Note 2: A-MPR values for NS-values in this table are the same as in section 6.2.4.3.
Note 3: Selection of CA configurations and NS-values to test is derived in TR 36.905 [19].
Note 4: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column.
Note 5: As an exception to note 4, PCC is mapped to the second band of the combination as listed in Uplink CA Configuration column.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in tables 6.6.2.2A.2_1.4.1-2 to 6.6.2.2A.1.4.1-9. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.2A.2_1.4.1-2: Test Configuration Table (network signalled value NS_01/NS_03 or network signalled value NS_03/NS_01)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and high range for PCC<br>Mid range for SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **NS_03 CC** | **NS_01 CC** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 8 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 3 | 25 | 25 | | 64QAM | QPSK | 25 | 8 |
| 4 | 50 | 50 | | QPSK | QPSK | 6 | 12 |
| 5 | 50 | 50 | | 64QAM | 64QAM | 50 | 50 |
| 6 | 50 | 50 | | 64QAM | QPSK | 50 | 12 |
| 7 | 50 | 100 | | QPSK | QPSK | 6 | 18 |
| 8 | 50 | 100 | | 64QAM | 64QAM | 50 | 100 |
| 9 | 50 | 100 | | 64QAM | QPSK | 50 | 18 |
| 10 | 100 | 50 | | QPSK | QPSK | 10 | 12 |
| 11 | 100 | 50 | | 64QAM | 64QAM | 100 | 50 |
| 12 | 100 | 50 | | 64QAM | QPSK | 100 | 12 |
| 13 | 100 | 100 | | QPSK | QPSK | 10 | 18 |
| 14 | 100 | 100 | | 64QAM | 64QAM | 100 | 100 |
| 15 | 100 | 100 | | 64QAM | QPSK | 100 | 18 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. For Mid range place test point with RBstart=0 and RBstart=RBmax-LCRB+1.

Note 4: Mapping of NS-value per CC and PCC/SCC selection are specified in Table 6.6.2.2A.2_1.4.1-1.

**Table 6.6.2.2A.2_1.4.1-3: Test Configuration Table (network signalled value NS_01/NS_06)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03)** | **SCC (NS_07)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 6 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 25 | 9 |
| 3 | 25 | 25 | | QPSK | 64QAM | 6 | 9 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12 |
| 5 | 50 | 50 | | 64QAM | 64QAM | 50 | 15 |
| 6 | 50 | 50 | | QPSK | 64QAM | 12 | 15 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.<br>Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.6.2.2A.2_1.4.1-4: Test Configuration Table (network signalled value NS_01/NS_21)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$ | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 3 | 25 | 25 | | QPSK | 64QAM | 8 | 25 |
| 4 (Note 4) | 50 | 50 | | QPSK | QPSK | 12 | 12@7 |
| 5 (Note 5) | 50 | 50 | | QPSK | QPSK | 12 | 12@31 |
| 6 | 50 | 50 | | 64QAM | 64QAM | 50 | 1 |
| 7 | 50 | 50 | | QPSK | 64QAM | 12 | 1 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.6.2.2A.2_1.4.1-1. | | | | | | | |
| Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |
| Note 4: Applicable only to Low range frequency testing. | | | | | | | |
| Note 5: Applicable only to High range frequency testing. | | | | | | | |

**Table 6.6.2.2A.2_1.4.1-5: Test Configuration Table (network signalled value NS_03/NS_03)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$ (Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_03) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 15 | 25 | N/A for this test | QPSK | QPSK | 4 | 6 |
| 2 | 15 | 25 | | 64QAM | 64QAM | 15 | 25 |
| 3 | 15 | 25 | | 64QAM | QPSK | 15 | 6 |
| 4 | 25 | 25 | | QPSK | QPSK | 6 | 6 |
| 5 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 6 | 25 | 25 | | 64QAM | QPSK | 25 | 6 |
| 7 | 50 | 50 | | QPSK | QPSK | 6 | 6 |
| 8 | 50 | 50 | | 64QAM | 64QAM | 50 | 50 |
| 9 | 50 | 50 | | 64QAM | QPSK | 50 | 6 |
| 10 | 100 | 100 | | QPSK | QPSK | 10 | 10 |
| 11 | 100 | 100 | | 64QAM | 64QAM | 100 | 100 |
| 12 | 100 | 100 | | 64QAM | QPSK | 100 | 10 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.6.2.2A.2_1.4.1-6: Test Configuration Table (network signalled value NS_03/NS_06)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_06) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 15 | 25 | N/A for this test | QPSK | QPSK | 4 | 8 |
| 2 | 15 | 25 | | 64QAM | 64QAM | 15 | 25 |
| 3 | 15 | 25 | | 64QAM | QPSK | 15 | 8 |
| 4 | 25 | 15 | | QPSK | QPSK | 6 | 4 |
| 5 | 25 | 15 | | 64QAM | 64QAM | 25 | 15 |
| 6 | 25 | 15 | | 64QAM | QPSK | 25 | 4 |
| 7 | 25 | 25 | | QPSK | QPSK | 6 | 8 |
| 8 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 9 | 25 | 25 | | 64QAM | QPSK | 25 | 8 |
| 10 | 25 | 50 | | QPSK | QPSK | 6 | 12 |
| 11 | 25 | 50 | | 64QAM | 64QAM | 25 | 50 |
| 12 | 25 | 50 | | 64QAM | QPSK | 25 | 12 |
| 13 | 50 | 50 | | QPSK | QPSK | 6 | 12 |
| 14 | 50 | 50 | | 64QAM | 64QAM | 50 | 50 |
| 15 | 50 | 50 | | 64QAM | QPSK | 50 | 12 |
| 16 | 100 | 50 | | QPSK | QPSK | 10 | 12 |
| 17 | 100 | 50 | | 64QAM | 64QAM | 100 | 50 |
| 18 | 100 | 50 | | 64QAM | QPSK | 100 | 12 |
| X+1 | 75 | 25 | | QPSK | QPSK | 8 | 8 |
| X+2 | 75 | 25 | | 64QAM | 64QAM | 75 | 25 |
| X+3 | 75 | 25 | | 64QAM | QPSK | 75 | 8 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.6.2.2A.2_1.4.1-7: Test Configuration Table (network signalled value NS_03/NS_07)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03)** | **SCC (NS_07)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 50 | N/A for this test | QPSK | QPSK | 6 | 7@13 |
| 2 | 25 | 50 | | 64QAM | 64QAM | 25 | 50 |
| 3 | 25 | 50 | | QPSK | 64QAM | 6 | 50 |
| 4 | 50 | 50 | | QPSK | QPSK | 6 | 7@13 |
| 5 | 50 | 50 | | 64QAM | 64QAM | 50 | 50 |
| 6 | 50 | 50 | | QPSK | 64QAM | 6 | 50 |
| 7 | 100 | 50 | | QPSK | QPSK | 10 | 7@13 |
| 8 | 100 | 50 | | 64QAM | 64QAM | 100 | 50 |
| 9 | 100 | 50 | | QPSK | 64QAM | 10 | 50 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.<br>Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.6.2.2A.2_1.4.1-8: Test Configuration Table (network signalled value NS_03/NS_21)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | NC | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | Low and High range for both PCC and SCC | | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest and Highest $N_{RBagg}$ | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 8 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 3 | 25 | 25 | | 64QAM | QPSK | 25 | 8 |
| 4 (Note 4) | 100 | 50 | | QPSK | QPSK | 10 | 12@7 |
| 5 (Note 5) | 100 | 50 | | QPSK | QPSK | 10 | 12@31 |
| 6 | 100 | 50 | | 64QAM | 64QAM | 100 | 1 |
| 7 | 100 | 50 | | QPSK | 64QAM | 10 | 1 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.6.2.2A.2_1.4.1-1.
Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.
Note 4: Applicable only to Low range frequency testing.
Note 5: Applicable only to High range frequency testing.

**Table 6.6.2.2A.2_1.4.1-9: Test Configuration Table (network signalled value NS_06/NS_21)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for both PCC and SCC |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 3 | 25 | 25 | | 64QAM | QPSK | 25 | 8 |
| 4 (Note 4) | 50 | 50 | | QPSK | QPSK | 12 | 12@7 |
| 5 (Note 5) | 50 | 50 | | QPSK | QPSK | 12 | 12@31 |
| 6 | 50 | 50 | | 64QAM | 64QAM | 50 | 1 |
| 7 | 50 | 50 | | QPSK | 64QAM | 12 | 1 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.6.2.2A.2_1.4.1-1.
Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.
Note 4: Applicable only to Low range frequency testing.
Note 5: Applicable only to High range frequency testing.

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.2A.2_1.4.1-2 to 6.6.2.2A.2_1.4.1-9.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.2A.2_1.4.3.

### 6.6.2.2A.2_1.4.2 Test procedure

Same test procedure as in clause 6.6.2.2A.2.4.2.

### 6.6.2.2A.2_1.4.3 Message contents

Same message contents as in clause 6.6.2.2A.2.4.3.

#### 6.6.2.2A.2_1.5 Test Requirements

Same test requirements as in clause 6.6.2.2A.2.5.

### 6.6.2.2A.2_2 Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA) for UL 256QAM

#### 6.6.2.2A.2_2.1 Test purpose

To verify that the power of any UE emission shall not exceed specified lever for the specified channel bandwidth for CA under the deployment scenarios where additional requirements are specified.

#### 6.6.2.2A.2_2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support inter-band DL CA and UL CA and UL 256QAM.

#### 6.6.2.2A.2_2.3 Minimum conformance requirements

The minimum requirements are the same as in section 6.6.2.2A.2.3.

#### 6.6.2.2A.2_2.4 Test description

##### 6.6.2.2A.2_2.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state. For Uplink CA Configurations listed in table 6.6.2.2A.2_2.4.1-1, Additional Spectrum emission requirements are tested.

**Table 6.6.2.2A.2_2.4.1-1 Additional Spectrum Emission mask for inter-band CA**

| Uplink CA Configuration | NS-value per CC (in same order as UL CA Configuration column) | | Applicable spectrum emission requirements (in same order as UL CA Configuration column) | |
|---|---|---|---|---|
| CA_2A-4A, CA_2A-66A | NS_03 | NS_03 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.1-1 |
| CA_2A-12A, CA_2A-13A, CA_4A-12A, CA_4A-13A, CA_4A-17A | NS_03 | NS_06 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.3-1 |
| CA_2A-13A, CA_4A-13A | NS_03 | NS_07 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.3-1 |
| CA_2A-5A, CA_2A-7A, CA_4A-5A, CA_4A-7A | NS_03 | NS_01 | Table 6.6.2.2.3.1-1 | N/A |
| CA_5A-66A[Note5] | NS_01 | NS_03 | N/A | Table 6.6.2.2.3.1-1 |
| CA_2A-30A | NS_03 | NS_21 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.1-1 |
| CA_5A-12A | NS_01 | NS_06 | N/A | Table 6.6.2.2.3.3-1 |
| CA_5A-30A | NS_01 | NS_21 | N/A | Table 6.6.2.2.3.1-1 |
| CA_12A-30A | NS_06 | NS_21 | Table 6.6.2.2.3.3-1 | Table 6.6.2.2.3.3-1 |
| CA_1A-3A | NS_05 | NS_01 | N/A | N/A |
| CA_1A-19A | NS_05 | NS_08 | N/A | N/A |
| CA_1A-21A | NS_05 | NS_09 | N/A | N/A |
| CA_3A-19A | NS_01 | NS_08 | N/A | N/A |
| CA_19A-21A | NS_08 | NS_09 | N/A | N/A |

Note 1: For CCs with NS_01, there are no additional requirements defined in 36.101. Only CCs with NS-value different than NS_01 needs to be tested.
Note 2: A-MPR values for NS-values in this table are the same as in section 6.2.4.3.
Note 3: Selection of CA configurations and NS-values to test is derived in TR 36.905 [19].
Note 4: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column.
Note 5: As an exception to note 4, PCC is mapped to the second band of the combination as listed in Uplink CA Configuration column.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in tables 6.6.2.2A.2_2.4.1-2 to 6.6.2.2A.2.4.1-9. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.2A.2_2.4.1-2: Test Configuration Table (network signalled value NS_01/NS_03 or network signalled value NS_03/NS_01)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and high range for PCC<br>Mid range for SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **NS_03 CC** | **NS_01 CC** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 8 |
| 2 | 25 | 25 | | 256QAM | 256QAM | 25 | 25 |
| 3 | 25 | 25 | | 256QAM | QPSK | 25 | 8 |
| 4 | 50 | 50 | | QPSK | QPSK | 6 | 12 |
| 5 | 50 | 50 | | 256QAM | 256QAM | 50 | 50 |
| 6 | 50 | 50 | | 256QAM | QPSK | 50 | 12 |
| 7 | 50 | 100 | | QPSK | QPSK | 6 | 18 |
| 8 | 50 | 100 | | 256QAM | 256QAM | 50 | 100 |
| 9 | 50 | 100 | | 256QAM | QPSK | 50 | 18 |
| 10 | 100 | 50 | | QPSK | QPSK | 10 | 12 |
| 11 | 100 | 50 | | 256QAM | 256QAM | 100 | 50 |
| 12 | 100 | 50 | | 256QAM | QPSK | 100 | 12 |
| 13 | 100 | 100 | | QPSK | QPSK | 10 | 18 |
| 14 | 100 | 100 | | 256QAM | 256QAM | 100 | 100 |
| 15 | 100 | 100 | | 256QAM | QPSK | 100 | 18 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.<br>Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.<br>Note 4: Mapping of NS-value per CC and PCC/SCC selection are specified in Table 6.6.2.2A.2_2.4.1-1. | | | | | | | |

**Table 6.6.2.2A.2_2.4.1-3: Test Configuration Table (network signalled value NS_01/NS_06)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03)** | **SCC (NS_07)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 6 |
| 2 | 25 | 25 | | 256QAM | 256QAM | 25 | 9 |
| 3 | 25 | 25 | | QPSK | 256QAM | 6 | 9 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12 |
| 5 | 50 | 50 | | 256QAM | 256QAM | 50 | 15 |
| 6 | 50 | 50 | | QPSK | 256QAM | 12 | 15 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.<br>Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.6.2.2A.2_2.4.1-4: Test Configuration Table (network signalled value NS_01/NS_21)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$ | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8 |
| 2 | 25 | 25 | | 256QAM | 256QAM | 25 | 25 |
| 3 | 25 | 25 | | QPSK | 256QAM | 8 | 25 |
| 4 (Note 4) | 50 | 50 | | QPSK | QPSK | 12 | 12@7 |
| 5 (Note 5) | 50 | 50 | | QPSK | QPSK | 12 | 12@31 |
| 6 | 50 | 50 | | 256QAM | 256QAM | 50 | 1 |
| 7 | 50 | 50 | | QPSK | 256QAM | 12 | 1 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.6.2.2A.2_2.4.1-1. | | | | | | | |
| Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |
| Note 4: Applicable only to Low range frequency testing. | | | | | | | |
| Note 5: Applicable only to High range frequency testing. | | | | | | | |

**Table 6.6.2.2A.2_2.4.1-5: Test Configuration Table (network signalled value NS_03/NS_03)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$ (Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_03) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 15 | 25 | N/A for this test | QPSK | QPSK | 4 | 6 |
| 2 | 15 | 25 | | 256QAM | 256QAM | 15 | 25 |
| 3 | 15 | 25 | | 256QAM | QPSK | 15 | 6 |
| 4 | 25 | 25 | | QPSK | QPSK | 6 | 6 |
| 5 | 25 | 25 | | 256QAM | 256QAM | 25 | 25 |
| 6 | 25 | 25 | | 256QAM | QPSK | 25 | 6 |
| 7 | 50 | 50 | | QPSK | QPSK | 6 | 6 |
| 8 | 50 | 50 | | 256QAM | 256QAM | 50 | 50 |
| 9 | 50 | 50 | | 256QAM | QPSK | 50 | 6 |
| 10 | 100 | 100 | | QPSK | QPSK | 10 | 10 |
| 11 | 100 | 100 | | 256QAM | 256QAM | 100 | 100 |
| 12 | 100 | 100 | | 256QAM | QPSK | 100 | 10 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested. | | | | | | | |
| Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.6.2.2A.2_2.4.1-6: Test Configuration Table (network signalled value NS_03/NS_06)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03)** | **SCC (NS_06)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 15 | 25 | N/A for this test | QPSK | QPSK | 4 | 8 |
| 2 | 15 | 25 | | 256QAM | 256QAM | 15 | 25 |
| 3 | 15 | 25 | | 256QAM | QPSK | 15 | 8 |
| 4 | 25 | 15 | | QPSK | QPSK | 6 | 4 |
| 5 | 25 | 15 | | 256QAM | 256QAM | 25 | 15 |
| 6 | 25 | 15 | | 256QAM | QPSK | 25 | 4 |
| 7 | 25 | 25 | | QPSK | QPSK | 6 | 8 |
| 8 | 25 | 25 | | 256QAM | 256QAM | 25 | 25 |
| 9 | 25 | 25 | | 256QAM | QPSK | 25 | 8 |
| 10 | 25 | 50 | | QPSK | QPSK | 6 | 12 |
| 11 | 25 | 50 | | 256QAM | 256QAM | 25 | 50 |
| 12 | 25 | 50 | | 256QAM | QPSK | 25 | 12 |
| 13 | 50 | 50 | | QPSK | QPSK | 6 | 12 |
| 14 | 50 | 50 | | 256QAM | 256QAM | 50 | 50 |
| 15 | 50 | 50 | | 256QAM | QPSK | 50 | 12 |
| 16 | 100 | 50 | | QPSK | QPSK | 10 | 12 |
| 17 | 100 | 50 | | 256QAM | 256QAM | 100 | 50 |
| 18 | 100 | 50 | | 256QAM | QPSK | 100 | 12 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.6.2.2A.2_2.4.1-7: Test Configuration Table (network signalled value NS_03/NS_07)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03)** | **SCC (NS_07)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 50 | N/A for this test | QPSK | QPSK | 6 | 7@13 |
| 2 | 25 | 50 | | 256QAM | 256QAM | 25 | 50 |
| 3 | 25 | 50 | | QPSK | 256QAM | 6 | 50 |
| 4 | 50 | 50 | | QPSK | QPSK | 6 | 7@13 |
| 5 | 50 | 50 | | 256QAM | 256QAM | 50 | 50 |
| 6 | 50 | 50 | | QPSK | 256QAM | 6 | 50 |
| 7 | 100 | 50 | | QPSK | QPSK | 10 | 7@13 |
| 8 | 100 | 50 | | 256QAM | 256QAM | 100 | 50 |
| 9 | 100 | 50 | | QPSK | 256QAM | 10 | 50 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested. | | | | | | | |
| Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.6.2.2A.2_2.4.1-8: Test Configuration Table (network signalled value NS_03/NS_21)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | NC | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | Low and High range for both PCC and SCC | | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest and Highest $N_{RBagg}$ | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 8 |
| 2 | 25 | 25 | | 256QAM | 256QAM | 25 | 25 |
| 3 | 25 | 25 | | 256QAM | QPSK | 25 | 8 |
| 4 (Note 4) | 100 | 50 | | QPSK | QPSK | 10 | 12@7 |
| 5 (Note 5) | 100 | 50 | | QPSK | QPSK | 10 | 12@31 |
| 6 | 100 | 50 | | 256QAM | 256QAM | 100 | 1 |
| 7 | 100 | 50 | | QPSK | 256QAM | 10 | 1 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.6.2.2A.2_2.4.1-1.
Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.
Note 4: Applicable only to Low range frequency testing.
Note 5: Applicable only to High range frequency testing.

**Table 6.6.2.2A.2_2.4.1-9: Test Configuration Table (network signalled value NS_06/NS_21)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for both PCC and SCC |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8 |
| 2 | 25 | 25 | | 256QAM | 256QAM | 25 | 25 |
| 3 | 25 | 25 | | 256QAM | QPSK | 25 | 8 |
| 4 (Note 4) | 50 | 50 | | QPSK | QPSK | 12 | 12@7 |
| 5 (Note 5) | 50 | 50 | | QPSK | QPSK | 12 | 12@31 |
| 6 | 50 | 50 | | 256QAM | 256QAM | 50 | 1 |
| 7 | 50 | 50 | | QPSK | 256QAM | 12 | 1 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.6.2.2A.2_2.4.1-1.
Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.
Note 4: Applicable only to Low range frequency testing.
Note 5: Applicable only to High range frequency testing.

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.2A.2_2.4.1-2 to 6.6.2.2A.2_2.4.1-9.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.2A.2_2.4.3.

### 6.6.2.2A.2_2.4.2 Test procedure

Same test procedure as in clause 6.6.2.2A.2.4.2.

### 6.6.2.2A.2_2.4.3 Message contents

Same message contents as in clause 6.6.2.2A.2.4.3.

#### 6.6.2.2A.2_2.5 Test Requirements

Same test requirements as in clause 6.6.2.2A.2.5.

### 6.6.2.2A.3 Additional Spectrum Emission Mask for CA (intra-band non-contiguous DL CA and UL CA)

#### 6.6.2.2A.3.1 Test purpose

To verify that the power of any UE emission shall not exceed specified lever for the specified channel bandwidth for CA under the deployment scenarios where additional requirements are specified.

#### 6.6.2.2A.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

#### 6.6.2.2A.3.3 Minimum conformance requirements

Minimum conformance requirements are specified in section 6.2.4A.3.1.

#### 6.6.2.2A.3.4 Test description

##### 6.6.2.2A.3.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.2A.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.2.4A.3.4.1-1: Test Configuration Table (network signalled value CA_NC_NS_01)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: Low Wgap, Maximum Wgap |
| Test CC Combination setting ($N_{RB}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@24 |
| 2 | 25 | 25 | 35 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@0 |
| 3 | 25 | 25 | 5 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@24 |
| 4 | 25 | 25 | 5 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@0 |
| 5 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@99 |
| 6 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@75 |
| 7 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_100@0 | 16QAM | S_100@0 |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.2A.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.2A.3.4.3.

### 6.6.2.2A.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.2.2A.3.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.2A.3.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the mean power over all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in Table 6.2.3A.3.5-1. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

7. Measure the power of the transmitted signal for PCC with a measurement filter of bandwidths according to tables 6.6.2.2A.3.5.1-1 to 6.6.2.2A.3.5.1-2 as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

8. Measure the power of the transmitted signal for SCC with a measurement filter of bandwidths according to tables 6.6.2.2A.3.5.1-1 to 6.6.2.2A.3.5.1-2 as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

#### 6.6.2.2A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. The following exceptions apply for each network signalled value. These exceptions indicate that the UE shall meet the additional spectrum emission requirement for a specific deployment scenario.

##### 6.6.2.2A.3.4.3.2 Message contents exceptions (network signalled value "CA_NC_NS_01")

1. Information element additionalSpectrumEmissionSCell-r10 is set to CA_NC_NS_01. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages.

**Table 6.6.2.2A.3.4.3.2-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NC_NS_01"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 1 (CA_NC_NS_01) | | |

#### 6.6.2.2A.3.5 Test Requirements

The measured UE mean power with the aggregated channel bandwidth as specified in clause 5.4.2A, derived in step 6 , shall fulfil requirements in Table 6.2.3A.3.5-1,

and

The power of any UE emission per component carrier derived in step 7 and 8 shall not exceed the levels specified in Tables 6.6.2.2A.3.5.1-1 to 6.6.2.2A.3.5.1-2. The spectrum emission mask requirement is defined as a composite spectrum emissions mask, as defined in section 6.6.2.1A.0.

**Table 6.6.2.2A.3.5-1: Additional requirements (network signalled value " CA_NC_NS_01"), E-UTRA bands ≤ 3GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | | | | | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2A.3.5-2: Additional requirements (network signalled value " CA_NC_NS_01"), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | | | | | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

### 6.6.2.2A.4 Additional Spectrum Emission Mask for CA (3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

-Test Configuration Table is incomplete

-The Test applicability needs to be added to TS36.521-2

-Test Requirements Table is incomplete

#### 6.6.2.2A.4.1 Test purpose

To verify that the power of any UE emission shall not exceed specified lever for the specified channel bandwidth for CA under the deployment scenarios where additional requirements are specified.

#### 6.6.2.2A.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support 3UL with Intra-band contiguous CA or with Intra-band contiguous and Inter-band CA.

#### 6.6.2.2A.4.3 Minimum conformance requirements

The minimum requirements are the same as in section 6.6.2.2.3 per component carrier.

#### 6.6.2.2A.4.4 Test description

##### 6.6.2.2A.4.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-3. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.2A.4.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.2A.4.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br><br>A: Low Wgap, Maximum Wgap |
| Test CC Combination setting ($N_{RB}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

| Test Parameters for CA Configurations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ | DL Allocation | | UL Allocation | | | | |
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | [MHz] | CC MOD | PCC & SCC RB allocation | CC MOD | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A for this test | | 16QAM | P_1@0 | 16QAM | S_1@24 | 16QAM | S_1@24 |
| 2 | 25 | 25 | 35 | | | 16QAM | P_25@0 | 16QAM | S_25@0 | 16QAM | S_25@0 |
| 3 | 25 | 25 | 5 | | | 16QAM | P_1@0 | 16QAM | S_1@24 | 16QAM | S_1@24 |
| 4 | 25 | 25 | 5 | | | 16QAM | P_25@0 | 16QAM | S_25@0 | 16QAM | S_25@0 |
| 5 | 100 | 100 | 5 | | | 16QAM | P_1@0 | 16QAM | S_1@99 | 16QAM | S_1@99 |
| 6 | 100 | 100 | 5 | | | 16QAM | P_25@0 | 16QAM | S_25@75 | 16QAM | S_25@75 |
| 7 | 100 | 100 | 5 | | | 16QAM | P_100@0 | 16QAM | S_100@0 | 16QAM | S_100@0 |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.2A.4.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.2A.4.4.3.

### 6.6.2.2A.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.2.2A.4.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.2A.4.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the mean power over all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in Table 6.2.3A.3.5-1. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

7. Measure the power of the transmitted signal for PCC with a measurement filter of bandwidths according to tables 6.6.2.2A.4.5.1-1 to 6.6.2.2A.4.5.1-2 as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

8. Measure the power of the transmitted signal for SCC with a measurement filter of bandwidths according to tables 6.6.2.2A.4.5.1-1 to 6.6.2.2A.4.5.1-2 as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

#### 6.6.2.2A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. The following exceptions apply for each network signalled value. These exceptions indicate that the UE shall meet the additional spectrum emission requirement for a specific deployment scenario.

### 6.6.2.2A.4.5 Test Requirements

The measured UE mean power with the aggregated channel bandwidth as specified in clause 5.4.2A, derived in step 6 , shall fulfil requirements in Table 6.2.3A.3.5-1,and

The power of any UE emission per component carrier derived in step 7 and 8 shall not exceed the levels specified in Tables 6.6.2.2A.4.5.1-1 to 6.6.2.2A.4.5.1-2. The spectrum emission mask requirement is defined as a composite spectrum emissions mask, as defined in section 6.6.2.1A.0.

**Table 6.6.2.2A.4.5-1: Additional requirements**

**FFS**

**Table 6.6.2.2A.4.5-2: Additional requirements**

**FFS**

## 6.6.2.2B Additional Spectrum Emission Mask for UL-MIMO

### 6.6.2.2B.1 Test purpose

To verify that the power of any UE emission at each transmit antenna shall not exceed specified lever for the specified channel bandwidth under the deployment scenarios where additional requirements are specified.

### 6.6.2.2B.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO

### 6.6.2.2B.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.2.3.

## 6.6.2.2B.4 Test description

### 6.6.2.2B.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Tables 6.6.2.2B.4.1-1 to 6.6.2.2B.4.1-7.The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.2B.4.1-1: Test Configuration Table (network signalled value "NS_03", “NS_11”, and “NS_20”)**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] clause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] clause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] clause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | N/A for Additional Spectrum Emission Mask testing. | | | QPSK | 6 | 6 |
| 1.4MHz | | | | QPSK | 5 | 5 |
| 1.4MHz | | | | 16QAM | 5 | 5 |
| 3MHz | | | | QPSK | 15 | 15 |
| 3MHz | | | | QPSK | 4 | 4 |
| 3MHz | | | | 16QAM | 15 | 15 |
| 3MHz | | | | 16QAM | 4 | 4 |
| 5MHz | | | | QPSK | 25 | 25 |
| 5MHz | | | | QPSK | 8 | 8 |
| 5MHz | | | | QPSK | 6 | 6 |
| 5MHz | | | | 16QAM | 25 | 25 |
| 5MHz | | | | 16QAM | 8 | 8 |
| 10MHz | | | | QPSK | 50 | 50 |
| 10MHz | | | | QPSK | 12 | 12 |
| 10MHz | | | | QPSK | 6 | 6 |
| 10MHz | | | | 16QAM | 50 (Note 3) | 50 (Note 3) |
| 10MHz | | | | 16QAM | 12 | 12 |
| 15MHz | | | | QPSK | 75 | 75 |
| 15MHz | | | | QPSK | 16 | 16 |
| 15MHz | | | | QPSK | 8 | 8 |
| 15MHz | | | | 16QAM | 75 (Note 3) | 75 (Note 3) |
| 15MHz | | | | 16QAM | 16 | 16 |
| 20MHz | | | | QPSK | 100 | 100 |
| 20MHz | | | | QPSK | 18 | 18 |
| 20MHz | | | | QPSK | 10 | 10 |
| 20MHz | | | | 16QAM | 100 (Note 3) | 100 (Note 3) |
| 20MHz | | | | 16QAM | 18 | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories [FFS].

**Table 6.6.2.2B.4.1-2: Test Configuration Table (network signalled value "NS_04")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range<br><br>Additional test frequencies for Rel-12 to Rel-13 and bit 2 of modifiedMPRbehavior = 0:<br><br>For 5 MHz bandwidth:<br>2499.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866<br><br>Additional test frequencies for Rel-12 and later and bit 2 of modifiedMPRbehavior = 1:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39686<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866 | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10 MHz, 15 MHz, 20MHz | | |
| **Test Parameters for NS_04 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation TDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 (Note 6) | 5MHz | N/A for A-MPR testing | | QPSK | 25 | 0 |
| 2 (Note 6) | 5MHz | | | QPSK | 8 | Note 3 |
| 3(Note 6) | 5MHz | | | QPSK | 6 | Note 3 |
| 4 (Note 6) | 5MHz | | | 16QAM (Note 5) | 25 | 0 |
| 5 (Note 6) | 5MHz | | | 16QAM (Note 5) | 8 | Note 3 |
| 6 (Note 6) | 10MHz | | | QPSK | 1 | 0 |
| 7 (Note 6) | 10MHz | | | QPSK | 12 | 0 |
| 8 (Note 6) | 10MHz | | | QPSK | 50 | 0 |
| 9 Note 6) | 10MHz | | | 16QAM (Note 5) | 50 (Note 4) | 0 |
| 10 (Note 6) | 10MHz | | | QPSK | 24 | 13 |
| 11 (Note 6) | 10MHz | | | 16QAM (Note 5) | 24 | 13 |
| 12 (Note 6) | 10MHz | | | QPSK | 36 | 13 |
| 13 (Note 6) | 10MHz | | | QPSK | 12 | 37 |
| 14 (Note 6) | 10MHz | | | QPSK | 1 | 49 |
| 15 (Note 6) | 15MHz | | | QPSK | 1 | 0 |
| 16 (Note 6) | 15MHz | | | QPSK | 16 | 0 |
| 17 (Note 6) | 15MHz | | | QPSK | 75 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| 18 (Note 6) | 15MHz | | 16QAM (Note 5) | 75 (Note 4) | 0 |
| 19 (Note 6) | 15MHz | | QPSK | 36 | 19 |
| 20 (Note 6) | 15MHz | | 16QAM (Note 5) | 36 (Note 4) | 19 |
| 21 (Note 6) | 15MHz | | QPSK | 50 | 19 |
| 22 (Note 6) | 15MHz | | QPSK | 18 | 56 |
| 23 (Note 6) | 15MHz | | QPSK | 1 | 74 |
| 24 (Note 6) | 20MHz | | QPSK | 1 | 0 |
| 25 (Note 6) | 20MHz | | QPSK | 18 | 0 |
| 26 (Note 6) | 20MHz | | QPSK | 100 | 0 |
| 27 (Note 6) | 20MHz | | 16QAM (Note 5) | 100 (Note 4) | 0 |
| 28 (Note 6) | 20MHz | | QPSK | 50 | 25 |
| 29 (Note 6) | 20MHz | | 16QAM (Note 5) | 50 (Note 4) | 25 |
| 30 (Note 6) | 20MHz | | QPSK | 75 | 25 |
| 31 (Note 6) | 20MHz | | QPSK | 25 | 75 |
| 32 (Note 6) | 20MHz | | QPSK | 1 | 99 |
| 33 (Note 8) | 5MHz | | QPSK | 1 | 0 |
| 34 (Note 8) | 5MHz | | QPSK | 16 | 9 |
| 35 (Note 9) | 5MHz | | QPSK | 25 | 0 |
| 36 (Note 8) | 5MHz | | 16QAM (Note 5) | 16 | 9 |
| 37 (Note 9) | 5MHz | | 16QAM (Note 5) | 25 | 0 |
| 38 (Note 8) | 10MHz | | QPSK | 1 | 0 |
| 39 (Note 8) | 10MHz | | QPSK | 1 | 49 |
| 40 (Note 8) | 10MHz | | QPSK | 24 | 0 |
| 41 (Note 8) | 10MHz | | QPSK | 40 | 10 |
| 42 (Note 7) | 10MHz | | QPSK | 50 | 0 |
| 43 (Note 7) | 10MHz | | 16QAM (Note 5) | 50 | 0 |
| 44 (Note 8) | 15MHz | | QPSK | 1 | 0 |
| 45 (Note 8) | 15MHz | | QPSK | 1 | 74 |
| 46 (Note 8) | 15MHz | | QPSK | 32 | 0 |
| 47 (Note 8) | 15MHz | | QPSK | 60 | 15 |
| 48 (Note 7) | 15MHz | | QPSK | 75 | 0 |
| 49 (Note 7) | 15MHz | | 16QAM (Note 5) | 75 | 0 |
| 50 (Note 8) | 20MHz | | QPSK | 1 | 0 |
| 51 (Note 8) | 20MHz | | QPSK | 1 | 99 |
| 52 (Note 8) | 20MHz | | QPSK | 36 | 0 |
| 53 (Note 8) | 20MHz | | QPSK | 75 | 25 |
| 54 (Note 7) | 20MHz | | QPSK | 100 | 0 |
| 55 (Note 7) | 20MHz | | 16QAM (Note 5) | 100 | 0 |

Note 1: Test Channel Bandwidths are checked separately for E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: The configuration ID will be used to map the applicable Test Configuration to be corresponding Test Requirement in subclause 6.2.4 as not all combinations are necessarily required based on the applicability of the UE.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 4: Applies only for UE-Categories ≥2.
Note 5: Void.
Note 6: Applies only for Rel-11 and earlier.
Note 7: Applies only for Rel-12 and later.
Note 8: Applies only for Rel-12 and later and Low Range.
Note 9: Applies only for Rel-12 and later and Mid, High Range and additional test frequencies.

**Table 6.6.2.2B.4.1-3: Test Configuration Table (network signalled value "NS_06")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] clause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] clause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] clause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | N/A for Additional Spectrum Emission Mask testing. | | | QPSK | 6 | NA |
| 1.4MHz | | | | QPSK | 5 | |
| 1.4MHz | | | | 16QAM | 5 | |
| 3MHz | | | | QPSK | 15 | |
| 3MHz | | | | QPSK | 4 | |
| 3MHz | | | | 16QAM | 4 | |
| 5MHz | | | | QPSK | 25 | |
| 5MHz | | | | QPSK | 8 | |
| 5MHz | | | | 16QAM | 8 | |
| 10MHz | | | | QPSK | 50 | |
| 10MHz | | | | QPSK | 12 | |
| 10MHz | | | | 16QAM | 12 | |
| 15MHz | | | | QPSK | 75 | |
| 15MHz | | | | QPSK | 16 | |
| 15MHz | | | | 16QAM | 16 | |
| 20MHz | | | | QPSK | 100 | |
| 20MHz | | | | QPSK | 18 | |
| 20MHz | | | | 16QAM | 18 | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | | |

**Table 6.6.2.2B.4.1-4: Test Configuration Table (network signalled value "NS_07")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] clause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | Mid range | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | 10MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | $RB_{start}$ |
| 1 | 10MHz | N/A for Additional Spectrum Emission Mask testing. | | QPSK | 1 | 0 |
| 2 | 10MHz | | | QPSK | 8 | 0 |
| 3 | 10MHz | | | QPSK | 6 | 13 |
| 4 | 10MHz | | | QPSK | 20 | 13 |
| 5 | 10MHz | | | QPSK | 12 | 13 |
| 6 | 10MHz | | | 16QAM | 36<br>(Note 1) | 13 |
| 7 | 10MHz | | | QPSK | 16 | 19 |
| 8 | 10MHz | | | QPSK | 12 | 19 |
| 9 | 10MHz | | | 16QAM | 16 | 19 |
| 10 | 10MHz | | | QPSK | 30 | 19 |
| 11 | 10MHz | | | 16QAM | 30<br>(Note 1) | 19 |
| 12 | 10MHz | | | QPSK | 6 | 43 |
| 13 | 10MHz | | | QPSK | 2 | 48 |
| 14 | 10MHz | | | QPSK | 50 | 0 |
| 15 | 10MHz | | | QPSK | 12 | 0 |
| 16 | 10MHz | | | 16QAM | 50<br>(Note 1) | 0 |
| Note 1: Applies only for UE-Categories [FFS]. | | | | | | |

**Table 6.6.2.2B.4.1-5: Test Configuration Table (network signalled value "NS_21")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range or High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5 MHz, 10 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 (note 2) | 5 MHz | | | QPSK | 1 | 0 |
| 2 (note 2) | 5 MHz | | | QPSK | 25 | 0 |
| 3 (note 2) | 10 MHz | | | QPSK | 1 | 0 |
| 4 (note 3) | 10 MHz | | | QPSK | 1 | 49 |
| 5 (note 2) | 10 MHz | | | QPSK | 15 | 0 |
| 6 (note 3) | 10 MHz | | | QPSK | 3 | 47 |
| 7 (note 3) | 10 MHz | | | QPSK | 50 | 0 |
| 8 (note 1, 3) | 10 MHz | | | 16QAM | 50 | 0 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: Applicable only to low range frequency testing.
Note 3: Applicable only to high range frequency testing.

**Table 6.6.2.2B.4.1-6: Test Configuration Table (network signalled value "NS_27")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to Frequency column in test parameters | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_27 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Frequency** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | Low/Mid | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | High | 5MHz | | | QPSK | 1 | 24 |
| 3 | Low/Mid/High | 5MHz | | | QPSK | 25 | 0 |
| 4 | Low/Mid/High | 5MHz | | | 16QAM | 25 | 0 |
| 5 | Low/Mid | 10MHz | | | QPSK | 1 | 0 |
| 6 | High | 10MHz | | | QPSK | 1 | 49 |
| 7 | Low/Mid/High | 10MHz | | | QPSK | 50 | 0 |
| 8 (Note 2) | Low/Mid/High | 10MHz | | | 16QAM | 50 | 0 |
| 9 | Low/Mid | 15MHz | | | QPSK | 1 | 0 |
| 10 | Low | 15MHz | | | QPSK | 1 | 7 |
| 11 | Low/Mid | 15MHz | | | QPSK | 16 | 0 |
| 12 | High | 15MHz | | | QPSK | 1 | 74 |
| 13 | High | 15MHz | | | QPSK | 1 | 67 |
| 14 | High | 15MHz | | | QPSK | 16 | 74 |
| 15 | Low/Mid/High | 15MHz | | | QPSK | 75 | 0 |
| 16 (Note 2) | Low/Mid/High | 15MHz | | | 16QAM | 75 | 0 |
| 17 | Low/Mid | 20MHz | | | QPSK | 1 | 0 |
| 18 | Low | 20MHz | | | QPSK | 1 | 13 |
| 19 | Low | 20MHz | | | QPSK | 1 | 16 |
| 20 | Low/Mid | 20MHz | | | QPSK | 21 | 0 |
| 21 | High | 20MHz | | | QPSK | 1 | 99 |
| 22 | High | 20MHz | | | QPSK | 1 | 86 |
| 23 | High | 20MHz | | | QPSK | 1 | 83 |
| 24 | High | 20MHz | | | QPSK | 21 | 0 |
| 25 | Low/Mid/High | 20MHz | | | QPSK | 100 | 0 |
| 26 (Note 2) | Low/Mid/High | 20MHz | | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4B.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: Applies only for UE-Categories ≥2.
Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.2.2B.4.1-7: Test Configuration Table (network signalled value "NS_35")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] clause 4.1) | NC | | | | | |
| Test Frequencies (as specified in TS 36.508 [7] clause 4.3.1) | Low range, Mid range, High range | | | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] clause 4.3.1) | Lowest, 5MHz, 10MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 5MHz | N/A for Additional Spectrum Emission Mask testing. | | | QPSK | 25 | |
| 5MHz | | | | QPSK | 8 | |
| 5MHz | | | | 16QAM | 8 | |
| 10MHz | | | | QPSK | 50 | |
| 10MHz | | | | QPSK | 12 | |
| 10MHz | | | | 16QAM | 12 | |
| 15MHz | | | | QPSK | 75 | |
| 15MHz | | | | QPSK | 16 | |
| 15MHz | | | | 16QAM | 16 | |
| 20MHz | | | | QPSK | 100 | |
| 20MHz | | | | QPSK | 18 | |
| 20MHz | | | | 16QAM | 18 | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Tables 6.6.2.2B.4.1-1 to 6.6.2.2B.4.1-7.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.2B.4.3.

#### 6.6.2.2B.4.2 Test procedure

Same test procedure as defined in clause 6.6.2.2.4.2.

#### 6.6.2.2B.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, with the same exceptions as in clause 6.6.2.2.4.3.

### 6.6.2.2B.5 Test requirements

Same test requirements as defined in clause 6.6.2.2.5.

## 6.6.2.2E Additional Spectrum Emission Mask for UE category 0

### 6.6.2.2E.1 Test purpose

Same test purpose as in clause 6.6.2.2.1.

### 6.6.2.2E.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.6.2.2E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.2.3

### 6.6.2.2E.4 Test description

#### 6.6.2.2E.4.1 Initial conditions

Same initial conditions as in clause 6.6.2.4.1 with following exceptions for HD-FDD:

- Instead of Tables 6.6.2.2.4.1-1 through 6.6.2.2.4.1-10 → use Table 6.6.2.2E.4.1-1 through 6.6.2.2E.4.1-4.
- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.6.2.2E.4.1-1: Test Configuration Table (network signalled value "NS_03")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD and HD-FDD | TDD |
| 1.4MHz | N/A for Additional Spectrum Emission Mask testing. | | | QPSK | 6 | 6 |
| 1.4MHz | | | | QPSK | 5 | 5 |
| 1.4MHz | | | | 16QAM | 5 | 5 |
| 3MHz | | | | QPSK | 15 | 15 |
| 3MHz | | | | QPSK | 4 | 4 |
| 3MHz | | | | 16QAM | 5 | 5 |
| 3MHz | | | | 16QAM | 4 | 4 |
| 5MHz | | | | QPSK | 25 | 25 |
| 5MHz | | | | QPSK | 8 | 8 |
| 5MHz | | | | QPSK | 6 | 6 |
| 5MHz | | | | 16QAM | 5 | 5 |
| 10MHz | | | | QPSK | 36 | 36 |
| 10MHz | | | | QPSK | 12 | 12 |
| 10MHz | | | | QPSK | 6 | 6 |
| 10MHz | | | | 16QAM | 5 | 5 |
| 15MHz | | | | QPSK | 36 | 36 |
| 15MHz | | | | QPSK | 16 | 16 |
| 15MHz | | | | QPSK | 8 | 8 |
| 15MHz | | | | 16QAM | 5 | 5 |
| 20MHz | | | | QPSK | 36 | 36 |
| 20MHz | | | | QPSK | 18 | 18 |
| 20MHz | | | | QPSK | 10 | 10 |
| 20MHz | | | | 16QAM | 5 | 5 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | | |

**Table 6.6.2.2E.4.1-2: Test Configuration Table (network signalled value "NS_04")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10 MHz, 15 MHz, 20MHz | | |
| **Test Parameters for NS_04 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Configuration ID | Ch BW | Mod'n | RB allocation TDD | Mod'n | RB allocation TDD | $RB_{start}$ TDD |
| 1 | 5MHz | N/A for Additional Spectrum Emission Mask testing | | QPSK | 25 | Note 2 |
| 2 | 5MHz | | | QPSK | 8 | Note 2 |
| 3 | 5MHz | | | QPSK | 6 | Note 2 |
| 4 | 5MHz | | | 16QAM | 5 | Note 2 |
| 5 | 10MHz | | | QPSK | 1 | 0 |
| 6 | 10MHz | | | QPSK | 12 | 0 |
| 7 | 10MHz | | | QPSK | 36 | 0 |
| 8 | 10MHz | | | QPSK | 24 | 13 |
| 9 | 10MHz | | | 16QAM | 5 | 13 |
| 10 | 10MHz | | | QPSK | 36 | 13 |
| 11 | 10MHz | | | QPSK | 12 | 37 |
| 12 | 10MHz | | | QPSK | 1 | 49 |
| 13 | 15MHz | | | QPSK | 1 | 0 |
| 14 | 15MHz | | | QPSK | 16 | 0 |
| 15 | 15MHz | | | QPSK | 36 | 0 |
| 16 | 15MHz | | | QPSK | 36 | 19 |
| 17 | 15MHz | | | QPSK | 18 | 56 |
| 18 | 15MHz | | | QPSK | 1 | 74 |
| 19 | 20MHz | | | QPSK | 1 | 0 |
| 20 | 20MHz | | | QPSK | 18 | 0 |
| 21 | 20MHz | | | QPSK | 36 | 0 |
| 22 | 20MHz | | | QPSK | 36 | 25 |
| 23 | 20MHz | | | QPSK | 25 | 75 |
| 24 | 20MHz | | | QPSK | 1 | 99 |

Note 1: Test Channel Bandwidths are checked separately for E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

**Table 6.6.2.2E.4.1-3: Test Configuration Table (network signalled value "NS_06")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD and HD-FDD | TDD |
| 1.4MHz | N/A for Additional Spectrum Emission Mask testing. | | | QPSK | 6 | NA |
| 1.4MHz | | | | QPSK | 5 | |
| 1.4MHz | | | | 16QAM | 5 | |
| 3MHz | | | | QPSK | 15 | |
| 3MHz | | | | QPSK | 4 | |
| 3MHz | | | | 16QAM | 4 | |
| 5MHz | | | | QPSK | 25 | |
| 5MHz | | | | QPSK | 8 | |
| 5MHz | | | | 16QAM | 5 | |
| 10MHz | | | | QPSK | 36 | |
| 10MHz | | | | QPSK | 12 | |
| 10MHz | | | | 16QAM | 5 | |
| 15MHz | | | | QPSK | 36 | |
| 15MHz | | | | QPSK | 16 | |
| 15MHz | | | | 16QAM | 5 | |
| 20MHz | | | | QPSK | 36 | |
| 20MHz | | | | QPSK | 18 | |
| 20MHz | | | | 16QAM | 5 | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | | |

**Table 6.6.2.2E.4.1-4: Test Configuration Table (network signalled value "NS_07")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Mid range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation FDD | Mod'n | RB allocation FDD and HD-FDD | $RB_{start}$ |
| 1 | 10MHz | N/A for Additional Spectrum Emission Mask testing. | | QPSK | 1 | 0 |
| 2 | 10MHz | | | QPSK | 8 | 0 |
| 3 | 10MHz | | | QPSK | 6 | 13 |
| 4 | 10MHz | | | QPSK | 20 | 13 |
| 5 | 10MHz | | | QPSK | 12 | 13 |
| 6 | 10MHz | | | QPSK | 16 | 19 |
| 7 | 10MHz | | | QPSK | 12 | 19 |
| | 10MHz | | | 16QAM | 5 | 19 |
| 10 | 10MHz | | | QPSK | 30 | 19 |
| 12 | 10MHz | | | QPSK | 6 | 43 |
| 13 | 10MHz | | | QPSK | 2 | 48 |
| 14 | 10MHz | | | QPSK | 36 | 0 |
| 15 | 10MHz | | | QPSK | 12 | 0 |

### 6.6.2.2E.4.2 Test procedure

Same test procedure as in clause 6.2.3.4.2 with following exception for HD-FDD:

- In step 3, slots with transient periods are not under test. Half-duplex guard sub frame are not under test.

### 6.6.2.2E.4.3 Message contents

Same message contents as in clause 6.6.2.2.4.3.

## 6.6.2.2E.5 Test requirements

### 6.6.2.2E.5.1 Test requirements (network signalled value "NS_03"")

When "NS_03" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-1 and 6.2.4.5-2 as appropriate,

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2E.5.1-1 or 6.6.2.2E.5.1-2, as applicable.

**Table 6.6.2.2E.5.1-1: Additional requirements (network signalled value "NS_03"), E-UTRA bands ≤ 3GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | | | | | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2E.5.1-2: Additional requirements (network signalled value "NS_03"), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | | | | | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

### 6.6.2.2E.5.2 Test requirements (network signalled value "NS_04")

When "NS_04" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-3 as appropriate,

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2E.5.2-1 or Table.6.6.2.2E.5.2-2, as applicable.

**Table 6.6.2.2E.5.2-1: Additional requirements (network signalled value "NS_04"), E-UTRA bands ≤ 3GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -23.5 | -23.5 | -23.5 | -23.5 | 1 MHz |
| 6-10 | | | | | | | 1 MHz |
| 10-15 | | | | | | | 1 MHz |
| 15-20 | | | | | | | 1 MHz |
| 20-25 | | | | | | | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_04 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2E.5.2-2: Additional requirements (network signalled value "NS_04"), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | -23.2 | -23.2 | -23.2 | -23.2 | 1 MHz |
| 6-10 | | | | | | | 1 MHz |
| 10-15 | | | | | | | 1 MHz |
| 15-20 | | | | | | | 1 MHz |
| 20-25 | | | | | | | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_04 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

Test requirements (network signalled value "NS_06" or "NS_07")

When "NS_06" or "NS_07" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-5, 6.2.4.5-6 and 6.2.4.5-7 as appropriate l,

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2E.5.3-1 or Table.6.6.2.2E.5.3-2, as applicable.

**Table 6.6.2.2E.5.3-1: Additional requirements (network signalled value "NS_06" or "NS_07"), E-UTRA bands ≤ 3GHz**

| | **Spectrum emission limit (dBm)/ Channel bandwidth** | | | | |
|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **Measurement bandwidth** |
| 0-0.1 | -11.5 | -11.5 | -13.5 | -16.5 | 30 kHz |
| 0.1-1 | -11.5 | -11.5 | -11.5 | -11.5 | 100 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | 1 MHz |
| 2.8-5 | | | | | 1 MHz |
| 5-6 | | -23.5 | | | 1 MHz |
| 6-10 | | | -23.5 | | 1 MHz |
| 10-15 | | | | -23.5 | 1 MHz |
| Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.085 MHz. The first and last measurement position with a 100 kHz filter is at ΔfOOB equals to 0.15 MHz and 0.95 MHz. | | | | | |
| Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively. | | | | | |
| Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel. | | | | | |
| Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_06 and NS_07 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1. | | | | | |
| Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz. | | | | | |

**Table 6.6.2.2E.5.3-2: Additional requirements (network signalled value "NS_06" or "NS_07"), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | Measurement bandwidth |
| 0-0.1 | -11.2 | -11.2 | -13.2 | -16.2 | 30 kHz |
| 0.1-1 | -11.2 | -11.2 | -11.2 | -11.2 | 100 kHz |
| 1-2.5 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | 1 MHz |
| 2.8-5 | | | | | 1 MHz |
| 5-6 | | -23.2 | | | 1 MHz |
| 6-10 | | | -23.2 | | 1 MHz |
| 10-15 | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.085 MHz. The first and last measurement position with a 100 kHz filter is at ΔfOOB equals to 0.15 MHz and 0.95 MHz.

Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.

Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel

Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_06 and NS_07 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.

Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.2EA Additional Spectrum Emission Mask for UE category M1

Editor's note: This clause is incomplete. The following aspects are either missing or not yet determined:

- NS_04 (B41): Test configuration table missing due to minimum requirements for A-MPR in 36.101 are incomplete.

### 6.6.2.2EA.1 Test purpose

Same test purpose as in clause 6.6.2.2.1.

### 6.6.2.2EA.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

### 6.6.2.2EA.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.2.3

## 6.6.2.2EA.4 Test description

### 6.6.2.2EA.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Tables 6.6.2.2EA.4.1-1 through 6.6.2.2EA.4.1-4. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 respectively. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.2EA.4.1-1: Test Configuration Table (network signalled value "NS_03")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| **Low range, Mid range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 5 | 0 |
| 6 | 3MHz | | QPSK | 2 | 0 |
| 7 | 3MHz | | QPSK | 5 | 0 |
| 8 | 3MHz | | QPSK | 6 | 0 |
| 9 | 3MHz | | 16QAM | 2 | 0 |
| 10 | 3MHz | | 16QAM | 5 | 0 |
| 11 | 5MHz | | QPSK | 6 | 0 |
| 12 (Note 4) | 5MHz | | 16QAM | 1 | 0 |
| 13 | 5MHz | | 16QAM | 3 | 0 |
| 14 | 5MHz | | 16QAM | 5 | 0 |
| 15 (Note 4) | 10MHz | | QPSK | 4 | 0 |
| 16 | 10MHz | | QPSK | 6 | 0 |
| 17 (Note 4) | 10MHz | | 16QAM | 3 | 0 |
| 18 | 10MHz | | 16QAM | 5 | 0 |
| 19 | 15MHz | | QPSK | 6 | 0 |
| 20 | 15MHz | | 16QAM | 5 | 0 |
| 21 | 20MHz | | 16QAM | 5 | 0 |
| **High range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 5 | 0 |
| 6 | 3MHz | | QPSK | 2 | 1 |
| 7 | 3MHz | | QPSK | 5 | 1 |
| 8 | 3MHz | | QPSK | 6 | 1 |
| 9 | 3MHz | | 16QAM | 2 | 1 |
| 10 | 3MHz | | 16QAM | 5 | 1 |
| 11 | 5MHz | | QPSK | 6 | 3 |
| 12 (Note 4) | 5MHz | | 16QAM | 1 | 3 |
| 13 | 5MHz | | 16QAM | 3 | 3 |
| 14 | 5MHz | | 16QAM | 5 | 3 |

| | | | | | |
|---|---|---|---|---|---|
| 15 (Note 4) | 10MHz | | QPSK | 4 | 7 |
| 16 | 10MHz | | QPSK | 6 | 7 |
| 17 (Note 4) | 10MHz | | 16QAM | 3 | 7 |
| 18 | 10MHz | | 16QAM | 5 | 7 |
| 19 | 15MHz | | QPSK | 6 | 11 |
| 20 | 15MHz | | 16QAM | 5 | 11 |
| 21 | 20MHz | | 16QAM | 6 | 15 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband.<br>Note 4: Only for power class 3 UE | | | | | |

**Table 6.6.2.2EA.4.1-2: Test Configuration Table (network signalled value "NS_04")**

TBD

**Table 6.6.2.2EA.4.1-3: Test Configuration Table (network signalled value "NS_06")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | Normal | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest, 5MHz, 10MHz | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| **Low range, Mid range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 5 | 0 |
| 6 | 3MHz | | QPSK | 2 | 0 |
| 7 | 3MHz | | QPSK | 5 | 0 |
| 8 | 3MHz | | QPSK | 6 | 0 |
| 9 | 3MHz | | 16QAM | 2 | 0 |
| 10 | 3MHz | | 16QAM | 5 | 0 |
| 11 | 5MHz | | QPSK | 6 | 0 |
| 12 (Note 4) | 5MHz | | 16QAM | 1 | 0 |
| 13 | 5MHz | | 16QAM | 3 | 0 |
| 14 | 5MHz | | 16QAM | 5 | 0 |
| 15 (Note 4) | 10MHz | | QPSK | 4 | 0 |
| 16 | 10MHz | | QPSK | 6 | 0 |
| 17 (Note 4) | 10MHz | | 16QAM | 3 | 0 |
| 18 | 10MHz | | 16QAM | 5 | 0 |
| **High range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 5 | 0 |
| 6 | 3MHz | | QPSK | 2 | 1 |
| 7 | 3MHz | | QPSK | 5 | 1 |
| 8 | 3MHz | | QPSK | 6 | 1 |
| 9 | 3MHz | | 16QAM | 2 | 1 |
| 10 | 3MHz | | 16QAM | 5 | 1 |
| 11 | 5MHz | | QPSK | 6 | 3 |
| 12 (Note 4) | 5MHz | | 16QAM | 1 | 3 |
| 13 | 5MHz | | 16QAM | 3 | 3 |
| 14 | 5MHz | | 16QAM | 5 | 3 |
| 15 (Note 4) | 10MHz | | QPSK | 4 | 7 |
| 16 | 10MHz | | QPSK | 6 | 7 |
| 17 (Note 4) | 10MHz | | 16QAM | 3 | 7 |
| 18 | 10MHz | | 16QAM | 5 | 7 |

Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4

Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband.

Note 4: Only for power class 3 UE

**Table 6.6.2.2EA.4.1-4: Test Configuration Table (network signalled value "NS_07")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 10MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| **Low range, Mid range** | | | | | |
| 1 | 10MHz | | QPSK | 1 | 0 |
| 2 | 10MHz | | QPSK | 4 | 0 |
| 3 | 10MHz | | QPSK | 6 | 0 |
| 4 | 10MHz | | 16QAM | 5 | 0 |
| **High range** | | | | | |
| 1 | 10MHz | | QPSK | 1 | 7 |
| 2 | 10MHz | | QPSK | 4 | 7 |
| 3 | 10MHz | | QPSK | 6 | 7 |
| 4 | 10MHz | | 16QAM | 5 | 7 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

1. Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The DL Reference Measurement channels are set according to Tables 6.6.2.2EA.4.1-1 to 6.6.2.2EA.4.1-4.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.6.2.2EA.4.3.

### 6.6.2.2EA.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to applicable table from Table 6.6.2.2EA.4.1-1 to 6.6.2.2.4EA.1-4. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

4. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.4EA.5-1 to 6.2.4EA.5-9 as appropriate. The period of the measurement shall be at least one sub-frame (1ms). For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods and Half-duplex guard subframe are not under test

5. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.6.2.2EA.5.1-1, 6.6.2.2EA.5.2-1 and, 6.6.2.2.5EA.3-1 as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

#### 6.6.2.2EA.4.3 Message contents

Message contents are same as in clause 6.2.4EA.4.3.

### 6.6.2.2EA.5 Test requirements

#### 6.6.2.2EA.5.1 Test requirements (network signalled value "NS_03"")

When "NS_03" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4EA.5-1 and 6.2.4EA.5-2 as appropriate,

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2EA.5.1-1, as applicable.

**Table 6.6.2.2EA.5.1-1: Additional requirements (network signalled value "NS_03")**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | | | | | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |
| Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz. | | | | | | | |
| Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively. | | | | | | | |
| Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel | | | | | | | |
| Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 E Table 6.2.4 E -1. | | | | | | | |
| Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz. | | | | | | | |

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.6.2.2EA.5.2 Test requirements (network signalled value "NS_04")

When "NS_04" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4EA.5-3 as appropriate,

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2EA.5.2-1, as applicable.

**Table 6.6.2.2EA.5.2-1: Additional requirements (network signalled value "NS_04")**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -23.5 | -23.5 | -23.5 | -23.5 | 1 MHz |
| 6-10 | | | | | | | 1 MHz |
| 10-15 | | | | | | | 1 MHz |
| 15-20 | | | | | | | 1 MHz |
| 20-25 | | | | | | | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_04 as defined in TS 36.101 [2] subclause 6.2.4 E Table 6.2.4 E -1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

Test requirements (network signalled value "NS_06" or "NS_07")

When "NS_06" or "NS_07" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4EA.5-5, 6.2.4EA.5-6 and 6.2.4EA.5-7 as appropriate ,

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2EA.5.3-1, as applicable.

**Table 6.6.2.2EA.5.3-1: Additional requirements (network signalled value "NS_06" or "NS_07")**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | Measurement bandwidth |
| 0-0.1 | -11.5 | -11.5 | -13.5 | -16.5 | 30 kHz |
| 0.1-1 | -11.5 | -11.5 | -11.5 | -11.5 | 100 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | 1 MHz |
| 2.8-5 | | | | | 1 MHz |
| 5-6 | | -23.5 | | | 1 MHz |
| 6-10 | | | -23.5 | | 1 MHz |
| 10-15 | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.085 MHz. The first and last measurement position with a 100 kHz filter is at ΔfOOB equals to 0.15 MHz and 0.95 MHz.

Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.

Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel

Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_06 and NS_07 as defined in TS 36.101 [2] subclause 6.2.4 E Table 6.2.4 E -1.

Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.2EB Additional Spectrum Emission Mask for UE category 1bis

### 6.6.2.2EB.1 Test purpose

Same test purpose as in clause 6.6.2.2.1.

### 6.6.2.2EB.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

### 6.6.2.2EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.2.3

### 6.6.2.2EB.4 Test description

#### 6.6.2.2EB.4.1 Initial conditions

Same initial conditions as in clause 6.6.2.2.4.1 with following exceptions:

- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.6.2.2EB.4.2 Test procedure

Same test procedure as in clause 6.2.3.4.2.

#### 6.6.2.2EB.4.3 Message contents

Same message contents as in clause 6.6.2.2.4.3.

### 6.6.2.2EB.5 Test requirements

#### 6.6.2.2EB.5.1 Test requirements (network signalled value "NS_03"")

When "NS_03" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-1 and 6.2.4.5-2 as appropriate,

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2EB.5.1-1 or 6.6.2.2EB.5.1-2, as applicable.

**Table 6.6.2.2EB.5.1-1: Additional requirements (network signalled value "NS_03"), E-UTRA bands ≤ 3GHz**

| | **Spectrum emission limit (dBm)/ Channel bandwidth** | | | | | | |
|---|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | | | | | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2EB.5.1-2: Additional requirements (network signalled value "NS_03"), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | | | | | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

### 6.6.2.2EB.5.2 Test requirements (network signalled value "NS_04")

When "NS_04" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-3 as appropriate,

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2EB.5.2-1 or Table.6.6.2.2EB.5.2-2, as applicable.

**Table 6.6.2.2EB.5.2-1: Additional requirements (network signalled value "NS_04"), E-UTRA bands ≤ 3GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | | | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -23.5 | -23.5 | -23.5 | -23.5 | 1 MHz |
| 6-10 | | | | | | | 1 MHz |
| 10-15 | | | | | | | 1 MHz |
| 15-20 | | | | | | | 1 MHz |
| 20-25 | | | | | | | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_04 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2EB.5.2-2: Additional requirements (network signalled value "NS_04"), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -11.2 | | | | | | 1 MHz |
| 2.5-2.8 | -23.2 | -11.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | -23.2 | -23.2 | -23.2 | -23.2 | 1 MHz |
| 6-10 | | | | | | | 1 MHz |
| 10-15 | | | | | | | 1 MHz |
| 15-20 | | | | | | | 1 MHz |
| 20-25 | | | | | | | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_04 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.
Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

Test requirements (network signalled value "NS_06" or "NS_07")

When "NS_06" or "NS_07" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-5, 6.2.4.5-6 and 6.2.4.5-7 as appropriate l,

and

- the power of any UE emission shall fulfil requirements in Table 6.6.2.2EB.5.3-1 or Table.6.6.2.2EB.5.3-2, as applicable.

**Table 6.6.2.2EB.5.3-1: Additional requirements (network signalled value "NS_06" or "NS_07"), E-UTRA bands ≤ 3GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | Measurement bandwidth |
| 0-0.1 | -11.5 | -11.5 | -13.5 | -16.5 | 30 kHz |
| 0.1-1 | -11.5 | -11.5 | -11.5 | -11.5 | 100 kHz |
| 1-2.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 2.5-2.8 | -23.5 | | | | 1 MHz |
| 2.8-5 | | | | | 1 MHz |
| 5-6 | | -23.5 | | | 1 MHz |
| 6-10 | | | -23.5 | | 1 MHz |
| 10-15 | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.085 MHz.
The first and last measurement position with a 100 kHz filter is at ΔfOOB equals to 0.15 MHz and 0.95 MHz.

Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.

Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel.

Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_06 and NS_07 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.

Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2EB.5.3-2: Additional requirements (network signalled value "NS_06" or "NS_07"), 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | |
|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | Measurement bandwidth |
| 0-0.1 | -11.2 | -11.2 | -13.2 | -16.2 | 30 kHz |
| 0.1-1 | -11.2 | -11.2 | -11.2 | -11.2 | 100 kHz |
| 1-2.5 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 2.5-2.8 | -23.2 | | | | 1 MHz |
| 2.8-5 | | | | | 1 MHz |
| 5-6 | | -23.2 | | | 1 MHz |
| 6-10 | | | -23.2 | | 1 MHz |
| 10-15 | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.085 MHz. The first and last measurement position with a 100 kHz filter is at ΔfOOB equals to 0.15 MHz and 0.95 MHz.

Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.

Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel

Note 4: Above SEM requirement applies to bands corresponding to network signalling value NS_06 and NS_07 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.

Note 5: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

NOTE: (only for emission measurement) As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.2G Additional Spectrum Emission Mask for V2X Communication

### 6.6.2.2G.0 Minimum Requirements

TS 36.101 [2] clause 6.6.2G

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.5G-1, the requirements in subclause 6.6.2 apply except for the ACLR requirements for power class 2 V2X UE.

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.5G-2, the requirements in subclause 6.6.2 apply per V2X sidelink transmission and E-UTRA uplink transmission as specified for the corresponding inter-band con-current operation with uplink assigned to two bands.

For intra-band contiguous multi-carrier operation, the general CA spectrum emission mask for CA Bandwidth Class B specified in subclause 6.6.2.1A shall apply for V2X Bandwidth Class B, the general CA spectrum emission mask for CA Bandwidth Class C specified in subclause 6.6.2.1A shall apply for V2X Bandwidth Class C and $C_1$.

TS 36.101 [2] clause 6.2.2.4

The additional spectrum mask in Table 6.6.2.2.4-1 applies for E-UTRA V2X UE within 5 855 MHz to 5 950 MHz according to ETSI EN 302 571. Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_33" or “NS_34” is indicated in the cell, the power of any V2X UE emission shall not exceed the levels specified in Table 6.6.2.2.4-1.

**Table 6.6.2.2.4-1: Additional requirements for 10MHz channel bandwidth**

| Spectrum emission limit (dBm EIRP)/ Channel bandwidth | | |
|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 10 MHz | Measurement bandwidth |
| ± 0-0.5 | $[-13 - 12\left(\left\|\Delta fOOB\right\| / MHz\right)]$ | 100 kHz |
| ± 0.5-5 | $[-19 - \frac{16}{9}\left(\left\|\Delta fOOB\right\| / MHz - 0.5\right)]$ | 100 kHz |
| ± 5-10 | $[-27 - 2\left(\left\|\Delta fOOB\right\| / MHz - 5.0\right)]$ | 100 kHz |

NOTE 1: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 2: Additional SEM for V2X overrides any other requirements in frequency range 5855-5950MHz.

NOTE 3: The EIRP requirement is converted to conducted requirement depend on the supported post antenna connector gain $G_{\text{post connector}}$ declared by the UE following the principle described in annex I.

The normative reference for this requirement is TS 36.101 [2] clauses 6.6.2G, and 6.6.2.2.4 and 6.2.4G where the A-MPR requirement is specified.

## 6.6.2.2G.1 Additional Spectrum Emission Mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 6.6.2.2G.1.1 Test purpose

To verify that the power of V2X UE emission shall not exceed specified level for the specified channel bandwidth under the deployment scenarios where additional requirements are specified.

### 6.6.2.2G.1.2 Test applicability

This test case applies to UE which support V2X Sidelink communication and Band 47.

### 6.6.2.2G.1.3 Minimum conformance requirements

The additional spectrum mask in Table 6.6.2.2G.1.3-1 applies for E-UTRA V2X UE within 5855 MHz to 5950 MHz according to ETSI EN 302 571. Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_33" or "NS_34" is indicated in the cell, the power of any V2X UE emission shall not exceed the levels specified in Table 6.6.2.2G.1.3-1.

**Table 6.6.2.2G.1.3-1: Additional requirements for 10MHz channel bandwidth**

| Spectrum emission limit (dBm)/ Channel bandwidth | | |
|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 10 MHz | Measurement bandwidth |
| ± 0-0.5 | $[-13 - 12\left(\left\|\Delta f_{OOB}\right\| / MHz\right)]$ | 100 kHz |
| ± 0.5-5 | $[-19 - \frac{16}{9}\left(\left\|\Delta f_{OOB}\right\| / MHz - 0.5\right)]$ | 100 kHz |
| ± 5-10 | $[-27 - 2\left(\left\|\Delta f_{OOB}\right\| / MHz - 5.0\right)]$ | 100 kHz |

NOTE 1: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 2: Additional SEM for V2X overrides any other requirements in frequency range 5855-5950MHz.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2.2.4.

### 6.6.2.2G.1.4 Test description

#### 6.6.2.2G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2G. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.4G.1.4.1-1 the details of the V2X reference measurement channels (RMCs) are specified in sub-clause A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508[7] Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 for both SS and UE are pre-configured according to TS 36.508 [7] subclause 4.10.1 with the exception specified in clause 6.6.2.2G.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.2.4G.1.4.1-1
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0;
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 6.6.2.2G.1.4.2 Test procedure

1. The V2X UE schedules the V2X RMC with transmission power at $P_{UMAX}$ level according to *SL-V2X-Preconfiguration* which is in line with the test configuration in Table 6.2.4G.1.4.1-1;
2. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in subclass 6.2.4G.1.5 The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.
3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.2.2G.1.3-1. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

#### 6.6.2.2G.1.4.3 Message contents

Refer to the subclause 6.2.4G.1.4.3

### 6.6.2.2G.1.5 Test requirements

When "NS_33" or "NS_34" is indicated in the cell,

- the measured UE mean power in the channel bandwidth, derived in step 2, shall fulfil the requirements described in subclass 6.2.4G.1.5;

And

- The power of any UE emission shall fulfil requirements in Table 6.6.2.2G.1.5-1 as applicable.

The power of any V2X UE emission shall not exceed the levels specified in Table 6.6.2.2G.1.3-1.

**Table 6.6.2.2G.1.5-1: Additional requirements for 10MHz channel bandwidth**

| Spectrum emission limit (dBm)/ Channel bandwidth | | |
|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 10 MHz | Measurement bandwidth |
| ± 0-0.5 | $[-13 - 12(\lvert\Delta f_{OOB}\rvert / MHz)]$ +2 | 100 kHz |
| ± 0.5-5 | $[-19 - \frac{16}{9}(\lvert\Delta f_{OOB}\rvert / MHz - 0.5)]$+2 | 100 kHz |
| ± 5-10 | $[-27 - 2(\lvert\Delta f_{OOB}\rvert / MHz - 5.0)]$+2 | 100 kHz |

## 6.6.2.2G.2 Additional Spectrum Emission Mask for V2X Communication / Sidelink simultaneous with E-UTRA uplink transmissions

### 6.6.2.2G.2.1 Test purpose

To verify that the power of V2X UE emission shall not exceed specified level for the specified channel bandwidth under the deployment scenarios where additional requirements are specified.

### 6.6.2.2G.2.2 Test applicability

This test case applies to E-UTRA UE release 14 and forward which support V2X communication sidelink simultaneous with E-UTRA uplink transmissions.

### 6.6.2.2G.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.2G.0.

### 6.6.2.2G.2.4 Test description

#### 6.6.2.2G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC bandwidths based on Inter-band con-current V2X specified in sub-clause 5.4.2G. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.4G.2.4.1-1 the details of the uplink and V2X reference measurement channels (RMCs) are specified in sub-clause A.2 and A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.6.2.2G.2.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and V2X Reference Measurement Channels are set according to subclause 6.2.4G.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in the state 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message contents are defined in clause 6.6.2.2G.2.4.3.

### 6.6.2.2G.2.4.2 Test procedure

1. SS sends RRC reconfiguration message specified in clause 6.6.2.2G.2.4.3 to enable PSCCH and PSSCH transmission at the $P_{UMAX}$ level.

2. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.6.2.2G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.

3. SS sends continuously “uplink power control” up commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

4. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in subclass 6.2.4G.1.5. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

5. Measure the power of the transmitted signal for E-UTRA uplink with a measurement filter of bandwidths according to table 6.6.2.2G.2.5-1or 6.6.2.2G.2.5-2, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

6. Measure the power of the transmitted signal for V2X sidelink with a measurement filter of bandwidths according to table 6.6.2.2G.2.5-3, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

### 6.6.2.2G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions as defined in sub-clause 6.2.4G.2.4.3

### 6.6.2.2G.2.5 Test requirements

When "NS_33" or "NS_34" is indicated in the cell,

- the measured UE mean power in the channel bandwidth, derived in step 4, shall fulfil the requirements described in subclause 6.2.4G.1.5 for Power Class 3 or Power Class 2 UEs;

And

- The power of any UE emission shall fulfil requirements in Table 6.6.2.2G.2.5-1, 6.6.2.2G.2.5-2 or 6.6.2.2G.2.5-3 as applicable.

The E-UTRA uplink emission derived in step 5 shall fulfil requirements in Table 6.6.2.2G.2.5-1 or Table 6.6.2.2G.2.5-1 as applicable.

**Table 6.6.2.2G.2.5-1: General E-UTRA spectrum emission mask, E-UTRA bands ≤ 3GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| 0-1 | -8.5 | -11.5 | -13.5 | -16.5 | -18.5 | -19.5 | 30 kHz |
| 1-2.5 | -8.5 | | | | | | 1 MHz |
| 2.5-2.8 | -23.5 | -8.5 | -8.5 | -8.5 | -8.5 | -8.5 | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.5 | -11.5 | -11.5 | -11.5 | -11.5 | 1 MHz |
| 6-10 | | | -23.5 | | | | 1 MHz |
| 10-15 | | | | -23.5 | | | 1 MHz |
| 15-20 | | | | | -23.5 | | 1 MHz |
| 20-25 | | | | | | -23.5 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

**Table 6.6.2.2G.2.5-2: General E-UTRA spectrum emission mask, 3GHz < E-UTRA bands ≤ 4.2GHz**

| | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Measurement bandwidth** |
| 0-1 | -8.2 | -11.2 | -13.2 | -16.2 | -18.2 | -19.2 | 30 kHz |
| 1-2.5 | -8.2 | | | | | | 1 MHz |
| 2.5-2.8 | -23.2 | -8.2 | -8.2 | -8.2 | -8.2 | -8.2 | 1 MHz |
| 2.8-5 | | | | | | | 1 MHz |
| 5-6 | | -23.2 | -11.2 | -11.2 | -11.2 | -11.2 | 1 MHz |
| 6-10 | | | -23.2 | | | | 1 MHz |
| 10-15 | | | | -23.2 | | | 1 MHz |
| 15-20 | | | | | -23.2 | | 1 MHz |
| 20-25 | | | | | | -23.2 | 1 MHz |

Note 1: The first and last measurement position with a 30 kHz filter is at $\Delta f_{OOB}$ equals to 0.015 MHz and 0.985 MHz.
Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.
Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel
Note 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at $\Delta f_{OOB}$ equals to 3 MHz.

The power of any V2X sidelink emission derived in step 6 shall not exceed the levels specified in Table 6.6.2.2G.2.5-3.

**Table 6.6.2.2G.2.5-3: Additional requirements for 10MHz channel bandwidth**

| Spectrum emission limit (dBm)/ Channel bandwidth | | |
|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | 10 MHz | **Measurement bandwidth** |
| ± 0-0.5 | $[-13 - 12\left(\left\|\Delta f_{OOB}\right\| / MHz\right)]$ + 2 | 100 kHz |
| ± 0.5-5 | $[-19 - \frac{16}{9}\left(\left\|\Delta f_{OOB}\right\| / MHz - 0.5\right)]$+ 2 | 100 kHz |
| ± 5-10 | $[-27 - 2\left(\left\|\Delta f_{OOB}\right\| / MHz - 5.0\right)]$+ 2 | 100 kHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

## 6.6.2.3 Adjacent Channel Leakage power Ratio

### 6.6.2.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

### 6.6.2.3.2 Test applicability

This test case applies to all types of E-UTRA Power Class 3 UE release 8 and forward.

### 6.6.2.3.3 Minimum conformance requirements

ACLR requirements are specified for two scenarios for an adjacent E -UTRA$_{ACLR}$ and UTRA$_{ACLR1/2}$ as shown in Figure 6.6.2.3.3-1.

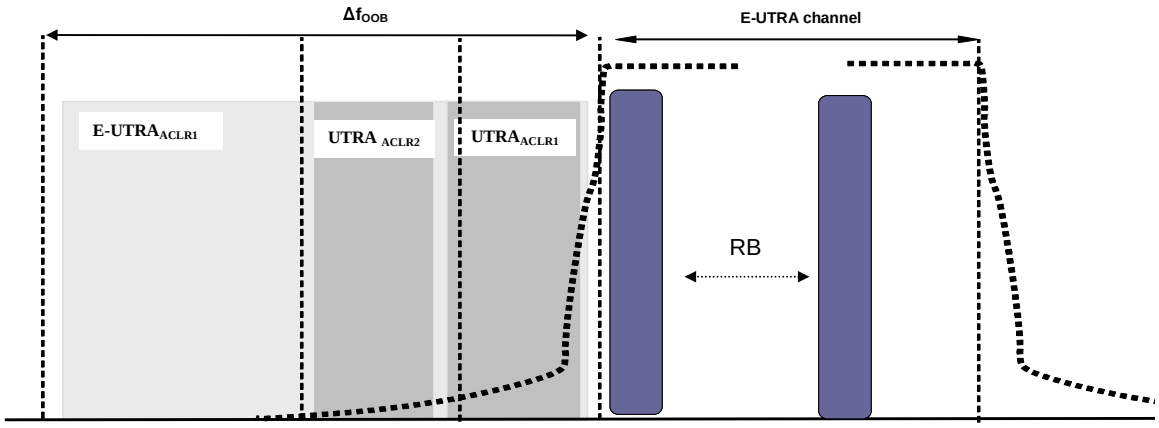



**Figure 6.6.2.3.3-1: Adjacent Channel Leakage Power Ratio requirements**

#### 6.6.2.3.3.1 Minimum conformance requirements for E-UTRA

E-UTRA ACLR (E-UTRA$_{ACLR}$) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. The assigned E-UTRA channel power and adjacent E-UTRA channel power are measured with rectangular filters with measurement bandwidth specified in Table 6.6.2.3.3.1-1.

If the measured adjacent channel power is greater than –50dBm then the E-UTRA$_{ACLR}$ shall be higher than the valued specified in Table 6.6.2.3.3.1-1.

**Table 6.6.2.3.3.1-1: General requirements for E-UTRA$_{ACLR}$**

| | **Channel bandwidth / E-UTRA$_{ACLR1}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **E-UTRA$_{ACLR1}$** | 30 dB | 30 dB | 30 dB | 30 dB | 30 dB | 30 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.2.3.1.

#### 6.6.2.3.3.2 Minimum conformance requirements for UTRA

UTRA ACLR ($UTRA_{ACLR}$) is the ratio of the filtered mean power centred on the assigned E-UTRA channel frequency to the filtered mean power centred on an adjacent UTRA channel frequency.

UTRA ACLR is specified for both the first UTRA adjacent channel ($UTRA_{ACLR1}$) and the 2nd UTRA adjacent channel ($UTRA_{ACLR2}$). The UTRA channel power is measured with a RRC bandwidth filter with roll-off factor $\alpha = 0.22$. The assigned E-UTRA channel power is measured with a rectangular filter with measurement bandwidth specified in Table 6.6.2.3.3.2-1.

If the measured UTRA channel power is greater than –50dBm then the $UTRA_{ACLR1}$, and $UTRA_{ACLR2}$ shall be higher than the valued specified in Table 6.6.2.3.3.2-1.

**Table 6.6.2.3.3.2-1: General requirements for $UTRA_{ACLR1/2}$**

| | Channel bandwidth / $UTRA_{ACLR1/2}$ / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **$UTRA_{ACLR1}$** | 33 dB | 33 dB | 33 dB | 33 dB | 33 dB | 33 dB |
| **Adjacent channel centre frequency offset (in MHz)** | 0.7+$BW_{UTRA}$/2 / -0.7-$BW_{UTRA}$/2 | 1.5+$BW_{UTRA}$/2 / -1.5-$BW_{UTRA}$/2 | 2.5+$BW_{UTRA}$/2 / -2.5-$BW_{UTRA}$/2 | 5+$BW_{UTRA}$/2 / -5-$BW_{UTRA}$/2 | 7.5+$BW_{UTRA}$/2 / -7.5-$BW_{UTRA}$/2 | 10+$BW_{UTRA}$/2 / -10-$BW_{UTRA}$/2 |
| **$UTRA_{ACLR2}$** | - | - | 36 dB | 36 dB | 36 dB | 36 dB |
| **Adjacent channel centre frequency offset (in MHz)** | - | - | 2.5+3*$BW_{UTRA}$/2 / -2.5-3*$BW_{UTRA}$/2 | 5+3*$BW_{UTRA}$/2 / -5-3*$BW_{UTRA}$/2 | 7.5+3*$BW_{UTRA}$/2 / -7.5-3*$BW_{UTRA}$/2 | 10+3*$BW_{UTRA}$/2 / -10-3*$BW_{UTRA}$/2 |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UTRA 5MHz channel Measurement bandwidth[1]** | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| **UTRA 1.6MHz channel measurement bandwidth[2]** | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum. | | | | | | |

The normative reference for this requirement is TS 36.101 subclause 6.6.2.3.2.

### 6.6.2.3.4 Test description

#### 6.6.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in AnnexeA.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | N/A for ACLR testing | | | QPSK | 6 | 6 |
| 1.4MHz | | | | QPSK | 5 | 5 |
| 1.4MHz | | | | 16QAM | 6 | 6 |
| 1.4MHz | | | | 16QAM | 5 | 5 |
| 3MHz | | | | QPSK | 15 | 15 |
| 3MHz | | | | QPSK | 4 | 4 |
| 3MHz | | | | 16QAM | 15 | 15 |
| 3MHz | | | | 16QAM | 4 | 4 |
| 5MHz | | | | QPSK | 25 | 25 |
| 5MHz | | | | QPSK | 8 | 8 |
| 5MHz | | | | 16QAM | 25 | 25 |
| 5MHz | | | | 16QAM | 8 | 8 |
| 10MHz | | | | QPSK | 50 | 50 |
| 10MHz | | | | QPSK | 12 | 12 |
| 10MHz | | | | 16QAM | 50 (Note 3) | 50 (Note 3) |
| 10MHz | | | | 16QAM | 12 | 12 |
| 15MHz | | | | QPSK | 75 | 75 |
| 15MHz | | | | QPSK | 16 | 16 |
| 15MHz | | | | 16QAM | 75 (Note 3) | 75 (Note 3) |
| 15MHz | | | | 16QAM | 16 | 16 |
| 20MHz | | | | QPSK | 100 | 100 |
| 20MHz | | | | QPSK | 18 | 18 |
| 20MHz | | | | 16QAM | 100 (Note 3) | 100 (Note 3) |
| 20MHz | | | | 16QAM | 18 | 18 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max + 1 - RB allocation) of the channel bandwidth.

Note 3: Applies only for UE-Categories 2-5

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3.4.3.

#### 6.6.2.3.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3.5-1. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

4. Measure the rectangular filtered mean power for E-UTRA.

5. Measure the rectangular filtered mean power of the first E-UTRA adjacent channel on both lower and upper side of the E-UTRA channel, respectively.

6. Measure the RRC filtered mean power of the first and the second UTRA adjacent channel on both lower and upper side of the E-UTRA channel, respectively.

7. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper E-$UTRA_{ACLR}$, respectively.

8. Calculated the ratios of the power between the values measured in step 4 over step 6 for lower and upper $UTRA_{ACLR1}$, $UTRA_{ACLR2}$, respectively.

#### 6.6.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.2.3.5 Test requirement

#### 6.6.2.3.5.1 Test requirements E-UTRA

- The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-1 as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured E-$UTRA_{ACLR}$, derived in step 7, shall be higher than the limits in table 6.6.2.3.5.1-1.

**Table 6.6.2.3.5.1-1: E-UTRA UE ACLR**

| | **Channel bandwidth / E-$UTRA_{ACLR1}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **E-$UTRA_{ACLR1}$** | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UE channel** | +1.4 MHz or -1.4 MHz | +3 MHz or -3 MHz | +5MHz or -5MHz | +10MHz or -10MHz | +15MHz or -15MHz | +20MHz or -20MHz |

Test requirements UTRA

If the measured UTRA channel power is greater than –50dBm then the measured $UTRA_{ACLR1}$, $UTRA_{ACLR2}$, derived in step 8, shall be higher than the limits in table 6.6.2.3.5.2-1.

**Table 6.6.2.3.5.2-1: UTRA UE ACLR**

| | Channel bandwidth / $UTRA_{ACLR1/2}$ / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **$UTRA_{ACLR1}$** | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | 0.7+$BW_{UTRA}$/2 / -0.7-$BW_{UTRA}$/2 | 1.5+$BW_{UTRA}$/2 / -1.5-$BW_{UTRA}$/2 | 2.5+$BW_{UTRA}$/2 / -2.5-$BW_{UTRA}$/2 | 5+$BW_{UTRA}$/2 / -5-$BW_{UTRA}$/2 | 7.5+$BW_{UTRA}$/2 / -7.5-$BW_{UTRA}$/2 | 10+$BW_{UTRA}$/2 / -10-$BW_{UTRA}$/2 |
| **$UTRA_{ACLR2}$** | - | - | 35.2 dB | 35.2 dB | 35.2 dB | 35.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | - | - | 2.5+3*$BW_{UTRA}$/2 / -2.5-3*$BW_{UTRA}$/2 | 5+3*$BW_{UTRA}$/2 / -5-3*$BW_{UTRA}$/2 | 7.5+3*$BW_{UTRA}$/2 / -7.5-3*$BW_{UTRA}$/2 | 10+3*$BW_{UTRA}$/2 / -10-3*$BW_{UTRA}$/2 |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UTRA 5MHz channel Measurement bandwidth[1]** | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| **UTRA 1.6MHz channel measurement bandwidth[2]** | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.<br>Note 3: $BW_{UTRA}$ for UTRA FDD is 5MHz and for UTRA TDD is 1.6MHz. | | | | | | |

## 6.6.2.3_1 Adjacent Channel Leakage power Ratio for HPUE

### 6.6.2.3_1.1 Test purpose

To verify that HPUE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

### 6.6.2.3_1.2 Test applicability

This test case applies to all types of E-UTRA Power Class 1 or Power Class 2 UE release 10 and forward.

### 6.6.2.3_1.3 Minimum conformance requirements

ACLR requirements are specified for an adjacent E -$UTRA_{ACLR}$ as shown in Figure 6.6.2.3_1.3-1.

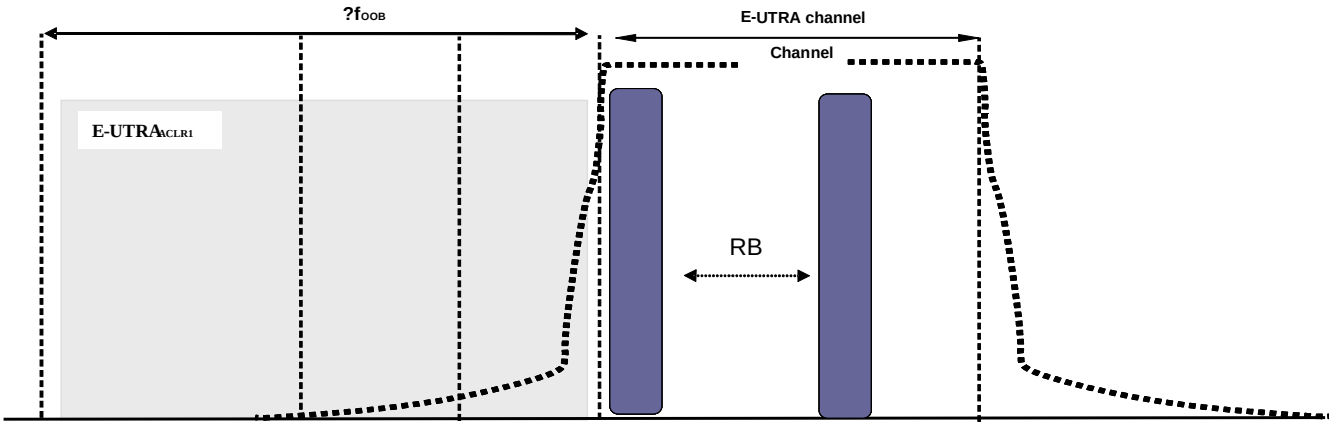



**Figure 6.6.2.3_1.3-1: Adjacent Channel Leakage Power Ratio requirements**

### 6.6.2.3_1.3.1 Minimum conformance requirements for E-UTRA for HPUE

Same minimum conformance requirements as in clause 6.6.2.3.3.1 with for following exceptions:

- Instead of Table 6.6.2.3.3.1-1 → use Table 6.6.2.3_1.3.1-1 and 6.6.2.3_1.3.1-2

**Table 6.6.2.3_1.3.1-1: Additional E-UTRA$_{ACLR}$ requirements for Power Class 1**

| | Channel bandwidth / E-UTRA$_{ACLR1}$ / Measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| E-UTRA$_{ACLR1}$ | N/A | N/A | 37 dB | 37 dB | N/A | N/A |
| E-UTRA channel Measurement bandwidth | N/A | N/A | 4.5 MHz | 9.0 MHz | N/A | N/A |
| Adjacent channel centre frequency offset [MHz] | N/A | N/A | +5 / -5 | +10 / -10 | N/A | N/A |
| Note 1: E-UTRA$_{ACLR1}$ shall be applicable for >23dBm | | | | | | |

**Table 6.6.2.3_1.3.1-2: Additional E-UTRA$_{ACLR}$ requirements for Band 41 Power Class 2**

| | Channel bandwidth / E-UTRA$_{ACLR1}$ / Measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| E-UTRA$_{ACLR1}$ | N/A | N/A | 31 dB | 31 dB | 31 dB | 31 dB |
| E-UTRA channel Measurement bandwidth | N/A | N/A | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Adjacent channel centre frequency offset [MHz] | N/A | N/A | +5 / -5 | +10 / -10 | +15 / -15 | +20 / -20 |

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2.3.

## 6.6.2.3_1.4 Test description

### 6.6.2.3_1.4.1 Initial conditions

Same initial conditions as in clause 6.6.2.3.4.1.

#### 6.6.2.3_1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3_1.5-1. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

4. Measure the rectangular filtered mean power for E-UTRA.

5. Measure the rectangular filtered mean power of the first E-UTRA adjacent channel on both lower and upper side of the E-UTRA channel, respectively.

6. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper E-$UTRA_{ACLR}$, respectively.

#### 6.6.2.3_1.4.3 Message contents

Same message contents as in clause 6.6.2.3.4.3

### 6.6.2.3_1.5 Test requirement

#### 6.6.2.3_1.5.1 Test requirements E-UTRA

- The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3_1.5-1 as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured E-$UTRA_{ACLR}$, derived in step 7, shall be higher than the limits in table 6.6.2.3_1.4.1-1 for Power Class1 UE and in table 6.6.2.3_1.4.1-2 for Power Class 2 UE.

**Table 6.6.2.3_1.4.1-1: E-UTRA UE ACLR for Power Class 1**

| | **Channel bandwidth / E-$UTRA_{ACLR1}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **E-$UTRA_{ACLR1}$** | N/A | N/A | 36.2 dB | 36.2 dB | N/A | N/A |
| **E-UTRA channel Measurement bandwidth** | N/A | N/A | 4.5 MHz | 9.0 MHz | N/A | N/A |
| **UE channel** | N/A | N/A | +5MHz or -5MHz | +10MHz or -10MHz | N/A | N/A |

**Table 6.6.2.3_1.4.1-2: E-UTRA UE ACLR for Power Class 2**

| | Channel bandwidth / $E\text{-}UTRA_{ACLR1}$ / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $E\text{-}UTRA_{ACLR1}$ | N/A | N/A | 30.2 dB | 30.2 dB | 30.2 dB | 30.2 dB |
| E-UTRA channel Measurement bandwidth | N/A | N/A | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| UE channel | N/A | N/A | +5MHz or -5MHz | +10MHz or -10MHz | +15MHz or -15MHz | +20MHz or -20MHz |

## 6.6.2.3_2 Adjacent Channel Leakage power Ratio for Multi-Cluster PUSCH

### 6.6.2.3_2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR) for Multi-Cluster PUSCH transmission.

### 6.6.2.3_2.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support multi cluster PUSCH within a component carrier for the tested band but do not support UL 64QAM or UL 256QAM.

### 6.6.2.3_2.3 Minimum conformance requirements

ACLR requirements are specified for two scenarios for an adjacent E -$UTRA_{ACLR}$ and $UTRA_{ACLR1/2}$ as shown in Figure 6.6.2.3_2.3-1.

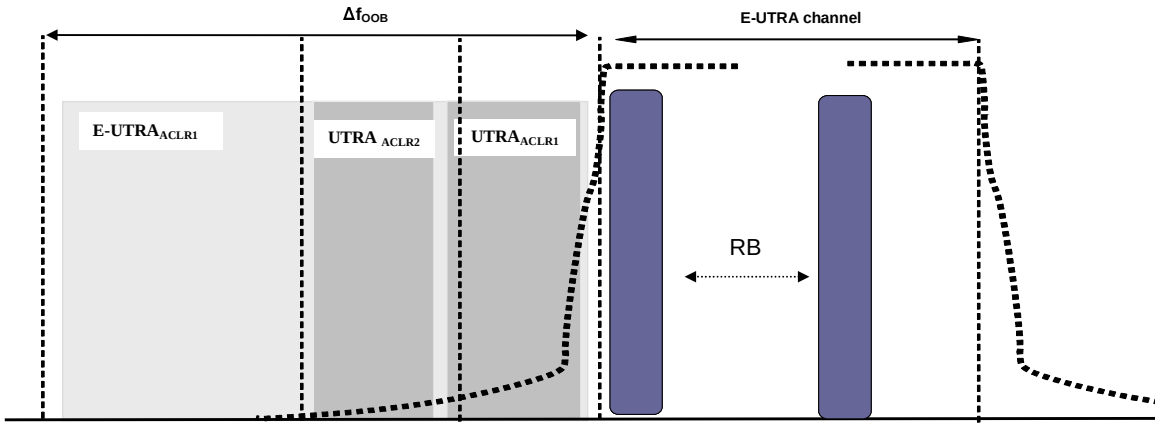



**Figure 6.6.2.3_2.3-1: Adjacent Channel Leakage Power Ratio requirements**

#### 6.6.2.3_2.3.1 Minimum conformance requirements for E-UTRA

E-UTRA ACLR ($E\text{-}UTRA_{ACLR}$) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. The assigned E-UTRA channel power and adjacent E-UTRA channel power are measured with rectangular filters with measurement bandwidth specified in Table 6.6.2.3_2.3.1-1.

If the measured adjacent channel power is greater than –50dBm then the $E\text{-}UTRA_{ACLR}$ shall be higher than the valued specified in Table 6.6.2.3_2.3.1-1.

**Table 6.6.2.3_2.3.1-1: General requirements for E-UTRA$_{ACLR}$**

| | Channel bandwidth / E-UTRA$_{ACLR1}$ / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| E-UTRA$_{ACLR1}$ | 30 dB | 30 dB | 30 dB | 30 dB | 30 dB | 30 dB |
| E-UTRA channel Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.2.3.1.

### 6.6.2.3_2.3.2 Minimum conformance requirements for UTRA

UTRA ACLR (UTRA$_{ACLR}$) is the ratio of the filtered mean power centred on the assigned E-UTRA channel frequency to the filtered mean power centred on an adjacent UTRA channel frequency.

UTRA ACLR is specified for both the first UTRA adjacent channel (UTRA$_{ACLR1}$) and the 2$^{nd}$ UTRA adjacent channel (UTRA$_{ACLR2}$). The UTRA channel power is measured with a RRC bandwidth filter with roll-off factor $\alpha = 0.22$. The assigned E-UTRA channel power is measured with a rectangular filter with measurement bandwidth specified in Table 6.6.2.3_2.3.2-1.

If the measured UTRA channel power is greater than –50dBm then the UTRA$_{ACLR1}$, and UTRA$_{ACLR2}$ shall be higher than the valued specified in Table 6.6.2.3_2.3.2-1.

**Table 6.6.2.3_2.3.2-1: General requirements for UTRA$_{ACLR1/2}$**

| | Channel bandwidth / UTRA$_{ACLR1/2}$ / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| UTRA$_{ACLR1}$ | 33 dB | 33 dB | 33 dB | 33 dB | 33 dB | 33 dB |
| Adjacent channel centre frequency offset (in MHz) | 0.7+BW$_{UTRA}$/2 / -0.7-BW$_{UTRA}$/2 | 1.5+BW$_{UTRA}$/2 / -1.5-BW$_{UTRA}$/2 | 2.5+BW$_{UTRA}$/2 / -2.5-BW$_{UTRA}$/2 | 5+BW$_{UTRA}$/2 / -5-BW$_{UTRA}$/2 | 7.5+BW$_{UTRA}$/2 / -7.5-BW$_{UTRA}$/2 | 10+BW$_{UTRA}$/2 / -10-BW$_{UTRA}$/2 |
| UTRA$_{ACLR2}$ | - | - | 36 dB | 36 dB | 36 dB | 36 dB |
| Adjacent channel centre frequency offset (in MHz) | - | - | 2.5+3*BW$_{UTRA}$/2 / -2.5-3*BW$_{UTRA}$/2 | 5+3*BW$_{UTRA}$/2 / -5-3*BW$_{UTRA}$/2 | 7.5+3*BW$_{UTRA}$/2 / -7.5-3*BW$_{UTRA}$/2 | 10+3*BW$_{UTRA}$/2 / -10-3*BW$_{UTRA}$/2 |
| E-UTRA channel Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| UTRA 5MHz channel Measurement bandwidth[1] | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| UTRA 1.6MHz channel measurement bandwidth[2] | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum. | | | | | | |

The normative reference for this requirement is TS 36.101 subclause 6.6.2.3.2.

## 6.6.2.3_2.4 Test description

### 6.6.2.3_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3_2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in AnnexeA.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3_2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| **Configuration ID** | **Downlink Configuration** | | **Uplink Configuration** | | |
| | Ch BW | N/A for SEM testing | Mod'n | Cluster1 RB allocations ($L_{CRB}$ @ $RB_{start}$) | Cluster2 RB allocations ($L_{CRB}$ @ $RB_{start}$) |
| 1 | 5MHz | | 16QAM | 2@0 | 1@24 |
| 2 | 5MHz | | 16QAM | 18@0 | 2@22 |
| 3 | 5MHz | | 16QAM | 2@0 | 18@6 |
| 4 | 10MHz | | 16QAM | 3@0 | 2@48 |
| 5 | 10MHz | | 16QAM | 42@0 | 3@45 |
| 6 | 10MHz | | 16QAM | 3@0 | 42@6 |
| 7 | 15MHz | | 16QAM | 8@0 | 7@68 |
| 8 | 15MHz | | 16QAM | 60@0 | 4@68 |
| 9 | 15MHz | | 16QAM | 4@0 | 60@12 |
| 10 | 20MHz | | 16QAM | 4@0 | 4@96 |
| 11 | 20MHz | | 16QAM | 92@0 | 4@96 |
| 12 | 20MHz | | 16QAM | 4@0 | 92@8 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.3_2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3_2.4.3.

### 6.6.2.3_2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.3_2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3_2.5-1. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.
4. Measure the rectangular filtered mean power for E-UTRA.
5. Measure the rectangular filtered mean power of the first E-UTRA adjacent channel on both lower and upper side of the E-UTRA channel, respectively.
6. Measure the RRC filtered mean power of the first and the second UTRA adjacent channel on both lower and upper side of the E-UTRA channel, respectively.
7. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper E-$UTRA_{ACLR}$, respectively.
8. Calculated the ratios of the power between the values measured in step 4 over step 6 for lower and upper $UTRA_{ACLR1}$, $UTRA_{ACLR2}$, respectively.

#### 6.6.2.3_2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.2.3_2.5 Test requirement

#### 6.6.2.3_2.5.1 Test requirements E-UTRA

- The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3_2.5-1 as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured E-$UTRA_{ACLR}$, derived in step 7, shall be higher than the limits in table 6.6.2.3_2.5.1-1.

**Table 6.6.2.3_2.5.1-1: E-UTRA UE ACLR**

| | **Channel bandwidth / E-$UTRA_{ACLR1}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **E-$UTRA_{ACLR1}$** | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UE channel** | +1.4 MHz or -1.4 MHz | +3 MHz or -3 MHz | +5MHz or -5MHz | +10MHz or -10MHz | +15MHz or -15MHz | +20MHz or -20MHz |

#### 6.6.2.3_2.5.2 Test requirements UTRA

If the measured UTRA channel power is greater than –50dBm then the measured $UTRA_{ACLR1}$, $UTRA_{ACLR2}$, derived in step 8, shall be higher than the limits in table 6.6.2.3_2.5.2-1.

**Table 6.6.2.3_2.5.2-1: UTRA UE ACLR**

| | **Channel bandwidth / $UTRA_{ACLR1/2}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **$UTRA_{ACLR1}$** | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | 0.7+$BW_{UTRA}$/2 / -0.7-$BW_{UTRA}$/2 | 1.5+$BW_{UTRA}$/2 / -1.5-$BW_{UTRA}$/2 | 2.5+$BW_{UTRA}$/2 / -2.5-$BW_{UTRA}$/2 | 5+$BW_{UTRA}$/2 / -5-$BW_{UTRA}$/2 | 7.5+$BW_{UTRA}$/2 / -7.5-$BW_{UTRA}$/2 | 10+$BW_{UTRA}$/2 / -10-$BW_{UTRA}$/2 |
| **$UTRA_{ACLR2}$** | - | - | 35.2 dB | 35.2 dB | 35.2 dB | 35.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | - | - | 2.5+3*$BW_{UTRA}$/2 / -2.5-3*$BW_{UTRA}$/2 | 5+3*$BW_{UTRA}$/2 / -5-3*$BW_{UTRA}$/2 | 7.5+3*$BW_{UTRA}$/2 / -7.5-3*$BW_{UTRA}$/2 | 10+3*$BW_{UTRA}$/2 / -10-3*$BW_{UTRA}$/2 |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UTRA 5MHz channel Measurement bandwidth[1]** | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| **UTRA 1.6MHz channel measurement bandwidth[2]** | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.<br>Note 3: $BW_{UTRA}$ for UTRA FDD is 5MHz and for UTRA TDD is 1.6MHz. | | | | | | |

## 6.6.2.3_3 Adjacent Channel Leakage power Ratio for UL 64QAM

### 6.6.2.3_3.1 Test purpose

Same test purpose as in clause 6.6.2.3.1.

### 6.6.2.3_3.2 Test applicability

This test case applies to all types of E-UTRA UE from release 13 and forward that support UL 64QAM.

### 6.6.2.3_3.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.3.3.

### 6.6.2.3_3.4 Test description

#### 6.6.2.3_3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3_3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in AnnexeA.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3_3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | | | | 64QAM | 6 | 6 |
| 1.4MHz | | | | 64QAM | 5 | 5 |
| 3MHz | | | | 64QAM | 15 | 15 |
| 3MHz | | | | 64QAM | 4 | 4 |
| 5MHz | | | | 64QAM | 25 | 25 |
| 5MHz | | | | 64QAM | 8 | 8 |
| 10MHz | | | | 64QAM | 50 | 50 |
| 10MHz | | | | 64QAM | 12 | 12 |
| 15MHz | | | | 64QAM | 75 | 75 |
| 15MHz | | | | 64QAM | 16 | 16 |
| 20MHz | | | | 64QAM | 100 | 100 |
| 20MHz | | | | 64QAM | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max + 1 - RB allocation) of the channel bandwidth. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.3_3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3_3.4.3.

### 6.6.2.3_3.4.2 Test procedure

Same test procedure as in clause 6.6.2.3.4.2 with the following exceptions

- In step 3, instead of Table 6.2.3.5-1 use Table 6.2.3_3.5-1

.

### 6.6.2.3_3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.6.2.3_3.5 Test requirement

### 6.6.2.3_3.5.1 Test requirements E-UTRA

- The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3_1.5-1 as appropriate, and

- if the measured adjacent channel power is greater than –50 dBm then the measured E-UTRA$_{ACLR}$, derived in step 7, shall be higher than the limits in table 6.6.2.3_3.5.1-1.

**Table 6.6.2.3_3.5.1-1: E-UTRA UE ACLR**

| | Channel bandwidth / E-UTRA$_{ACLR1}$ / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **E-UTRA$_{ACLR1}$** | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UE channel** | +1.4 MHz or -1.4 MHz | +3 MHz or -3 MHz | +5MHz or -5MHz | +10MHz or -10MHz | +15MHz or -15MHz | +20MHz or -20MHz |

### 6.6.2.3_3.5.1 Test requirements UTRA

If the measured UTRA channel power is greater than –50dBm then the measured UTRA$_{ACLR1}$, UTRA$_{ACLR2}$, derived in step 8, shall be higher than the limits in table 6.6.2.3_3.5.2-1.

**Table 6.6.2.3_3.5.2-1: UTRA UE ACLR**

| | Channel bandwidth / UTRA$_{ACLR1/2}$ / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **UTRA$_{ACLR1}$** | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | 0.7+BW$_{UTRA}$/2 / -0.7-BW$_{UTRA}$/2 | 1.5+BW$_{UTRA}$/2 / -1.5-BW$_{UTRA}$/2 | 2.5+BW$_{UTRA}$/2 / -2.5-BW$_{UTRA}$/2 | 5+BW$_{UTRA}$/2 / -5-BW$_{UTRA}$/2 | 7.5+BW$_{UTRA}$/2 / -7.5-BW$_{UTRA}$/2 | 10+BW$_{UTRA}$/2 / -10-BW$_{UTRA}$/2 |
| **UTRA$_{ACLR2}$** | - | - | 35.2 dB | 35.2 dB | 35.2 dB | 35.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | - | - | 2.5+3*BW$_{UTRA}$/2 / -2.5-3*BW$_{UTRA}$/2 | 5+3*BW$_{UTRA}$/2 / -5-3*BW$_{UTRA}$/2 | 7.5+3*BW$_{UTRA}$/2 / -7.5-3*BW$_{UTRA}$/2 | 10+3*BW$_{UTRA}$/2 / -10-3*BW$_{UTRA}$/2 |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UTRA 5MHz channel Measurement bandwidth[1]** | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| **UTRA 1.6MHz channel measurement bandwidth[2]** | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.<br>Note 3: BW$_{UTRA}$ for UTRA FDD is 5MHz and for UTRA TDD is 1.6MHz. | | | | | | |

## 6.6.2.3_4 Adjacent Channel Leakage power Ratio for Multi-Cluster PUSCH with UL 64QAM

Editor's note: For a transition period until RAN5#83, this test case in version 15.3.1 of 36.521-1 shall be used. This is to ensure no test coverage is lost before the UL 256QAM test case becomes available.

### 6.6.2.3_4.1 Test purpose

Same test purpose as in clause 6.6.2.3_2.

### 6.6.2.3_4.2 Test applicability

This test case applies to all types of E-UTRA UE from release 13 and forward that support UL 64QAM and multi cluster PUSCH within a component carrier for the tested band but do not support UL 256QAM.

### 6.6.2.3_4.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.3_2.3.

### 6.6.2.3_4.4 Test description

#### 6.6.2.3_4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3_4.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in AnnexeA.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3_4.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| **Configuration ID** | **Downlink Configuration** | | **Uplink Configuration** | | |
| | Ch BW | N/A for SEM testing | Mod'n | Cluster1 RB allocations ($L_{CRB}$ @ $RB_{start}$) | Cluster2 RB allocations ($L_{CRB}$ @ $RB_{start}$) |
| 1 | 5MHz | | 64QAM (Note 2) | 2@0 | 1@24 |
| 2 | 5MHz | | 64QAM | 18@0 | 2@22 |
| 3 | 5MHz | | 64QAM | 2@0 | 18@6 |
| 4 | 10MHz | | 64QAM (Note 2) | 3@0 | 2@48 |
| 5 | 10MHz | | 64QAM | 42@0 | 3@45 |
| 6 | 10MHz | | 64QAM | 3@0 | 42@6 |
| 7 | 15MHz | | 64QAM (Note 2) | 8@0 | 7@68 |
| 8 | 15MHz | | 64QAM | 60@0 | 4@68 |
| 9 | 15MHz | | 64QAM | 4@0 | 60@12 |
| 10 | 20MHz | | 64QAM (Note 2) | 4@0 | 4@96 |
| 11 | 20MHz | | 64QAM | 92@0 | 4@96 |
| 12 | 20MHz | | 64QAM | 4@0 | 92@8 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The 64QAM configurations shall not apply to UEs for which TC 6.6.2.3_6 is executed. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.3_4.4.1-1.

5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3_4.4.3.

#### 6.6.2.3_4.4.2 Test procedure

Same test procedure as in clause 6.6.2.3_2.4.2 with following exception:

- In step 3, instead of Table 6.2.3_2.5-1 → use Table 6.2.3_4.5-1

#### 6.6.2.3_4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.2.3_4.5 Test requirement

Same test requirements as in clause 6.6.2.3_2.5 with following exception:

- Instead of Table 6.2.3_2.5-1 → use Table 6.2.3_4.5-1

## 6.6.2.3_5 Adjacent Channel Leakage power Ratio for UL 256QAM

### 6.6.2.3_5.1 Test purpose

Same test purpose as in clause 6.6.2.3.1.

### 6.6.2.3_5.2 Test applicability

This test case applies to all types of E-UTRA UE from release 14 and forward that support UL 256QAM.

### 6.6.2.3_5.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.3.3.

### 6.6.2.3_5.4 Test description

#### 6.6.2.3_5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3_5.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in AnnexeA.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3_5.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | | | | 256QAM | 6 | 6 |
| 3MHz | | | | 256QAM | 15 | 15 |
| 5MHz | | | | 256QAM | 25 | 25 |
| 10MHz | | | | 256QAM | 50 | 50 |
| 15MHz | | | | 256QAM | 75 | 75 |
| 20MHz | | | | 256QAM | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.3_5.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3_5.4.3.

### 6.6.2.3_5.4.2 Test procedure

Same test procedure as in clause 6.6.2.3.4.2 with the following exceptions

- In step 3, instead of Table 6.2.3.5-1 use Table 6.2.3_5.5-1

### 6.6.2.3_5.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.6.2.3_5.5 Test requirement

### 6.6.2.3_5.5.1 Test requirements E-UTRA

- The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3_5.5-1 as appropriate, and
- if the measured adjacent channel power is greater than –50 dBm then the measured E-UTRA$_{ACLR}$, derived in step 7, shall be higher than the limits in table 6.6.2.3_5.5.1-1.

**Table 6.6.2.3_5.5.1-1: E-UTRA UE ACLR**

| | **Channel bandwidth / E-UTRA$_{ACLR1}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **E-UTRA$_{ACLR1}$** | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UE channel** | +1.4 MHz or -1.4 MHz | +3 MHz or -3 MHz | +5MHz or -5MHz | +10MHz or -10MHz | +15MHz or -15MHz | +20MHz or -20MHz |

6.6.2.3_5.5.1 Test requirements UTRA

If the measured UTRA channel power is greater than –50dBm then the measured UTRA$_{ACLR1}$, UTRA$_{ACLR2}$, derived in step 8, shall be higher than the limits in table 6.6.2.3_5.5.2-1.

**Table 6.6.2.3_5.5.2-1: UTRA UE ACLR**

| | **Channel bandwidth / UTRA$_{ACLR1/2}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **UTRA$_{ACLR1}$** | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | 0.7+BW$_{UTRA}$/2 / -0.7-BW$_{UTRA}$/2 | 1.5+BW$_{UTRA}$/2 / -1.5-BW$_{UTRA}$/2 | 2.5+BW$_{UTRA}$/2 / -2.5-BW$_{UTRA}$/2 | 5+BW$_{UTRA}$/2 / -5-BW$_{UTRA}$/2 | 7.5+BW$_{UTRA}$/2 / -7.5-BW$_{UTRA}$/2 | 10+BW$_{UTRA}$/2 / -10-BW$_{UTRA}$/2 |
| **UTRA$_{ACLR2}$** | - | - | 35.2 dB | 35.2 dB | 35.2 dB | 35.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | - | - | 2.5+3*BW$_{UTRA}$/2 / -2.5-3*BW$_{UTRA}$/2 | 5+3*BW$_{UTRA}$/2 / -5-3*BW$_{UTRA}$/2 | 7.5+3*BW$_{UTRA}$/2 / -7.5-3*BW$_{UTRA}$/2 | 10+3*BW$_{UTRA}$/2 / -10-3*BW$_{UTRA}$/2 |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UTRA 5MHz channel Measurement bandwidth[1]** | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| **UTRA 1.6MHz channel measurement bandwidth[2]** | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.<br>Note 3: BW$_{UTRA}$ for UTRA FDD is 5MHz and for UTRA TDD is 1.6MHz. | | | | | | |

## 6.6.2.3_6 Adjacent Channel Leakage power Ratio for Multi-Cluster PUSCH with UL 256QAM

### 6.6.2.3_6.1 Test purpose

Same test purpose as in clause 6.6.2.3_2.

### 6.6.2.3_6.2 Test applicability

This test case applies to all types of E-UTRA UE from release 14 and forward that support UL 256QAM and multi cluster PUSCH within a component carrier for the tested band.

### 6.6.2.3_6.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.3_2.3.

## 6.6.2.3_6.4 Test description

### 6.6.2.3_6.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3_6.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in AnnexeA.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3_6.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| **Configuration ID** | **Downlink Configuration** | | **Uplink Configuration** | | |
| | **Ch BW** | **RB allocations** | **Mod'n** | **Cluster1 RB allocations ($L_{CRB}$ @ $RB_{start}$)** | **Cluster2 RB allocations ($L_{CRB}$ @ $RB_{start}$)** |
| 1 | 5MHz | N/A for ACLR Test case | 256QAM | 2@0 | 1@24 |
| 2 | 5MHz | | 256QAM | 18@0 | 2@22 |
| 3 | 5MHz | | 256QAM | 2@0 | 18@6 |
| 4 | 10MHz | | 256QAM | 3@0 | 2@48 |
| 5 | 10MHz | | 256QAM | 42@0 | 3@45 |
| 6 | 10MHz | | 256QAM | 3@0 | 42@6 |
| 7 | 15MHz | | 256QAM | 8@0 | 7@68 |
| 8 | 15MHz | | 256QAM | 60@0 | 4@68 |
| 9 | 15MHz | | 256QAM | 4@0 | 60@12 |
| 10 | 20MHz | | 256QAM | 4@0 | 4@96 |
| 11 | 20MHz | | 256QAM | 92@0 | 4@96 |
| 12 | 20MHz | | 256QAM | 4@0 | 92@8 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.3_6.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3_6.4.3.

### 6.6.2.3_6.4.2 Test procedure

Same test procedure as in clause 6.6.2.3_2.4.2 with following exception:

- In step 1, instead of Table 6.6.2.3_2.4.1-1 → use Table 6.6.2.3_6.4.1-1

- In step 3, instead of Table 6.2.3_2.5-1 → use Table 6.2.3_6.5-1

#### 6.6.2.3_6.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.2.3_6.5 Test requirement

Same test requirements as in clause 6.6.2.3_2.5 with following exception:

- Instead of Table 6.2.3_2.5-1 → use Table 6.2.3_6.5-1

## 6.6.2.3A Adjacent Channel Leakage power Ratio for CA

### 6.6.2.3A.0 Minimum conformance requirements

ACLR for CA requirements are specified for two scenarios for an adjacent E -UTRA$_{ACLR}$ and UTRA$_{ACLR1/2}$ as shown in Figure 6.6.2.3A.0-1.

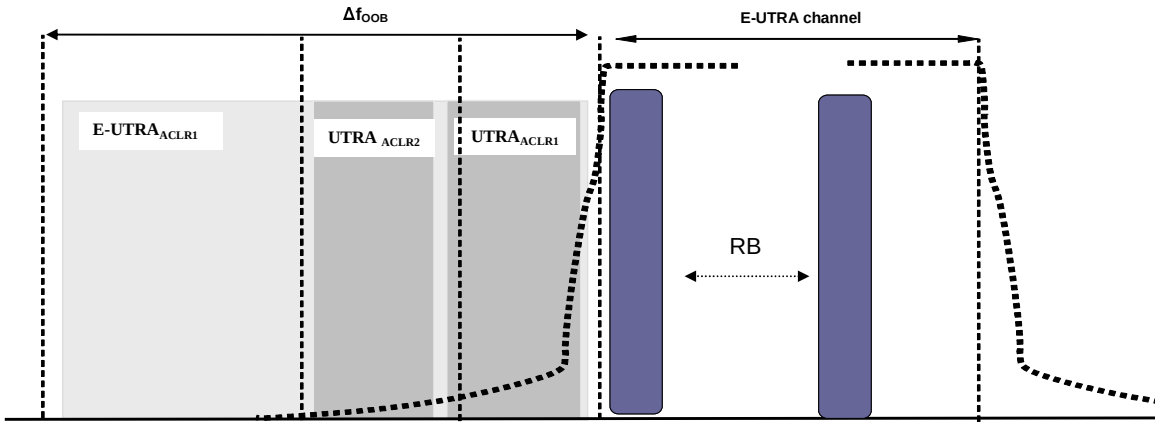



**Figure 6.6.2.3A.0-1: Adjacent Channel Leakage Power Ratio for CA requirements**

#### 6.6.2.3A.0.1 Minimum requirement UTRA for CA

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the UTRA Adjacent Channel Leakage power Ratio (UTRA$_{ACLR}$) is the ratio of the filtered mean power centred on the assigned channel bandwidth on the component carrier to the filtered mean power centred on an adjacent channel frequency. The UTRA Adjacent Channel Leakage power Ratio is defined per carrier and the requirement is specified in subclause 6.6.2.3.3.

For intra-band contiguous carrier aggregation the UTRA Adjacent Channel Leakage power Ratio (UTRA$_{ACLR}$) is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent(s) UTRA channel frequency.

For intra-band non-contiguous carrier aggregation when all sub-blocks consist of one component carrier the UTRA Adjacent Channel Leakage power Ratio (UTRA$_{ACLR}$) is the ratio of the sum of the filtered mean powers centred on the assigned sub-block frequencies to the filtered mean power centred on an adjacent(s) UTRA channel frequency. UTRA$_{ACLR1/2}$ requirements are applicable for all sub-blocks and are specified in Table 6.6.2.3A.0.1-2. UTRA$_{ACLR1}$ is required to be met in the sub-block gap when the gap bandwidth Wgap is 5MHz≤Wgap <15MHz. Both UTRA$_{ACLR1}$ and UTRA$_{ACLR2}$ are required to be met in the sub-block gap when the gap bandwidth Wgap is 15MHz≤Wgap.

UTRA Adjacent Channel Leakage power Ratio is specified for both the first UTRA adjacent channel (UTRA$_{ACLR1}$) and the 2$^{nd}$ UTRA adjacent channel (UTRA$_{ACLR2}$). The UTRA channel power is measured with a RRC bandwidth filter with roll-off factor $\alpha$ =0.22. The assigned aggregated channel bandwidth power is measured with a rectangular filter with measurement bandwidth specified in Table 6.6.2.3A.0.1-1 for intraband contiguous carrier aggregation or 6.6.2.3A.0.1-2 for intraband non-contiguous carrier aggregation. If the measured UTRA channel power is greater than –50dBm then

the $UTRA_{ACLR}$ shall be higher than the value specified in Table 6.6.2.3A.0.1-1 for intraband contiguous carrier aggregation or 6.6.2.3A.0.1-2 for intraband non-contiguous carrier aggregation.

**Table 6.6.2.3A.0.1-1: Requirements for $UTRA_{ACLR1/2}$**

| | CA bandwidth class / $UTRA_{ACLR1/2}$ / measurement bandwidth |
|---|---|
| | CA bandwidth class B and C |
| $UTRA_{ACLR1}$ | 33 dB |
| Adjacent channel centre frequency offset (in MHz) | + $BW_{Channel_CA}$ /2 + $BW_{UTRA}$/2<br>/<br>- $BW_{Channel_CA}$ / 2 - $BW_{UTRA}$/2 |
| $UTRA_{ACLR2}$ | 36 dB |
| Adjacent channel centre frequency offset (in MHz) | + $BW_{Channel_CA}$ /2 + 3*$BW_{UTRA}$/2<br>/<br>- $BW_{Channel_CA}$ /2 – 3*$BW_{UTRA}$/2 |
| CA E-UTRA channel Measurement bandwidth | $BW_{Channel_CA}$ - 2* $BW_{GB}$ |
| UTRA 5MHz channel Measurement bandwidth (Note 1) | 3.84 MHz |
| UTRA 1.6MHz channel measurement bandwidth (Note 2) | 1.28 MHz |
| NOTE 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>NOTE 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum. | |

**Table 6.6.2.3A.0.1-2: Requirements for intraband non-contiguous CA $UTRA_{ACLR1/2}$**

| | **$UTRA_{ACLR1/2}$ / measurement bandwidth** |
|---|---|
| **$UTRA_{ACLR1}$** | 33 dB |
| **Adjacent channel centre frequency offset (in MHz)** | + $F_{edge,block,high}$ + $BW_{UTRA}$/2<br>/<br>- $F_{edge,block,low}$ - $BW_{UTRA}$/2 |
| **$UTRA_{ACLR2}$** | 36 dB |
| **Adjacent channel centre frequency offset (in MHz)** | + $F_{edge,block,high}$ + 3*$BW_{UTRA}$/2<br>/<br>- $F_{edge,block,low}$ – 3*$BW_{UTRA}$/2 |
| **Sub-block measurement bandwidth** | $BW_{Channel,block}$ - 2* $BW_{GB}$ |
| **UTRA 5 MHz channel Measurement bandwidth (Note 1)** | 3.84 MHz |
| **UTRA 1.6 MHz channel measurement bandwidth (Note 2)** | 1.28 MHz |
| NOTE 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>NOTE 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum. | |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.2.3.2A.

### 6.6.2.3A.0.2 Minimum requirements for CA E-UTRA

For intra-band contiguous carrier aggregation the carrier aggregation E-UTRA Adjacent Channel Leakage power Ratio (CA $E\text{-}UTRA_{ACLR}$) is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent aggregated channel bandwidth at nominal channel spacing. The assigned aggregated channel bandwidth power and adjacent aggregated channel bandwidth power are measured with rectangular filters with measurement bandwidths specified in Table 6.6.2.3A.0.2-1. If the measured adjacent channel power is greater than –50dBm then the $E\text{-}UTRA_{ACLR}$ shall be higher than the value specified in Table 6.6.2.3A.0.2-1.

**Table 6.6.2.3A.0.2-1: General requirements for CA E-UTRA$_{ACLR}$**

| | CA bandwidth class / CA E-UTRA$_{ACLR}$ / Measurement bandwidth |
|---|---|
| | CA bandwidth class B and C |
| CA E-UTRA$_{ACLR}$ | 30 dB |
| CA E-UTRA channel Measurement bandwidth | $BW_{Channel_CA}$ - 2* $BW_{GB}$ |
| Adjacent channel centre frequency offset (in MHz) | + $BW_{Channel_CA}$<br>/<br>- $BW_{Channel_CA}$ |

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, E-UTRA Adjacent Channel Leakage power Ratio (E-UTRA$_{ACLR}$) is the ratio of the filtered mean power centred on the assigned channel bandwidth on a component carrier to the filtered mean power centred on an adjacent channel frequency. The E-UTRA Adjacent Channel Leakage power Ratio is defined per carrier and the requirement is specified in subclause 6.6.2.3.1.

For intra-band non-contiguous carrier aggregation when all sub-blocks consist of one component carrier the E-UTRA Adjacent Channel Leakage power Ratio (E-UTRA$_{ACLR}$) is the ratio of the sum of the filtered mean powers centred on the assigned sub-block frequencies to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. In case the sub-block gap bandwidth Wgap is smaller than of the sub-block bandwidth then for that sub-block no E-UTRA$_{ACLR}$ requirement is set for the gap. In case the sub-block gab bandwidth Wgap is smaller than either of the sub-block bandwidths then no E- UTRA$_{ACLR}$ requirement is set for the gap. The assigned E-UTRA sub-block power and adjacent E-UTRA channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.6.2.3A.0.2-2. If the measured adjacent channel power is greater than –50dBm then the E-UTRA$_{ACLR}$ shall be higher than the value specified in Table 6.6.2.3A.0.2-2.

**Table 6.6.2.3A.0.2-2: General requirements for non-contiguous intraband CA E-UTRA$_{ACLR}$**

| | CC and adjacent channel bandwidth / E-UTRA$_{ACLR}$ / Measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **E-UTRA$_{ACLR1}$** | 30 dB | 30 dB | 30 dB | 30 dB | 30 dB | 30 dB |
| **CC and adjacent channel measurement bandwidth [MHz]** | 1.08 | 2.7 | 4.5 | 9 | 13.5 | 18 |
| **Adjacent channel centre frequency offset [MHz]** | + 1.4<br>/<br>- 1.4 | + 3<br>/<br>- 3 | + 5<br>/<br>- 5 | + 10<br>/<br>- 10 | + 15<br>/<br>- 15 | + 20<br>/<br>- 20 |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.2.3.3A.

### 6.6.2.3A.0.3 Additional minimum requirement for E-UTRA (network signalled value “NS_29”)

When "NS_29" is indicated in the cell, the UE emission shall meet the additional requirements specified in Table 6.6.2.3A.0.3-1 for E-UTRA channels assigned within the frequency ranges 5150-5350 MHz and 5470-5725 MHz. The assigned E-UTRA channel power and alternative adjacent E-UTRA channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.6.2.3A.0.3-1. If the measured alternative adjacent channel power is greater than –50dBm then the E-UTRA$_{ACLR2}$ shall be higher than the value specified in Table 6.6.2.3A.0.3-1.

**Table 6.6.2.3A.0.3-1: Additional E-UTRA$_{ACLR}$ requirement**

| | Channel bandwidth / E-UTRA$_{ACLR2}$ / Measurement bandwidth |
|---|---|
| | 20 MHz |
| E-UTRA$_{ACLR2}$ | 40 dBc |
| E-UTRA channel Measurement bandwidth | NOTE 1 |
| Adjacent channel centre frequency offset [MHz] | +40<br>/<br>-40 |
| NOTE 1: 18 MHz for E-UTRA channels assigned within 5150-5350 MHz; 19 MHz for E-UTRA channels assigned within 5470-5725 MHz. | |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.2.3.1A.

## 6.6.2.3A.1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA)

### 6.6.2.3A.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR) for CA.

### 6.6.2.3A.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra band contiguous DL CA and UL CA.

### 6.6.2.3A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.3A.0.

### 6.6.2.3A.1.4 Test description

#### 6.6.2.3A.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3A.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low range, High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ (Note 2) |
| Test Parameters for CA Configurations | | | |
| **CA Configuration / $N_{RB_agg}$** | **DL Allocation** | **CC** | **UL Allocation** |

| ID | PCC $N_{RB}$ | SCCs $N_{RB}$ | PCC & SCC RB allocation | MOD | $N_{RB_alloc}$ | PCC & SCC RB allocations($L_{CRB}$ @ $RB_{start}$) | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 100 | 25 | N/A for this test | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 2 | 100 | 25 | | QPSK | 25 | P_25@0 | S_0@0 | - | - |
| 3 | 100 | 25 | | QPSK | 125 | P_100@0 | S_25@0 | - | - |
| 4 | 100 | 25 | | 16QAM | 8 | P_8@0 | S_0@0 | - | - |
| 5 | 100 | 25 | | 16QAM | 25 | P_25@0 | S_0@0 | - | - |
| 6 | 100 | 25 | | 16QAM | 125 | P_100@0 | S_25@0 | - | - |
| 7 | 100 | 25 | | QPSK | 2 | P_1@0 | S_1@24 | - | - |
| 8 | 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 9 | 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 10 | 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 11 | 75 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | - | - |
| 12 | 75 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | - | - |
| 13 | 75 | 75 | | 16QAM | 150 | P_75@0 | S_75@0 | - | - |
| 14 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | - | - |
| 15 | 100 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 16 | 100 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 17 | 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 18 | 100 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | - | - |
| 19 | 100 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | - | - |
| 20 | 100 | 50 | | 16QAM | 150 | P_100@0 | S_50@0 | - | - |
| 21 | 100 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | - | - |
| 22 | 100 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 23 | 100 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 24 | 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | - | - |
| 25 | 100 | 75 | | 16QAM | 16 | P_16@0 | S_0@0 | - | - |
| 26 | 100 | 75 | | 16QAM | 75 | P_75@0 | S_0@0 | - | - |
| 27 | 100 | 75 | | 16QAM | 175 | P_100@0 | S_75@0 | - | - |
| 28 | 100 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | - | - |
| 29 | 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| 30 | 100 | 100 | | QPSK | 100 | P_100@0 | S_0@0 | - | - |
| 31 | 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| 32 | 100 | 100 | | 16QAM | 18 | P_18@0 | S_0@0 | - | - |
| 33 | 100 | 100 | | 16QAM | 100 | P_100@0 | S_0@0 | - | - |
| 34 | 100 | 100 | | 16QAM | 200 | P_100@0 | S_100@0 | - | - |
| 35 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | - | - |
| 36 | 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 37 | 25 | 50 | | QPSK | 25 | P_25@0 | S_0@0 | - | - |
| 38 | 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | - | - |
| 39 | 25 | 50 | | 16QAM | 8 | P_8@0 | S_0@0 | - | - |
| 40 | 25 | 50 | | 16QAM | 25 | P_25@0 | S_0@0 | - | - |
| 41 | 25 | 50 | | 16QAM | 75 | P_25@0 | S_50@0 | - | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 42 | 25 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | - | - |
| 43 | 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 44 | 50 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 45 | 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | - | - |
| 46 | 50 | 50 | | 16QAM | 12 | P_12@0 | S_0@0 | - | - |
| 47 | 50 | 50 | | 16QAM | 50 | P_50@0 | S_0@0 | - | - |
| 48 | 50 | 50 | | 16QAM | 100 | P_50@0 | S_50@0 | - | - |
| 49 | 50 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested. | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.3A.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3A.1.4.3.

### 6.6.2.3A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.2.3A.1.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.3A.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control “up” commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
6. Measure the mean power over all component carriers of the UE in the CA configuration of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3A.1.5-1. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.
7. Measure the rectangular filtered mean power for CA E-UTRA.
8. Measure the rectangular filtered mean power of the first CA E-UTRA adjacent channel on both lower and upper side of the CA E-UTRA channel, respectively.
9. Measure the RRC filtered mean power of the first and the second UTRA adjacent channel on both lower and upper side of the CA E-UTRA channel, respectively.
10. Calculate the ratio of the power between the values measured in step 7 over step 8 for CA E-$UTRA_{ACLR}$.
11. Calculate the ratio of the power between the values measured in step 7 over step 9 for $UTRA_{ACLR1}$, $UTRA_{ACLR2}$.

#### 6.6.2.3A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.2.3A.1.5 Test Requirements

#### 6.6.2.3A.1.5.1 Test requirements of UTRA for CA

If the measured UTRA channel power is greater than –50dBm then the measured $UTRA_{ACLR1}$ and $UTRA_{ACLR2}$, derived in step 11, shall be higher than the limits in table 6.6.2.3A.1.5.1-1.

**Table 6.6.2.3A.1.5.1-1: UTRA UE ACLR for CA**

| | **CA bandwidth class / $UTRA_{ACLR1/2}$ / measurement bandwidth** |
|---|---|
| | **CA bandwidth class B and C** |
| $UTRA_{ACLR1}$ | 32.2 dB |
| Adjacent channel centre frequency offset (in MHz) | + $BW_{Channel_CA}$ /2 + $BW_{UTRA}$/2<br>/<br>- $BW_{Channel_CA}$ / 2 - $BW_{UTRA}$/2 |
| $UTRA_{ACLR2}$ | 35.2 dB |
| Adjacent channel centre frequency offset (in MHz) | + $BW_{Channel_CA}$ /2 + 3*$BW_{UTRA}$/2<br>/<br>- $BW_{Channel_CA}$ /2 – 3*$BW_{UTRA}$/2 |
| CA E-UTRA channel Measurement bandwidth | $BW_{Channel_CA}$ - 2* $BW_{GB}$ |
| UTRA 5MHz channel Measurement bandwidth (Note 1) | 3.84 MHz |
| UTRA 1.6MHz channel measurement bandwidth (Note 2) | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum. | |

#### 6.6.2.3A.1.5.2 Test requirements of CA E-UTRA

- The measured UE mean power in the channel bandwidth as specified in clause 5.4.2A, derived in step 6, shall fulfil requirements in Table 6.2.3A.1.5-1 as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured CA $E\text{-}UTRA_{ACLR}$, derived in step 10, shall be higher than the limits in table 6.6.2.3A.1.5.2-1.

**Table 6.6.2.3A.1.5.2-1: CA E-UTRA ACLR**

| | **CA bandwidth class / CA $E\text{-}UTRA_{ACLR}$ / Measurement bandwidth** |
|---|---|
| | **CA bandwidth class B and C** |
| CA $E\text{-}UTRA_{ACLR}$ | 29.2 dB |
| CA E-UTRA channel Measurement bandwidth | $BW_{Channel_CA}$ - 2* $BW_{GB}$ |
| Adjacent channel centre frequency offset (in MHz) | + $BW_{Channel_CA}$<br>/<br>- $BW_{Channel_CA}$ |

## 6.6.2.3A.1_1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM

### 6.6.2.3A.1_1.1 Test purpose

Same test purpose as defined in clause 6.6.2.3A.1.1.

### 6.6.2.3A.1_1.2 Test applicability

This test case applies to all types of E-UTRA UE from release 13 and forward that support intra-band contiguous DL CA, UL CA and UL 64QAM.

### 6.6.2.3A.1_1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.3A.0.

### 6.6.2.3A.1_1.4 Test description

#### 6.6.2.3A.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in Table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.2.3A.1_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3A.1_1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low range, High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ (Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **ID** | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_allo}$** | **PCC & SCC RB allocations($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 100 | 25 | N/A | 64QAM | 8 | P_8@0 | S_0@0 | | |
| 2 | 100 | 25 | | 64QAM | 100 | P_100@0 | S_0@0 | | |
| 3 | 100 | 25 | | 64QAM | 125 | P_100@0 | S_25@0 | | |
| 4 | 100 | 50 | | 64QAM | 12 | P_12@0 | S_0@0 | | |
| 5 | 100 | 50 | | 64QAM | 100 | P_100@0 | S_0@0 | | |
| 6 | 100 | 50 | | 64QAM | 150 | P_100@0 | S_50@0 | | |
| 7 | 75 | 75 | | 64QAM | 16 | P_16@0 | S_0@0 | | |
| 8 | 75 | 75 | | 64QAM | 75 | P_75@0 | S_0@0 | | |
| 9 | 75 | 75 | | 64QAM | 150 | P_75@0 | S_75@0 | | |
| 10 | 100 | 75 | | 64QAM | 16 | P_16@0 | S_0@0 | | |
| 11 | 100 | 75 | | 64QAM | 100 | P_100@0 | S_0@0 | | |
| 12 | 100 | 75 | | 64QAM | 175 | P_100@0 | S_75@0 | | |
| 13 | 100 | 100 | | 64QAM | 18 | P_18@0 | S_0@0 | | |
| 14 | 100 | 100 | | 64QAM | 100 | P_100@0 | S_0@0 | | |
| 15 | 100 | 100 | | 64QAM | 200 | P_100@0 | S_100@0 | | |
| 16 | 25 | 50 | | 64QAM | 8 | P_8@0 | S_0@0 | | |
| 17 | 25 | 50 | | 64QAM | 25 | P_25@0 | S_0@0 | | |
| 18 | 25 | 50 | | 64QAM | 75 | P_25@0 | S_50@0 | | |
| 19 | 50 | 50 | | 64QAM | 12 | P_12@0 | S_0@0 | | |
| 20 | 50 | 50 | | 64QAM | 50 | P_50@0 | S_0@0 | | |
| 21 | 50 | 50 | | 64QAM | 100 | P_50@0 | S_50@0 | | |
| 22 | 50 | 100 | | 64QAM | 12 | P_12@0 | S_0@0 | | |
| 23 | 50 | 100 | | 64QAM | 50 | P_50@0 | S_0@0 | | |
| 24 | 50 | 100 | | 64QAM | 150 | P_50@0 | S_100@0 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | | |

### 6.6.2.3A.1_1.4.2 Test procedure

Same test procedure as defined in clause 6.6.2.3A.1.4.2 with following exceptions:

- Instead of Table 6.2.3A.1.5-1 → use Table 6.2.3A.1_1.5-1.

#### 6.6.2.3A.1_1.4.3 Message contents

Same message contents as defined in clause 6.6.2.3A.1.4.3.

#### 6.6.2.3A.1_1.5 Test requirement

Same test requirement as defined in clause 6.6.2.3A.1.5 with following exceptions:

- Instead of Table 6.2.3A.1.5-1 → use Table 6.2.3A.1_1.5-1.

### 6.6.2.3A.1_2 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM

#### 6.6.2.3A.1_2.1 Test purpose

Same test purpose as defined in clause 6.6.2.3A.1.1.

#### 6.6.2.3A.1_2.2 Test applicability

This test case applies to all types of E-UTRA UE from release 14 and forward that support intra-band contiguous DL CA, UL CA and UL 256QAM.

#### 6.6.2.3A.1_2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.3A.0.

#### 6.6.2.3A.1_2.4 Test description

##### 6.6.2.3A.1_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in Table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.2.3A.1_2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3A.1_2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | Low and High range | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | |
| Test Parameters for CA Configurations | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | | **DL Allocation** | **CC MOD** | **UL Allocation** | | |
| **ID** | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 1 | 25 | 50 | N/A | 256QAM | 25 | P_25@0 | S_0@0 |
| 2 | 25 | 50 | | 256QAM | 75 | P_25@0 | S_50@0 |
| 3 | 50 | 50 | | 256QAM | 50 | P_50@0 | S_0@0 |
| 4 | 50 | 50 | | 256QAM | 100 | P_50@0 | S_50@0 |
| 5 | 50 | 100 | | 256QAM | 50 | P_50@0 | S_0@0 |
| 6 | 50 | 100 | | 256QAM | 150 | P_50@0 | S_100@0 |
| 7 | 75 | 50 | | 256QAM | 75 | P_75@0 | S_0@0 |
| 8 | 75 | 50 | | 256QAM | 125 | P_75@0 | S_50@0 |
| 9 | 75 | 75 | | 256QAM | 75 | P_75@0 | S_0@0 |
| 10 | 75 | 75 | | 256QAM | 150 | P_75@0 | S_75@0 |
| 11 | 100 | 25 | | 256QAM | 100 | P_100@0 | S_0@0 |
| 12 | 100 | 25 | | 256QAM | 125 | P_100@0 | S_25@0 |
| 13 | 100 | 50 | | 256QAM | 100 | P_100@0 | S_0@0 |
| 14 | 100 | 50 | | 256QAM | 150 | P_100@0 | S_50@0 |
| 15 | 100 | 75 | | 256QAM | 100 | P_100@0 | S_0@0 |
| 16 | 100 | 75 | | 256QAM | 175 | P_100@0 | S_75@0 |
| 17 | 100 | 100 | | 256QAM | 100 | P_100@0 | S_0@0 |
| 18 | 100 | 100 | | 256QAM | 200 | P_100@0 | S_100@0 |
| NOTE 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>NOTE 2: If UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest $N_{RB_PCC}$ is tested. | | | | | | | |

### 6.6.2.3A.1_2.4.2 Test procedure

Same test procedure as defined in clause 6.6.2.3A.1.4.2 with following exceptions:

- In step 2, instead of clause 6.6.2.3A.1.4.3 → use clause 6.6.2.3A.1_2.4.3.
- In step 4, instead of Table 6.6.2.3A.1.4.1-1 → use Table 6.6.2.3A.1_2.4.1-1.
- In step 6, instead of Table 6.2.3A.1.5-1 → use Table 6.2.3A.1_2.5-1.

### 6.6.2.3A.1_2.4.3 Message contents

Same message contents as defined in clause 6.6.2.3A.1.4.3.

### 6.6.2.3A.1_2.5 Test requirement

Same test requirement as defined in clause 6.6.2.3A.1.5 with following exception:

- Instead of Table 6.2.3A.1.5-1 → use Table 6.2.3A.1_2.5-1.

### 6.6.2.3A.2 Adjacent Channel Leakage power Ratio for CA (inter-band DL CA and UL CA)

#### 6.6.2.3A.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR) for CA.

#### 6.6.2.3A.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA. The requirements also apply to all types of E-UTRA UE release 14 and forward that support uplink LAA.

#### 6.6.2.3A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.3A.0.

#### 6.6.2.3A.2.4 Test description

##### 6.6.2.3A.2.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3A.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3A.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest $N_{RB_agg}$ Highest $N_{RB_agg}$ (Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | | |
| | **PCC** | **SCC** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **NRB_alloc** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | | |
| 1 | 6 | 25 | N/A for this test | QPSK | QPSK | 13 | 5 | 8 |
| 2 | 6 | 25 | | QPSK | QPSK | 31 | 6 | 25 |
| 3 | 6 | 25 | | 16QAM | 16QAM | 13 | 5 | 8 |
| 4 | 6 | 25 | | 16QAM | 16QAM | 31 | 6 | 25 |
| 5 | 6 | 25 | | QPSK | 16QAM | 30 | 5 | 25 |
| 6 | 6 | 50 | | QPSK | QPSK | 17 | 5 | 12 |
| 7 | 6 | 50 | | QPSK | QPSK | 56 | 6 | 50 |
| 8 | 6 | 50 | | 16QAM | 16QAM | 17 | 5 | 12 |
| 9 | 6 | 50 | | 16QAM | 16QAM | 56 | 6 | 50 |
| 10 | 6 | 50 | | QPSK | 16QAM | 55 | 5 | 50 |
| 11 | 25 | 15 | | QPSK | QPSK | 12 | 8 | 4 |
| 12 | 25 | 15 | | QPSK | QPSK | 40 | 25 | 15 |
| 13 | 25 | 15 | | 16QAM | 16QAM | 12 | 8 | 4 |
| 14 | 25 | 15 | | 16QAM | 16QAM | 40 | 25 | 15 |
| 15 | 25 | 15 | | QPSK | 16QAM | 23 | 8 | 15 |
| 16 | 25 | 25 | | QPSK | QPSK | 16 | 8 | 8 |
| 17 | 25 | 25 | | QPSK | QPSK | 50 | 25 | 25 |
| 18 | 25 | 25 | | 16QAM | 16QAM | 16 | 8 | 8 |
| 19 | 25 | 25 | | 16QAM | 16QAM | 50 | 25 | 25 |
| 20 | 25 | 25 | | QPSK | 16QAM | 33 | 8 | 25 |
| 21 | 25 | 50 | | QPSK | QPSK | 16 | 4 | 12 |
| 22 | 25 | 50 | | QPSK | QPSK | 65 | 15 | 50 |
| 23 | 25 | 50 | | 16QAM | 16QAM | 16 | 4 | 12 |
| 24 | 25 | 50 | | 16QAM | 16QAM | 65 | 15 | 50 |
| 25 | 25 | 50 | | QPSK | 16QAM | 54 | 4 | 50 |
| 26 | 50 | 25 | | QPSK | QPSK | 20 | 12 | 8 |
| 27 | 50 | 25 | | QPSK | QPSK | 75 | 50 | 25 |
| 28 | 50 | 25 | | 16QAM | 16QAM | 20 | 12 | 8 |
| 29 | 50 | 25 | | 16QAM | 16QAM | 75 | 50 | 25 |
| 30 | 50 | 25 | | QPSK | 16QAM | 37 | 12 | 25 |
| 31 | 50 | 50 | | QPSK | QPSK | 24 | 12 | 12 |
| 32 | 50 | 50 | | QPSK | QPSK | 100 | 50 | 50 |
| 33 | 50 | 50 | | 16QAM | 16QAM | 24 | 12 | 12 |
| 34 | 50 | 50 | | 16QAM | 16QAM | 100 | 50 | 50 |
| 35 | 50 | 50 | | QPSK | 16QAM | 62 | 12 | 50 |
| 36 | 50 | 100 | | QPSK | QPSK | 30 | 12 | 18 |
| 37 | 50 | 100 | | QPSK | QPSK | 150 | 50 | 100 |
| 38 | 50 | 100 | | 16QAM | 16QAM | 30 | 12 | 18 |
| 39 | 50 | 100 | | 16QAM | 16QAM | 150 | 50 | 100 |
| 40 | 50 | 100 | | QPSK | 16QAM | 112 | 12 | 100 |
| 41 | 75 | 75 | | QPSK | QPSK | 32 | 16 | 16 |
| 42 | 75 | 75 | | QPSK | QPSK | 150 | 75 | 75 |
| 43 | 75 | 75 | | 16QAM | 16QAM | 32 | 16 | 16 |
| 44 | 75 | 75 | | 16QAM | 16QAM | 150 | 75 | 75 |
| 45 | 75 | 75 | | QPSK | 16QAM | 91 | 16 | 75 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 46 | 100 | 50 | | QPSK | QPSK | 30 | 18 | 12 |
| 47 | 100 | 50 | | QPSK | QPSK | 150 | 100 | 50 |
| 48 | 100 | 50 | | 16QAM | 16QAM | 30 | 18 | 12 |
| 49 | 100 | 50 | | 16QAM | 16QAM | 150 | 100 | 50 |
| 50 | 100 | 50 | | QPSK | 16QAM | 68 | 18 | 50 |
| 51 | 100 | 75 | | QPSK | QPSK | 34 | 18 | 16 |
| 52 | 100 | 75 | | QPSK | QPSK | 175 | 100 | 75 |
| 53 | 100 | 75 | | 16QAM | 16QAM | 34 | 18 | 16 |
| 54 | 100 | 75 | | 16QAM | 16QAM | 175 | 100 | 75 |
| 55 | 100 | 75 | | QPSK | 16QAM | 93 | 18 | 75 |
| 56 | 100 | 100 | | QPSK | QPSK | 36 | 18 | 18 |
| 57 | 100 | 100 | | QPSK | QPSK | 200 | 100 | 100 |
| 58 | 100 | 100 | | 16QAM | 16QAM | 36 | 18 | 18 |
| 59 | 100 | 100 | | 16QAM | 16QAM | 200 | 100 | 100 |
| 60 | 100 | 100 | | QPSK | 16QAM | 118 | 18 | 100 |
| 61 | 15 | 25 | | QPSK | QPSK | 12 | 4 | 8 |
| 62 | 15 | 25 | | QPSK | QPSK | 40 | 15 | 25 |
| 63 | 15 | 25 | | 16QAM | 16QAM | 12 | 4 | 8 |
| 64 | 15 | 25 | | 16QAM | 16QAM | 40 | 15 | 25 |
| 65 | 15 | 25 | | QPSK | 16QAM | 40 | 15 | 25 |
| 66 | 25 | 6 | | QPSK | QPSK | 13 | 8 | 5 |
| 67 | 25 | 6 | | QPSK | QPSK | 31 | 25 | 6 |
| 68 | 25 | 6 | | 16QAM | 16QAM | 13 | 8 | 5 |
| 69 | 25 | 6 | | 16QAM | 16QAM | 31 | 25 | 6 |
| 70 | 25 | 6 | | QPSK | 16QAM | 30 | 25 | 5 |
| 71 | 25 | 75 | | QPSK | QPSK | 24 | 8 | 16 |
| 72 | 25 | 75 | | QPSK | QPSK | 100 | 25 | 75 |
| 73 | 25 | 75 | | 16QAM | 16QAM | 24 | 8 | 16 |
| 74 | 25 | 75 | | 16QAM | 16QAM | 100 | 25 | 75 |
| 75 | 25 | 75 | | QPSK | 16QAM | 100 | 25 | 75 |
| X+1 | 75 | 25 | | QPSK | QPSK | 24 | 16 | 8 |
| X+2 | 75 | 25 | | QPSK | QPSK | 100 | 75 | 25 |
| X+3 | 75 | 25 | | 16QAM | 16QAM | 24 | 16 | 8 |
| X+4 | 75 | 25 | | 16QAM | 16QAM | 100 | 75 | 25 |
| X+5 | 75 | 25 | | QPSK | 16QAM | 41 | 16 | 25 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.6.2.3A.2.4.1-2: Test Configuration Table for UL LAA**

| Initial Conditions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC (Note 2) and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ | | |
| **Test Parameters for CA Configurations** | | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | | |
| | **PCC** | **SCC** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **NRB_alloc** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | | |
| 1 | 100 | 100 | N/A for this test | QPSK | QPSK | 11 | 1 | L=1 |
| 2 | 100 | 100 | | QPSK | QPSK | 108 | 18 | L=9 |
| 3 | 100 | 100 | | 16QAM | 16QAM | 11 | 1 | L=1 |
| 4 | 100 | 100 | | 16QAM | 16QAM | 108 | 18 | L=9 |
| 5 | 100 | 100 | | QPSK | QPSK | 200 | 100 | L=10 |
| 6 | 100 | 100 | | 16QAM | 16QAM | 200 | 100 | L=10 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.<br>Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=N-L$, with N defined in Clause 8.1.4 of [10].<br>Note 4: Applicable only for an LAA Scell configured in Band 46. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.3A.2.4.1-1 or Table 6.6.2.3A.2.4.1-2.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3A.2.4.3.

### 6.6.2.3A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.2.3A.2.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 or DCI format 0A for LAA SCC for C_RNTI to schedule the UL RMC according to Table 6.6.2.3A.2.4.1-1 or Table

6.6.2.3A.2.4.1-2 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the mean power of the component carrier of the UE in the first band of the CA configuration of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3A.2.5-1 or Table 6.2.3A.2.5-2. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

7. Measure the rectangular filtered mean power for CA E-UTRA in the first band of the CA configuration.

8. Measure the rectangular filtered mean power of the first CA E-UTRA adjacent channel on both lower and upper side of the CA E-UTRA channel in the first band of the CA configuration, respectively.

9. Measure the RRC filtered mean power of the first and the second UTRA adjacent channel on both lower and upper side of the CA E-UTRA channel in the first band of the CA configuration, respectively.

10. Calculate the ratio of the power between the values measured in step 7 over step 8 for CA E-$UTRA_{ACLR}$.

11. Calculate the ratio of the power between the values measured in step 7 over step 9 for $UTRA_{ACLR1}$, $UTRA_{ACLR2}$.

12. Repeat steps 6 to 11 for the second band of the CA configuration.

### 6.6.2.3A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

For SCC in the case of uplink LAA, message contents are according to TS 36.508[7] subclause4.6 with the following exceptions specified in Tables 6.6.2.3A.1.2.4.3-1, 6.6.2.3A.1.2.4.3-2 and 6.6.2.3A.1.2.4.3-3.

**Table 6.6.2.3A.1.2.4.3-1 LogicalChannelConfig-DRB (Initial Condition, step 14, Table 4.5.2.3-1)**

| Derivation Path: 36.508 Table 4.8.2.1.4-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LogicalChannelConfig-DRB ::= SEQUENCE { | | | |
| ul-SpecificParameters SEQUENCE { | | | |
| laa-UL-Allowed-r14 | true | | |
| } | | | |
| } | | | |

**Table 6.6.2.3A.1.2.4.3-2 PhysicalConfigDedicatedSCell (Step 2, test procedure)**

| Derivation Path: 36.508 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| laa-SCellConfiguration-v1430 ::= SEQUENCE { | | | |
| | NULL | | |
| } | | | |
| } | | | |

**Table 6.6.2.3A.1.2.4.3-3: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_29" on SCC**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 29 (NS_29) | | |

6.6.2.3A.2.5 Test Requirements

6.6.2.3A.2.5.1 Test requirements of UTRA for CA

If the measured UTRA channel power is greater than –50dBm then the measured $UTRA_{ACLR1}$ and $UTRA_{ACLR2}$, derived in step 11, shall be higher than the limits in table 6.6.2.3A.2.5.1-1.

**Table 6.6.2.3A.2.5.1-1: UTRA UE ACLR for CA**

| | **Channel bandwidth / $UTRA_{ACLR1/2}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **$UTRA_{ACLR1}$** | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | 0.7+$BW_{UTRA}$/2 / -0.7-$BW_{UTRA}$/2 | 1.5+$BW_{UTRA}$/2 / -1.5-$BW_{UTRA}$/2 | 2.5+$BW_{UTRA}$/2 / -2.5-$BW_{UTRA}$/2 | 5+$BW_{UTRA}$/2 / -5-$BW_{UTRA}$/2 | 7.5+$BW_{UTRA}$/2 / -7.5-$BW_{UTRA}$/2 | 10+$BW_{UTRA}$/2 / -10-$BW_{UTRA}$/2 |
| **$UTRA_{ACLR2}$** | - | - | 35.2 dB | 35.2 dB | 35.2 dB | 35.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | - | - | 2.5+3*$BW_{UTRA}$/2 / -2.5-3*$BW_{UTRA}$/2 | 5+3*$BW_{UTRA}$/2 / -5-3*$BW_{UTRA}$/2 | 7.5+3*$BW_{UTRA}$/2 / -7.5-3*$BW_{UTRA}$/2 | 10+3*$BW_{UTRA}$/2 / -10-3*$BW_{UTRA}$/2 |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UTRA 5MHz channel Measurement bandwidth[1]** | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| **UTRA 1.6MHz channel measurement bandwidth[2]** | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.<br>Note 3: $BW_{UTRA}$ for UTRA FDD is 5MHz and for UTRA TDD is 1.6MHz. | | | | | | |

6.6.2.3A.2.5.2 Test requirements of CA E-UTRA

- The measured UE mean power in the channel bandwidth as specified in clause 5.4.2A, derived in step 6, shall fulfil requirements in Table 6.2.3A.2.5-1 as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured CA $E\text{-}UTRA_{ACLR}$, derived in step 10, shall be higher than the limits in table 6.6.2.3A.2.5.2-1.

**Table 6.6.2.3A.2.5.2-1: CA E-UTRA ACLR**

| | **Channel bandwidth / $E\text{-}UTRA_{ACLR1}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **$E\text{-}UTRA_{ACLR1}$** | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UE channel** | +1.4 MHz or -1.4 MHz | +3 MHz or -3 MHz | +5MHz or -5MHz | +10MHz or -10MHz | +15MHz or -15MHz | +20MHz or -20MHz |

#### 6.6.2.3A.2.5.3 Test requirements of E-UTRA (network signalled value “NS_29”)

When "NS_29" is indicated in the cell, the UE emission shall meet the additional requirements specified in Table 6.6.2.3A.2.5.3-1 for E-UTRA channels assigned within the frequency ranges 5150-5350 MHz and 5470-5725 MHz.

- The measured UE mean power in the channel bandwidth as specified in clause 5.4.2A, derived in step 6, shall fulfil requirements in Table 6.2.3A.2.5-1 as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured CA E-UTRA$_{ACLR2}$, derived in step 10, shall be higher than the limits in table 6.6.2.3A.2.5.3-1.

**Table 6.6.2.3A.2.5.3-1: Additional E-UTRA$_{ACLR}$ requirement**

| | **Channel bandwidth / E-UTRA$_{ACLR2}$ / Measurement bandwidth** |
|---|---|
| | **20 MHz** |
| E-UTRA$_{ACLR2}$ | 38.7 dBc |
| E-UTRA channel Measurement bandwidth | NOTE 1 |
| Adjacent channel centre frequency offset [MHz] | +40<br>/<br>-40 |
| NOTE 1: 18 MHz for E-UTRA channels assigned within 5150-5350 MHz; 19 MHz for E-UTRA channels assigned within 5470-5725 MHz. | |

### 6.6.2.3A.2_1 Adjacent Channel Leakage power Ratio for CA (inter-band DL CA and UL CA) for UL 64QAM

#### 6.6.2.3A.2_1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR) for CA.

#### 6.6.2.3A.2_1.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support inter band DL CA and UL CA and UL 64QAM.

#### 6.6.2.3A.2_1.3 Minimum conformance requirements

The minimum requirements are the same as in section 6.6.2.3A.2.3.

#### 6.6.2.3A.2_1.4 Test description

##### 6.6.2.3A.2_1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3A.2_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3A.2_1.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for both PCC and SCC (Note 3) |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest $N_{RB_agg}$ Highest $N_{RB_agg}$ (Note 2) |

| Test Parameters for CA Configurations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | | |
| | **PCC** | **SCC** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **NRB_alloc** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | | |
| 1 | 6 | 25 | N/A for this test | 64QAM | 64QAM | 13 | 5 | 8 |
| 2 | 6 | 25 | | 64QAM | 64QAM | 31 | 6 | 25 |
| 3 | 6 | 50 | | 64QAM | 64QAM | 17 | 5 | 12 |
| 4 | 6 | 50 | | 64QAM | 64QAM | 56 | 6 | 50 |
| 5 | 25 | 15 | | 64QAM | 64QAM | 12 | 8 | 4 |
| 6 | 25 | 15 | | 64QAM | 64QAM | 40 | 25 | 15 |
| 7 | 25 | 25 | | 64QAM | 64QAM | 16 | 8 | 8 |
| 8 | 25 | 25 | | 64QAM | 64QAM | 50 | 25 | 25 |
| 9 | 25 | 50 | | 64QAM | 64QAM | 16 | 4 | 12 |
| 10 | 25 | 50 | | 64QAM | 64QAM | 65 | 15 | 50 |
| 11 | 50 | 25 | | 64QAM | 64QAM | 20 | 12 | 8 |
| 12 | 50 | 25 | | 64QAM | 64QAM | 75 | 50 | 25 |
| 13 | 50 | 50 | | 64QAM | 64QAM | 24 | 12 | 12 |
| 14 | 50 | 50 | | 64QAM | 64QAM | 100 | 50 | 50 |
| 15 | 50 | 100 | | 64QAM | 64QAM | 30 | 12 | 18 |
| 16 | 50 | 100 | | 64QAM | 64QAM | 150 | 50 | 100 |
| 17 | 75 | 75 | | 64QAM | 64QAM | 32 | 16 | 16 |
| 18 | 75 | 75 | | 64QAM | 64QAM | 150 | 75 | 75 |
| 19 | 100 | 50 | | 64QAM | 64QAM | 30 | 18 | 12 |
| 20 | 100 | 50 | | 64QAM | 64QAM | 150 | 100 | 50 |
| 21 | 100 | 75 | | 64QAM | 64QAM | 34 | 18 | 16 |
| 22 | 100 | 75 | | 64QAM | 64QAM | 175 | 100 | 75 |
| 23 | 100 | 100 | | 64QAM | 64QAM | 36 | 18 | 18 |
| 24 | 100 | 100 | | 64QAM | 64QAM | 200 | 100 | 100 |
| 25 | 15 | 25 | | 64QAM | 64QAM | 12 | 4 | 8 |
| 26 | 15 | 25 | | 64QAM | 64QAM | 40 | 15 | 25 |
| 27 | 25 | 6 | | 64QAM | 64QAM | 13 | 8 | 5 |
| 28 | 25 | 6 | | 64QAM | 64QAM | 31 | 25 | 6 |
| 29 | 25 | 75 | | 64QAM | 64QAM | 24 | 8 | 16 |
| 30 | 25 | 75 | | 64QAM | 64QAM | 100 | 25 | 75 |
| X+1 | 75 | 25 | | 64QAM | 64QAM | 24 | 16 | 8 |
| X+2 | 75 | 25 | | 64QAM | 64QAM | 100 | 75 | 25 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.
Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same NRB_agg. only the first of those is tested. according to the order on the Test Configuration Table list.
Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.3A.2_1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3A.1.4.3.

#### 6.6.2.3A.2_1.4.2 Test procedure

Same test procedure as in clause 6.6.2.3A.2.4.2.

#### 6.6.2.3A.2_1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.2.3A.2_1.5 Test Requirements

Same test requirements as in clause 6.6.2.3A.2.5.

## 6.6.2.3A.2_2 Adjacent Channel Leakage power Ratio for CA (inter-band DL CA and UL CA) for UL 256QAM

### 6.6.2.3A.2_2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR) for CA.

### 6.6.2.3A.2_2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support inter band DL CA and UL CA and UL 256QAM.

### 6.6.2.3A.2_2.3 Minimum conformance requirements

The minimum requirements are the same as in section 6.6.2.3A.2.3.

### 6.6.2.3A.2_2.4 Test description

#### 6.6.2.3A.2_2.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3A.2_2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3A.2_2.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for both PCC and SCC |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) |

| Test Parameters for CA Configurations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | | |
| | **PCC** | **SCC** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **NRB_alloc** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | | |
| 1 | 6 | 25 | N/A for this Test | 256QAM | 256QAM | 31 | 6 | 25 |
| 2 | 6 | 50 | | 256QAM | 256QAM | 56 | 6 | 50 |
| 3 | 25 | 15 | | 256QAM | 256QAM | 40 | 25 | 15 |
| 4 | 25 | 25 | | 256QAM | 256QAM | 50 | 25 | 25 |
| 5 | 25 | 50 | | 256QAM | 256QAM | 75 | 25 | 50 |
| 6 | 50 | 25 | | 256QAM | 256QAM | 75 | 50 | 25 |
| 7 | 50 | 50 | | 256QAM | 256QAM | 100 | 50 | 50 |
| 8 | 50 | 100 | | 256QAM | 256QAM | 150 | 50 | 100 |
| 9 | 75 | 75 | | 256QAM | 256QAM | 150 | 75 | 75 |
| 10 | 100 | 50 | | 256QAM | 256QAM | 150 | 100 | 50 |
| 11 | 100 | 75 | | 256QAM | 256QAM | 175 | 100 | 75 |
| 12 | 100 | 100 | | 256QAM | 256QAM | 200 | 100 | 100 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | | | |
| Note 2: If UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest $N_{RB_PCC}$ is tested. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.3A.2_2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3A.2_2.4.3.

### 6.6.2.3A.2_2.4.2 Test procedure

Same test procedure as in clause 6.6.2.3A.2.4.2 with following exceptions:

- In step 2, instead of clause 6.6.2.3A.2.4.3 → use clause 6.6.2.3A.2_2.4.3.
- In step 4, instead of Table 6.6.2.3A.2.4.1-1 → use Table 6.6.2.3A.2_2.4.1-1.
- In step 6, instead of clause 6.2.3A.2.5-1 → use Table 6.2.3A.2_2.5-1.

#### 6.6.2.3A.2_2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

#### 6.6.2.3A.2_2.5 Test Requirements

Same test requirements as in clause 6.6.2.3A.2.5 with following exception:

- Instead of Table 6.2.3A.2.5-1 → use Table 6.2.3A.2_2.5-1.

### 6.6.2.3A.3 Adjacent Channel Leakage power Ratio for CA (intra-band non-contiguous DL CA and UL CA)

#### 6.6.2.3A.3.1 Test purpose

Same test purpose as defined in clause 6.6.2.3A.1.1.

### 6.6.2.3A.3_1 Adjacent Channel Leakage power Ratio for CA (intra-band non-contiguous DL CA and UL CA) for UL 64QAM

#### 6.6.2.3A.3_1.1 Test purpose

Same test purpose as defined in clause 6.6.2.3A.1.1.

#### 6.6.2.3A.3_1.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band non-contiguous DL CA and UL CA and UL 64QAM.

#### 6.6.2.3A.3_1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.3A.0.

#### 6.6.2.3A.3_1.4 Test description

##### 6.6.2.3A.3_1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3A.3_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3A.3_1.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: Mid frequency, Maximum Wgap(low + high frequency) |
| Test CC Combination setting ($N_{RB}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ [MHz] | DL Allocation | | UL Allocation | | | |
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | | CC MOD | PCC & SCC RB allocation | CC MOD | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | 64QAM | P_1@0 | 64QAM | S_1@24 |
| 2 | 25 | 25 | 35 | N/A | N/A | 64QAM | P_25@0 | 64QAM | S_25@0 |
| 3 | 25 | 25 | 5 | N/A | N/A | 64QAM | P_1@0 | 64QAM | S_1@24 |
| 4 | 25 | 25 | 5 | N/A | N/A | 64QAM | P_25@0 | 64QAM | S_25@0 |
| 5 | 100 | 100 | 5 | N/A | N/A | 64QAM | P_1@0 | 64QAM | S_1@99 |
| 6 | 100 | 100 | 5 | N/A | N/A | 64QAM | P_25@0 | 64QAM | S_25@75 |
| 7 | 100 | 100 | 5 | N/A | N/A | 64QAM | P_100@0 | 64QAM | S_100@0 |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.3A.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3A.1.4.3.

### 6.6.2.3A.3_1.4.2 Test procedure

Same test procedure as in clause 6.6.2.3A.3.4.2.

### 6.6.2.3A.3_1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.2.3A.3_1.5 Test Requirements

Same test requirements as in clause 6.6.2.3A.3.5.

### 6.6.2.3A.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA but do not support UL 64QAM or UL 256QAM..

### 6.6.2.3A.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.3A.0.

### 6.6.2.3A.3.4 Test description

#### 6.6.2.3A.3.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3A.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3A.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | Refer to test points<br>A: Low Wgap, Maximum Wgap | | | | | |
| Test CC Combination setting ($N_{RB}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@24 |
| 2 | 25 | 25 | 35 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@0 |
| 3 | 25 | 25 | 5 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@24 |
| 4 | 25 | 25 | 5 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@0 |
| 5 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@99 |
| 6 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@75 |
| 7 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_100@0 | 16QAM | S_100@0 |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Table 6.6.2.3A.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3A.1.4.3.

#### 6.6.2.3A.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.2.3A.1.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.3A.3.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control “up” commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the mean power over all component carriers of the UE in the CA configuration of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3A.3.5-1. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

7. Measure the rectangular filtered mean power for E-UTRA.

8. Measure the rectangular filtered mean power of the CA E-UTRA adjacent channel on lower side of the lowest sub-clock, and the higher side of the highest sub-block (out of gap measurement).

9. If Wgap is larger or equal to either of the sub-block bandwidths, perform this step, otherwise continue to next step. Measure the rectangular filtered mean power of the CA E-UTRA adjacent channel on higher side of the lowest sub-clock, and the lower side of the highest sub-block (in gap measurement).

10. Measure the RRC filtered mean power of the first and the second UTRA adjacent channel on lower side of the lowest sub-clock, and the higher side of the highest sub-block (out of gap measurement).

11. If Wgap is larger or equal to 5 MHz, perform this step, otherwise continue to next step. Measure the rectangular filtered mean power of the first UTRA adjacent channel on higher side of the lowest sub-clock, and the lower side of the highest sub-block (in gap measurement).

12. If Wgap is larger or equal to 15 MHz, perform this step, otherwise continue to next step. Measure the rectangular filtered mean power of the second UTRA adjacent channel on higher side of the lowest sub-clock, and the lower side of the highest sub-block (in gap measurement).

13. Calculate the ratio of the power between the values measured in step 7 over step 8 for CA E-$UTRA_{ACLR}$ (out of gap measurement).

14. Calculate the ratio of the power between the values measured in step 7 over step 9 for CA E-$UTRA_{ACLR}$ (in gap measurement).

15. Calculate the ratio of the power between the values measured in step 7 over step 10 for $UTRA_{ACLR1}$, $UTRA_{ACLR2}$ (out of gap measurement).

16. Calculate the ratio of the power between the values measured in step 7 over step 11 and 12 for $UTRA_{ACLR1}$, $UTRA_{ACLR2}$ (in gap measurement).

#### 6.6.2.3A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.2.3A.3.5 Test Requirements

#### 6.6.2.3A.3.5.1 Test requirements E-UTRA

- The measured UE mean power, derived in step 6, shall fulfil requirements in Table 6.2.3A.3.5-1 as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured E-UTRA$_{ACLR}$, derived in step 13 and 14, shall be higher than the limits in table 6.6.2.3A.3.5.1-1.

**Table 6.6.2.3A.3.5.1-1: E-UTRA UE ACLR**

| | **Channel bandwidth / E-UTRA$_{ACLR1}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **E-UTRA$_{ACLR1}$** | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UE channel** | +1.4 MHz or -1.4 MHz | +3 MHz or -3 MHz | +5MHz or -5MHz | +10MHz or -10MHz | +15MHz or -15MHz | +20MHz or -20MHz |

#### 6.6.2.3A.3.5.2 Test requirements UTRA

If the measured UTRA channel power is greater than –50dBm then the measured UTRA$_{ACLR1}$, UTRA$_{ACLR2}$, derived in steps 15 and 16, shall be higher than the limits in table 6.6.2.3A.3.5.2-1.

**Table 6.6.2.3A.3.5.2-1: UTRA UE ACLR**

| | **Channel bandwidth / UTRA$_{ACLR1/2}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **$UTRA_{ACLR1}$** | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | 0.7+$BW_{UTRA}$/2 / -0.7-$BW_{UTRA}$/2 | 1.5+$BW_{UTRA}$/2 / -1.5-$BW_{UTRA}$/2 | 2.5+$BW_{UTRA}$/2 / -2.5-$BW_{UTRA}$/2 | 5+$BW_{UTRA}$/2 / -5-$BW_{UTRA}$/2 | 7.5+$BW_{UTRA}$/2 / -7.5-$BW_{UTRA}$/2 | 10+$BW_{UTRA}$/2 / -10-$BW_{UTRA}$/2 |
| **$UTRA_{ACLR2}$** | - | - | 35.2 dB | 35.2 dB | 35.2 dB | 35.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | - | - | 2.5+3*$BW_{UTRA}$/2 / -2.5-3*$BW_{UTRA}$/2 | 5+3*$BW_{UTRA}$/2 / -5-3*$BW_{UTRA}$/2 | 7.5+3*$BW_{UTRA}$/2 / -7.5-3*$BW_{UTRA}$/2 | 10+3*$BW_{UTRA}$/2 / -10-3*$BW_{UTRA}$/2 |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UTRA 5MHz channel Measurement bandwidth[1]** | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| **UTRA 1.6MHz channel measurement bandwidth[2]** | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.<br>Note 3: $BW_{UTRA}$ for UTRA FDD is 5MHz and for UTRA TDD is 1.6MHz. | | | | | | |

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

-The test applicability needs to be added to TS36.521-2

- The test configuration table for inter-band CA is needed for FFS.

### 6.6.2.3A.4.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR) for CA.

### 6.6.2.3A.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support 3DL CA and 3UL CA.

### 6.6.2.3A.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.3A.0.

### 6.6.2.3A.4.4 Test description

#### 6.6.2.3A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1 and 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.6.2.3A.4.4.1-1 for intra-band contiguous CA, 6.6.2.3A.4.4.1-2 for inter-band CA and 6.6.2.3A.4.4.1-3 for intra-band non-contiguous CA. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3A.4.4.1-1: Test Configuration Table for intra-band contiguous CA**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low range, High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ (Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCC1 $N_{RB}$** | **SCC2 $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations($L_{CRB}$ @ $RB_{start}$)** | | | |
| 50 | 100 | 100 | N/A for this test | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 50 | 100 | 100 | | QPSK | 200 | P_50@0 | P_100@0 | P_100@0 | - |
| 50 | 100 | 100 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 50 | 100 | 100 | | 16QAM | 200 | P_50@0 | P_100@0 | P_100@0 | - |
| 75 | 100 | 100 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 75 | 100 | 100 | | QPSK | 275 | P_75@0 | P_100@0 | P_100@0 | - |
| 75 | 100 | 100 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 75 | 100 | 100 | | 16QAM | 275 | P_75@0 | P_100@0 | P_100@0 | - |
| 100 | 100 | 100 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 100 | 100 | 100 | | QPSK | 300 | P_100@0 | P_100@0 | P_100@0 | - |
| 100 | 100 | 100 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 100 | 100 | 100 | | 16QAM | 300 | P_100@0 | P_100@0 | P_100@0 | - |
| 100 | 50 | 100 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 100 | 50 | 100 | | QPSK | 250 | P_100@0 | P_50@0 | P_100@0 | - |
| 100 | 50 | 100 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 100 | 50 | 100 | | 16QAM | 250 | P_100@0 | P_50@0 | P_100@0 | - |
| 100 | 75 | 100 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 100 | 75 | 100 | | QPSK | 275 | P_100@0 | P_75@0 | P_100@0 | - |
| 100 | 75 | 100 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 100 | 75 | 100 | | 16QAM | 275 | P_100@0 | P_75@0 | P_100@0 | - |
| 100 | 100 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 100 | 100 | 50 | | QPSK | 250 | P_100@0 | P_100@0 | P_50@0 | - |
| 100 | 100 | 50 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 100 | 100 | 50 | | 16QAM | 250 | P_100@0 | P_100@0 | P_50@0 | - |
| 100 | 100 | 75 | | QPSK | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 100 | 100 | 75 | | QPSK | 275 | P_100@0 | P_100@0 | P_75@0 | - |
| 100 | 100 | 75 | | 16QAM | 8 | P_8@0 | S_0@0 | S_0@0 | - |
| 100 | 100 | 75 | | 16QAM | 275 | P_100@0 | P_100@0 | P_75@0 | - |

| | |
|---|---|
| Note 1: | CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. |
| Note 2: | If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , only the first of those is tested, according to the order on the Test Configuration Table list. |

**Table 6.6.2.3A.4.4.1-2: Test Configuration Table for inter-band CA**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC (Note 3) | | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | |
| **Test Parameters for CA Configurations** | | | | | | | | |
| **CA Configuration / NRB_agg** | | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | |
| **PCC** | **SCC1** | **SCC2** | **PCC & SCC RB allocation** | | **NRB_alloc** | **PCC & SCCs RB allocations** | | |
| **NRB** | **NRB** | **NRB** | | | | **PCC** | **SCCs** | |
| 25 | 100 | 100 | N/A for this test | QPSK | 44 | P_8@0 | S_18@0 | S_18@0 |
| 25 | 100 | 100 | | QPSK | 225 | P_25@0 | S_100@0 | S_100@0 |
| 25 | 100 | 100 | | 16QAM | 44 | P_8@0 | S_18@0 | S_18@0 |
| 25 | 100 | 100 | | 16QAM | 225 | P_25@0 | S_100@0 | S_100@0 |
| 50 | 100 | 100 | | QPSK | 48 | P_12@0 | S_18@0 | S_18@0 |
| 50 | 100 | 100 | | QPSK | 250 | P_50@0 | S_100@0 | S_100@0 |
| 50 | 100 | 100 | | 16QAM | 48 | P_12@0 | S_18@0 | S_18@0 |
| 50 | 100 | 100 | | 16QAM | 250 | P_50@0 | S_100@0 | S_100@0 |
| 75 | 100 | 100 | | QPSK | 52 | P_16@0 | S_18@0 | S_18@0 |
| 75 | 100 | 100 | | QPSK | 275 | P_75@0 | S_100@0 | S_100@0 |
| 75 | 100 | 100 | | 16QAM | 52 | P_16@0 | S_18@0 | S_18@0 |
| 75 | 100 | 100 | | 16QAM | 275 | P_75@0 | S_100@0 | S_100@0 |
| 100 | 100 | 100 | | QPSK | 54 | P_18@0 | S_18@0 | S_18@0 |
| 100 | 100 | 100 | | QPSK | 300 | P_100@0 | S_100@0 | S_100@0 |
| 100 | 100 | 100 | | 16QAM | 54 | P_18@0 | S_18@0 | S_18@0 |
| 100 | 100 | 100 | | 16QAM | 300 | P_100@0 | S_100@0 | S_100@0 |
| 100 | 25 | 100 | | QPSK | 44 | P_18@0 | S_8@0 | S_18@0 |
| 100 | 25 | 100 | | QPSK | 225 | P_100@0 | S_25@0 | S_100@0 |
| 100 | 25 | 100 | | 16QAM | 44 | P_18@0 | S_8@0 | S_18@0 |
| 100 | 25 | 100 | | 16QAM | 225 | P_100@0 | S_25@0 | S_100@0 |
| 100 | 50 | 100 | | QPSK | 48 | P_18@0 | S_12@0 | S_18@0 |
| 100 | 50 | 100 | | QPSK | 250 | P_100@0 | S_50@0 | S_100@0 |
| 100 | 50 | 100 | | 16QAM | 48 | P_18@0 | S_12@0 | S_18@0 |
| 100 | 50 | 100 | | 16QAM | 250 | P_100@0 | S_50@0 | S_100@0 |
| 100 | 75 | 100 | | QPSK | 52 | P_18@0 | S_16@0 | S_18@0 |
| 100 | 75 | 100 | | QPSK | 275 | P_100@0 | S_75@0 | S_100@0 |
| 100 | 75 | 100 | | 16QAM | 52 | P_18@0 | S_16@0 | S_18@0 |
| 100 | 75 | 100 | | 16QAM | 275 | P_100@0 | S_75@0 | S_100@0 |

| | | |
|---|---|---|
| 50 | 50 | 100 |
| 50 | 50 | 100 |
| 50 | 50 | 100 |
| 50 | 50 | 100 |
| 50 | 75 | 100 |
| 50 | 75 | 100 |
| 50 | 75 | 100 |
| 50 | 75 | 100 |
| 75 | 50 | 100 |
| 75 | 50 | 100 |
| 75 | 50 | 100 |
| 75 | 50 | 100 |
| 75 | 75 | 100 |
| 75 | 75 | 100 |
| 75 | 75 | 100 |
| 75 | 75 | 100 |
| 50 | 100 | 50 |
| 50 | 100 | 50 |
| 50 | 100 | 50 |
| 50 | 100 | 50 |
| 50 | 100 | 75 |
| 50 | 100 | 75 |
| 50 | 100 | 75 |
| 50 | 100 | 75 |
| 75 | 100 | 50 |
| 75 | 100 | 50 |
| 75 | 100 | 50 |
| 75 | 100 | 50 |
| 75 | 100 | 75 |
| 75 | 100 | 75 |
| 75 | 100 | 75 |
| 75 | 100 | 75 |
| 75 | 75 | 50 |
| 75 | 75 | 50 |
| 75 | 75 | 50 |
| 75 | 75 | 50 |
| 75 | 75 | 75 |
| 75 | 75 | 75 |
| 75 | 75 | 75 |
| 75 | 75 | 75 |
| 100 | 50 | 50 |

| | | | | |
|---|---|---|---|---|
| QPSK | 42 | P_12@0 | S_12@0 | S_18@0 |
| QPSK | 200 | P_50@0 | S_50@0 | S_100@0 |
| 16QAM | 42 | P_12@0 | S_12@0 | S_18@0 |
| 16QAM | 200 | P_50@0 | S_50@0 | S_100@0 |
| QPSK | 46 | P_12@0 | S_16@0 | S_18@0 |
| QPSK | 225 | P_50@0 | S_75@0 | S_100@0 |
| 16QAM | 46 | P_12@0 | S_16@0 | S_18@0 |
| 16QAM | 225 | P_50@0 | S_75@0 | S_100@0 |
| QPSK | 46 | P_16@0 | S_12@0 | S_18@0 |
| QPSK | 225 | P_50@0 | S_75@0 | S_100@0 |
| 16QAM | 46 | P_16@0 | S_12@0 | S_18@0 |
| 16QAM | 225 | P_50@0 | S_75@0 | S_100@0 |
| QPSK | 50 | P_16@0 | S_16@0 | S_18@0 |
| QPSK | 250 | P_75@0 | S_75@0 | S_100@0 |
| 16QAM | 50 | P_16@0 | S_16@0 | S_18@0 |
| 16QAM | 250 | P_75@0 | S_75@0 | S_100@0 |
| QPSK | 42 | P_12@0 | S_18@0 | S_12@0 |
| QPSK | 200 | P_50@0 | S_100@0 | S_50@0 |
| 16QAM | 42 | P_12@0 | S_18@0 | S_12@0 |
| 16QAM | 200 | P_50@0 | S_100@0 | S_50@0 |
| QPSK | 46 | P_12@0 | S_18@0 | S_16@0 |
| QPSK | 225 | P_50@0 | S_100@0 | S_75@0 |
| 16QAM | 46 | P_12@0 | S_18@0 | S_16@0 |
| 16QAM | 225 | P_50@0 | S_100@0 | S_75@0 |
| QPSK | 46 | P_16@0 | S_18@0 | S_12@0 |
| QPSK | 225 | P_75@0 | S_100@0 | S_50@0 |
| 16QAM | 46 | P_16@0 | S_18@0 | S_12@0 |
| 16QAM | 225 | P_75@0 | S_100@0 | S_50@0 |
| QPSK | 50 | P_16@0 | S_18@0 | S_16@0 |
| QPSK | 250 | P_75@0 | S_100@0 | S_75@0 |
| 16QAM | 50 | P_16@0 | S_18@0 | S_16@0 |
| 16QAM | 250 | P_75@0 | S_100@0 | S_75@0 |
| QPSK | 44 | P_16@0 | S_16@0 | S_12@0 |
| QPSK | 200 | P_75@0 | S_75@0 | S_50@0 |
| 16QAM | 44 | P_16@0 | S_16@0 | S_12@0 |
| 16QAM | 200 | P_75@0 | S_75@0 | S_50@0 |
| QPSK | 48 | P_16@0 | S_16@0 | S_16@0 |
| QPSK | 225 | P_75@0 | S_75@0 | S_75@0 |
| 16QAM | 48 | P_16@0 | S_16@0 | S_16@0 |
| 16QAM | 225 | P_75@0 | S_75@0 | S_75@0 |
| QPSK | 42 | P_18@0 | S_12@0 | S_12@0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 100 | 50 | 50 | | QPSK | 200 | P_100@0 | S_50@0 | S_50@0 |
| 100 | 50 | 50 | | 16QAM | 42 | P_18@0 | S_12@0 | S_12@0 |
| 100 | 50 | 50 | | 16QAM | 200 | P_100@0 | S_50@0 | S_50@0 |
| 100 | 50 | 75 | | QPSK | 46 | P_18@0 | S_12@0 | S_16@0 |
| 100 | 50 | 75 | | QPSK | 225 | P_100@0 | S_50@0 | S_75@0 |
| 100 | 50 | 75 | | 16QAM | 46 | P_18@0 | S_12@0 | S_16@0 |
| 100 | 50 | 75 | | 16QAM | 225 | P_100@0 | S_50@0 | S_75@0 |
| 100 | 75 | 50 | | QPSK | 46 | P_18@0 | S_16@0 | S_12@0 |
| 100 | 75 | 50 | | QPSK | 225 | P_100@0 | S_75@0 | S_50@0 |
| 100 | 75 | 50 | | 16QAM | 46 | P_18@0 | S_16@0 | S_12@0 |
| 100 | 75 | 50 | | 16QAM | 225 | P_100@0 | S_75@0 | S_50@0 |
| 100 | 75 | 75 | | QPSK | 50 | P_18@0 | S_16@0 | S_16@0 |
| 100 | 75 | 75 | | QPSK | 250 | P_100@0 | S_75@0 | S_75@0 |
| 100 | 75 | 75 | | 16QAM | 50 | P_18@0 | S_16@0 | S_16@0 |
| 100 | 75 | 75 | | 16QAM | 250 | P_100@0 | S_75@0 | S_75@0 |
| 100 | 100 | 50 | | QPSK | 48 | P_18@0 | S_18@0 | S_12@0 |
| 100 | 100 | 50 | | QPSK | 250 | P_100@0 | S_100@0 | S_50@0 |
| 100 | 100 | 50 | | 16QAM | 48 | P_18@0 | S_18@0 | S_12@0 |
| 100 | 100 | 50 | | 16QAM | 250 | P_100@0 | S_100@0 | S_50@0 |
| 100 | 100 | 75 | | QPSK | 52 | P_18@0 | S_18@0 | S_16@0 |
| 100 | 100 | 75 | | QPSK | 275 | P_100@0 | S_100@0 | S_75@0 |
| 100 | 100 | 75 | | 16QAM | 52 | P_18@0 | S_18@0 | S_16@0 |
| 100 | 100 | 75 | | 16QAM | 275 | P_100@0 | S_100@0 | S_75@0 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same NRB_agg. only the first of those is tested. according to the order on the Test Configuration Table list.
Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.6.2.3A.4.4.1-3: Test Configuration Table for intra-band non-contiguous CA**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: Low Wgap, Maximum Wgap |
| Test CC Combination setting ($N_{RB}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

| Test Parameters for CA Configurations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ [MHz] | DL Allocation | | UL Allocation | | | | |
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | | CC MOD | PCC & SCC RB allocation | CC MOD | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@24 | S_1@24 |
| 2 | 25 | 25 | 35 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@0 | S_25@0 |
| 3 | 25 | 25 | 5 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@24 | S_1@24 |
| 4 | 25 | 25 | 5 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@0 | S_25@0 |
| 5 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_1@0 | 16QAM | S_1@99 | S_1@99 |
| 6 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_25@0 | 16QAM | S_25@75 | S_25@75 |
| 7 | 100 | 100 | 5 | N/A | N/A | 16QAM | P_100@0 | 16QAM | S_100@0 | S_100@0 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.6.2.3A.4.4.1-1 for intra-band contiguous CA, 6.6.2.3A.4.4.1-2 for inter-band CA and 6.6.2.3A.4.4.1-3 for intra-band non-contiguous CA.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3A.4.4.3.

### 6.6.2.3A.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.2.3A.1.4.3
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.3A.1.4.1-1 for intra-band contiguous CA, 6.6.2.3A.4.4.1-2 for inter-band CA and 6.6.2.3A.4.4.1-3 for intra-band non-contiguous CA on all PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the mean power over all component carriers of the UE in the CA configuration of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3A.1.5-1 for intra-band non-contiguous CA, 6.2.3A.2.5-1 for inter-band CA and 6.2.3A.3.5-1 for intra-band non-contiguous CA. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

7. Measure the rectangular filtered mean power for CA E-UTRA (in the first band for inter-band CA UE).

8. For intra-band non-contiguous 3UL CA UE, execute steps 8a) to 8d):

   8a) Measure the rectangular filtered mean power of the first CA E-UTRA adjacent channel on both lower and upper side of the CA E-UTRA channel, respectively.

   8b) Measure the RRC filtered mean power of the first and the second UTRA adjacent channel on both lower and upper side of the CA E-UTRA channel, respectively.

   8c) Calculate the ratio of the power between the values measured in step 7 over step 8a) for CA E-$UTRA_{ACLR}$.

   8d) Calculate the ratio of the power between the values measured in step 7 over step 8b) for $UTRA_{ACLR1}$, $UTRA_{ACLR2}$

9. For inter-band 3UL CA UE, execute steps 9a) to 9e):

   9a) Measure the rectangular filtered mean power of the first CA E-UTRA adjacent channel on both lower and upper side of the CA E-UTRA channel in the first band of the CA configuration, respectively

   9b) Measure the RRC filtered mean power of the first and the second UTRA adjacent channel on both lower and upper side of the CA E-UTRA channel in the first band of the CA configuration, respectively.

   9c) Calculate the ratio of the power between the values measured in step 7 over step 9a) for CA E-$UTRA_{ACLR}$.

   9d) Calculate the ratio of the power between the values measured in step 7 over step 9b) for $UTRA_{ACLR1}$, $UTRA_{ACLR2}$.

   9e) Repeat steps 6 to 11 for the second band of the CA configuration.

10. For intra-band non-contiguous 3UL CA UE, execute steps 10a) to 10i):

    10a) Measure the rectangular filtered mean power of the CA E-UTRA adjacent channel on lower side of the lowest sub-clock, and the higher side of the highest sub-block (out of gap measurement).

    10b) If Wgap is larger or equal to either of the sub-block bandwidths, perform this step, otherwise continue to next step. Measure the rectangular filtered mean power of the CA E-UTRA adjacent channel on higher side of the lowest sub-clock, and the lower side of the highest sub-block (in gap measurement).

    10c) Measure the RRC filtered mean power of the first and the second UTRA adjacent channel on lower side of the lowest sub-clock, and the higher side of the highest sub-block (out of gap measurement).

    10d) If Wgap is larger or equal to 5 MHz, perform this step, otherwise continue to next step. Measure the rectangular filtered mean power of the first UTRA adjacent channel on higher side of the lowest sub-clock, and the lower side of the highest sub-block (in gap measurement).

    10e) If Wgap is larger or equal to 15 MHz, perform this step, otherwise continue to next step. Measure the rectangular filtered mean power of the second UTRA adjacent channel on higher side of the lowest sub-clock, and the lower side of the highest sub-block (in gap measurement).

    10f) Calculate the ratio of the power between the values measured in step 7 over step 10a) for CA E-$UTRA_{ACLR}$ (out of gap measurement).

10g) Calculate the ratio of the power between the values measured in step 7 over step 10b) for CA E-UTRA$_{ACLR}$ (in gap measurement).

10h) Calculate the ratio of the power between the values measured in step 7 over step 10c) for UTRA$_{ACLR1}$, UTRA$_{ACLR2}$ (out of gap measurement).

10i) Calculate the ratio of the power between the values measured in step 7 over step 10d) and 10e) for UTRA$_{ACLR1}$, UTRA$_{ACLR2}$ (in gap measurement).

#### 6.6.2.3A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.2.3A.4.5 Test Requirements

#### 6.6.2.3A.4.5.1 Test requirements of UTRA for CA

If the measured UTRA channel power is greater than –50dBm then the measured UTRA$_{ACLR1}$ and UTRA$_{ACLR2}$, derived in steps 8d), 9d) 10h)and 10i), shall be higher than the limits in table 6.6.2.3A.4.5.1-1.

**Table 6.6.2.3A.4.5.1-1: UTRA UE ACLR for CA**

| | **CA bandwidth class / UTRA$_{ACLR1/2}$ / measurement bandwidth** |
|---|---|
| | **CA bandwidth class D** |
| UTRA$_{ACLR1}$ | 32.2 dB |
| Adjacent channel centre frequency offset (in MHz) | + $BW_{Channel_CA}$ /2 + $BW_{UTRA}$/2<br>/<br>- $BW_{Channel_CA}$ / 2 - $BW_{UTRA}$/2 |
| UTRA$_{ACLR2}$ | 35.2 dB |
| Adjacent channel centre frequency offset (in MHz) | + $BW_{Channel_CA}$ /2 + 3*$BW_{UTRA}$/2<br>/<br>- $BW_{Channel_CA}$ /2 – 3*$BW_{UTRA}$/2 |
| CA E-UTRA channel Measurement bandwidth | $BW_{Channel_CA}$ - 2* $BW_{GB}$ |
| UTRA 5MHz channel Measurement bandwidth (Note 1) | 3.84 MHz |
| UTRA 1.6MHz channel measurement bandwidth (Note 2) | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum. | |

#### 6.6.2.3A.4.5.2 Test requirements of CA E-UTRA

- The measured UE mean power in the channel bandwidth as specified in clause 5.4.2A, derived in step 6, shall fulfil requirements in Table 6.2.3A.1.5-1 for intra-band non-contiguous CA, 6.2.3A.2.5-1 for inter-band CA and 6.2.3A.3.5-1 for intra-band non-contiguous CA as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured CA E-UTRA$_{ACLR}$, derived in steps 8c), 9c) 10f)and 10g), shall be higher than the limits in table 6.6.2.3A.4.5.2-1.

**Table 6.6.2.3A.4.5.2-1: CA E-UTRA ACLR**

| | **CA bandwidth class / CA E-UTRA$_{ACLR}$ / Measurement bandwidth** |
|---|---|
| | **CA bandwidth class D** |

| | |
|---|---|
| CA E-UTRA$_{ACLR}$ | 29.2 dB |
| CA E-UTRA channel Measurement bandwidth | $BW_{Channel_CA}$ - 2* $BW_{GB}$ |
| Adjacent channel centre frequency offset (in MHz) | + $BW_{Channel_CA}$ / - $BW_{Channel_CA}$ |

## 6.6.2.3B Adjacent Channel Leakage power Ratio for UL-MIMO

### 6.6.2.3B.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR) for UL-MIMO.

### 6.6.2.3B.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

### 6.6.2.3B.3 Minimum conformance requirements

For UE with multiple transmit antenna connectors, the requirements for ACLR are specified at each transmit antenna connector. ACLR requirements are specified for two scenarios for an adjacent E -UTRAACLR and UTRAACLR1/2 as shown in Figure 6.6.2.3B.3-1.

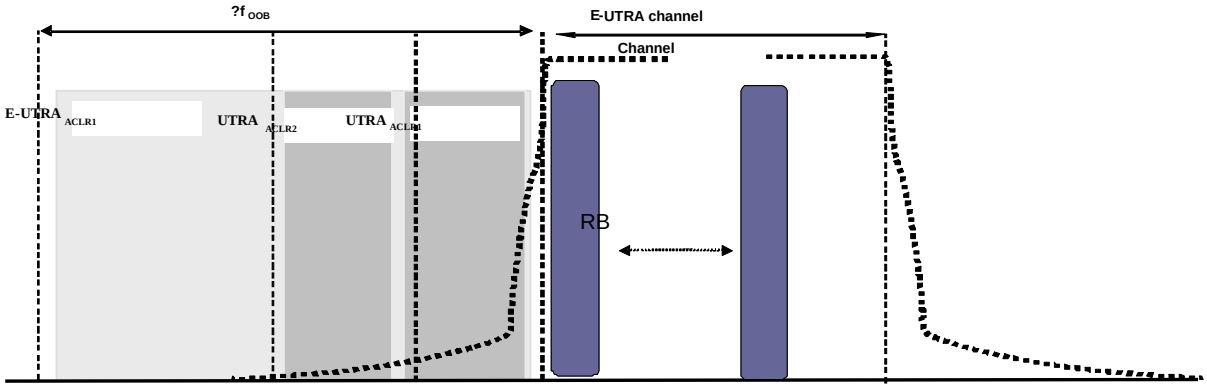



**Figure 6.6.2.3B.3-1: Adjacent Channel Leakage Power Ratio requirements**

#### 6.6.2.3B.3.1 Minimum conformance requirements for E-UTRA

E-UTRA ACLR (E-UTRAACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. The assigned E-UTRA channel power and adjacent E-UTRA channel power are measured with rectangular filters with measurement bandwidth specified in Table 6.6.2.3B.3.1-1.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme ,, the requirements in Table 6.6.2.3B.3.1-1 apply to each transmit antenna connector with the UL-MIMO configurations specified in Table 6.2.2B.3-2.

If the measured adjacent channel power is greater than -50dBm then the E-UTRAACLR shall be higher than the valued specified in Table 6.6.2.3B.3.1-1.

**Table 6.6.2.3B.3.1-1: General requirements for E-UTRA$_{ACLR}$**

| | Channel bandwidth / E-UTRA$_{ACLR1}$ / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |

| | | | | | | |
|---|---|---|---|---|---|---|
| **E-UTRA$_{ACLR1}$** | 30 dB | 30 dB | 30 dB | 30 dB | 30 dB | 30 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

The normative reference for this requirement is TS 36.101 clause 6.6.2B.

### 6.6.2.3B.3.2 Minimum conformance requirements for UTRA

UTRA ACLR (UTRA$_{ACLR}$) is the ratio of the filtered mean power centred on the assigned E-UTRA channel frequency to the filtered mean power centred on an adjacent UTRA channel frequency.

UTRA ACLR is specified for both the first UTRA adjacent channel (UTRAACLR1) and the 2nd UTRA adjacent channel (UTRA$_{ACLR2}$).The UTRA channel power is measured with a RRC bandwidth filter with roll-off factor $\alpha$ = 0.22. The assigned E-UTRA channel power is measured with a rectangular filter with measurement bandwidth specified in Table 6.6.2.3B.3.2-1.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in Table 6.6.2.3B.3.2-1 apply to each transmit antenna connector with the UL-MIMO configurations specified in Table 6.2.2B.3-2.

If the measured UTRA channel power is greater than -50dBm then the UTRAACLR1, and UTRAACLR2 shall be higher than the valued specified in Table 6.6.2.3B.3.2-1.

**Table 6.6.2.3B.3.2-1: General requirements for UTRA$_{ACLR1/2}$**

| | **Channel bandwidth / E-UTRA$_{ACLR1/2}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **E-UTRA$_{ACLR1}$** | 33 dB | 33 dB | 33 dB | 33 dB | 33 dB | 33 dB |
| **Adjacent channel centre frequency offset (in MHz)** | 0.7+BW$_{UTRA}$/2 / -0.7-BW$_{UTRA}$/2 | 1.5+BW$_{UTRA}$/2 / -1.5-BW$_{UTRA}$/2 | 2.5+BW$_{UTRA}$/2 / -2.5-BW$_{UTRA}$/2 | 5+BW$_{UTRA}$/2 / -5-BW$_{UTRA}$/2 | 7.5+BW$_{UTRA}$/2 / -7.5-BW$_{UTRA}$/2 | 10+BW$_{UTRA}$/2 / -10-BW$_{UTRA}$/2 |
| **UTRA$_{ACLR2}$** | - | - | 36 dB | 36 dB | 36 dB | 36 dB |
| **Adjacent channel centre frequency offset (in MHz)** | - | - | 2.5+3*BW$_{UTRA}$/2 / -2.5-3*BW$_{UTRA}$/2 | 5+3*BW$_{UTRA}$/2 / -5-3*BW$_{UTRA}$/2 | 7.5+3*BW$_{UTRA}$/2 / -7.5-3*BW$_{UTRA}$/2 | 10+3*BW$_{UTRA}$/2 / -10-3*BW$_{UTRA}$/2 |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UTRA 5MHz channel Measurement bandwidth[1]** | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| **UTRA 1.6MHz channel measurement bandwidth[2]** | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum. | | | | | | |

The normative reference for this requirement is TS 36.101 clause 6.6.2B.

### 6.6.2.3B.4 Test description

#### 6.6.2.3B.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3B.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in AnnexeA.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] clause 4.1) | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies (as specified in TS 36.508 [7] clause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] clause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | N/A for ACLR testing | | | QPSK | 6 | 6 |
| 1.4MHz | | | | QPSK | 5 | 5 |
| 1.4MHz | | | | 16QAM | 6 | 6 |
| 1.4MHz | | | | 16QAM | 5 | 5 |
| 3MHz | | | | QPSK | 15 | 15 |
| 3MHz | | | | QPSK | 4 | 4 |
| 3MHz | | | | 16QAM | 15 | 15 |
| 3MHz | | | | 16QAM | 4 | 4 |
| 5MHz | | | | QPSK | 25 | 25 |
| 5MHz | | | | QPSK | 8 | 8 |
| 5MHz | | | | 16QAM | 25 | 25 |
| 5MHz | | | | 16QAM | 8 | 8 |
| 10MHz | | | | QPSK | 50 | 50 |
| 10MHz | | | | QPSK | 12 | 12 |
| 10MHz | | | | 16QAM | 50 (Note 3) | 50 (Note 3) |
| 10MHz | | | | 16QAM | 12 | 12 |
| 15MHz | | | | QPSK | 75 | 75 |
| 15MHz | | | | QPSK | 16 | 16 |
| 15MHz | | | | 16QAM | 75 (Note 3) | 75 (Note 3) |
| 15MHz | | | | 16QAM | 16 | 16 |
| 20MHz | | | | QPSK | 100 | 100 |
| 20MHz | | | | QPSK | 18 | 18 |
| 20MHz | | | | 16QAM | 100 (Note 3) | 100 (Note 3) |
| 20MHz | | | | 16QAM | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The RBstart of partial RB allocation shall be RB#0 and RB# (max + 1 - RB allocation) of the channel bandwidth.<br>Note 3: Applies only for UE-Categories [FFS]. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.28.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Table 6.6.2.3B.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.2.3B.4.3.

#### 6.6.2.3B.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.6.2.3B.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the sum of the mean power at each antenna connector of UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in clause 6.2.3B.5. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

4. Measure the rectangular filtered mean power for E-UTRA at each antenna connector of UE.

5. Measure the rectangular filtered mean power of the first E-UTRA adjacent channel at each antenna connector of UE.

6. Measure the RRC filtered mean power of the first and the second UTRA adjacent channel at each antenna connector of UE.

7. Calculate the ratio of the power between the values measured in step 4 over step 5 for $E\text{-}UTRA_{ACLR}$.

8. Calculated the ratio of the power between the values measured in step 4 over step 6 for $UTRA_{ACLR1}$, $UTRA_{ACLR2}$.

#### 6.6.2.3B.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.2.3B.5 Test requirement

#### 6.6.2.3B.5.1 Test requirements E-UTRA

- The measured sum of mean power at each transmit antenna connector for UE in the channel bandwidth, derived in step 3, shall fulfil requirements in clause 6.2.3B.5 as appropriate,

and

- The requirements apply to each transmit antenna connector.

- if the measured adjacent channel power is greater than -50 dBm then the measured E-UTRAACLR, derived in step 7, shall be higher than the limits in table 6.6.2.3B.5.1-1.

**Table 6.6.2.3B.5.1-1: E-UTRA UE ACLR**

| | Channel bandwidth / $E\text{-}UTRA_{ACLR1}$ / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **$E\text{-}UTRA_{ACLR1}$** | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UE channel** | +1.4 MHz or -1.4 MHz | +3 MHz or -3 MHz | +5MHz or -5MHz | +10MHz or -10MHz | +15MHz or -15MHz | +20MHz or -20MHz |

### 6.6.2.3B.5.2 Test requirements UTRA

The requirements apply to each transmit antenna connector.

If the measured UTRA channel power is greater than -50dBm then the measured $UTRA_{ACLR1}$, $UTRA_{ACLR2}$, derived in step 8, shall be higher than the limits in table 6.6.2.3B.5.2-1.

**Table 6.6.2.3B.5.2-1: UTRA UE ACLR**

| | Channel bandwidth / $E\text{-}UTRA_{ACLR1/2}$ / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **$UTRA_{ACLR1}$** | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | $0.7+BW_{UTRA}/2$ / $-0.7-BW_{UTRA}/2$ | $1.5+BW_{UTRA}/2$ / $-1.5-BW_{UTRA}/2$ | $2.5+BW_{UTRA}/2$ / $-2.5-BW_{UTRA}/2$ | $5+BW_{UTRA}/2$ / $-5-BW_{UTRA}/2$ | $7.5+BW_{UTRA}/2$ / $-7.5-BW_{UTRA}/2$ | $10+BW_{UTRA}/2$ / $-10-BW_{UTRA}/2$ |
| **$UTRA_{ACLR2}$** | - | - | 35.2 dB | 35.2 dB | 35.2 dB | 35.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | - | - | $2.5+3*BW_{UTRA}/2$ / $-2.5-3*BW_{UTRA}/2$ | $5+3*BW_{UTRA}/2$ / $-5-3*BW_{UTRA}/2$ | $7.5+3*BW_{UTRA}/2$ / $-7.5-3*BW_{UTRA}/2$ | $10+3*BW_{UTRA}/2$ / $-10-3*BW_{UTRA}/2$ |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UTRA 5MHz channel Measurement bandwidth[1]** | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| **UTRA 1.6MHz channel measurement bandwidth[2]** | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum. | | | | | | |
| Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum. | | | | | | |
| Note 3: $BW_{UTRA}$ for UTRA FDD is 5MHz and for UTRA TDD is 1.6MHz. | | | | | | |

## 6.6.2.3E Adjacent Channel Leakage power Ratio for UE category 0

### 6.6.2.3E.1 Test purpose

Same test purpose as in clause 6.6.2.3.1.

### 6.6.2.3E.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.6.2.3E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.3.3.

### 6.6.2.3E.4 Test description

#### 6.6.2.3E.4.1 Initial conditions

Same initial conditions as in clause 6.6.2.3.4.1 with following exceptions:

- Instead of Table 6.6.2.3.4.1-1 → use Table 6.6.2.3E.4.1-1.
- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.6.2.3E.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD and HD-FDD** | **TDD** |
| 1.4MHz | N/A for ACLR testing | | | QPSK | 6 | 6 |
| 1.4MHz | | | | QPSK | 5 | 5 |
| 1.4MHz | | | | 16QAM | 5 | 5 |
| 3MHz | | | | QPSK | 15 | 15 |
| 3MHz | | | | QPSK | 4 | 4 |
| 3MHz | | | | 16QAM | 5 | 5 |
| 3MHz | | | | 16QAM | 4 | 4 |
| 5MHz | | | | QPSK | 25 | 25 |
| 5MHz | | | | QPSK | 8 | 8 |
| 5MHz | | | | 16QAM | 5 | 5 |
| 10MHz | | | | QPSK | 25 | 25 |
| 10MHz | | | | QPSK | 12 | 12 |
| 10MHz | | | | 16QAM | 5 | 5 |
| 15MHz | | | | QPSK | 36 | 36 |
| 15MHz | | | | QPSK | 16 | 16 |
| 15MHz | | | | 16QAM | 5 | 5 |
| 20MHz | | | | QPSK | 36 | 36 |
| 20MHz | | | | QPSK | 18 | 18 |
| 20MHz | | | | 16QAM | 5 | 5 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max + 1 - RB allocation) of the channel bandwidth. | | | | | | |

#### 6.6.2.3E.4.2 Test procedure

Same test procedure as in clause 6.6.2.3.4.2 with following exception for HD-FDD:

- In step 3, slots with transient periods are not under test. Half-duplex guard subframe are not under test.

#### 6.6.2.3E.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.2.3E.5 Test requirement

#### 6.6.2.3E.5.1 Test requirements E-UTRA

- The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3E.5-1 as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured E-UTRA$_{ACLR}$, derived in step 7, shall be higher than the limits in table 6.6.2.3E.5.1-1.

**Table 6.6.2.3E.5.1-1: E-UTRA UE ACLR**

| | **Channel bandwidth / E-UTRA$_{ACLR1}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **E-UTRA$_{ACLR1}$** | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UE channel** | +1.4 MHz or -1.4 MHz | +3 MHz or -3 MHz | +5MHz or -5MHz | +10MHz or -10MHz | +15MHz or -15MHz | +20MHz or -20MHz |

Test requirements UTRA

If the measured UTRA channel power is greater than –50dBm then the measured UTRA$_{ACLR1}$, UTRA$_{ACLR2}$, derived in step 8, shall be higher than the limits in table 6.6.2.3E.5.2-1.

**Table 6.6.2.3E.5.2-1: UTRA UE ACLR**

| | **Channel bandwidth / UTRA$_{ACLR1/2}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **UTRA$_{ACLR1}$** | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | 0.7+BW$_{UTRA}$/2 / -0.7-BW$_{UTRA}$/2 | 1.5+BW$_{UTRA}$/2 / -1.5-BW$_{UTRA}$/2 | 2.5+BW$_{UTRA}$/2 / -2.5-BW$_{UTRA}$/2 | 5+BW$_{UTRA}$/2 / -5-BW$_{UTRA}$/2 | 7.5+BW$_{UTRA}$/2 / -7.5-BW$_{UTRA}$/2 | 10+BW$_{UTRA}$/2 / -10-BW$_{UTRA}$/2 |
| **UTRA$_{ACLR2}$** | - | - | 35.2 dB | 35.2 dB | 35.2 dB | 35.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | - | - | 2.5+3*BW$_{UTRA}$/2 / -2.5-3*BW$_{UTRA}$/2 | 5+3*BW$_{UTRA}$/2 / -5-3*BW$_{UTRA}$/2 | 7.5+3*BW$_{UTRA}$/2 / -7.5-3*BW$_{UTRA}$/2 | 10+3*BW$_{UTRA}$/2 / -10-3*BW$_{UTRA}$/2 |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UTRA 5MHz channel Measurement bandwidth[1]** | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| **UTRA 1.6MHz channel measurement bandwidth[2]** | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.<br>Note 3: BW$_{UTRA}$ for UTRA FDD is 5MHz and for UTRA TDD is 1.6MHz. | | | | | | |

## 6.6.2.3EA Adjacent Channel Leakage power Ratio for UE category M1

### 6.6.2.3EA.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

### 6.6.2.3EA.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

### 6.6.2.3EA.3 Minimum conformance requirements

ACLR requirements are specified for two scenarios for an adjacent E -UTRA$_{ACLR}$ and UTRA$_{ACLR1/2}$ as shown in Figure 6.6.2.3EA.3-1.

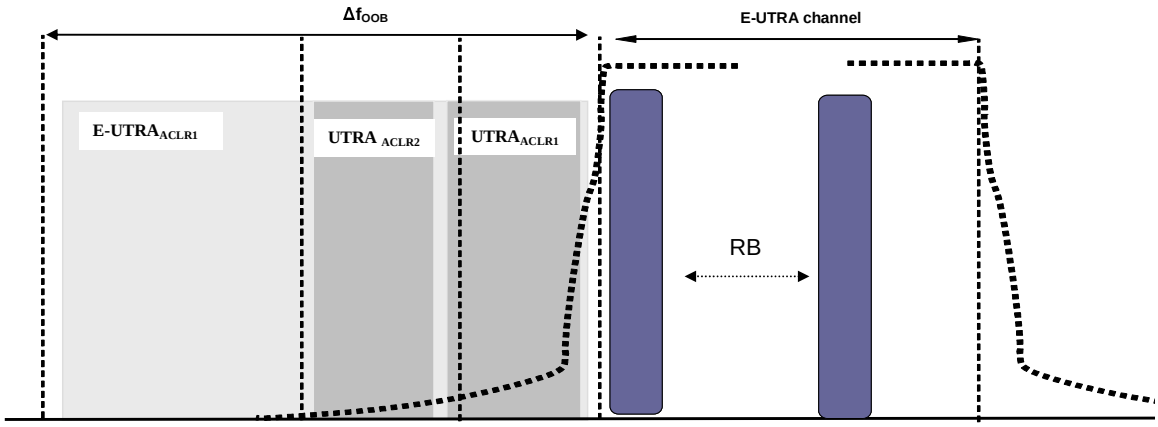



**Figure 6.6.2.3EA.3-1: Adjacent Channel Leakage Power Ratio requirements**

#### 6.6.2.3EA.3.1 Minimum conformance requirements for E-UTRA

E-UTRA ACLR (E-UTRA$_{ACLR}$) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. The assigned E-UTRA channel power and adjacent E-UTRA channel power are measured with rectangular filters with measurement bandwidth specified in Table 6.6.2.3EA.3.1-1.

If the measured adjacent channel power is greater than –50dBm then the E-UTRA$_{ACLR}$ shall be higher than the valued specified in Table 6.6.2.3EA.3.1-1.

**Table 6.6.2.3EA.3.1-1: General requirements for E-UTRA$_{ACLR}$**

| | **Channel bandwidth / E-UTRA$_{ACLR1}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **E-UTRA$_{ACLR1}$** | 30 dB | 30 dB | 30 dB | 30 dB | 30 dB | 30 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.2.3.1.

#### 6.6.2.3EA.3.2 Minimum conformance requirements for UTRA

UTRA ACLR (UTRA$_{ACLR}$) is the ratio of the filtered mean power centred on the assigned E-UTRA channel frequency to the filtered mean power centred on an adjacent UTRA channel frequency.

UTRA ACLR is specified for both the first UTRA adjacent channel ($UTRA_{ACLR1}$) and the 2nd UTRA adjacent channel ($UTRA_{ACLR2}$). The UTRA channel power is measured with a RRC bandwidth filter with roll-off factor $\alpha = 0.22$. The assigned E-UTRA channel power is measured with a rectangular filter with measurement bandwidth specified in Table 6.6.2.3EA.3.2-1.

If the measured UTRA channel power is greater than –50dBm then the $UTRA_{ACLR1}$, and $UTRA_{ACLR2}$ shall be higher than the valued specified in Table 6.6.2.3EA.3.2-1.

**Table 6.6.2.3EA.3.2-1: General requirements for $UTRA_{ACLR1/2}$**

| | Channel bandwidth / $UTRA_{ACLR1/2}$ / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **$UTRA_{ACLR1}$** | 33 dB | 33 dB | 33 dB | 33 dB | 33 dB | 33 dB |
| **Adjacent channel centre frequency offset (in MHz)** | 0.7+$BW_{UTRA}$/2 / -0.7-$BW_{UTRA}$/2 | 1.5+$BW_{UTRA}$/2 / -1.5-$BW_{UTRA}$/2 | 2.5+$BW_{UTRA}$/2 / -2.5-$BW_{UTRA}$/2 | 5+$BW_{UTRA}$/2 / -5-$BW_{UTRA}$/2 | 7.5+$BW_{UTRA}$/2 / -7.5-$BW_{UTRA}$/2 | 10+$BW_{UTRA}$/2 / -10-$BW_{UTRA}$/2 |
| **$UTRA_{ACLR2}$** | - | - | 36 dB | 36 dB | 36 dB | 36 dB |
| **Adjacent channel centre frequency offset (in MHz)** | - | - | 2.5+3*$BW_{UTRA}$/2 / -2.5-3*$BW_{UTRA}$/2 | 5+3*$BW_{UTRA}$/2 / -5-3*$BW_{UTRA}$/2 | 7.5+3*$BW_{UTRA}$/2 / -7.5-3*$BW_{UTRA}$/2 | 10+3*$BW_{UTRA}$/2 / -10-3*$BW_{UTRA}$/2 |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UTRA 5MHz channel Measurement bandwidth[1]** | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| **UTRA 1.6MHz channel measurement bandwidth[2]** | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum. | | | | | | |
| Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum. | | | | | | |

The normative reference for this requirement is TS 36.101 subclause 6.6.2.3.2.

## 6.6.2.3EA.4 Test description

### 6.6.2.3EA.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3EA.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in AnnexeA.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3EA.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | Lowest, 5MHz, 10MHz, Highest | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A for ACLR test case | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| **Low range, Mid range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 5 | 0 |
| 6 | 3MHz | | QPSK | 2 | 0 |
| 7 | 3MHz | | QPSK | 5 | 0 |
| 8 | 3MHz | | QPSK | 6 | 0 |
| 9 | 3MHz | | 16QAM | 2 | 0 |
| 10 | 3MHz | | 16QAM | 5 | 0 |
| 11 | 5MHz | | QPSK | 6 | 0 |
| 12 (Note 4) | 5MHz | | 16QAM | 1 | 0 |
| 13 | 5MHz | | 16QAM | 3 | 0 |
| 14 | 5MHz | | 16QAM | 5 | 0 |
| 15 (Note 4) | 10MHz | | QPSK | 4 | 0 |
| 16 | 10MHz | | QPSK | 6 | 0 |
| 17 (Note 4) | 10MHz | | 16QAM | 3 | 0 |
| 18 | 10MHz | | 16QAM | 5 | 0 |
| 19 | 15MHz | | QPSK | 6 | 0 |
| 20 | 15MHz | | 16QAM | 5 | 0 |
| 21 | 20MHz | | 16QAM | 5 | 0 |
| **High range** | | | | | |
| 1 | 1.4MHz | | QPSK | 2 | 0 |
| 2 | 1.4MHz | | QPSK | 5 | 0 |
| 3 | 1.4MHz | | QPSK | 6 | 0 |
| 4 | 1.4MHz | | 16QAM | 2 | 0 |
| 5 | 1.4MHz | | 16QAM | 5 | 0 |
| 6 | 3MHz | | QPSK | 2 | 1 |
| 7 | 3MHz | | QPSK | 5 | 1 |
| 8 | 3MHz | | QPSK | 6 | 1 |
| 9 | 3MHz | | 16QAM | 2 | 1 |
| 10 | 3MHz | | 16QAM | 5 | 1 |
| 11 | 5MHz | | QPSK | 6 | 3 |
| 12 (Note 4) | 5MHz | | 16QAM | 1 | 3 |
| 13 | 5MHz | | 16QAM | 3 | 3 |
| 14 | 5MHz | | 16QAM | 5 | 3 |
| 15 (Note 4) | 10MHz | | QPSK | 4 | 7 |
| 16 | 10MHz | | QPSK | 6 | 7 |
| 17 (Note 4) | 10MHz | | 16QAM | 3 | 7 |
| 18 | 10MHz | | 16QAM | 5 | 7 |
| 19 | 15MHz | | QPSK | 6 | 11 |
| 20 | 15MHz | | 16QAM | 5 | 11 |
| 21 | 20MHz | | 16QAM | 5 | 15 |

Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4

Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.

| | |
|---|---|
| Note 3: | The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. |
| Note 4: | Only for power class 3 UE |

1. Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.3EA.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.6.2.3EA.4.3.

#### 6.6.2.3EA.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.6.2.3EA.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3EA.5-1 to 6.2.3EA.5-3. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods and Half-duplex guard subframe are not under test.
4. Measure the rectangular filtered mean power for E-UTRA.
5. Measure the rectangular filtered mean power of the first E-UTRA adjacent channel on both lower and upper side of the E-UTRA channel, respectively.
6. Measure the RRC filtered mean power of the first and the second UTRA adjacent channel on both lower and upper side of the E-UTRA channel, respectively.
7. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper E-$UTRA_{ACLR}$, respectively.
8. Calculated the ratios of the power between the values measured in step 4 over step 6 for lower and upper $UTRA_{ACLR1}$, $UTRA_{ACLR2}$, respectively.

#### 6.6.2.3EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.2.3EA.5 Test requirement

#### 6.6.2.3EA.5.1 Test requirements E-UTRA

- The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in [Table 6.2.3EA.5-1, 6.2.3EA.5-2 and 6.2.3EA.5-3 as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured E-$UTRA_{ACLR}$, derived in step 7, shall be higher than the limits in table 6.6.2.3EA.5.1-1.

**Table 6.6.2.3EA.5.1-1: E-UTRA UE ACLR**

| | Channel bandwidth / E-UTRA$_{ACLR1}$ / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **E-UTRA$_{ACLR1}$** | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UE channel** | +1.4 MHz or -1.4 MHz | +3 MHz or -3 MHz | +5MHz or -5MHz | +10MHz or -10MHz | +15MHz or -15MHz | +20MHz or -20MHz |

Test requirements UTRA

If the measured UTRA channel power is greater than –50dBm then the measured UTRA$_{ACLR1}$, UTRA$_{ACLR2}$, derived in step 8, shall be higher than the limits in table 6.6.2.3EA.5.2-1.

**Table 6.6.2.3EA.5.2-1: UTRA UE ACLR**

| | Channel bandwidth / UTRA$_{ACLR1/2}$ / measurement bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **UTRA$_{ACLR1}$** | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | 0.7+BW$_{UTRA}$/2 / -0.7-BW$_{UTRA}$/2 | 1.5+BW$_{UTRA}$/2 / -1.5-BW$_{UTRA}$/2 | 2.5+BW$_{UTRA}$/2 / -2.5-BW$_{UTRA}$/2 | 5+BW$_{UTRA}$/2 / -5-BW$_{UTRA}$/2 | 7.5+BW$_{UTRA}$/2 / -7.5-BW$_{UTRA}$/2 | 10+BW$_{UTRA}$/2 / -10-BW$_{UTRA}$/2 |
| **UTRA$_{ACLR2}$** | - | - | 35.2 dB | 35.2 dB | 35.2 dB | 35.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | - | - | 2.5+3*BW$_{UTRA}$/2 / -2.5-3*BW$_{UTRA}$/2 | 5+3*BW$_{UTRA}$/2 / -5-3*BW$_{UTRA}$/2 | 7.5+3*BW$_{UTRA}$/2 / -7.5-3*BW$_{UTRA}$/2 | 10+3*BW$_{UTRA}$/2 / -10-3*BW$_{UTRA}$/2 |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UTRA 5MHz channel Measurement bandwidth[1]** | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| **UTRA 1.6MHz channel measurement bandwidth[2]** | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.<br>Note 3: BW$_{UTRA}$ for UTRA FDD is 5MHz and for UTRA TDD is 1.6MHz. | | | | | | |

## 6.6.2.3EB Adjacent Channel Leakage power Ratio for UE category 1bis

### 6.6.2.3EB.1 Test purpose

Same test purpose as in clause 6.6.2.3.1.

### 6.6.2.3EB.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

### 6.6.2.3EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.2.3.3.

## 6.6.2.3EB.4 Test description

### 6.6.2.3EB.4.1 Initial conditions

Same initial conditions as in clause 6.6.2.3.4.1 with following exceptions:

- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

### 6.6.2.3EB.4.2 Test procedure

Same test procedure as in clause 6.6.2.3.4.2

### 6.6.2.3EB.4.3 Message contents

Message contents same as clause 6.6.2.3.4.3.

## 6.6.2.3EB.5 Test requirement

### 6.6.2.3EB.5.1 Test requirements E-UTRA

- The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3EB.5-1 as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured E-UTRA$_{ACLR}$, derived in step 7, shall be higher than the limits in table 6.6.2.3EB.5.1-1.

**Table 6.6.2.3EB.5.1-1: E-UTRA UE ACLR**

| | **Channel bandwidth / E-UTRA$_{ACLR1}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **E-UTRA$_{ACLR1}$** | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UE channel** | +1.4 MHz or -1.4 MHz | +3 MHz or -3 MHz | +5MHz or -5MHz | +10MHz or -10MHz | +15MHz or -15MHz | +20MHz or -20MHz |

Test requirements UTRA

If the measured UTRA channel power is greater than –50dBm then the measured UTRA$_{ACLR1}$, UTRA$_{ACLR2}$, derived in step 8, shall be higher than the limits in table 6.6.2.3EB.5.2-1.

**Table 6.6.2.3EB.5.2-1: UTRA UE ACLR**

| | **Channel bandwidth / UTRA$_{ACLR1/2}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **$UTRA_{ACLR1}$** | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB | 32.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | 0.7+$BW_{UTRA}$/2 / -0.7-$BW_{UTRA}$/2 | 1.5+$BW_{UTRA}$/2 / -1.5-$BW_{UTRA}$/2 | 2.5+$BW_{UTRA}$/2 / -2.5-$BW_{UTRA}$/2 | 5+$BW_{UTRA}$/2 / -5-$BW_{UTRA}$/2 | 7.5+$BW_{UTRA}$/2 / -7.5-$BW_{UTRA}$/2 | 10+$BW_{UTRA}$/2 / -10-$BW_{UTRA}$/2 |
| **$UTRA_{ACLR2}$** | - | - | 35.2 dB | 35.2 dB | 35.2 dB | 35.2 dB |
| **Adjacent channel centre frequency offset (in MHz)** | - | - | 2.5+3*$BW_{UTRA}$/2 / -2.5-3*$BW_{UTRA}$/2 | 5+3*$BW_{UTRA}$/2 / -5-3*$BW_{UTRA}$/2 | 7.5+3*$BW_{UTRA}$/2 / -7.5-3*$BW_{UTRA}$/2 | 10+3*$BW_{UTRA}$/2 / -10-3*$BW_{UTRA}$/2 |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UTRA 5MHz channel Measurement bandwidth[1]** | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz | 3.84 MHz |
| **UTRA 1.6MHz channel measurement bandwidth[2]** | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz | 1.28 MHz |
| Note 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.<br>Note 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.<br>Note 3: $BW_{UTRA}$ for UTRA FDD is 5MHz and for UTRA TDD is 1.6MHz. | | | | | | |

## 6.6.2.3F Adjacent Channel Leakage power Ratio for category NB1 and NB2

### 6.6.2.3F.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

### 6.6.2.3F.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

### 6.6.2.3F.3 Minimum conformance requirements

Adjacent Channel Leakage power Ratio is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency. The assigned category NB1 or NB2 channel power and adjacent channel power are measured with filters and measurement bandwidths specified in Table 6.6.2.3F-1. If the measured adjacent channel power is greater than –50dBm then the category NB1 or NB2 UE ACLR shall be higher than the value specified in Table 6.6.2.3F-1. $GSM_{ACLR}$ requirement is intended for protection of GSM system. $UTRA_{ACLR}$ requirement is intended for protection of UTRA and E-UTRA systems.

**Table 6.6.2.3F-1: category NB1 and NB2 UE ACLR requirements**

| | $GSM_{ACLR}$ | $UTRA_{ACLR}$ |
|---|---|---|
| **ACLR** | 20 dB | 37 dB |
| **Adjacent channel centre frequency offset from category NB1 or NB2 Channel edge** | ±200 kHz | ±2.5 MHz |
| **Adjacent channel measurement bandwidth** | 180 kHz | 3.84 MHz |
| **Measurement filter** | Rectangular | RRC-filter α=0.22 |
| **Category NB1 and NB2 channel measurement bandwidth** | 180 kHz | 180 kHz |
| **Category NB1 and NB2 channel Measurement filter** | Rectangular | Rectangular |

The normative reference for this requirement is TS 36.101 subclause 6.6.2F.3.

## 6.6.2.3F.4 Test description

### 6.6.2.3F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters shown in table 6.6.2.3F.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2.4. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 6.6.2.3F.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 8.1.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.2 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A | Modulation | $N_{tones}$ | Sub-carrier spacing (kHz) |
| 1 | | QPSK | 1@0 | 3.75kHz |
| 2 | | QPSK | 1@47 | 3.75kHz |
| 3 | | QPSK | 1@0 | 15kHz |
| 4 | | QPSK | 1@11 | 15kHz |
| 5 (Note 1) | | QPSK | 3@0 | 15kHz |
| 6 (Note 1) | | QPSK | 3@3 | 15kHz |
| 7 (Note 1) | | QPSK | 3@9 | 15kHz |
| 8 (Note 1) | | QPSK | 6@0 | 15kHz |
| 9 (Note 1) | | QPSK | 6@6 | 15kHz |
| 10 (Note 1) | | QPSK | 12@0 | 15kHz |
| Note 1: Applicable to UE supporting UL multi-tone transmissions | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3 using only main Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1.1 and H.4.0.
4. The UL Reference Measurement channels are set according to Table 6.6.2.3F.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.6.2.3F.4.3.

### 6.6.2.3F.4.2 Test procedure

1. SS sends uplink scheduling information for the UL HARQ process via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.6.2.3F.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. (UE should be already transmitting $P_{UMAX}$ after Initial Conditions setting).
2. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3F.5-1. The measurement period is at least one sub-frame **(**1ms) for 15 KHz channel spacing, and at least a 2ms slot (excluding the 2304Ts gap when UE is not transmitting) respectively for the 3.75 KHz channel spacing.
3. Measure the rectangular filtered mean power for category NB1 or NB2 UE channel.
4. Measure the rectangular filtered mean power of the GSM adjacent channel on both lower and upper side of the category NB1 or NB2 UE channel, respectively.
5. Measure the RRC filtered mean power of UTRA adjacent channel on both lower and upper side of the category NB1 or NB2 UE channel, respectively.
6. Calculate the ratios of the power between the value measured in step 3 over step 4 for lower and upper $GSM_{ACLR}$.
7. Calculated the ratio of the power between the value measured in step 3 over step 5 for lower and upper $UTRA_{ACLR}$.

NOTE 1: For configuration IDs applicable to UE depending on UE capability in Test Configuration Table with different UL sub-carrier spacing, the SS shall release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the appropriate UL subcarrier spacing in Random Access Response message.

### 6.6.2.3F.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6.

## 6.6.2.3F.5 Test requirement

- The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3F.5-1 as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured $GSM_{ACLR}$ derived in step 7 and $UTRA_{ACLR}$ derived in step 8 shall be higher than the limits in table 6.6.2.3F.5-1.

**Table 6.6.2.3F.5-1: Category NB1 and UE ACLR Test requirements**

| | $GSM_{ACLR}$ | $UTRA_{ACLR}$ |
|---|---|---|
| **ACLR** | 19.2 dB | 36.2 dB |
| **Adjacent channel centre frequency offset from category NB1 or NB2 Channel edge** | ±200 kHz | ±2.5 MHz |
| **Adjacent channel measurement bandwidth** | 180 kHz | 3.84 MHz |
| **Measurement filter** | Rectangular | RRC-filter α=0.22 |
| **Category NB1 and NB2 channel measurement bandwidth** | 180 kHz | 180 kHz |
| **Category NB1 and NB2 channel Measurement filter** | Rectangular | Rectangular |

## 6.6.2.3G Adjacent Channel Leakage power Ratio for V2X Communication

### 6.6.2.3G.1 Adjacent Channel Leakage power Ratio for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

#### 6.6.2.3G.1.1 Test purpose

To verify that V2X UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR) when UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions.

#### 6.6.2.3G.1.2 Test applicability

This test case applies to E-UTRA UE release 14 and forward which support V2X communication.

#### 6.6.2.3G.1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.2G-1, the requirements in subclause 6.6.2.3 apply except for the ACLR requirements for power class 2 V2X UE.

For power class 2 V2X UE, the assigned channel power and adjacent channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.6.2.3G.1.3-1. If the measured adjacent channel power is greater than –50dBm then ACLR shall be higher than the value specified in Table 6.6.2.3G.1.3-1.

**Table 6.6.2.3G.1.3-1: ACLR requirements for power class 2 V2X Communication**

| | **Channel bandwidth / ACLR / Measurement bandwidth** | |
|---|---|---|
| | **10 MHz** | **20 MHz** |
| ACLR | 31 dB | 31 dB |
| E-UTRA channel Measurement bandwidth | 9.0 MHz | 18 MHz |
| Adjacent channel centre frequency offset [MHz] | +10<br>/<br>-10 | +20<br>/<br>-20 |

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2G, and clause 6.6.2.3.

### 6.6.2.3G.1.4 Test description

#### 6.6.2.3G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2G. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3G.1.4.1-1 the details of the V2X reference measurement channels (RMCs) are specified in sub-clause A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.6.2.3G.1.4.1-1: Test Configuration for V2X sidelink transmission**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | Low range, Mid range, High range |
| Test Channel Bandwidths (as specified in subclause 5.4.2G) | | Lowest, Mid, Highest |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X sidelink transmission** | |
| Ch BW | Mod'n | RB Allocation |
| 10MHz | QPSK | 12 |
| 10MHz | QPSK | 48 |
| 10MHz | 16QAM | 12 |
| 10MHz | 16QAM | 48 |
| 20MHz | QPSK | 18 |
| 20MHz | QPSK | 96 |
| 20MHz | 16QAM | 18 |
| 20MHz | 16QAM | 96 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in specified in subclause 5.4.2G. | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max+1 - RB allocation) of the channel bandwidth. | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508[7] Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 for both SS and UE are pre-configured according to TS 36.508 [7] subclause 4.10.1 with the exception specified in clause 6.6.2.3G.1.4.3.
3. The V2X reference measurement channel is set according to Table 6.6.2.3G.1.4.1-1
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0;
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 6.6.2.3G.1.4.2 Test procedure

1. The V2X UE schedules the V2X RMC with transmission power at $P_{UMAX}$ level according to *SL-V2X-Preconfiguration* which is in line with the test configuration in Table 6.6.2.3G.1.4.1-1;
2. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in subclass 6.2.3G.1 for power class 3 UE, and shall meet the requirements described in subclass 6.2.3G.2 for power class 2 UE. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

3. Measure the rectangular filtered mean power for E-UTRA sidelink.

4. Measure the rectangular filtered mean power of the first E-UTRA adjacent channel on both lower and upper side of the E-UTRA sidelink channel, respectively.

6. Calculate the ratios of the power between the values measured in step 3 over step 4 for lower and upper E-UTRA$_{ACLR}$, respectively.

#### 6.6.2.3G.1.4.3 Message contents

Refer to the subclause 6.6.3G.1.4.3.

### 6.6.2.3G.1.5 Test requirements

- The measured UE mean power in the channel bandwidth, derived in step 2, shall fulfil requirements in subclause 6.2.3G.1 for power class 3 UE, and shall meet the requirements described in subclass 6.2.3G.2 for power class 2 UE as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured E-UTRA$_{ACLR}$, derived in step 6, shall be higher than the limits in table 6.6.2.3.5.1-1.

**Table6.6.2.3G.1.5-1: E-UTRA UE ACLR for power class 3 UE**

| | **Channel bandwidth / E-UTRA$_{ACLR1}$ / measurement bandwidth** | |
|---|---|---|
| | **10MHz** | **20MHz** |
| **E-UTRA$_{ACLR1}$** | 29.2dB | 29.2dB |
| **E-UTRA channel Measurement bandwidth** | 9.0 MHz | 18 MHz |
| **UE channel** | +10MHz or -10MHz | +20MHz or -20MHz |

**Table6.6.2.3G.1.5-2: E-UTRA UE ACLR for power class 2 UE**

| | **Channel bandwidth / E-UTRA$_{ACLR1}$ / measurement bandwidth** | |
|---|---|---|
| | **10MHz** | **20MHz** |
| **E-UTRA$_{ACLR1}$** | 30.2dB | 30.2dB |
| **E-UTRA channel Measurement bandwidth** | 9.0 MHz | 18 MHz |
| **UE channel** | +10MHz or -10MHz | +20MHz or -20MHz |

## 6.6.2.3G.2 Adjacent Channel Leakage power Ratio for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

### 6.6.2.3G.2.1 Test purpose

To verify that V2X UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR) when UE is configured for E-UTRA V2X sidelink and E-UTRA uplink transmissions.

### 6.6.2.3G.2.2 Test applicability

This test case applies to E-UTRA UE release 14 and forward which support V2X communication.

### 6.6.2.3G.2.3 Minimum conformance requirements

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.5G-2, the requirements in subclause 6.6.2 apply per V2X sidelink transmission and E-UTRA uplink transmission as specified for the corresponding inter-band con-current operation with uplink assigned to two bands.

The assigned channel power and adjacent channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.6.2.3G.2.3-1 and 6.6.2.3G.2.3-2. If the measured adjacent channel power is greater than –50dBm then ACLR shall be higher than the value specified in Table 6.6.2.3G.2.3-1 and 6.6.2.3G.2.3-2.

**Table 6.6.2.3G.2.3-1: E-UTRA UE ACLR for power class 3 UE**

| | **Channel bandwidth / E-UTRA$_{ACLR1}$ / Measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| E-UTRA$_{ACLR1}$ | 30 dB | 30 dB | 30 dB | 30 dB | 30 dB | 30 dB |
| E-UTRA channel Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Adjacent channel centre frequency offset [MHz] | +1.4 / -1.4 | +3.0 / -3.0 | +5 / -5 | +10 / -10 | +15 / -15 | +20 / -20 |

**Table 6.6.2.3G.2.3-2: E-UTRA UE ACLR for power class 2 UE**

| | **Channel bandwidth / E-UTRA$_{ACLR1}$ / Measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| E-UTRA$_{ACLR1}$ | 31 dB | 31 dB | 31 dB | 31 dB | 31 dB | 31 dB |
| E-UTRA channel Measurement bandwidth | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| Adjacent channel centre frequency offset [MHz] | +1.4 / -1.4 | +3.0 / -3.0 | +5 / -5 | +10 / -10 | +15 / -15 | +20 / -20 |

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2G, and clause 6.6.2.3.

### 6.6.2.3G.2.4 Test description

#### 6.6.2.3G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 6.6.2.3G.2.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in sub-clause A.8.3.

**Table 6.6.2.3G.2.4.1-1: Test Configuration**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | Normal | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range for uplink and Low range for V2X, High range for uplink and High range for V2X | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink** | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4MHz | | QPSK | 5 | 10 MHz | QPSK | 48@2 |
| 1.4MHz | | QPSK | 6 | 10 MHz | 16QAM | 48@2 |
| 1.4MHz | | 16QAM | 5 | 20 MHz | QPSK | 96@2 |
| 1.4MHz | | 16QAM | 6 | 20 MHz | 16QAM | 96@2 |
| 3MHz | | QPSK | 4 | | | |
| 3MHz | | QPSK | 15 | | | |
| 3MHz | | 16QAM | 4 | | | |
| 3MHz | | 16QAM | 15 | | | |
| 5MHz | | QPSK | 8 | | | |
| 5MHz | | QPSK | 25 | | | |
| 5MHz | | 16QAM | 8 | | | |
| 5MHz | | 16QAM | 25 | | | |
| 10MHz | | QPSK | 12 | | | |
| 10MHz | | QPSK | 50 | | | |
| 10MHz | | 16QAM | 12 | | | |
| 10MHz | | 16QAM | 50 (Note 3) | | | |
| 15MHz | | QPSK | 16 | | | |
| 15MHz | | QPSK | 75 | | | |
| 15MHz | | 16QAM | 16 | | | |
| 15MHz | | 16QAM | 75 (Note 3) | | | |
| 20MHz | | QPSK | 18 | | | |
| 20MHz | | QPSK | 100 | | | |
| 20MHz | | 16QAM | 18 | | | |
| 20MHz | | 16QAM | 100 (Note 3) | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | |
| Note 2: For Low range the E-UTRA carrier uses only test points with RBstart=0. For High range the E-UTRA carrier uses only test points with RBstart=RBmax-LCRB+1. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.6.2.3G.2.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to table 6.6.2.3G.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in the state 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C.

### 6.6.2.3G.2.4.2 Test procedure

1. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.6.2.3G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends MAC padding bits on the UL and V2X RMCs.

2. SS sends the appropriate TPC commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in subclass 6.2.3G.1 for power class 3 UE, and shall meet the requirements described in subclass 6.2.3G.2 for power class 2 UE. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

4. Measure the rectangular filtered mean power for E-UTRA V2X sidelink and E-UTRA uplink, respectively.

5. Measure the rectangular filtered mean power of the first E-UTRA adjacent channel on both lower and upper side of the E-UTRA V2X sidelink and E-UTRA uplink channel, respectively.

6. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper E-$UTRA_{ACLR}$, respectively.

#### 6.6.2.3G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exception:

**Table 6.6.2.3G.2.4.3-1: SL-CommResourcePoolV2X-r14-DEFAULT**

| Derivation Path: 36.508 Table 4.6.3-20C | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResourcePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| sizeSubchannel-r14 | n50 | | BW10 |
| | n100 | | BW20 |
| numSubchannel-r14 | n1 | | |
| } | | | |

#### 6.6.2.3G.2.5 Test requirements

- The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in subclause 6.2.3G.1 for power class 3 UE, and shall meet the requirements described in subclass 6.2.3G.2 for power class 2 UE as appropriate,

and

- if the measured adjacent channel power is greater than –50 dBm then the measured E-$UTRA_{ACLR}$, derived in step 6, shall be higher than the limits in table 6.6.2.3G.2.5-1 and 6.6.2.3G.2.5-2.

**Table 6.6.2.3G.2.5-1: E-UTRA UE ACLR for power class 3 UE**

| | **Channel bandwidth / E-$UTRA_{ACLR1}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| **E-$UTRA_{ACLR1}$** | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB | 29.2 dB |
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UE channel** | +1.4 MHz or -1.4 MHz | +3 MHz or -3 MHz | +5MHz or -5MHz | +10MHz or -10MHz | +15MHz or -15MHz | +20MHz or -20MHz |

**Table 6.6.2.3G.2.5-2: E-UTRA UE ACLR for power class 2 UE**

| | **Channel bandwidth / E-$UTRA_{ACLR1}$ / measurement bandwidth** | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| **E-UTRA$_{ACLR1}$** | 30.2 dB | 30.2 dB | 30.2 dB | 30.2 dB | 30.2 dB | 30.2 dB |
|---|---|---|---|---|---|---|
| **E-UTRA channel Measurement bandwidth** | 1.08 MHz | 2.7 MHz | 4.5 MHz | 9.0 MHz | 13.5 MHz | 18 MHz |
| **UE channel** | +1.4 MHz or -1.4 MHz | +3 MHz or -3 MHz | +5MHz or -5MHz | +10MHz or -10MHz | +15MHz or -15MHz | +20MHz or -20MHz |

### 6.6.2.4 Void

## 6.6.3 Spurious emissions

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products, but exclude out of band emissions. The spurious emission limits are specified in terms of general requirements inline with SM.329 [3] and E-UTRA operating band requirement to address UE co-existence.

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than $\Delta f_{OOB}$ (MHz) in Table6.6.3.1.3-1 from the edge of the channel bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

### 6.6.3.1 Transmitter Spurious emissions

#### 6.6.3.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

#### 6.6.3.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 8 and forward.

#### 6.6.3.1.3 Minimum conformance requirements

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.6.3.1.3-2.

The spurious emission limits apply for the frequency ranges that are more than $\Delta f_{OOB}$ (MHz) from the edge of the channel bandwidth.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3.1.3-1: $\Delta f_{OOB}$ boundary between E-UTRA channel and spurious emission domain**

| **Channel bandwidth** | **1.4 MHz** | **3.0 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
|---|---|---|---|---|---|---|
| **$\Delta f_{OOB}$ (MHz)** | 2.8 | 6 | 10 | 15 | 20 | 25 |

The spurious emission limits in Table 6.6.3.1.3-2 apply for all transmitter band configurations (RB) and channel bandwidths.

**Table 6.6.3.1.3-2: Spurious emissions limits**

| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26GHz | -30dBm | 1MHz | 2 |
| NOTE 1: Applies for Band 22, Band 42, Band 43 and Band 48.<br>NOTE 2: Applies for Band 46 and Band 47. | | | |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.3.1.

### 6.6.3.1.4 Test description

#### 6.6.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in Table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | N/A for Spurious Emissions testing | | | QPSK | 6 | 6 |
| 1.4MHz | | | | QPSK | 1 | 1 |
| 3MHz | | | | QPSK | 15 | 15 |
| 3MHz | | | | QPSK | 1 | 1 |
| 5MHz | | | | QPSK | 25 | 25 |
| 5MHz | | | | QPSK | 1 | 1 |
| 10MHz | | | | QPSK | 50 | 50 |
| 10MHz | | | | QPSK | 1 | 1 |
| 15MHz | | | | QPSK | 75 | 75 |
| 15MHz | | | | QPSK | 1 | 1 |
| 20MHz | | | | QPSK | 100 | 100 |
| 20MHz | | | | QPSK | 1 | 1 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The 1 RB allocation shall be tested at both RB #0 and RB #max. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.7.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Table 6.6.3.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.1.4.3.

#### 6.6.3.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.3.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.3.1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

#### 6.6.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.3.1.5 Test requirement

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in Table 6.6.3.1.5-1.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in Table 6.6.3.1.5-1.

The spurious emission limits apply for the frequency ranges that are more than $\Delta f_{OOB}$ (MHz) from the edge of the channel bandwidth shown in Table 6.6.3.1.3-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3.1.5-1: General spurious emissions test requirements**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | Note 1 |
| Note 1: Applies for Band 22, Band 42 and Band 43 | | | |

## 6.6.3.1_1 Transmitter Spurious emissions for Multi-Cluster PUSCH

### 6.6.3.1_1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions for Multi-Cluster PUSCH transmission.

### 6.6.3.1_1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support multi cluster PUSCH within a component carrier for the tested band.

### 6.6.3.1_1.3 Minimum conformance requirements

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.6.3.1_1.3-2.

The spurious emission limits apply for the frequency ranges that are more than $\Delta f_{OOB}$ (MHz) from the edge of the channel bandwidth.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3.1_1.3-1: $\Delta f_{OOB}$ boundary between E-UTRA channel and spurious emission domain**

| Channel bandwidth | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
|---|---|---|---|---|---|---|
| $\Delta f_{OOB}$ (MHz) | 2.8 | 6 | 10 | 15 | 20 | 25 |

The spurious emission limits in Table 6.6.3.1_1.3-2 apply for all transmitter band configurations (RB) and channel bandwidths.

**Table 6.6.3.1_1.3-2: Spurious emissions limits**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | Note 1 |
| Note 1: Applies for Band 22, Band 42 and Band 43 | | | |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.3.1.

### 6.6.3.1_1.4 Test description

#### 6.6.3.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in Table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3.1_1.4.1-1. The details of the uplink reference measurement

channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.1_1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| **Configuration ID** | **Downlink Configuration** | | **Uplink Configuration** | | |
| | Ch BW | N/A for SEM testing | Mod'n | Cluster1 RB allocations ($L_{CRB}$ @ $RB_{start}$) | Cluster2 RB allocations ($L_{CRB}$ @ $RB_{start}$) |
| 1 | 5MHz | | 16QAM | 2@0 | 1@24 |
| 2 | 5MHz | | 16QAM | 18@0 | 2@22 |
| 3 | 5MHz | | 16QAM | 2@0 | 18@6 |
| 4 | 10MHz | | 16QAM | 3@0 | 2@48 |
| 5 | 10MHz | | 16QAM | 42@0 | 3@45 |
| 6 | 10MHz | | 16QAM | 3@0 | 42@6 |
| 7 | 15MHz | | 16QAM | 8@0 | 7@68 |
| 8 | 15MHz | | 16QAM | 60@0 | 4@68 |
| 9 | 15MHz | | 16QAM | 4@0 | 60@12 |
| 10 | 20MHz | | 16QAM | 4@0 | 4@96 |
| 11 | 20MHz | | 16QAM | 92@0 | 4@96 |
| 12 | 20MHz | | 16QAM | 4@0 | 92@8 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.7.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.3.1_1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.1_1.4.3.

### 6.6.3.1_1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.3.1_1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.3.1_1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3.1_1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

### 6.6.3.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

#### 6.6.3.1_1.5 Test requirement

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.6.3.1_1.5-1.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in Table 6.6.3.1_1.5-1.

The spurious emission limits apply for the frequency ranges that are more than $\Delta f_{OOB}$ (MHz) from the edge of the channel bandwidth shown in Table 6.6.3.1_1.5-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3.1_1.5-1: General spurious emissions test requirements**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | Note 1 |
| Note 1: Applies for Band 22, Band 42 and Band 43 | | | |

### 6.6.3.1A Transmitter Spurious emissions for CA

#### 6.6.3.1A.0 Minimum conformance requirements

This clause specifies the spurious emission requirements for carrier aggregation.

NOTE 1: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the spurious emission requirement Table 6.6.3.1.3-2 apply for the frequency ranges that are more than $F_{OOB}$ as defined in Table 6.6.3.1.3-1 away from edges of the assigned channel bandwidth on a component carrier. If for some frequency a spurious emission requirement of individual component carrier overlaps with the spectrum emission mask or channel bandwidth of another component carrier then it does not apply.

NOTE 2: For inter-band carrier aggregation with uplink assigned to two E-UTRA bands the requirements in Table 6.6.3.1.3-2 could be verified by measuring spurious emissions at the specific frequencies where second and third order intermodulation products generated by the two transmitted carriers can occur; in that case, the requirements for remaining applicable frequencies in Table 6.6.3.1.3-2 would be considered to be verified by the measurements verifying the one uplink inter-band CA spurious emission requirement.

For intra-band contiguous carrier aggregation the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Table 6.6.3.1A.0-1 from the edge of the aggregated channel bandwidth (Table 5.4.2A-1). For frequencies ΔfOOB greater than FOOB as specified in Table 6.6.3.1A.0-1the spurious emission requirements in Table 6.6.3.1.3-2 are applicable.

**Table 6.6.3.1A.0-1: Boundary between E-UTRA out of band and spurious emission domain for intra-band contiguous carrier aggregation**

| CA Bandwidth Class | OOB boundary $F_{OOB}$ (MHz) |
|---|---|
| A | Table 6.6.3.1.3-1 |
| B | $BW_{Channel_CA}$ + 5 |
| C | $BW_{Channel_CA}$ + 5 |

For intra-band non-contiguous carrier aggregation transmission the spurious emission requirement is defined as a composite spurious emission requirement. Composite spurious emission requirement applies to frequency ranges that are more than $F_{OOB}$ away from the edges of the sub-blocks. Composite spurious emission requirement is defined as follows

a) Composite spurious emission requirement is a combination of individual sub-block spurious emission requirements

b) In case the sub-block consist of one component carrier the sub-lock spurious emission requirement and $F_{OOB}$ are defined in subclause 6.6.3.1.3

c) If for some frequency an individual sub-block spurious emission requirement overlaps with the general spectrum emission mask or the sub-block bandwidth of another sub-block then it does not apply

The normative reference for this requirement is TS 36.101[2] clause 6.6.3.1A

## 6.6.3.1A.1 Transmitter Spurious emissions for CA (intra-band contiguous DL CA and UL CA)

### 6.6.3.1A.1.1 Test purpose

To verify that transmitter of UE that support CA does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

### 6.6.3.1A.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 6.6.3.1A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.3.1A.0.

### 6.6.3.1A.1.4 Test description

#### 6.6.3.1A.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA bands specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA configuration, and are shown in table 6.6.3.1A.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.1A.1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low range, High range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ (Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 50 | N/A for Spurious Emissions testing | QPSK | 25 | P_25@0 | S_0@0 | - | - |
| 25 | 50 | | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 25 | 50 | | QPSK | 1 | P_1@24 | S_0@0 | - | - |
| 25 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | - | - |
| 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | - | - |
| 50 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 50 | 50 | | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 50 | 50 | | QPSK | 1 | P_1@49 | S_0@0 | - | - |
| 50 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | - | - |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | - | - |
| 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 75 | 75 | | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 75 | 75 | | QPSK | 1 | P_1@74 | S_0@0 | - | - |
| 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | - | - |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 100 | 25 | | QPSK | 25 | P_25@0 | S_0@0 | | |
| 100 | 25 | | QPSK | 1 | P_1@0 | S_0@0 | | |
| 100 | 25 | | QPSK | 1 | P_1@99 | S_0@0 | | |
| 100 | 25 | | QPSK | 2 | P_1@0 | S_1@24 | | |
| 100 | 25 | | QPSK | 125 | P_100@0 | S_25@0 | | |
| 100 | 50 | | QPSK | 50 | P_50@0 | S_0@0 | - | - |
| 100 | 50 | | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 100 | 50 | | QPSK | 1 | P_1@99 | S_0@0 | - | - |
| 100 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | - | - |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | | |
| 100 | 75 | | QPSK | 1 | P_1@0 | S_0@0 | | |
| 100 | 75 | | QPSK | 1 | P_1@99 | S_0@0 | | |
| 100 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | | |
| 100 | 100 | | QPSK | 100 | P_100@0 | S_0@0 | - | - |
| 100 | 100 | | QPSK | 1 | P_1@0 | S_0@0 | - | - |
| 100 | 100 | | QPSK | 1 | P_1@99 | S_0@0 | - | - |
| 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |

| |
|---|
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.33 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.6.3.1A.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.1A.1.4.3.

#### 6.6.3.1A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.3.1A.1.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.3.1A.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control “up” commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.6.3.1A.1.5-1 for each component carrier. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.6.3.1A.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

#### 6.6.3.1A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.3.1A.1.5 Test Requirements

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.6.3.1A.1.5-1.

For frequencies $\Delta f_{OOB}$ greater than $F_{OOB}$ as specified in Table 6.6.3.1A.0-1the measured average power of spurious emission, derived in step 6, shall not exceed the described value in Table 6.6.3.1A.1.5-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3.1A.1.5-1: Spurious emissions limits**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | Note 1 |
| 12.75 GHz < f < 26GHz | -30dBm | 1MHz | Note 2 |
| Note1: Applies for Band 22, Band 42, Band 43 and Band 48.<br>Note 2: Applies for Band 46 and Band 47. | | | |

## 6.6.3.1A.2 Transmitter Spurious emissions for CA (inter-band DL CA and UL CA)

### 6.6.3.1A.2.1 Test purpose

To verify that transmitter of UE that support CA does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

### 6.6.3.1A.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA. The requirements also apply to all types of E-UTRA UE release 14 and forward that support uplink LAA.

### 6.6.3.1A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.3.1A.0.

### 6.6.3.1A.2.4 Test description

#### 6.6.3.1A.2.4.1 Initial condition

Same as in clause 6.6.3.1A.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands.
- Instead of Table 6.6.3.1A.1.4.1-1 → use Table 6.6.3.1A.2.4.1-1 or Table 6.6.3.1A.2.4.1-2.
- Instead of clause 6.6.3.1A.1.4.3 use clause 6.6.3.1A.2.4.3.

**Table 6.6.3.1A.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | Low range for PCC and SCC<br>High range for PCC and SCC | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | N/A for this test | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 6 | 25 | | QPSK | 2 | P_1@5 | S_1@24 | - | - |
| 6 | 25 | | QPSK | 31 | P_6@0 | S_25@0 | - | - |
| 6 | 50 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 6 | 50 | | QPSK | 2 | P_1@5 | S_1@49 | - | - |
| 6 | 50 | | QPSK | 56 | P_6@0 | S_50@0 | - | - |
| 25 | 15 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 25 | 15 | | QPSK | 2 | P_1@24 | S_1@14 | - | - |
| 25 | 15 | | QPSK | 40 | P_25@0 | S_15@0 | - | - |
| 25 | 25 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 25 | 25 | | QPSK | 2 | P_1@24 | S_1@24 | - | - |
| 25 | 25 | | QPSK | 50 | P_25@0 | S_25@0 | - | - |
| 25 | 50 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 25 | 50 | | QPSK | 2 | P_1@24 | S_1@49 | - | - |
| 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | - | - |
| 50 | 50 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 50 | 50 | | QPSK | 2 | P_1@49 | S_1@49 | - | - |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | - | - |
| 50 | 100 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 50 | 100 | | QPSK | 2 | P_1@49 | S_1@99 | - | - |
| 50 | 100 | | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 75 | 25 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 75 | 25 | | QPSK | 2 | P_1@74 | S_1@24 | - | - |
| 75 | 25 | | QPSK | 100 | P_75@0 | S_25@0 | - | - |
| 75 | 75 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 75 | 75 | | QPSK | 2 | P_1@74 | S_1@74 | - | - |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 100 | 75 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 100 | 75 | | QPSK | 2 | P_1@99 | S_1@74 | - | - |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | - | - |
| 100 | 50 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 100 | 50 | | QPSK | 2 | P_1@99 | S_1@49 | - | - |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 100 | | QPSK | 2 | P_1@0 | S_1@0 | - | - |
| 100 | 100 | | QPSK | 2 | P_1@99 | S_1@99 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | - | - |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested.

**Table 6.6.3.1A.2.4.1-2: Test Configuration Table for UL LAA**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | Low range for PCC and SCC<br>High range for PCC and SCC | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC RB Allocation ($L_{CRB}$ @ RBstart) SCC RB Allocations(L@ RBstart) (Note 3)** | | | |
| 6 | 100 | N/Afor this test | QPSK | 11 | P_1@0 | S_1@0 | - | - |
| 6 | 100 | | QPSK | 11 | P_1@5 | S_1@9 | - | - |
| 6 | 100 | | QPSK | 106 | P_6@0 | S_10@0 | - | - |
| 15 | 100 | | QPSK | 11 | P_1@0 | S_1@0 | - | - |
| 15 | 100 | | QPSK | 11 | P_1@14 | S_1@9 | - | - |
| 15 | 100 | | QPSK | 115 | P_15@0 | S_10@0 | - | - |
| 25 | 100 | | QPSK | 11 | P_1@0 | S_1@0 | - | - |
| 25 | 100 | | QPSK | 11 | P_1@24 | S_1@9 | - | - |
| 25 | 100 | | QPSK | 125 | P_25@0 | S_10@0 | - | - |
| 50 | 100 | | QPSK | 11 | P_1@0 | S_1@0 | - | - |
| 50 | 100 | | QPSK | 11 | P_1@49 | S_1@9 | - | - |
| 50 | 100 | | QPSK | 150 | P_50@0 | S_10@0 | - | - |
| 75 | 100 | | QPSK | 11 | P_1@0 | S_1@0 | - | - |
| 75 | 100 | | QPSK | 11 | P_1@74 | S_1@9 | - | - |
| 75 | 100 | | QPSK | 175 | P_75@0 | S_10@0 | - | - |
| 100 | 100 | | QPSK | 11 | P_1@0 | S_1@0 | - | - |
| 100 | 100 | | QPSK | 11 | P_1@99 | S_1@9 | - | - |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_10@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.<br>Note 3: For eLAA SCC, the RBstart and L are defined in TS 36.213[10] clause 8.1.4. | | | | | | | | |

6.6.3.1A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.3.1A.2.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 (or DCI format 0A for SCC in the case of uplink LAA) for C_RNTI to schedule the UL RMC according to Table 6.6.3.1A.2.4.1-1 (or Table 6.6.3.1A.2.4.1-2 for SCC in the case of uplink LAA) on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.6.3.1A.2.5-1 for each component carrier. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.6.3.1A.2.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

### 6.6.3.1A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with exceptions as in clause 6.6.3.1A.1.4.3.

For SCC in the case of uplink LAA, message contents are according to TS 36.508[7] subclause4.6 with the following exceptions specified in Tables 6.6.3.1A.1.2.4.3-1 and 6.6.3.1A.1.2.4.3-2.

**Table 6.6.3.1A.1.2.4.3-1 LogicalChannelConfig-DRB (Initial Condition, step 14, Table 4.5.2.3-1)**

| Derivation Path: 36.508 Table 4.8.2.1.4-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| LogicalChannelConfig-DRB ::= SEQUENCE { | | | |
| ul-SpecificParameters SEQUENCE { | | | |
| laa-UL-Allowed-r14 | true | | |
| } | | | |
| } | | | |

**Table 6.6.3.1A.1.2.4.3-2 PhysicalConfigDedicatedSCell (Step 2, test procedure)**

| Derivation Path: 36.508 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| laa-SCellConfiguration-v1430 ::= SEQUENCE { | | | |
| | NULL | | |
| } | | | |
| } | | | |

### 6.6.3.1A.2.5 Test requirement

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.6.3.1A.2.5-1.

For frequencies $\Delta f_{OOB}$ greater than $F_{OOB}$ as specified in Table 6.6.3.1A.0-1the measured average power of spurious emission, derived in step 6, shall not exceed the described value in Table 6.6.3.1A.2.5-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3.1A.2.5-1: Spurious emissions limits**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| **Test requirements for CA_1A-3A Configuration** | | | |
| 135 MHz ≤ f ≤ 270 MHz | -36 dBm | 100 kHz | |
| 1440 MHz ≤ f ≤ 1650 MHz<br>2055 MHz ≤ f ≤ 2250 MHz<br>3630 MHz ≤ f ≤ 3765 MHz<br>5340 MHz ≤ f ≤ 5745 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_1A-5A Configuration** | | | |
| 222 MHz ≤ f ≤ 332 MHz | -36 dBm | 100 kHz | |
| 1071 MHz ≤ f ≤ 1156 MHz<br>2744 MHz ≤ f ≤ 2829 MHz<br>2991 MHz ≤ f ≤ 3136 MHz<br>3568 MHz ≤ f ≤ 3678 MHz<br>4664 MHz ≤ f ≤ 4809 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_1A-7A Configuration** | | | |
| 520 MHz ≤ f ≤ 650 MHz | -36 dBm | 100 kHz | |
| 1270 MHz ≤ f ≤ 1460 MHz<br>3020 MHz ≤ f ≤ 3220 MHz<br>4420 MHz ≤ f ≤ 4550 MHz<br>6340 MHz ≤ f ≤ 6530 MHz<br>6920 MHz ≤ f ≤ 7120 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_1A-8A Configuration** | | | |
| 90 MHz ≤ f ≤ 220 MHz | -36 dBm | 100 kHz | |
| 1005 MHz ≤ f ≤ 1100 MHz<br>2800 MHz ≤ f ≤ 2895 MHz<br>2925 MHz ≤ f ≤ 3080 MHz<br>3680 MHz ≤ f ≤ 3810 MHz<br>4720 MHz ≤ f ≤ 4875 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_1A-18A Configuration** | | | |
| 260 MHz ≤ f ≤ 350 MHz | -36 dBm | 100 kHz | |
| 1090 MHz ≤ f ≤ 1165 MHz<br>2735 MHz ≤ f ≤ 2810 MHz<br>3010 MHz ≤ f ≤ 3145 MHz<br>3550 MHz ≤ f ≤ 3640 MHz<br>4655 MHz ≤ f ≤ 4790 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_1A-19A Configuration** | | | |
| 230 MHz ≤ f ≤ 320 MHz | -36 dBm | 100 kHz | |
| 1075 MHz ≤ f ≤ 1150 MHz<br>2750 MHz ≤ f ≤ 2825 MHz<br>2995 MHz ≤ f ≤ 3130 MHz<br>3580 MHz ≤ f ≤ 3670 MHz<br>4670 MHz ≤ f ≤ 4805 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_1A-21A Configuration** | | | |
| 457.1 MHz ≤ f ≤ 532.1 MHz<br>915.8 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1000 MHz ≤ f ≤ 1005.8 MHz<br>2377.1 MHz ≤ f ≤ 2512.1 MHz<br>3367.9 MHz ≤ f ≤ 3442.9 MHz<br>4515.8 MHz ≤ f ≤ 4905.8 MHz<br>5287.9 MHz ≤ f ≤ 5422.9 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_1A-26A Configuration** | | | |
| 222 MHz ≤ f ≤ 352 MHz | -36 dBm | 100 kHz | |
| 1071 MHz ≤ f ≤ 1166 MHz<br>2734 MHz ≤ f ≤ 2829 MHz<br>2991 MHz ≤ f ≤ 3146 MHz<br>3548 MHz ≤ f ≤ 3678 MHz<br>4654 MHz ≤ f ≤ 4809 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_1A-28A Configuration** | | | |
| 424 MHz ≤ f ≤ 574 MHz | -36 dBm | 100 kHz | |

| | | | |
|---|---|---|---|
| 1172 MHz ≤ f ≤ 1277 MHz<br>2623 MHz ≤ f ≤ 2728 MHz<br>3092 MHz ≤ f ≤ 3257 MHz<br>3326 MHz ≤ f ≤ 3476 MHz<br>4543 MHz ≤ f ≤ 4708 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_1A-42A Configuration** | | | |
| 240 MHz ≤ f ≤ 560 MHz | -36 dBm | 100 kHz | |
| 1420 MHz ≤ f ≤ 1680 MHz<br>4820 MHz ≤ f ≤ 5280 MHz<br>5320 MHz ≤ f ≤ 5580 MHz<br>7240 MHz ≤ f ≤ 7560 MHz<br>8720 MHz ≤ f ≤ 9180 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_2A-4A Configuration** | | | |
| 95 MHz ≤ f ≤ 200 MHz | -36 dBm | 100 kHz | |
| 1510 MHz ≤ f ≤ 1660 MHz<br>1945 MHz ≤ f ≤ 2110 MHz<br>3560 MHz ≤ f ≤ 3665 MHz<br>5270 MHz ≤ f ≤ 5575 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_2A-5A Configuration** | | | |
| 152 MHz ≤ f ≤ 262 MHz | -36 dBm | 100 kHz | |
| 1001 MHz ≤ f ≤ 1086 MHz<br>2674 MHz ≤ f ≤ 2759 MHz<br>2851 MHz ≤ f ≤ 2996 MHz<br>3498 MHz ≤ f ≤ 3608 MHz<br>4524 MHz ≤ f ≤ 4669 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_2A-7A Configuration** | | | |
| 590 MHz ≤ f ≤ 720 MHz | -36 dBm | 100 kHz | |
| 1130 MHz ≤ f ≤ 1320 MHz<br>3090 MHz ≤ f ≤ 3290 MHz<br>4350 MHz ≤ f ≤ 4480 MHz<br>6200 MHz ≤ f ≤ 6390 MHz<br>6850 MHz ≤ f ≤ 7050 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_2A-12A Configuration** | | | |
| 418 MHz ≤ f ≤ 512 MHz | -36 dBm | 100 kHz | |
| 1134 MHz ≤ f ≤ 1211 MHz<br>2549 MHz ≤ f ≤ 2626 MHz<br>2984 MHz ≤ f ≤ 3121 MHz<br>3248 MHz ≤ f ≤ 3342 MHz<br>4399 MHz ≤ f ≤ 4536 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_2A-13A Configuration** | | | |
| 276 MHz ≤ f ≤ 356 MHz | -36 dBm | 100 kHz | |
| 1063 MHz ≤ f ≤ 1133 MHz<br>2627 MHz ≤ f ≤ 2697 MHz<br>2913 MHz ≤ f ≤ 3043 MHz<br>3404 MHz ≤ f ≤ 3484 MHz<br>4477 MHz ≤ f ≤ 4607 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_2A-30A Configuration** | | | |
| 395 MHz ≤ f ≤ 465 MHz | -36 dBm | 100 kHz | |
| 1385 MHz ≤ f ≤ 1515 MHz<br>2700 MHz ≤ f ≤ 2780 MHz<br>4155 MHz ≤ f ≤ 4225 MHz<br>6005 MHz ≤ f ≤ 6135 MHz<br>6460 MHz ≤ f ≤ 6540 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_2A-46A Configuration** | | | |
| 1330 MHz ≤ f ≤ 2225 MHz<br>3240 MHz ≤ f ≤ 4075 MHz<br>7000 MHz ≤ f ≤ 7835 MHz<br>8390 MHz ≤ f ≤ 10000 MHz<br>12150 MHz ≤ f ≤ 13760 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_2A-66A Configuration** | | | |
| 70 MHz ≤ f ≤ 200 MHz | -36 dBm | 100 kHz | |
| 1510 MHz ≤ f ≤ 1710 MHz<br>1920 MHz ≤ f ≤ 2110 MHz | -30 dBm | 1 MHz | |

| | | | |
|---|---|---|---|
| 3560 MHz ≤ f ≤ 3690 MHz<br>5270 MHz ≤ f ≤ 5600 MHz | | | |
| **Test requirements for CA_3A-5A Configuration** | | | |
| 12 MHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f ≤ 137 MHz<br>861 MHz ≤ f ≤ 961 MHz | -36 dBm | 100 kHz | |
| 2534 MHz ≤ f ≤ 2746 MHz<br>3358 MHz ≤ f ≤ 3483 MHz<br>4244 MHz ≤ f ≤ 4419 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_3A-7A Configuration** | | | |
| 715 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1000 MHz ≤ f ≤ 1070 MHz<br>3215 MHz ≤ f ≤ 3430 MHz<br>4210 MHz ≤ f ≤ 4355 MHz<br>5920 MHz ≤ f ≤ 6140 MHz<br>6710 MHz ≤ f ≤ 6925 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_3A-8A Configuration** | | | |
| 25 MHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f ≤ 120 MHz<br>795 MHz ≤ f ≤ 905 MHz | -36 dBm | 100 kHz | |
| 2505 MHz ≤ f ≤ 2700 MHz<br>3470 MHz ≤ f ≤ 3615 MHz<br>4300 MHz ≤ f ≤ 4485 MHz | -30 dBm | 1 MHz | |
| Test requirements for CA_3A-18A Configuration | | | |
| 50 MHz ≤ f ≤ 155 MHz<br>880 MHz ≤ f ≤ 970 MHz | -36 dBm | 100 kHz | |
| 2525 MHz ≤ f ≤ 2755 MHz<br>3340 MHz ≤ f ≤ 3445 MHz<br>4235 MHz ≤ f ≤ 4400 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_3A-19A Configuration** | | | |
| 20 MHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f ≤ 125 MHz<br>865 MHz ≤ f ≤ 955 MHz | -36 dBm | 100 kHz | |
| 2540 MHz ≤ f ≤ 2740 MHz<br>3370 MHz ≤ f ≤ 3475 MHz<br>4250 MHz ≤ f ≤ 4415 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_3A-20A Configuration** | | | |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f ≤ 121 MHz<br>848 MHz ≤ f ≤ 953 MHz | -36 dBm | 100 kHz | |
| 2542 MHz ≤ f ≤ 2738 MHz<br>3374 MHz ≤ f ≤ 3509 MHz<br>4252 MHz ≤ f ≤ 4432 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_3A-26A Configuration** | | | |
| 12 MHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f ≤ 157 MHz | -36 dBm | 100 kHz | |
| 861 MHz ≤ f ≤ 971 MHz | -36 dBm | 100 kHz | |
| 2524 MHz ≤ f ≤ 2756 MHz<br>3338 MHz ≤ f ≤ 3483 MHz<br>4234 MHz ≤ f ≤ 4419 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_3A-18A Configuration** | | | |
| 214 MHz ≤ f ≤ 379 MHz<br>962 MHz ≤ f ≤ 1000 MHz | -36 dBm | 100 kHz | |
| 1000 MHz ≤ f ≤ 1082 MHz<br>2413 MHz ≤ f ≤ 2533 MHz<br>2672 MHz ≤ f ≤ 2867 MHz<br>3116 MHz ≤ f ≤ 3281 MHz<br>4123 MHz ≤ f ≤ 4318 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_3A-41A Configuration** | | | |
| 711 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |

| | | | |
|---|---|---|---|
| 1000 MHz ≤ f ≤ 1074 MHz<br>3207 MHz ≤ f ≤ 3670 MHz<br>4206 MHz ≤ f ≤ 4475 MHz<br>5916 MHz ≤ f ≤ 6260 MHz<br>6702 MHz ≤ f ≤ 7165 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_3A-42A Configuration** | | | |
| 170 MHz ≤ f ≤ 180 MHz | -36 dBm | 100 kHz | |
| 1615 MHz ≤ f ≤ 1890 MHz<br>5015 MHz ≤ f ≤ 5490 MHz<br>6820 MHz ≤ f ≤ 7170 MHz<br>8510 MHz ≤ f ≤ 8985 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_4A-5A Configuration** | | | |
| 12 MHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f ≤ 107 MHz<br>861 MHz ≤ f ≤ 931 MHz | -36 dBm | 100 kHz | |
| 2534 MHz ≤ f ≤ 2686 MHz<br>3358 MHz ≤ f ≤ 3453 MHz<br>4244 MHz ≤ f ≤ 4359 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_4A-7A Configuration** | | | |
| 745 MHz ≤ f ≤ 1000 MHz | -36 dBm | 100 kHz | |
| 1000 MHz ≤ f ≤ 1010 MHz<br>3245 MHz ≤ f ≤ 3430 MHz<br>4210 MHz ≤ f ≤ 4325 MHz<br>5920 MHz ≤ f ≤ 6080 MHz<br>6710 MHz ≤ f ≤ 6895 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_4A-12A Configuration** | | | |
| 278 MHz ≤ f ≤ 357 MHz<br>994 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1000 MHz ≤ f ≤ 1056 MHz<br>2409 MHz ≤ f ≤ 2471 MHz<br>2704 MHz ≤ f ≤ 2811 MHz<br>3108 MHz ≤ f ≤ 3187 MHz<br>4119 MHz ≤ f ≤ 4226 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_4A-13A Configuration** | | | |
| 136 MHz ≤ f ≤ 201 MHz<br>923 MHz ≤ f ≤ 978 MHz | -36 dBm | 100 kHz | |
| 2487 MHz ≤ f ≤ 2542 MHz<br>2633 MHz ≤ f ≤ 2733 MHz<br>3264 MHz ≤ f ≤ 3329 MHz<br>4197 MHz ≤ f ≤ 4297 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_4A-17A Configuration** | | | |
| 278 MHz ≤ f ≤ 347 MHz<br>994 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1000 MHz ≤ f ≤ 1056 MHz<br>2414 MHz ≤ f ≤ 2471 MHz<br>2704 MHz ≤ f ≤ 2806 MHz<br>3118 MHz ≤ f ≤ 3187 MHz<br>4124 MHz ≤ f ≤ 4226 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_5A-7A Configuration** | | | |
| 802 MHz ≤ f ≤ 922 MHz | -36 dBm | 100 kHz | |
| 1651 MHz ≤ f ≤ 1746 MHz<br>3324 MHz ≤ f ≤ 3419 MHz<br>4148 MHz ≤ f ≤ 4316 MHz<br>5824 MHz ≤ f ≤ 5989 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_5A-12A Configuration** | | | |
| 108 MHz ≤ f ≤ 150 MHz<br>549 MHz ≤ f ≤ 608 MHz<br>932 MHz ≤ f ≤ 999 MHz | -36 dBm | 100 kHz | |
| 1523 MHz ≤ f ≤ 1565 MHz<br>2222 MHz ≤ f ≤ 2281 MHz<br>2347 MHz ≤ f ≤ 2414 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_5A-17A Configuration** | | | |

| | | | |
|---|---|---|---|
| 108 MHz ≤ f ≤ 145 MHz<br>559 MHz ≤ f ≤ 608 MHz<br>932 MHz ≤ f ≤ 99e4 MHz | -36 dBm | 100 kHz | |
| 1528 MHz ≤ f ≤ 1565 MHz<br>2232 MHz ≤ f ≤ 2281 MHz<br>2352 MHz ≤ f ≤ 2414 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_5A-30A Configuration** | | | |
| 607 MHz ≤ f ≤ 667 MHz | -36 dBm | 100 kHz | |
| 1456 MHz ≤ f ≤ 1491 MHz<br>3129 MHz ≤ f ≤ 3164 MHz<br>3761 MHz ≤ f ≤ 3806 MHz<br>3953 MHz ≤ f ≤ 4013 MHz<br>5434 MHz ≤ f ≤ 5479 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_5A-66A Configuration** | | | |
| 12 MHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f ≤ 132 MHz<br>861 MHz ≤ f ≤ 956 MHz | -36 dBm | 100 kHz | |
| 2534 MHz ≤ f ≤ 2736 MHz<br>3358 MHz ≤ f ≤ 3478 MHz<br>4244 MHz ≤ f ≤ 4409 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_7A-20A Configuration** | | | |
| 776 MHz ≤ f ≤ 906 MHz | -36 dBm | 100 kHz | |
| 1638 MHz ≤ f ≤ 1738 MHz<br>3332 MHz ≤ f ≤ 3432 MHz<br>4138 MHz ≤ f ≤ 4308 MHz<br>5832 MHz ≤ f ≤ 6002 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_7A-28A Configuration** | | | |
| 1004 MHz ≤ f ≤ 1164 MHz<br>1752 MHz ≤ f ≤ 1867 MHz<br>3203 MHz ≤ f ≤ 3318 MHz<br>3906 MHz ≤ f ≤ 4066 MHz<br>4252 MHz ≤ f ≤ 4437 MHz<br>5703 MHz ≤ f ≤ 5888 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_11A-18A Configuration** | | | |
| 182.1 MHz ≤ f ≤ 232.1 MHz<br>597.9 MHz ≤ f ≤ 632.9 MHz | -36 dBm | 100 kHz | |
| 2025.8 MHz ≤ f ≤ 2080.8 MHz<br>2242.9 MHz ≤ f ≤ 2277.9 MHz<br>3057.9 MHz ≤ f ≤ 3107.9 MHz<br>3670.8 MHz ≤ f ≤ 3725.8 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_12A-30A Configuration** | | | |
| 873 MHz ≤ f ≤ 917 MHz | -36 dBm | 100 kHz | |
| 1589 MHz ≤ f ≤ 1616 MHz<br>3004 MHz ≤ f ≤ 3031 MHz<br>3703 MHz ≤ f ≤ 3747 MHz<br>3894 MHz ≤ f ≤ 3931 MHz<br>5009 MHz ≤ f ≤ 5046 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_18A-28A Configuration** | | | |
| 82 MHz ≤ f ≤ 127 MHz<br>576 MHz ≤ f ≤ 651 MHz<br>897 MHz ≤ f ≤ 957 MHz | -36 dBm | 100 kHz | |
| 1518 MHz ≤ f ≤ 1563 MHz<br>2221 MHz ≤ f ≤ 2296 MHz<br>2333 MHz ≤ f ≤ 2393 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_19A-21A Configuration** | | | |
| 197.1 MHz ≤ f ≤ 242.1 MHz<br>602.9 MHz ≤ f ≤ 632.9 MHz | -36 dBm | 100 kHz | |
| 2050.8 MHz ≤ f ≤ 2095.8 MHz<br>2277.9 MHz ≤ f ≤ 2307.9 MHz<br>3107.9 MHz ≤ f ≤ 3152.9 MHz<br>3725.8 MHz ≤ f ≤ 3770.8 MHz | -30 dBm | 1 MHz | |

| Test requirements for CA_26A-46A Configuration | | | |
|---|---|---|---|
| 3542 MHz ≤ f ≤ 4297 MHz<br>4301 MHz ≤ f ≤ 5111 MHz<br>5964 MHz ≤ f ≤ 6774 MHz<br>6778 MHz ≤ f ≤ 7623 MHz<br>9541 MHz ≤ f ≤ 11036 MHz<br>11114 MHz ≤ f ≤ 12699 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_39A-41A Configuration** | | | |
| 576 MHz ≤ f ≤ 810 MHz | -36 dBm | 100 kHz | |
| 1070 MHz ≤ f ≤ 1344 MHz<br>3072 MHz ≤ f ≤ 3500 MHz<br>4376 MHz ≤ f ≤ 4610 MHz<br>6256 MHz ≤ f ≤ 6530 MHz<br>6872 MHz ≤ f ≤ 7300 MHz | -30 dBm | 1 MHz | |
| **Test requirements for CA_41A-42A Configuration** | | | |
| 710 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1000 MHz ≤ f ≤ 1104 MHz<br>1392 MHz ≤ f ≤ 1980 MHz<br>4110 MHz ≤ f ≤ 4704 MHz<br>5896 MHz ≤ f ≤ 6290 MHz<br>8392 MHz ≤ f ≤ 8980 MHz<br>9296 MHz ≤ f ≤ 9890 MHz | -30 dBm | 1 MHz | |

## 6.6.3.1A.3 Transmitter Spurious emissions for CA (intra-band non-contiguous DL CA and UL CA)

### 6.6.3.1A.3.1 Test purpose

To verify that transmitter of UE that support CA does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

### 6.6.3.1A.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

### 6.6.3.1A.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.3.1A.0.

### 6.6.3.1A.3.4 Test description

#### 6.6.3.1A.3.4.1 Initial condition

Same as in clause 6.6.3.1A.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-3 for CA configurations.
- Instead of Table 6.6.3.1A.1.4.1-1 → use Table 6.6.3.1A.3.4.1-1.
- Instead of clause 6.6.3.1A.1.4.3 → use clause 6.6.3.1A.3.4.3.

**Table 6.6.3.1A.3.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: N/A (Range is not relevant),<br>Maximum Wgap | | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | | QPSK | P_1@0 | QPSK | S_1@0 |
| 2 | 25 | 25 | 35 | | | QPSK | P_1@24 | QPSK | S_1@24 |
| 3 | 25 | 25 | 35 | | | QPSK | P_25@0 | QPSK | S_25@0 |
| 4 | 50 | 50 | 25 | | | QPSK | P_1@0 | QPSK | S_1@0 |
| 5 | 50 | 50 | 25 | | | QPSK | P_1@49 | QPSK | S_1@49 |
| 6 | 50 | 50 | 25 | | | QPSK | P_50@0 | QPSK | S_50@0 |
| 7 | 100 | 100 | 5 | | | QPSK | P_1@0 | QPSK | S_1@0 |
| 8 | 100 | 100 | 5 | | | QPSK | P_1@99 | QPSK | S_1@99 |
| 9 | 100 | 100 | 5 | | | QPSK | P_100@0 | QPSK | S_100@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.<br>Note 2: The measurements need to be executed for in-gap interferer positions when the sub-block gap size $W_{gap}$ allows. | | | | | | | | | |

6.6.3.1A.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.3.1A.3.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.3.1A.3.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control “up” commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.6.3.1A.3.5-1 for each component carrier. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.6.3.1A.3.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

7. Repeat the measurement for in-gap interferer positions when the sub-block gap size $W_{gap}$ allows.

#### 6.6.3.1A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

#### 6.6.3.1A.3.5 Test Requirements

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.6.3.1A.3.5-1.

For frequencies $\Delta f_{OOB}$ greater than $F_{OOB}$ as specified in Table 6.6.3.1A.0-1the measured average power of spurious emission, derived in step 6, shall not exceed the described value in Table 6.6.3.1A.3.5-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3.1A.3.5-1: Spurious emissions limits**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |

### 6.6.3.1A.4 Transmitter Spurious emissions for CA (3UL CA)

#### 6.6.3.1A.4.1 Transmitter Spurious emissions for CA (intra-band contiguous 3DL CA and 3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

-The test applicability needs to be added to TS36.521-2

#### 6.6.3.1A.4.1.1 Test purpose

To verify that transmitter of UE that support CA does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

#### 6.6.3.1A.4.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band contiguous 3DL CA and 3UL CA.

#### 6.6.3.1A.4.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.3.1A.0.

#### 6.6.3.1A.4.1.4 Test description

##### 6.6.3.1A.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test

parameters for each CA Configuration, and are shown in table 6.6.3.1A.4.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.1A.4.1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low range, High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ (Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCC1 $N_{RB}$** | **SCC2 $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 50 | 100 | 100 | N/A for this test | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 50 | 100 | 100 | | QPSK | 1 | P_1@49 | S_0@0 | S_0@0 | - |
| 50 | 100 | 100 | | QPSK | 250 | P_50@0 | S_100@0 | S_100@0 | - |
| 75 | 100 | 100 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 75 | 100 | 100 | | QPSK | 1 | P_1@74 | S_0@0 | S_0@0 | - |
| 75 | 100 | 100 | | QPSK | 275 | P_75@0 | S_100@0 | S_100@0 | - |
| 100 | 100 | 100 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 100 | 100 | 100 | | QPSK | 1 | P_1@99 | S_0@0 | S_0@0 | - |
| 100 | 100 | 100 | | QPSK | 300 | P_100@0 | S_100@0 | S_100@0 | - |
| 100 | 50 | 100 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 100 | 50 | 100 | | QPSK | 1 | P_1@99 | S_0@0 | S_0@0 | - |
| 100 | 50 | 100 | | QPSK | 250 | P_100@0 | S_50@0 | S_100@0 | - |
| 100 | 75 | 100 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 100 | 75 | 100 | | QPSK | 1 | P_1@99 | S_0@0 | S_0@0 | - |
| 100 | 75 | 100 | | QPSK | 275 | P_100@0 | S_75@0 | S_100@0 | - |
| 100 | 100 | 50 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 100 | 100 | 50 | | QPSK | 1 | P_1@99 | S_0@0 | S_0@0 | - |
| 100 | 100 | 50 | | QPSK | 250 | P_100@0 | S_100@0 | S_50@0 | - |
| 100 | 100 | 75 | | QPSK | 1 | P_1@0 | S_0@0 | S_0@0 | - |
| 100 | 100 | 75 | | QPSK | 1 | P_1@99 | S_0@0 | S_0@0 | - |
| 100 | 100 | 75 | | QPSK | 275 | P_100@0 | S_100@0 | S_75@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , only the first of those is tested, according to the order on the Test Configuration Table list. | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A Figure group A.32 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channel is set according to Table 6.6.3.1A.4.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.1A.4.1.4.3.

#### 6.6.3.1A.4.1.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.3.1A.1.4.1-1 on all PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.6.3.1A.1.5-1 for each component carrier. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.6.3.1A.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

#### 6.6.3.1A.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.3.1A.4.1.5 Test Requirements

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.6.3.1A.4.1.5-1.

For frequencies $\Delta f_{OOB}$ greater than $F_{OOB}$ as specified in Table 6.6.3.1A.0-1the measured average power of spurious emission, derived in step 6, shall not exceed the described value in Table 6.6.3.1A.4.1.5-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3.1A.4.1.5-1: Spurious emissions limits**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | Note 1 |
| Note1: Applicability of this test requirement is FFS. | | | |

## 6.6.3.1A.4.2 Transmitter Spurious emissions for CA (inter-band 3DL CA and 3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

-The test applicability needs to be added to TS36.521-2

- The test configuration table is needed for FFS.

#### 6.6.3.1A.4.2.1 Test purpose

Same as in clause 6.6.3.1A.4.1.1.

#### 6.6.3.1A.4.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support inter-band 3DL CA and 3UL CA.

#### 6.6.3.1A.4.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.3.1A.0.

#### 6.6.3.1A.4.2.4 Test description

##### 6.6.3.1A.4.2.4.1 Initial conditions

Same as in clause 6.6.3.1A.4.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands.
- Instead of Table 6.6.3.1A.4.1.4.1-1 → use Table 6.6.3.1A.4.2.4.1-1.
- Instead of clause 6.6.3.1A.4.1.4.3 use clause 6.6.3.1A.4.2.4.3.

**Table 6.6.3.1A.4.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | Low range for PCC and SCC<br>High range for PCC and SCC | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCC1 $N_{RB}$** | **SCC2 $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 100 | 100 | N/Afor this test | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 25 | 100 | 100 | | QPSK | 3 | P_1@0 | S_1@99 | S_1@99 | - |
| 25 | 100 | 100 | | QPSK | 225 | P_25@0 | S_100@0 | S_100@0 | - |
| 50 | 100 | 100 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 50 | 100 | 100 | | QPSK | 3 | P_1@0 | S_1@99 | S_1@99 | - |
| 50 | 100 | 100 | | QPSK | 250 | P_50@0 | S_100@0 | S_100@0 | - |
| 75 | 100 | 100 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 75 | 100 | 100 | | QPSK | 3 | P_1@0 | S_1@99 | S_1@99 | - |
| 75 | 100 | 100 | | QPSK | 275 | P_75@0 | S_100@0 | S_100@0 | - |
| 100 | 100 | 100 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 100 | 100 | 100 | | QPSK | 3 | P_1@0 | S_1@99 | S_1@99 | - |
| 100 | 100 | 100 | | QPSK | 300 | P_100@0 | S_100@0 | S_100@0 | - |
| 100 | 25 | 100 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 100 | 25 | 100 | | QPSK | 3 | P_1@0 | S_1@5 | S_1@99 | - |
| 100 | 25 | 100 | | QPSK | 225 | P_100@0 | S_25@0 | S_100@0 | - |
| 100 | 50 | 100 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 100 | 50 | 100 | | QPSK | 3 | P_1@0 | S_1@49 | S_1@99 | - |
| 100 | 50 | 100 | | QPSK | 200 | P_100@0 | S_50@0 | S_100@0 | - |
| 100 | 75 | 100 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 100 | 75 | 100 | | QPSK | 3 | P_1@0 | S_1@74 | S_1@99 | - |
| 100 | 75 | 100 | | QPSK | 275 | P_100@0 | S_75@0 | S_100@0 | - |
| 50 | 50 | 100 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 50 | 50 | 100 | | QPSK | 3 | P_1@0 | S_1@49 | S_1@99 | - |
| 50 | 50 | 100 | | QPSK | 200 | P_50@0 | S_50@0 | S_100@0 | - |
| 50 | 75 | 100 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 50 | 75 | 100 | | QPSK | 3 | P_1@0 | S_1@74 | S_1@99 | - |
| 50 | 75 | 100 | | QPSK | 225 | P_50@0 | S_75@0 | S_100@0 | - |
| 75 | 50 | 100 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 75 | 50 | 100 | | QPSK | 3 | P_1@0 | S_1@49 | S_1@99 | - |
| 75 | 50 | 100 | | QPSK | 225 | P_75@0 | S_50@0 | S_100@0 | - |
| 75 | 75 | 100 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 75 | 75 | 100 | | QPSK | 3 | P_1@0 | S_1@74 | S_1@99 | - |
| 75 | 75 | 100 | | QPSK | 250 | P_75@0 | S_75@0 | S_100@0 | - |
| 50 | 100 | 50 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 50 | 100 | 50 | | QPSK | 3 | P_1@0 | S_1@99 | S_1@49 | - |
| 50 | 100 | 50 | | QPSK | 200 | P_50@0 | S_100@0 | S_50@0 | - |
| 50 | 100 | 75 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 50 | 100 | 75 | | QPSK | 3 | P_1@0 | S_1@99 | S_1@74 | - |
| 50 | 100 | 75 | | QPSK | 225 | P_50@0 | S_100@0 | S_75@0 | - |
| 75 | 100 | 50 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 75 | 100 | 50 | | QPSK | 3 | P_1@0 | S_1@99 | S_1@49 | - |
| 75 | 100 | 50 | | QPSK | 225 | P_75@0 | S_100@0 | S_50@0 | - |
| 75 | 100 | 75 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 75 | 100 | 75 | | QPSK | 3 | P_1@0 | S_1@99 | S_1@74 | - |
| 75 | 100 | 75 | | QPSK | 250 | P_75@0 | S_100@0 | S_75@0 | - |
| 75 | 75 | 50 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 75 | 75 | 50 | | QPSK | 3 | P_1@0 | S_1@74 | S_1@49 | - |
| 75 | 75 | 50 | | QPSK | 200 | P_75@0 | S_75@0 | S_50@0 | - |
| 75 | 75 | 75 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 75 | 75 | 75 | | QPSK | 3 | P_1@0 | S_1@74 | S_1@74 | - |
| 75 | 75 | 75 | | QPSK | 225 | P_75@0 | S_75@0 | S_75@0 | - |
| 100 | 50 | 50 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 100 | 50 | 50 | | QPSK | 3 | P_1@0 | S_1@49 | S_1@49 | - |
| 100 | 50 | 50 | | QPSK | 200 | P_100@0 | S_50@0 | S_50@0 | - |
| 100 | 50 | 75 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 100 | 50 | 75 | | QPSK | 3 | P_1@0 | S_1@49 | S_1@74 | - |
| 100 | 50 | 75 | | QPSK | 225 | P_100@0 | S_50@0 | S_75@0 | - |
| 100 | 75 | 50 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 100 | 75 | 50 | | QPSK | 3 | P_1@0 | S_1@74 | S_1@49 | - |
| 100 | 75 | 50 | | QPSK | 225 | P_100@0 | S_75@0 | S_50@0 | - |
| 100 | 75 | 75 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 100 | 75 | 75 | | QPSK | 3 | P_1@0 | S_1@74 | S_1@74 | - |
| 100 | 75 | 75 | | QPSK | 250 | P_100@0 | S_75@0 | S_75@0 | - |
| 100 | 100 | 50 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 100 | 100 | 50 | | QPSK | 3 | P_1@0 | S_1@99 | S_1@49 | - |
| 100 | 100 | 50 | | QPSK | 250 | P_100@0 | S_100@0 | S_50@0 | - |
| 100 | 100 | 75 | | QPSK | 3 | P_1@0 | S_1@0 | S_1@0 | - |
| 100 | 100 | 75 | | QPSK | 3 | P_1@0 | S_1@99 | S_1@74 | - |
| 100 | 100 | 75 | | QPSK | 275 | P_100@0 | S_100@0 | S_75@0 | - |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , only the first of those is tested, according to the order on the Test Configuration Table list.

### 6.6.3.1A.4.2.4.2 Test procedure

Same test procedure as in clause 6.6.3.1A.4.1.4.2.

- Instead of Table 6.6.3.1A.4.1.4.1-1→ use Table 6.6.3.1A.4.2.4.1-1.

- Instead of Table 6.6.3.1A.4.1.5-1 → use Table 6.6.3.1A.4.2.5-1.
- Instead of clause 6.6.3.1A.4.1.4.3 use clause 6.6.3.1A.4.2.4.3.

#### 6.6.3.1A.4.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.3.1A.4.2.5 Test Requirements

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.6.3.1A.4.2.5-1.

For frequencies $\Delta f_{OOB}$ greater than $F_{OOB}$ as specified in Table 6.6.3.1A.0-1the measured average power of spurious emission, derived in step 6, shall not exceed the described value in Table 6.6.3.1A.4.2.5-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3.1A.4.2.5-1: Spurious emissions limits**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | Note 1 |
| Note1: Applicability of this test requirement is FFS. | | | |

## 6.6.3.1A.4.3 Transmitter Spurious emissions for CA (3UL CA) (intra-band non-contiguous 3DL CA and 3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

-The test applicability needs to be added to TS36.521-2

### 6.6.3.1A.4.3.1 Test purpose

Same as in clause 6.6.3.1A.4.1.1.

### 6.6.3.1A.4.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support intra-band non-contiguous 3DL CA and 3UL CA.

### 6.6.3.1A.4.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.3.1A.0

6.6.3.1A.4.3.4 Test description

6.6.3.1A.4.3.4.1 Initial conditions

Same as in clause 6.6.3.1A.4.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands.
- Instead of Table 6.6.3.1A.4.1.4.1-1 → use Table 6.6.3.1A.4.3.4.1-1.
- Instead of clause 6.6.3.1A.4.1.4.3 use clause 6.6.3.1A.4.3.4.3.

**Table 6.6.3.1A.4.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | Normal | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | Refer to test points<br>A: N/A (Range is not relevant),<br>Maximum Wgap | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Refer to test point<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | | QPSK | P_1@0 | QPSK | S_1@0 | S_1@0 |
| 2 | 25 | 25 | 35 | | | QPSK | P_1@24 | QPSK | S_1@24 | S_1@24 |
| 3 | 25 | 25 | 35 | | | QPSK | P_25@0 | QPSK | S_25@0 | S_25@0 |
| 4 | 50 | 50 | 25 | | | QPSK | P_1@0 | QPSK | S_1@0 | S_1@0 |
| 5 | 50 | 50 | 25 | | | QPSK | P_1@49 | QPSK | S_1@49 | S_1@49 |
| 6 | 50 | 50 | 25 | | | QPSK | P_50@0 | QPSK | S_50@0 | S_50@0 |
| 7 | 100 | 100 | 5 | | | QPSK | P_1@0 | QPSK | S_1@0 | S_1@0 |
| 8 | 100 | 100 | 5 | | | QPSK | P_1@99 | QPSK | S_1@99 | S_1@99 |
| 9 | 100 | 100 | 5 | | | QPSK | P_100@0 | QPSK | S_100@0 | S_100@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.<br>Note 2: The measurements need to be executed for in-gap interferer positions when the sub-block gap size $W_{gap}$ allows. | | | | | | | | | | |

6.6.3.1A.4.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.3.1A.1.4.1-1 on all PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.6.3.1A.1.5-1 for each component carrier. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.6.3.1A.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

7. Repeat the measurement for in-gap interferer positions when the sub-block gap size $W_{gap}$ allows.

#### 6.6.3.1A.4.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

#### 6.6.3.1A.4.3.5 Test requirement

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.6.3.1A.4.3.5-1.

For frequencies $\Delta f_{OOB}$ greater than $F_{OOB}$ as specified in Table 6.6.3.1A.0-1the measured average power of spurious emission, derived in step 6, shall not exceed the described value in Table 6.6.3.1A.4.3.5-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3.1A.4.3.5-1: Spurious emissions limits**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |

### 6.6.3.2 Spurious emission band UE co-existence

Editor's note: This test case contains different requirements for different UE releases

#### 6.6.3.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

#### 6.6.3.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 8 and forward.

#### 6.6.3.2.3 Minimum conformance requirements

This clause specifies the requirements for the specified E-UTRA band for coexistence with protected bands as indicated in Table 6.6.3.2.3-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3.2.3-1: Spurious emission band UE co-existence limits Rel-8**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | Comment |
| 1 | E-UTRA Band 1, 3, 7, 8, 9, 11, 34, 38, 40 | FDL_low | - | FDL_high | -50 | 1 | |
| | Frequency range | 860 | - | 895 | -50 | 1 | |
| | Frequency range | 1475.9 | - | 1510.9 | -50 | 1 | |
| | Frequency range | 1895 | - | 1915 | -15.5 | 5 | Note[14], Note[17] |
| | Frequency range | 1915 | - | 1920 | +1.6 | 5 | Note[14], Note[17] |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17 | FDL_low | - | FDL_high | -50 | 1 | |
| | E-UTRA Band 2 | FDL_low | - | FDL_high | -50 | | Note[14] |
| 3 | E-UTRA Band 1, 7, 8, 33, 34, 38 | FDL_low | - | FDL_high | -50 | 1 | |
| | E-UTRA Band 3 | FDL_low | - | FDL_high | -50 | | Note[14] |
| | Frequency range | 860 | - | 895 | -50 | 1 | Note[13] |
| | Frequency range | 1475.9 | - | 1510.9 | -50 | 1 | Note[13] |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | Note[13] |
| 4 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17 | FDL_low | - | FDL_high | -50 | 1 | |
| 5 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17 | FDL_low | - | FDL_high | -50 | 1 | |
| 6 | E-UTRA Band 1, 9, 11, 34 | FDL_low | - | FDL_high | -50 | 1 | |
| | Frequency range | 860 | - | 875 | -37 | 1 | |
| | Frequency range | 875 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1919.6 | -41 | 0.3 | Note[7] |
| | | 1884.5 | - | 1915.7 | | | Note[8] |
| 7 | E-UTRA Band 1, 3, 7, 8, 33, 34 | FDL_low | - | FDL_high | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | Note[14] , Note[15], Note[18] |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | Note[14], Note[15], Note[18] |
| 8 | E-UTRA Band 1, 33, 34, 38, 39, 40 | FDL_low | - | FDL_high | -50 | 1 | |
| | E-UTRA band 3 | FDL_low | - | FDL_high | -50 | 1 | Note [2] |
| | E-UTRA band 7 | FDL_low | - | FDL_high | -50 | 1 | Note [2] |
| | E-UTRA Band 8 | FDL_low | - | FDL_high | -50 | 1 | Note[14] |
| 9 | E-UTRA Band 1, 9, 11, 34 | FDL_low | - | FDL_high | -50 | 1 | |
| | Frequency range | 860 | - | 895 | -50 | 1 | |
| | Frequency range | 1475.9 | - | 1510.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | Note[8] |
| 10 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17 | FDL_low | - | FDL_high | -50 | 1 | |
| 11 | E-UTRA Band 1, 9, 11, 34 | FDL_low | - | FDL_high | -50 | 1 | |
| | Frequency range | 1457.9 | - | 1510.9 | -50 | 1 | |
| | Frequency range | 860 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | Note[8] |
| 12 | E-UTRA Band 2, 5, 13, 14, 17 | FDL_low | - | FDL_high | -50 | 1 | |
| | E-UTRA Band 4, 10 | FDL_low | - | FDL_high | -50 | 1 | Note[2] |
| | E-UTRA Band 12 | FDL_low | - | FDL_high | -50 | 1 | Note[14] |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17 | FDL_low | - | FDL_high | -50 | 1 | |
| | E-UTRA Band 14 | FDL_low | - | FDL_high | -50 | 1 | Note[14] |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | Note[14] |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | Note[11], Note[14] |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17 | FDL_low | - | FDL_high | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | Note[12] Note[14] |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | Note[11], Note[12] Note[14] |
| 17 | E-UTRA Band 2, 5, 13, 14, 17 | FDL_low | - | FDL_high | -50 | 1 | |
| | E-UTRA Band 4, 10 | FDL_low | - | FDL_high | -50 | 1 | Note[2] |
| | E-UTRA Band 12 | FDL_low | - | FDL_high | -50 | 1 | Note[14] |
| … | | | | | | | |
| 33 | E-UTRA Band 1, 7, 8, 34, 38, 40 | FDL_low | - | FDL_high | -50 | 1 | Note[5] |
| | E-UTRA Band 3 | FDL_low | - | FDL_high | -50 | 1 | Note[14] |
| 34 | E-UTRA Band 1, 3, 7, 8, 9, 11, 33, 38, 39, 40 | FDL_low | - | FDL_high | -50 | 1 | Note[5] |
| | Frequency range | 860 | - | 895 | -50 | 1 | |
| | Frequency range | 1475.9 | - | 1510.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | Note[8] |
| 35 | | | | | | | |
| 36 | | | | | | | |
| 37 | | | - | | | | |
| 38 | E-UTRA Band 1, 3, 8, 33, 34 | FDL_low | - | FDL_high | -50 | 1 | |
| | Frequency range | 2620 | - | 2645 | -15.5 | 5 | Note[14], Note[16], Note[18] |
| 39 | E-UTRA Band 34, 40 | FDL_low | - | FDL_high | -50 | 1 | |
| 40 | E-UTRA Band 1, 3, 33, 34, 39 | FDL_low | - | FDL_high | -50 | 1 | |

Note 1: FDL_low and FDL_high refer to each E-UTRA frequency band specified in Table 5.2-1

Note 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd or 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RE within the transmission bandwidth (see Figure 5.4.2-1) for which the 2nd or 3rd harmonic, i.e. the frequency equal to two or three times the frequency of that RE, is within the measurement bandwidth (MBW).

Note 3: To meet these requirements some restriction will be needed for either the operating band or protected band

Note 4: N/A

Note 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band

Note 6: N/A.

Note 7: Applicable when co-existence with PHS system operating in 1884.5-1919.6MHz.

Note 8: Applicable when co-existence with PHS system operating in 1884.5-1915.7MHz.

Note 9: N/A

Note 10: N/A

Note 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD

Note 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB

Note 13: Applicable when UE transmits anywhere within 1749.9 – 1784.9MHz.Applicable when the assigned E-UTRA UL operating channel is ≥1 749.9MHz and ≤ 1 784.9MHz.

Note 14: These requirements also apply for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

Note 15: This requirement is applicable for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz. This requirement is applicable without any other uplink transmission bandwidth restriction for channel bandwidths within the range 2500 - 2570 MHz.

Note 16: This requirement is applicable for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 – 2605 MHz. This requirement is applicable without any other uplink transmission bandwidth restriction for channel bandwidths within the range 2570 – 2615 MHz. For assigned carriers with bandwidths overlapping the frequency range 2615-2620 MHz the requirements apply with the maximum output power configured to +19 dBm in the IE *P-Max*.

Note 17: This requirement is applicable for an uplink transmission bandwidth less than or equal to 54 RB for carriers of

15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz. This requirement is applicable without any other uplink transmission bandwidth restriction for channel bandwidths within the range 1920 - 1980 MHz.

Note 18: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

NOTE: The restriction on the maximum uplink transmission to 54 RB in Notes 15, 16, and 17 of Table 6.6.3.2.3-1 is intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future.

**Table 6.6.3.2.3-1A: Spurious emission band UE co-existence limits Rel-9**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum level (dBm) | MBW (MHz) | NOTE |
| 1 | E-UTRA Band 1, 3, 7, 8, 11, 20, 21, 34, 38, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 895 | -50 | 1 | |
| | Frequency range | 1880 | - | 1895 | -40 | 1 | 14,18 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1895 | - | 1915 | -15.5 | 5 | 14,18,19 |
| | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 14,18,19 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 14 |
| 3 | E-UTRA Band 1, 7, 8, 20, 33, 34, 38 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 14 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 13 |
| | Frequency range | 860 | - | 895 | -50 | 1 | 13 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 13 |
| 4 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 5 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 6 | E-UTRA Band 1, 9, 11, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 875 | -37 | 1 | |
| | Frequency range | 875 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1919.6 | -41 | 0.3 | 7 |
| | Frequency range | 1884.5 | - | 1915.7 | | | 8 |
| 7 | E-UTRA Band 1, 3, 7, 8, 20, 33, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | -+1.6 | 5 | 14, 15, 19 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 14, 15, 19 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 14, 15 |
| 8 | E-UTRA Band 1, 20, 33, 34, 38, 39, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 7 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 14 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 17 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 14, 17 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 17 |
| 9 | E-UTRA Band 1, 11, 21, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 10 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 11 | E-UTRA Band 1, 9, 11, 21, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| 12 | E-UTRA Band 2, 5, 13, 14, 17 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 14 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 14 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 14 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 14 |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 14 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 14 |
| 17 | E-UTRA Band 2, 5, 13, 14, 17 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | E-UTRA Band 4, 10 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 14 |
| 18 | E-UTRA Band 1, 11, 21, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 895 | -40 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 19 | E-UTRA Band 1, 11, 21, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 20 | E-UTRA Band 1, 3, 7, 8, 33, 34, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 14 |
| | E-UTRA Band 38 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 21 | E-UTRA Band 1, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 33 | E-UTRA Band 1, 7, 8, 20, 34, 38, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 14 |
| 34 | E-UTRA Band 1, 3, 7, 8, 11, 20, 21, 33, 38,39, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | Frequency range | 860 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 35 | | | - | | | | |
| 36 | | | - | | | | |
| 37 | | | - | | | | |
| 38 | E-UTRA Band 1,3, 8, 20, 33, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 14, 16, 19 |
| | Frequency range | 2645 | - | 2690 | -40 | 1 | 14, 16 |
| 39 | E-UTRA Band 34, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 40 | E-UTRA Band 1, 3, 33, 34, 39 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

Note 1: FDL_low and FDL_high refer to each E-UTRA frequency band specified in Table 5.2-1
Note 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd or 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RE within the transmission bandwidth (see Figure 5.4.2-1) for which the 2nd or 3rd harmonic, i.e. the frequency equal to two or three times the frequency of that RE, is within the measurement bandwidth (MBW).
Note 3: To meet these requirements some restriction will be needed for either the operating band or protected band
Note 4: N/A
Note 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band
Note 6: N/A
Note 7: Applicable when co-existence with PHS system operating in 1884.5-1919.6MHz.
Note 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.
Note 9: N/A
Note 10: N/A
Note 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD
Note 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB
Note 13: Applicable when the assigned E-UTRA UL operating channel is ≥1744.9MHz and ≤ 1784.9MHz.
Note 14: These requirements also apply for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.
Note 15: This requirement is applicable for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz. This requirement is applicable without any other uplink transmission bandwidth restriction for channel bandwidths within the range 2500 - 2570 MHz.
Note 16: This requirement is applicable for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 – 2605 MHz. This requirement is applicable without any other uplink transmission bandwidth restriction for channel bandwidths within the

range 2570 – 2615 MHz. For assigned carriers with bandwidths overlapping the frequency range 2615-2620 MHz the requirements apply with the maximum output power configured to +19 dBm in the IE *P-Max*.

Note 17: For carriers of 5 MHz channel bandwidth with carrier centre frequencies ($F_c$) in the range 902.5MHz ≤ $F_c$ < 907.5 MHz, the requirement applies for uplink transmission bandwidths less than or equal to 20 RB. No restrictions apply in the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz. For carriers of 10 MHz channel bandwidth, the requirement only applies for $F_c$ = 910 MHz and uplink transmission bandwidths less than or equal to 32 RB with $RB_{start}$ > 3.

Note 18: This requirement is applicable for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz. This requirement is applicable without any other uplink transmission bandwidth restriction for channel bandwidths within the range 1920 - 1980 MHz.

Note 19: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

NOTE: The restriction on the maximum uplink transmission to 54 RB in Notes 15, 16 and 18 of Table 6.6.3.2.3-1A is intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future.

**Table 6.6.3.2.3-1B: Spurious emission band UE co-existence limits Rel-10**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | Note |
| 1 | E-UTRA Band 1, 7, 8, 11, 18, 19, 20, 21, 22, 38, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | Frequency range | 1880 | - | 1895 | -40 | 1 | 15,19 |
| | Frequency range | 1895 | - | 1915 | -15.5 | 5 | 15,19,20 |
| | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15,19,20 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 15 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 7, 8, 20, 33, 34, 38, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 13 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 13 |
| 4 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 25, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 25, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 6 | E-UTRA Band 1, 9, 11, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 875 | -37 | 1 | |
| | Frequency range | 875 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1919.6 | -41 | 0.3 | 7 |
| | | 1884.5 | - | 1915.7 | | | 8 |
| 7 | E-UTRA Band 1, 3, 7, 8, 20, 22, 33, 34, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 16, 20 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 16, 20 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 16 |
| 8 | E-UTRA Band 1, 20, 33, 34, 38, 39, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 7 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 22, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 18 |
| | Frequency range | 860 | | 890 | -40 | 1 | 15, 18 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 18 |
| 9 | E-UTRA Band 1, 11, 18, 19, 21, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 10 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 11 | E-UTRA Band 1, 11, 18, 19, 21, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 12 | E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 23, 25, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| 17 | E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 18 | E-UTRA Band 1, 11, 21, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 19 | E-UTRA Band 1, 11, 21, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 20 | E-UTRA Band 1, 3, 7, 8, 20, 22, 33, 34, 40, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1, 18, 19, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 22 | E-UTRA Band 1, 3, 7, 8, 20, 33, 34, 38, 39, 40, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 3510 | - | 3525 | -40 | 1 | 15 |
| | Frequency range | 3525 | - | 3590 | -50 | 1 | |
| 23 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 24 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 25 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| … | | | | | | | |
| 33 | E-UTRA Band 1, 7, 8, 20, 22, 34, 38, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 33, 38, 39, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 35 | | | | | | | |
| 36 | | | | | | | |
| 37 | | | - | | | | |
| 38 | E-UTRA Band 1, 3, 8, 20, 22, 33, 34, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 17, 20 |
| | Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 17 |
| 39 | E-UTRA Band 22, 34, 40, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 40 | E-UTRA Band 1, 3, 7, 8, 20, 22, 33, 34, 38, 39, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 41 | E-UTRA Band 2, 4, 5, 10, 12, 13 , 14, 17, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 23, 24, 25 | | | | | | |
| 42 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 33, 34, 38, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 43 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 33, 34, 38, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

Note 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.2-1

Note 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th ] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th ] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

Note 3: N/A

Note 4: N/A

Note 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band

Note 6: N/A

Note 7: Applicable when co-existence with PHS system operating in 1884.5-1919.6MHz.

Note 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.

Note 9: N/A

Note 10: N/A

Note 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD

Note 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB

Note 13: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.

Note 14: N/A

Note 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.1.3-1 from the edge of the channel bandwidth.

NOTE 16: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 17: This requirement is applicable for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
For carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.

NOTE 18: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.

NOTE 19: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

Note 20: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

Note 21 N/A

Note 22 N/A

NOTE: The restriction on the maximum uplink transmission to 54 RB in Notes 16, 17, and 19 of Table 6.6.3.2.3-1B is intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future.

**Table 6.6.3.2.3-1C: Spurious emission band UE co-existence limits Rel-11**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | Note |
| 1 | E-UTRA Band 1, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 38, 40, 41, 42, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 15,27 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 15, 26, 27 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 15 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 26, 27, 28, 29, 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 7, 8, 20, 26, 27, 28, 33, 34, 38, 41, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 13 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 13 |
| 4 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 25, 26, 27, 28, 29, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 25, 28, 29,42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| 6 | E-UTRA Band 1, 9, 11, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 875 | -37 | 1 | |
| | Frequency range | 875 | - | 895 | -50 | 1 | |
| | | 1884.5 | - | 1919.6 | -41 | 0.3 | 7 |
| | Frequency range | 1884.5 | - | 1915.7 | | | 8 |
| 7 | E-UTRA Band 1, 3, 7, 8, 20, 22, 27, 28, 29, 33, 34, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| 8 | E-UTRA Band 1, 20, 28, 33, 34, 38, 39, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 7 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 15, 23 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23 |
| 9 | E-UTRA Band 1, 11, 18, 19, 21, 26, 28, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| 10 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 11 | E-UTRA Band 1, 11, 18, 19, 21, 28, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| 12 | E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 26, 27, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 23, 25, 26, 27, 29, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| 17 | E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 26, 27, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 18 | E-UTRA Band 1, 11, 21, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| 19 | E-UTRA Band 1, 11, 21, 28, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| 20 | E-UTRA Band 1, 3, 7, 8, 20, 22, 33, 34, 40, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| | E-UTRA Band 1, 18, 19, 28, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| 22 | E-UTRA Band 1, 3, 7, 8, 20, 26, 27, 28, 33, 34, 38, 39, 40, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 3510 | - | 3525 | -40 | 1 | 15 |
| | Frequency range | 3525 | - | 3590 | -50 | 1 | |
| 23 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 29, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 24 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 29, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 25 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 26 | E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18, 19, 21, 23, 24, 25, 26, 29, 34, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 27 | E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 23, 25, 26, 27, 29, 38, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | |
| | | | | | | | |
| | E-UTRA Band 28 | $F_{DL_low}$ | - | 790 | -50 | 1 | |
| 28 | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 25, 26, 27, 34, 38, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1, 4, 10, 22, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 24 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 25 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 15, 32 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 31 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| … | | | | | | | |
| 33 | E-UTRA Band 1, 7, 8, 20, 22, 28, 34, 38, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 33, 38, 39, 40, 41, 42, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 35 | | | | | | | |
| 36 | | | | | | | |
| 37 | | | - | | | | |
| 38 | E-UTRA Band 1,3, 8, 20, 22, 27, 28, 29, 33, 34, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
| | Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| 39 | E-UTRA Band 22, 34, 40, 41, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 40 | E-UTRA Band 1, 3, 7, 8, 20, 22, 26, 27, 28, 33, 34, 38, 39, 41, 42, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 23, 24, 25, 26, 27, 28, 29, 34, 39, 40, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 30 |
| | Frequency range | 1839.9 | | 1879.9 | -50 | 1 | 30 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 30 |
| 42 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 33, 34, 38, 40, 41, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 43 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 33, 34, 38, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 44 | E-UTRA Band 3, 5, 8, 34, 39, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1, 40, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |

Note 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.2-1

Note 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th ] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

Note 3: N/A

Note 4: N/A

Note 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band

Note 6: N/A

Note 7: Applicable when co-existence with PHS system operating in 1884.5 -1919.6MHz.

Note 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.

Note 9: N/A

Note 10: N/A

Note 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD

Note 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB

Note 13: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.

Note 14: N/A

Note 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.1.3-1 from the edge of the channel bandwidth.

Note 16: N/A

Note 17: N/A

Note 18: N/A

Note 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.

Note 20: N/A

Note 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

Note 22: This requirement is applicable for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
For carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.

Note 23: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.

Note 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).

Note 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).

Note 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

Note 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

Note 28: N/A
Note 29: N/A
Note 30: This requirement applies when the E-UTRA carrier is confined within 2545-2575 MHz and the channel bandwidth is 10 or 20 MHz
Note 31: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.
Note 32: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.

**Table 6.6.3.2.3-1D: Spurious emission band UE co-existence limits Rel-12**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Protected band** | **Frequency range (MHz)** | | | **Maximum Level (dBm)** | **MBW (MHz)** | **Note** |
| 1 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 15,27 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 15, 26, 27 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 15 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 26, 27, 28, 29, 30, 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 41, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 13 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 13 |
| 4 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 25, 26, 27, 28, 29, 30, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 23, 24, 25, 28, 29, 30, 31, 38, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| 6 | E-UTRA Band 1, 9, 11, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 875 | -37 | 1 | |
| | Frequency range | 875 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1919.6 | -41 | 0.3 | 7 |
| | | 1884.5 | - | 1915.7 | | | 8 |
| 7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| 8 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 7 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 15, 23 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23 |
| 9 | E-UTRA Band 1, 11, 18, 19, 21, 26, 28, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 10 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 11 | E-UTRA Band 1, 11, 18, 19, 21, 28, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 12 | E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 26, 27, 30, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 23, 25, 26, 27, 29, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| 17 | E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 26, 27, 30, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 18 | E-UTRA Band 1, 11, 21, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 19 | E-UTRA Band 1, 11, 21, 28, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 20 | E-UTRA Band 1, 3, 7, 8, 20, 22, 31, 32, 33, 34, 40, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| 21 | E-UTRA Band 1, 18, 19, 28, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 22 | E-UTRA Band 1, 3, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 3510 | - | 3525 | -40 | 1 | 15 |
| | Frequency range | 3525 | - | 3590 | -50 | 1 | |
| 23 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 29, 30, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 24 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 29, 30, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 25 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 30, 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 26 | E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18, 19, 21, 23, 24, 25, 26, 29, 30, 31, 34, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 27 | E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 23, 25, 26, 27, 29, 30, 31, 38, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | |
| | | | | | | | |
| | E-UTRA Band 28 | $F_{DL_low}$ | - | 790 | -50 | 1 | |
| 28 | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1, 4, 10, 22, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 24 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 25 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 30 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 38, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 31 | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28,31, 32, 33, 34, 38, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| … | | | | | | | |
| 33 | E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 34, 38, 40, 42, 43 | | | | | | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38, 39, 40, 41, 42, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| 35 | | | | | | | |
| 36 | | | | | | | |
| 37 | | | - | | | | |
| 38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
| | Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| 39 | E-UTRA Band 22, 34, 40, 41, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | | 1855 | -40 | 1 | 33 |
| | Frequency range | 1855 | | 1880 | -15.5 | 5 | 15,26,33 |
| 40 | E-UTRA Band 1, 3, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 30 |
| | Frequency range | 1839.9 | | 1879.9 | -50 | 1 | 30 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 30 |
| 42 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 43 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 44 | E-UTRA Band 3, 5, 8, 34, 39, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1, 40, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |

Note 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1

Note 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th ] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

Note 3: N/A

Note 4: N/A

Note 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band

Note 6: N/A

Note 7: Applicable when co-existence with PHS system operating in 1884.5 -1919.6MHz.

Note 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.

Note 9: N/A

Note 10: N/A

Note 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD

Note 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB

Note 13: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.

Note 14: N/A

Note 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.1.3-1 from the edge of the channel bandwidth.

Note 16: N/A

Note 17: N/A

Note 18: N/A

Note 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.

Note 20: N/A

Note 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

Note 22: This requirement is applicable for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
For carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.

Note 23 This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.

Note 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).

Note 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).

Note 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

Note 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

Note 28: N/A
Note 29: N/A
Note 30: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz
Note 31: N/A
Note 32: Void.
Note 33: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to [54 RB] for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.
Note 34: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.
Note 35: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.

**Table 6.6.3.2.3-1E: Spurious emission band UE co-existence limits Rel-13**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| 1 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | Frequency range | 1880 | - | 1895 | -40 | 1 | 15, 27 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 15, 26, 27, 39 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 30, 41, 42, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | |
| 4 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 23, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 18, 19 | $F_{DL_low}$ | - | $F_{DL_high}$ | -40 | 1 | 38 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 38 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 38 |
| 6 | E-UTRA Band 1, 9, 11, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 875 | -37 | 1 | |
| | Frequency range | 875 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1919.6 | -41 | 0.3 | 7 |
| | | 1884.5 | - | 1915.7 | | | 8 |
| 7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| 8 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 15, 23 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23 |
| 9 | E-UTRA Band 1, 3, 11, 18, 19, 21, 26, 28, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 11 | E-UTRA Band 1, 3, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 12 | E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 26, 27, 30, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 23, 25, 26, 27, 29, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| 17 | E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 26, 27, 30, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 18 | E-UTRA Band 1, 3, 11, 21, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 19 | E-UTRA Band 1, 3, 11, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| 21 | E-UTRA Band 1, 3, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 22 | E-UTRA Band 1, 3, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 43, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 3510 | - | 3525 | -40 | 1 | 15 |
| | Frequency range | 3525 | - | 3590 | -50 | 1 | |
| 23 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 29, 30, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 24 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 29, 30, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 25 | E-UTRA Band 4, 5, 10,12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 30, 41, 42, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 26 | E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 23, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 27 | E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 23, 25, 26, 27, 29, 30, 31, 38, 40, 41, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 28 | $F_{DL_low}$ | - | 790 | -50 | 1 | |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | |
| 28 | E-UTRA Band 1, 4, 10, 22, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 25 |
| | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 24 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| 30 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 38, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 31 | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 40, 42, 43, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 470 | - | 694 | -42 | 8 | |
| … | | | | | | | |
| 33 | E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 34, 38, 40, 42, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38,39, 40, 41, 42, 43, 44, 45, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 35 | | | | | | | |
| 36 | | | | | | | |
| 37 | | | - | | | | |
| 38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 34, 40, 42, 43, 65, 66, 67, 68 | | | | | | |
| | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
| | Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| 39 | E-UTRA Band 1, 8, 22, 26, 34, 40, 41, 42, 44, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | | 1855 | -40 | 1 | 33 |
| | Frequency range | 1855 | | 1880 | -15.5 | 5 | 15,26,33 |
| 40 | E-UTRA Band 1, 3, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 45, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 30 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 30 |
| 42 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 45, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 43 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 31,32, 33, 34, 38, 40, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 44 | E-UTRA Band 1, 40, 42, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 5, 8, 34, 39, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 45 | E-UTRA Band 1, 3, 5, 8, 34, 39, 40, 41, 42.44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 65 | E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 65, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 36 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 37 |
| | Frequency range | 1900 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| 66 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 68 | E-UTRA Band 3, 7, 8, 20, 22, 28, 31, 38, 40, 42, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1
NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.
NOTE 3: N/A
NOTE 4: N/A
NOTE 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band
NOTE 6: N/A
NOTE 7: Applicable when co-existence with PHS system operating in 1884.5 -1919.6MHz.
NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.
NOTE 9: N/A
NOTE 10: N/A
NOTE 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD
NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB
NOTE 13: N/A
NOTE 14: N/A
NOTE 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.3-1 from the edge of the channel bandwidth.
NOTE 16: N/A
NOTE 17: N/A

NOTE 18: N/A
NOTE 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.
NOTE 20: N/A
NOTE 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 22: This requirement is applicable for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
For carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.
NOTE 23: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.
NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.
NOTE 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 28: N/A
NOTE 29: N/A
NOTE 30: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz
NOTE 31: N/A
NOTE 32: Void
NOTE 33: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.
NOTE 34: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.
NOTE 35: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.
NOTE 36: This requirement is applicable for E-UTRA channel bandwidth allocated within 1920-1980 MHz.
NOTE 37: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980MHz.
NOTE 38: Applicable only for UE category M1 and NB1.
NOTE 39: For category NB1 UE when carrier centre frequency is 1920.1 MHz, in case of single-tone uplink transmission the requirement is applicable only for sub-carrier index > 2.

NOTE: The restriction on the maximum uplink transmission to 54 RB in Notes 21, 22, and 27 of Table 6.6.3.2.3-1E and the restriction on the single-tone uplink transmission to sub-carrier index > 2 in Note 39 of Table 6.6.3.2.3-1E are intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future.

**Table 6.6.3.2.3-1F: Spurious emission band UE co-existence limits Rel-14**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| 1 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 15, 27 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 15, 26, 27, 42 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | |
| 4 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 18, 19 | $F_{DL_low}$ | - | $F_{DL_high}$ | -40 | 1 | 39 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 39 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 39 |
| 6 | E-UTRA Band 1, 9, 11, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 875 | -37 | 1 | |
| | Frequency range | 875 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1919.6 | -41 | 0.3 | 7 |
| | | 1884.5 | - | 1915.7 | | | 8 |
| 7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| 8 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 15, 23 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23 |
| 9 | E-UTRA Band 1, 3, 11, 18, 19, 21, 26, 28, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 11 | E-UTRA Band 1, 3, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 12 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 25, 26, 27, 29, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| 17 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 18 | E-UTRA Band 1, 3, 11, 21, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 19 | E-UTRA Band 1, 3, 11, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| 21 | E-UTRA Band 1, 3, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 22 | E-UTRA Band 1, 3, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 43, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 3510 | - | 3525 | -40 | 1 | 15 |
| | Frequency range | 3525 | - | 3590 | -50 | 1 | |
| 23 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 29, 30, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 24 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 25 | E-UTRA Band 4, 5, 10,12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 26 | E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 48, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 27 | E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 25, 26, 27, 29, 30, 31, 38, 40, 41, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 28 | $F_{DL_low}$ | - | 790 | -50 | 1 | |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | |
| 28 | E-UTRA Band 1, 4, 10, 22, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 25 |
| | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 24 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| 30 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 29, 30, 38, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 31 | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 40, 42, 43, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 470 | - | 694 | -42 | 8 | |
| … | | | | | | | |
| 33 | E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 34, 38, 40, 42, 43, 65, 67, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38,39, 40, 41, 42, 43, 44, 45, 65, 67, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 35 | | | | | | | |
| 36 | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 37 | | | - | | | | |
| 38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
| | Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| 39 | E-UTRA Band 1, 8, 22, 26, 34, 40, 41, 42, 44, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | | 1855 | -40 | 1 | 33 |
| | Frequency range | 1855 | | 1880 | -15.5 | 5 | 15,26,33 |
| 40 | E-UTRA Band 1, 3, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 45, 48, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 30 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 30 |
| 42 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 45, 65, 66, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 43 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 31,32, 33, 34, 38, 40, 65, 66, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 44 | E-UTRA Band 1, 40, 42, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 5, 8, 34, 39, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 45 | E-UTRA Band 1, 3, 5, 8, 34, 39, 40, 41, 42.44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| … | | | | | | | |
| 47 | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 65, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 5925 | - | 5950 | -30 EIRP | 1 | 38, 40, 41 |
| | Frequency range | 5815 | - | 5855 | -30 EIRP | 1 | 38, 41 |
| | | | | | | | |
| 48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 66, 70 | $FD_{L_low}$ | - | $FD_{L_high}$ | -50 | 1 | |
| 65 | E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 65, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 36 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 37 |
| | Frequency range | 1900 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| 66 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42, 48 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 68 | E-UTRA Band 3, 7, 8, 20, 22, 28, 31, 38, 40, 42, 43, 47, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| … | | | | | | | |
| 70 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1
NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.
NOTE 3: N/A
NOTE 4: N/A
NOTE 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band
NOTE 6: N/A
NOTE 7: Applicable when co-existence with PHS system operating in 1884.5 -1919.6MHz.
NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.
NOTE 9: N/A
NOTE 10: N/A
NOTE 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD
NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB
NOTE 13: N/A
NOTE 14: N/A
NOTE 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.3-1 from the edge of the channel bandwidth.
NOTE 16: N/A
NOTE 17: N/A
NOTE 18: N/A
NOTE 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.
NOTE 20: N/A
NOTE 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 22: This requirement is applicable for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
For carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.
NOTE 23: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.
NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.4.2-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.4.2-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.
NOTE 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 28: N/A

NOTE 29: N/A
NOTE 30: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz
NOTE 31: N/A
NOTE 32: Void
NOTE 33: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.
NOTE 34: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.
NOTE 35: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.
NOTE 36: This requirement is applicable for E-UTRA channel bandwidth allocated within 1920-1980 MHz.
NOTE 37: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980MHz.
NOTE 38: Applicable when NS_33 or NS_34 is configured by the pre-configured radio parameters.
NOTE 39: Applicable only when the assigned E-UTRA carrier is confined within 824 MHz and 849 MHz for UE category M1, M2 and UE category NB1 and NB2.
NOTE 40: In the frequency range x-5950MHz, SE requirement of -30dBm/MHz should be applied; where x = max (5925, fc + 15), where fc is the channel centre frequency.
NOTE 41: The EIRP requirement is converted to conducted requirement depend on the supported post antenna connector gain $G_{post\ connector}$ declared by the UE following the principle described in annex I.
NOTE 42: For category NB1 and NB2 UE when carrier centre frequency is 1920.1 MHz, in case of single-tone uplink transmission the requirement is applicable only for sub-carrier index > 2.

NOTE: The restriction on the maximum uplink transmission to 54 RB in Notes 21, 22, and 27 of Table 6.6.3.2.3-1F and the restriction on the single-tone uplink transmission to sub-carrier index > 2 in Note 42 of Table 6.6.3.2.3-1F are intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future.

**Table 6.6.3.2.3-1G: Spurious emission band UE co-existence limits Rel-15**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| 1 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 15, 27 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 15, 26, 27, 44 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 50, 51, 66, 70, 71, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 50, 51, 65, 67, 68, 69, 72, 73,74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 22, 42, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | |
| 4 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 48, 50, 51, 66, 70, 71, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 50, 51, 65, 66, 70, 71, 73, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 18, 19 | $F_{DL_low}$ | - | $F_{DL_high}$ | -40 | 1 | 39 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 39 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 39 |
| 6 | E-UTRA Band 1, 9, 11, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 875 | -37 | 1 | |
| | Frequency range | 875 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1919.6 | -41 | 0.3 | 7 |
| | | 1884.5 | - | 1915.7 | | | 8 |
| 7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| 8 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 50, 51, 65, 67, 68, 69, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 7, 22, 41, 42, 43, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 15, 23 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23 |
| 9 | E-UTRA Band 1, 3, 11, 18, 19, 21, 26, 28, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 10 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66, 70, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 11 | E-UTRA Band 1, 3, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | | | | | | | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 12 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48, 50, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 51, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 25, 26, 27, 29, 41, 48, 50, 51, 66, 70, 71, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 48, 66, 70, 71, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| 17 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48, 50, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 51, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 18 | E-UTRA Band 1, 3, 11, 21, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 19 | E-UTRA Band 1, 3, 11, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 68, 72, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42, 52, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| 21 | E-UTRA Band 1, 3, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 22 | E-UTRA Band 1, 3, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 43, 65, 67, 68, 69, 72, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 3510 | - | 3525 | -40 | 1 | 15 |
| | Frequency range | 3525 | - | 3590 | -50 | 1 | |
| 23 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 29, 30, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 24 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70, 71, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 25 | E-UTRA Band 4, 5, 10,12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 66, 70, 71, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 26 | E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 48, 50, 51, 65, 66, 70, 71, 73,74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 27 | E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 25, 26, 27, 29, 30, 31, 38, 40, 41, 42, 43, 65, 66, 73, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 28 | $F_{DL_low}$ | - | 790 | -50 | 1 | |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | |
| 28 | E-UTRA Band 1, 4, 10, 22, 42, 43, 50, 51, 52, 65, 66, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 25 |
| | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, 41, 72 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 24 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| 30 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 29, 30, 38, 41, 48, 66, 70, 71, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 31 | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 40, 42, 43, 50, 51, 52, 65, 67, 68, 69, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 470 | - | 694 | -42 | 8 | |
| … | | | | | | | |
| 33 | E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 34, 38, 40, 42, 43, 52, 65, 67, 69, 72, 73, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38,39, 40, 41, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 42, 43, 44, 45, 50, 51, 52, 65, 67, 69, 72, 73, 74, 75, 76 | | | | | | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 35 | | | | | | | |
| 36 | | | | | | | |
| 37 | | | - | | | | |
| 38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
| | Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| 39 | E-UTRA Band 1, 8, 22, 26, 34, 40, 41, 42, 44, 45, 50, 51, 52, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | | 1855 | -40 | 1 | 33 |
| | Frequency range | 1855 | | 1880 | -15.5 | 5 | 15,26,33 |
| 40 | E-UTRA Band 1, 3, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 30 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 30 |
| 42 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 45, 50, 51, 65, 66, 67, 68, 69, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 43 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 31,32, 33, 34, 38, 40, 50, 51, 65, 66, 67, 68, 69, 72, 73, 74, 75, 76, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 44 | E-UTRA Band 1, 40, 42, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 5, 8, 34, 39, 41, 73 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 45 | E-UTRA Band 1, 3, 5, 8, 34, 39, 40, 41, 42, 44, 52, 73 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| … | | | | | | | |
| 47 | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 47, 65, 68, 72, 73 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 5925 | - | 5950 | -30 EIRP | 1 | 38, 40, 43 |
| | Frequency range | 5815 | - | 5855 | -30 EIRP | 1 | 38, 43 |
| 48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 66, 70, 71, 74, 85 | $FD_{L_low}$ | - | $FD_{L_high}$ | -50 | 1 | |
| 50 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 51 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 52 | E-UTRA Band 1, 3, 5, 7, 8, 20, 28, 31, 33, 34, 38, 39, 40, 41, 45, 47, 50, 51, 68, 72, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 65 | E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 50, 51, 65, 68, 69, 72, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 36 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 37 |
| | Frequency range | 1900 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| 66 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 50, 51, 66, 70, 71, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | E-UTRA Band 42, 48 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 68 | E-UTRA Band 3, 7, 8, 20, 22, 28, 31, 38, 40, 42, 43, 47, 50, 51, 65, 72, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| … | | | | | | | |
| 70 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70, 71, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 71 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 30, 48, 66, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25, 41, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 29 | $F_{DL_low}$ | - | $F_{DL_high}$ | -38 | 1 | 15 |
| | E-UTRA Band 71 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 72 | E-UTRA Band 1, 7, 20, 22, 28, 31, 32, 33, 34, 38, 42, 43, 47, 52, 65, 68, [72] | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 8, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 470 | - | 694 | -42 | 8 | |
| 73 | E-UTRA Band 1, 26, 28, 33, 34, 39, 41, 42, 43, 44, 45, 47, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 5, 8, 27, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 74 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 1400 | - | 1427 | -32 | 27 | 15, 41 |
| | Frequency range | 1475 | - | 1488 | -50 | 1 | 42 |
| | Frequency range | 1488 | - | 1518 | -50 | 1 | 15 |
| 85 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48, 51, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

NOTE 3: N/A

NOTE 4: N/A

NOTE 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band

NOTE 6: N/A

NOTE 7: Applicable when co-existence with PHS system operating in 1884.5-1919.6MHz.

NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.

NOTE 9: N/A

NOTE 10: N/A

NOTE 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD

NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB

NOTE 13: N/A

NOTE 14: N/A

NOTE 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.3-1 from the edge of the channel bandwidth.

NOTE 16: N/A

NOTE 17: N/A

NOTE 18: N/A

NOTE 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.

NOTE 20: N/A

NOTE 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 22: This requirement is applicable for power class 3 UE for any channel bandwidths within the range

2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. For power class 2 UE for any channel bandwidths within the range 2570 - 2615 MHz, NS_44 shall apply.
For power class 2 or 3 UE for carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.

NOTE 23: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.

NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

NOTE 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 28: N/A

NOTE 29: N/A

NOTE 30: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz

NOTE 31: N/A

NOTE 32: Void

NOTE 33: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.

NOTE 34: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.

NOTE 35: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.

NOTE 36: This requirement is applicable for E-UTRA channel bandwidth allocated within 1920-1980 MHz.

NOTE 37: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980MHz.

NOTE 38: Applicable when NS_33 or NS_34 is configured by the pre-configured radio parameters.

NOTE 39: Applicable only when the assigned E-UTRA carrier is confined within 824 MHz and 849 MHz for UE category M1, M2 and UE category NB1 and NB2.

NOTE 40: In the frequency range x-5950MHz, SE requirement of -30dBm/MHz should be applied; where x = max (5925, fc + 15), where fc is the channel centre frequency.

NOTE 41: Applicable for all bandwidths, and when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is greater than or equal to 1427 MHz + the channel BW assigned for 1.4, 3, 5 and 10 MHz bandwidth, and when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is greater than or equal to 1440 MHz for 15 and 20 MHz bandwidth. This requirement shall be verified with UE transmission power of 15 dBm.

NOTE 42: Applicable for 1.4 , 3 and 5 MHz bandwidth, and when the upper edge of the assigned E-UTRA UL channel bandwidth frequency is less than or equal to 1467 MHz assigned for10 MHz bandwidth, and when the upper edge of the assigned E-UTRA UL channel bandwidth frequency is less than or equal to 1463.8 MHz for 15 MHz bandwidth, and when the upper edge of the assigned E-UTRA UL channel bandwidth frequency is less than or equal to 1460.8 MHz for 20 MHz bandwidth.

NOTE 43: The EIRP requirement is converted to conducted requirement depend on the supported post antenna connector gain $G_{post\ connector}$ declared by the UE following the principle described in annex

| |
|---|
| I.<br>NOTE 44: For category NB1 and NB2 UE when carrier centre frequency is 1920.1 MHz, in case of single-tone uplink transmission the requirement is applicable only for sub-carrier index > 2. |

NOTE: The restriction on the maximum uplink transmission to 54 RB in Notes 21, 22, and 27 of Table 6.6.3.2.3-1G and the restriction on the single-tone uplink transmission to sub-carrier index > 2 in Note 44 of Table 6.6.3.2.3-1G are intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future.

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.3.2.

This test use minimum requirements from many releases of TS 36.101 [2] due to release independence defined in TS 36.307 [16]

### 6.6.3.2.4 Test description

#### 6.6.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in Table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1)<br>(Note 6, Note 7) | | | | Low range, Mid range, High range<br>(Note 6, 13, 16) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, Highest<br>(Note 13, 16) | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | N/A for Spurious Emissions testing | | | QPSK | 6 | 6 |
| 1.4MHz | | | | QPSK | 1 | 1 |
| 3MHz | | | | QPSK | 15 | 15 |
| 3MHz | | | | QPSK | 1 | 1 |
| 5MHz | | | | QPSK | 25 | 25[12] |
| 5MHz | | | | QPSK | 1 | 1[12] |
| 5MHz | | | | QPSK | 20[8] | - |
| 10MHz | | | | QPSK | 50 | 50 |
| 10MHz | | | | QPSK | 1 | 1 |
| 10MHz | | | | QPSK | 30[15] | |
| 10MHz | | | | QPSK | 32[9] | - |
| 10MHz | | | | QPSK | 1[10, 14] | - |
| 15MHz | | | | QPSK | 75 | 75 |
| 15MHz | | | | QPSK | 54[3, 11] | 54[4, 18] |
| 15MHz | | | | QPSK | 1 | 1[5] |
| 20MHz | | | | QPSK | 100 | 100 |
| 20MHz | | | | QPSK | 54[3, 11] | 54[4, 18] |
| 20MHz | | | | QPSK | 1 | 1[5] |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: The 1 RB allocation shall be tested at both RB #0 and RB #max.
Note 3: To be used for requirements under note 15 in table 6.6.3.2.3-1 and table 6.6.3.2.3-1A, note 16 in table 6.6.3.2.3-1B, note 21 in table 6.6.3.2.3-1C in high range at RB#(full allocation – 54), instead of full allocation.
Note 4: To be used for requirements under note 16 in table 6.6.3.2.3-1 and table 6.6.3.2.3-1A, note 17 in table 6.6.3.2.3-1B, note 22 in table 6.6.3.2.3-1C in high range - 5MHz at RB#(full allocation – 54), instead of full allocation.
Note 5: For requirements under note 16 in table 6.6.3.2.-1 and table 6.6.3.2.3-1A, note 17 in table 6.6.3.2.3-1B, note 22 in table 6.6.3.2.3-1C (high range – 5MHz) is tested instead of high channel.
Note 6: Do not apply for requirements under Note 13 in Tables 6.6.3.2.3-1 to 6.6.3.2.3-1C. Test frequencies for these requirements are defined in Table 6.6.3.2.4.1-2.
Note 7: Void
Note 8: For requirements under note 17 in table 6.6.3.2.3-1A, note 18 in table 6.6.3.2.3-1B, note 23 in table 6.6.3.2.3-1C (high range – 10MHz) is tested with RB #0 to RB #19 used.
Note 9: For requirements under note 17 in table 6.6.3.2.3-1A, note 18 in table 6.6.3.2.3-1B, note 23 in table 6.6.3.2.3-1C high range is tested with RB #4 to RB #35 used.
Note 10: For requirements under note 17 in table 6.6.3.2.3-1A, note 18 in table 6.6.3.2.3-1B, note 23 in table 6.6.3.2.3-1C high range is tested with RB #4 and (RB#max -4) used.
Note 11: To be used for requirements under note 17 in table 6.6.3.2.3-1, note 18 in table 6.6.3.2.3-1A, note 19 in table 6.6.3.2.3-1B and note 27 in table 6.6.3.2.3-1C in low range at RB#0, instead of full allocation.
Note 12: For requirements under note 16 in table 6.6.3.2.3-1 and table 6.6.3.2.3-1A, note 17 in table 6.6.3.2.3-1B, note 22 in table 6.6.3.2.3-1C, the message exception in Table 6.6.3.2.4.3-1 is used to test with the high range.
Note 13: For requirements under note 31 in table 6.6.3.2.3-1C and note 34 in table 6.6.3.2.3-1D only 720.5 MHz is tested with 5 MHz and only 723 MHz is tested with 10 MHz.
Note 14: For requirements under note 31 in table 6.6.3.2.3-1C and note 34 in table 6.6.3.2.3-1D RB #2 and RB #47 used.
Note 15: To be used for requirements under note 31 in table 6.6.3.2.3-1C and note 34 in table 6.6.3.2.3-1D at RB#2, instead of full allocation.
Note 16: For requirements under note 32 in table 6.6.3.2.3-1C and note 35 in table 6.6.3.2.3-1D only low range and 728 MHz with 10 MHz is tested.
Note 17: Void.
Note 18: To be used for requirements under note 33 in table 6.6.3.2.3-1D, table 6.6.3.2.3-1E or table 6.6.3.2.3-1F (high range-18 MHz for 15MHz channel bandwidth and high range-7 MHz for 20MHz channel bandwidth), instead of full allocation and high range. RB allocation shall start at RBstart=0.

**Table 6.6.3.2.4.1-2: Test frequencies for E-UTRA channel bandwidth for operating band 3 with Note 13 (in Tables 6.6.3.2.3-1 to 6.6.3.2.3-1G)**

| Bandwidth [MHz] | $N_{UL}$ | Frequency of Uplink [MHz] | $N_{DL}$ | Frequency of Downlink [MHz] |
|---|---|---|---|---|
| 1.4 | 19942 | 1784.2 | 1942 | 1879.2 |
| 3 | 19934 | 1783.4 | 1934 | 1878.4 |
| 5 | 19924 | 1782.4 | 1924 | 1877.4 |
| 10 | 19899 | 1779.9 | 1899 | 1874.9 |
| 15 | 19874 | 1777.4 | 1874 | 1872.4 |
| 20 | 19849 | 1774.9 | 1849 | 1869.9 |
| Note: 1.4 and 3 MHz only tested for Rel8 and Rel9. | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.7.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Table 6.6.3.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.2.4.3.

### 6.6.3.2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.3.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.3.2.3-1 to 6.6.3.2.3-1G. For band 14 measurements made in a bandwidth of 6.25kHz, measurement parameter settings defined in table 6.6.3.2.4.2-1 shall be used. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3.2.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

**Table 6.6.3.2.4.2-1: Measurement setup for band 14**

| | **Option 1: Measurement with No RMS VBW available** | **Option2 Measurement with VBW Filtering on Power scale** |
|---|---|---|
| VBW | >=62.5 kHz<br><br>(10 times or more the RBW) | <=43Hz |
| RBW | <=6.25kHz | <=6.25kHz |
| Detector type | Averages signal envelope during each measurement point, such as "RMS detector" | Peak |
| Averaging mode (Trace averaging) | Power (RMS voltage) | Power (RMS voltage), as controlled by "Average Type" |
| Average Type (applies to detector) | Power (RMS voltage) (automatically occurs with "RMS detector") | Not applicable |
| Average Type (applies to VBW filter) | Not applicable | Power (RMS voltage) |
| Number of averages | 30, to reduce variance as required, or use an even longer sweep time | 1 or use an even narrower VBW filter, thus a longer sweep time |
| Sweep time | [Don't specify] | Sweep rate (span divided by sweep time) <= 0.8 * RBW*VBW |

### 6.6.3.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.6.3.2.4.3-1: SystemInformationBlockType1 for Note 16 in table 6.6.3.2.3-1 and table 6.6.3.2.3-1A, Note 17 in table 6.6.3.2.3-1B, Note 22 in table 6.6.3.2.3-1C, table 6.6.3.2.3-1D, table 6.6.3.2.3-1E, table 6.6.3.2.3-1F and table 6.6.3.2.3-1G**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 19 | | |

#### 6.6.3.2.5 Test requirement

Test requirements for Spurious Emissions UE Co-existence are the same as the minimum requirements and are not repeated in this section.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in tables 6.6.3.2.3-1 to 6.6.3.2.3-1G according to the following rule:

The requirements for the UE are release specific and can be found in Tables 6.6.3.2.3-1 to 6.6.3.2.3-1G. If the UE support a band, which is not defined in the table corresponding UE's release, the requirements for this band are taken from the table of earliest release where requirements for this band are defined. This has been described in following Table 6.6.3.2.5-1.

**Table 6.6.3.2.5-1: UE Requirements according to UE E-UTRA release and supported E-UTRA band**

| Band | UE Requirements per release | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Rel-8 | Rel-9 | Rel-10 | Rel-11 | Rel-12 | Rel-13 | Rel-14 | Rel-15 |
| 1 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 2 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 3 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 4 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 5 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 6 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 7 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 8 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 9 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 10 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 11 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 12 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 13 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 14 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| … | | | | | | | | |
| 17 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 18 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 19 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 20 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 21 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 22 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 23 | Table 6.6.3.2.3- | Table 6.6.3.2.3- | Table 6.6.3.2.3- | Table 6.6.3.2.3- | Table 6.6.3.2.3- | Table 6.6.3.2.3- | Table 6.6.3.2.3- | Table 6.6.3.2.3- |

| | 1B | 1B | 1B | 1C | 1D | 1E | 1F | 1G |
|---|---|---|---|---|---|---|---|---|
| 24 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 25 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 26 | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 27 | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 28 | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 30 | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 31 | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| … | | | | | | | | |
| 33 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 34 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 35 | | | | | | | | |
| 36 | | | | | | | | |
| 37 | | | | | | | | |
| 38 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 39 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 40 | Table 6.6.3.2.3-1 | Table 6.6.3.2.3-1A | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 41 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 42 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 43 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 44 | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 45 | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| … | | | | | | | | |
| 48 | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| ….. | | | | | | | | |
| 65 | N/A [1] | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 66 | N/A [2] | N/A [2] | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| … | | | | | | | | |
| 68 | N/A [1] | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G |
| … | | | | | | | | |
| 71 | N/A [1] | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G |
| 72 | N/A [1] | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G |
| ….. | | | | | | | | |
| 74 | N/A [1] | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G |
| Note 1: Operating band with number > 64 requires Rel-9 signalling (refer to TS 36.307 Ch. 3A.1 [16]) and tests can only be done from Rel-9 and onwards.<br>Note 2: Asymmetric operating band is release independent from release 10 (refer to TS 36.307 Ch. 3A.1 [16]) and tests can only be done from Rel-10 and onwards.<br>Note 3: Protected bands with Note 38 in Table 6.6.3.2.3-1E are tested in 6.6.3EA.2 or 6.6.3F.2. | | | | | | | | |

NOTE 1: The frequency range applicable with network signalled values of NS_05, NS_08, NS_09, NS_15,NS_16, NS_27, NS_36 are covered in 6.6.3.3 Additional Spurious Emissions.

NOTE 2: The following is applied to Note2 in Table 6.6.3.2.3-1, Table 6.6.3.2.3-1A, Table 6.6.3.2.3-1B, Table 6.6.3.2.3-1C and Table 6.6.3.2.3-1E. For frequency with 2nd, 3rd or 4th harmonic spurious emissions, the measurements are covered in 6.6.3.1.

NOTE 2: The restriction on the maximum uplink transmission to 54 RB in Notes 14 and 15 of Table 6.6.3.2.5-1 is intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future.

## 6.6.3.2_1 Void

## 6.6.3.2A Spurious emission band UE co-existence for CA

Editor's note:

- This test case contains different requirements for different UE releases
- Additional TP analysis needs to be added to TR36.905

### 6.6.3.2A.0 Minimum conformance requirements

This clause specifies the requirements for the specified carrier aggregation configurations for coexistence with protected bands.

NOTE 1: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

For inter-band carrier aggregation with the uplink assigned to two E-UTRA bands, the requirements in Table 6.6.3.2A.0-1a to 6.6.3.2A.0-1d apply on each component carrier with both component carriers are active.

NOTE 2: For inter-band carrier aggregation with uplink assigned to two E-UTRA bands the requirements in Table 6.6.3.2A.0-1a to 6.6.3.2A.0-1d could be verified by measuring spurious emissions at the specific frequencies where second and third order intermodulation products generated by the two transmitted carriers can occur; in that case, the requirements for remaining applicable frequencies in Table 6.6.3.2A.0-1a to 6.6.3.2A.0-1d would be considered to be verified by the measurements verifying the one uplink inter-band CA UE to UE co-existence requirements.

**Table 6.6.3.2A.0-1a: Requirements for dual-uplink inter-band carrier aggregation limits for Rel-11 and Rel-12**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | Note |
| CA_1A-3A | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 38, 40, 41, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 11,18,19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7, 10 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| CA_1A-5A | E-UTRA Band 1, 5, 7, 8, 22, 28, 31, 38, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3,34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_1A-7A | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_1A-8A | E-UTRA Band 1, 20, 26, 28, 31, 32, 38, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2,3 |
| | E-UTRA band 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 11 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 11 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7, 11 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| CA_1A-19A | E-UTRA Band 1, 11, 21, 28, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | 3 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 7 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_1A-21A | E-UTRA Band 11 | $F_{DL_low}$ | - | $F_{DL_high}$ | -35 | 1 | 3, 16 |
| | E-UTRA Band 1, 18, 19, 28, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 16 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_2A-4A | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 26, 27, 28, 29, 30, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CA_2A-13A | E-UTRA Band 4, 5,10,12,13,17, 22, 23, 26, 27, 29, 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2,14, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 24, 30, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 3 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 3, 9 |
| CA_3A-5A | E-UTRA Band 1, 5, 7, 8, 22, 28, 31, 38, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3,34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| CA_3A-7A | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 40, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_3A-8A | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2, 3 |
| | E-UTRA band 11, , , 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10,11 |
| | E-UTRA band 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 10, 11 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3,11,17 |
| CA_3A-19A | E-UTRA Band 1, 11, 21, 28 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 4 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_3A-20A | E-UTRA Band 1, 7, 8, 31, 32, 33, 34, 40, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 22, 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| eCA_3A-26A | E-UTRA Band 1, 5, 7, 26, 34, 39, 40, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA band 22, 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 10 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 851 | - | 859 | -53 | 0.00625 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| CA_4A-7A | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 26, 27, 28, 29, 30, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_4A-12A | E-UTRA Band 2, 5, 7,13, 14, 17, 22, 23, 24, 25, 26, 27, 30, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_4A-13A | E-UTRA Band 2,4, 5, 7, 10,12,13,17, 22, 23,25, 26, 27, 29, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 24, 30, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 3 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 3, 9 |
| CA_4A-17A | E-UTRA Band 2, 5, 7,13, 14, 17, 22, 23, 24, 25, 26, 27, 30, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_5A-7A | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 22, 28, 29, 30, 31, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_5A-12A | E-UTRA Band 2, 5, 13, 14, 17, 22, 23, 24, 25, 30, 31, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 4, 10, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_5A-17A | E-UTRA Band 2, 5, 13, 14, 17, 22, 23, 24, 25, 30, 31, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 4, 10, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_7A-20A | E-UTRA Band 1,3, 7, 8, 22, 28, 31,32, 33, 34, 40, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_7A-28A | E-UTRA Band 2, 3, 5, 7,8, 20, 26, 27,31,34, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1, 4, 10, 22, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_19A-21A | E-UTRA Band 1, 18, 19, 28, 34, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3, 16 |
| | E-UTRA Band 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 16 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA 39A-41A | E-UTRA Band 1, 8, 26, 34, 40, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | - | 1855 | -40 | 1 | 20 |
| | Frequency range | 1855 | - | 1880 | -15.5 | 5 | 3, 13, 20 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 18 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.2-1
NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.4.2-1) for which the 2nd, 3rd or 4th harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 3: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.0-1 from the edge of the aggregated channel bandwidth.
NOTE 4: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.
NOTE 5: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.

NOTE 6: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 7: Applicable when NS_05 in section 6.6.3.3.3.2 is signalled by the network.
NOTE 8: Applicable when NS_08 in subclause 6.6.3.3.3.4 is signalled by the network
NOTE 9: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD.
NOTE10: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.
NOTE 11: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.
NOTE 12: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE13: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.
NOTE 14: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 15: Applicable when NS_15 in subclause 6.6.3.3.3.10 is signalled by the network.
NOTE 16: Applicable when NS_09 in subclause 6.6.3.3.3.5 is signalled by the network
NOTE 17: This requirement is applicable only when Band 3 transmission frequency is less than or equal to 1765 MHz.
NOTE 18: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz
NOTE 19: Void.
NOTE 20: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.

**Table 6.6.3.2A.0-1b: Requirements for dual-uplink inter-band carrier aggregation limits for Rel-13**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA_1A-3A | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 38, 40, 41, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 11,18,19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7, 10 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| CA_1A-5A | E-UTRA Band 1, 5, 7, 8, 22, 28, 31, 38, 40, 42, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3,34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_1A-7A | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31,32, 40, 42, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_1A-8A | E-UTRA Band 1, 20, 26, 28, 31, 32, 38, 40, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2,3 |
| | E-UTRA band 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 11 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 11 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7, 11 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| CA_1A-18A | E-UTRA Band 1, 11, 21, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 7 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_1A-19A | E-UTRA Band 1, 11, 21, 28, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 7 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_1A-21A | E-UTRA Band 11 | $F_{DL_low}$ | - | $F_{DL_high}$ | -35 | 1 | 3, 16 |
| | E-UTRA Band 1, 18, 19, 28, 34, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 42, 65 | | | | | | |
| | E-UTRA Band 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 16 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_1A-26A | E-UTRA Band 1,5, 7, 11, 18, 19, 20, 21, 22, 26, 27, 31, 38, 40, 42, 43, 44, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1880 | - | 1895 | -40 | 1 | 3, 12 |
| | Frequency range | 1895 | - | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 3, 12, 13 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| CA_1A-28A | E-UTRA Band 5, 7, 8, 18, 19, 20, 26, 27, 31, 32, 38, 40, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 22, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 21 |
| | E-UTRA Band 1, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 3, 22 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 3 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5, 7 |
| CA_1A-42A | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 7 |
| CA_2A-4A | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 26, 27, 28, 29, 30, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-5A | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 28, 29, 30, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-12A | E-UTRA Band 5, 13, 14, 17, 23, 24, 26, 27, 30, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 12, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 4, 10 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-13A | E-UTRA Band 4, 5,10,12,13,17, 22, 23, 26, 27, 29, 41, 42, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2,14, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 24, 30, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 3, 9 |
| CA_3A-5A | E-UTRA Band 1, 5, 7, 8, 22, 28, 31, 38, 40, 42, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3,34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| CA_3A-7A | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 40, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_3A-8A | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2, 3 |
| | E-UTRA band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10,11 |
| | E-UTRA band 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 10, 11 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3,11,17 |
| CA_3A-19A | E-UTRA Band 1, 11, 21, 28, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | 3 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 4, 7 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_3A-20A | E-UTRA Band 1, 7, 8, 31, 32, 33, 34, 40, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 22, 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| CA_3A-26A | E-UTRA Band 1, 5, 7, 26, 34, 39, 40, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA band 22, 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 10 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 851 | - | 859 | -53 | 0.00625 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| CA_4A-5A | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 28, 29, 30, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_4A-7A | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 26, 27, 28, 29, 30, 43, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_4A-12A | E-UTRA Band 2, 5, 7,13, 14, 17, 22, 23, 24, 25, 26, 27, 30, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 42, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_4A-13A | E-UTRA Band 2,4, 5, 7, 10,12,13,17, 22, 23,25, 26, 27, 29, 41, 43, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | E-UTRA Band 24, 30, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 3 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 3, 9 |
| CA_4A-17A | E-UTRA Band 2, 5, 7,13, 14, 17, 22, 23, 24, 25, 26, 27, 30, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 42, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_5A-7A | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 22, 28, 29, 30, 31, 40, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_5A-12A | E-UTRA Band 2, 5, 13, 14, 17, 22, 23, 24, 25, 30, 31, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 4, 10, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_5A-17A | E-UTRA Band 2, 5, 13, 14, 17, 22, 23, 24, 25, 30, 31, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 4, 10, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_7A-20A | E-UTRA Band 1,3, 7, 8, 22, 28, 31, 32, 33, 34, 40, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_7A-28A | E-UTRA Band 2, 3, 5, 7, 8, 20, 26, 27, 31, 34, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1, 4, 10, 22, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_18A-28A | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 21 |
| | E-UTRA Band 1, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | E-UTRA Band 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | 3 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_19A-21A | E-UTRA Band 1, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3, 16 |
| | E-UTRA Band 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 16 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA 39A-41A | E-UTRA Band 1, 8, 26, 34, 40, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | - | 1855 | -40 | 1 | 20 |
| | Frequency range | 1855 | - | 1880 | -15.5 | 5 | 3, 13, 20 |
| CA 39A-41C | E-UTRA Band 1, 8, 26, 34, 40, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | - | 1855 | -40 | 1 | 20 |
| | Frequency range | 1855 | - | 1880 | -15.5 | 5 | 3, 13, 20 |
| CA 39C-41A | E-UTRA Band 34, 40, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. In case the exceptions are allowed due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3 or 4 for the 2nd, 3rd or 4th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

NOTE 3: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

NOTE 4: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.

NOTE 5: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.

NOTE 6: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 7: Applicable when NS_05 in section 6.6.3.3.3.2 is signalled by the network.

NOTE 8: Applicable when NS_08 in subclause 6.6.3.3.3.4 is signalled by the network

NOTE 9: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD.

NOTE10: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.

NOTE 11: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.

NOTE 12: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE13: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

NOTE 14: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 15: Applicable when NS_15 in subclause 6.6.3.3.3.10 is signalled by the network.

NOTE 16: Applicable when NS_09 in subclause 6.6.3.3.3.5 is signalled by the network

NOTE 17: This requirement is applicable only when Band 3 transmission frequency is less than or equal to 1765 MHz.

NOTE 18: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz

NOTE 19: Void.

NOTE 20: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to [54 RB] for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.

NOTE 21: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic

spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 22: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.

NOTE 23: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.

**Table 6.6.3.2A.0-1c: Requirements for dual-uplink inter-band carrier aggregation limits for Rel-14**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA_1A-3A | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 38, 40, 41, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 11,18,19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7, 10 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| CA_1A-5A | E-UTRA Band 1, 5, 7, 8, 22, 28, 31, 38, 40, 42, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3,34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_1A-7A | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31,32, 40, 42, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_1A-8A | E-UTRA Band 1, 20, 26, 28, 31, 32, 38, 40, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2,3 |
| | E-UTRA band 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 11 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 11 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7, 11 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| CA_1A-18A | E-UTRA Band 1, 11, 21, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 7 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_1A-19A | E-UTRA Band 1, 11, 21, 28, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 7 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_1A-21A | E-UTRA Band 11 | $F_{DL_low}$ | - | $F_{DL_high}$ | -35 | 1 | 3, 16 |
| | E-UTRA Band 1, 18, 19, 28, 34, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 42, 65 | | | | | | |
| | E-UTRA Band 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 16 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_1A-26A | E-UTRA Band 1,5, 7, 11, 18, 19, 20, 21, 22, 26, 27, 31, 38, 40, 42, 43, 44, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1880 | - | 1895 | -40 | 1 | 3, 12 |
| | Frequency range | 1895 | - | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 3, 12, 13 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| CA_1A-28A | E-UTRA Band 5, 7, 8, 18, 19, 20, 26, 27, 31, 32, 38, 40, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 22, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 21 |
| | E-UTRA Band 1, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 3, 22 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 3 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5, 7 |
| CA_1A-42A | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 7 |
| CA_2A-4A | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 22, 24, 26, 27, 28, 29, 30, 41, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-5A | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 24, 28, 29, 30, 42, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-7A | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 26, 27, 29, 30, 42, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-12A | E-UTRA Band 5, 13, 14, 17, 24, 26, 27, 30, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 12, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 4, 10, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-13A | E-UTRA Band 4, 5,10,12,13,17, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 22, 26, 27, 29, 41, 42, 66, 70 | | | | | | |
| | E-UTRA Band 2,14, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 24, 30, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 3 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 3, 9 |
| CA_3A-5A | E-UTRA Band 1, 5, 7, 8, 22, 28, 31, 38, 40, 42, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3,34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| CA_3A-7A | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 40, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_3A-8A | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2, 3 |
| | E-UTRA band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10,11 |
| | E-UTRA band 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 10, 11 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3,11,17 |
| CA_3A-19A | E-UTRA Band 1, 11, 21, 28, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 4 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_3A-20A | E-UTRA Band 1, 7, 8, 31, 32, 33, 34, 40, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 22, 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| CA_3A-21A | E-UTRA Band 1, 18, 19, 28, 34, 65 | FDL_low | - | FDL_high | -50 | 1 | |
| | E-UTRA Band 42 | FDL_low | - | FDL_high | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_3A-26A | E-UTRA Band 1, 5, 7, 26, 34, 39, 40, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA band 22, 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 10 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 851 | - | 859 | -53 | 0.00625 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| CA_3A-42A | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 45, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 13 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 13 |
| CA_4A-5A | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 28, 29, 30, 43, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_4A-7A | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 26, 27, 28, 29, 30, 43, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_4A-12A | E-UTRA Band 2, 5, 7,13, 14, 17, 22, 24, 25, 26, 27, 30, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 42, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_4A-13A | E-UTRA Band 2,4, 5, 7, 10,12,13,17, 22, 25, 26, 27, 29, 41, 43, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 24, 30, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 3 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 3, 9 |
| CA_4A-17A | E-UTRA Band 2, 5, 7,13, 14, 17, 22, 24, 25, 26, 27, 30, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 42, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_5A-7A | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 22, 28, 29, 30, 31, 40, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_5A-12A | E-UTRA Band 2, 5, 13, 14, 17, 22, 24, 25, 30, 31, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 4, 10, 41, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_5A-17A | E-UTRA Band 2, 5, 13, 14, 17, 22, 24, 25, 30, 31, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 4, 10, 41, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_7A-20A | E-UTRA Band 1,3, 7, 8, 22, 28, 31, 32, 33, 34, 40, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_7A-28A | E-UTRA Band 2, 3, 5, 7, 8, 20, 26, 27, 31, 34, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1, 4, 10, 22, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_8A-41A | E-UTRA Band 1, 28, 34, 39, 40, 45, 65, | FDL_low | - | FDL_high | -50 | 1 | |
| | E-UTRA band 3, 42 | FDL_low | - | FDL_high | -50 | 1 | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | E-UTRA band 11, 21 | FDL_low | - | FDL_high | -50 | 1 | 23, 30 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23, 30 |
| CA_18A-28A | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 21 |
| | E-UTRA Band 1, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | E-UTRA Band 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | 3 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_19A-21A | E-UTRA Band 1, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3, 16 |
| | E-UTRA Band 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 16 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_19A-42A | E-UTRA Band 1, 11, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_21A-42A | E-UTRA Band 1, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA 39A-41A | E-UTRA Band 1, 8, 26, 34, 40, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | - | 1855 | -40 | 1 | 20 |
| | Frequency range | 1855 | - | 1880 | -15.5 | 5 | 3, 13, 20 |
| CA_39A-41C | E-UTRA Band 1, 8, 26, 34, 40, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | - | 1855 | -40 | 1 | 20 |
| | Frequency range | 1855 | - | 1880 | -15.5 | 5 | 3, 13, 20 |
| CA_39C-41A | E-UTRA Band 34, 40, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_41A-42A | E-UTRA Band 1, 3, 5, 8, 26, 28, 33, 34, 39, 40, 44, 45, 65, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 18 |
| | Frequency range | 1839.9 | | 1879.9 | -50 | 1 | 18 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 4, 18 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. In case the exceptions are allowed due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3 or 4 for the 2nd, 3rd or 4th harmonic respectively. The exception is allowed if the

measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

NOTE 3: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

NOTE 4: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.

NOTE 5: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.

NOTE 6: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 7: Applicable when NS_05 in section 6.6.3.3.3.2 is signalled by the network.

NOTE 8: Applicable when NS_08 in subclause 6.6.3.3.3.4 is signalled by the network

NOTE 9: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD.

NOTE10: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.

NOTE 11: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.

NOTE 12: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE13: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

NOTE 14: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 15: Applicable when NS_15 in subclause 6.6.3.3.3.10 is signalled by the network.

NOTE 16: Applicable when NS_09 in subclause 6.6.3.3.3.5 is signalled by the network

NOTE 17: This requirement is applicable only when Band 3 transmission frequency is less than or equal to 1765 MHz.

NOTE 18: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz

NOTE 19: Void

NOTE 20: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.

NOTE 21: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 22: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.

NOTE 23: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.

**Table 6.6.3.2A.0-1d: Requirements for dual-uplink inter-band carrier aggregation limits for Rel-15**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA_1A-3A | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 38, 40, 41, 43, 44, 50, 51, 65, 67, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 11,18,19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7, 10 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| CA_1A-5A | E-UTRA Band 1, 5, 7, 8, 22, 28, 31, 38, 40, 42, 43, 50, 51, 65, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3,34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_1A-7A | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31,32, 40, 42, 43, 50, 51, 65, 67, 72, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_1A-8A | E-UTRA Band 1, 20, 26, 28, 31, 32, 38, 40, 50, 51, 65, 67, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2,3 |
| | E-UTRA band 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 11 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 11 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7, 11 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| CA_1A-11A | E-UTRA Band 1, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_1A-18A | E-UTRA Band 1, 11, 21, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 7 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_1A-19A | E-UTRA Band 1, 11, 21, 28, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |

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|---|---|---|---|---|---|---|---|
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 7 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_1A-21A | E-UTRA Band 11 | $F_{DL_low}$ | - | $F_{DL_high}$ | -35 | 1 | 3, 16 |
| | E-UTRA Band 1, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 16 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_1A-26A | E-UTRA Band 1,5, 7, 11, 18, 19, 20, 21, 22, 26, 27, 31, 38, 40, 42, 43, 44, 50, 51, 65, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1880 | - | 1895 | -40 | 1 | 3, 12 |
| | Frequency range | 1895 | - | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 3, 12, 13 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| CA_1A-28A | E-UTRA Band 5, 7, 8, 18, 19, 20, 26, 27, 31, 32, 38, 40, 41, 50, 51, 72, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 22, 42, 43, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 21 |
| | E-UTRA Band 1, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 3, 22 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 3 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5, 7 |
| CA_1A-42A | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 44, 50, 51, 65, 67, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 3,12 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 3, 12, 13 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 3, 12, 13 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 7 |
| CA_2A-4A | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 22, 24, 26, 27, 28, 29, 30, 41, 50, 51, 66, 70, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-5A | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 24, 28, 29, 30, 42, 50, 51, 70, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |

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|---|---|---|---|---|---|---|---|
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-7A | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 26, 27, 29, 30, 42, 50, 51, 65, 66, 70, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-12A | E-UTRA Band 5, 13, 14, 17, 24, 26, 27, 30, 41, 50, 51, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 12, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 4, 10, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-13A | E-UTRA Band 4, 5,10,12,13,17, 22, 26, 27, 29, 41, 42, 50, 51, 66, 70, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2,14, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 24, 30, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 3 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 3, 9 |
| CA_2A-49A | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 66, 70, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_3A-5A | E-UTRA Band 1, 5, 7, 8, 22, 28, 31, 38, 40, 42, 43, 50, 51, 65, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3,34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| CA_3A-7A | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 40, 43, 44, 50, 51, 65, 67, 72, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_3A-8A | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 44, 50, 51, 65, 67, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2, 3 |
| | E-UTRA band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10,11 |
| | E-UTRA band 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 10, 11 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3,11,17 |
| CA_3A-18A | E-UTRA Band 1, 3, 11, 21, 28, 34, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | PHS |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_3A-19A | E-UTRA Band 1, 11, 21, 28, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 4 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 3 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_3A-20A | E-UTRA Band 1, 7, 8, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 72, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 22, 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| CA_3A-21A | E-UTRA Band 1, 18, 19, 28, 34, 65 | $FDL_{low}$ | - | $FDL_{high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $FDL_{low}$ | - | $FDL_{high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |

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|---|---|---|---|---|---|---|---|
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_3A-26A | E-UTRA Band 1, 5, 7, 26, 34, 39, 40, 43, 50, 51, 65, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA band 22, 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 10 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 851 | - | 859 | -53 | 0.00625 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| CA_3A-28A | E-UTRA Band 1, 22, 42, 43, 50, 51, 65, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 5, 7, 8, 20, 26, 27, 31, 34, 38, 40, 41, 72, 73 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 10 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 5 |
| CA_3A-40A | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 43, 44, 45, 50, 51, 65, 67, 68, 69, 72, 73, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 10 |
| CA_3A-42A | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 45, 50, 51, 65, 67, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 13 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 13 |
| CA_4A-5A | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 28, 29, 30, 43, 50, 51, 70, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_4A-7A | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 26, 27, 28, 29, 30, 43, 50, 51, 66, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_4A-12A | E-UTRA Band 2, 5, 7,13, 14, 17, 22, 24, 25, 26, 27, 30, 41, 43, 50, 51, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 42, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_4A-13A | E-UTRA Band 2,4, 5, 7, 10,12,13,17, 22, 25, 26, 27, 29, 41, 43, 50, 51, 66, 70, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 24, 30, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 3 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 3, 9 |
| CA_4A-17A | E-UTRA Band 2, 5, 7,13, 14, 17, 22, 24, 25, 26, 27, 30, 41, 43, 50, 51, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 42, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_5A-7A | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 22, 28, 29, 30, 31, 40, 42, 43, 50, 51, 65, 66, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_5A-12A | E-UTRA Band 2, 5, 13, 14, 17, 22, 24, 25, 30, 31, 42, 43, 50, 51, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 4, 10, 41, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_5A-17A | E-UTRA Band 2, 5, 13, 14, 17, 22, 24, 25, 30, 31, 42, 43, 50, 51, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 4, 10, 41, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA-5A-40A | E-UTRA Band 1, 3, 5, 7, 8, 28, 31, 34, 38, 42, 43, 45, 65, 73 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| CA_7A-8A | E-UTRA Band 1, 5, 10, 20, 26, 27, 28, 31, 32, 34, 38, 40, 50, 51, 65, 67, 68, 69, 72, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CA_7A-20A | E-UTRA Band 1,3, 7, 8, 22, 28, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 72, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_7A-26A | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 22, 28, 29, 30, 31, 40, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 7 |
| CA_7A-28A | E-UTRA Band 2, 3, 5, 7, 8, 20, 26, 27, 31, 34, 40, 72 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1, 4, 10, 22, 42, 43, 50, 51, 65, 66, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 13, 14 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 13, 14 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 14 |
| CA_8A-39A | E-UTRA Band 1, 40, 45, 50, 51, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 22, 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| CA_8A-41A | E-UTRA Band 1, 28, 34, 39, 40, 45, 50, 51, 65, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23, 30 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23, 30 |
| CA_11A-18A | E-UTRA Band 1, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| CA_11A-26A | E-UTRA Band 1, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| CA_18A-28A | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 21 |
| | E-UTRA Band 1, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | E-UTRA Band 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 3 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | 3 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_19A-21A | E-UTRA Band 1, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3, 16 |
| | E-UTRA Band 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 16 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3, 8 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_19A-42A | E-UTRA Band 1, 11, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_21A-28A | E-UTRA Band 1, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | E-UTRA Band 18, 19, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 5 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_21A-42A | E-UTRA Band 1, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_26A-46A | E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 48, 65, 66, 70, 71 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 1 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA_28A-41A | E-UTRA Band E-UTRA Band 1, 4, 10, 22, 42, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | E-UTRA band 2, 3, 5, 7, 8, 20, 25, 26, 27, 31, 32, 33, 34, 38, 40, 41, 44, 45, 48, 66, 67, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 18, 21 |
| | E-UTRA band 9, 18, 19 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 18 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 3, 22 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 3 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 5, 18 |
| CA_28A-42A | E-UTRA Band 1, 4, 10, 50, 51, 65, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 41, 66, 72, 73 | | | | | | |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 21 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 5 |
| CA 39A-41A | E-UTRA Band 1, 8, 26, 34, 40, 42, 44, 50, 51, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | - | 1855 | -40 | 1 | 20 |
| | Frequency range | 1855 | - | 1880 | -15.5 | 5 | 3, 13, 20 |
| CA_39A-41C | E-UTRA Band 1, 8, 26, 34, 40, 42, 44, 50, 51, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | - | 1855 | -40 | 1 | 20 |
| | Frequency range | 1855 | - | 1880 | -15.5 | 5 | 3, 13, 20 |
| CA_39C-41A | E-UTRA Band 34, 40, 42, 44, 50, 51, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_41A-42A | E-UTRA Band 1, 3, 5, 8, 26, 28, 33, 34, 39, 40, 44, 45, 50, 51, 65, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 18 |
| | Frequency range | 1839.9 | | 1879.9 | -50 | 1 | 18 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 4, 18 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.2-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. In case the exceptions are allowed due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3 or 4 for the 2nd, 3rd or 4th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

NOTE 3: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.0-1 from the edge of the aggregated channel bandwidth.

NOTE 4: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.

NOTE 5: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.

NOTE 6: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.4.2-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 7: Applicable when NS_05 in section 6.6.3.3.3.2 is signalled by the network.

NOTE 8: Applicable when NS_08 in subclause 6.6.3.3.3.4 is signalled by the network

NOTE 9: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD.

NOTE10: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.

NOTE 11: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.

NOTE 12: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE13: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

NOTE 14: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 15: Applicable when NS_15 in subclause 6.6.3.3.3.10 is signalled by the network.

NOTE 16: Applicable when NS_09 in subclause 6.6.3.3.3.5 is signalled by the network

NOTE 17: This requirement is applicable only when Band 3 transmission frequency is less than or equal to

1765 MHz.
NOTE 18: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz
NOTE 19: Void
NOTE 20: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.
NOTE 21: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.4.2-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 22: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.
NOTE 23: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.NOTE 24: Void
NOTE 25: Void

**Table 6.6.3.2A.0-2a: Spurious emission band UE co-existence for intraband carrier aggregation limits for Rel10**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | Note |
| CA_1C | E-UTRA Band 1, 7, 8, 11, 18, 19, 20, 21, 22, 38, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 8 |
| CA_40C | E-UTRA Band 1, 3, 7, 8, 20, 22, 33, 34, 38, 39, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.2-1
NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd , 3rd , 4th , [or 5th ] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th ] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.
NOTE 3: To meet these requirements some restriction will be needed for either the operating band or protected band
NOTE 4: N/A
NOTE 5: N/A
NOTE 6: N/A
NOTE 7: N/A
NOTE 8: The requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.1.3-1 from the edge of the channel bandwidth.
NOTE 9: N/A.

**Table 6.6.3.2A.0-2b: Spurious emission band UE co-existence for intraband carrier aggregation limits for Rel11**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | Note |
| CA_1C | E-UTRA Band 1, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 38, 40, 41, 42, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | | | | | | | |
| CA_7C | E-UTRA Band 1, 3, 7, 8, 20, 22, 27, 28, 29, 33, 34, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_38C | E-UTRA Band 1,3, 8, 20, 22, 27, 28, 29, 33, 34, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_40C | E-UTRA Band 1, 3, 7, 8, 20, 22, 26, 27, 33, 34, 38, 39, 41, 42, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_41C | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 23, 24, 25, 26, 27, 28, 29, 34, 39, 40, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.2-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to $2^{nd}$ , $3^{rd}$ , $4^{th}$ [or $5^{th}$ ] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the $2^{nd}$, $3^{rd}$, $4^{th}$ or [$5^{th}$ ] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

NOTE 3: To meet these requirements some restriction will be needed for either the operating band or protected band

NOTE 4: N/A

NOTE 5: N/A

NOTE 6: N/A

NOTE 7: N/A

NOTE 8: N/A

NOTE 9: N/A

NOTE 10: The requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.1.3-1 from the edge of the aggregated channel bandwidth.

NOTE 11: N/A

NOTE 12: N/A

**Table 6.6.3.2A.0-2c: Spurious emission band UE co-existence for intraband carrier aggregation limits for Rel12**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | Note |
| CA_1C | E-UTRA Band 1, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 38, 40, 41, 42, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| CA_3C | E-UTRA Band 1, 7, 8, 20, 26, 27, 28, 31, 33, 34, 38, 41, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_7C | E-UTRA Band 1, 3, 7, 8, 20, 22, 27, 28, 29, 30, 31, 33, 34, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_38C | E-UTRA Band 1,3, 8, 20, 22, 27, 28, 29, 30, 31, 33, 34, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_39C | E-UTRA Band 22, 34, 40, 41, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_40C | E-UTRA Band 1, 3, 7, 8, 20, 22, 26, 27, 33, 34, 38, 39, 41, 42, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_41C | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_42C | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 33, 34, 38, 40, 41, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | |

NOTE 1: FDL_low and FDL_high refer to each E-UTRA frequency band specified in Table 5.2-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval

NOTE 3: To meet these requirements some restriction will be needed for either the operating band or protected band

NOTE 4: N/A

NOTE 5: N/A

NOTE 6: N/A

NOTE 7: N/A

NOTE 8: N/A

NOTE 9: N/A

NOTE 10: The requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.0-1 from the edge of the aggregated channel bandwidth.

NOTE 11: N/A

NOTE 12: N/A

NOTE 13: N/A

NOTE 14: N/A

**Table 6.6.3.2A.0-2d: Spurious emission band UE co-existence for intraband carrier aggregation limits for Rel13**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA_1C | E-UTRA Band 1, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| CA_3C | E-UTRA Band 1, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 41, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_7C | E-UTRA Band 1, 3, 7, 8, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_8B | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 7 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA Band 22, 41, 42, 43 | $F_{DL_low}$ | | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_38C | E-UTRA Band 1,3, 8, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_39C | E-UTRA Band 22, 34, 40, 41, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_40C | E-UTRA Band 1, 3, 7, 8, 20, 22, 26, 27, 32, 33, 34, 38, 39, 41, 42, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_41C | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_42C | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 65, 66, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | |

NOTE 1: FDL_low and FDL_high refer to each E-UTRA frequency band specified in Table 5.5-1.
NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.
NOTE 3: To meet these requirements some restriction will be needed for either the operating band or protected band.
NOTE 4: N/A
NOTE 5: N/A
NOTE 6: N/A
NOTE 7: N/A
NOTE 8: N/A
NOTE 9: N/A
NOTE 10: The requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.
NOTE 11: N/A
NOTE 12: N/A
NOTE 13: N/A
NOTE 14: N/A

**Table 6.6.3.2A.0-2e: Spurious emission band UE co-existence for intraband carrier aggregation limits for Rel14**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA_1C | E-UTRA Band 1, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| CA_3C | E-UTRA Band 1, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 41, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_5B | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_7C | E-UTRA Band 1, 3, 7, 8, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_8B | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 7 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA Band 22, 41, 42, 43 | $F_{DL_low}$ | | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_38C | E-UTRA Band 1,3, 8, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_39C | E-UTRA Band 22, 34, 40, 41, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_40C | E-UTRA Band 1, 3, 7, 8, 20, 22, 26, 27, 32, 33, 34, 38, 39, 41, 42, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_40D | E-UTRA Band 1, 3, 7, 8, 20, 22, 26, 27, 32, 33, 34, 38, 39, 41, 42, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_41C | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_42C | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 65, 66, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | |

NOTE 1: FDL_low and FDL_high refer to each E-UTRA frequency band specified in Table 5.5-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval

NOTE 3: To meet these requirements some restriction will be needed for either the operating band or protected band

NOTE 4: N/A

NOTE 5: N/A

NOTE 6: N/A

NOTE 7: N/A

NOTE 8: N/A

NOTE 9: N/A

NOTE 10: The requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

NOTE 11: N/A

NOTE 12: N/A

NOTE 13: N/A

NOTE 14: N/A

**Table 6.6.3.2A.0-2f: Spurious emission band UE co-existence for intraband carrier aggregation limits for Rel15**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA_1C | E-UTRA Band 1, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| CA_3C | E-UTRA Band 1, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 41, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_5B | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 65, 66, 70, 71 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_7C | E-UTRA Band 1, 3, 7, 8, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_8B | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 7 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| | E-UTRA Band 22, 41, 42, 43 | $F_{DL_low}$ | | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_38C | E-UTRA Band 1,3, 8, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_39C | E-UTRA Band 22, 34, 40, 41, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_40C | E-UTRA Band 1, 3, 7, 8, 20, 22, 26, 27, 32, 33, 34, 38, 39, 41, 42, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_40D | E-UTRA Band 1, 3, 7, 8, 20, 22, 26, 27, 32, 33, 34, 38, 39, 41, 42, 43, 44, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_41C | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 65, 66, 70, 71 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_42C | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 65, 66, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | |

NOTE 1: FDL_low and FDL_high refer to each E-UTRA frequency band specified in Table 5.5-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval

NOTE 3: To meet these requirements some restriction will be needed for either the operating band or protected band

NOTE 4: N/A

NOTE 5: N/A

NOTE 6: N/A

NOTE 7: N/A

NOTE 8: N/A

NOTE 9: N/A

NOTE 10: The requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

NOTE 11: N/A

NOTE 12: N/A

NOTE 13: N/A

NOTE 14: N/A

**Table 6.6.3.2A.0-3: Requirements for intraband non-contiguous CA**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | Note |
| CA_4A-4A | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 22, 23, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66, 71 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.2-1<br>NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd or 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RE within the transmission bandwidth (see Figure 5.4.2-1) for which the 2nd or 3rd harmonic, i.e. the frequency equal to two or three times the frequency of that RE, is within the measurement bandwidth (MBW). | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.3.2A.

This test use minimum requirements from many releases of TS 36.101 [2] due to release independence defined in TS 36.307 [16].

## 6.6.3.2A.1 Spurious emission band UE co-existence for CA (intra-band contiguous DL CA and UL CA)

- Editor's Note : Additional TP analysis needs to be added to TR36.905

### 6.6.3.2A.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions for intra-band contiguous DL CA and UL CA.

### 6.6.3.2A.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 6.6.3.2A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.3.2A.0.

### 6.6.3.2A.1.4 Test description

#### 6.6.3.2A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in Table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3.2A.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.2A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | | | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Low range, High range | | | | | |
| Test CC Combination setting (NRB_agg) as specified in clause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |
| 25 | 50 | | QPSK | 75 | P_25@0 | S_50@0 | | |
| 50 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |
| 50 | 50 | | QPSK | 100 | P_50@0 | S_50@0 | | |
| 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | | |
| 100 | 25 | | QPSK | 2 | P_1@0 | S_1@24 | | |
| 100 | 25 | | QPSK | 125 | P_100@0 | S_25@0 | | |
| 100 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |
| 100 | 50 | | QPSK | 150 | P_100@0 | S_50@0 | | |
| 100 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 100 | 75 | | QPSK | 175 | P_100@0 | S_75@0 | | |
| 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.33 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.3.2A.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.2A.1.4.3.

### 6.6.3.2A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.3.2A.1.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.3.2A.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.6.3.2A.0-2a to 6.6.3.2A.0-2f. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.6.3.2A.0-2a to 6.6.3.2A.0-2f. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

#### 6.6.3.2A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.3.2A.1.5 Test requirement

Test requirements for Spurious Emissions UE Co-existence are the same as the minimum requirements and are not repeated in this section.

The measured average power of spurious emission, derived in step 6, shall not exceed the described value in Tables 6.6.3.2A.1.5-1.

The requirements for the UE are release specific and can be found in Tables 6.6.3.2A.0-2a to 6.6.3.2A.0-2f. If the UE support a band, which is not defined in the table corresponding UE's release, the requirements for this band are taken from the table of earliest release where requirements for this band are defined. This has been described in following Table 6.6.3.2A.1.5-1.

**Table 6.6.3.2A.1.5-1: UE Requirements according to UE E-UTRA release and supported E-UTRA CA configuration**

| E-UTRA CA Configuration | UE Requirements per release | | | | | |
|---|---|---|---|---|---|---|
| | **Rel-10** | **Rel-11** | **Rel-12** | **Rel-13** | **Rel-14** | **Rel-15** |
| CA_1C | Table 6.6.3.2A.0-2a | Table 6.6.3.2A.0-2b | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2f |
| CA_3C | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2f |
| CA_7C | Table 6.6.3.2A.0-2b | Table 6.6.3.2A.0-2b | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2f |
| CA_8B | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2f |
| CA_38C | Table 6.6.3.2A.0-2b | Table 6.6.3.2A.0-2b | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2f |
| CA_39C | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2f |
| CA_40C | Table 6.6.3.2A.0-2a | Table 6.6.3.2A.0-2b | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2f |
| CA_41C | Table 6.6.3.2A.0-2b | Table 6.6.3.2A.0-2b | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2e | Table 6.6.3.2A.0-2f |
| CA_42C | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2c | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2d | Table 6.6.3.2A.0-2f |

## 6.6.3.2A.2 Spurious emission band UE co-existence for CA (inter-band DL CA and UL CA)

### 6.6.3.2A.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions for inter-band DL CA and UL CA.

### 6.6.3.2A.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA.

### 6.6.3.2A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.3.2A.0.

### 6.6.3.2A.2.4 Test description

#### 6.6.3.2A.2.4.1 Initial conditions

Same as in clause 6.6.3.2A.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands.
- Instead of Table 6.6.3.2A.1.4.1-1 → use Table 6.6.3.2A.2.4.1-1.
- Instead of clause 6.6.3.2A.1.4.3 use clause 6.6.3.2A.2.4.3.

**Table 6.6.3.2A.2.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC $N_{RB}$”and “SCC $N_{RB}$ ” columns |

| Test Parameters for CA Configurations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ (Note 4) | | | | PCC $N_{RB}$ | SCC $N_{RB}$ | DL Allocation | | UL Allocation (Note 2,3) | | |
| | CA Configuration | | | | | | CC MOD | PCC & SCC RB allocation | | PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$) | |
| | PCC | | SCC | | | | | PCC | SCC | | |
| | Band | Range | Band | Range | | | | | | | |
| **Default Test Settings for a CA_XA-YA Configuration** | | | | | | | | | | | |
| **1** | X | Low | Y | Low | Highest $N_{RB}$ | Highest $N_{RB}$ | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | X | High | Y | High | Highest $N_{RB}$ | Highest $N_{RB}$ | QPSK | NA | QPSK | 1@$RB_{max}$ | 1@$RB_{max}$ |
| **Test Settings for CA_1A-3A Configuration** | | | | | | | | | | | |
| **1** | 1 | Low | 3 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 1 | Low | 3 | Low | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@0 |
| **3** | 1 | High | 3 | High | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **4** | 1 | High | 3 | Note 7 | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@0 |
| **Test Settings for CA_1A-7A Configuration(Note 12)** | | | | | | | | | | | |
| **1** | 1 | High | 7 | Low | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@0 |
| **2** | 1 | High | 7 | Low | 100 | 100 | QPSK | NA | QPSK | 1@49 | 1@49 |
| **Test Settings for CA_1A-8A Configuration** | | | | | | | | | | | |
| **1** | 1 | Low | 8 | Low | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 1 | Low | 8 | Low | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **Test Settings for CA_1A-18A Configuration** | | | | | | | | | | | |
| **1** | 1 | Low | 18 | Low | 100 | 75 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 1 | Low | 18 | Low | 100 | 75 | QPSK | NA | QPSK | 1@99 | 1@74 |
| **Test Settings for CA_1A-19A Configuration** | | | | | | | | | | | |
| **1** | 1 | Mid | 19 | Mid | 25 | 25 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 1 | Mid | 19 | Mid | 25 | 25 | QPSK | NA | QPSK | 25@0 | 25@0 |
| **3** | 1 | Mid | 19 | Mid | 100 | 75 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **4** | 1 | Mid | 19 | Mid | 100 | 75 | QPSK | NA | QPSK | 100@0 | 75@0 |
| **Test Settings for CA_1A-21A Configuration** | | | | | | | | | | | |
| **1** | 1 | Mid | 21 | Mid | 25 | 25 | QPSK | NA | QPSK | 1@24 | 1@24 |
| **2** | 1 | Mid | 21 | Mid | 25 | 25 | QPSK | NA | QPSK | 1@24 | 1@12 |
| **3** | 1 | Mid | 21 | Mid | 25 | 25 | QPSK | NA | QPSK | 25@0 | 25@0 |
| **4** | 1 | Mid | 21 | Mid | 100 | 75 | QPSK | NA | QPSK | 1@99 | 1@74 |
| **5** | 1 | Mid | 21 | Mid | 100 | 75 | QPSK | NA | QPSK | 1@99 | 1@37 |
| **6** | 1 | Mid | 21 | Mid | 100 | 75 | QPSK | NA | QPSK | 100@0 | 75@0 |
| **Test Settings for CA_1A-28A Configuration (Note 16)** | | | | | | | | | | | |
| **1** | 1 | Low | 28 | Mid | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@49 |
| **2** | 1 | Low | 28 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 1 | High | 28 | Mid | 100 | 50 | QPSK | NA | QPSK | 1@99 | 1@47 |
| **4** | 1 | Low | 28 | Mid | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@49 |
| **5** | 1 | Low | 28 | Low | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **6** | 1 | High | 28 | Mid | 50 | 50 | QPSK | NA | QPSK | 1@49 | 1@47 |
| **Test Settings for CA_1A-42A Configuration (Note 13)** | | | | | | | | | | | |
| **1** | 1 | Low | 42 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 1 | Low | 42 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@99 |
| **3** | 1 | High | 42 | Mid | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@24 |
| **4** | 1 | High | 42 | Low | 100 | 100 | QPSK | NA | QPSK | 1@49 | 1@0 |
| **Test Settings for CA_2A-4A Configuration (Note 6)** | | | | | | | | | | | |
| **1** | 2 | Low | 4 | Low | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 2 | High | 4 | High | 50 | 50 | QPSK | NA | QPSK | 1@49 | 1@49 |
| **3** | 2 | Low | 4 | Low | 50 | 50 | QPSK | NA | QPSK | 1@49 | 1@49 |
| **4** | 2 | High | 4 | Low | 50 | 50 | QPSK | NA | QPSK | 1@49 | 1@0 |
| **5** | 2 | High | 4 | Low | 50 | 50 | QPSK | NA | QPSK | 1@49 | 1@49 |
| **6** | 2 | Low | 4 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **7** | 2 | High | 4 | High | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **8** | 2 | Low | 4 | Low | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **9** | 2 | High | 4 | Low | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@0 |
| **10** | 2 | High | 4 | Low | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **Test Settings for CA_2A-7A Configuration** | | | | | | | | | | | |
| **1** | 2 | Low | 7 | High | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@99 |
| **Test Settings for CA_3A-5A Configuration** | | | | | | | | | | | |
| **1** | 3 | Low | 5 | Low | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 3 | High | 5 | High | 50 | 50 | QPSK | NA | QPSK | 1@49 | 1@49 |
| **3** | 3 | Low | 5 | High | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@49 |
| **4** | 3 | Low | 5 | Low | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **5** | 3 | High | 5 | High | 100 | 50 | QPSK | NA | QPSK | 1@99 | 1@49 |
| **6** | 3 | Low | 5 | High | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@49 |
| **Test Settings for CA_3A-7A Configuration (Note 5)** | | | | | | | | | | | |
| **1** | 3 | Low | 7 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 3 | High | 7 | High | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **3** | 3 | Low | 7 | Low | 100 | 100 | QPSK | NA | QPSK | 1@75 | 1@99 |
| **4** | 3 | High | 7 | High | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@99 |
| **5** | 3 | Low | 7 | High | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@99 |
| **6** | 3 | Low | 7 | High | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **7** | 3 | High | 7 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@99 |
| **Test Settings for CA_3A-8A Configuration** | | | | | | | | | | | |
| **1** | 3 | Low | 8 | Low | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 3 | High | 8 | High | 50 | 50 | QPSK | NA | QPSK | 1@49 | 1@49 |
| **3** | 3 | High | 8 | High | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **4** | 3 | Low | 8 | High | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@49 |
| **5** | 3 | Low | 8 | Low | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **6** | 3 | High | 8 | High | 100 | 50 | QPSK | NA | QPSK | 1@99 | 1@49 |
| **7** | 3 | Low | 8 | Low | 100 | 50 | QPSK | NA | QPSK | 1@99 | 1@49 |
| **8** | 3 | High | 8 | High | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **9** | 3 | Low | 8 | High | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@49 |
| **Test Settings for CA_3A-18A Configuration** | | | | | | | | | | | |
| **1** | 3 | Low | 18 | Low | 100 | 75 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 3 | Low | 18 | Low | 100 | 75 | QPSK | NA | QPSK | 1@99 | 1@74 |
| **Test Settings for CA_3A-19A Configuration** | | | | | | | | | | | |
| **1** | 3 | High | 19 | Mid | 25 | 25 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 3 | High | 19 | Mid | 25 | 25 | QPSK | NA | QPSK | 1@24 | 1@0 |
| **3** | 3 | High | 19 | Mid | 25 | 25 | QPSK | NA | QPSK | 25@0 | 25@0 |
| **4** | 3 | High | 19 | Mid | 100 | 75 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **5** | 3 | High | 19 | Mid | 100 | 75 | QPSK | NA | QPSK | 1@99 | 1@0 |
| **6** | 3 | High | 19 | Mid | 100 | 75 | QPSK | NA | QPSK | 100@0 | 75@0 |
| **Test Settings for CA_3A-20A Configuration** | | | | | | | | | | | |
| **1** | 3 | Low | 20 | Low | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 3 | High | 20 | High | 100 | 50 | QPSK | NA | QPSK | 1@99 | 1@49 |
| **3** | 3 | High | 20 | High | 100 | 50 | QPSK | NA | QPSK | 1@99 | 1@0 |
| **4** | 3 | Low | 20 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **5** | 3 | High | 20 | High | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **6** | 3 | High | 20 | High | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@0 |
| **Test Settings for CA_3A-26A Configuration** | | | | | | | | | | | |
| **1** | 3 | Low | 26 | Low | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 3 | High | 26 | High | 50 | 50 | QPSK | NA | QPSK | 1@49 | 1@49 |
| **3** | 3 | Low | 26 | Low | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@49 |
| **4** | 3 | High | 26 | High | 50 | 50 | QPSK | NA | QPSK | 1@49 | 1@0 |
| **5** | 3 | Low | 26 | Low | 100 | 75 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **6** | 3 | High | 26 | High | 100 | 75 | QPSK | NA | QPSK | 1@99 | 1@74 |
| **7** | 3 | Low | 26 | Low | 100 | 75 | QPSK | NA | QPSK | 1@0 | 1@74 |
| **8** | 3 | High | 26 | High | 100 | 75 | QPSK | NA | QPSK | 1@99 | 1@0 |
| Test Settings for CA_3A-28A Configuration | | | | | | | | | | | |
| **1** | High | 28 | High | 100 | 50 | High | QPSK | NA | QPSK | 1@99 | 1@49 |
| **2** | Low | 28 | High | 100 | 50 | Low | QPSK | NA | QPSK | 1@0 | 1@49 |
| **Test Settings for CA_4A-5A Configuration** | | | | | | | | | | | |
| **1** | 4 | Low | 5 | Low | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 4 | High | 5 | High | 50 | 50 | QPSK | NA | QPSK | 1@49 | 1@49 |
| **3** | 4 | Low | 5 | High | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@49 |
| **4** | 4 | Low | 5 | Low | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **5** | 4 | High | 5 | High | 100 | 50 | QPSK | NA | QPSK | 1@99 | 1@49 |
| **6** | 4 | Low | 5 | High | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@49 |
| **Test Settings for CA_4A-7A Configuration** | | | | | | | | | | | |
| **1** | 4 | Low | 7 | Low | 50 | 100 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 4 | High | 7 | Low | 50 | 100 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **3** | 4 | High | 7 | Low | 50 | 100 | QPSK | NA | QPSK | 1@49 | 1@0 |
| **4** | 4 | High | 7 | Low | 50 | 100 | QPSK | NA | QPSK | 1@49 | 1@99 |
| **5** | 4 | Low | 7 | High | 50 | 100 | QPSK | NA | QPSK | 1@49 | 1@0 |
| **6** | 4 | Low | 7 | High | 50 | 100 | QPSK | NA | QPSK | 1@0 | 1@99 |
| **7** | 4 | Low | 7 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **8** | 4 | High | 7 | Low | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **9** | 4 | High | 7 | Low | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **10** | 4 | High | 7 | Low | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@49 |
| **11** | 4 | Low | 7 | High | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **12** | 4 | Low | 7 | High | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@99 |
| **Test Settings for CA_5A-7A Configuration** | | | | | | | | | | | |
| **1** | 5 | High | 7 | High | 50 | 100 | QPSK | NA | QPSK | 1@49 | 1@99 |
| **2** | 5 | High | 7 | High | 50 | 100 | QPSK | NA | QPSK | 1@24 | 1@0 |
| **3** | 5 | High | 7 | Low | 50 | 100 | QPSK | NA | QPSK | 1@49 | 1@0 |
| **Test Settings for CA_5A-12A Configuration** | | | | | | | | | | | |
| **1** | 5 | Low | 12 | Low | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@49 |
| **2** | 5 | High | 12 | High | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **Test Settings for CA_5A-17A Configuration** | | | | | | | | | | | |
| **1** | 5 | Low | 17 | Low | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **Test Settings for CA_7A-20A Configuration** | | | | | | | | | | | |
| **1** | 7 | High | 20 | High | 100 | 50 | QPSK | NA | QPSK | 1@99 | 1@49 |
| **2** | 7 | Low | 20 | Low | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@49 |
| **3** | 7 | Low | 20 | High | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@49 |
| **4** | 7 | High | 20 | High | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **5** | 7 | Low | 20 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@99 |
| **Test Settings for CA_7A-28A Configuration** | | | | | | | | | | | |
| **1** | 7 | High | 28 | High | 100 | 75 | QPSK | NA | QPSK | 1@0 | 1@74 |
| **2** | 7 | High | 28 | High | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **Test Settings for CA_18A-28A Configuration** | | | | | | | | | | | |
| **1** | 18 | Low | 28 | Note 15 | 75 | 50 | QPSK | NA | QPSK | 1@0 | 1@2 |
| **2** | 18 | Low | 28 | Note 15 | 75 | 50 | QPSK | NA | QPSK | 1@74 | 1@47 |
| **Test Settings for CA_39A-41A Configuration** | | | | | | | | | | | |
| **1** | 39 | High | 41 | High | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **Test Settings for CA_41A-42A Configuration (Note 14)** | | | | | | | | | | | |
| **1** | 41 | Note 8 | 42 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@99 |
| **2** | 41 | Note 9 | 42 | Note 11 | 100 | 100 | QPSK | NA | QPSK | 1@22 | 1@99 |
| **3** | 41 | Note 9 | 42 | Low | 100 | 100 | QPSK | NA | QPSK | 1@44 | 1@99 |
| **4** | 41 | Note 8 | 42 | Low | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **5** | 41 | Note 9 | 42 | High | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@99 |
| **6** | 41 | Note 9 | 42 | High | 100 | 100 | QPSK | NA | QPSK | 1@44 | 1@99 |
| **7** | 41 | Note 10 | 42 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@99 |
| **8** | 41 | Note 8 | 42 | Low | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@0 |
| **9** | 41 | Note 9 | 42 | Mid | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| **10** | 41 | Low | 42 | High | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use the Default Test Settings test points.
Note 3: X,Y correspond to the different bands in the CA Configuration. E.g. for CA_1A-19A,X=1,Y=19.
Note 4: For CA configurations CA_1A-18A, CA_1A-19A, CA_1A-21A , CA_3A-19A and CA_18A-28A each test point shall be tested. For all other CA configurations only test points with highest $N_{RB_agg}$ , according to UE supported BCS shall be tested.
Note 5: Test Point ID 7 for CA_3A-7A is applicable only for a Rel-13 and forward UE.
Note 6: Test Point ID 3 and Test Point ID 8 for CA_2A-4A are applicable only for a Rel-14 and forward UE.
Note 7: Test Point ID 4 for CA_1A-3A has the centre carrier frequency 1849.9 MHz, i.e. DL E-ARFCN is 1649.

Note 8: Test Point ID 1, 4 and 8 for CA_41A-42A have the centre carrier frequency of 2635 MHz in Band 41 (EARFCN=41040).
Note 9: Test Point ID 2, 3, 5, 6 and 9 for CA_41A-42A has the centre carrier frequency of 2555 MHz in Band 41 (EARFCN=40240).
Note 10: Test Point ID 7 for CA_41A-42A has the centre carrier frequency of 2674 MHz in Band 41 (EARFCN=41430).
Note 11: Test Point ID 2 for CA_41A-42A has the centre carrier frequency of 3421 MHz in Band 42 (EARFCN=41800).
Note 12: Test Point ID 2 for CA_1A-7A is applicable only for a Rel-15 and forward UE.
Note 13: Test Point ID 4 for CA_1A-42A is applicable only for a Rel-15 and forward UE.
Note 14: Test Point ID 10 for CA_41A-42A is applicable only for a Rel-15 and forward UE.
Note 15: Test Point ID 1 and 2 for CA_18A-28A have the centre carrier frequency of 778 MHz in Band 28 (EARFCN=9410).
Note 16: As an exception to Note 4, Test Point ID 3 for CA_1A-28A shall be tested for a UE supporting bandwidth combination set 0, even though it has not highest $N_{RB_agg}$ for this UE.

#### 6.6.3.2A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.3.2A.2.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.3.2A.2.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control “up” commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
6. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.6.3.2A.2.5-1 to Table 6.6.3.2A.2.5-4. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.6.3.2A.2.5-1 to Table 6.6.3.2A.2.5-4. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

#### 6.6.3.2A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.3.2A.2.5 Test requirement

The measured average power of spurious emission, derived in step 6, shall not exceed the described value in Tables 6.6.3.2A.2.5-1 to 6.6.3.2A.2.5-4 according to the following rule:

The requirements for the UE are release specific and can be found in Tables 6.6.3.2A.2.5-1 to 6.6.3.2A.2.5-4. If the UE supports a CA configuration, which is not defined in the table corresponding to UE’s release, the requirements for this CA configuration are taken from the table of earliest release where requirements for this CA Configuration are defined. This has been described in following Table 6.6.3.2A.2.5-0.

**Table 6.6.3.2A.2.5-0: UE Requirements according to UE E-UTRA release and supported E-UTRA CA Configuration**

| E-UTRA CA Configuration | UE Requirements per release | | | | |
|---|---|---|---|---|---|
| | Rel-11 | Rel-12 | Rel-13 | Rel-14 | Rel-15 |

| | | | | | |
|---|---|---|---|---|---|
| CA_1A-3A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_1A-5A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_1A-7A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_1A-8A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_1A-18A | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_1A-19A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_1A-21A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_1A-26A | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_1A-28A | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_1A-42A | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_2A-4A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_2A-5A | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_2A-7A | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_2A-12A | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_2A-13A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.25-3 | Table 6.6.3.2A.25-4 |
| CA_3A-5A | Table 6.6.3.2A.25-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.25-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_3A-7A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_3A-8A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_3A-18A | Table 6.6.3.2A.2.5-4 | Table 6.6.3.2A.2.5-4 | Table 6.6.3.2A.2.5-4 | Table 6.6.3.2A.2.5-4 | Table 6.6.3.2A.2.5-4 |
| CA_3A-19A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_3A-20A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_3A-21A | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 |
| CA_3A-26A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_3A-28A | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_3A-42A | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 |
| CA_4A-5A | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_4A-7A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_4A-12A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_4A-13A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_4A-17A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_5A-7A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_5A-12A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_5A-17A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_7A-20A | Table | Table | Table | Table | Table |

| | 6.6.3.2A.2.5-1 | 6.6.3.2A.2.5-1 | 6.6.3.2A.2.5-2 | 6.6.3.2A.2.5-3 | 6.6.3.2A.2.5-4 |
|---|---|---|---|---|---|
| CA_7A-28A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_8A-41A | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 |
| CA_11A-18A | 6.6.3.2A.2.5-4 | 6.6.3.2A.2.5-4 | 6.6.3.2A.2.5-4 | 6.6.3.2A.2.5-4 | 6.6.3.2A.2.5-4 |
| CA_18A-28A | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA_19A-21A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA 19A-42A | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 |
| CA 21A-42A | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 |
| CA 39A-41A | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-1 | Table 6.6.3.2A.2.5-2 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-4 |
| CA 41A-42A | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 | Table 6.6.3.2A.2.5-3 |

**Table 6.6.3.2A.2.5-1: Requirements for dual-uplink inter-band carrier aggregation for Rel-11 and Rel-12**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | Note |
| CA_1A-3A | E-UTRA Band 1, 32, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| CA_1A-5A | E-UTRA Band 22, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-7A | E-UTRA Band 32 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-8A | E-UTRA band43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_1A-19A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-21A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| CA_2A-4A | E-UTRA Band 4, 10, 22, 24 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-13A | E-UTRA Band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_3A-5A | E-UTRA Band 5, 7, 8, 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| CA_3A-7A | E-UTRA Band 5,8, 20, 26, 27, 28, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_3A-8A | E-UTRA Band 20, 28, 38, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3,11,17 |
| CA_3A-19A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_3A-20A | E-UTRA Band 7, 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_3A-26A | E-UTRA Band 5, 7, 26 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | | | | | | | |
| | E-UTRA band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| CA_4A-7A | E-UTRA Band 5, 12, 13, 14, 17, 26, 27, 28 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_4A-12A | No requirement | | | | | | |
| CA_4A-13A | E-UTRA Band 7, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_4A-17A | No requirement | | | | | | |
| CA_5A-7A | E-UTRA Band 5, 28, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| CA_5A-12A | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_5A-17A | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_7A-20A | E-UTRA Band 28 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_7A-28A | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_19A-21A | No requirement | | | | | | |
| CA_39A-41A | E-UTRA Band 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.2-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.4.2-1) for which the 2nd, 3rd or 4th harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 3: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.0-1 from the edge of the aggregated channel bandwidth.

NOTE 4-9: Void.

NOTE10: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.

NOTE 11: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.

NOTE 12: Void.
NOTE13: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.
NOTE 14: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 15: Void.
NOTE 16: Void.
NOTE 17: This requirement is applicable only when Band 3 transmission frequency is less than or equal to 1765 MHz.
NOTE 18-20: Void.

**Table 6.6.3.2A.2.5-2: Requirements for dual-uplink inter-band carrier aggregation for Rel-13**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | Note |
| CA_1A-3A | E-UTRA Band 1, 32, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| CA_1A-5A | E-UTRA Band 22, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-7A | E-UTRA Band 32 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-8A | E-UTRA band43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_1A-18A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-19A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-21A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| CA_1A-26A | E-UTRA Band 22, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-28A | E-UTRA Band 7, 31, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 3, 22 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| CA_1A-42A | E-UTRA Band 11, 21, 31, 32 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_2A-4A | E-UTRA Band 4, 10, 22, 24, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-5A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-12A | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_2A-13A | E-UTRA Band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_3A-5A | E-UTRA Band 5, 7, 8, 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| CA_3A-7A | E-UTRA Band 5, 8, 20, 26, 27, 28, 44, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_3A-8A | E-UTRA Band 20, 28, 38, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3,11,17 |
| CA_3A-19A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_3A-20A | E-UTRA Band 7, 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_3A-26A | E-UTRA Band 5, 7, 26 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| CA_4A-5A | E-UTRA Band 5,7 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_4A-7A | E-UTRA Band 5, 12, 13, 14, 17, 26, 27, 28 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_4A-12A | No requirement | | | | | | |
| CA_4A-13A | E-UTRA Band 7, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_4A-17A | No requirement | | | | | | |
| CA_5A-7A | E-UTRA Band 5, 28, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| CA_5A-12A | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_5A-17A | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_7A-20A | E-UTRA Band 28 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_7A-28A | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CA_18A-28A | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| CA_19A-21A | No requirement | | | | | | |
| CA_39A-41A | E-UTRA Band 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.2-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.4.2-1) for which the 2nd, 3rd or 4th harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 3: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.0-1 from the edge of the aggregated channel bandwidth.

NOTE 4-9: Void.

NOTE10: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.

NOTE 11: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.

NOTE 12: Void.

NOTE13: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

NOTE 14: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 15-21: Void.

NOTE 22: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.

NOTE 23: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.

**Table 6.6.3.2A.2.5-3: Requirements for dual-uplink inter-band carrier aggregation for Rel-14**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA_1A-3A | E-UTRA Band 1, 32, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| CA_1A-5A | E-UTRA Band 22, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-7A | E-UTRA Band 32 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-8A | E-UTRA band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_1A-18A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-19A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-21A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| CA_1A-26A | E-UTRA Band 22, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-28A | E-UTRA Band 7, 31, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 3, 22 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| CA_1A-42A | E-UTRA Band 11, 21, 31, 32 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_2A-4A | E-UTRA Band 4, 10, 22, 24, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-5A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-7A | E-UTRA Band 29 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_2A-12A | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_2A-13A | E-UTRA Band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_3A-5A | E-UTRA Band 5, 7, 8, 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| CA_3A-7A | E-UTRA Band 5, 8, 20, 26, 27, 28, 44, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_3A-8A | E-UTRA Band 20, 28, 38, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3,11,17 |
| CA_3A-19A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_3A-20A | E-UTRA Band 7, 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_3A-26A | E-UTRA Band 5, 7, 26 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| CA_3A-28A | E-UTRA Band 1, 22, 42, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 5, 7, 8, 11, 18, 19, 20, 21, 26, 27, 31, 34, 38, 40, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| CA_4A-5A | E-UTRA Band 5, 7 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_4A-7A | E-UTRA Band 5, 12, 13, 14, 17, 26, 27, 28 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_4A-12A | No requirement | | | | | | |
| CA_4A-13A | E-UTRA Band 7, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_4A-17A | No requirement | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CA_5A-7A | E-UTRA Band 5, 28, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| CA_5A-12A | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_5A-17A | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_7A-20A | E-UTRA Band 28 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_7A-28A | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_18A-28A | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| CA_19A-21A | No requirement | | | | | | |
| CA_39A-41A | E-UTRA Band 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_41A-42A | E-UTRA Band 3, 5, 8, 26, 28, 33, 39, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 18 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 18 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 18 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. In case the exceptions are allowed due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3 or 4 for the 2nd, 3rd or 4th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

NOTE 3: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

NOTE 4: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.

NOTE 5-9: Void

NOTE10: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.

NOTE 11: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.

NOTE 12-16: Void

NOTE 17: This requirement is applicable only when Band 3 transmission frequency is less than or equal to 1765 MHz.

NOTE 18: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz

NOTE 19-21: Void

NOTE 22: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.

NOTE 23: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.

**Table 6.6.3.2A.2.5-4: Requirements for dual-uplink inter-band carrier aggregation for Rel-15**

| E-UTRA CA Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA_1A-3A | E-UTRA Band 1, 32, 43, 50, 65, 74, 75 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10 |
| CA_1A-5A | E-UTRA Band 22, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-7A | E-UTRA Band 32, 50, 51, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-8A | E-UTRA band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_1A-18A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-19A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-21A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| CA_1A-26A | E-UTRA Band 22, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_1A-28A | E-UTRA Band 7, 31, 41, 72, 73 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 3, 22 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| CA_1A-42A | E-UTRA Band 11, 21, 31, 32, 50, 51, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_2A-4A | E-UTRA Band 4, 10, 22, 24, 50, 66, 70, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-5A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_2A-7A | E-UTRA Band 29 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_2A-12A | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_2A-13A | E-UTRA Band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_3A-5A | E-UTRA Band 5, 7, 8, 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| CA_3A-7A | E-UTRA Band 5, 8, 20, 26, 27, 28, 44, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_3A-8A | E-UTRA Band 20, 28, 38, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3,11,17 |
| CA_3A-19A | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| CA_3A-20A | E-UTRA Band 7, 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_3A-26A | E-UTRA Band 5, 7, 26 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| CA_3A-28A | E-UTRA Band 1, 11, 18, 19, 21, 22, 42, 43, 50, 51, 52, 65, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5, 6 |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 5, 7, 8, 20, 26, 27, 31, 34, 38, 40, 41, 72, 73 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| CA_4A-5A | E-UTRA Band 5, 7 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA band 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_4A-7A | E-UTRA Band 5, 12, 13, 14, 17, 26, 27, 28 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CA_4A-12A | No requirement | | | | | | |
| CA_4A-13A | E-UTRA Band 7, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_4A-17A | No requirement | | | | | | |
| CA_5A-7A | E-UTRA Band 5, 28, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 26 | 859 | - | 869 | -27 | 1 | |
| CA_5A-12A | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_5A-17A | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_7A-20A | E-UTRA Band 28 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| CA_7A-28A | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_11A-18A | E-UTRA Band 1, 3, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 890 | -40 | 1 | 3 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| CA_18A-28A | Frequency range | 470 | - | 710 | -26.2 | 6 | 23 |
| CA_19A-21A | No requirement | | | | | | |
| CA_39A-41A | E-UTRA Band 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| CA_41A-42A | E-UTRA Band 3, 5, 8, 26, 28, 33, 39, 44, 50, 51, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 18 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 18 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 4, 18 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. In case the exceptions are allowed due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3 or 4 for the 2nd, 3rd or 4th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

NOTE 3: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

NOTE 4: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.

NOTE 5-9: Void.

NOTE10: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.

NOTE 11: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.

NOTE 12-16: Void.

NOTE 17: This requirement is applicable only when Band 3 transmission frequency is less than or equal to 1765 MHz.

NOTE 18: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz

NOTE 19-21: Void

NOTE 22: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.

NOTE 23: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.

NOTE 24-25: Void.

## 6.6.3.2A.3 Spurious emission band UE co-existence for CA (intra-band non-contiguous DL CA and UL CA)

### 6.6.3.2A.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions for intra-band non-contiguous DL CA and UL CA.

### 6.6.3.2A.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

### 6.6.3.2A.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.3.2A.0.

### 6.6.3.2A.3.4 Test description

#### 6.6.3.2A.3.4.1 Initial conditions

Same as in clause 6.6.3.2A.1.4.1 with the following exceptions:

- Instead of Table 6.6.3.2A.1.4.1-1 → use Table 6.6.3.2A.3.4.1-1.
- Instead of clause 6.6.3.2A.1.4.3 → use clause 6.6.3.2A.3.4.3.

**Table 6.6.3.2A.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | Refer to test points<br>A: N/A (Range is not relevant),<br>Maximum Wgap(low + high frequency) |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to test points<br>Test only test points with<br>Lowest $N_{RB}$ for PCC and SCC<br>Highest $N_{RB}$ for PCC and SCC |

| **Test Parameters for CA Configurations** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** | **CC MOD** | **SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 25 | 25 | 35 | N/A | N/A | QPSK | P_1@0 | QPSK | S_1@24 |
| 2 | 25 | 25 | 35 | N/A | N/A | QPSK | P_25@0 | QPSK | S_25@0 |
| 3 | 100 | 100 | 5 | N/A | N/A | QPSK | P_1@0 | QPSK | S_1@99 |
| 4 | 100 | 100 | 5 | N/A | N/A | QPSK | P_100@0 | QPSK | S_100@0 |

#### 6.6.3.2A.3.4.2 Test procedure

Same test procedure as in clause 6.6.3.2A.1.4.2 with the following exceptions:

- Instead of Table 6.6.3.2A.1.4.1-1 → use Table 6.6.3.2A.3.4.1-1.
- Instead of Table 6.6.3.2A.0-2a to 6.6.3.2A.0-2c → use Table 6.6.3.2A.0-3
- Instead of clause 6.6.3.2A.1.4.3 → use clause 6.6.3.2A.3.4.3.

#### 6.6.3.2A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.3.2A.3.5 Test requirement

Test requirements for Spurious Emissions UE Co-existence are the same as the minimum requirements and are not repeated in this section.

The measured average power of spurious emission, derived in step 6, shall not exceed the described value in Table 6.6.3.2A.3.5-1.

The requirements for the UE are release specific and can be found in Table 6.6.3.2A.0-3. If the UE supports a band, which is not defined in the table corresponding UE's release, the requirements for this band are taken from the table of earliest release where requirements for this band are defined. This has been described in following Table 6.6.3.2A.3.5-1.

**Table 6.6.3.2A.3.5-1: UE Requirements according to UE E-UTRA release and supported E-UTRA CA configuration**

| E-UTRA CA Configuration | UE Requirements per release |
|---|---|
| | Rel-12 |
| CA_4A-4A | Table 6.6.3.2A.0-3 |

## 6.6.3.2A.4 Spurious emission band UE co-existence for CA (3UL CA)

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- Additional TP analysis needs to be added to TR36.905
- Test Configuration Table
- Applicability spec
-Test requirement is FFS

### 6.6.3.2A.4.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions for 3UL CA.

### 6.6.3.2A.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support 3UL CA.

### 6.6.3.2A.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.3.2A.0.

### 6.6.3.2A.4.4 Test description

#### 6.6.3.2A.4.4.1 Initial conditions

Same as in clause 6.6.3.2A.1.4.1 with the following exceptions:

- Instead of Table 6.6.3.2A.1.4.1-1 → use Table 6.6.3.2A.4.4.1-1.
- Instead of clause 6.6.3.2A.1.4.3 → use clause 6.6.3.2A.4.4.3.

**Table 6.6.3.2A.4.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC $N_{RB}$”and “SCC $N_{RB}$ ” columns |

**Test Parameters for CA Configurations**

| | CA Configuration / $N_{RB_agg}$ | | | | | | | | | | DL Allocation | | | | UL Al | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CA Configuration | | | | | | | | | | PCC & SCC RB allocation | | | | | | |
| | PCC | | SCC1 | | SCC2 | | PCC | SCC1 | SCC2 | | | | | | | PCC & | |
| ID | Band | Range | Band | Range | Band | Range | $N_{RB}$ | $N_{RB}$ | $N_{RB}$ | CC MOD | PCC | SCC1 | SCC2 | CC MOD | RB all | | |
| TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | TBD | T | |

#### 6.6.3.2A.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.3.2A.4.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.3.2A.4.4.1-1 on all PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control “up” commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
6. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Tables in 6.6.3.2A.4.5 (Tables are FFS). The centre frequency of the filter shall be stepped in contiguous steps according to Tables in 6.6.3.2A.4.5 (Tables are FFS). The measured power shall be verified for each step. The measurement period shall capture the active time slots.

#### 6.6.3.2A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.6.3.2A.4.5 Test requirement

FFS

## 6.6.3.3 Additional spurious emissions

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- Test configuration table for NS_38 and NS_39 is not defined.

### 6.6.3.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

### 6.6.3.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 8 and forward.

### 6.6.3.3.3 Minimum conformance requirements

These requirements are specified in terms of an additional spectrum emission requirement. Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

#### 6.6.3.3.3.1 Minimum requirement (network signalled value "NS_04")

When "NS 04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.1-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.1-1: Additional requirements**

| Frequency band | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 5, 10, 15, 20 MHz | |
| 2490.5 MHz ≤ f < 2495 MHz | -13 | 1 MHz |
| 9 kHz < f < 2490.5 MHz | -25 | 1 MHz |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.19.

#### 6.6.3.3.3.2 Minimum conformance requirements (network signalled value "NS_05")

When "NS_05" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.2-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.2-1: Additional requirements (PHS)**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | | | | Measurement bandwidth |
|---|---|---|---|---|---|
| | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| 1884.5 ≤ f ≤1915.7*1 | -41 | -41 | -41 | -41 | 300 KHz |
| Note 1: Applicable when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to the upper edge of PHS band (1915.7 MHz) + 4 MHz + the Channel BW assigned, where Channel BW is as defined in sub-clause 5.4.2. Additional restrictions apply for operations below this point. | | | | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.1.

### 6.6.3.3.3.3 Minimum conformance requirements (network signalled value "NS_07")

When "NS_07" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.3-1. These requirements also apply for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.3-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 10 MHz | |
| 769 ≤ f ≤ 775 | -57 | 6.25 kHz |
| Note: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.2.

### 6.6.3.3.3.4 Minimum requirement (network signalled value "NS_08")

When "NS_08" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.4-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.4-1: Additional requirement**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | | | Measurement bandwidth |
|---|---|---|---|---|
| | 5MHz | 10MHz | 15MHz | |
| 860 ≤ f ≤ 895 | -40 | -40 | -40 | 1 MHz |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.3.

### 6.6.3.3.3.5 Minimum requirement (network signalled value "NS_09")

When "NS 09" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.5-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.5-1: Additional requirement**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | | | Measurement bandwidth |
|---|---|---|---|---|
| | 5MHz | 10MHz | 15MHz | |
| 1475.9 ≤ f ≤ 1510.9 | -35 | -35 | -35 | 1 MHz |

NOTE 1: To improve measurement accuracy, A-MPR values for NS_09 specified in Table 6.2.4.3-1 in sub-clause 6.2.4 are derived based on 100 kHz RBW.

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.4.

#### 6.6.3.3.3.6 Minimum requirement (network signalled value "NS_11")

When “NS_11” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.6-1. These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.6-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 1.4, 3, 5, 10, 15, 20 MHz | | |
| E-UTRA Band 2 | -50 | 1 MHz | |
| 1998 ≤ f ≤ 1999 | -21 | 1 MHz | |
| 1997 ≤ f < 1998 | -27 | 1 MHz | |
| 1996 ≤ f < 1997 | -32 | 1 MHz | |
| 1995 ≤ f < 1996 | -37 | 1 MHz | |
| 1990 ≤ f < 1995 | -40 | 1 MHz | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.13.

#### 6.6.3.3.3.7 Minimum requirement (network signalled value "NS_12")

When "NS 12" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.7-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.7-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth/ Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz | |
| 806 ≤ f ≤ 813.5 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 814.2 MHz.<br>NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.5.

#### 6.6.3.3.3.8 Minimum requirement (network signalled value "NS_13")

When "NS 13" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.8-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.8-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth/ Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 1.4, 3, 5 MHz | |
| 806 ≤ f ≤ 816 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 819 MHz.<br>NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.6.

### 6.6.3.3.3.9 Minimum requirement (network signalled value "NS_14")

When "NS 14" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.9-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.9-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth/ Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 10 MHz, 15 MHz | |
| 806 ≤ f ≤ 816 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 824 MHz.<br>NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.7.

### 6.6.3.3.3.10 Minimum requirement (network signalled value "NS_15")

When "NS 15" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.10-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.10-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 1.4, 3, 5, 10, 15 MHz | | |
| 851 ≤ f ≤ 859 | -53 | 6.25 kHz | 1 |
| Note 1: The emissions measurement shall be sufficiently power averaged to ensure standard deviation < 0.5 dB. | | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.8.

### 6.6.3.3.3.11 Minimum requirement (network signalled value "NS_16")

When “NS_16” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.11-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.11-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 1.4, 3, 5, 10 MHz | | |
| 790 ≤ f ≤ 803 | -32 | 1 MHz | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.9.

6.6.3.3.3.12 Minimum requirement (network signalled value "NS_17")

When “NS_17” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.12-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.12-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 5, 10 MHz | | |
| 470 ≤ f ≤ 710 | -26.2 | 6 MHz | 1 |
| Note 1: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz. | | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.10.

6.6.3.3.3.13 Minimum requirement (network signalled value "NS_18")

When “NS_18” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.13-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.13-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 5, 10, 15, 20 MHz | | |
| 692 ≤ f ≤ 698 | -26.2 | 6 MHz | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.11.

6.6.3.3.3.14 Minimum requirement (network signalled value "NS_19")

When “NS_19” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.14-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.14-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 3, 5, 10, 15, 20 MHz | | |
| 662 ≤ f ≤ 694 | -25 | 8 MHz | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.12.

6.6.3.3.3.15 Minimum requirement (network signalled value "NS_20")

When “NS_20” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.15-1. These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.15-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 5, 10, 15, 20 MHz | | |
| 1990 ≤ f < 1999 | -40 | 1 MHz | |
| 1999 ≤ f ≤ 2000 | -40 | Note 1 | |
| Note 1: The measurement bandwidth is 1% of the applicable E-UTRA channel bandwidth (5.4.2.1-1). | | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.14.

6.6.3.3.3.16 Minimum requirement (network signalled value “NS_21”)

When “NS_21” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.16-1. These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.16-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 5, 10 MHz | |
| 2200 ≤ f < 2288 | -40 | 1 MHz |
| 2288 ≤ f < 2292 | -37 | 1 MHz |
| 2292 ≤ f < 2296 | -31 | 1 MHz |
| 2296 ≤ f < 2300 | -25 | 1 MHz |
| 2320 ≤ f < 2324 | -25 | 1 MHz |
| 2324 ≤ f < 2328 | -31 | 1 MHz |
| 2328 ≤ f < 2332 | -37 | 1 MHz |
| 2332 ≤ f ≤ 2395 | -40 | 1 MHz |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.15.

6.6.3.3.3.17 Minimum requirement (network signalled value “NS_22”)

When "NS_22" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.17-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.17-1: Additional requirement**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | MBW |
|---|---|---|
| | 5, 10, 15, 20 MHz | |
| 3400 ≤ f ≤ 3800 | -23 (NOTE 1, NOTE 3) | 5 MHz |
| | -40 (NOTE 2) | 1 MHz |
| NOTE 1: This requirement applies within an offset between 5 MHz and 25 MHz from the lower and from the upper edge of the channel bandwidth, whenever these frequencies overlap with the specified frequency band.<br>NOTE 2: This requirement applies from 3400 MHz to 25 MHz below the lower E-UTRA channel edge and from 25 MHz above the upper E-UTRA channel edge to 3800 MHz.<br>NOTE 3: This emission limit might imply risk of harmful interference to UE(s) operating in the protected operating band | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.16.

6.6.3.3.3.18 Minimum requirement (network signalled value “NS_23”)

When "NS_23" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.18-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

**6.6.3.3.3.18-1: Additional requirement**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | MBW |
|---|---|---|
| | 5, 10, 15, 20 MHz | |
| 3400 ≤ f ≤ 3800 | -23 (NOTE 1, NOTE 4) | 5 MHz |
| | -40 (NOTE 2) | 1 MHz |
| NOTE 1: This requirement applies within an offset between 5 MHz + $F_{offset_NS_23}$ and 25 MHz + $F_{offset_NS_23}$ from the lower and from the upper edges of the channel bandwidth, whenever these frequencies overlap with the specified frequency band. | | |
| NOTE 2: This requirement applies from 3400 MHz to 25 MHz + $F_{offset_NS_23}$ below the lower E-UTRA channel edge and from 25 MHz + Foffset$_{NS_23}$ above the upper E-UTRA channel edge to 3800 MHz. | | |
| NOTE 3: $F_{offset_NS_23}$ is:<br>0 MHz for 5 MHz channel BW,<br>5 MHz for 10 MHz channel BW,<br>9 MHz for 15 MHz channel BW and<br>12 MHz for 20 MHz channel BW. | | |
| NOTE 4: This emission limit might imply risk of harmful interference to UE(s) operating in the protected operating band. | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.17.

6.6.3.3.3.19 Minimum requirement (network signalled value “NS_24”)

When "NS_24" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.19-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.19-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 5 MHz, 10 MHz, 15 MHz, 20 MHz | |
| Band 34 | -50 | MHz |
| Note 1: This requirement applies at a frequency offset equal or larger than 5 MHz from the upper edge of the channel bandwidth, whenever these frequencies overlap with the specified frequency band. | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.20.

6.6.3.3.3.20 Minimum requirement (network signalled value “NS_25”)

When "NS_25" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.20-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.20-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 5 MHz, 10 MHz, 15 MHz, 20 MHz | |
| Band 34 | -40 | MHz |
| Note 1: This requirement applies at a frequency offset equal or larger than 5 MHz from the upper edge of the channel bandwidth, whenever these frequencies overlap with the specified frequency band. | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.21.

6.6.3.3.3.21 Minimum requirement (network signalled value “NS_27”)

When "NS_27" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3.21-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.21-1: Additional requirements**

| Frequency band | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 5, 10, 15, 20 MHz | |
| 9 kHz ≤ f ≤ 3530 MHz | -40 | 1 MHz |
| 3720 MHz ≤ f ≤ 5th harmonic of the upper frequency edge of the UL operating band | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.23.

6.6.3.3.3.22 Minimum requirement (network signalled value “NS_28”)

When "NS_28" is indicated in the cell, the power of any UE emission for E-UTRA channels assigned within 5150-5350 MHz and 5470-5725 MHz shall not exceed the levels specified in Table 6.6.3.3.22-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.22-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 20 MHz | |
| 47 ≤ f ≤ 74 | -54 | 100 kHz |
| 87.5 ≤ f ≤ 118 | -54 | 100 kHz |
| 174 ≤ f ≤ 230 | -54 | 100 kHz |
| 470 ≤ f ≤ 862 | -54 | 100 kHz |
| 1000 ≤ f ≤ 5150 | -30 | 1 MHz |
| 5350 ≤ f ≤ 5470 | -30 | 1 MHz |
| 5725 ≤ f ≤ 26000 | -30 | 1 MHz |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.24.

6.6.3.3.3.23 Minimum requirement (network signalled value “NS_29”)

When "NS_29" is indicated in the cell, the power of any UE emission for E-UTRA channels assigned within 5150-5350 and 5470-5725 MHz shall not exceed the levels specified in Table 6.6.3.3.3.25-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.23-1: Additional requirements**

| Centre Frequency Fc [MHz] | Protected range [MHz] | Frequency difference Δf between centre frequency – 5240 (for Fc=5180, 5200, 5220, 5240) 5260 (for Fc=5260, 5280, 5300, 5320) (MHz) | Minimum requirement [dBm] | Measurement bandwidth |
|---|---|---|---|---|
| 5180, 5200, 5220, 5240 | 5135 ≤ f ≤ 5142 | - | -26 | 1 MHz |
| | 5142 < f ≤ 5150 | - | -18 | |
| | 5250 ≤ f < 5251 | ≥ 10 and < 11 | 10(10 - Δf) | |
| | 5251 ≤ f < 5260 | ≥ 11 and < 20 | -10 – 8/9(Δf – 11) | |
| | 5260 ≤ f < 5266.7 | ≥ 20 and < 26.7 | -18 – 1.2(Δf – 20) | |
| | 5266.7 ≤ f ≤ 5365 | - | -26 | |
| 5260, 5280, 5300, 5320 | 5135 ≤ f ≤ 5233.3 | - | -26 | |
| | 5233.3 < f ≤ 5240 | ≥ 20 and < 26.7 | -18 – 1.2(Δf – 20) | |
| | 5240 < f ≤ 5249 | ≥ 11 and < 20 | -10 – 8/9(Δf – 11) | |
| | 5249 < f ≤ 5250 | ≥ 10 and < 11 | 10(10 - Δf) | |
| | 5350 ≤ f ≤ 5365 | - | -26 | |
| 5500, 5520, 5540, 5560, 5580, 5600, 5620, 5640, 5660, 5680, 5700 | 5455 ≤ f ≤ 5460 | - | -26 | |
| | 5460 < f ≤ 5470 | - | -19 | |
| | 5725 ≤ f < 5740 | - | -19 | |
| | 5740 ≤ f ≤ 5745 | - | -26 | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.25.

6.6.3.3.3.24 Minimum requirement (network signalled value “NS_30”)

When "NS_30" is indicated in the cell, the power of any UE emission for E-UTRA channels assigned within 5150-5350 MHz, 5470-5725 MHz and 5725-5850 MHz shall not exceed the levels specified in Table 6.6.3.3.3.24-1, Table 6.6.3.3.3.24-2 and Table 6.6.3.3.3.26-3, respectively. These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.24-1: Additional requirements for E-UTRA channels assigned within 5150-5350 MHz**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 20 MHz | |
| 4500 ≤ f ≤ 5150 | -41 | 1 MHz |
| 5350 ≤ f ≤ 5460 | -41 | |

**Table 6.6.3.3.3.24-2: Additional requirements for E-UTRA channels assigned within 5470-5725 MHz**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 20 MHz | |
| 4500 ≤ f ≤ 5150 | -41 | 1 MHz |
| 5350 ≤ f ≤ 5460 | -41 | |
| 5460 < f ≤ 5470 | -27 | |
| 5725 ≤ f | -27 | |

**Table 6.6.3.3.24-3: Additional requirements for E-UTRA channels assigned within 5725-5850 MHz**

| Frequency offset of measurement filter -3dB point, Δf | Frequency offset of measurement filter centre frequency, f_offset | Minimum requirement [dBm] | Measurement bandwidth |
|---|---|---|---|
| 0 MHz ≤ Δf < 5 MHz | 0.5 MHz ≤ f_offset < 5.5 MHz | 27 – 2.28(f_offset/MHz – 0.5) | 1 MHz |
| 5 MHz ≤ Δf < 25 MHz | 5.5 MHz ≤ f_offset < 25.5 MHz | 15.6 – 0.28(f_offset/MHz – 0.5) | 1 MHz |
| 25 MHz ≤ Δf < 75 MHz | 25.5 MHz ≤ f_offset < 75.5 MHz | 10 – 0.74(f_offset/MHz – 0.5) | 1 MHz |
| 75 MHz ≤ Δf | 75.5 MHz ≤ f_offset | -27 | 1 MHz |
| NOTE 1: The frequency offset f_offset is below and above the range 5725-5850 MHz; the measurement filter -3dB point is that closest to the range 5725-5850 MHz<br>NOTE 2: The requirement applies when the offset of the measurement filter centre frequency is such that both -3 dB points of the measurement filter are confined within the frequency range 5725-5850 MHz. | | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.26.

6.6.3.3.3.25 Minimum requirement (network signalled value “NS_31”)

When "NS_31" is indicated in the cell, the power of any UE emission for E-UTRA channels assigned within 5150-5250 MHz, 5250-5350 MHz, 5470-5725 MHz and 5725-5850 MHz shall not exceed the levels specified in Table 6.6.3.3.3.25-1, Table 6.6.3.3.3.25-2, Table 6.6.3.3.3.25-3 and Table 6.6.3.3.3.25-4, respectively. These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.25-1: Additional requirements for E-UTRA channels assigned within 5150-5250 MHz**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 20 MHz | |
| f ≤ 5150 | -27 | 1 MHz |
| f ≥ 5250 | -27 | |

**Table 6.6.3.3.3.25-2: Additional requirements for E-UTRA channels assigned within 5250-5350 MHz**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 20 MHz | |
| f ≤ 5250 | -27 | 1 MHz |
| f ≥ 5350 | -27 | |

**Table 6.6.3.3.3.25-3: Additional requirements for E-UTRA channels assigned within 5470-5725 MHz**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 20 MHz | |
| f ≤ 5470 | -27 | 1 MHz |
| f ≥ 5725 | -27 | |

**Table 6.6.3.3.3.25-4: Additional requirements for E-UTRA channels assigned within 5725-5850 MHz**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 20 MHz | |
| f ≤ 5725 | -27 | 1 MHz |
| f ≥ 5850 | -27 | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.27.

6.6.3.3.3.26 Minimum requirement (network signalled value “NS_36”)

When "NS_36" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.26-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.26-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 5 MHz, 10 MHz and 15 MHz | |
| 470 ≤ f ≤ 694 | -42 | 8MHz |
| NOTE: For a 5 MHz E-UTRA carrier confined within 698MHz and 703MHz, this requirement shall be met in normal conditions only. The requirement is relaxed to -30dBm in extreme conditions. | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.28.

6.6.3.3.3.27 Minimum requirement (network signalled value “NS_38”)

When "NS_38" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.27-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.27-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz | |
| 1400 ≤ f ≤ 1427 | -32 | 27MHz |
| NOTE 1: This requirement shall be verified with UE transmission power of 15 dBm. | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.29.

6.6.3.3.3.28 Minimum requirement (network signalled value “NS_39”)

When "NS_36" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.28-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.3.28-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz | |
| 1475 ≤ f ≤ 1488 | -28 | 1MHz |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.30.

### 6.6.3.3.4 Test description

#### 6.6.3.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3.3.4.1-1 through Table 6.6.3.3.4.1-22. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.3.4.1-1: Test Configuration Table (network signalled value "NS_04") (Power Class 2)**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range<br><br>Additional test frequencies:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866 | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_04 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation TDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 (Note 1) | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 (Note 1) | 5MHz | | | QPSK | 16 | 9 |
| 3 (Note 2) | 5MHz | | | QPSK | 25 | 0 |
| 4 (Note 1) | 5MHz | | | 16QAM | 16 | 9 |
| 5 (Note 2) | 5MHz | | | 16QAM | 25 | 0 |
| 6 (Note 1) | 10MHz | | | QPSK | 1 | 0 |
| 7 (Note 1) | 10MHz | | | QPSK | 1 | 49 |
| 8 (Note 1) | 10MHz | | | QPSK | 24 | 0 |
| 9 (Note 1) | 10MHz | | | QPSK | 40 | 10 |
| 10 | 10MHz | | | QPSK | 50 | 0 |
| 11 | 10MHz | | | 16QAM | 50 | 0 |
| 12 (Note 1) | 15MHz | | | QPSK | 1 | 0 |
| 13 (Note 1) | 15MHz | | | QPSK | 1 | 74 |
| 14 (Note 1) | 15MHz | | | QPSK | 32 | 0 |
| 15 (Note 1) | 15MHz | | | QPSK | 60 | 15 |
| 16 | 15MHz | | | QPSK | 75 | 0 |
| 17 | 15MHz | | | 16QAM | 75 | 0 |
| 18 (Note 1) | 20MHz | | | QPSK | 1 | 0 |
| 19 (Note 1) | 20MHz | | | QPSK | 1 | 99 |
| 20 (Note 1) | 20MHz | | | QPSK | 36 | 0 |
| 21 (Note 1) | 20MHz | | | QPSK | 75 | 25 |
| 22 | 20MHz | | | QPSK | 100 | 0 |
| 23 | 20MHz | | | 16QAM | 100 | 0 |
| Note 1: Only applicable for Low Range.<br>Note 2: Only applicable for additional test frequencies. | | | | | | |

**Table 6.6.3.3.4.1-2: Test Configuration Table (network signalled value "NS_04") (Power Class 3)**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range<br><br>Additional test frequencies for Rel-12 to Rel-13 and bit 2 of modifiedMPRbehavior = 0:<br><br>For 5 MHz bandwidth:<br>2499.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866<br><br>Additional test frequencies for Rel-12 and later and bit 2 of modifiedMPRbehavior = 1:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39686<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866 | | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10 MHz, 15 MHz, 20MHz | | |
| **Test Parameters for NS_04 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation TDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 (Note 6) | 5MHz | N/A for A-MPR testing | | QPSK | 25 | 0 |
| 2 (Note 6) | 5MHz | | | QPSK | 8 | Note 3 |
| 3(Note 6) | 5MHz | | | QPSK | 6 | Note 3 |
| 4 (Note 6) | 5MHz | | | 16QAM (Note 5) | 25 | 0 |
| 5 (Note 6) | 5MHz | | | 16QAM (Note 5) | 8 | Note 3 |
| 6 (Note 6) | 10MHz | | | QPSK | 1 | 0 |
| 7 (Note 6) | 10MHz | | | QPSK | 12 | 0 |
| 8 (Note 6) | 10MHz | | | QPSK | 50 | 0 |
| 9 Note 6) | 10MHz | | | 16QAM (Note 5) | 50 (Note 4) | 0 |
| 10 (Note 6) | 10MHz | | | QPSK | 24 | 13 |
| 11 (Note 6) | 10MHz | | | 16QAM (Note 5) | 24 | 13 |
| 12 (Note 6) | 10MHz | | | QPSK | 36 | 13 |
| 13 (Note 6) | 10MHz | | | QPSK | 12 | 37 |
| 14 (Note 6) | 10MHz | | | QPSK | 1 | 49 |
| 15 (Note 6) | 15MHz | | | QPSK | 1 | 0 |
| 16 (Note 6) | 15MHz | | | QPSK | 16 | 0 |
| 17 (Note 6) | 15MHz | | | QPSK | 75 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| 18 (Note 6) | 15MHz | | 16QAM (Note 5) | 75 (Note 4) | 0 |
| 19 (Note 6) | 15MHz | | QPSK | 36 | 19 |
| 20 (Note 6) | 15MHz | | 16QAM (Note 5) | 36 (Note 4) | 19 |
| 21 (Note 6) | 15MHz | | QPSK | 50 | 19 |
| 22 (Note 6) | 15MHz | | QPSK | 18 | 56 |
| 23 (Note 6) | 15MHz | | QPSK | 1 | 74 |
| 24 (Note 6) | 20MHz | | QPSK | 1 | 0 |
| 25 (Note 6) | 20MHz | | QPSK | 18 | 0 |
| 26 (Note 6) | 20MHz | | QPSK | 100 | 0 |
| 27 (Note 6) | 20MHz | | 16QAM (Note 5) | 100 (Note 4) | 0 |
| 28 (Note 6) | 20MHz | | QPSK | 50 | 25 |
| 29 (Note 6) | 20MHz | | 16QAM (Note 5) | 50 (Note 4) | 25 |
| 30 (Note 6) | 20MHz | | QPSK | 75 | 25 |
| 31 (Note 6) | 20MHz | | QPSK | 25 | 75 |
| 32 (Note 6) | 20MHz | | QPSK | 1 | 99 |
| 33 (Note 8) | 5MHz | | QPSK | 1 | 0 |
| 34 (Note 8) | 5MHz | | QPSK | 16 | 9 |
| 35 (Note 9) | 5MHz | | QPSK | 25 | 0 |
| 36 (Note 8) | 5MHz | | 16QAM (Note 5) | 16 | 9 |
| 37 (Note 9) | 5MHz | | 16QAM (Note 5) | 25 | 0 |
| 38 (Note 8) | 10MHz | | QPSK | 1 | 0 |
| 39 (Note 8) | 10MHz | | QPSK | 1 | 49 |
| 40 (Note 8) | 10MHz | | QPSK | 24 | 0 |
| 41 (Note 8) | 10MHz | | QPSK | 40 | 10 |
| 42 (Note 7) | 10MHz | | QPSK | 50 | 0 |
| 43 (Note 7) | 10MHz | | 16QAM (Note 5) | 50 | 0 |
| 44 (Note 8) | 15MHz | | QPSK | 1 | 0 |
| 45 (Note 8) | 15MHz | | QPSK | 1 | 74 |
| 46 (Note 8) | 15MHz | | QPSK | 32 | 0 |
| 47 (Note 8) | 15MHz | | QPSK | 60 | 15 |
| 48 (Note 7) | 15MHz | | QPSK | 75 | 0 |
| 49 (Note 7) | 15MHz | | 16QAM (Note 5) | 75 | 0 |
| 50 (Note 8) | 20MHz | | QPSK | 1 | 0 |
| 51 (Note 8) | 20MHz | | QPSK | 1 | 99 |
| 52 (Note 8) | 20MHz | | QPSK | 36 | 0 |
| 53 (Note 8) | 20MHz | | QPSK | 75 | 25 |
| 54 (Note 7) | 20MHz | | QPSK | 100 | 0 |
| 55 (Note 7) | 20MHz | | 16QAM (Note 5) | 100 | 0 |

Note 1: Test Channel Bandwidths are checked separately for E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: The configuration ID will be used to map the applicable Test Configuration to be corresponding Test Requirement in subclause 6.2.4 as not all combinations are necessarily required based on the applicability of the UE.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 4: Applies only for UE-Categories ≥2.
Note 5: The 16QAM configurations shall not apply to UEs which support UL 64QAM.
Note 6: Applies only for Rel-11 and earlier.
Note 7: Applies only for Rel-12 and later.
Note 8: Applies only for Rel-12 and later and Low Range.
Note 9: Applies only for Rel-12 and later and Mid, High Range and additional test frequencies.

**Table 6.6.3.3.4.1-3: Test Configuration Table (network signalled value "NS_05")**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range<br><br>In case of Low range:<br>- For 5MHz Channel Bandwidth: 1927.2MHz ($N_{UL}$ = 18072)<br>- For 10MHz Channel Bandwidth: 1934.7MHz ($N_{UL}$ = 18147)<br>- For 15MHz Channel Bandwidth: 1932.5MHz ($N_{UL}$ = 18125)<br>- For 20MHz Channel Bandwidth: 1930MHz ($N_{UL}$ = 18100) | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, 10MHz, 15MHz, 20MHz | | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | | **$RB_{start}$** |
| | | **FDD** | **TDD** | | **FDD** | **TDD** | **FDD** |
| 5MHz | N/A for Additional Spurious Emissions testing | | | QPSK | 1 | N/A | 0 |
| 5MHz | | | | QPSK | 1 | | 24 |
| 5MHz | | | | QPSK | 25 | | 0 |
| 10MHz | | | | QPSK | 1 | | 0 |
| 10MHz | | | | QPSK | 1 | | 49 |
| 10MHz | | | | QPSK | 12 | | 0 |
| 10MHz | | | | QPSK | 12 | | 38 |
| 10MHz | | | | QPSK | 48 | | 0 |
| 10MHz | | | | QPSK | 48 | | 2 |
| 10MHz (Note 7) | | | | QPSK | 50 | | 0 |
| 10MHz (Note 7) | | | | 16QAM (Note 6) | 50 (Note 3) | | 0 |
| 15MHz (Note 8) | | | | QPSK | 1 | | 8 |
| 15MHz (Note 8) | | | | QPSK | 1 | | 66 |
| 15MHz (Note 8) | | | | QPSK | 16 | | 8 |
| 15MHz (Note 8) | | | | QPSK | 16 | | 51 |
| 15MHz (Note 8) | | | | QPSK | 30 | | 8 |
| 15MHz (Note 8) | | | | QPSK | 30 | | 37 |
| 20MHz (Note 8) | | | | QPSK | 1 | | 24 |
| 20MHz (Note 8) | | | | QPSK | 1 | | 75 |
| 20MHz (Note 8) | | | | QPSK | 18 | | 24 |
| 20MHz (Note 8) | | | | QPSK | 18 | | 58 |
| 20MHz (Note 8) | | | | QPSK | 24 | | 24 |
| 20MHz (Note 8) | | | | QPSK | 24 | | 52 |
| 15MHz (Note 9) | | | | QPSK | 1 | | 0 |
| 15MHz (Note 9) | | | | QPSK | 1 | | 74 |
| 15MHz (Note 9) | | | | QPSK | 16 | | 0 |
| 15MHz (Note 9) | | | | QPSK | 16 | | 59 |
| 15MHz (Note 9) | | | | QPSK | 48 | | 0 |
| 15MHz (Note 9) | | | | QPSK | 48 | | 27 |

| | | | | | |
|---|---|---|---|---|---|
| 15MHz (Note 9) | | QPSK | 75 | | 0 |
| 15MHz (Note 9) | | 16QAM (Note 6) | 75 (Note 3) | | 0 |
| 20MHz (Note 9) | | QPSK | 1 | | 0 |
| 20MHz (Note 9) | | QPSK | 1 | | 99 |
| 20MHz (Note 9) | | QPSK | 18 | | 0 |
| 20MHz (Note 9) | | QPSK | 18 | | 82 |
| 20MHz (Note 9) | | QPSK | 48 | | 0 |
| 20MHz (Note 9) | | QPSK | 48 | | 52 |
| 20MHz (Note 9) | | QPSK | 100 | | 0 |
| 20MHz (Note 9) | | 16QAM (Note 6) | 100 (Note 3) | | 0 |
| 10MHz (Note 10) | | QPSK | 50 | | 0 |
| 10MHz (Note 10) | | 16QAM (Note 6) | 50 (Note 3) | | 0 |
| 15MHz (Note 10) | | QPSK | 1 | | 0 |
| 15MHz (Note 10) | | QPSK | 75 | | 0 |
| 15MHz (Note 10) | | QPSK | 16 | | 8 |
| 15MHz (Note 10) | | QPSK | 30 | | 8 |
| 15MHz (Note 10) | | QPSK | 54 | | 8 |
| 15MHz (Note 10) | | QPSK | 64 | | 8 |
| 15MHz (Note 10) | | QPSK | 1 | | 74 |
| 15MHz (Note 10) | | QPSK | 6 | | 69 |
| 15MHz (Note 10) | | QPSK | 8 | | 67 |
| 20MHz (Note 10) | | QPSK | 1 | | 0 |
| 20MHz (Note 10) | | QPSK | 100 | | 0 |
| 20MHz (Note 10) | | QPSK | 18 | | 24 |
| 20MHz (Note 10) | | QPSK | 24 | | 24 |
| 20MHz (Note 10) | | QPSK | 40 | | 24 |
| 20MHz (Note 10) | | QPSK | 50 | | 24 |
| 20MHz (Note 10) | | QPSK | 72 | | 24 |
| 20MHz (Note 10) | | QPSK | 1 | | 99 |
| 20MHz (Note 10) | | QPSK | 6 | | 94 |
| 20MHz (Note 10) | | QPSK | 24 | | 76 |
| 10MHz (Note 11) | | QPSK | 50 | | 0 |
| 10MHz (Note 11) | | 16QAM (Note 6) | 50 (Note 3) | | 0 |

| | | | | | |
|---|---|---|---|---|---|
| 15MHz (Note 11) | | QPSK | 1 | | 0 |
| 15MHz (Note 11) | | QPSK | 1 | | 74 |
| 15MHz (Note 11) | | QPSK | 16 | | 0 |
| 15MHz (Note 11) | | QPSK | 16 | | 59 |
| 15MHz (Note 11) | | QPSK | 48 | | 0 |
| 15MHz (Note 11) | | QPSK | 48 | | 27 |
| 15MHz (Note 11) | | QPSK | 75 | | 0 |
| 15MHz (Note 11) | | 16QAM (Note 6) | 75 (Note 3) | | 0 |
| 20MHz (Note 11) | | QPSK | 1 | | 0 |
| 20MHz (Note 11) | | QPSK | 1 | | 99 |
| 20MHz (Note 11) | | QPSK | 18 | | 0 |
| 20MHz (Note 11) | | QPSK | 18 | | 82 |
| 20MHz (Note 11) | | QPSK | 48 | | 0 |
| 20MHz (Note 11) | | QPSK | 48 | | 52 |
| 20MHz (Note 11) | | QPSK | 100 | | 0 |
| 20MHz (Note 11) | | 16QAM (Note 6) | 100 (Note 3) | | 0 |

Note 1: Void
Note 2: Void
Note 3: Applies only for UE-Categories ≥2.
Note 4: Void.
Note 5: Void.
Note 6: The 16QAM configurations shall not apply to UEs which support UL 64QAM.
Note 7: Applies when bit number 1 in modifiedMPRbehavior = 0 (Rel-11 minimum requirements apply) for Band1 and not available for Band65.
Note 8: Applies for low range and when bit number 1 in modifiedMPRbehavior = 0 (Rel-11 minimum requirements apply) for Band1 and not available for Band65.
Note 9: Applies for mid range and when bit number 1 in modifiedMPRbehavior = 0 (Rel-11 minimum requirements apply) for Band1 and not available for Band65.
Note 10: Applies only for low range and when bit number 1 in modifiedMPRbehavior = 1 (Rel-12 minimum requirements apply) for Band1 and low range for Band65.
Note 11: Applies only for mid range and when bit number 1 in modifiedMPRbehavior = 1 (Rel-12 minimum requirements apply) for Band1 and mid range for Band65.
Note 12: ModifiedMPRbehavior is defined in annex J.1

**Table 6.6.3.3.4.1-4: Test Configuration Table (network signalled value "NS_07")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Mid range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | $RB_{start}$ |
| 1 | 10MHz | N/A for Additional Spurious Emissions testing. | | QPSK | 1 | 0 |
| 2 | 10MHz | | | QPSK | 8 | 0 |
| 3 | 10MHz | | | QPSK | 6 | 13 |
| 4 | 10MHz | | | QPSK | 20 | 13 |
| 5 | 10MHz | | | QPSK | 12 | 13 |
| 6 | 10MHz | | | 16QAM (Note 2) | 36 (Note 1) | 13 |
| 7 | 10MHz | | | QPSK | 16 | 19 |
| 8 | 10MHz | | | QPSK | 12 | 19 |
| 9 | 10MHz | | | 16QAM (Note 2) | 16 | 19 |
| 10 | 10MHz | | | QPSK | 30 | 19 |
| 11 | 10MHz | | | 16QAM (Note 2) | 30 (Note 1) | 19 |
| 12 | 10MHz | | | QPSK | 6 | 43 |
| 13 | 10MHz | | | QPSK | 2 | 48 |
| 14 | 10MHz | | | QPSK | 50 | 0 |
| 15 | 10MHz | | | QPSK | 12 | 0 |
| 16 | 10MHz | | | 16QAM (Note 2) | 50 (Note 1) | 0 |
| Note 1: Applies only for UE-Categories ≥2. | | | | | | |
| Note 2: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | |

**Table 6.6.3.3.4.1-5: Test Configuration Table (network signalled value "NS_08")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, 10MHz, 15MHz | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 5MHz | N/A for Additional Spurious Emissions testing | | | QPSK | 1 | N/A |
| 5MHz | | | | QPSK | 8 | |
| 5MHz | | | | QPSK | 25 | |
| 10MHz | | | | QPSK | 1 | |
| 10MHz | | | | QPSK | 12 | |
| 10MHz | | | | QPSK | 40 | |
| 10MHz | | | | QPSK | 50 | |
| 10MHz | | | | 16QAM (Note 4) | 50 (Note 3) | |
| 15MHz | | | | QPSK | 1 | |
| 15MHz | | | | QPSK | 16 | |
| 15MHz | | | | QPSK | 40 | |
| 15MHz | | | | QPSK | 75 | |
| 15MHz | | | | 16QAM (Note 4) | 75 (Note 3) | |
| Note 1: The 1 RB allocation shall be tested at both RB #0 and RB #max. | | | | | | |
| Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max + 1 - RB allocation) of the channel bandwidth | | | | | | |
| Note 3: Applies only for UE-Categories ≥2. | | | | | | |
| Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | |

**Table 6.6.3.3.4.1-6: Test Configuration Table (network signalled value "NS_09")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, 10MHz, 15MHz | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 5MHz | N/A for Additional Spurious Emissions testing | | | QPSK | 1 | N/A |
| 5MHz | | | | QPSK | 8 | |
| 5MHz | | | | QPSK | 25 | |
| 10MHz | | | | QPSK | 1 | |
| 10MHz | | | | QPSK | 12 | |
| 10MHz | | | | QPSK | 40 | |
| 10MHz | | | | QPSK | 50 | |
| 10MHz | | | | 16QAM (Note 4) | 50 (Note 3) | |
| 15MHz | | | | QPSK | 1 | |
| 15MHz | | | | QPSK | 16 | |
| 15MHz | | | | QPSK | 40 | |
| 15MHz | | | | QPSK | 54 | |
| 15MHz | | | | QPSK | 75 | |
| 15MHz | | | | 16QAM (Note 4) | 75 (Note 3) | |

Note 1: The 1 RB allocation shall be tested at both RB #0 and RB #max.
Note 2: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (max + 1 - RB allocation) of the channel bandwidth
Note 3: Applies only for UE-Categories ≥2.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3.3.4.1-7: Test Configuration Table (network signalled value "NS_11")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | For 3 MHz Channel Bandwidth:<br>a. 2001.5 MHz ($N_{UL}$ = 25515)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br><br>For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br>c. 2007.5 MHz ($N_{UL}$ = 25575)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2005.5 MHz ($N_{UL}$ = 25555)<br>c. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2007.5 MHz ($N_{UL}$ = 25575)<br>b. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 3MHz, 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_11 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 3MHz | N/A for A-MPR testing | | QPSK | 6 |
| 2 | 3MHz | | | QPSK | 15 |
| 3 | 3MHz | | | 16QAM (Note 4) | 6 |
| 4 | 3MHz | | | 16QAM (Note 4) | 15 |
| 5 | 5MHz | | | QPSK | 1 |
| 6 | 5MHz | | | QPSK | 8 |
| 7 | 5MHz | | | QPSK | 25 |
| 8 | 5MHz | | | 16QAM (Note 4) | 8 |
| 9 | 5MHz | | | 16QAM (Note 4) | 25 |
| 10 | 10MHz | | | QPSK | 1 |
| 11 | 10MHz | | | QPSK | 12 |
| 12 | 10MHz | | | QPSK | 50 |
| 13 | 10MHz | | | 16QAM (Note 4) | 12 |
| 14 | 10MHz | | | 16QAM (Note 4) | 50 (Note 3) |
| 15 | 15MHz | | | QPSK | 1 |
| 16 | 15MHz | | | QPSK | 8 |

| | | | | |
|---|---|---|---|---|
| 17 | 15MHz | | QPSK | 25 |
| 18 | 15MHz | | QPSK | 30 |
| 19 | 15MHz | | QPSK | 75 |
| 20 | 15MHz | | 16QAM (Note 4) | 8 |
| 21 | 15MHz | | 16QAM (Note 4) | 25 |
| 22 | 15MHz | | 16QAM (Note 4) | 30 |
| 23 | 15MHz | | 16QAM (Note 4) | 75 |
| 24 | 20MHz | | QPSK | 1 |
| 25 | 20MHz | | QPSK | 10 |
| 26 | 20MHz | | QPSK | 25 |
| 27 | 20MHz | | QPSK | 100 |
| 28 | 20MHz | | 16QAM (Note 4) | 10 |
| 29 | 20MHz | | 16QAM (Note 4) | 25 |
| 30 | 20MHz | | 16QAM (Note 4) | 100 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories ≥2.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3.3.4.1-8: Test Configuration Table (network signalled value "NS_12")**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | NC |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | For 1.4 MHz Channel Bandwidth: UL 814.9 MHz (NUL = 26699)<br><br>For 3 MHz Channel Bandwidth: UL 815.7 MHz (NUL = 26707)<br><br>For 5 MHz Channel Bandwidth: UL 816.7 MHz (NUL = 26717)<br><br>For 10 MHz Channel Bandwidth: UL 819.2 MHz (NUL = 26742)<br><br>For 15 MHz Channel Bandwidth: UL 821.7 MHz (NUL = 26767) |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz and 15 MHz |
| **Test Parameters for Channel Bandwidths** | | | |
| | | **Downlink Configuration** | **Uplink Configuration** |

| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation FDD | RBstart FDD |
|---|---|---|---|---|---|---|
| 1 | 1.4 MHz | N/A for Additional Spurious Emissions testing | | QPSK | 1 | 0 |
| 2 | 1.4 MHz | | | QPSK | 6 | 0 |
| 3 | 1.4 MHz | | | QPSK | 1 | 1 |
| 4 | 1.4 MHz | | | QPSK | 5 | 1 |
| 5 | 1.4 MHz | | | 16QAM (Note 3) | 6 | 0 |
| 6 (Note 1) | 3 MHz | | | QPSK | 4 | 0 |
| 7 (Note 1) | 3 MHz | | | QPSK | 10 | 0 |
| 8 | 3 MHz | | | QPSK | 4 | 4 |
| 9 | 3 MHz | | | QPSK | 10 | 4 |
| 10 (Note 1) | 3 MHz | | | 16QAM (Note 3) | 15 | 0 |
| 11 | 5 MHz | | | QPSK | 8 | 0 |
| 12 | 5 MHz | | | QPSK | 15 | 0 |
| 13 | 5 MHz | | | QPSK | 8 | 7 |
| 14 (Note 1) | 5 MHz | | | QPSK | 15 | 7 |
| 15 | 5 MHz | | | 16QAM (Note 3) | 25 | 0 |
| 16 (Note 2) | 10 MHz | | | QPSK | 18 | 0 |
| 17 (Note 2) | 10 MHz | | | QPSK | 18 | 16 |
| 18 (Note 2) | 10 MHz | | | 16QAM (Note 4, 3) | 50 | 0 |
| 19 (Note 2) | 15 MHz | | | QPSK | 30 | 0 |
| 20 (Note 2) | 15 MHz | | | QPSK | 30 | 31 |
| 21 (Note 2) | 15 MHz | | | 16QAM (Note 4, 3) | 75 | 0 |

Note 1: Only for UEs of Rel-11 and earlier.
Note 2: Only for UEs of Rel-12 and later.
Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.
Note 4 : Applies only for UE-Categories ≥2.

**Table 6.6.3.3.4.1-9: Test Configuration Table (network signalled value "NS_13")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | NC | | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | For 1.4 MHz Channel Bandwidth: UL 819.7 MHz (NUL = 26747)<br><br>For 3 MHz Channel Bandwidth: UL 820.5 MHz (NUL = 26755)<br><br>For 5 MHz Channel Bandwidth: UL 821.5 MHz (NUL = 26765) | | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | 1.4 MHz, 3MHz and 5 MHz | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation FDD | RBstart FDD |

| | | | | | |
|---|---|---|---|---|---|
| 1 (Note 1) | 1.4 MHz | N/A for Additional Spurious Emissions testing | QPSK | 6 | 0 |
| 2 (Note 1) | 3 MHz | | QPSK | 15 | 0 |
| 3 | 5 MHz | | QPSK | 1 | 0 |
| 4 | 5 MHz | | QPSK | 25 | 0 |
| 5 | 5 MHz | | QPSK | 15 | 0 |
| 6 | 5 MHz | | QPSK | 15 | 7 |
| 7 | 5 MHz | | 16QAM (Note 2) | 25 | 0 |

Note 1: Only for UEs of Rel-12 and later
Note 2: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3.3.4.1-10: Test Configuration Table (network signalled value "NS_14")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | NC | | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | For 10 MHz Channel Bandwidth: UL 829 MHz ($N_{UL}$ = 26840)<br>For 15 MHz Channel Bandwidth: Mid range | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | 10 MHz, 15 MHz | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation FDD | RBstart FDD |
| 1 | 10 MHz | N/A for Additional Spurious Emissions testing | | QPSK | 1 | 0 |
| 2 | 10 MHz | | | QPSK | 25 | 0 |
| 3 | 10 MHz | | | QPSK | 50 | 0 |
| 4 | 10 MHz | | | QPSK | 25 | 1 |
| 5 (Note 1) | 10 MHz | | | 16QAM (Note 2) | 50 | 0 |
| 6 | 15 MHz | | | QPSK | 8 | 0 |
| 7 | 15 MHz | | | QPSK | 25 | 0 |
| 8 | 15 MHz | | | QPSK | 75 | 0 |
| 9 | 15 MHz | | | QPSK | 50 | 15 |
| 10 (Note 1) | 15 MHz | | | 16QAM (Note 2) | 75 | 0 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3.3.4.1-11: Test Configuration Table (network signalled value "NS_15")**

| Initial Conditions | |
|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | NC |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | For 1.4 MHz Channel Bandwidth: High range<br><br>For 3 MHz Channel Bandwidth: UL 843.5 MHz ($N_{UL}$ = 26985) or High range<br><br>For 5 MHz Channel Bandwidth: UL 842.5 MHz ($N_{UL}$ = 26975) or High range<br><br>For 10 MHz Channel Bandwidth: UL 840 MHz (NUL = 26950) or High range<br><br>For 15 MHz Channel Bandwidth: UL 837.5 MHz (NUL = 26925) or High range |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz |

| Test Parameters for Channel Bandwidths | | | | | | |
|---|---|---|---|---|---|---|
| | | Downlink Configuration | | Uplink Configuration | | |
| Configuration ID | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation FDD | RBstart FDD |
| 1 (note 3) | 1.4 MHz | N/A for Additional Spurious Emissions testing | | QPSK | 4 | 0 |
| 2 (note 3) | 1.4 MHz | | | 16QAM (Note 4) | 6 | 0 |
| 3 (note 3) | 3 MHz | | | QPSK | 6 | 7 |
| 4 (note 3) | 3 MHz | | | QPSK | 12 | 1 |
| 5 (note 3) | 3 MHz | | | 16QAM (Note 4) | 15 | 0 |
| 6 (note 2) | 3 MHz | | | QPSK | 15 | 0 |
| 7 (note 3) | 5 MHz | | | QPSK | 6 | 14 |
| 8 (note 3) | 5 MHz | | | QPSK | 20 | 0 |
| 9 (note 3) | 5 MHz | | | 16QAM (Note 4) | 25 | 0 |
| 10 (note 2) | 5 MHz | | | QPSK | 16 | 9 |
| 11 (note 2) | 5 MHz | | | QPSK | 25 | 0 |
| 12 (note 3) | 10 MHz | | | QPSK | 1 | 39 |
| 13 (note 3) | 10 MHz | | | QPSK | 1 | 10 |
| 14 (note 3) | 10 MHz | | | QPSK | 3 | 0 |
| 15 (note 3) | 10 MHz | | | QPSK | 20 | 3 |
| 16 (note 3) | 10 MHz | | | QPSK | 36 | 1 |
| 17 (note 3) | 10 MHz | | | QPSK | 50 | 0 |
| 18 (note 1, 3) | 10 MHz | | | 16QAM (Note 4) | 50 | 0 |
| 19 (note 2) | 10 MHz | | | QPSK | 20 | 25 |
| 20 (note 2) | 10 MHz | | | QPSK | 45 | 0 |
| 21 (note 3) | 15 MHz | | | QPSK | 18 | 36 |
| 22 (note 3) | 15 MHz | | | QPSK | 25 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| 23 (note 3) | 15 MHz | | QPSK | 54 | 0 |
| 24 (note 1, 3) | 15 MHz | | 16QAM (Note 4) | 75 | 0 |
| 25 (note 2) | 15 MHz | | QPSK | 18 | 44 |
| 26 (note 2) | 15 MHz | | QPSK | 60 | 2 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: Applicable only test frequency < high range
Note 3: Applicable only to high range frequency testing.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3.3.4.1-12: Test Configuration Table (network signalled value "NS_16")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: Low range<br><br>For 3 MHz Channel Bandwidth: Low range, 810 MHz ($N_{UL}$= 27070)<br><br>For 5 MHz Channel Bandwidth: Low range, 811 MHz ($N_{UL}$= 27080) , 814.5 MHz ($N_{UL}$= 27115)<br><br>For 10 MHz Channel Bandwidth: Low range, 813.5 MHz ($N_{UL}$= 27105), 817 MHz ($N_{UL}$= 27140) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for Additional Spurious Emissions testing. | | QPSK | 1 | 0 |
| 2 | 1.4 MHz | | | QPSK | 6 | 0 |
| 3<br>(Note 1) | 1.4 MHz | | | 16QAM<br>(Note 4) | 6 | 0 |
| 4 | 3 MHz | | | QPSK | 1 | 0 |
| 5 | 3 MHz | | | QPSK | 12 | 1 |
| 6 | 3 MHz | | | QPSK | 15 | 0 |
| 7<br>(Note 1) | 3 MHz | | | 16QAM<br>(Note 4) | 15 | 0 |
| 8 | 5 MHz | | | QPSK | 1 | 0 |
| 9 | 5 MHz | | | QPSK | 12 | 2 |
| 10 | 5 MHz | | | QPSK | 18 | 2 |
| 11 | 5 MHz | | | QPSK | 20 | 0 |
| 12 | 5 MHz | | | QPSK | 20 | 2 |
| 13 | 5 MHz | | | QPSK | 25 | 0 |
| 14<br>(Note 1) | 5 MHz | | | 16QAM<br>(Note 4) | 25 | 0 |
| 15 | 10 MHz | | | QPSK | 1 | 0 |
| 16<br>(Note 2) | 10 MHz | | | QPSK | 1 | 10 |

| | | | | | |
|---|---|---|---|---|---|
| 17 (Note 2) | 10 MHz | | QPSK | 20 | 0 |
| 18 (Note 2) | 10 MHz | | QPSK | 27 | 15 |
| 19 (Note 2) | 10 MHz | | QPSK | 32 | 15 |
| 20 | 10 MHz | | QPSK | 32 | 0 |
| 21 | 10 MHz | | QPSK | 50 | 0 |
| 22 (Note 1) | 10 MHz | | 16QAM (Note 4) | 50 | 0 |
| 23 (Note 3) | 10 MHz | | QPSK | 40 | 0 |
| 24 (Note 3) | 10 MHz | | QPSK | 40 | 1 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: Applies only for 10 MHz channel for Low Range, and 813.5 MHz.
Note 3: Applies only for 10 MHz channel for 817 MHz range.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3.3.4.1-13: Test Configuration Table (network signalled value "NS_17")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508[7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified inTS36.508 [7] subclause 4.3.1) | | | | Mid range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing | | QPSK | 1 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | QPSK | 25 |
| 4 | 5MHz | | | 16QAM (Note 4) | 25 (Note 3) |
| 5 | 10MHz | | | QPSK | 1 |
| 6 | 10MHz | | | QPSK | 12 |
| 7 | 10MHz | | | QPSK | 50 |
| 8 | 10MHz | | | 16QAM (Note 4) | 50 (Note 3) |

Note 1: The 1 RB allocation shall be tested at both RB #0 and RB #max.
Note 2: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories ≥2.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3.3.4.1-14: Test Configuration Table (network signalled value "NS_18")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508[7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified inTS36.508 [7] subclause 4.3.1) | | | | Low range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing | | QPSK | 1 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | QPSK | 25 |
| 4 | 5MHz | | | 16QAM (Note 2) | 25 (Note 3) |
| 5 | 10MHz | | | QPSK | 1 |
| 6 | 10MHz | | | QPSK | 12 |
| 7 | 10MHz | | | QPSK | 50 |
| 8 | 10MHz | | | 16QAM (Note 2) | 50 (Note 3) |
| 9 | 15MHz | | | QPSK | 1 |
| 10 | 15MHz | | | QPSK | 16 |
| 11 | 15MHz | | | QPSK | 75 |
| 12 | 15MHz | | | 16QAM (Note 2) | 75 (Note 3) |
| 13 | 20MHz | | | QPSK | 1 |
| 14 | 20MHz | | | QPSK | 18 |
| 15 | 20MHz | | | QPSK | 100 |
| 16 | 20MHz | | | 16QAM (Note 2) | 100 (Note 3) |

Note 1: The 1 RB allocation shall be tested at both RB #0 and RB #max.
Note 2: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories ≥2.
Note 2: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3.3.4.1-15: Test Configuration Table (network signalled value "NS_19")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508[7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified inTS36.508 [7] subclause 4.3.1) | | | | Low range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 3MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** |
| 1 | 3MHz | N/A | | QPSK | 15 |
| 2 | 3MHz | | | 16QAM<br>(Note 4) | 15<br>(Note 3) |
| 3 | 10MHz | | | QPSK | 40 |
| 4 | 10MHz | | | 16QAM<br>(Note 4) | 40<br>(Note 3) |
| 5 | 15MHz | | | QPSK | 1 |
| 6 | 15MHz | | | QPSK | 18 |
| 7 | 15MHz | | | QPSK | 36 |
| 8 | 15MHz | | | QPSK | 45 |
| 9 | 15MHz | | | 16QAM<br>(Note 4) | 45<br>(Note 3) |
| 10 | 20MHz | | | QPSK | 1 |
| 11 | 20MHz | | | QPSK | 40 |
| 12 | 20MHz | | | QPSK | 45 |
| 13 | 20MHz | | | QPSK | 50 |
| 14 | 20MHz | | | 16QAM<br>(Note 4) | 50<br>(Note 3) |

Note 1: The 1 RB allocation shall be tested at both RB #0 and RB #max.
Note 2: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories ≥2.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3.3.4.1-16: Test Configuration Table (network signalled value "NS_20")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2007.5 MHz ($N_{UL}$ = 25575)<br>c. 2012.5 MHz ($N_{UL}$ = 25625)<br>d. 2017.5 MHz ($N_{UL}$ = 25675)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_20 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 8 |
| 2 | 5MHz | | | QPSK | 15 |
| 3 | 5MHz | | | QPSK | 25 |
| 4 | 5MHz | | | 16QAM (Note 4) | 15 |
| 5 | 5MHz | | | 16QAM (Note 4) | 25 |
| 6 | 10MHz | | | QPSK | 8 |
| 7 | 10MHz | | | QPSK | 12 |
| 8 | 10MHz | | | QPSK | 50 |
| 9 | 10MHz | | | 16QAM (Note 4) | 12 |
| 10 | 10MHz | | | 16QAM (Note 4) | 50 (Note 3) |
| 11 | 15MHz | | | QPSK | 6 |
| 12 | 15MHz | | | QPSK | 25 |
| 13 | 15MHz | | | QPSK | 36 |
| 14 | 15MHz | | | QPSK | 75 |
| 15 | 15MHz | | | 16QAM (Note 4) | 25 |
| 16 | 15MHz | | | 16QAM (Note 4) | 36 |
| 17 | 15MHz | | | 16QAM (Note 4) | 75 |
| 18 | 20MHz | | | QPSK | 8 |
| 19 | 20MHz | | | QPSK | 18 |

| | | | | |
|---|---|---|---|---|
| 20 | 20MHz | QPSK | 25 |
| 21 | 20MHz | QPSK | 75 |
| 22 | 20MHz | QPSK | 100 |
| 23 | 20MHz | 16QAM (Note 4) | 18 |
| 24 | 20MHz | 16QAM (Note 4) | 25 |
| 25 | 20MHz | 16QAM (Note 4) | 75 |
| 26 | 20MHz | 16QAM (Note 4) | 100 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 3: Applies only for UE-Categories ≥2.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3.3.4.1-17: Test Configuration Table (network signalled value "NS_21")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range or High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5 MHz, 10 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 (note 2) | 5 MHz | | | QPSK | 1 | 0 |
| 2 (note 2) | 5 MHz | | | QPSK | 25 | 0 |
| 3 (note 2) | 10 MHz | | | QPSK | 1 | 0 |
| 4 (note 3) | 10 MHz | | | QPSK | 1 | 49 |
| 5 (note 2) | 10 MHz | | | QPSK | 15 | 0 |
| 6 (note 3) | 10 MHz | | | QPSK | 3 | 47 |
| 7 (note 3) | 10 MHz | | | QPSK | 50 | 0 |
| 8 (note 1, 3) | 10 MHz | | | 16QAM (Note 4) | 50 | 0 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: Applicable only to low range frequency testing.
Note 3: Applicable only to high range frequency testing.
Note 4: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3.3.4.1-18: Test Configuration Table (network signalled value "NS_22")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_22 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 5MHz | | | QPSK | 25 | 0 |
| 3 | 5MHz | | | QPSK | 1 | 24 |
| 4 | 5MHz | | | 16QAM | 1 | 0 |
| 5 | 5MHz | | | 16QAM | 1 | 24 |
| 6 | 10MHz | | | QPSK | 50 | 0 |
| 7 | 10MHz | | | QPSK | 36 | 0 |
| 8 | 10MHz | | | QPSK | 1 | 0 |
| 9 | 10MHz | | | QPSK | 1 | 49 |
| 10 | 10MHz | | | 16QAM | 1 | 0 |
| 11 | 10MHz | | | 16QAM | 1 | 49 |
| 12 | 15MHz | | | QPSK | 75 | 0 |
| 13 | 15MHz | | | QPSK | 50 | 0 |
| 14 | 15MHz | | | QPSK | 1 | 0 |
| 15 | 15MHz | | | QPSK | 1 | 74 |
| 16 | 15MHz | | | 16QAM | 1 | 0 |
| 17 | 15MHz | | | 16QAM | 1 | 74 |
| 18 | 20MHz | | | QPSK | 100 | 0 |
| 19 | 20MHz | | | QPSK | 64 | 0 |
| 20 | 20MHz | | | QPSK | 1 | 0 |
| 21 | 20MHz | | | QPSK | 1 | 99 |
| 22 | 20MHz | | | 16QAM | 1 | 0 |
| 23 | 20MHz | | | 16QAM | 1 | 99 |
| Note 1: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | |

**Table 6.6.3.3.4.1-19: Test Configuration Table (network signalled value "NS_23")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_23 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 5MHz | | | QPSK | 1 | 24 |
| 3 | 5MHz | | | QPSK | 25 | 0 |
| 4 | 5MHz | | | 16QAM | 1 | 0 |
| 5 | 5MHz | | | 16QAM | 1 | 24 |
| 6 | 10MHz | | | QPSK | 50 | 0 |
| 7 | 15MHz | | | QPSK | 75 | 0 |
| 8 | 20MHz | | | QPSK | 100 | 0 |
| Note 1: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | |

**Table 6.6.3.3.4.1-20: Test Configuration Table (network signalled value "NS_24")**

| Initial Conditions | |
|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | Normal |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | Refer to $F_{UL}$ in test parameters with following:<br>5 MHz CH BW:<br>- 1985 MHz ($N_{UL}$ = 131722)<br>- 2007.5 MHz ($N_{UL}$ = high range)<br>10 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772)<br>- 2005 MHz ($N_{UL}$ = high range)<br>15 MHZ CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772)<br>- 2002.5 MHz ($N_{UL}$ = high range)<br>20 MHz CH BW:<br>2000 MHz ($N_{UL}$ = high range)<br>- |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | 5MHz, 10MHz, 15MHz, 20MHz |

**Test Parameters for NS_24 A-MPR**

| | | | Downlink Configuration | | Uplink Configuration | | |
|---|---|---|---|---|---|---|---|
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 2007.5 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 2007.5 | 5MHz | | | QPSK | 8 | 17 |
| 3 | 2007.5 | 5MHz | | | QPSK | 25 | 0 |
| 4 (Notes 2,3) | 2007.5 | 5MHz | | | 16QAM | 25 | 0 |
| 5 | 1985 | 5MHz | | | QPSK | 8 | 17 |
| 6 | 1980 | 10MHz | | | QPSK | 12 | 1 |
| 7 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 50 | 0 |
| 8 | 1980 | 10MHz | | | QPSK | 48 | 2 |
| 9 | 1980 | 10MHz | | | QPSK | 25 | 25 |
| 10 | 1980 | 10MHz | | | QPSK | 1 | 49 |
| 11 | 1980 | 10MHz | | | QPSK | 12 | 38 |
| 12 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 12 | 38 |
| 13 | 1980 | 10MHz | | | QPSK | 3 | 47 |
| 14 | 1980 | 10MHz | | | QPSK | 8 | 1 |
| 15 | 1990 | 10MHz | | | QPSK | 1 | 0 |
| 16 | 1990 | 10MHz | | | QPSK | 12 | 38 |
| 17 (Notes 2,3) | 1990 | 10MHz | | | 16QAM | 50 | 0 |
| 18 | 2005 | 10MHz | | | QPSK | 12 | 38 |
| 19 | 2005 | 10MHz | | | QPSK | 50 | 0 |
| 20 (Notes 2,3) | 2005 | 10MHz | | | 16QAM | 50 | 0 |
| 21 | 1980 | 15MHz | | | QPSK | 1 | 11 |
| 22 | 1980 | 15MHz | | | QPSK | 16 | 11 |
| 23 | 1980 | 15MHz | | | QPSK | 45 | 11 |
| 24 (Notes 2,3) | 1980 | 15MHz | | | 16QAM | 50 | 0 |
| 25 | 1980 | 15MHz | | | QPSK | 16 | 28 |
| 26 | 1980 | 15MHz | | | QPSK | 16 | 59 |
| 27 | 1980 | 15MHz | | | QPSK | 60 | 15 |
| 28 | 1980 | 15MHz | | | QPSK | 30 | 12 |
| 29 | 2002.5 | 15MHz | | | QPSK | 1 | 0 |
| 30 | 2002.5 | 15MHz | | | QPSK | 16 | 59 |
| 31 (Notes 2,3) | 2002.5 | 15MHz | | | 16QAM | 16 | 59 |
| 32 (Notes 2,3) | 2002.5 | 15MHz | | | 16QAM | 75 | 0 |
| 33 | 2000 | 20MHz | | | QPSK | 1 | 0 |
| 34 | 2000 | 20MHz | | | QPSK | 18 | 82 |
| 35 (Notes 2,3) | 2000 | 20MHz | | | 16QAM | 18 | 82 |
| 36 (Notes 2,3) | 2000 | 20MHz | | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.

| | |
|---|---|
| Note 2: | Applies only for UE-Categories ≥2. |
| Note 3: | The 16QAM configurations shall not apply to UEs which support UL 64QAM. |

**Table 6.6.3.3.4.1-21: Test Configuration Table (network signalled value "NS_25")**

| Initial Conditions | |
|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | Normal |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | Refer to $F_{UL}$ in test parameters with following:<br>5 MHz CH BW:<br>- 2007.5 MHz ($N_{UL}$ = high range)<br>10 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772)<br>- 2005 MHz ($N_{UL}$ = high range)<br>15 MHZ CH BW:<br>- 1980 MHz ($N_{UL}$ = 132672)<br>- 1990 MHz ($N_{UL}$ = 131772)<br>- 2002.5 MHz ($N_{UL}$ = high range)<br>20 MHz CH BW:<br>2000 MHz ($N_{UL}$ = high range)<br>- |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | 5MHz, 10MHz, 15MHz, 20MHz |

| Test Parameters for NS_25 A-MPR | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Downlink Configuration | | Uplink Configuration | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 2007.5 | 5MHz | N/A for A-MPR testing | | QPSK | 25 | 0 |
| 2 (Notes 2,3) | 2007.5 | 5MHz | | | 16QAM | 25 | 0 |
| 3 | 2007.5 | 5MHz | | | QPSK | 8 | 9 |
| 4 | 2007.5 | 5MHz | | | QPSK | 1 | 24 |
| 5 | 2007.5 | 5MHz | | | QPSK | 8 | 17 |
| 6 (Notes 2,3) | 2007.5 | 5MHz | | | 16QAM | 8 | 17 |
| 7 | 1980 | 10MHz | | | QPSK | 12 | 1 |
| 8 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 50 | 0 |
| 9 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 48 | 2 |
| 10 | 1980 | 10MHz | | | QPSK | 25 | 25 |
| 11 | 1980 | 10MHz | | | QPSK | 1 | 49 |
| 12 | 1980 | 10MHz | | | QPSK | 12 | 38 |
| 13 | 1990 | 10MHz | | | QPSK | 12 | 0 |
| 14 | 1990 | 10MHz | | | QPSK | 25 | 0 |
| 15 | 1990 | 10MHz | | | QPSK | 50 | 0 |
| 16 (Notes 2,3) | 1990 | 10MHz | | | 16QAM | 25 | 0 |
| 17 | 1990 | 10MHz | | | QPSK | 48 | 2 |
| 18 | 1990 | 10MHz | | | QPSK | 30 | 19 |
| 19 (Notes 2,3) | 1990 | 10MHz | | | 16QAM | 30 | 19 |
| 20 | 1990 | 10MHz | | | QPSK | 12 | 31 |
| 21 | 2005 | 10MHz | | | QPSK | 1 | 0 |
| 22 | 2005 | 10MHz | | | QPSK | 12 | 6 |
| 23 | 2005 | 10MHz | | | QPSK | 50 | 0 |
| 24 (Notes 2,3) | 2005 | 10MHz | | | 16QAM | 50 | 0 |
| 25 | 2005 | 10MHz | | | QPSK | 40 | 10 |
| 26 (Notes 2,3) | 2005 | 10MHz | | | 16QAM | 40 | 10 |
| 27 | 2005 | 10MHz | | | QPSK | 32 | 18 |
| 28 (Notes 2,3) | 2005 | 10MHz | | | 16QAM | 32 | 18 |
| 29 | 2005 | 10MHz | | | QPSK | 12 | 23 |
| 30 | 1980 | 15MHz | | | QPSK | 16 | 4 |
| 31 | 1980 | 15MHz | | | QPSK | 75 | 0 |
| 32 | 1980 | 15MHz | | | QPSK | 60 | 15 |
| 33 (Notes 2,3) | 1980 | 15MHz | | | 16QAM | 40 | 35 |
| 34 | 1980 | 15MHz | | | QPSK | 1 | 74 |
| 35 | 1980 | 15MHz | | | QPSK | 12 | 63 |
| 36 | 1980 | 15MHz | | | QPSK | 16 | 55 |
| 37 | 2002.5 | 15MHz | | | QPSK | 1 | 0 |
| 38 | 2002.5 | 15MHz | | | QPSK | 16 | 0 |
| 39 (Notes 2,3) | 2002.5 | 15MHz | | | 16QAM | 16 | 0 |
| 40 (Notes 2,3) | 2002.5 | 15MHz | | | 16QAM | 1 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 41 | 1980 | 20MHz | | QPSK | 1 | 0 |
| 42 | 1980 | 20MHz | | QPSK | 18 | 0 |
| 43 (Notes 2,3) | 1980 | 20MHz | | 16QAM | 100 | 0 |
| 44 | 1980 | 20MHz | | QPSK | 64 | 36 |
| 45 | 1980 | 20MHz | | QPSK | 18 | 72 |
| 46 (Notes 2,3) | 1980 | 20MHz | | 16QAM | 54 | 46 |
| 47 | 1980 | 20MHz | | QPSK | 18 | 55 |
| 48 | 2000 | 20MHz | | QPSK | 1 | 0 |
| 49 | 2000 | 20MHz | | QPSK | 18 | 72 |
| 50 (Notes 2,3) | 2000 | 20MHz | | 16QAM | 18 | 72 |
| 51 (Notes 2,3) | 2000 | 20MHz | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: Applies only for UE-Categories ≥2.
Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3.3.4.1-22: Test Configuration Table (network signalled value "NS_27")**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to Frequency column in test parameters | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_27 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Frequency** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | Low/Mid | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | High | 5MHz | | | QPSK | 1 | 24 |
| 3 | Low/Mid/High | 5MHz | | | QPSK | 25 | 0 |
| 4 | Low/Mid/High | 5MHz | | | 16QAM | 25 | 0 |
| 5 | Low/Mid | 10MHz | | | QPSK | 1 | 0 |
| 6 | High | 10MHz | | | QPSK | 1 | 49 |
| 7 | Low/Mid/High | 10MHz | | | QPSK | 50 | 0 |
| 8 (Note 2) | Low/Mid/High | 10MHz | | | 16QAM | 50 | 0 |
| 9 | Low/Mid | 15MHz | | | QPSK | 1 | 0 |
| 10 | Low | 15MHz | | | QPSK | 1 | 7 |
| 11 | Low/Mid | 15MHz | | | QPSK | 16 | 0 |
| 12 | High | 15MHz | | | QPSK | 1 | 74 |
| 13 | High | 15MHz | | | QPSK | 1 | 67 |
| 14 | High | 15MHz | | | QPSK | 16 | 74 |
| 15 | Low/Mid/High | 15MHz | | | QPSK | 75 | 0 |
| 16 (Note 2) | Low/Mid/High | 15MHz | | | 16QAM | 75 | 0 |
| 17 | Low/Mid | 20MHz | | | QPSK | 1 | 0 |
| 18 | Low | 20MHz | | | QPSK | 1 | 13 |
| 19 | Low | 20MHz | | | QPSK | 1 | 16 |
| 20 | Low/Mid | 20MHz | | | QPSK | 21 | 0 |
| 21 | High | 20MHz | | | QPSK | 1 | 99 |
| 22 | High | 20MHz | | | QPSK | 1 | 86 |
| 23 | High | 20MHz | | | QPSK | 1 | 83 |
| 24 | High | 20MHz | | | QPSK | 21 | 0 |
| 25 | Low/Mid/High | 20MHz | | | QPSK | 100 | 0 |
| 26 (Note 2) | Low/Mid/High | 20MHz | | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: Applies only for UE-Categories ≥2.
Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3.3.4.1-23: Test Configuration Table (network signalled value "NS_36")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>5 MHz CH BW:<br>- 700.5 MHz ($N_{UL}$ = low range)<br>- 705.5 MHz ($N_{UL}$ =132747)<br>10 MHz CH BW:<br>- 703 MHz ($N_{UL}$ = low range)<br>- 708 MHz ($N_{UL}$ = 132772)<br>15 MHz CH BW:<br>- 705.5 MHz ($N_{UL}$ = low range)<br>- 710.5 MHz ($N_{UL}$ =132797 ) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz | | |
| **Test Parameters for NS_36 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 700.5 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 700.5 | 5MHz | | | QPSK | 25 | 0 |
| 3 | 700.5 | 5MHz | | | QPSK | 20 | 1 |
| 4 | 700.5 | 5MHz | | | QPSK | 24 | 1 |
| 5 | 700.5 | 5MHz | | | QPSK | 12 | 0 |
| 6 (Notes 2,3) | 700.5 | 5MHz | | | 16QAM | 12 | 0 |
| 7 | 705.5 | 5MHz | | | QPSK | 25 | 0 |
| 8 (Notes 2,3) | 705.5 | 5MHz | | | 16QAM | 25 | 0 |
| 9 | 703 | 10MHz | | | QPSK | 50 | 0 |
| 10 | 703 | 10MHz | | | QPSK | 1 | 0 |
| 11 | 703 | 10MHz | | | QPSK | 40 | 9 |
| 12 | 703 | 10MHz | | | QPSK | 36 | 13 |
| 13 | 703 | 10MHz | | | QPSK | 10 | 40 |
| 14 | 703 | 10MHz | | | QPSK | 6 | 44 |
| 15 | 708 | 10MHz | | | QPSK | 50 | 0 |
| 16 (Notes 2,3) | 708 | 10MHz | | | 16QAM | 50 | 0 |
| 17 | 705.5 | 15MHz | | | QPSK | 75 | 0 |
| 18 | 705.5 | 15MHz | | | QPSK | 50 | 17 |
| 19 | 705.5 | 15MHz | | | QPSK | 50 | 24 |
| 20 | 705.5 | 15MHz | | | QPSK | 1 | 57 |
| 21 | 705.5 | 15MHz | | | QPSK | 10 | 17 |
| 22 | 705.5 | 15MHz | | | QPSK | 18 | 24 |
| 23 (Notes 2,3) | 705.5 | 15MHz | | | 16QAM | 18 | 24 |
| 24 | 710.5 | 15MHz | | | QPSK | 75 | 0 |
| 25 | 710.5 | 15MHz | | | 16QAM | 75 | 0 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 2: Applies only for UE-Categories ≥2.<br>Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | | |

Editor's note: The following lines belong at the end of section 6.2.4.4.1. As new tables are added to this section, these lines should always follow the tables.

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.7.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.3.3.4.1-1to Table 6.6.3.3.4.1-23 depending on network signal value.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.3.4.3.

#### 6.6.3.3.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.3.3.4.1-1 to 6.6.3.3.4.1-28. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Tables 6.2.4.5-1 to 6.2.4.5-27 for Power Class 3 UEs or 6.2.4_1.5-2 for Power Class 2 UEs as appropriate. The period of the measurement shall be at least one sub-frame (1ms).

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.6.3.3.5.1-1 to 6.6.3.3.5.21-1 as appropriate. The centre frequency of the filter shall be stepped in contiguous steps according to the same table. For NS_07 measurements made in a bandwidth of 6.25kHz, measurement parameter settings defined in table 6.6.3.3.4.2-1 shall be used. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

**Table 6.6.3.3.4.2-1: Measurement setup for NS_07**

| | **Option 1: Measurement with No RMS VBW available** | **Option2 Measurement with VBW Filtering on Power scale** |
|---|---|---|
| VBW | >=62.5 kHz (10 times or more the RBW) | <=43Hz |
| RBW | <=6.25kHz | <=6.25kHz |
| Detector type | Averages signal envelope during each measurement point, such as "RMS detector" | Peak |
| Averaging mode (Trace averaging) | Power (RMS voltage) | Power (RMS voltage), as controlled by "Average Type" |
| Average Type (applies to detector) | Power (RMS voltage) (automatically occurs with "RMS detector") | Not applicable |
| Average Type (applies to VBW filter) | Not applicable | Power (RMS voltage) |
| Number of averages | 30, to reduce variance as required, or use an even longer sweep time | 1 or use an even narrower VBW filter, thus a longer sweep time |
| Sweep time | [Don't specify] | Sweep rate (span divided by sweep time) <= 0.8 * RBW*VBW |

#### 6.6.3.3.4.3 Message contents

##### 6.6.3.3.4.3.1 Message contents exceptions (network signalled value "NS_04")

1. Information element additionalSpectrumEmission is set to NS_04. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.1-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_04" for Power Class 2**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 4 (NS_04) | | |

6.6.3.3.4.3.2 Message contents (network signalled value "NS_05")

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS_05. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.2-1: *SystemInformationBlockType2: A*dditional spurious emissions requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 5 (NS_05) | | |

6.6.3.3.4.3.3 Message contents (network signalled value "NS_07")

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS_07. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.3-1: *SystemInformationBlockType2: A*dditional spurious emissions requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 7 (NS_07) | | |

6.6.3.3.4.3.4 Message contents (network signalled value "NS_08")

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS_08. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.4-1: *SystemInformationBlockType2: A*dditional spurious emissions requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 8 (NS_08) | | |

6.6.3.3.4.3.5 Message contents (network signalled value "NS_09")

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS_09. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.5-1: *SystemInformationBlockType2: A*dditional spurious emissions requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 9 (NS_09) | | |

6.6.3.3.4.3.6 Message contents exceptions (network signalled value "NS_11")

1. Information element additionalSpectrumEmission is set to NS_11. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.6-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_11"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 11 (NS_11) | | |

6.6.3.3.4.3.7 Message contents exceptions (network signalled value "NS_12")

1. Information element additionalSpectrumEmission is set to NS_12. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.7-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_12"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 12 (NS_12) | | |

6.6.3.3.4.3.8 Message contents exceptions (network signalled value "NS_13")

1. Information element additionalSpectrumEmission is set to NS_13. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.8-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_13"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 13 (NS_13) | | |

6.6.3.3.4.3.9 Message contents exceptions (network signalled value "NS_14")

1. Information element additionalSpectrumEmission is set to NS_14. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.9-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_14"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 14 (NS_14) | | |

6.6.3.3.4.3.10 Message contents exceptions (network signalled value "NS_15")

1. Information element additionalSpectrumEmission is set to NS_15. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.10-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_15"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 15 (NS_15) | | |

6.6.3.3.4.3.11 Message contents exceptions (network signalled value "NS_16")

1. Information element additionalSpectrumEmission is set to NS_16. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.11-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_16"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 16 (NS_16) | | |

6.6.3.3.4.3.12 Message contents exceptions (network signalled value "NS_17")

1. Information element additionalSpectrumEmission is set to NS_17. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.12-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_17"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 17 (NS_17) | | |

6.6.3.3.4.3.13 Message contents exceptions (network signalled value "NS_18")

1. Information element additionalSpectrumEmission is set to NS_18. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.13-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_18"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 18 (NS_18) | | |

6.6.3.3.4.3.14 Message contents exceptions (network signalled value "NS_19")

1. Information element additionalSpectrumEmission is set to NS_19. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.14-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_19"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 19 (NS_19) | | |

6.6.3.3.4.3.15 Message contents exceptions (network signalled value "NS_20")

1. Information element additionalSpectrumEmission is set to NS_20. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.15-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_20"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 20 (NS_20) | | |

6.6.3.3.4.3.16 Message contents exceptions (network signalled value "NS_21")

1. Information element additionalSpectrumEmission is set to NS_21. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.16-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_21"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 21 (NS_21) | | |

6.6.3.3.4.3.17 Message contents exceptions (network signalled value "NS_22")

1. Information element additionalSpectrumEmission is set to NS_22. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.17-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_22"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 22(NS_23) | | |

6.6.3.3.4.3.18 Message contents exceptions (network signalled value "NS_23")

1. Information element additionalSpectrumEmission is set to NS_23. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.18-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_23"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 23(NS_23) | | |

6.6.3.3.4.3.19 Message contents exceptions (network signalled value "NS_24")

1. Information element additionalSpectrumEmission is set to NS_24. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.19-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_24"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 24 (NS_24) | | |

6.6.3.3.4.3.20 Message contents exceptions (network signalled value "NS_25")

1. Information element additionalSpectrumEmission is set to NS_25. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.20-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_25"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 25 (NS_25) | | |

6.6.3.3.4.3.21 Message contents exceptions (network signalled value "NS_27")

1. Information element additionalSpectrumEmission is set to NS_27. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.21-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_27"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 27(NS_27) | | |

6.6.3.3.4.3.22 Message contents exceptions (network signalled value "NS_36")

1. Information element additionalSpectrumEmission is set to NS_36. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.22-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_36"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 32 | | |
| additionalSpectrumEmission-v10l0 | 36 (NS_36) | | |

6.6.3.3.4.3.23 Message contents exceptions (network signalled value "NS_38")

1. Information element additionalSpectrumEmission is set to NS_38. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.23-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_38"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 32 | | |
| additionalSpectrumEmission-v10l0 | 38 (NS_38) | | |

6.6.3.3.4.3.24 Message contents exceptions (network signalled value "NS_39")

1. Information element additionalSpectrumEmission is set to NS_39. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3.4.3.24-1: *SystemInformationBlockType2: A*dditional spurious emissions test requirement for "NS_39"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 32 | | |
| additionalSpectrumEmission-v10l0 | 39 (NS_39) | | |

## 6.6.3.3.5 Test requirement

This clause specifies the requirements for the specified E-UTRA band for an additional spectrum emission requirement with protected bands as indicated from table 6.6.3.3.5.1-1 to table 6.6.3.3.5.22-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

### 6.6.3.3.5.1 Test requirement (network signalled value “NS_04”)

When "NS 04" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-3 or 6.2.4_1.5-2 as appropriate, and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.1-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.1-1: Additional requirements**

| Frequency band | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 5, 10, 15, 20 MHz | |
| 2490.5 MHz ≤ f < 2495 MHz | -13 | 1 MHz |
| 9 kHz < f < 2490.5 MHz | -25 | 1 MHz |

6.6.3.3.5.2 Test requirement (network signalled value "NS_05")

When "NS_05" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-4 as appropriate,

and

the measured average power of spurious emission, derived in step 2, shall not exceed the described value in Table 6.6.3.3.5.2-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.2-1: Additional requirements (PHS) test requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | | | | Measurement bandwidth |
|---|---|---|---|---|---|
| | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| 1884.5 ≤ f ≤1915.7[*1] | -41 | -41 | -41 | -41 | 300 KHz |
| Note 1: Applicable when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to the upper edge of PHS band (1915.7 MHz) + 4 MHz + the Channel BW assigned, where Channel BW is as defined in sub-clause 5.4.2. Additional restrictions apply for operations below this point. | | | | | |

The requirements in Table 6.6.3.3.5.2-1 apply with the additional restrictions specified in Table 6.6.3.3.5.2-2 when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is less than the upper edge of PHS band (1915.7 MHz) + 4 MHz + the channel BW assigned.

**Table 6.6.3.3.5.2-2: RB restrictions for additional requirement (PHS) (Rel-11 and earlier and bit number 1 in modifiedMPRbehavior = 0)**

| **15 MHz channel bandwidth with $f_c$ = 1932.5 MHz** | | | |
|---|---|---|---|
| $RB_{start}$ | 0-7 | 8-66 | 67-74 |
| $L_{CRB}$ | N/A | ≤ MIN(30, 67 – $RB_{start}$) | N/A |
| **20 MHz channel bandwidth with $f_c$ = 1930 MHz** | | | |
| $RB_{start}$ | 0-23 | 24-75 | 76-99 |
| $L_{CRB}$ | N/A | ≤ MIN(24, 76 – $RB_{start}$) | N/A |

6.6.3.3.5.3 Test requirement (network signalled value "NS_07")

When "NS_07" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-7 as appropriate,

and

- the measured average power of spurious emission, derived in step 4, shall not exceed the described value in Table 6.6.3.3.5.3-1. These requirements also apply for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.3-1: Additional requirements (network signalled value "NS_07")**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 10 MHz | |
| 769 ≤ f ≤ 775 | -55.5 | 6.25 kHz |
| Note: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB | | |

### 6.6.3.3.5.4 Test requirement (network signalled value "NS_08")

When "NS_08" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-8 as appropriate,

and

the measured average power of spurious emission, derived in step 4, shall not exceed the described value in Table 6.6.3.3.5.4-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.4-1: Additional requirements (network signalled value "NS_08")**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | | | Measurement bandwidth |
|---|---|---|---|---|
| | 5MHz | 10MHz | 15MHz | |
| 860 ≤ f ≤ 895 | -40 | -40 | -40 | 1 MHz |

### 6.6.3.3.5.5 Test requirement (network signalled value "NS_09")

When "NS_09" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-9 as appropriate,

and

- the measured average power of spurious emission, derived in step 4, shall not exceed the described value in table 6.6.3.3.5.5-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.5-1: Additional requirements (network signalled value "NS_09")**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | | | Measurement bandwidth |
|---|---|---|---|---|
| | 5MHz | 10MHz | 15MHz | |
| 1475.9 ≤ f ≤ 1510.9 | -35 | -35 | -35 | 1 MHz |

NOTE 1: To improve measurement accuracy, A-MPR values for NS_09 specified in Table 6.2.4.3-1 in sub-clause 6.2.4 are derived based on 100 kHz RBW.

6.6.3.3.5.6 Test requirement (network signalled value "NS_11")

When "NS 11" is indicated in the cell:

the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-11 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.6-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.6-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 1.4, 3, 5, 10, 15, 20 MHz | | |
| E-UTRA Band 2 | -50 | 1 MHz | |
| 1998 ≤ f ≤ 1999 | -21 | 1 MHz | |
| 1997 ≤ f < 1998 | -27 | 1 MHz | |
| 1996 ≤ f < 1997 | -32 | 1 MHz | |
| 1995 ≤ f < 1996 | -37 | 1 MHz | |
| 1990 ≤ f < 1995 | -40 | 1 MHz | |

6.6.3.3.5.7 Test requirement (network signalled value "NS_12")

When "NS 12" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-12 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.7-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.7-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth/ Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz | |
| 806 ≤ f ≤ 813.5 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 814.2 MHz.<br>NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

6.6.3.3.5.8 Test requirement (network signalled value "NS_13")

When "NS 13" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-13 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.8-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.8-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth/ Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 1.4, 3, 5 MHz | |
| 806 ≤ f ≤ 816 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 819 MHz.<br>NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

6.6.3.3.5.9 Test requirement (network signalled value "NS_14")

When "NS 14" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-14 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.9-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.9-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth/ Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 10 MHz, 15 MHz | |
| 806 ≤ f ≤ 816 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 824 MHz.<br>NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

6.6.3.3.5.10 Test requirement (network signalled value "NS_15")

When "NS 15" is indicated in the cell:

the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-15 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.10-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.10-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 1.4, 3, 5, 10, 15 MHz | | |
| 851 ≤ f ≤ 859 | -53 | 6.25 kHz | |

6.6.3.3.5.11 Test requirement (network signalled value "NS_16")

When "NS 16" is indicated in the cell:

the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-16 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.11-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.11-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 1.4, 3, 5, 10 MHz | | |
| 790 ≤ f ≤ 803 | -32 | 1 MHz | |

6.6.3.3.5.12 Test requirement (network signalled value "NS_17")

When "NS 17" is indicated in the cell:

the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-17 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.12-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.12-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 5, 10 MHz | | |
| 470 ≤ f ≤ 710 | -26.2 | 6 MHz | 1 |
| Note 1: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz. | | | |

6.6.3.3.5.13 Test requirement (network signalled value "NS_18")

When "NS 18" is indicated in the cell:

the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-18 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.13-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.13-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 5, 10, 15, 20 MHz | | |
| 692 ≤ f ≤ 698 | -26.2 | 6 MHz | |

6.6.3.3.5.14 Test requirement (network signalled value "NS_19")

When "NS 19" is indicated in the cell:

the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-19 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.14-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.14-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 3, 5, 10, 15, 20 MHz | | |
| 662 ≤ f ≤ 694 | -25 | 8 MHz | |

6.6.3.3.5.15 Test requirement (network signalled value "NS_20")

When "NS 20" is indicated in the cell:

the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-20 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.15-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.15-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | Note |
|---|---|---|---|
| | 5, 10, 15, 20 MHz | | |
| 1990 ≤ f < 1999 | -40 | 1 MHz | |
| 1999 ≤ f ≤ 2000 | -40 | Note 1 | |
| Note 1: The measurement bandwidth is 1% of the applicable E-UTRA channel bandwidth (5.4.2.1-1). | | | |

6.6.3.3.5.16 Test requirement (network signalled value “NS_21”)

When “NS_21” is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-21 as appropriate, and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.16-1. These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.16-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 5, 10 MHz | |
| 2200 ≤ f < 2288 | -40 | 1 MHz |
| 2288 ≤ f < 2292 | -37 | 1 MHz |
| 2292 ≤ f < 2296 | -31 | 1 MHz |
| 2296 ≤ f < 2300 | -25 | 1 MHz |
| 2320 ≤ f < 2324 | -25 | 1 MHz |
| 2324 ≤ f < 2328 | -31 | 1 MHz |
| 2328 ≤ f < 2332 | -37 | 1 MHz |
| 2332 ≤ f ≤ 2395 | -40 | 1 MHz |

6.6.3.3.5.17 Test requirement (network signalled value “NS_22”)

When "NS 22" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-22 as appropriate, and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.17-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.17-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | MBW |
|---|---|---|
| | 5, 10, 15, 20 MHz | |
| 3400 ≤ f ≤ 3800 | -23 (NOTE 1, NOTE 3) | 5 MHz |
| | -40 (NOTE 2) | 1 MHz |
| NOTE 1: This requirement applies within an offset between 5 MHz and 25 MHz from the lower and from the upper edge of the channel bandwidth, whenever these frequencies overlap with the specified frequency band. | | |
| NOTE 2: This requirement applies from 3400 MHz to 25 MHz below the lower E-UTRA channel edge and from 25 MHz above the upper E-UTRA channel edge to 3800 MHz. | | |
| NOTE 3: This emission limit might imply risk of harmful interference to UE(s) operating in the protected operating band | | |

6.6.3.3.5.18 Test requirement (network signalled value “NS_23”)

When "NS 23" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-23 as appropriate, and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.18-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.18-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | MBW |
|---|---|---|
| | 5, 10, 15, 20 MHz | |
| 3400 ≤ f ≤ 3800 | -23 (NOTE 1, NOTE 4) | 5 MHz |
| | -40 (NOTE 2) | 1 MHz |

NOTE 1: This requirement applies within an offset between 5 MHz + $F_{offset_NS_23}$ and 25 MHz + $F_{offset_NS_23}$ from the lower and from the upper edges of the channel bandwidth, whenever these frequencies overlap with the specified frequency band.
NOTE 2: This requirement applies from 3400 MHz to 25 MHz + $F_{offset_NS_23}$ below the lower E-UTRA channel edge and from 25 MHz + Foffset$_{NS_23}$ above the upper E-UTRA channel edge to 3800 MHz.
NOTE 3: $F_{offset_NS_23}$ is:
0 MHz for 5 MHz channel BW,
5 MHz for 10 MHz channel BW,
9 MHz for 15 MHz channel BW and
12 MHz for 20 MHz channel BW.
NOTE 4: This emission limit might imply risk of harmful interference to UE(s) operating in the protected operating band.

### 6.6.3.3.5.19 Test requirement (network signalled value “NS_24”)

When "NS 24" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-24 as appropriate, and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.19-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.19-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 5 MHz, 10 MHz, 15 MHz, 20 MHz | |
| Band 34 | -50 | MHz |

Note 1: This requirement applies at a frequency offset equal or larger than 5 MHz from the upper edge of the channel bandwidth, whenever these frequencies overlap with the specified frequency band.

### 6.6.3.3.5.20 Test requirement (network signalled value “NS_25”)

When "NS 25" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-25 as appropriate, and

  - the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.20-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.20-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 5 MHz, 10 MHz, 15 MHz, 20 MHz | |
| Band 34 | -40 | MHz |
| Note 1: This requirement applies at a frequency offset equal or larger than 5 MHz from the upper edge of the channel bandwidth, whenever these frequencies overlap with the specified frequency band. | | |

6.6.3.3.5.21 Test requirement (network signalled value “NS_27”)

When "NS 27" is indicated in the cell:

the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-27 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.21-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.21-1: Additional requirements**

| Frequency band | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 5, 10, 15, 20 MHz | |
| 9 kHz ≤ f ≤ 3530 MHz | -40 | 1 MHz |

6.6.3.3.5.22 Test requirement (network signalled value “NS_36”)

When "NS 36" is indicated in the cell:

the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-29 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.22-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.22-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 5 MHz, 10 MHz and 15 MHz | |
| 470 ≤ f ≤ 694 | -42 | 8MHz |

6.6.3.3.5.23 Test requirement (network signalled value “NS_38”)

When "NS 38" is indicated in the cell:

the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-29 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.23-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.23-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz | |
| 1400 ≤ f ≤ 1427 | -32 | 27MHz |
| NOTE 1: This requirement shall be verified with UE transmission power of 15 dBm. | | |

6.6.3.3.5.24 Test requirement (network signalled value “NS_39”)

When "NS 39" is indicated in the cell:

the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-29 as appropriate,

and

- the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5.24-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3.5.24-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz | |
| 1475 ≤ f ≤ 1488 | -28 | 1MHz |

## 6.6.3.3_1 Additional spurious emissions for UL 64QAM

### 6.6.3.3_1.1 Test purpose

Same test purpose as in clause 6.6.3.3.1.

### 6.6.3.3_1.2 Test applicability

This test case applies to all types of E-UTRA UE from release 13 and forward that support UL 64QAM.

### 6.6.3.3_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.3.3.3.

### 6.6.3.3_1.4 Test description

#### 6.6.3.3_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3.3_1.4.1-1 through Table 6.6.3.3_1.4.1-21. The

details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.3_1.4.1-1: Test Configuration Table (network signalled value "NS_04")**

<table>
<tr><th colspan="7">Initial Conditions</th></tr>
<tr><td colspan="4">Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1)</td><td colspan="3">Normal</td></tr>
<tr><td colspan="4">Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="3">Low Range, Mid Range, High Range<br>Additional test frequencies for Rel-12 to Rel-13 and bit 2 of modifiedMPRbehavior = 0:<br><br>For 5 MHz bandwidth:<br>2499.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866<br><br>Additional test frequencies for Rel-12 and later and bit 2 of modifiedMPRbehavior = 1:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39686<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866</td></tr>
<tr><td colspan="4">Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="3">5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><th colspan="7">Test Parameters for NS_04 A-MPR</th></tr>
<tr><th></th><th></th><th colspan="2">Downlink Configuration</th><th colspan="3">Uplink Configuration</th></tr>
<tr><th>Configuration ID</th><th>Ch BW</th><th>Mod'n</th><th>RB allocation FDD</th><th>Mod'n</th><th>RB allocation FDD</th><th>$RB_{start}$ FDD</th></tr>
<tr><td>1 (Note 1)</td><td>5MHz</td><td colspan="2" rowspan="5">N/A for A-MPR testing</td><td>64QAM</td><td>16</td><td>9</td></tr>
<tr><td>2 (Note 2)</td><td>5MHz</td><td>64QAM</td><td>25</td><td>0</td></tr>
<tr><td>3</td><td>10MHz</td><td>64QAM</td><td>50</td><td>0</td></tr>
<tr><td>4</td><td>15MHz</td><td>64QAM</td><td>75</td><td>0</td></tr>
<tr><td>5</td><td>20MHz</td><td>64QAM</td><td>100</td><td>0</td></tr>
<tr><td colspan="7">Note 1: Only applicable for Low Range.<br>Note 2: Only applicable for Mid, High Range and additional test frequencies.<br>Note 3: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_04.</td></tr>
</table>

**Table 6.6.3.3_1.4.1-2: Test Configuration Table (network signalled value "NS_05")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range<br><br>In case of Low range:<br>- For 5MHz Channel Bandwidth: 1927.2MHz ($N_{UL}$ = 18072)<br>- For 10MHz Channel Bandwidth: 1934.7MHz ($N_{UL}$ = 18147)<br>- For 15MHz Channel Bandwidth: 1932.5MHz ($N_{UL}$ = 18125)<br>- For 20MHz Channel Bandwidth: 1930MHz ($N_{UL}$ = 18100) | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, 10MHz, 15MHz, 20MHz | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 5MHz | N/A for Additional Spurious Emissions testing | | | 64QAM | 25 | NA |
| 10MHz | | | | 64QAM | 50 (Note 1) | |
| 15MHz | | | | 64QAM | 75 (Note 1) | |
| 20MHz | | | | 64QAM | 100 (Note 1) | |
| 10MHz | | | | 64QAM | 50 (Note 2) | |
| 15MHz | | | | 64QAM | 75 (Note 2) | |
| 20MHz | | | | 64QAM | 100 (Note 2) | |
| Note 1: Applies only for Low Range.<br>Note 2: Applies only for Mid Range.<br>Note 3: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_05. | | | | | | |

**Table 6.6.3.3_1.4.1-3: Test Configuration Table (network signalled value "NS_07")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 10MHz | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | $RB_{start}$ |
| 1 | 10MHz | N/A for Additional Spurious Emissions testing. | | 64QAM | 36 | 13 |
| 2 | 10MHz | | | 64QAM | 16 | 19 |
| 3 | 10MHz | | | 64QAM | 30 | 19 |
| 4 | 10MHz | | | 64QAM | 50 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_07. | | | | | | |

**Table 6.6.3.3_1.4.1-4: Test Configuration Table (network signalled value "NS_08")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, 10MHz, 15MHz | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 5MHz | N/A for Additional Spurious Emissions testing | | | 64QAM | 25 | N/A |
| 10MHz | | | | 64QAM | 50 | |
| 15MHz | | | | 64QAM | 75 | |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_08. | | | | | | |

**Table 6.6.3.3_1.4.1-5: Test Configuration Table (network signalled value "NS_09")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, 10MHz, 15MHz | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 5MHz | N/A for Additional Spurious Emissions testing | | | 64QAM | 25 | N/A |
| 10MHz | | | | 64QAM | 50 | |
| 15MHz | | | | 64QAM | 75 | |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_09. | | | | | | |

**Table 6.6.3.3_1.4.1-6: Test Configuration Table (network signalled value "NS_11")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | For 3 MHz Channel Bandwidth:<br>a. 2001.5 MHz ($N_{UL}$ = 25515)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br><br>For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2004.5 MHz ($N_{UL}$ = 25545)<br>c. 2007.5 MHz ($N_{UL}$ = 25575)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2005.5 MHz ($N_{UL}$ = 25555)<br>c. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2007.5 MHz ($N_{UL}$ = 25575)<br>b. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 3MHz, 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_11 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 3MHz | N/A for Additional Spurious Emissions testing. | | 64QAM | 6 |
| 2 | 3MHz | | | 64QAM (Note 3) | 15 |
| 3 | 5MHz | | | 64QAM | 8 |
| 4 | 5MHz | | | 64QAM (Note 3) | 25 |
| 5 | 10MHz | | | 64QAM | 12 |
| 6 | 10MHz | | | 64QAM (Note 3) | 50 |
| 7 | 15MHz | | | 64QAM (Note 3) | 8 |
| 8 | 15MHz | | | 64QAM (Note 3) | 25 |
| 9 | 15MHz | | | 64QAM (Note 3) | 30 |
| 10 | 15MHz | | | 64QAM (Note 3) | 75 |
| 11 | 20MHz | | | 64QAM (Note 3) | 10 |
| 12 | 20MHz | | | 64QAM (Note 3) | 25 |
| 13 | 20MHz | | | 64QAM (Note 3) | 100 |

| | |
|---|---|
| Note 1: | The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE. |
| Note 2: | The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. |
| Note 3: | The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_11. |

**Table 6.6.3.3_1.4.1-7: Test Configuration Table (network signalled value "NS_12")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: UL 814.9 MHz (NUL = 26699)<br><br>For 5 MHz Channel Bandwidth: UL 816.7 MHz (NUL = 26717)<br><br>For 10 MHz Channel Bandwidth: UL 819.2 MHz (NUL = 26742)<br><br>For 15 MHz Channel Bandwidth: UL 821.7 MHz (NUL = 26767) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 5 MHz, 10 MHz and 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation FDD | RBstart FDD |
| 1 | 1.4 MHz | N/A for Additional Spurious Emissions testing | | 64QAM | 6 | 0 |
| 2 | 5 MHz | | | 64QAM | 25 | 0 |
| 3 | 10 MHz | | | 64QAM | 50 | 0 |
| 4 | 15 MHz | | | 64QAM | 75 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_12. | | | | | | |

**Table6.6.3.3_1.4.1-8: Test Configuration Table (network signalled value "NS_13")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | For 5 MHz Channel Bandwidth: UL 821.5 MHz (NUL = 26765) | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation FDD | RBstart FDD |
| 1 | 5 MHz | N/A for Additional Spurious Emissions testing | | 64QAM | 25 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_13. | | | | | | |

**Table 6.6.3.3_1.4.1-9: Test Configuration Table (network signalled value "NS_14")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | For 10 MHz Channel Bandwidth: UL 829 MHz ($N_{UL}$ = 26840)<br>For 15 MHz Channel Bandwidth: Mid range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10 MHz, 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation FDD | RBstart FDD |
| 1 | 10 MHz | N/A for Additional Spurious Emissions testing | | 64QAM | 50 | 0 |
| 2 | 15 MHz | | | 64QAM | 75 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_14. | | | | | | |

**Table 6.6.3.3_1.4.1-10: Test Configuration Table (network signalled value "NS_15")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | | High range | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for Additional Spurious Emissions testing | | 64QAM | 6 | 0 |
| 2 | 3 MHz | | | 64QAM | 15 | 0 |
| 3 | 5 MHz | | | 64QAM | 25 | 0 |
| 4 | 10 MHz | | | 64QAM | 50 | 0 |
| 5 | 15 MHz | | | 64QAM | 75 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_15. | | | | | | |

**Table 6.6.3.3_1.4.1-11: Test Configuration Table (network signalled value "NS_16")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: Low range<br><br>For 3 MHz Channel Bandwidth: Low range, 810 MHz ($N_{UL}$= 27070)<br><br>For 5 MHz Channel Bandwidth: Low range, 811 MHz ($N_{UL}$= 27080) , 814.5 MHz ($N_{UL}$= 27115)<br><br>For 10 MHz Channel Bandwidth: Low range, 813.5 MHz ($N_{UL}$= 27105), 817 MHz ($N_{UL}$= 27140) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for Additional Spurious Emissions testing. | | 64QAM | 6 | 0 |
| 2 | 3 MHz | | | 64QAM | 15 | 0 |
| 3 | 5 MHz | | | 64QAM | 25 | 0 |
| 4 | 10 MHz | | | 64QAM | 50 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_16. | | | | | | |

**Table 6.6.3.3_1.4.1-12: Test Configuration Table (network signalled value "NS_17")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508[7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified inTS36.508 [7] subclause 4.3.1) | | | | Mid range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing. | | 64QAM | 25 |
| 2 | 10MHz | | | 64QAM | 50 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_17. | | | | | |

**Table 6.6.3.3_1.4.1-13: Test Configuration Table (network signalled value "NS_18")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508[7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified inTS36.508 [7] subclause 4.3.1) | | | | Low range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing. | | 64QAM | 25 |
| 2 | 10MHz | | | 64QAM | 50 |
| 3 | 15MHz | | | 64QAM | 75 |
| 4 | 20MHz | | | 64QAM | 100 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_18. | | | | | |

**Table 6.6.3.3_1.4.1-14: Test Configuration Table (network signalled value "NS_19")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508[7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified inTS36.508 [7] subclause 4.3.1) | | | | Low range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 3MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** |
| 1 | 3MHz | N/A for Additional Spurious Emissions testing. | | 64QAM | 15 |
| 2 | 10MHz | | | 64QAM | 40 |
| 3 | 15MHz | | | 64QAM | 45 |
| 4 | 20MHz | | | 64QAM | 50 |
| Note 1: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.<br>Note 2: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_19. | | | | | |

**Table 6.6.3.3_1.4.1-15: Test Configuration Table (network signalled value "NS_20")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2007.5 MHz ($N_{UL}$ = 25575)<br>c. 2012.5 MHz ($N_{UL}$ = 25625)<br>d. 2017.5 MHz ($N_{UL}$ = 25675)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for NS_20 A-MPR** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing. | | 64QAM (Note 3) | 15 |
| 2 | 5MHz | | | 64QAM (Note 3) | 25 |
| 3 | 10MHz | | | 64QAM | 12 |
| 4 | 10MHz | | | 64QAM (Note 3) | 50 |
| 5 | 15MHz | | | 64QAM (Note 3) | 25 |
| 6 | 15MHz | | | 64QAM (Note 3) | 36 |
| 7 | 15MHz | | | 64QAM (Note 3) | 75 |
| 8 | 20MHz | | | 64QAM | 18 |
| 9 | 20MHz | | | 64QAM (Note 3) | 25 |
| 10 | 20MHz | | | 64QAM (Note 3) | 75 |
| 11 | 20MHz | | | 64QAM (Note 3) | 100 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.

Note 2: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.

Note 3: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_20.

**Table 6.6.3.3_1.4.1-16: Test Configuration Table (network signalled value "NS_21")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | NC | | | | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | High range | | | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | 10 MHz | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 (note 1) | 10 MHz | N/A for Additional Spurious Emissions testing. | | 64QAM | 50 | 0 |
| Note 1: Applicable only to high range frequency testing.<br>Note 2: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_21. | | | | | | |

**Table 6.6.3.3_1.4.1-17: Test Configuration Table (network signalled value "NS_22")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | Normal | | | | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | Low Range, Mid Range, High Range | | | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | 5MHz, 10MHz, 15MHz, 20MHz | | | | | |
| **Test Parameters for NS_22 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 64QAM | 1 | 0 |
| 2 | 5MHz | | | 64QAM | 1 | 24 |
| 3 | 10MHz | | | 64QAM | 1 | 0 |
| 4 | 10MHz | | | 64QAM | 1 | 49 |
| 5 | 15MHz | | | 64QAM | 1 | 0 |
| 6 | 15MHz | | | 64QAM | 1 | 74 |
| 7 | 20MHz | | | 64QAM | 1 | 0 |
| 8 | 20MHz | | | 64QAM | 1 | 99 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_22. | | | | | | |

**Table 6.6.3.3_1.4.1-18: Test Configuration Table (network signalled value "NS_23")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz | | |
| **Test Parameters for NS_23 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | 64QAM | 1 | 0 |
| 2 | 5MHz | | | 64QAM | 1 | 24 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_23. | | | | | | |

**Table 6.6.3.3_1.4.1-19: Test Configuration Table (network signalled value "NS_24")**

| | Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>5 MHz CH BW:<br>2007.5 MHz ($N_{UL}$ = high range)<br>10 and 15 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772)<br>20 MHz CH BW:<br>- 2000 MHz ($N_{UL}$ = high range) | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | | |
| **Test Parameters for NS_24 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 2007.5 | 5MHz | N/A for A-MPR testing | | 64QAM | 25 | 0 |
| 2 | 1980 | 10MHz | | | 64QAM | 50 | 0 |
| 3 | 1990 | 10MHz | | | 64QAM | 50 | 0 |
| 4 | 1980 | 15MHz | | | 64QAM | 75 | 0 |
| 5 | 2000 | 20MHz | | | 64QAM | 100 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_24. | | | | | | | |

**Table 6.6.3.3_1.4.1-20: Test Configuration Table (network signalled value "NS_25")**

| | Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>5 MHz CH BW:<br>2007.5 MHz ($N_{UL}$ = high range)10 and 15 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772)<br>20 MHz CH BW:<br>- 2000 MHz ($N_{UL}$ = high range) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_25 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 2007.5 | 5MHz | N/A for A-MPR testing | | 64QAM | 25 | 0 |
| 2 | 1980 | 10MHz | | | 64QAM | 50 | 0 |
| 3 | 1990 | 10MHz | | | 64QAM | 50 | 0 |
| 4 | 1980 | 15MHz | | | 64QAM | 75 | 0 |
| 5 | 1980 | 20MHz | | | 64QAM | 100 | 0 |
| 6 | 2000 | 20MHz | | | 64QAM | 100 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_25. | | | | | | | |

**Table 6.6.3.3_1.4.1-21: Test Configuration Table (network signalled value "NS_27")**

| | Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to Frequency column in test parameters | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_27 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Frequency** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | Low/Mid/High | 5MHz | | | 64QAM | 25 | 0 |
| 2 | Low/Mid/High | 10MHz | | | 64QAM | 50 | 0 |
| 3 | Low/Mid/High | 15MHz | | | 64QAM | 75 | 0 |
| 4 | Low/Mid/High | 20MHz | | | 64QAM | 100 | 0 |
| Note 1: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_27. | | | | | | | |

**Table 6.6.3.3_1.4.1-22: Test Configuration Table (network signalled value "NS_36")**

| | Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>5 MHz CH BW:<br>- 700.5 MHz ($N_{UL}$ = low range)<br>- 705.5 MHz ($N_{UL}$ =132747)<br>10 MHz CH BW:<br>- 703 MHz ($N_{UL}$ = low range)<br>- 708 MHz ($N_{UL}$ = 132772)<br>15 MHz CH BW:<br>- 705.5 MHz ($N_{UL}$ = low range)<br>- 710.5 MHz ($N_{UL}$ =132797 ) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz | | |
| **Test Parameters for NS_36 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 700.5 | 5MHz | N/A for A-MPR testing | | 64QAM | 25 | 0 |
| 2 | 705.5 | 5MHz | | | 64QAM | 25 | 0 |
| 3 | 703 | 10MHz | | | 64QAM | 50 | 0 |
| 4 | 708 | 10MHz | | | 64QAM | 50 | 0 |
| 5 | 705.5 | 15MHz | | | 64QAM | 75 | 0 |
| 6 | 710.5 | 15MHz | | | 64QAM | 75 | 0 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 2: Void.<br>Note 3: Void.<br>Note 4: The 64QAM configurations shall not apply to UEs for which TC 6.6.3.3_2 is executed with network signalled value NS_36. | | | | | | | |

Editor's note: The following lines belong at the end of section 6.6.3.3_1.4.1. As new tables are added to this section, these lines should always follow the tables.

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.7.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.3.3_1.4.1-1 to Table 6.6.3.3_1.4.1-22 depending on network signal value.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.3_1.4.3.

### 6.6.3.3_1.4.2 Test procedure

Same test procedure as in clause 6.6.3.3.4.2.

### 6.6.3.3_1.4.3 Message contents

Same message contents as in clause 6.6.3.3.4.3.

#### 6.6.3.3_1.5 Test requirement

Same test requirement as in clause 6.6.3.3.5.

### 6.6.3.3_2 Additional spurious emissions for UL 256QAM

#### 6.6.3.3_2.1 Test purpose

Same test purpose as in clause 6.6.3.3.1.

#### 6.6.3.3_2.2 Test applicability

This test case applies to all types of E-UTRA UE from release 14 and forward that support UL 256QAM.

#### 6.6.3.3_2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.3.3.3.

#### 6.6.3.3_2.4 Test description

##### 6.6.3.3_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3.3_2.4.1-1 through Table 6.6.3.3_2.4.1-22. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.3_2.4.1-1: Test Configuration Table (network signalled value "NS_04")**

<table>
<tr><th colspan="7">Initial Conditions</th></tr>
<tr><td colspan="3">Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1)</td><td colspan="4">Normal</td></tr>
<tr><td colspan="3">Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="4">Low Range, Mid Range, High Range<br>Additional test frequencies for Rel-12 to Rel-13 and bit 2 of modifiedMPRbehavior = 0:<br><br>For 5 MHz bandwidth:<br>2499.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866<br><br>Additional test frequencies for Rel-12 and later and bit 2 of modifiedMPRbehavior = 1:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39686<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866</td></tr>
<tr><td colspan="3">Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1)</td><td colspan="4">5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><th colspan="7">Test Parameters for Channel Bandwidths</th></tr>
<tr><th></th><th></th><th colspan="2">Downlink Configuration</th><th colspan="3">Uplink Configuration</th></tr>
<tr><th>Configuration ID</th><th>Ch BW</th><th>Mod'n</th><th>RB allocation FDD</th><th>Mod'n</th><th>RB allocation FDD</th><th>$RB_{start}$ FDD</th></tr>
<tr><td>1 (Note 1)</td><td>5MHz</td><td colspan="2" rowspan="5">N/A for Additional Spurious Emissions testing</td><td>256QAM</td><td>16</td><td>9</td></tr>
<tr><td>2 (Note 2)</td><td>5MHz</td><td>256QAM</td><td>25</td><td>0</td></tr>
<tr><td>3</td><td>10MHz</td><td>256QAM</td><td>50</td><td>0</td></tr>
<tr><td>4</td><td>15MHz</td><td>256QAM</td><td>75</td><td>0</td></tr>
<tr><td>5</td><td>20MHz</td><td>256QAM</td><td>100</td><td>0</td></tr>
<tr><td colspan="7">Note 1: Only applicable for Low Range.<br>Note 2: Only applicable for Mid, High Range and additional test frequencies.</td></tr>
</table>

**Table 6.6.3.3_2.4.1-2: Test Configuration Table (network signalled value "NS_05")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range<br><br>In case of Low range:<br>- For 5 MHz Channel Bandwidth: 1927.2 MHz (NUL = 18072)<br>- For 10 MHz Channel Bandwidth: 1934.7 MHz (NUL = 18147)<br>- For 15 MHz Channel Bandwidth: 1932.5 MHz (NUL = 18125)<br>- For 20 MHz Channel Bandwidth: 1930 MHz (NUL = 18100) | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 25 |
| 2 (Note 1) | 10MHz | | | 256QAM | 50 |
| 3(Note 1) | 15MHz | | | 256QAM | 75 |
| 4 (Note 1) | 20MHz | | | 256QAM | 100 |
| 5 (Note 2) | 10MHz | | | 256QAM | 50 |
| 6 (Note 2) | 15MHz | | | 256QAM | 75 |
| 7 (Note 2) | 20MHz | | | 256QAM | 100 |
| Note 1: Applies only for Low Range.<br>Note 2: Applies only for Mid Range. | | | | | |

**Table 6.6.3.3_2.4.1-3: Test Configuration Table (network signalled value "NS_07")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | NC | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | | | | Mid range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | | 10MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation** | **RBstart** |
| 1 | 10MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 36 | 13 |
| 2 | 10MHz | | | 256QAM | 16 | 19 |
| 3 | 10MHz | | | 256QAM | 30 | 19 |
| 4 | 10MHz | | | 256QAM | 50 | 0 |

**Table 6.6.3.3_2.4.1-4: Test Configuration Table (network signalled value "NS_08")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 25 |
| 2 | 10MHz | | | 256QAM | 50 |
| 3 | 15MHz | | | 256QAM | 75 |

**Table 6.6.3.3_2.4.1-5: Test Configuration Table (network signalled value "NS_09")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | High range | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 25 |
| 2 | 10MHz | | | 256QAM | 50 |
| 3 | 15MHz | | | 256QAM | 75 |

**Table 6.6.3.3_2.4.1-6: Test Configuration Table (network signalled value "NS_11")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | | For 3 MHz Channel Bandwidth:<br>a. 2001.5 MHz (NUL = 25515)<br>b. 2004.5 MHz (NUL = 25545)<br><br>For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz (NUL = 25525)<br>b. 2004.5 MHz (NUL = 25545)<br>c. 2007.5 MHz (NUL = 25575)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz (NUL = 25550)<br>b. 2005.5 MHz (NUL = 25555)<br>c. 2015 MHz (NUL = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2007.5 MHz (NUL = 25575)<br>b. 2012.5 MHz (NUL = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz (NUL = 25600) | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 3MHz, 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 3MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 15 |
| 2 | 5MHz | | | 256QAM | 25 |
| 3 | 10MHz | | | 256QAM | 50 |
| 4 | 15MHz | | | 256QAM | 8 |
| 5 | 15MHz | | | 256QAM | 25 |
| 6 | 15MHz | | | 256QAM | 30 |
| 7 | 15MHz | | | 256QAM | 75 |
| 8 | 20MHz | | | 256QAM | 10 |
| 9 | 20MHz | | | 256QAM | 25 |
| 10 | 20MHz | | | 256QAM | 100 |
| Note 1: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | |

**Table 6.6.3.3_2.4.1-7: Test Configuration Table (network signalled value "NS_12")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: UL 814.9 MHz (NUL = 26699)<br><br>For 5 MHz Channel Bandwidth: UL 816.7 MHz (NUL = 26717)<br><br>For 10 MHz Channel Bandwidth: UL 819.2 MHz (NUL = 26742)<br><br>For 15 MHz Channel Bandwidth: UL 821.7 MHz (NUL = 26767) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 5 MHz, 10 MHz and 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 6 | 0 |
| 2 | 5 MHz | | | 256QAM | 25 | 0 |
| 3 | 10 MHz | | | 256QAM | 50 | 0 |
| 4 | 15 MHz | | | 256QAM | 75 | 0 |

**Table6.6.3.3_2.4.1-8: Test Configuration Table (network signalled value "NS_13")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | | For 5 MHz Channel Bandwidth: UL 821.5 MHz (NUL = 26765) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 5 MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 25 | 0 |

**Table 6.6.3.3_2.4.1-9: Test Configuration Table (network signalled value "NS_14")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | | For 10 MHz Channel Bandwidth: UL 829 MHz ($N_{UL}$ = 26840)<br><br>For 15 MHz Channel Bandwidth: Mid range | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10 MHz, 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 10 MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 50 | 0 |
| 2 | 15 MHz | | | 256QAM | 75 | 0 |

**Table 6.6.3.3_2.4.1-10: Test Configuration Table (network signalled value "NS_15")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | | High range | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 6 | 0 |
| 2 | 3 MHz | | | 256QAM | 15 | 0 |
| 3 | 5 MHz | | | 256QAM | 25 | 0 |
| 4 | 10 MHz | | | 256QAM | 50 | 0 |
| 5 | 15 MHz | | | 256QAM | 75 | 0 |

**Table 6.6.3.3_2.4.1-11: Test Configuration Table (network signalled value "NS_16")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: Low range<br><br>For 3 MHz Channel Bandwidth: Low range, 810 MHz ($N_{UL}$= 27070)<br><br>For 5 MHz Channel Bandwidth: Low range, 811 MHz ($N_{UL}$= 27080) , 814.5 MHz ($N_{UL}$= 27115)<br><br>For 10 MHz Channel Bandwidth: Low range, 813.5 MHz ($N_{UL}$= 27105), 817 MHz ($N_{UL}$= 27140) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 6 | 0 |
| 2 | 3 MHz | | | 256QAM | 15 | 0 |
| 3 | 5 MHz | | | 256QAM | 25 | 0 |
| 4 | 10 MHz | | | 256QAM | 50 | 0 |

**Table 6.6.3.3_2.4.1-12: Test Configuration Table (network signalled value "NS_17")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508[7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified inTS36.508 [7] subclause 4.3.1) | | | | Mid range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 25 |
| 2 | 10MHz | | | 256QAM | 50 |

**Table 6.6.3.3_2.4.1-13: Test Configuration Table (network signalled value "NS_18")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508[7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified inTS36.508 [7] subclause 4.3.1) | | | | Low range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 25 |
| 2 | 10MHz | | | 256QAM | 50 |
| 3 | 15MHz | | | 256QAM | 75 |
| 4 | 20MHz | | | 256QAM | 100 |

**Table 6.6.3.3_2.4.1-14: Test Configuration Table (network signalled value "NS_19")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508[7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified inTS36.508 [7] subclause 4.3.1) | | | | Low range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 3MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** |
| 1 | 3MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 15 |
| 2 | 10MHz | | | 256QAM | 40 |
| 3 | 15MHz | | | 256QAM | 45 |
| 4 | 20MHz | | | 256QAM | 50 |
| Note 1: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | |

**Table 6.6.3.3_2.4.1-15: Test Configuration Table (network signalled value "NS_20")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | | For 5 MHz Channel Bandwidth<br>a. 2002.5 MHz ($N_{UL}$ = 25525)<br>b. 2007.5 MHz ($N_{UL}$ = 25575)<br>c. 2012.5 MHz ($N_{UL}$ = 25625)<br>d. 2017.5 MHz ($N_{UL}$ = 25675)<br><br>For 10 MHz Channel Bandwidth<br>a. 2005 MHz ($N_{UL}$ = 25550)<br>b. 2015 MHz ($N_{UL}$ = 25650)<br><br>For 15 MHz Channel Bandwidth<br>a. 2012.5 MHz ($N_{UL}$ = 25625)<br><br>For 20 MHz Channel Bandwidth<br>a. 2010 MHz ($N_{UL}$ = 25600) | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 15 |
| 2 | 5MHz | | | 256QAM | 25 |
| 3 | 10MHz | | | 256QAM | 50 |
| 4 | 15MHz | | | 256QAM | 25 |
| 5 | 15MHz | | | 256QAM | 36 |
| 6 | 15MHz | | | 256QAM | 75 |
| 7 | 20MHz | | | 256QAM | 25 |
| 8 | 20MHz | | | 256QAM | 75 |
| 9 | 20MHz | | | 256QAM | 100 |
| Note 1: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth. | | | | | |

**Table 6.6.3.3_2.4.1-16: Test Configuration Table (network signalled value "NS_21")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 10 MHz | N/A for Additional Spurious Emissions testing. | | 256QAM | 50 | 0 |

**Table 6.6.3.3_2.4.1-17: Test Configuration Table (network signalled value "NS_22")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 1 | 0 |
| 2 | 5MHz | | | 256QAM | 1 | 24 |
| 3 | 10MHz | | | 256QAM | 1 | 0 |
| 4 | 10MHz | | | 256QAM | 1 | 49 |
| 5 | 15MHz | | | 256QAM | 1 | 0 |
| 6 | 15MHz | | | 256QAM | 1 | 74 |
| 7 | 20MHz | | | 256QAM | 1 | 0 |
| 8 | 20MHz | | | 256QAM | 1 | 99 |

**Table 6.6.3.3_2.4.1-18: Test Configuration Table (network signalled value "NS_23")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 1 | 0 |
| 2 | 5MHz | | | 256QAM | 1 | 24 |

**Table 6.6.3.3_2.4.1-19: Test Configuration Table (network signalled value "NS_24")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>5 MHz CH BW:<br>2007.5 MHz ($N_{UL}$ = high range)<br>10 and 15 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772)<br>20 MHz CH BW:<br>- 2000 MHz ($N_{UL}$ = high range) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 2007.5 | 5MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 25 | 0 |
| 2 | 1980 | 10MHz | | | 256QAM | 50 | 0 |
| 3 | 1990 | 10MHz | | | 256QAM | 50 | 0 |
| 4 | 1980 | 15MHz | | | 256QAM | 75 | 0 |
| 5 | 2000 | 20MHz | | | 256QAM | 100 | 0 |

**Table 6.6.3.3_2.4.1-20: Test Configuration Table (network signalled value "NS_25")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>5 MHz CH BW:<br>2007.5 MHz ($N_{UL}$ = high range)10 and 15 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772)<br>20 MHz CH BW:<br>- 2000 MHz ($N_{UL}$ = high range) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 2007.5 | 5MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 25 | 0 |
| 2 | 1980 | 10MHz | | | 256QAM | 50 | 0 |
| 3 | 1990 | 10MHz | | | 256QAM | 50 | 0 |
| 4 | 1980 | 15MHz | | | 256QAM | 75 | 0 |
| 5 | 1980 | 20MHz | | | 256QAM | 100 | 0 |
| 6 | 2000 | 20MHz | | | 256QAM | 100 | 0 |

**Table 6.6.3.3_2.4.1-21: Test Configuration Table (network signalled value "NS_27")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to Frequency column in test parameters | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Frequency** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | Low/Mid/High | 5MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 25 | 0 |
| 2 | Low/Mid/High | 10MHz | | | 256QAM | 50 | 0 |
| 3 | Low/Mid/High | 15MHz | | | 256QAM | 75 | 0 |
| 4 | Low/Mid/High | 20MHz | | | 256QAM | 100 | 0 |

**Table 6.6.3.3_2.4.1-22: Test Configuration Table (network signalled value "NS_36")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>5 MHz CH BW:<br>- 700.5 MHz ($N_{UL}$ = low range)<br>- 705.5 MHz ($N_{UL}$ =132747)<br>10 MHz CH BW:<br>- 703 MHz ($N_{UL}$ = low range)<br>- 708 MHz ($N_{UL}$ = 132772)<br>15 MHz CH BW:<br>- 705.5 MHz ($N_{UL}$ = low range)<br>- 710.5 MHz ($N_{UL}$ =132797 ) | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 700.5 | 5MHz | N/A for Additional Spurious Emissions testing | | 256QAM | 25 | 0 |
| 2 | 705.5 | 5MHz | | | 256QAM | 25 | 0 |
| 3 | 703 | 10MHz | | | 256QAM | 50 | 0 |
| 4 | 708 | 10MHz | | | 256QAM | 50 | 0 |
| 5 | 705.5 | 15MHz | | | 256QAM | 75 | 0 |
| 6 | 710.5 | 15MHz | | | 256QAM | 75 | 0 |

Editor's note: The following lines belong at the end of section 6.6.3.3_2.4.1. As new tables are added to this section, these lines should always follow the tables.

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.7.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.3.3_2.4.1-1 to Table 6.6.3.3_2.4.1-22 depending on network signal value.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.3_2.4.3.

#### 6.6.3.3_2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.6.3.3_2.4.1-1 to 6.6.3.3_2.4.1-22. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Tables 6.2.4_4.5-1 to 6.2.4_4.5-29 for Power Class 3 UEs as appropriate. The period of the measurement shall be at least one sub-frame (1ms).

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.6.3.3.5.1-1 to 6.6.3.3.5.22-1 as appropriate. The centre frequency of the filter shall be stepped in contiguous steps according to the same table. For NS_07 measurements made in a bandwidth of 6.25kHz, measurement parameter settings defined in table 6.6.3.3.4.2-1 shall be used. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

#### 6.6.3.3_2.4.3 Message contents

Same message contents as in clause 6.6.3.3.4.3.

### 6.6.3.3_2.5 Test requirement

Same test requirement as in clause 6.6.3.3.5.

## 6.6.3.3A Additional spurious emissions for CA

### 6.6.3.3A.1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA)

#### 6.6.3.3A.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions in intra-band contiguous carrier aggregation under the deployment scenarios where additional requirements are specified.

#### 6.6.3.3A.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA but do not support UL 64QAM or UL 256QAM.

#### 6.6.3.3A.1.3 Minimum conformance requirements

This clause specifies the requirements for the specified E-UTRA band for an additional spectrum emission for CA requirement with protected bands as indicated from Table 6.6.3.3A.1.3.1-1 to Table 6.6.3.3A.1.3.6-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

#### 6.6.3.3A.1.3.1 Minimum conformance requirements for CA_1C (network signalled value "CA_NS_01")

When "CA_NS_01" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.1.3.1-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1A.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3A.1.3.1-1: Additional requirements (PHS) for CA**

| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | Note |
|---|---|---|---|---|---|---|
| E-UTRA band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 1 |
| Note 1: Applicable when the aggregated channel bandwidth is confined within frequency range 1940 – 1980 MHz | | | | | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3A.1.

#### 6.6.3.3A.1.3.2 Minimum conformance requirements for CA_1C (network signalled value "CA_NS_02")

When "CA_NS_02" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.1.3.2-1. These requirements also apply for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1A.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3A.1.3.2-1: Additional requirements for CA**

| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) |
|---|---|---|---|---|---|
| E-UTRA band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 |
| Frequency range | 1900 | - | 1915 | -15.5 | 5 |
| Frequency range | 1915 | - | 1920 | +1.6 | 5 |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3A.2.

#### 6.6.3.3A.1.3.3 Minimum requirement for CA_1C (network signalled value "CA_NS_03")

When "CA_NS_03" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.1.3.3-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1A.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3A.1.3.3-1: Additional requirement for CA**

| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) |
|---|---|---|---|---|---|
| E-UTRA band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 |
| Frequency range | 1880 | - | 1895 | -40 | 1 |
| Frequency range | 1895 | - | 1915 | -15.5 | 5 |
| Frequency range | 1915 | - | 1920 | +1.6 | 5 |

#### 6.6.3.3A.1.3.4 Minimum requirement for CA_38C (network signalled value "CA_NS_05")

When "CA_NS_05" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.1.3.4-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1A.1.3-1 from the edge of the aggregated channel bandwidth.

**Table 6.6.3.3A.1.3.4-1: Additional requirements**

| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) |
|---|---|---|---|---|---|
| Frequency range | 2620 | - | 2645 | -15.5 | 5 |
| Frequency range | 2645 | - | 2690 | -40 | 1 |

6.6.3.3A.1.3.5 Minimum requirement for CA_7C (network signalled value "CA_NS_06")

When "CA_NS_06" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.1.3.5-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1A.3-1 from the edge of the aggregated channel bandwidth.

**Table 6.6.3.3A.1.3.5-1: Additional requirements**

| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) |
|---|---|---|---|---|---|
| Frequency range | 2570 | - | 2575 | +1.6 | 5 |
| Frequency range | 2575 | - | 2595 | -15.5 | 5 |
| Frequency range | 2595 | - | 2620 | -40 | 1 |

6.6.3.3A.1.3.6 Minimum requirement for CA_39C (network signalled value "CA_NS_07")

When "CA_NS_07" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.1.3.6-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1A.1.3-1 from the edge of the aggregated channel bandwidth.

**Table 6.6.3.3A.1.3.6-1: Additional requirements**

| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
|---|---|---|---|---|---|---|
| Frequency range | 1805 | - | 1855 | -40 | 1 | 1 |
| Frequency range | 1855 | - | 1880 | -15.5 | 5 | 1, 2, 3 |
| NOTE 1: This requirement is applicable for carriers with aggregated channel bandwidths confined in 1885-1920 MHz.<br>NOTE 2: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.0-1 from the edge of the aggregated channel bandwidth.<br>NOTE 3: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3A.3.

6.6.3.3A.1.4 Test description

6.6.3.3A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in tables' 6.6.3.3A.1.4.1-1 to 6.6.3.3A.1.4.1-3. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.3A.1.4.1-1: Test Configuration Table for CA (network signalled value "CA_NS_01")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | QPSK | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | | |
| 3 | 75 | 75 | | QPSK | 45 | P_45@7 | S_0@0 | | |
| 4 | 75 | 75 | | QPSK | 8 | P_0@0 | S_8@67 | | |
| 5 | 75 | 75 | | QPSK | 129 | P_75@0 | S_54@0 | | |
| 6 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | QPSK | 200 | P_100@0 | S_100@0 | | |
| 8 | 100 | 100 | | QPSK | 1 | P_1@0 | S_0@0 | | |
| 9 | 100 | 100 | | QPSK | 175 | P_75@25 | S_100@0 | | |
| 10 | 100 | 100 | | QPSK | 25 | P_0@0 | S_25@75 | | |
| 11 | 100 | 100 | | QPSK | 64 | P_64@24 | S_0@0 | | |
| 12 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

**Table 6.6.3.3A.1.4.1-2: Test Configuration Table for CA (network signalled value "CA_NS_02")**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | C: Low and High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $NR_{B_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | QPSK | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | | |
| 3 | 75 | 75 | | QPSK | 129 | P_75@0 | S_54@0 | | |
| 4 | 75 | 75 | | QPSK | 129 | P_54@21 | S_75@0 | | |
| 5 | 75 | 75 | | QPSK | 1 | P_0@0 | S_1@74 | | |
| 6 | 75 | 75 | | QPSK | 1 | P_0@0 | S_1@54 | | |
| 7 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 8 | 100 | 100 | | QPSK | 1 | P_1@0 | S_0@0 | | |
| 9 | 100 | 100 | | QPSK | 1 | P_1@21 | S_0@0 | | |
| 10 | 100 | 100 | | QPSK | 90 | P_90@0 | S_0@0 | | |
| 11 | 100 | 100 | | QPSK | 180 | P_100@0 | S_80@0 | | |
| 12 | 100 | 100 | | QPSK | 1 | P_0@0 | S_1@99 | | |
| 13 | 100 | 100 | | QPSK | 1 | P_0@0 | S_1@83 | | |
| 14 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

**Table 6.6.3.3A.1.4.1-3: Test Configuration Table for CA (network signalled value "CA_NS_03")**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | C: Low and High range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | QPSK | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | QPSK | 1 | P_1@21 | S_0@0 | | |
| 3 | 75 | 75 | | QPSK | 75 | P_75@0 | S_0@0 | | |
| 4 | 75 | 75 | | QPSK | 90 | P_75@0 | S_15@0 | | |
| 5 | 75 | 75 | | QPSK | 150 | P_75@0 | S_75@0 | | |
| 6 | 75 | 75 | | QPSK | 1 | P_0@0 | S_1@74 | | |
| 7 | 75 | 75 | | QPSK | 1 | P_0@0 | S_1@44 | | |
| 8 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 9 | 100 | 100 | | QPSK | 1 | P_1@0 | S_0@0 | | |
| 10 | 100 | 100 | | QPSK | 60 | P_60@0 | S_0@0 | | |
| 11 | 100 | 100 | | QPSK | 1 | P_1@63 | S_0@0 | | |
| 12 | 100 | 100 | | QPSK | 90 | P_90@0 | S_0@0 | | |
| 13 | 100 | 100 | | QPSK | 164 | P_100@0 | S_64@0 | | |
| 14 | 100 | 100 | | QPSK | 1 | P_0@0 | S_1@99 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 100 | 100 | | QPSK | 1 | P_0@0 | S_1@70 | | |
| 16 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

**Table 6.6.3.3A.1.4.1-4: Test Configuration Table for CA (network signalled value "CA_NS_05")**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ |

**Test Parameters for CA Configurations**

| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | QPSK | 40 | P_40@0 | S_0@0 | | |
| 2 | 75 | 75 | | QPSK | 80 | P_50@25 | S_30@0 | | |
| 3 | 75 | 75 | | QPSK | 60 | P_10@65 | S_50@0 | | |
| 4 | 75 | 75 | | QPSK | 65 | P_1@74 | S_64@0 | | |
| 5 | 75 | 75 | | QPSK | 92 | P_20@55 | S_72@0 | | |
| 6 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | QPSK | 8 | P_8@0 | S_0@0 | | |
| 8 | 100 | 100 | | QPSK | 40 | P_40@0 | S_0@0 | | |
| 9 | 100 | 100 | | QPSK | 80 | P_50@50 | S_30@0 | | |
| 10 | 100 | 100 | | QPSK | 150 | P_60@40 | S_90@0 | | |
| 11 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

**Table 6.6.3.3A.1.4.1-5: Test Configuration Table (network signalled value "CA_NS_06")**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | As in Table 6.2.4A.1.3.6-1 |

**Test Parameters for CA Configurations**

| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | |
|---|---|---|---|---|---|---|
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 75 | 75 | N/A | QPSK | 5 | P_5@0 | S_0@0 | | |
| 2 | 75 | 75 | | QPSK | 45 | P_45@0 | S_0@0 | | |
| 3 | 75 | 75 | | QPSK | 75 | P_60@15 | S_15@0 | | |
| 4 | 75 | 75 | | QPSK | 60 | P_10@65 | S_50@0 | | |
| 5 | 75 | 75 | | QPSK | 90 | P_18@57 | S_72@0 | | |
| 6 | 75 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | QPSK | 10 | P_10@0 | S_0@0 | | |
| 8 | 100 | 100 | | QPSK | 30 | P_30@0 | S_0@0 | | |
| 9 | 100 | 100 | | QPSK | 100 | P_75@25 | S_25@0 | | |
| 10 | 100 | 100 | | QPSK | 90 | P_40@60 | S_50@0 | | |
| 11 | 100 | 100 | | QPSK | 96 | P_15@85 | S_81@0 | | |
| 12 | 100 | 100 | | QPSK | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

**Table 6.6.3.3A.1.4.1-6: Test Configuration Table for CA (network signalled value "CA_NS_07")**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | As in Table 6.2.4A.1.3.7-1 |

| **Test Parameters for CA Configurations** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 100 | 25 | N/A | QPSK | 1 | P_1@0 | S_0@0 | | |
| 2 | 100 | 25 | | QPSK | 85 | P_80@20 | S_5@0 | | |
| 3 | 100 | 25 | | QPSK | 65 | P_60@40 | S_5@0 | | |
| 4 | 100 | 25 | | QPSK | 35 | P_30@70 | S_5@0 | | |
| 5 | 100 | 25 | | QPSK | 2 | P_1@0 | S_1@24 | | |
| 6 | 100 | 50 | | QPSK | 1 | P_1@1 | S_0@0 | | |
| 7 | 100 | 50 | | QPSK | 10 | P_10@30 | S_0@0 | | |
| 8 | 100 | 50 | | QPSK | 30 | P_30@30 | S_0@0 | | |
| 9 | 100 | 50 | | QPSK | 60 | P_40@60 | S_20@0 | | |
| 10 | 100 | 50 | | QPSK | 30 | P_10@90 | S_20@0 | | |
| 11 | 100 | 50 | | QPSK | 5 | P_0@0 | S_5@45 | | |
| 12 | 100 | 50 | | QPSK | 2 | P_1@0 | S_1@49 | | |
| 13 | 100 | 75 | | QPSK | 1 | P_1@1 | S_0@0 | | |
| 14 | 100 | 75 | | QPSK | 40 | P_40@20 | S_0@0 | | |
| 15 | 100 | 75 | | QPSK | 85 | P_80@20 | S_5@0 | | |
| 16 | 100 | 75 | | QPSK | 40 | P_0@0 | S_40@20 | | |
| 17 | 100 | 75 | | QPSK | 15 | P_0@0 | S_15@60 | | |
| 18 | 100 | 75 | | QPSK | 2 | P_1@0 | S_1@74 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.33 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Table 6.6.3.3A.1.4.1-1, Table 6.6.3.3A.1.4.1-2, Table 6.6.3.3A.1.4.1-3, Table 6.6.3.3A.1.4.1-4, Table 6.6.3.3A.1.4.1-5 or Table 6.6.3.3A.1.4.1-6 depending on network signal value.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.3A.1.4.3.

#### 6.6.3.3A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.3.3A.1.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC on both PCC and SCC, according to Table 6.6.3.3A.1.4.1-1, Table 6.6.3.3A.1.4.1-2, Table 6.6.3.3A.1.4.1-3, Table 6.6.3.3A.1.4.1-4, Table 6.6.3.3A.1.4.1-5 or Table 6.6.3.3A.1.4.1-6 depending on network signal value. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control “up” commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

6. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Tables 6.2.4A.1.5-1 to 6.2.4A.1.5-7 as appropriate. The period of the measurement shall be at least one sub-frame (1ms).

7. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.6.3.3A.1.5.1-1, 6.6.3.3A.1.5.2-1, 6.6.3.3A.1.5.3-1, 6.6.3.3A.1.5.4-1, 6.6.3.3A.1.5.5-1 and 6.6.3.3A.1.5.6-1 as appropriate. The centre frequency of the filter shall be stepped in contiguous steps according to the same table. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

#### 6.6.3.3A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exceptions for each network signalled value.

##### 6.6.3.3A.1.4.3.1 Message contents (network signalled value "CA_NS_01")

1. Information element additionalSpectrumEmissionSCell-r10 is set to CA_NS_01. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3A.1.4.3.1-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for “CA_NS_01”**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 1 (CA_NS_01) | | |

##### 6.6.3.3A.1.4.3.2 Message contents exceptions (network signalled value "CA_NS_02")

1. Information element additionalSpectrumEmissionSCell-r10 is set to CA_NS_02. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3A.1.4.3.2-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NS_02"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 2 (CA_NS_02) | | |

6.6.3.3A.1.4.3.3 Message contents exceptions (network signalled value "CA_NS_03")

1. Information element additionalSpectrumEmission is set to NS_08. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3A.1.4.3.3-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NS_03"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 3 (CA_NS_03) | | |

6.6.3.3A.1.4.3.4 Message contents exceptions (network signalled value "CA_NS_05")

1. Information element additionalSpectrumEmission is set to CA_NS_05. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3A.1.4.3.4-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NS_05"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 5 (CA_NS_05) | | |

6.6.3.3A.1.4.3.5 Message contents exceptions (network signalled value "CA_NS_06")

1. Information element additionalSpectrumEmission is set to CA_NS_06. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3A.1.4.3.5-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NS_06"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 6 (CA_NS_06) | | |

6.6.3.3A.1.4.3.6 Message contents exceptions (network signalled value "CA_NS_07")

1. Information element additionalSpectrumEmission is set to CA_NS_07. This can be set in the *RadioResourceConfigCommonSCell-r10-DEFAULT* as part of the common RRC messages. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 6.6.3.3A.1.4.3.6-1: *RadioResourceConfigCommonSCell-r10-DEFAULT*: Additional spectrum emission test requirement for "CA_NS_07"**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-13A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmissionSCell-r10 | 7 (CA_NS_07) | | |

### 6.6.3.3A.1.5 Test requirement

This clause specifies the requirements for the specified E-UTRA band for an additional spectrum emission for CA requirement with protected bands as indicated from table 6.6.3.3A.1.5.1-1 to table 6.6.3.3A.1.5.6-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

#### 6.6.3.3A.1.5.1 Test requirement for CA (network signalled value "CA_NS_01")

When "CA_NS_01" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4A.1.5-1 as appropriate,

and

the measured average power of spurious emission, derived in step 2, shall not exceed the described value in Table 6.6.3.3A.1.5.1-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1A.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3A.1.5.1-1: Additional requirements (PHS) for CA**

| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | Note |
|---|---|---|---|---|---|---|
| E-UTRA band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 1 |
| Note 1: Applicable when the aggregated channel bandwidth is confined within frequency range 1940 – 1980 MHz. | | | | | | |

#### 6.6.3.3A.1.5.2 Test requirement for CA (network signalled value “CA_NS_02")

When “CA_NS_02” is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4A.1.5-2 as appropriate,

and

the measured average power of spurious emission, derived in step 2, shall not exceed the described value in Table 6.6.3.3A.1.5.2-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1A.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3A.1.5.2-1: Additional requirements for CA**

| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) |
|---|---|---|---|---|---|
| E-UTRA band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 |
| Frequency range | 1900 | - | 1915 | -15.5 | 5 |
| Frequency range | 1915 | - | 1920 | +1.6 | 5 |

#### 6.6.3.3A.1.5.3 Test requirement for CA (network signalled value “CA_NS_03")

When “CA_NS_03” is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4A.1.5-3 as appropriate,

and

the measured average power of spurious emission, derived in step 2, shall not exceed the described value in Table 6.6.3.3A.1.5.3-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1A.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3A.1.5.3-1: Additional requirement for CA**

| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) |
|---|---|---|---|---|---|
| E-UTRA band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 |
| Frequency range | 1880 | - | 1895 | -40 | 1 |
| Frequency range | 1895 | - | 1915 | -15.5 | 5 |
| Frequency range | 1915 | - | 1920 | +1.6 | 5 |

### 6.6.3.3A.1.5.4 Test requirement for CA (network signalled value “CA_NS_05")

When “CA_NS_05” is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4A.1.5-5 as appropriate,

and

the measured average power of spurious emission, derived in step 2, shall not exceed the described value in Table 6.6.3.3A.1.5.4-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1A.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3A.1.5.4-1: Additional requirement for CA**

| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) |
|---|---|---|---|---|---|
| Frequency range | 2620 | - | 2645 | -15.5 | 5 |
| Frequency range | 2645 | - | 2690 | -40 | 1 |

### 6.6.3.3A.1.5.5 Test requirement for CA (network signalled value “CA_NS_06")

When “CA_NS_06” is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4A.1.5-6 as appropriate,

and

the measured average power of spurious emission, derived in step 2, shall not exceed the described value in Table 6.6.3.3A.1.5.5-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1A.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3A.1.5.5-1: Additional requirements**

| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) |
|---|---|---|---|---|---|
| Frequency range | 2570 | - | 2575 | +1.6 | 5 |
| Frequency range | 2575 | - | 2595 | -15.5 | 5 |
| Frequency range | 2595 | - | 2620 | -40 | 1 |

### 6.6.3.3A.1.5.6 Test requirement for CA (network signalled value “CA_NS_07")

When “CA_NS_07” is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4A.1.5-7 as appropriate,

and

the measured average power of spurious emission, derived in step 2, shall not exceed the described value in Table 6.6.3.3A.1.5.6-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1A.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3.3A.1.5.6-1: Additional requirement for CA**

| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
|---|---|---|---|---|---|---|
| Frequency range | 1805 | - | 1855 | -40 | 1 | 1 |
| Frequency range | 1855 | - | 1880 | -15.5 | 5 | 1, 2, 3 |
| NOTE 1: This requirement is applicable for carriers with aggregated channel bandwidths confined in 1885-1920 MHz<br>NOTE 2: The requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.0-1 from the edge of the channel bandwidth.<br>NOTE 3: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

## 6.6.3.3A.1_1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM

Editor's note: For a transition period until RAN5#83, this test case in version 15.3.1 of 36.521-1 shall be used. This is to ensure no test coverage is lost before the UL 256QAM test case becomes available.

### 6.6.3.3A.1_1.1 Test purpose

Same test purpose as in clause 6.6.3.3A.1.1

### 6.6.3.3A.1_1.2 Test applicability

This test case applies to all types of E-UTRA UE from release 13 and forward that support intra-band contiguous DL CA, UL CA and UL 64QAM but do not support UL 256QAM.

### 6.6.3.3A.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.3.3.3A.1.3

### 6.6.3.3A.1_1.4 Test description

#### 6.6.3.3A.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in tables' 6.6.3.3A.1_1.4.1-1 to 6.6.3.3A.1_1.4.1-3. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.3A.1_1.4.1-1: Test Configuration Table for CA (network signalled value "CA_NS_01")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | 64QAM | 150 | P_75@0 | S_75@0 | | |
| 3 | 75 | 75 | | 64QAM | 45 | P_45@7 | S_0@0 | | |
| 4 | 75 | 75 | | 64QAM | 8 | P_0@0 | S_8@67 | | |
| 5 | 75 | 75 | | 64QAM | 129 | P_75@0 | S_54@0 | | |
| 6 | 75 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | 64QAM | 200 | P_100@0 | S_100@0 | | |
| 8 | 100 | 100 | | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 9 | 100 | 100 | | 64QAM | 175 | P_75@25 | S_100@0 | | |
| 10 | 100 | 100 | | 64QAM | 25 | P_0@0 | S_25@75 | | |
| 11 | 100 | 100 | | 64QAM | 64 | P_64@24 | S_0@0 | | |
| 12 | 100 | 100 | | 64QAM | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

**Table 6.6.3.3A.1_1.4.1-2: Test Configuration Table for CA (network signalled value "CA_NS_02")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $NR_{B_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | 64QAM | 75 | P_75@0 | S_0@0 | | |
| 3 | 75 | 75 | | 64QAM | 129 | P_75@0 | S_54@0 | | |
| 4 | 75 | 75 | | 64QAM | 129 | P_54@21 | S_75@0 | | |
| 5 | 75 | 75 | | 64QAM | 1 | P_0@0 | S_1@74 | | |
| 6 | 75 | 75 | | 64QAM | 1 | P_0@0 | S_1@54 | | |
| 7 | 75 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 8 | 100 | 100 | | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 9 | 100 | 100 | | 64QAM | 1 | P_1@21 | S_0@0 | | |
| 10 | 100 | 100 | | 64QAM | 90 | P_90@0 | S_0@0 | | |
| 11 | 100 | 100 | | 64QAM | 180 | P_100@0 | S_80@0 | | |
| 12 | 100 | 100 | | 64QAM | 1 | P_0@0 | S_1@99 | | |
| 13 | 100 | 100 | | 64QAM | 1 | P_0@0 | S_1@83 | | |
| 14 | 100 | 100 | | 64QAM | 2 | P_1@0 | S_1@99 | | |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1

**Table 6.6.3.3A.1_1.4.1-3: Test Configuration Table for CA (network signalled value "CA_NS_03")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | 64QAM | 1 | P_1@21 | S_0@0 | | |
| 3 | 75 | 75 | | 64QAM | 75 | P_75@0 | S_0@0 | | |
| 4 | 75 | 75 | | 64QAM | 90 | P_75@0 | S_15@0 | | |
| 5 | 75 | 75 | | 64QAM | 150 | P_75@0 | S_75@0 | | |
| 6 | 75 | 75 | | 64QAM | 1 | P_0@0 | S_1@74 | | |
| 7 | 75 | 75 | | 64QAM | 1 | P_0@0 | S_1@44 | | |
| 8 | 75 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 9 | 100 | 100 | | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 10 | 100 | 100 | | 64QAM | 60 | P_60@0 | S_0@0 | | |
| 11 | 100 | 100 | | 64QAM | 1 | P_1@63 | S_0@0 | | |
| 12 | 100 | 100 | | 64QAM | 90 | P_90@0 | S_0@0 | | |
| 13 | 100 | 100 | | 64QAM | 164 | P_100@0 | S_64@0 | | |
| 14 | 100 | 100 | | 64QAM | 1 | P_0@0 | S_1@99 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 100 | 100 | | 64QAM | 1 | P_0@0 | S_1@70 | | |
| 16 | 100 | 100 | | 64QAM | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

**Table 6.6.3.3A.1_1.4.1-4: Test Configuration Table for CA (network signalled value "CA_NS_05")**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | C: High range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | 64QAM | 40 | P_40@0 | S_0@0 | | |
| 2 | 75 | 75 | | 64QAM | 80 | P_50@25 | S_30@0 | | |
| 3 | 75 | 75 | | 64QAM | 60 | P_10@65 | S_50@0 | | |
| 4 | 75 | 75 | | 64QAM | 65 | P_1@74 | S_64@0 | | |
| 5 | 75 | 75 | | 64QAM | 92 | P_20@55 | S_72@0 | | |
| 6 | 75 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | 64QAM | 8 | P_8@0 | S_0@0 | | |
| 8 | 100 | 100 | | 64QAM | 40 | P_40@0 | S_0@0 | | |
| 9 | 100 | 100 | | 64QAM | 80 | P_50@50 | S_30@0 | | |
| 10 | 100 | 100 | | 64QAM | 150 | P_60@40 | S_90@0 | | |
| 11 | 100 | 100 | | 64QAM | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

**Table 6.6.3.3A.1_1.4.1-5: Test Configuration Table (network signalled value "CA_NS_06")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | NC | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | C: Low and High range | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | As in Table 6.2.4A.1_1.3.6-1 | | |
| **Test Parameters for CA Configurations** | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 75 | 75 | N/A | 64QAM | 5 | P_5@0 | S_0@0 | | |
| 2 | 75 | 75 | | 64QAM | 45 | P_45@0 | S_0@0 | | |
| 3 | 75 | 75 | | 64QAM | 75 | P_60@15 | S_15@0 | | |
| 4 | 75 | 75 | | 64QAM | 60 | P_10@65 | S_50@0 | | |
| 5 | 75 | 75 | | 64QAM | 90 | P_18@57 | S_72@0 | | |
| 6 | 75 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | 64QAM | 10 | P_10@0 | S_0@0 | | |
| 8 | 100 | 100 | | 64QAM | 30 | P_30@0 | S_0@0 | | |
| 9 | 100 | 100 | | 64QAM | 100 | P_75@25 | S_25@0 | | |
| 10 | 100 | 100 | | 64QAM | 90 | P_40@60 | S_50@0 | | |
| 11 | 100 | 100 | | 64QAM | 96 | P_15@85 | S_81@0 | | |
| 12 | 100 | 100 | | 64QAM | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

**Table 6.6.3.3A.1_1.4.1-6: Test Configuration Table for CA (network signalled value "CA_NS_07")**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | As in Table 6.2.4A.1_1.3.7-1 |

| **Test Parameters for CA Configurations** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 100 | 25 | N/A | 64QAM | 1 | P_1@0 | S_0@0 | | |
| 2 | 100 | 25 | | 64QAM | 85 | P_80@20 | S_5@0 | | |
| 3 | 100 | 25 | | 64QAM | 65 | P_60@40 | S_5@0 | | |
| 4 | 100 | 25 | | 64QAM | 35 | P_30@70 | S_5@0 | | |
| 5 | 100 | 25 | | 64QAM | 2 | P_1@0 | S_1@24 | | |
| 6 | 100 | 50 | | 64QAM | 1 | P_1@1 | S_0@0 | | |
| 7 | 100 | 50 | | 64QAM | 10 | P_10@30 | S_0@0 | | |
| 8 | 100 | 50 | | 64QAM | 30 | P_30@30 | S_0@0 | | |
| 9 | 100 | 50 | | 64QAM | 60 | P_40@60 | S_20@0 | | |
| 10 | 100 | 50 | | 64QAM | 30 | P_10@90 | S_20@0 | | |
| 11 | 100 | 50 | | 64QAM | 5 | P_0@0 | S_5@45 | | |
| 12 | 100 | 50 | | 64QAM | 2 | P_1@0 | S_1@49 | | |
| 13 | 100 | 75 | | 64QAM | 1 | P_1@1 | S_0@0 | | |
| 14 | 100 | 75 | | 64QAM | 40 | P_40@20 | S_0@0 | | |
| 15 | 100 | 75 | | 64QAM | 85 | P_80@20 | S_5@0 | | |
| 16 | 100 | 75 | | 64QAM | 40 | P_0@0 | S_40@20 | | |
| 17 | 100 | 75 | | 64QAM | 15 | P_0@0 | S_15@60 | | |
| 18 | 100 | 75 | | 64QAM | 2 | P_1@0 | S_1@74 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.33 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Table 6.6.3.3A.1_1.4.1-1, Table 6.6.3.3A.1_1.4.1-2, Table 6.6.3.3A.1_1.4.1-3, Table 6.6.3.3A.1_1.4.1-4, Table 6.6.3.3A.1_1.4.1-5 or Table 6.6.3.3A.1_1.4.1-6 depending on network signal value.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.3A.1_1.4.3.

#### 6.6.3.3A.1_1.4.2 Test procedure

Same test procedure as in clause 6.6.3.3A.1.4.2 with following exceptions:

- In step 2: Instead of clause 6.6.3.3A.1.4.3 → use clause 6.6.3.3A.1_1.4.3.

- In step 4: Instead of Table 6.6.3.3A.1.4.1-1, Table 6.6.3.3A.1.4.1-2, Table 6.6.3.3A.1.4.1-3, Table 6.6.3.3A.1.4.1-4, Table 6.6.3.3A.1.4.1-5 or Table 6.6.3.3A.1.4.1-6 → use Table 6.6.3.3A.1_1.4.1-1, Table 6.6.3.3A.1_1.4.1-2, Table 6.6.3.3A.1_1.4.1-3, Table 6.6.3.3A.1_1.4.1-4, Table 6.6.3.3A.1_1.4.1-5 or Table 6.6.3.3A.1_1.4.1-6.

- In step 6: Instead of Tables 6.2.4A.1.5-1 to 6.2.4A.1.5-7 → use Tables 6.2.4A.1_1.5-1 to 6.2.4A.1_1.5-7.

#### 6.6.3.3A.1_1.4.3 Message contents

Same message contents as in clause 6.6.3.3A.1.4.3.

### 6.6.3.3A.1_1.5 Test requirement

Same test requirements as in clause 6.6.3.3A.1.5.1 with following exceptions:

- Instead of Tables 6.2.4A.1.5-1 to 6.2.4A.1.5-7 → use Tables 6.2.4A.1_1.5-1 to 6.2.4A.1_1.5-7.

## 6.6.3.3A.1_2 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM

### 6.6.3.3A.1_2.1 Test purpose

Same test purpose as in clause 6.6.3.3A.1.1

### 6.6.3.3A.1_2.2 Test applicability

This test case applies to all types of E-UTRA UE from release 14 and forward that support intra-band contiguous DL CA, UL CA and UL 256QAM.

### 6.6.3.3A.1_2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.3.3A.1.3

### 6.6.3.3A.1_2.4 Test description

#### 6.6.3.3A.1_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in tables 6.6.3.3A.1_2.4.1-1 to 6.6.3.3A.1_2.4.1-6. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.3A.1_2.4.1-1: Test Configuration Table for CA (network signalled value "CA_NS_01")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | 256QAM | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | 256QAM | 150 | P_75@0 | S_75@0 | | |
| 3 | 75 | 75 | | 256QAM | 45 | P_45@7 | S_0@0 | | |
| 4 | 75 | 75 | | 256QAM | 8 | P_0@0 | S_8@67 | | |
| 5 | 75 | 75 | | 256QAM | 129 | P_75@0 | S_54@0 | | |
| 6 | 75 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | 256QAM | 200 | P_100@0 | S_100@0 | | |
| 8 | 100 | 100 | | 256QAM | 1 | P_1@0 | S_0@0 | | |
| 9 | 100 | 100 | | 256QAM | 175 | P_75@25 | S_100@0 | | |
| 10 | 100 | 100 | | 256QAM | 25 | P_0@0 | S_25@75 | | |
| 11 | 100 | 100 | | 256QAM | 64 | P_64@24 | S_0@0 | | |
| 12 | 100 | 100 | | 256QAM | 2 | P_1@0 | S_1@99 | | |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1

**Table 6.6.3.3A.1_2.4.1-2: Test Configuration Table for CA (network signalled value "CA_NS_02")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $NR_{B_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | 256QAM | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | 256QAM | 75 | P_75@0 | S_0@0 | | |
| 3 | 75 | 75 | | 256QAM | 129 | P_75@0 | S_54@0 | | |
| 4 | 75 | 75 | | 256QAM | 129 | P_54@21 | S_75@0 | | |
| 5 | 75 | 75 | | 256QAM | 1 | P_0@0 | S_1@74 | | |
| 6 | 75 | 75 | | 256QAM | 1 | P_0@0 | S_1@54 | | |
| 7 | 75 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 | | |
| 8 | 100 | 100 | | 256QAM | 1 | P_1@0 | S_0@0 | | |
| 9 | 100 | 100 | | 256QAM | 1 | P_1@21 | S_0@0 | | |
| 10 | 100 | 100 | | 256QAM | 90 | P_90@0 | S_0@0 | | |
| 11 | 100 | 100 | | 256QAM | 180 | P_100@0 | S_80@0 | | |
| 12 | 100 | 100 | | 256QAM | 1 | P_0@0 | S_1@99 | | |
| 13 | 100 | 100 | | 256QAM | 1 | P_0@0 | S_1@83 | | |
| 14 | 100 | 100 | | 256QAM | 2 | P_1@0 | S_1@99 | | |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1

**Table 6.6.3.3A.1_2.4.1-3: Test Configuration Table for CA (network signalled value "CA_NS_03")**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | 256QAM | 1 | P_1@0 | S_0@0 | | |
| 2 | 75 | 75 | | 256QAM | 1 | P_1@21 | S_0@0 | | |
| 3 | 75 | 75 | | 256QAM | 75 | P_75@0 | S_0@0 | | |
| 4 | 75 | 75 | | 256QAM | 90 | P_75@0 | S_15@0 | | |
| 5 | 75 | 75 | | 256QAM | 150 | P_75@0 | S_75@0 | | |
| 6 | 75 | 75 | | 256QAM | 1 | P_0@0 | S_1@74 | | |
| 7 | 75 | 75 | | 256QAM | 1 | P_0@0 | S_1@44 | | |
| 8 | 75 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 | | |
| 9 | 100 | 100 | | 256QAM | 1 | P_1@0 | S_0@0 | | |
| 10 | 100 | 100 | | 256QAM | 60 | P_60@0 | S_0@0 | | |
| 11 | 100 | 100 | | 256QAM | 1 | P_1@63 | S_0@0 | | |
| 12 | 100 | 100 | | 256QAM | 90 | P_90@0 | S_0@0 | | |
| 13 | 100 | 100 | | 256QAM | 164 | P_100@0 | S_64@0 | | |
| 14 | 100 | 100 | | 256QAM | 1 | P_0@0 | S_1@99 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 100 | 100 | | 256QAM | 1 | P_0@0 | S_1@70 | | |
| 16 | 100 | 100 | | 256QAM | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

**Table 6.6.3.3A.1_2.4.1-4: Test Configuration Table for CA (network signalled value "CA_NS_05")**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | C: High range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 75 | 75 | N/A | 256QAM | 40 | P_40@0 | S_0@0 | | |
| 2 | 75 | 75 | | 256QAM | 80 | P_50@25 | S_30@0 | | |
| 3 | 75 | 75 | | 256QAM | 60 | P_10@65 | S_50@0 | | |
| 4 | 75 | 75 | | 256QAM | 65 | P_1@74 | S_64@0 | | |
| 5 | 75 | 75 | | 256QAM | 92 | P_20@55 | S_72@0 | | |
| 6 | 75 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | 256QAM | 8 | P_8@0 | S_0@0 | | |
| 8 | 100 | 100 | | 256QAM | 40 | P_40@0 | S_0@0 | | |
| 9 | 100 | 100 | | 256QAM | 80 | P_50@50 | S_30@0 | | |
| 10 | 100 | 100 | | 256QAM | 150 | P_60@40 | S_90@0 | | |
| 11 | 100 | 100 | | 256QAM | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

**Table 6.6.3.3A.1_2.4.1-5: Test Configuration Table (network signalled value "CA_NS_06")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | NC | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | | C: Low and High range | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | | As in Table 6.2.4A.1_2.3.6-1 | | |
| **Test Parameters for CA Configurations** | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 75 | 75 | N/A | 256QAM | 5 | P_5@0 | S_0@0 | | |
| 2 | 75 | 75 | | 256QAM | 45 | P_45@0 | S_0@0 | | |
| 3 | 75 | 75 | | 256QAM | 75 | P_60@15 | S_15@0 | | |
| 4 | 75 | 75 | | 256QAM | 60 | P_10@65 | S_50@0 | | |
| 5 | 75 | 75 | | 256QAM | 90 | P_18@57 | S_72@0 | | |
| 6 | 75 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 | | |
| 7 | 100 | 100 | | 256QAM | 10 | P_10@0 | S_0@0 | | |
| 8 | 100 | 100 | | 256QAM | 30 | P_30@0 | S_0@0 | | |
| 9 | 100 | 100 | | 256QAM | 100 | P_75@25 | S_25@0 | | |
| 10 | 100 | 100 | | 256QAM | 90 | P_40@60 | S_50@0 | | |
| 11 | 100 | 100 | | 256QAM | 96 | P_15@85 | S_81@0 | | |
| 12 | 100 | 100 | | 256QAM | 2 | P_1@0 | S_1@99 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |

**Table 6.6.3.3A.1_2.4.1-6: Test Configuration Table for CA (network signalled value "CA_NS_07")**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | C: Low and High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | As in Table 6.2.4A.1_2.3.7-1 |

| **Test Parameters for CA Configurations** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **DL Allocation (PDCCH on PCC)** | **CC MOD** | **UL Allocation** | | | | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 1 | 100 | 25 | N/A | 256QAM | 1 | P_1@0 | S_0@0 | | |
| 2 | 100 | 25 | | 256QAM | 85 | P_80@20 | S_5@0 | | |
| 3 | 100 | 25 | | 256QAM | 65 | P_60@40 | S_5@0 | | |
| 4 | 100 | 25 | | 256QAM | 35 | P_30@70 | S_5@0 | | |
| 5 | 100 | 25 | | 256QAM | 2 | P_1@0 | S_1@24 | | |
| 6 | 100 | 50 | | 256QAM | 1 | P_1@1 | S_0@0 | | |
| 7 | 100 | 50 | | 256QAM | 10 | P_10@30 | S_0@0 | | |
| 8 | 100 | 50 | | 256QAM | 30 | P_30@30 | S_0@0 | | |
| 9 | 100 | 50 | | 256QAM | 60 | P_40@60 | S_20@0 | | |
| 10 | 100 | 50 | | 256QAM | 30 | P_10@90 | S_20@0 | | |
| 11 | 100 | 50 | | 256QAM | 5 | P_0@0 | S_5@45 | | |
| 12 | 100 | 50 | | 256QAM | 2 | P_1@0 | S_1@49 | | |
| 13 | 100 | 75 | | 256QAM | 1 | P_1@1 | S_0@0 | | |
| 14 | 100 | 75 | | 256QAM | 40 | P_40@20 | S_0@0 | | |
| 15 | 100 | 75 | | 256QAM | 85 | P_80@20 | S_5@0 | | |
| 16 | 100 | 75 | | 256QAM | 40 | P_0@0 | S_40@20 | | |
| 17 | 100 | 75 | | 256QAM | 15 | P_0@0 | S_15@60 | | |
| 18 | 100 | 75 | | 256QAM | 2 | P_1@0 | S_1@74 | | |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1 | | | | | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.33 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Table 6.6.3.3A.1_2.4.1-1, Table 6.6.3.3A.1_2.4.1-2, Table 6.6.3.3A.1_2.4.1-3, Table 6.6.3.3A.1_2.4.1-4, Table 6.6.3.3A.1_2.4.1-5 or Table 6.6.3.3A.1_2.4.1-6 depending on network signal value.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.3A.1_2.4.3.

#### 6.6.3.3A.1_2.4.2 Test procedure

Same test procedure as in clause 6.6.3.3A.1.4.2 with following exceptions:

- Instead of Tables 6.2.4A.1.5-1 to 6.2.4A.1.5-7 → use Tables 6.2.4A.1_2.5-1 to 6.2.4A.1_2.5-7.

#### 6.6.3.3A.1_2.4.3 Message contents

Same message contents as in clause 6.6.3.3A.1.4.3.

#### 6.6.3.3A.1_2.5 Test requirement

Same test requirements as in clause 6.6.3.3A.1.5.1 with following exceptions:

- Instead of Tables 6.2.4A.1.5-1 to 6.2.4A.1.5-7 → use Tables 6.2.4A.1_2.5-1 to 6.2.4A.1_2.5-7.

### 6.6.3.3A.2 Additional spurious emissions for CA (inter-band DL CA and UL CA)

#### 6.6.3.3A.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions in inter-band carrier aggregation under the deployment scenarios where additional requirements are specified.

#### 6.6.3.3A.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA but do not support UL 64QAM or UL 256QAM.

#### 6.6.3.3A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.3.3.3.

#### 6.6.3.3A.2.4 Test description

##### 6.6.3.3A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state. For the UE maximum output power modified by A-MPR specified in table 6.6.3.3A.2.4.1-1, the power limits specified in subclause 6.2.5A.2.3 apply

**Table 6.6.3.3A.2.4.1-1: Additional spurious emissions for inter-band CA**

| Uplink CA Configuration | NS-value per CC (in same order as UL CA Configuration column) | | Applicable emissions requirements (in same order as UL CA Configuration column) | |
|---|---|---|---|---|
| CA_1A-3A Note 3<br>CA_1A-5A Note 3<br>CA_1A-7A Note 3<br>CA_1A-8A Note 3<br>CA_1A-18A Note 3<br>CA_1A-26A Note 3<br>CA_1A-42A Note 3 | NS_05 | NS_01 | Table 6.6.3.3.5.2-1 | N/A |
| CA_1A-19A Note 3 | NS_05 | NS_08 | Table 6.6.3.3.5.2-1 | Table 6.6.3.3.5.4-1 |
| CA_1A-21A Note 3 | NS_05 | NS_09 | Table 6.6.3.3.5.2-1 | Table 6.6.3.3.5.5-1 |
| CA_2A-4A<br>CA_2A-66A | NS_03 | NS_03 | N/A | N/A |
| CA_2A-12A<br>CA_2A-13A<br>CA_4A-12A<br>CA_4A-13A<br>CA_4A-17A | NS_03 | NS_06 | N/A | N/A |
| CA_2A-13A Note 3,<br>CA_4A-13A Note 3 | NS_03 | NS_07 | N/A | Table 6.6.3.3.5.3-1 |
| CA_2A-30A Note 3 | NS_03 | NS_21 | N/A | Table 6.6.3.3.5.16-1 |
| CA_2A-46A | NS_03 | NS_28 | N/A | Table 6.6.3.3.3.22-1 |
| CA_2A-46A | NS_03 | NS_29 | N/A | Table 6.6.3.3.3.23-1 |
| CA_2A-46A | NS_03 | NS_30 | N/A | Table 6.6.3.3.3.24-1<br>Table 6.6.3.3.3.24-2<br>Table 6.6.3.3.3.24-3 |
| CA_2A-46A | NS_03 | NS_31 | N/A | Table 6.6.3.3.3.25-1<br>Table 6.6.3.3.3.25-2<br>Table 6.6.3.3.3.25-3<br>Table 6.6.3.3.3.25-4 |
| CA_3A-5A<br>CA_3A-7A<br>CA_3A-8A<br>CA_5A-7A | NS_01 | NS_01 | N/A | N/A |
| CA_3A-19A Note 3 | NS_01 | NS_08 | N/A | Table 6.6.3.3.5.4-1 |
| CA_3A-20A<br>CA_7A-20A | NS_01 | NS_10 | N/A | N/A |
| CA_3A-26A | NS_01 | NS_12 | N/A | Table 6.6.3.3.5.7-1 |
| CA_3A-26A | NS_01 | NS_13 | N/A | Table 6.6.3.3.3.8-1 |
| CA_3A-26A | NS_01 | NS_14 | N/A | Table 6.6.3.3.3.9-1 |
| CA_3A-26A | NS_01 | NS_15 | N/A | Table 6.6.3.3.5.10-1 |
| CA_2A-5A<br>CA_2A-7ACA_4A-5A<br>CA_4A-7A | NS_03 | NS_01 | N/A | N/A |
| CA_5A-12A<br>CA_5A-17A | NS_01 | NS_06 | N/A | N/A |
| CA_5A-30A Note 3 | NS_01 | NS_21 | N/A | Table 6.6.3.3.5.16-1 |
| CA_5A-66A | NS_01 | NS_03 | N/A | N/A |
| CA_7A-28A Note 3 | NS_01 | NS_17 | N/A | Table 6.6.3.3.5.12-1 |
| | NS_01 | NS_18 | N/A | Table 6.6.3.3.5.13-1 |
| CA_19A-21A Note 3 | NS_08 | NS_09 | Table 6.6.3.3.5.4-1 | Table 6.6.3.3.5.5-1 |
| CA_1A-28A Note 3 | NS_05 | NS_17 | Table 6.6.3.3.5.2-1 | Table 6.6.3.3.5.12-1 |
| CA_12A-30A Note 3 | NS_06 | NS_21 | N/A | Table 6.6.3.3.5.16-1 |
| CA_18A-28A | NS_01 | NS_17 | N/A | Table 6.6.3.3.5.12-1 |

Note 1: For CCs with NS_01, there are no additional requirements defined in 36.101. Only CCs with NS-value different than NS_01 and present in 6.6.3.3.3 needs to be tested.
Note 2: A-MPR values for NS-values in this table are the same as in section 6.2.4.3.
Note 3: No test required since the frequency range to test is unaffected by intermodulation products as described in section 4.3 in TR 36.905.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test

parameters for each CA Configuration, and are shown in tables 6.6.3.3A.2.4.1-2 to 6.6.3.3A.2.4.1-9. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.3A.2.4.1-2: Test Configuration Table (network signalled value NS_01/NS_12)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01)** | **SCC (NS_12)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8@7 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 10 | 8 |
| 3 | 25 | 25 | | QPSK | 16QAM | 8 | 8 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12@16 |
| 5 | 50 | 50 | | 16QAM | 16QAM | 15 | 18 |
| 6 | 50 | 50 | | QPSK | 16QAM | 12 | 18 |
| 7 | 100 | 75 | | QPSK | QPSK | 15 | 16@31 |
| 8 | 100 | 75 | | 16QAM | 16QAM | 20 | 30 |
| 9 | 100 | 75 | | QPSK | 16QAM | 15 | 30 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.<br>Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.6.3.3A.2.4.1-3: Test Configuration Table (network signalled value NS_01/NS_15)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_15) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 6@14 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 10 | 10@15 |
| 3 | 25 | 25 | | QPSK | 16QAM | 8 | 10@15 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12@25 |
| 5 | 50 | 50 | | 16QAM | 16QAM | 15 | 15@35 |
| 6 | 50 | 50 | | QPSK | 16QAM | 12 | 15@35 |
| 7 | 100 | 75 | | QPSK | QPSK | 18 | 18@19 |
| 8 | 100 | 75 | | 16QAM | 16QAM | 20 | 20@55 |
| 9 | 100 | 75 | | QPSK | 16QAM | 18 | 20@55 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.<br>Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.6.3.3A.2.4.1-4: Test Configuration Table (network signalled value NS_01/NS_17)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | | Low and High range for both PCC and SCC (Note 3) | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01)** | **SCC (NS_17)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 6 |
| 2 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 3 | 25 | 25 | | 16QAM | QPSK | 25 | 6 |
| 4 | 25 | 50 | | QPSK | QPSK | 6 | 12 |
| 5 | 25 | 50 | | 16QAM | 16QAM | 25 | 25 |
| 6 | 25 | 50 | | 16QAM | QPSK | 25 | 12 |
| 7 | 50 | 50 | | QPSK | QPSK | 12 | 12 |
| 8 | 50 | 50 | | 16QAM | 16QAM | 50 | 25 |
| 9 | 50 | 50 | | 16QAM | QPSK | 50 | 12 |
| 10 | 100 | 50 | | QPSK | QPSK | 16 | 12 |
| 11 | 100 | 50 | | 16QAM | 16QAM | 50 | 25 |
| 12 | 100 | 50 | | 16QAM | QPSK | 50 | 12 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.<br>Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.6.3.3A.2.4.1-5: Test Configuration Table (network signalled value NS_05/NS_01)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low range, Mid range for PCC<br>In case of Low range:<br>- For 5MHz Channel Bandwidth: 1927.2MHz (NUL = 18072)<br>- For 10 MHz Channel Bandwidth: 1934.7 MHz (NUL = 18147)<br>- For 20 MHz Channel Bandwidth: 1930 MHz (NUL = 18100)<br>Mid range for SCC(Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_05)** | **SCC (NS_01)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 15 | N/A for this test | QPSK | QPSK | 6 | 4 |
| 2 | 25 | 15 | | 16QAM | 16QAM | 25 | 6 |
| 3 | 25 | 15 | | 16QAM | QPSK | 25 | 4 |
| 4 | 25 | 25 | | QPSK | QPSK | 6 | 6 |
| 5 | 25 | 25 | | 16QAM | 16QAM | 25 | 25 |
| 6 | 25 | 25 | | 16QAM | QPSK | 25 | 6 |
| 7 | 25 | 50 | | QPSK | QPSK | 6 | 12 |
| 8 | 25 | 50 | | 16QAM | 16QAM | 25 | 25 |
| 9 | 25 | 50 | | 16QAM | QPSK | 25 | 12 |
| 10 | 50 | 50 | | QPSK | QPSK | 12 | 12 |
| 11 | 50 | 50 | | 16QAM | 16QAM | 50 | 25 |
| 12 | 50 | 50 | | 16QAM | QPSK | 50 | 12 |
| 13 | 100 | 50 | | QPSK | QPSK | 18 | 12 |
| 14 | 100 | 50 | | 16QAM | 16QAM | 50 | 25 |
| 15 | 100 | 50 | | 16QAM | QPSK | 50 | 12 |
| 16 | 100 | 75 | | QPSK | QPSK | 18 | 16 |
| 17 | 100 | 75 | | 16QAM | 16QAM | 50 | 25 |
| 18 | 100 | 75 | | 16QAM | QPSK | 50 | 16 |
| 19 | 100 | 100 | | QPSK | QPSK | 18 | 18 |
| 20 | 100 | 100 | | 16QAM | 16QAM | 50 | 25 |
| 21 | 100 | 100 | | 16QAM | QPSK | 50 | 18 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested. | | | | | | | |

| | |
|---|---|
| Note 3: | For Low range place test point with RBstart=0. For Mid range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. |

**Table 6.6.3.3A.2.4.1-6: Test Configuration Table (network signalled value NS_03/NS_28)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Mid range for PCC.<br>For SCC<br>a. 5340 MHz for config ID 1-4<br>b. 5520 MHz for config ID 5-8 | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$ | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06) NRB** | **SCC (NS_21) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 100 | N/A for this test | QPSK | QPSK | 6 | L=1 |
| 2 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 3 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 4 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 5 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 6 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 7 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 8 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.<br>Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.<br>Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.6.3.3A.2.4.1-7: Test Configuration Table (network signalled value NS_03/NS_29)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Mid range for PCC.<br>For SCC, for configuration ID:<br>a. 5180 MHz for config ID 1-4<br>b. 5240 MHz for config ID 5-8<br>c. 5260 MHz for config ID 9-12<br>d. 5320 MHz for config ID 13-16<br>e. 5500 MHz for config ID 17-20<br>f. 5700 MHz for config ID 21-24 |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06) NRB** | **SCC (NS_21) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 100 | N/A for this test | QPSK | QPSK | 6 | L=1 |
| 2 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 3 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 4 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 5 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 6 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 7 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 8 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 9 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 10 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 11 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 12 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 13 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 14 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 15 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 16 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 17 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 18 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 19 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 20 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 21 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 22 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 23 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 24 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.
Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.6.3.3A.2.4.1-8: Test Configuration Table (network signalled value NS_03/NS_30)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for PCC.<br>For SCC, for configuration ID:<br>a. 5160 MHz for config ID 1-4<br>b. 5320 MHz for config ID 5-8<br>c. 5480 MHz for config ID 9-12<br>d. 5700 MHz for config ID 13-16<br>e. 5180 MHz for config ID 17-20 | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$ | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06)** | **SCC (NS_21)** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| | **NRB** | **NRB** | | | | | |
| 1 | 25 | 100 | N/A for this test | QPSK | QPSK | 6 | L=1 |
| 2 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 3 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 4 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 5 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 6 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 7 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 8 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 9 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 10 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 11 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 12 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 13 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 14 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 15 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 16 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 17 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 18 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 19 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 20 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.

Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.6.3.3A.2.4.1-9: Test Configuration Table (network signalled value NS_03/NS_31)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for PCC.<br>For SCC, for configuration ID:<br>a. 5160 MHz for config ID 1-4<br>b. 5260 MHz for config ID 5-8<br>c. 5700 MHz for config ID 9-12<br>d. 5745 MHz for config ID 13-16<br>e. 5600 MHz for config ID 17-20 |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$ |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_06) NRB** | **SCC (NS_21) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 100 | N/A for this test | QPSK | QPSK | 6 | L=1 |
| 2 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 3 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 4 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 5 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 6 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 7 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 8 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 9 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 10 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 11 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 12 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 13 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 14 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 15 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 16 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |
| 17 | 25 | 100 | | QPSK | QPSK | 6 | L=1 |
| 18 | 25 | 100 | | 16QAM | 16QAM | 25 | L=10 |
| 19 | 100 | 100 | | QPSK | QPSK | 10 | L=1 |
| 20 | 100 | 100 | | 16QAM | 16QAM | 100 | L=10 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: For simplifying test, PCC is mapped to the first band of the combination as listed in Uplink CA Configuration column in Table 6.2.4A.2.4.1-1.
Note 3: For partial RB allocation unless RBstart is explicitly defined, for Low range place test point with RBstart=0, for High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.33 as appropriate.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Tables 6.6.3.3A.2.4.1-2 to 6.6.3.3A.2.4.1-9 depending on network signal value.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.3A.2.4.3.

#### 6.6.3.3A.2.4.2 Test procedures

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.6.3.3A.2.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Tables 6.6.3.3A.2.4.1-2 to 6.6.3.3A.2.4.1-9 as appropriate on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control “up” commands in every uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
6. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Tables 6.2.4A.2.5-1 to 6.2.4A.2.5-16 as appropriate. The period of the measurement shall be at least one sub-frame (1ms).
7. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Tables 6.6.3.3.5.1-1 to 6.6.3.3.5.24-1 as appropriate. The centre frequency of the filter shall be stepped in contiguous steps according to the same table. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

#### 6.6.3.3A.2.4.3 Message contents

Same message contents as in clause 6.2.4A.2.4.3.

#### 6.6.3.3A.2.5 Test requirement

Same test requirements as in clause 6.6.3.3.5 depending on network signal value.

### 6.6.3.3A.2_1 Additional spurious emissions for CA (inter-band DL CA and UL CA) for UL 64QAM

Editor's note: For a transition period until RAN5#83, this test case in version 15.3.1 of 36.521-1 shall be used. This is to ensure no test coverage is lost before the UL 256QAM test case becomes available.

#### 6.6.3.3A.2_1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions in inter-band carrier aggregation under the deployment scenarios where additional requirements are specified.

#### 6.6.3.3A.2_1.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward that support inter-band DL CA and UL CA and UL 64QAM but do not support UL 256QAM.

#### 6.6.3.3A.2_1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.3.3.3.

### 6.6.3.3A.2_1.4 Test description

#### 6.6.3.3A.2_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state. For the UE maximum output power modified by A-MPR specified in table 6.6.3.3A.2_1.4.1-1, the power limits specified in subclause 6.2.5A.2.3 apply

**6.6.3.3A.2_1.4.1-1 Additional spurious emissions for inter-band CA**

| Uplink CA Configuration | NS-value per CC (in same order as UL CA Configuration column) | | Applicable emissions requirements (in same order as UL CA Configuration column) | |
|---|---|---|---|---|
| CA_1A-3A Note 3<br>CA_1A-5A<br>CA_1A-7A<br>CA_1A-8A<br>CA_1A-18A Note 3<br>CA_1A-26A Note 3<br>CA_1A-42A Note 3 | NS_05 | NS_01 | Table 6.6.3.3.5.2-1 | N/A |
| CA_2A-13A,<br>CA_4A-13A | NS_03 | NS_07 | Table 6.6.2.2.3.1-1 | Table 6.6.2.2.3.3-1<br>Table 6.6.3.3.3.3-1 |
| CA_3A-26A | NS_01 | NS_12 | N/A | Table 6.6.3.3.3.7-1 |
| CA_3A-26A | NS_01 | NS_15 | N/A | Table 6.6.3.3.3.10-1 |
| CA_1A-19A Note 3 | NS_05 | NS_08 | Table 6.6.3.3.5.2-1 | Table 6.6.3.3.5.4-1 |
| CA_1A-21A Note 3 | NS_05 | NS_09 | Table 6.6.3.3.5.2-1 | Table 6.6.3.3.5.5-1 |
| CA_1A-28A Note 3 | NS_05 | NS_17 | Table 6.6.3.3.5.2-1 | Table 6.6.3.3.5.12-1 |
| CA_3A-19A Note 3 | NS_01 | NS_08 | N/A | Table 6.6.3.3.5.4-1 |
| CA_19A-21A Note 3 | NS_08 | NS_09 | Table 6.6.3.3.5.4-1 | Table 6.6.3.3.5.5-1 |
| CA_18A-28A | NS_01 | NS_17 | N/A | Table 6.6.3.3.5.12-1 |

Note 1: For CCs with NS_01, there are no additional requirements defined in 36.101. Only CCs with NS-value different than NS_01 needs to be tested.
Note 2: A-MPR values for NS-values in this table are the same as in section 6.2.4.3.
Note 3: No test required since only A-Spur requirements apply, and the frequency range to test is unaffected by intermodulation products as described in section 4.3 in TR 36.905.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in tables 6.6.3.3A.2_1.4.1-2 to 6.6.3.3A.2_1.4.1-5. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3.3A.2_1.4.1-2: Test Configuration Table (network signalled value NS_01/NS_12)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_12) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 8@7 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 10 | 8 |
| 3 | 25 | 25 | | QPSK | 64QAM | 8 | 8 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12@16 |
| 5 | 50 | 50 | | 64QAM | 64QAM | 15 | 18 |
| 6 | 50 | 50 | | QPSK | 64QAM | 12 | 18 |
| 7 | 100 | 75 | | QPSK | QPSK | 15 | 16@31 |
| 8 | 100 | 75 | | 64QAM | 64QAM | 20 | 30 |
| 9 | 100 | 75 | | QPSK | 64QAM | 15 | 30 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested. | | | | | | | |
| Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.6.3.3A.2_1.4.1-3: Test Configuration Table (network signalled value NS_01/NS_15)**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_15) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 8 | 6@14 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 10 | 10@15 |
| 3 | 25 | 25 | | QPSK | 64QAM | 8 | 10@15 |
| 4 | 50 | 50 | | QPSK | QPSK | 12 | 12@25 |
| 5 | 50 | 50 | | 64QAM | 64QAM | 15 | 15@35 |
| 6 | 50 | 50 | | QPSK | 64QAM | 12 | 15@35 |
| 7 | 100 | 75 | | QPSK | QPSK | 18 | 18@19 |
| 8 | 100 | 75 | | 64QAM | 64QAM | 20 | 20@55 |
| 9 | 100 | 75 | | QPSK | 64QAM | 18 | 20@55 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested. | | | | | | | |
| Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$. | | | | | | | |

**Table 6.6.3.3A.2_1.4.1-4: Test Configuration Table (network signalled value NS_03/NS_07)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for both PCC and SCC (Note 3) |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$(Note 2) |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_03) NRB** | **SCC (NS_07) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 50 | N/A for this test | QPSK | QPSK | 6 | 7@13 |
| 2 | 25 | 50 | | 64QAM | 64QAM | 25 | 50 |
| 3 | 25 | 50 | | QPSK | 64QAM | 6 | 50 |
| 4 | 50 | 50 | | QPSK | QPSK | 6 | 7@13 |
| 5 | 50 | 50 | | 64QAM | 64QAM | 50 | 50 |
| 6 | 50 | 50 | | QPSK | 64QAM | 6 | 50 |
| 7 | 100 | 50 | | QPSK | QPSK | 10 | 7@13 |
| 8 | 100 | 50 | | 64QAM | 64QAM | 100 | 50 |
| 9 | 100 | 50 | | QPSK | 64QAM | 10 | 50 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.6.3.3A.2_1.4.1-5: Test Configuration Table (network signalled value NS_05/NS_01)**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | | | | | Low and High range for both PCC and SCC (Note 3) | | |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Lowest and Highest $N_{RBagg}$(Note 2) | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_05) NRB** | **SCC (NS_01) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 15 | N/A for this test | QPSK | QPSK | 6 | 4 |
| 2 | 25 | 15 | | 64QAM | 64QAM | 25 | 6 |
| 3 | 25 | 15 | | 64QAM | QPSK | 25 | 4 |
| 4 | 25 | 25 | | QPSK | QPSK | 6 | 6 |
| 5 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 6 | 25 | 25 | | 64QAM | QPSK | 25 | 6 |
| 7 | 25 | 50 | | QPSK | QPSK | 6 | 12 |
| 8 | 25 | 50 | | 64QAM | 64QAM | 25 | 25 |
| 9 | 25 | 50 | | 64QAM | QPSK | 25 | 12 |
| 10 | 50 | 50 | | QPSK | QPSK | 12 | 12 |
| 11 | 50 | 50 | | 64QAM | 64QAM | 50 | 25 |
| 12 | 50 | 50 | | 64QAM | QPSK | 50 | 12 |
| 13 | 100 | 50 | | QPSK | QPSK | 18 | 12 |
| 14 | 100 | 50 | | 64QAM | 64QAM | 50 | 25 |
| 15 | 100 | 50 | | 64QAM | QPSK | 50 | 12 |
| 16 | 100 | 75 | | QPSK | QPSK | 18 | 16 |
| 17 | 100 | 75 | | 64QAM | 64QAM | 50 | 25 |
| 18 | 100 | 75 | | 64QAM | QPSK | 50 | 16 |
| 19 | 100 | 100 | | QPSK | QPSK | 18 | 18 |
| 20 | 100 | 100 | | 64QAM | 64QAM | 50 | 25 |
| 21 | 100 | 100 | | 64QAM | QPSK | 50 | 18 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

**Table 6.6.3.3A.2_1.4.1-6: Test Configuration Table (network signalled value NS_01/NS_17)**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes | Low and High range for both PCC and SCC (Note 3) |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest and Highest $N_{RBagg}$(Note 2) |

| Test Parameters for CA Configurations | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config ID** | **CA Configuration / NRB_agg** | | **DL Allocation** | **CC MOD** | | **UL Allocation** | |
| | **PCC (NS_01) NRB** | **SCC (NS_17) NRB** | **PCC & SCC RB allocation** | **PCC** | **SCC** | **PCC & SCC RB allocations** | |
| 1 | 25 | 25 | N/A for this test | QPSK | QPSK | 6 | 6 |
| 2 | 25 | 25 | | 64QAM | 64QAM | 25 | 25 |
| 3 | 25 | 25 | | 64QAM | QPSK | 25 | 6 |
| 4 | 25 | 50 | | QPSK | QPSK | 6 | 12 |
| 5 | 25 | 50 | | 64QAM | 64QAM | 25 | 25 |
| 6 | 25 | 50 | | 64QAM | QPSK | 25 | 12 |
| 7 | 50 | 50 | | QPSK | QPSK | 12 | 12 |
| 8 | 50 | 50 | | 64QAM | 64QAM | 50 | 25 |
| 9 | 50 | 50 | | 64QAM | QPSK | 50 | 12 |
| 10 | 100 | 50 | | QPSK | QPSK | 16 | 12 |
| 11 | 100 | 50 | | 64QAM | 64QAM | 50 | 25 |
| 12 | 100 | 50 | | 64QAM | QPSK | 50 | 12 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1

Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg. Only the combination with the highest NRB_PCC is tested.

Note 3: For Low range place test point with RBstart=0. For High range place test point with $RB_{start}=RB_{max}-L_{CRB}+1$.

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure group A.33 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Tables 6.6.3.3A.2_1.4.1-2 to 6.6.3.3A.2_1.4.1-6 depending on network signal value.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3.3A.2_1.4.3.

### 6.6.3.3A.2_1.4.2 Test procedures

Same test procedure as in clause 6.6.3.3A.2.4.2 with following exceptions:

- In step 2: Instead of clause 6.6.3.3A.2.4.3 → use clause 6.6.3.3A.2_1.4.3.
- In step 4: Instead of Tables 6.6.3.3A.2.4.1-2 to 6.6.3.3A.2.4.1-9 → use Tables 6.6.3.3A.2_1.4.1-2 to 6.6.3.3A.2_1.4.1-6.
- In step 6: Instead of Tables 6.2.4A.2.5-1 to 6.2.4A.2.5-16 → use Tables 6.2.4A.2_1.5-1 to 6.2.4A.2_1.5-11.
- In step 7: Instead of Table 6.6.3.3A.2.4.1-1 → use Table 6.6.3.3A.2_1.4.1-1.

#### 6.6.3.3A.2_1.4.3 Message contents

Same message content as in clause 6.6.3.3A.2.4.3.

#### 6.6.3.3A.2_1.5 Test requirement

Same test requirements as in clause 6.6.3.3A.2.5.

### 6.6.3.3A.3 Additional spurious emissions for CA (intra-band non-contiguous DL CA and UL CA)

Editor's note: No test case details specified because the additional maximum power reduction and the additional spurious emissions cannot be verified for the intra-band non-contiguous UL CA case due to A-MPR is N/A and no additional requirement is needed in current non-contiguous Uplink CA configuration CA_4A-4A according to Table 6.2.4A-2 in TS 36.101.

## 6.6.3B Spurious emission for UL-MIMO

For UE supporting UL-MIMO, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products are specified at each transmit antenna connector.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in subclause 6.6.3 apply to each transmit antenna connector. The requirements shall be met with the UL-MIMO configurations specified in Table 6.2.2B-1.

For single-antenna port scheme, the general requirements in subclause 6.6.2 apply.

### 6.6.3B.1 Transmitter Spurious emissions for UL-MIMO

#### 6.6.3B.1.1 Test purpose

To verify that UE transmitter with a UL-MIMO does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

#### 6.6.3B.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

#### 6.6.3B.1.3 Minimum conformance requirements

For UE with multiple transmit antenna connectors, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products are specified at each transmit antenna connector.

For UEs with two transmit antenna connectors, the requirements in clause 6.6.3 apply to each transmit antenna with the UL-MIMO configurations specified in Table 6.2.2B-1 for closed-loop spatial multiplexing scheme.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.3B.

### 6.6.3B.1.4 Test description

#### 6.6.3B.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in Table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3B.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3B.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] clause 4.1) | NC | | | | | |
| Test Frequencies (as specified in TS 36.508 [7] clause 4.3.1) | Low range, Mid range, High range | | | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] clause 4.3.1) | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | N/A for Spurious Emissions testing | | | QPSK | 6 | 6 |
| 1.4MHz | | | | QPSK | 1 | 1 |
| 3MHz | | | | QPSK | 15 | 15 |
| 3MHz | | | | QPSK | 1 | 1 |
| 5MHz | | | | QPSK | 25 | 25 |
| 5MHz | | | | QPSK | 1 | 1 |
| 10MHz | | | | QPSK | 50 | 50 |
| 10MHz | | | | QPSK | 1 | 1 |
| 15MHz | | | | QPSK | 75 | 75 |
| 15MHz | | | | QPSK | 1 | 1 |
| 20MHz | | | | QPSK | 100 | 100 |
| 20MHz | | | | QPSK | 1 | 1 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The 1 RB allocation shall be tested at both RB #0 and RB #max. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.38.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.3B.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3B.1.4.3.

#### 6.6.3B.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.6.3B.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the power of the transmitted signal at each UE antenna connector with a measurement filter of bandwidths according to table 6.6.3B.1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3B.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

#### 6.6.3B.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.3B.1.5 Test requirement

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in table 6.6.3B.1.5-1.

The spurious emission limits apply for the frequency ranges that are more than ΔfOOB (MHz) from the edge of the channel bandwidth shown in Table 6.6.3.1.3-1.

**Table 6.6.3B.1.5-1: General spurious emissions test requirements**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | Note 1 |
| Note 1: Applies for Band 22, Band 42 and Band 43. | | | |

NOTE: In order that the measurement of spurious emissions falls within the frequency ranges that are more than ΔfOOB (MHz) from the edge of the channel bandwidth, the minimum offset of the measurement frequency from each edge of the channel should be ΔfOOB + MBW/2. MBW denotes the measurement bandwidth defined in Table 6.6.3B.1.5-1.

## 6.6.3B.2 Spurious emission band UE co-existence for UL-MIMO

Editor's note: This test case contains different requirements for different UE releases

### 6.6.3B.2.1 Test purpose

To verify that UE transmitter with a UL-MIMO does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

### 6.6.3B.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

### 6.6.3B.2.3 Minimum conformance requirements

For UE with multiple transmit antenna connectors, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products are specified at each transmit antenna connector.

For UEs with two transmit antenna connectors, the requirements in clause 6.6.3 apply to each transmit antenna with the UL-MIMO configurations specified in Table 6.2.2B-1 for closed-loop spatial multiplexing scheme.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.3B.

This test use minimum requirements from many releases of TS 36.101 [2] due to release independence defined in TS 36.307 [16].

## 6.6.3B.2.4 Test description

### 6.6.3B.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in Table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3B.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3B.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] clause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS 36.508 [7] clause 4.3.1) (Note 3) | | | | Low range, Mid range, High range (Note 3) | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] clause 4.3.1) | | | | Lowest, 5MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | N/A for Spurious Emissions testing | | | QPSK | 6 | 6 |
| 1.4MHz | | | | QPSK | 1 | 1 |
| 3MHz | | | | QPSK | 15 | 15 |
| 3MHz | | | | QPSK | 1 | 1 |
| 5MHz | | | | QPSK | 25 | 25[5] |
| 5MHz | | | | QPSK | 1 | 1[5] |
| 10MHz | | | | QPSK | 50 | 50 |
| 10MHz | | | | QPSK | 1 | 1 |
| 15MHz | | | | QPSK | 75 | 75 |
| 15MHz | | | | QPSK | 1 | 1 |
| 20MHz | | | | QPSK | 100 | 100 |
| 20MHz | | | | QPSK | 1 | 1 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: The 1 RB allocation shall be tested at both RB #0 and RB #max. | | | | | | |
| Note 3: Do not apply for requirements under Note 13 in Tables 6.6.3.2.3-1B to 6.6.3.2.3-1E. Test frequencies for these requirements are defined in Table 6.6.3B.2.4.1-2. | | | | | | |
| Note 4: Void | | | | | | |
| Note 5: For requirements under note 22 in Table 6.6.3B.2.5-1, the message exception in Table 6.6.3B.2.4.3-1 is used to test with the high channel. | | | | | | |

**Table 6.6.3B.2.4.1-2: Test frequencies for E-UTRA channel bandwidth for operating band 3 with Note 13 (in Tables 6.6.3.2.3-1B to 6.6.3.2.3-1G)**

| **Bandwidth [MHz]** | **$N_{UL}$** | **Frequency of Uplink [MHz]** | **$N_{DL}$** | **Frequency of Downlink [MHz]** |
|---|---|---|---|---|
| | | | | |
| | | | | |
| 5 | 19924 | 1782.4 | 1924 | 1877.4 |
| 10 | 19899 | 1779.9 | 1899 | 1874.9 |
| 15 | 19874 | 1777.4 | 1874 | 1872.4 |
| 20 | 19849 | 1774.9 | 1849 | 1869.9 |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.38.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.3B.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3B.2.4.3.

### 6.6.3B.2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.6.3B.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure the power of the transmitted signal at each UE antenna connector with a measurement filter of bandwidths according to table 6.6.3B.2.5-1. For band 14 measurements made in a bandwidth of 6.25kHz, measurement parameter settings defined in table 6.6.3B.2.4.2-1 shall be used. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3B.2.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

**Table 6.6.3B.2.4.2-1: Measurement setup for band 14**

| | **Option 1: Measurement with No RMS VBW available** | **Option2 Measurement with VBW Filtering on Power scale** |
|---|---|---|
| VBW | >=62.5 kHz<br><br>(10 times or more the RBW) | <=43Hz |
| RBW | <=6.25kHz | <=6.25kHz |
| Detector type | Averages signal envelope during each measurement point, such as "RMS detector" | Peak |
| Averaging mode (Trace averaging) | Power (RMS voltage) | Power (RMS voltage), as controlled by "Average Type" |
| Average Type (applies to detector) | Power (RMS voltage) (automatically occurs with "RMS detector") | Not applicable |
| Average Type (applies to VBW filter) | Not applicable | Power (RMS voltage) |
| Number of averages | 30, to reduce variance as required, or use an even longer sweep time | 1 or use an even narrower VBW filter, thus a longer sweep time |
| Sweep time | [Don't specify] | Sweep rate (span divided by sweep time) <= 0.8 * RBW*VBW |

### 6.6.3B.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 6.6.3B.2.4.3-1: SystemInformationBlockType1 with Note 22 in table 6.6.3B.2.5-1**

| Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| p-Max | 20 | | |

## 6.6.3B.2.5 Test requirement

Test requirements for Spurious Emissions UE Co-existence for UL-MIMO are the same as the minimum requirements and are not repeated in this section.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in tables 6.6.3.2.3-1B to 6.6.3.2.3-1G according to the following rule:

The requirements for the UE are release specific and can be found in Tables 6.6.3.2.3-1B to 6.6.3.2.3-1G. If the UE support a band, which is not defined in the table corresponding UE's release, the requirements for this band are taken from the table of earliest release where requirements for this band are defined. This has been described in following Table 6.6.3B.2.5-1.

The spurious emission limits apply for the frequency ranges that are more than ΔfOOB (MHz) from the edge of the channel bandwidth shown in Table 6.6.3.1.3-1.

**Table 6.6.3B.2.5-1: UE Requirements according to UE E-UTRA release and supported E-UTRA band**

| Band | UE Requirements per release | | | | | |
|---|---|---|---|---|---|---|
| | Rel-10 | Rel-11 | Rel-12 | Rel-13 | Rel-14 | Rel-15 |
| 1 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 2 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 3 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 4 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 5 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 6 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 7 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 8 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 9 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 10 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 11 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 12 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 13 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 14 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| ... | | | | | | |
| 17 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 18 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 19 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 20 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 21 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 22 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |

| | | | | | | |
|---|---|---|---|---|---|---|
| 23 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 24 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 25 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 26 | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 27 | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 28 | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 30 | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 31 | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| ... | | | | | | |
| 33 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 34 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 35 | | | | | | |
| 36 | | | | | | |
| 37 | | | | | | |
| 38 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 39 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 40 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 41 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 42 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 43 | Table 6.6.3.2.3-1B | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 44 | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1C | Table 6.6.3.2.3-1D | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| 45 | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| … | | | | | | |
| 48 | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| | | | | | | |
| 65 | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1E | Table 6.6.3.2.3-1F | Table 6.6.3.2.3-1G |
| … | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 68 | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G |
| … | | | | | | |
| 71 | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G |
| 72 | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G | Table 6.6.3.2.3-1G |

NOTE: The frequency range applicable with network signalled values of NS_05, NS_08, and NS_09 are covered in 6.6.3B.3 Additional Spurious Emissions for UL-MIMO.

## 6.6.3B.3 Additional spurious emissions for UL-MIMO

Editor's note: This clause is incomplete. for Rel-10 as it is also testing Rel-11 minimum requirements.

### 6.6.3B.3.1 Test purpose

To verify that UE transmitter with a UL-MIMO does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

### 6.6.3B.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

### 6.6.3B.3.3 Minimum conformance requirements

For UE with multiple transmit antenna connectors, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products are specified at each transmit antenna connector.

For UEs with two transmit antenna connectors, the requirements in clause 6.6.3 apply to each transmit antenna with the UL-MIMO configurations specified in Table 6.2.2B-1 for closed-loop spatial multiplexing scheme.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.3B.

### 6.6.3B.3.4 Test description

#### 6.6.3B.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Tables 6.6.3B.3.4.1-1 to 6.6.3B.3.4.1-19. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3B.3.4.1-1: Test Configuration Table (network signalled value "NS_04") (Power Class 3)**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range<br><br>Additional test frequencies for Rel-12 to Rel-13 and bit 2 of modifiedMPRbehavior = 0:<br><br>For 5 MHz bandwidth:<br>2499.6 MHz, $N_{UL}$= 39696<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866<br><br>Additional test frequencies for Rel-12 and later and bit 2 of modifiedMPRbehavior = 1:<br><br>For 5 MHz bandwidth:<br>2500.6 MHz, $N_{UL}$= 39686<br><br>For 10 MHz bandwidth:<br>2504.1 MHz, $N_{UL}$= 39731<br><br>For 15 MHz bandwidth:<br>2510.9 MHz, $N_{UL}$= 39799<br><br>For 20 MHz bandwidth:<br>2517.6 MHz, $N_{UL}$= 39866 | | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10 MHz, 15 MHz, 20MHz | | |
| **Test Parameters for NS_04 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configura-tion ID** | **Ch BW** | **Mod'n** | **RB allocation TDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 (Note 6) | 5MHz | N/A for A-MPR testing | | QPSK | 25 | 0 |
| 2 (Note 6) | 5MHz | | | QPSK | 8 | Note 3 |
| 3(Note 6) | 5MHz | | | QPSK | 6 | Note 3 |
| 4 (Note 6) | 5MHz | | | 16QAM (Note 5) | 25 | 0 |
| 5 (Note 6) | 5MHz | | | 16QAM (Note 5) | 8 | Note 3 |
| 6 (Note 6) | 10MHz | | | QPSK | 1 | 0 |
| 7 (Note 6) | 10MHz | | | QPSK | 12 | 0 |
| 8 (Note 6) | 10MHz | | | QPSK | 50 | 0 |
| 9 Note 6) | 10MHz | | | 16QAM (Note 5) | 50 (Note 4) | 0 |
| 10 (Note 6) | 10MHz | | | QPSK | 24 | 13 |
| 11 (Note 6) | 10MHz | | | 16QAM (Note 5) | 24 | 13 |
| 12 (Note 6) | 10MHz | | | QPSK | 36 | 13 |
| 13 (Note 6) | 10MHz | | | QPSK | 12 | 37 |
| 14 (Note 6) | 10MHz | | | QPSK | 1 | 49 |
| 15 (Note 6) | 15MHz | | | QPSK | 1 | 0 |
| 16 (Note 6) | 15MHz | | | QPSK | 16 | 0 |
| 17 (Note 6) | 15MHz | | | QPSK | 75 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| 18 (Note 6) | 15MHz | | 16QAM (Note 5) | 75 (Note 4) | 0 |
| 19 (Note 6) | 15MHz | | QPSK | 36 | 19 |
| 20 (Note 6) | 15MHz | | 16QAM (Note 5) | 36 (Note 4) | 19 |
| 21 (Note 6) | 15MHz | | QPSK | 50 | 19 |
| 22 (Note 6) | 15MHz | | QPSK | 18 | 56 |
| 23 (Note 6) | 15MHz | | QPSK | 1 | 74 |
| 24 (Note 6) | 20MHz | | QPSK | 1 | 0 |
| 25 (Note 6) | 20MHz | | QPSK | 18 | 0 |
| 26 (Note 6) | 20MHz | | QPSK | 100 | 0 |
| 27 (Note 6) | 20MHz | | 16QAM (Note 5) | 100 (Note 4) | 0 |
| 28 (Note 6) | 20MHz | | QPSK | 50 | 25 |
| 29 (Note 6) | 20MHz | | 16QAM (Note 5) | 50 (Note 4) | 25 |
| 30 (Note 6) | 20MHz | | QPSK | 75 | 25 |
| 31 (Note 6) | 20MHz | | QPSK | 25 | 75 |
| 32 (Note 6) | 20MHz | | QPSK | 1 | 99 |
| 33 (Note 8) | 5MHz | | QPSK | 1 | 0 |
| 34 (Note 8) | 5MHz | | QPSK | 16 | 9 |
| 35 (Note 9) | 5MHz | | QPSK | 25 | 0 |
| 36 (Note 8) | 5MHz | | 16QAM (Note 5) | 16 | 9 |
| 37 (Note 9) | 5MHz | | 16QAM (Note 5) | 25 | 0 |
| 38 (Note 8) | 10MHz | | QPSK | 1 | 0 |
| 39 (Note 8) | 10MHz | | QPSK | 1 | 49 |
| 40 (Note 8) | 10MHz | | QPSK | 24 | 0 |
| 41 (Note 8) | 10MHz | | QPSK | 40 | 10 |
| 42 (Note 7) | 10MHz | | QPSK | 50 | 0 |
| 43 (Note 7) | 10MHz | | 16QAM (Note 5) | 50 | 0 |
| 44 (Note 8) | 15MHz | | QPSK | 1 | 0 |
| 45 (Note 8) | 15MHz | | QPSK | 1 | 74 |
| 46 (Note 8) | 15MHz | | QPSK | 32 | 0 |
| 47 (Note 8) | 15MHz | | QPSK | 60 | 15 |
| 48 (Note 7) | 15MHz | | QPSK | 75 | 0 |
| 49 (Note 7) | 15MHz | | 16QAM (Note 5) | 75 | 0 |
| 50 (Note 8) | 20MHz | | QPSK | 1 | 0 |
| 51 (Note 8) | 20MHz | | QPSK | 1 | 99 |
| 52 (Note 8) | 20MHz | | QPSK | 36 | 0 |
| 53 (Note 8) | 20MHz | | QPSK | 75 | 25 |
| 54 (Note 7) | 20MHz | | QPSK | 100 | 0 |
| 55 (Note 7) | 20MHz | | 16QAM (Note 5) | 100 | 0 |

Note 1: Test Channel Bandwidths are checked separately for E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: The configuration ID will be used to map the applicable Test Configuration to be corresponding Test Requirement in subclause 6.2.4 as not all combinations are necessarily required based on the applicability of the UE.
Note 3: The $RB_{start}$ of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.
Note 4: Applies only for UE-Categories ≥2.
Note 5: Void.
Note 6: Applies only for Rel-11 and earlier.
Note 7: Applies only for Rel-12 and later.
Note 8: Applies only for Rel-12 and later and Low Range.
Note 9: Applies only for Rel-12 and later and Mid, High Range and additional test frequencies.

**Table 6.6.3B.3.4.1-2: Test Configuration Table (network signalled value "NS_05")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range<br><br>In case of Low range:<br>- For 5MHz Channel Bandwidth: 1927.2MHz ($N_{UL}$ = 18072)<br>- For 10MHz Channel Bandwidth: 1934.7MHz ($N_{UL}$ = 18147)<br>- For 15MHz Channel Bandwidth: 1932.5MHz ($N_{UL}$ = 18125)<br>- For 20MHz Channel Bandwidth: 1930MHz ($N_{UL}$ = 18100) | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, 10MHz, 15MHz, 20MHz | | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | | **$RB_{start}$** |
| | | **FDD** | **TDD** | | **FDD** | **TDD** | **FDD** |
| 5MHz | N/A for Additional Spurious Emissions testing | | | QPSK | 1 | N/A | 0 |
| 5MHz | | | | QPSK | 1 | | 24 |
| 5MHz | | | | QPSK | 25 | | 0 |
| 10MHz | | | | QPSK | 1 | | 0 |
| 10MHz | | | | QPSK | 1 | | 49 |
| 10MHz | | | | QPSK | 12 | | 0 |
| 10MHz | | | | QPSK | 12 | | 38 |
| 10MHz | | | | QPSK | 48 | | 0 |
| 10MHz | | | | QPSK | 48 | | 2 |
| 10MHz (Note 6) | | | | QPSK | 50 | | 0 |
| 10MHz (Note 6) | | | | 16QAM | 50 (Note 3) | | 0 |
| 15MHz (Note 7) | | | | QPSK | 1 | | 8 |
| 15MHz (Note 7) | | | | QPSK | 1 | | 66 |
| 15MHz (Note 7) | | | | QPSK | 16 | | 8 |
| 15MHz (Note 7) | | | | QPSK | 16 | | 51 |
| 15MHz (Note 7) | | | | QPSK | 30 | | 8 |
| 15MHz (Note 7) | | | | QPSK | 30 | | 37 |
| 20MHz (Note 7) | | | | QPSK | 1 | | 24 |
| 20MHz (Note 7) | | | | QPSK | 1 | | 75 |
| 20MHz (Note 7) | | | | QPSK | 18 | | 24 |
| 20MHz (Note 7) | | | | QPSK | 18 | | 58 |
| 20MHz (Note 7) | | | | QPSK | 24 | | 24 |
| 20MHz (Note 7) | | | | QPSK | 24 | | 52 |
| 15MHz (Note 8) | | | | QPSK | 1 | | 0 |
| 15MHz (Note 8) | | | | QPSK | 1 | | 74 |
| 15MHz (Note 8) | | | | QPSK | 16 | | 0 |
| 15MHz (Note 8) | | | | QPSK | 16 | | 59 |
| 15MHz (Note 8) | | | | QPSK | 48 | | 0 |
| 15MHz (Note 8) | | | | QPSK | 48 | | 27 |

| | | | | | |
|---|---|---|---|---|---|
| 15MHz (Note 8) | | QPSK | 75 | | 0 |
| 15MHz (Note 8) | | 16QAM | 75 (Note 3) | | 0 |
| 20MHz (Note 8) | | QPSK | 1 | | 0 |
| 20MHz (Note 8) | | QPSK | 1 | | 99 |
| 20MHz (Note 8) | | QPSK | 18 | | 0 |
| 20MHz (Note 8) | | QPSK | 18 | | 82 |
| 20MHz (Note 8) | | QPSK | 48 | | 0 |
| 20MHz (Note 8) | | QPSK | 48 | | 52 |
| 20MHz (Note 8) | | QPSK | 100 | | 0 |
| 20MHz (Note 8) | | 16QAM | 100 (Note 3) | | 0 |
| 10MHz (Note 9) | | QPSK | 50 | | 0 |
| 10MHz (Note 9) | | 16QAM | 50 (Note 3) | | 0 |
| 15MHz (Note 9) | | QPSK | 1 | | 0 |
| 15MHz (Note 9) | | QPSK | 75 | | 0 |
| 15MHz (Note 9) | | QPSK | 16 | | 8 |
| 15MHz (Note 9) | | QPSK | 30 | | 8 |
| 15MHz (Note 9) | | QPSK | 54 | | 8 |
| 15MHz (Note 9) | | QPSK | 64 | | 8 |
| 15MHz (Note 9) | | QPSK | 1 | | 74 |
| 15MHz (Note 9) | | QPSK | 6 | | 69 |
| 15MHz (Note 9) | | QPSK | 8 | | 67 |
| 20MHz (Note 9) | | QPSK | 1 | | 0 |
| 20MHz (Note 9) | | QPSK | 100 | | 0 |
| 20MHz (Note 9) | | QPSK | 18 | | 24 |
| 20MHz (Note 9) | | QPSK | 24 | | 24 |
| 20MHz (Note 9) | | QPSK | 40 | | 24 |
| 20MHz (Note 9) | | QPSK | 50 | | 24 |
| 20MHz (Note 9) | | QPSK | 72 | | 24 |
| 20MHz (Note 9) | | QPSK | 1 | | 99 |
| 20MHz (Note 9) | | QPSK | 6 | | 94 |
| 20MHz (Note 9) | | QPSK | 24 | | 76 |
| 10MHz (Note 10) | | QPSK | 50 | | 0 |
| 10MHz (Note 10) | | 16QAM | 50 (Note 3) | | 0 |

| | | | | | |
|---|---|---|---|---|---|
| 15MHz (Note 10) | | QPSK | 1 | | 0 |
| 15MHz (Note 10) | | QPSK | 1 | | 74 |
| 15MHz (Note 10) | | QPSK | 16 | | 0 |
| 15MHz (Note 10) | | QPSK | 16 | | 59 |
| 15MHz (Note 10) | | QPSK | 48 | | 0 |
| 15MHz (Note 10) | | QPSK | 48 | | 27 |
| 15MHz (Note 10) | | QPSK | 75 | | 0 |
| 15MHz (Note 10) | | 16QAM | 75 (Note 3) | | 0 |
| 20MHz (Note 10) | | QPSK | 1 | | 0 |
| 20MHz (Note 10) | | QPSK | 1 | | 99 |
| 20MHz (Note 10) | | QPSK | 18 | | 0 |
| 20MHz (Note 10) | | QPSK | 18 | | 82 |
| 20MHz (Note 10) | | QPSK | 48 | | 0 |
| 20MHz (Note 10) | | QPSK | 48 | | 52 |
| 20MHz (Note 10) | | QPSK | 100 | | 0 |
| 20MHz (Note 10) | | 16QAM | 100 (Note 3) | | 0 |

Note 1: Void
Note 2: Void
Note 3: Applies only for UE-Categories ≥2.
Note 4: Void
Note 5: Void
Note 6: Applies when bit number 1 in modifiedMPRbehavior = 0 (Rel-11 minimum requirements apply) for Band1 and not available for Band65.
Note 7: Applies for low range and when bit number 1 in modifiedMPRbehavior = 0 (Rel-11 minimum requirements apply) for Band1 and not available for Band65.
Note 8: Applies for mid range and when bit number 1 in modifiedMPRbehavior = 0 (Rel-11 minimum requirements apply) for Band1 and not available for Band65.
Note 9: Applies only for low range and when bit number 1 in modifiedMPRbehavior = 1 (Rel-12 minimum requirements apply) for Band1 and low range for Band65.
Note 10: Applies only for mid range and when bit number 1 in modifiedMPRbehavior = 1 (Rel-12 minimum requirements apply) for Band1 and mid range for Band65.
Note 11: ModifiedMPRbehavior is defined in annex J.1

**Table 6.6.3B.3.4.1-3: Test Configuration Table (network signalled value "NS_07")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 4.1 | | | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] clause 4.3.1 | | | | Mid range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3.1 | | | | 10MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | TDD |
| 1 | 10MHz | N/A for Additional Spurious Emissions testing. | | QPSK | 1 | 0 |
| 2 | 10MHz | | | QPSK | 8 | 0 |
| 3 | 10MHz | | | QPSK | 6 | 13 |
| 4 | 10MHz | | | QPSK | 20 | 13 |
| 5 | 10MHz | | | QPSK | 12 | 13 |
| 6 | 10MHz | | | 16QAM | 36 (Note 1) | 13 |
| 7 | 10MHz | | | QPSK | 16 | 19 |
| 8 | 10MHz | | | QPSK | 12 | 19 |
| 9 | 10MHz | | | 16QAM | 16 | 19 |
| 10 | 10MHz | | | QPSK | 30 | 19 |
| 11 | 10MHz | | | 16QAM | 30 (Note 1) | 19 |
| 12 | 10MHz | | | QPSK | 6 | 43 |
| 13 | 10MHz | | | QPSK | 2 | 48 |
| 14 | 10MHz | | | QPSK | 50 | 0 |
| 15 | 10MHz | | | QPSK | 12 | 0 |
| 16 | 10MHz | | | 16QAM | 50 (Note 1) | 0 |
| Note 1: Applies only for UE-Categories ≥2. | | | | | | |

**Table 6.6.3B.3.4.1-4: Test Configuration Table (network signalled value "NS_08")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 4.1 | | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] clause 4.3.1 | | | | High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3.1 | | | | 5MHz, 10MHz, 15MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 5MHz | N/A for Additional Spurious Emissions testing | | | QPSK | 1 | N/A |
| 5MHz | | | | QPSK | 8 | |
| 5MHz | | | | QPSK | 25 | |
| 10MHz | | | | QPSK | 1 | |
| 10MHz | | | | QPSK | 12 | |
| 10MHz | | | | QPSK | 40 | |
| 10MHz | | | | QPSK | 50 | |
| 10MHz | | | | 16QAM | 50 (Note 3) | |
| 15MHz | | | | QPSK | 1 | |
| 15MHz | | | | QPSK | 16 | |
| 15MHz | | | | QPSK | 40 | |
| 15MHz | | | | QPSK | 75 | |
| 15MHz | | | | 16QAM | 75 (Note 3) | |
| Note 1: The 1 RB allocation shall be tested at both RB #0 and RB #max.<br>Note 2: The RBstart of partial RB allocation shall be RB#0 and RB# (max + 1 - RB allocation) of the channel bandwidth.<br>Note 3: Applies only for UE-Categories ≥2. | | | | | | |

**Table 6.6.3B.3.4.1-5: Test Configuration Table (network signalled value "NS_09")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 4.1 | | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] clause 4.3.1 | | | | High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3.1 | | | | 5MHz, 10MHz, 15MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 5MHz | N/A for Additional Spurious Emissions testing | | | QPSK | 1 | N/A |
| 5MHz | | | | QPSK | 8 | |
| 5MHz | | | | QPSK | 25 | |
| 10MHz | | | | QPSK | 1 | |
| 10MHz | | | | QPSK | 12 | |
| 10MHz | | | | QPSK | 40 | |
| 10MHz | | | | QPSK | 50 | |
| 10MHz | | | | 16QAM | 50 (Note 3) | |
| 15MHz | | | | QPSK | 1 | |
| 15MHz | | | | QPSK | 16 | |
| 15MHz | | | | QPSK | 40 | |
| 15MHz | | | | QPSK | 54 | |
| 15MHz | | | | QPSK | 75 | |
| 15MHz | | | | 16QAM | 75 (Note 3) | |
| Note 1: The 1 RB allocation shall be tested at both RB #0 and RB #max.<br>Note 2: The RBstart of partial RB allocation shall be RB#0 and RB# (max + 1 - RB allocation) of the channel bandwidth.<br>Note 3: Applies only for UE-Categories ≥2. | | | | | | |

**Table 6.6.3B.3.4.1-6: Test Configuration Table (network signalled value "NS_12")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] clause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: UL 814.9 MHz (NUL = 26699)<br><br>For 3 MHz Channel Bandwidth: UL 815.7 MHz (NUL = 26707)<br><br>For 5 MHz Channel Bandwidth: UL 816.7 MHz (NUL = 26717)<br><br>For 10 MHz Channel Bandwidth: UL 819.2 MHz (NUL = 26742)<br><br>For 15 MHz Channel Bandwidth: UL 821.7 MHz (NUL = 26767) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz and 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation FDD | $RB_{start}$ FDD |
| 1 | 1.4 MHz | N/A for Additional Spurious Emissions testing | | QPSK | 1 | 0 |
| 2 | 1.4 MHz | | | QPSK | 6 | 0 |
| 3 | 1.4 MHz | | | QPSK | 1 | 1 |
| 4 | 1.4 MHz | | | QPSK | 5 | 1 |
| 5 | 1.4 MHz | | | 16QAM | 6 | 0 |
| 6 (Note 1) | 3 MHz | | | QPSK | 4 | 0 |
| 7 (Note 1) | 3 MHz | | | QPSK | 10 | 0 |
| 8 | 3 MHz | | | QPSK | 4 | 4 |
| 9 | 3 MHz | | | QPSK | 10 | 4 |
| 10 (Note 1) | 3 MHz | | | 16QAM | 15 | 0 |
| 11 | 5 MHz | | | QPSK | 8 | 0 |
| 12 | 5 MHz | | | QPSK | 15 | 0 |
| 13 | 5 MHz | | | QPSK | 8 | 7 |
| 14 (Note 1) | 5 MHz | | | QPSK | 15 | 7 |
| 15 | 5 MHz | | | 16QAM | 25 | 0 |
| 16 (Note 2) | 10 MHz | | | QPSK | 18 | 0 |
| 17 (Note 2) | 10 MHz | | | QPSK | 18 | 16 |
| 18 (Note 2) | 10 MHz | | | 16QAM | 50 | 0 |
| 19 (Note 2) | 15 MHz | | | QPSK | 30 | 0 |
| 20 (Note 2) | 15 MHz | | | QPSK | 30 | 31 |
| 21 (Note 2) | 15 MHz | | | 16QAM | 75 | 0 |
| Note 1: Only for UEs of Rel-11 and earlier<br>Note 2: Only for UEs of Rel-12 and later | | | | | | |

**Table6.6.3B.3.4.1-7: Test Configuration Table (network signalled value "NS_13")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] clause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: UL 819.7 MHz (NUL = 26747)<br><br>For 3 MHz Channel Bandwidth: UL 820.5 MHz (NUL = 26755)<br><br>For 5 MHz Channel Bandwidth: UL 821.5 MHz (NUL = 26765) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | 1.4 MHz, 3MHz and 5 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation FDD | $RB_{start}$ FDD |
| 1 (Note 1) | 1.4 MHz | N/A for Additional Spurious Emissions testing | | QPSK | 6 | 0 |
| 2 (Note 1) | 3 MHz | | | QPSK | 15 | 0 |
| 1 | 5 MHz | | | QPSK | 1 | 0 |
| 2 | 5 MHz | | | QPSK | 25 | 0 |
| 3 | 5 MHz | | | QPSK | 15 | 0 |
| 4 | 5 MHz | | | QPSK | 15 | 7 |
| 5 | 5 MHz | | | 16QAM | 25 | 0 |
| Note 1: Only for UEs of Rel-12 and later | | | | | | |

**Table 6.6.3B.3.4.1-8: Test Configuration Table (network signalled value "NS_14")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] clause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | For 10 MHz Channel Bandwidth: UL 829 MHz (NUL = 26840)<br><br>For 15 MHz Channel Bandwidth: Mid range | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] clause 4.3.1) | | | | 10 MHz, 15 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation FDD | $RB_{start}$ FDD |
| 1 | 10 MHz | N/A for Additional Spurious Emissions testing | | QPSK | 1 | 0 |
| 2 | 10 MHz | | | QPSK | 25 | 0 |
| 3 | 10 MHz | | | QPSK | 50 | 0 |
| 4 | 10 MHz | | | QPSK | 25 | 1 |
| 5 (Note 1) | 10 MHz | | | 16QAM | 50 | 0 |
| 6 | 15 MHz | | | QPSK | 8 | 0 |
| 7 | 15 MHz | | | QPSK | 25 | 0 |
| 8 | 15 MHz | | | QPSK | 75 | 0 |
| 9 | 15 MHz | | | QPSK | 50 | 15 |
| 10 (Note 1) | 15 MHz | | | 16QAM | 75 | 0 |
| Note 1: Applies only for UE-Categories ≥2. | | | | | | |

**Table 6.6.3B.3.4.1-9: Test Configuration Table (network signalled value "NS_15")**

| Initial Conditions | |
|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | NC |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | For 1.4 MHz Channel Bandwidth: High range<br>For 3 MHz Channel Bandwidth: 843.5 MHz ($N_{UL}$ = 26985) or High range<br>For 5 MHz Channel Bandwidth: 842.5 MHz ($N_{UL}$ = 26975) or High range<br><br>For 10 MHz Channel Bandwidth: 840 MHz (NUL = 26950) or High range<br><br>For 15 MHz Channel Bandwidth: 837.5 MHz (NUL = 26925) or High range |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz |

**Test Parameters for Channel Bandwidths**

| | | Downlink Configuration | | Uplink Configuration | | |
|---|---|---|---|---|---|---|
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 (note 3) | 1.4 MHz | N/A for A-MPR testing. | | QPSK | 4 | 0 |
| 2 (note 3) | 1.4 MHz | | | 16QAM | 6 | 0 |
| 3 (note 3) | 3 MHz | | | QPSK | 6 | 7 |
| 4 (note 3) | 3 MHz | | | QPSK | 12 | 1 |
| 5 (note 3) | 3 MHz | | | 16QAM | 15 | 0 |
| 6 (note 2) | 3 MHz | | | QPSK | 15 | 0 |
| 7 (note 3) | 5 MHz | | | QPSK | 6 | 14 |
| 8 (note 3) | 5 MHz | | | QPSK | 20 | 0 |
| 9 (note 3) | 5 MHz | | | 16QAM | 25 | 0 |
| 10 (note 2) | 5 MHz | | | QPSK | 16 | 9 |
| 11 (note 2) | 5 MHz | | | QPSK | 25 | 0 |
| 12 (note 3) | 10 MHz | | | QPSK | 1 | 49 |
| 13 (note 3) | 10 MHz | | | QPSK | 1 | 0 |
| 14 (note 3) | 10 MHz | | | QPSK | 3 | 0 |
| 15 (note 3) | 10 MHz | | | QPSK | 20 | 3 |
| 16 (note 3) | 10 MHz | | | QPSK | 36 | 1 |
| 17 (note 3) | 10 MHz | | | QPSK | 50 | 0 |
| 18 (note 3) | 10 MHz | | | 16QAM | 50 | 0 |
| 19 (note 2) | 10 MHz | | | QPSK | 20 | 25 |
| 20 (note 2) | 10 MHz | | | QPSK | 45 | 0 |
| 21 (note 3) | 15 MHz | | | QPSK | 18 | 36 |
| 22 (note 3) | 15 MHz | | | QPSK | 25 | 1 |
| 23 (note 3) | 15 MHz | | | QPSK | 54 | 0 |
| 24 (note 3) | 15 MHz | | | 16QAM | 75 | 0 |
| 25 (note 2) | 15 MHz | | | QPSK | 18 | 44 |

| | | | | | |
|---|---|---|---|---|---|
| 26 (note 2) | 15 MHz | | QPSK | 60 | 2 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: Applicable only test frequency < high range
Note 3: Applicable only to high range frequency testing

**Table 6.6.3B.3.4.1-10: Test Configuration Table (network signalled value "NS_16")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | | | For 1.4 MHz Channel Bandwidth: Low range<br><br>For 3 MHz Channel Bandwidth: Low range, 810 MHz ($N_{UL}$= 27070)<br><br>For 5 MHz Channel Bandwidth: Low range, 811 MHz ($N_{UL}$= 27080) , 814.5 MHz ($N_{UL}$= 27115)<br><br>For 10 MHz Channel Bandwidth: Low range, 813.5 MHz ($N_{UL}$= 27105), 817 MHz ($N_{UL}$= 27140) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 | 1.4 MHz | N/A for Additional Spurious Emissions A-MPR testing. | | QPSK | 1 | 0 |
| 2 | 1.4 MHz | | | QPSK | 6 | 0 |
| 3<br>(Note 1) | 1.4 MHz | | | 16QAM | 6 | 0 |
| 4 | 3 MHz | | | QPSK | 1 | 0 |
| 5 | 3 MHz | | | QPSK | 12 | 1 |
| 6 | 3 MHz | | | QPSK | 15 | 0 |
| 7<br>(Note 1) | 3 MHz | | | 16QAM | 15 | 0 |
| 8 | 5 MHz | | | QPSK | 1 | 0 |
| 9 | 5 MHz | | | QPSK | 12 | 2 |
| 10 | 5 MHz | | | QPSK | 18 | 2 |
| 11 | 5 MHz | | | QPSK | 20 | 0 |
| 12 | 5 MHz | | | QPSK | 20 | 2 |
| 13 | 5 MHz | | | QPSK | 25 | 0 |
| 14<br>(Note 1) | 5 MHz | | | 16QAM | 25 | 0 |
| 15 | 10 MHz | | | QPSK | 1 | 0 |
| 16<br>(Note 2) | 10 MHz | | | QPSK | 1 | 10 |

| | | | | | |
|---|---|---|---|---|---|
| 17 (Note 2) | 10 MHz | | QPSK | 20 | 0 |
| 18 (Note 2) | 10 MHz | | QPSK | 27 | 15 |
| 19 (Note 2) | 10 MHz | | QPSK | 32 | 15 |
| 20 | 10 MHz | | QPSK | 32 | 0 |
| 21 | 10 MHz | | QPSK | 50 | 0 |
| 22 (Note 1) | 10 MHz | | 16QAM | 50 | 0 |
| 23 (Note 3) | 10 MHz | | QPSK | 40 | 0 |
| 24 Note 3) | 10 MHz | | QPSK | 40 | 1 |
| Note 1: Applies only for UE-Categories ≥2.<br>Note 2: Applies only for 10 MHz channel for Low Range, and 813.5 MHz<br>Note 3: Applies only for 10 MHz channel for 817 MHz range | | | | | |

**Table 6.6.3B.3.4.1-11: Test Configuration Table (network signalled value "NS_17")**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508[7] subclause 4.1) | | | | Normal | |
| Test Frequencies (as specified inTS36.508 [7] subclause 4.3.1) | | | | For 5 MHz Channel Bandwidth: 720.5 MHz ($N_{UL}$= 27385)<br><br>For 10 MHz Channel Bandwidth: 723 MHz ($N_{UL}$= 27410) | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing | | QPSK | 1 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | QPSK | 25 |
| 4 | 5MHz | | | 16QAM | 25 (Note 3) |
| 5 | 10MHz | | | QPSK | 1 |
| 6 | 10MHz | | | QPSK | 12 |
| 7 | 10MHz | | | QPSK | 50 |
| 8 | 10MHz | | | 16QAM | 50 (Note 3) |
| Note 1: The 1 RB allocation shall be tested at both RB #0 and RB #max.<br>Note 2: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.<br>Note 3: Applies only for UE-Categories ≥2. | | | | | |

**Table 6.6.3B.3.4.1-12: Test Configuration Table (network signalled value "NS_18")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508[7] subclause 4.1) | | | | Normal | |
| Test Frequencies<br>(as specified inTS36.508 [7] subclause 4.3.1) | | | | Low range | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** |
| 1 | 5MHz | N/A for Additional Spurious Emissions testing | | QPSK | 1 |
| 2 | 5MHz | | | QPSK | 8 |
| 3 | 5MHz | | | QPSK | 25 |
| 4 | 5MHz | | | 16QAM | 25<br>(Note 3) |
| 5 | 10MHz | | | QPSK | 1 |
| 6 | 10MHz | | | QPSK | 12 |
| 7 | 10MHz | | | QPSK | 50 |
| 8 | 10MHz | | | 16QAM | 50<br>(Note 3) |
| 9 | 15MHz | | | QPSK | 1 |
| 10 | 15MHz | | | QPSK | 16 |
| 11 | 15MHz | | | QPSK | 75 |
| 12 | 15MHz | | | 16QAM | 75<br>(Note 3) |
| 13 | 20MHz | | | QPSK | 1 |
| 14 | 20MHz | | | QPSK | 18 |
| 15 | 20MHz | | | QPSK | 100 |
| 16 | 20MHz | | | 16QAM | 100<br>(Note 3) |
| Note 1: The 1 RB allocation shall be tested at both RB #0 and RB #max.<br>Note 2: The RBstart of partial RB allocation shall be RB# 0 and RB# (max +1 - RB allocation) of the channel bandwidth.<br>Note 3: Applies only for UE-Categories ≥2. | | | | | |

**Table 6.6.3B.3.4.1-13: Test Configuration Table (network signalled value "NS_19")**

FFS

**Table 6.6.3B.3.4.1-14: Test Configuration Table (network signalled value "NS_21")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range or High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5 MHz, 10 MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation** | **Mod'n** | **RB allocation FDD** | **RBstart FDD** |
| 1 (note 2) | 5 MHz | | | QPSK | 1 | 0 |
| 2 (note 2) | 5 MHz | | | QPSK | 25 | 0 |
| 3 (note 2) | 10 MHz | | | QPSK | 1 | 0 |
| 4 (note 3) | 10 MHz | | | QPSK | 1 | 49 |
| 5 (note 2) | 10 MHz | | | QPSK | 15 | 0 |
| 6 (note 3) | 10 MHz | | | QPSK | 3 | 47 |
| 7 (note 3) | 10 MHz | | | QPSK | 50 | 0 |
| 8 (note 1, 3) | 10 MHz | | | 16QAM | 50 | 0 |

Note 1: Applies only for UE-Categories ≥2.
Note 2: Applicable only to low range frequency testing.
Note 3: Applicable only to high range frequency testing.

**Table 6.6.3B.3.4.1-15: Test Configuration Table (network signalled value "NS_22")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_22 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 5MHz | | | QPSK | 25 | 0 |
| 3 | 5MHz | | | QPSK | 1 | 24 |
| 4 | 5MHz | | | 16QAM | 1 | 0 |
| 5 | 5MHz | | | 16QAM | 1 | 24 |
| 6 | 10MHz | | | QPSK | 50 | 0 |
| 7 | 10MHz | | | QPSK | 36 | 0 |
| 8 | 10MHz | | | QPSK | 1 | 0 |
| 9 | 10MHz | | | QPSK | 1 | 49 |
| 10 | 10MHz | | | 16QAM | 1 | 0 |
| 11 | 10MHz | | | 16QAM | 1 | 49 |
| 12 | 15MHz | | | QPSK | 75 | 0 |
| 13 | 15MHz | | | QPSK | 50 | 0 |
| 14 | 15MHz | | | QPSK | 1 | 0 |
| 15 | 15MHz | | | QPSK | 1 | 74 |
| 16 | 15MHz | | | 16QAM | 1 | 0 |
| 17 | 15MHz | | | 16QAM | 1 | 74 |
| 18 | 20MHz | | | QPSK | 100 | 0 |
| 19 | 20MHz | | | QPSK | 64 | 0 |
| 20 | 20MHz | | | QPSK | 1 | 0 |
| 21 | 20MHz | | | QPSK | 1 | 99 |
| 22 | 20MHz | | | 16QAM | 1 | 0 |
| 23 | 20MHz | | | 16QAM | 1 | 99 |

**Table 6.6.3B.3.4.1-16: Test Configuration Table (network signalled value "NS_23")**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Low Range, Mid Range, High Range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_23 A-MPR** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation TDD** | **$RB_{start}$ TDD** |
| 1 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 5MHz | | | QPSK | 1 | 24 |
| 3 | 5MHz | | | QPSK | 25 | 0 |
| 4 | 5MHz | | | 16QAM | 1 | 0 |
| 5 | 5MHz | | | 16QAM | 1 | 24 |
| 6 | 10MHz | | | QPSK | 50 | 0 |
| 7 | 15MHz | | | QPSK | 75 | 0 |
| 8 | 20MHz | | | QPSK | 100 | 0 |

**Table 6.6.3B.3.4.1-17: Test Configuration Table (network signalled value "NS_24")**

| Initial Conditions | |
|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | Normal |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | Refer to $F_{UL}$ in test parameters with following:<br>5 MHz CH BW:<br>- 1985 MHz ($N_{UL}$ = 132722)<br>- 2007.5 MHz ($N_{UL}$ = high range)<br>10 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 132672)<br>- 1990 MHz ($N_{UL}$ = 132772)<br>- 2005 MHz ($N_{UL}$ = high range)<br>15 MHZ CH BW:<br>- 1980 MHz ($N_{UL}$ = 132672)<br>- 1990 MHz ($N_{UL}$ = 132772)<br>- 2002.5 MHz ($N_{UL}$ = high range)<br>20 MHz CH BW:<br>2000 MHz ($N_{UL}$ = high range)<br>- |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | 5MHz, 10MHz, 15MHz, 20MHz |

**Test Parameters for NS_24 A-MPR**

| | | | Downlink Configuration | | Uplink Configuration | | |
|---|---|---|---|---|---|---|---|
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 2007.5 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 2007.5 | 5MHz | | | QPSK | 8 | 17 |
| 3 | 2007.5 | 5MHz | | | QPSK | 25 | 0 |
| 4 (Notes 2,3) | 2007.5 | 5MHz | | | 16QAM | 25 | 0 |
| 5 | 1985 | 5MHz | | | QPSK | 8 | 17 |
| 6 | 1980 | 10MHz | | | QPSK | 12 | 1 |
| 7 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 50 | 0 |
| 8 | 1980 | 10MHz | | | QPSK | 48 | 2 |
| 9 | 1980 | 10MHz | | | QPSK | 25 | 25 |
| 10 | 1980 | 10MHz | | | QPSK | 1 | 49 |
| 11 | 1980 | 10MHz | | | QPSK | 12 | 38 |
| 12 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 12 | 38 |
| 13 | 1980 | 10MHz | | | QPSK | 3 | 47 |
| 14 | 1980 | 10MHz | | | QPSK | 8 | 1 |
| 15 | 1990 | 10MHz | | | QPSK | 1 | 0 |
| 16 | 1990 | 10MHz | | | QPSK | 12 | 38 |
| 17 (Notes 2,3) | 1990 | 10MHz | | | 16QAM | 50 | 0 |
| 18 | 2005 | 10MHz | | | QPSK | 12 | 38 |
| 19 | 2005 | 10MHz | | | QPSK | 50 | 0 |
| 20 (Notes 2,3) | 2005 | 10MHz | | | 16QAM | 50 | 0 |
| 21 | 1980 | 15MHz | | | QPSK | 1 | 11 |
| 22 | 1980 | 15MHz | | | QPSK | 16 | 11 |
| 23 | 1980 | 15MHz | | | QPSK | 45 | 11 |
| 24 (Notes 2,3) | 1980 | 15MHz | | | 16QAM | 50 | 0 |
| 25 | 1980 | 15MHz | | | QPSK | 16 | 28 |
| 26 | 1980 | 15MHz | | | QPSK | 16 | 59 |
| 27 | 1980 | 15MHz | | | QPSK | 60 | 15 |
| 28 | 1980 | 15MHz | | | QPSK | 30 | 12 |
| 29 | 2002.5 | 15MHz | | | QPSK | 1 | 0 |
| 30 | 2002.5 | 15MHz | | | QPSK | 16 | 59 |
| 31 (Notes 2,3) | 2002.5 | 15MHz | | | 16QAM | 16 | 59 |
| 32 (Notes 2,3) | 2002.5 | 15MHz | | | 16QAM | 75 | 0 |
| 33 | 2000 | 20MHz | | | QPSK | 1 | 0 |
| 34 | 2000 | 20MHz | | | QPSK | 18 | 82 |
| 35 (Notes 2,3) | 2000 | 20MHz | | | 16QAM | 18 | 82 |
| 36 (Notes 2,3) | 2000 | 20MHz | | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.

| | |
|---|---|
| Note 2: | Applies only for UE-Categories ≥2. |
| Note 3: | The 16QAM configurations shall not apply to UEs which support UL 64QAM. |

**Table 6.6.3B.3.4.1-18: Test Configuration Table (network signalled value "NS_25")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to $F_{UL}$ in test parameters with following:<br><br>10 and 15 MHz CH BW:<br>- 1980 MHz ($N_{UL}$ = 131672)<br>- 1990 MHz ($N_{UL}$ = 131772) | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_25 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 2007.5 | 5MHz | N/A for A-MPR testing | | QPSK | 25 | 0 |
| 2 (Notes 2,3) | 2007.5 | 5MHz | | | 16QAM | 25 | 0 |
| 3 | 2007.5 | 5MHz | | | QPSK | 8 | 9 |
| 4 | 2007.5 | 5MHz | | | QPSK | 1 | 24 |
| 5 | 2007.5 | 5MHz | | | QPSK | 8 | 17 |
| 6 (Notes 2,3) | 2007.5 | 5MHz | | | 16QAM | 8 | 17 |
| 7 | 1980 | 10MHz | | | QPSK | 12 | 1 |
| 8 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 50 | 0 |
| 9 (Notes 2,3) | 1980 | 10MHz | | | 16QAM | 48 | 2 |
| 10 | 1980 | 10MHz | | | QPSK | 25 | 25 |
| 11 | 1980 | 10MHz | | | QPSK | 1 | 49 |
| 12 | 1980 | 10MHz | | | QPSK | 12 | 38 |
| 13 | 1990 | 10MHz | | | QPSK | 12 | 0 |
| 14 | 1990 | 10MHz | | | QPSK | 25 | 0 |
| 15 | 1990 | 10MHz | | | QPSK | 50 | 0 |
| 16 (Notes 2,3) | 1990 | 10MHz | | | 16QAM | 25 | 0 |
| 17 | 1990 | 10MHz | | | QPSK | 48 | 2 |
| 18 | 1990 | 10MHz | | | QPSK | 30 | 19 |
| 19 (Notes 2,3) | 1990 | 10MHz | | | 16QAM | 30 | 19 |
| 20 | 1990 | 10MHz | | | QPSK | 12 | 31 |
| 21 | 2005 | 10MHz | | | QPSK | 1 | 0 |
| 22 | 2005 | 10MHz | | | QPSK | 12 | 6 |
| 23 | 2005 | 10MHz | | | QPSK | 50 | 0 |
| 24 (Notes 2,3) | 2005 | 10MHz | | | 16QAM | 50 | 0 |
| 25 | 2005 | 10MHz | | | QPSK | 40 | 10 |
| 26 (Notes 2,3) | 2005 | 10MHz | | | 16QAM | 40 | 10 |
| 27 | 2005 | 10MHz | | | QPSK | 32 | 18 |
| 28 (Notes 2,3) | 2005 | 10MHz | | | 16QAM | 32 | 18 |
| 29 | 2005 | 10MHz | | | QPSK | 12 | 23 |
| 30 | 1980 | 15MHz | | | QPSK | 16 | 4 |
| 31 | 1980 | 15MHz | | | QPSK | 75 | 0 |
| 32 | 1980 | 15MHz | | | QPSK | 60 | 15 |
| 33 (Notes 2,3) | 1980 | 15MHz | | | 16QAM | 40 | 35 |
| 34 | 1980 | 15MHz | | | QPSK | 1 | 74 |
| 35 | 1980 | 15MHz | | | QPSK | 12 | 63 |
| 36 | 1980 | 15MHz | | | QPSK | 16 | 55 |
| 37 | 2002.5 | 15MHz | | | QPSK | 1 | 0 |
| 38 | 2002.5 | 15MHz | | | QPSK | 16 | 0 |
| 39 (Notes 2,3) | 2002.5 | 15MHz | | | 16QAM | 16 | 0 |
| 40 (Notes 2,3) | 2002.5 | 15MHz | | | 16QAM | 1 | 0 |
| 41 | 1980 | 20MHz | | | QPSK | 1 | 0 |
| 42 | 1980 | 20MHz | | | QPSK | 18 | 0 |
| 43 (Notes 2,3) | 1980 | 20MHz | | | 16QAM | 100 | 0 |
| 44 | 1980 | 20MHz | | | QPSK | 64 | 36 |
| 45 | 1980 | 20MHz | | | QPSK | 18 | 72 |
| 46 (Notes 2,3) | 1980 | 20MHz | | | 16QAM | 54 | 46 |
| 47 | 1980 | 20MHz | | | QPSK | 18 | 55 |
| 48 | 2000 | 20MHz | | | QPSK | 1 | 0 |
| 49 | 2000 | 20MHz | | | QPSK | 18 | 72 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 50 (Notes 2,3) | 2000 | 20MHz | | 16QAM | 18 | 72 |
| 51 (Notes 2,3) | 2000 | 20MHz | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: Applies only for UE-Categories ≥2.
Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3B.3.4.1-19: Test Configuration Table (network signalled value "NS_27")Initial Conditions**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | | Normal | | |
| Test Frequencies (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | Refer to Frequency column in test parameters | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | | 5MHz, 10MHz, 15MHz, 20MHz | | |
| **Test Parameters for NS_27 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **Frequency** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | Low/Mid | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | High | 5MHz | | | QPSK | 1 | 24 |
| 3 | Low/Mid/High | 5MHz | | | QPSK | 25 | 0 |
| 4 | Low/Mid/High | 5MHz | | | 16QAM | 25 | 0 |
| 5 | Low/Mid | 10MHz | | | QPSK | 1 | 0 |
| 6 | High | 10MHz | | | QPSK | 1 | 49 |
| 7 | Low/Mid/High | 10MHz | | | QPSK | 50 | 0 |
| 8 (Note 2) | Low/Mid/High | 10MHz | | | 16QAM | 50 | 0 |
| 9 | Low/Mid | 15MHz | | | QPSK | 1 | 0 |
| 10 | Low | 15MHz | | | QPSK | 1 | 7 |
| 11 | Low/Mid | 15MHz | | | QPSK | 16 | 0 |
| 12 | High | 15MHz | | | QPSK | 1 | 74 |
| 13 | High | 15MHz | | | QPSK | 1 | 67 |
| 14 | High | 15MHz | | | QPSK | 16 | 74 |
| 15 | Low/Mid/High | 15MHz | | | QPSK | 75 | 0 |
| 16 (Note 2) | Low/Mid/High | 15MHz | | | 16QAM | 75 | 0 |
| 17 | Low/Mid | 20MHz | | | QPSK | 1 | 0 |
| 18 | Low | 20MHz | | | QPSK | 1 | 13 |
| 19 | Low | 20MHz | | | QPSK | 1 | 16 |
| 20 | Low/Mid | 20MHz | | | QPSK | 21 | 0 |
| 21 | High | 20MHz | | | QPSK | 1 | 99 |
| 22 | High | 20MHz | | | QPSK | 1 | 86 |
| 23 | High | 20MHz | | | QPSK | 1 | 83 |
| 24 | High | 20MHz | | | QPSK | 21 | 0 |
| 25 | Low/Mid/High | 20MHz | | | QPSK | 100 | 0 |
| 26 (Note 2) | Low/Mid/High | 20MHz | | | 16QAM | 100 | 0 |

Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4B.5 as not all combinations are necessarily required based on the applicability of the UE.
Note 2: Applies only for UE-Categories ≥2.
Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM.

**Table 6.6.3B.3.4.1-20: Test Configuration Table (network signalled value "NS_36")**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | Normal | | | | |
| Test Frequencies<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | Refer to $F_{UL}$ in test parameters with following:<br><br>5 MHz CH BW:<br>- 700.5 MHz ($N_{UL}$ = low range)<br>- 705.5 MHz ($N_{UL}$ =132747)<br>10 MHz CH BW:<br>- 703 MHz ($N_{UL}$ = low range)<br>- 708 MHz ($N_{UL}$ = 132772)<br>15 MHz CH BW:<br>- 705.5 MHz ($N_{UL}$ = low range)<br>- 710.5 MHz ($N_{UL}$ =132797 ) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | 5MHz, 10MHz, 15MHz | | | | |
| **Test Parameters for NS_36 A-MPR** | | | | | | | |
| | | | **Downlink Configuration** | | **Uplink Configuration** | | |
| **Configuration ID** | **$F_{UL}$** | **Ch BW** | **Mod'n** | **RB allocation FDD** | **Mod'n** | **RB allocation FDD** | **$RB_{start}$ FDD** |
| 1 | 700.5 | 5MHz | N/A for A-MPR testing | | QPSK | 1 | 0 |
| 2 | 700.5 | 5MHz | | | QPSK | 25 | 0 |
| 3 | 700.5 | 5MHz | | | QPSK | 20 | 1 |
| 4 | 700.5 | 5MHz | | | QPSK | 24 | 1 |
| 5 | 700.5 | 5MHz | | | QPSK | 12 | 0 |
| 6 (Notes 2,3) | 700.5 | 5MHz | | | 16QAM | 12 | 0 |
| 7 | 705.5 | 5MHz | | | QPSK | 25 | 0 |
| 8 (Notes 2,3) | 705.5 | 5MHz | | | 16QAM | 25 | 0 |
| 9 | 703 | 10MHz | | | QPSK | 50 | 0 |
| 10 | 703 | 10MHz | | | QPSK | 1 | 0 |
| 11 | 703 | 10MHz | | | QPSK | 40 | 9 |
| 12 | 703 | 10MHz | | | QPSK | 36 | 13 |
| 13 | 703 | 10MHz | | | QPSK | 10 | 40 |
| 14 | 703 | 10MHz | | | QPSK | 6 | 44 |
| 15 | 708 | 10MHz | | | QPSK | 50 | 0 |
| 16 (Notes 2,3) | 708 | 10MHz | | | 16QAM | 50 | 0 |
| 17 | 705.5 | 15MHz | | | QPSK | 75 | 0 |
| 18 | 705.5 | 15MHz | | | QPSK | 50 | 17 |
| 19 | 705.5 | 15MHz | | | QPSK | 50 | 24 |
| 20 | 705.5 | 15MHz | | | QPSK | 1 | 57 |
| 21 | 705.5 | 15MHz | | | QPSK | 10 | 17 |
| 22 | 705.5 | 15MHz | | | QPSK | 18 | 24 |
| 23 (Notes 2,3) | 705.5 | 15MHz | | | 16QAM | 18 | 24 |
| 24 | 710.5 | 15MHz | | | QPSK | 75 | 0 |
| 25 | 710.5 | 15MHz | | | 16QAM | 75 | 0 |
| Note 1: The Configuration ID will be used to map the applicable Test Configuration to the corresponding Test Requirement in subclause 6.2.4.5 as not all combinations are necessarily required based on the applicability of the UE.<br>Note 2: Applies only for UE-Categories ≥2.<br>Note 3: The 16QAM configurations shall not apply to UEs which support UL 64QAM. | | | | | | | |

Editor's note: The following lines belong at the end of section 6.2.4.4.1. As new tables are added to this section, these lines should always follow the tables.

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.38.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Tables 6.6.3B.3.4.1-1 to 6.6.3B.3.4.1-20 depending on network signal value.

5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.6.3B.3.4.3.

#### 6.6.3B.3.4.2 Test procedure

Same test procedure as defined in clause 6.6.2.2.4.2.

#### 6.6.3B.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, with the same exceptions as in clause 6.6.3.3.4.3.

### 6.6.3B.3.5 Test requirement

Same test requirements as defined in clause 6.6.3.3.5.

## 6.6.3E Spurious emission for UE category 0

### 6.6.3E.1 Transmitter Spurious emissions for UE category 0

#### 6.6.3E.1.1 Test purpose

Same test purpose as in clause 6.6.3.1.1.

#### 6.6.3E.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

#### 6.6.3E.1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.3.1.3.

#### 6.6.3E.1.4 Test description

##### 6.6.3E.1.4.1 Initial conditions

Same initial conditions as in clause 6.6.3.1.4.1 with following exceptions for HD-FDD:

- Instead of Table 6.6.3.1.4.1-1 → use Table 6.6.3E.1.4.1-1.
- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.6.3E.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD and HD-FDD** | **TDD** |
| 1.4MHz | N/A for Spurious Emissions testing | | | QPSK | 6 | 6 |
| 1.4MHz | | | | QPSK | 1 | 1 |
| 3MHz | | | | QPSK | 15 | 15 |
| 3MHz | | | | QPSK | 1 | 1 |
| 5MHz | | | | QPSK | 25 | 25 |
| 5MHz | | | | QPSK | 1 | 1 |
| 10MHz | | | | QPSK | 36 | 36 |
| 10MHz | | | | QPSK | 1 | 1 |
| 15MHz | | | | QPSK | 36 | 36 |
| 15MHz | | | | QPSK | 1 | 1 |
| 20MHz | | | | QPSK | 36 | 36 |
| 20MHz | | | | QPSK | 1 | 1 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: The 1 RB allocation shall be tested at both RB #0 and RB #max. | | | | | | |

### 6.6.3E.1.4.2 Test procedure

Same test procedure as in clause 6.6.3E.1.4.2 with following exception for HD-FDD:

- In step 3, slots with transient periods are not under test. Half-duplex guard subframe are not under test.

### 6.6.3E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.6.3E.1.5 Test requirement

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.6.3E.1.5-1.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in Table 6.6.3E.1.5-1.

The spurious emission limits apply for the frequency ranges that are more than $\Delta f_{OOB}$ (MHz) from the edge of the channel bandwidth shown in Table 6.6.3.1.3-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3E.1.5-1: General spurious emissions test requirements**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |

## 6.6.3E.2 Spurious emission band UE co-existence for UE category 0

### 6.6.3E.2.1 Test purpose

Same test purpose as in clause 6.6.3.2.1.

### 6.6.3E.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.6.3E.2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.3.2.3 with the following exceptions:

- Instead of Tables 6.6.3.2.3-1 through 6.6.3.2.3-1D → use Table 6.6.3E.2.3-1.

**Table 6.6.3E.2.3-1: Spurious emission band limits Rel-12**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Protected band** | **Frequency range (MHz)** | | | **Maximum Level (dBm)** | **MBW (MHz)** | **Note** |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 26, 27, 28, 29, 30, 41, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 41, 43, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 13 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 13 |
| 4 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 25, 26, 27, 28, 29, 30, 41, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 23, 24, 25, 28, 29, 30, 31, 38, 40, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| 8 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA band 7 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 15, 23 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 23, 25, 26, 27, 29, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 20 | E-UTRA Band 1, 3, 7, 8, 20, 22, 31, 32, 33, 34, 40, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| 39 | E-UTRA Band 22, 34, 40, 41, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | | 1855 | -40 | 1 | 32 |
| | Frequency range | 1855 | | 1875 | -15.5 | 5 | 15,26,32 |
| | Frequency range | 1875 | | 1880 | -15.5 | 5 | 15,26,33 |
| 41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 30 |
| | Frequency range | 1839.9 | | 1879.9 | -50 | 1 | 30 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 30 |

Note 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1.
Note 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th ] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.
Note 3: To meet these requirements some restriction will be needed for either the operating band or protected band.
Note 4: N/A
Note 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band.
Note 6: N/A
Note 7: Applicable when co-existence with PHS system operating in 1884.5 -1919.6MHz.
Note 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.
Note 9: N/A
Note 10: N/A
Note 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD.
Note 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB.
Note 13: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.
Note 14: N/A
Note 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.
Note 16: N/A
Note 17: N/A
Note 18: N/A
Note 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.
Note 20: N/A
Note 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
Note 22: This requirement is applicable for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
For carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.
Note 23: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.
Note 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).
Note 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).
Note 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.
Note 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink

| | |
|---|---|
| | transmission bandwidth less than or equal to 54 RB. |
| Note 28: | N/A |
| Note 29: | N/A |
| Note 30: | This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz. |
| Note 31: | N/A |
| Note 32: | This requirement is applicable for an uplink transmission bandwidth less than or equal to [54 RB] for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1887.5 - 1889.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1890 - 1898 MHz. |
| Note 33: | This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to [54 RB] for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz. |
| Note 34: | This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48. |
| Note 35: | This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies. |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.3E.2.

This test use minimum requirements from many releases of TS 36.101 [2] due to release independence defined in TS 36.307 [16]

## 6.6.3E.2.4 Test description

### 6.6.3E.2.4.1 Initial conditions

Same initial conditions as in clause 6.6.3.2.4.1 with the following exceptions:

- Instead of Table 6.6.3.2.4.1-1 and Table 6.6.3.2.4.1-2 → use Table 6.6.3E.2.4.1-1 and Table 6.6.3E.2.4.1-2.
- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.6.3E.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1)<br>(Note 6, Note 7) | | | | Low range, Mid range, High range<br>(Note 6, 13, 16) | | |
| Test Channel Bandwidths<br>(as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, Highest<br>(Note 13, 16) | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | N/A for Spurious Emissions testing | | | QPSK | 6 | 6 |
| 1.4MHz | | | | QPSK | 1 | 1 |
| 3MHz | | | | QPSK | 15 | 15 |
| 3MHz | | | | QPSK | 1 | 1 |
| 5MHz | | | | QPSK | 25 | 25[12] |
| 5MHz | | | | QPSK | 1 | 1[12] |
| 5MHz | | | | QPSK | 20[8] | - |
| 10MHz | | | | QPSK | 36 | 36 |
| 10MHz | | | | QPSK | 1 | 1 |
| 10MHz | | | | QPSK | 30[15] | |
| 10MHz | | | | QPSK | 32[9] | - |
| 10MHz | | | | QPSK | 1[10, 14] | - |
| 15MHz | | | | QPSK | 36 | 36 |
| 15MHz | | | | QPSK | 36[3, 11] | 36[4, 17, 18] |
| 15MHz | | | | QPSK | 1 | 1[5] |
| 20MHz | | | | QPSK | 36 | 36 |
| 20MHz | | | | QPSK | 36[3, 11] | 36[4, 17, 18] |
| 20MHz | | | | QPSK | 1 | 1[5] |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: The 1 RB allocation shall be tested at both RB #0 and RB #max.
Note 3: To be used for requirements under note 15 in table 6.6.3.2.3-1 in high range at RB#, instead of full allocation.
Note 4: To be used for requirements under note 16 in table 6.6.3.2.3-1 and table 6.6.3.2.3-1A, note 17 in table 6.6.3.2.3-1B, note 22 in table 6.6.3.2.3-1C in high range - 5MHz at RB#(full allocation – 54), instead of full allocation.
Note 5: For requirements under note 16 in table 6.6.3.2.-1 and table 6.6.3.2.3-1A, note 17 in table 6.6.3.2.3-1B, note 22 in table 6.6.3.2.3-1C (high range – 5MHz) is tested instead of high channel.
Note 6: Do not apply for requirements under Note 13 in Tables 6.6.3.2.3-1 to 6.6.3.2.3-1C. Test frequencies for these requirements are defined in Table 6.6.3.2.4.1-2.
Note 7: Void
Note 8: For requirements under note 17 in table 6.6.3.2.3-1A, note 18 in table 6.6.3.2.3-1, note 23 in table 6.6.3.2.3-1C (high range – 10MHz) is tested with RB #0 to RB #19 used.
Note 9: For requirements under note 17 in table 6.6.3.2.3-1A, note 18 in table 6.6.3.2.3-1B, note 23 in table 6.6.3.2.3-1C high range is tested with RB #4 to RB #35 used.
Note 10: For requirements under note 17 in table 6.6.3.2.3-1A, note 18 in table 6.6.3.2.3-1B, note 23 in table 6.6.3E.2.3-1C high range is tested with RB #4 and (RB#max -4) used.
Note 11: To be used for requirements under note 17 in table 6.6.3.2.3-1, note 18 in table 6.6.3.2.3-1A, note 19 in table 6.6.3.2.3-1B and note 27 in table 6.6.3.2.3-1C in low range at RB#0, instead of full allocation.
Note 12: For requirements under note 16 in table 6.6.3E.2.3-1 and table 6.6.3.2.3-1A, note 17 in table 6.6.3.2.3-1B, note 22 in table 6.6.3.2.3-1C, the message exception in Table 6.6.3.2.4.3-1 is used to test with the high range.
Note 13: For requirements under note 31 in table 6.6.3.2.3-1C and note 34 in table 6.6.3E.2.3-1 only 720.5 MHz is tested with 5 MHz and only 723 MHz is tested with 10 MHz.
Note 14: For requirements under note 31 in table 6.6.3.2.3-1C and note 34 in table 6.6.3E.2.3-1 RB #2 and RB #47 used.
Note 15: To be used for requirements under note 31 in table 6.6.3.2.3-1C and note 34 in table 6.6.3E.2.3-1 at RB#2, instead of full allocation.
Note 16: For requirements under note 32 in table 6.6.3.2.3-1C and note 35 in table 6.6.3E.2.3-1 only low range and 728 MHz with 10 MHz is tested.
Note 17: To be used for requirements under note 32 in table 6.6.3E.2.3-1 in low range, instead of full allocation.
Note 18: To be used for requirements under note 33 in table 6.6.3E.2.3-1 (high range-7 MHz), instead of full allocation and high range.

**Table 6.6.3E.2.4.1-2: Test frequencies for E-UTRA channel bandwidth for operating band 3 with Note 13 (in Tables 6.6.3E.2.3-1)**

| Bandwidth [MHz] | $N_{UL}$ | Frequency of Uplink [MHz] | $N_{DL}$ | Frequency of Downlink [MHz] |
|---|---|---|---|---|
| 5 | 19924 | 1782.4 | 1924 | 1877.4 |
| 10 | 19899 | 1779.9 | 1899 | 1874.9 |
| 15 | 19874 | 1777.4 | 1874 | 1872.4 |
| 20 | 19849 | 1774.9 | 1849 | 1869.9 |

### 6.6.3E.2.4.2 Test procedure

Same test procedure as in clause 6.6.3.2.4.2 with the following exception for HD-FDD:

- In step 3, slots with transient periods are not under test. Half-duplex guard subframes are not under test.

### 6.6.3E.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

## 6.6.3E.2.5 Test requirement

Test requirements for Spurious Emissions UE Co-existence are the same as the minimum requirements and are not repeated in this section.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in table 6.6.3E.2.3-1 according to the following rule:

The requirements for the UE are release specific and can be found in Tables 6.6.3E.2.3-1. If the UE support a band, which is not defined in the table corresponding UE's release, the requirements for this band are taken from the table of earliest release where requirements for this band are defined. This has been described in following Table 6.6.3E.2.5-1.

**Table 6.6.3E.2.5-1: UE Requirements according to UE E-UTRA release and supported E-UTRA band**

| Band | UE Requirements per release |
|---|---|
| | Rel-12 |
| 2 | Table 6.6.3E.2.3-1 |
| 3 | Table 6.6.3E.2.3-1 |
| 4 | Table 6.6.3E.2.3-1 |
| 5 | Table 6.6.3E.2.3-1 |
| 8 | Table 6.6.3E.2.3-1 |
| 13 | Table 6.6.3E.2.3-1 |
| 20 | Table 6.6.3E.2.3-1 |
| 39 | Table 6.6.3E.2.3-1 |
| 41 | Table 6.6.3E.2.3-1 |

NOTE 1: The following is applied to Note2 in Table 6.6.3E.2.3-1. For frequency with 2nd, 3rd or 4th harmonic spurious emissions, the measurements are covered in 6.6.3.1.

NOTE 2: The restriction on the maximum uplink transmission to 36 RB in Notes 14 and 15 of Table 6.6.3E.2.5-1 is intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future.

## 6.6.3E.3 Additional spurious emissions for UE category 0

### 6.6.3E.3.1 Test purpose

Same test purpose as in clause 6.6.3.3.1.

### 6.6.3E.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.6.3E.3.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.3.3.3.

### 6.6.3E.3.4 Test description

#### 6.6.3E.3.4.1 Initial conditions

Same initial conditions as in clause 6.2.3.4.1 with following exceptions for HD-FDD:

- Instead of Table 6.6.3.3.4.1-1 through 6.6.3.3.4.1-15 → use Table 6.6.3E.3.4.1-1 1.
- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 6.6.3E.3.4.1-1: Test Configuration Table (network signalled value "NS_07")**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) | | | | Mid range | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | 10MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | | |
| Test Number | Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | $RB_{start}$ |
| 1 | 10MHz | N/A for Additional Spurious Emissions testing. | | QPSK | 1 | 0 |
| 2 | 10MHz | | | QPSK | 8 | 0 |
| 3 | 10MHz | | | QPSK | 6 | 13 |
| 4 | 10MHz | | | QPSK | 20 | 13 |
| 5 | 10MHz | | | QPSK | 12 | 13 |
| 6 | 10MHz | | | 16QAM | 5 | 13 |
| 7 | 10MHz | | | QPSK | 16 | 19 |
| 8 | 10MHz | | | QPSK | 12 | 19 |
| 9 | 10MHz | | | 16QAM | 5 | 19 |
| 10 | 10MHz | | | QPSK | 30 | 19 |
| 11 | 10MHz | | | QPSK | 6 | 43 |
| 12 | 10MHz | | | QPSK | 2 | 48 |
| 13 | 10MHz | | | QPSK | 36 | 0 |
| 14 | 10MHz | | | QPSK | 12 | 0 |

Editor's note: The following lines belong at the end of section 6.2.4.4.1. As new tables are added to this section, these lines should always follow the tables.

#### 6.6.3E.3.4.2 Test procedure

Same test procedure as in clause 6.2.3.4.2 with following exception for HD-FDD:

- In step 3, slots with transient periods are not under test. Half-duplex guard subframe are not under test.

**Table 6.6.3E.3.4.2-1: Measurement setup for NS_07**

| | Option 1: Measurement with No RMS VBW available | Option2 Measurement with VBW Filtering on Power scale |
|---|---|---|
| VBW | >=62.5 kHz (10 times or more the RBW) | <=43Hz |
| RBW | <=6.25kHz | <=6.25kHz |
| Detector type | Averages signal envelope during each measurement point, such as "RMS detector" | Peak |
| Averaging mode (Trace averaging) | Power (RMS voltage) | Power (RMS voltage), as controlled by "Average Type" |
| Average Type (applies to detector) | Power (RMS voltage) (automatically occurs with "RMS detector") | Not applicable |
| Average Type (applies to VBW filter) | Not applicable | Power (RMS voltage) |
| Number of averages | 30, to reduce variance as required, or use an even longer sweep time | 1 or use an even narrower VBW filter, thus a longer sweep time |
| Sweep time | [Don't specify] | Sweep rate (span divided by sweep time) <= 0.8 * RBW*VBW |

### 6.6.3E.3.4.3 Message contents

Same message contents as in clause 6.6.3.3.4.3.

## 6.6.3E.3.5 Test requirement

This clause specifies the requirements for the specified E-UTRA band for an additional spectrum emission requirement with protected bands as indicated from table 6.6.3E.3.5.1-1 to table 6.6.3E.3.5.2-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

### 6.6.3E.3.5.1 Test requirement (network signalled value "NS_07")

When "NS_07" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-7 as appropriate,

and

- the measured average power of spurious emission, derived in step 4, shall not exceed the described value in Table 6.6.3E.3.5.1-1. These requirements also apply for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3E.3.5.1-1: Additional requirements (network signalled value "NS_07")**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 10 MHz | |

| | | |
|---|---|---|
| 769 ≤ f ≤ 775 | -55.5 | 6.25 kHz |
| Note: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

# 6.6.3EA Spurious emission for UE category M1

## 6.6.3EA.1 Transmitter Spurious emissions for UE category M1

### 6.6.3EA.1.1 Test purpose

Same test purpose as in clause 6.6.3.1.1.

### 6.6.3EA.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

### 6.6.3EA.1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.3.1.3.

### 6.6.3EA.1.4 Test description

#### 6.6.3EA.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3EA.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.6.3EA.1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index (Note 1) |
| **Low range, Mid range** | | | | | |
| 1.4MHz | N/A | QPSK | 1 | 1 | 0 |
| 1.4MHz | | QPSK | 6 | 6 | 0 |
| 3.0MHz | | QPSK | 1 | 1 | 0 |
| 3.0MHz | | QPSK | 6 | 6 | 0 |
| 5MHz | | QPSK | 1 | 1 | 0 |
| 5MHz | | QPSK | 6 | 6 | 0 |
| **High range** | | | | | |
| 1.4MHz | N/A | QPSK | 1 | 1 | 0 |
| 1.4MHz | | QPSK | 6 | 6 | 0 |
| 3.0MHz | | QPSK | 1 | 1 | 1 |
| 3.0MHz | | QPSK | 6 | 6 | 1 |
| 5MHz | | QPSK | 1 | 1 | 3 |
| 5MHz | | QPSK | 6 | 6 | 3 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

1. Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.7 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Table 6.6.3EA.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.6.3EA.1.4.3.

### 6.6.3EA.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.6.3EA.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.

3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.3EA.1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3.EA 1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

#### 6.6.3EA.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEmodeA.

### 6.6.3EA.1.5 Test requirement

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.6.3EA.1.5-1.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in Table 6.6.3EA.1.5-1.

The spurious emission limits apply for the frequency ranges that are more than $\Delta f_{OOB}$ (MHz) from the edge of the channel bandwidth shown in Table 6.6.3.1.3-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3EA.1.5-1: General spurious emissions test requirements**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |

## 6.6.3EA.2 Spurious emission band UE co-existence for UE category M1

### 6.6.3EA.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

### 6.6.3EA.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

### 6.6.3EA.2.3 Minimum conformance requirements

This clause specifies the requirements for the specified E-UTRA band for coexistence with protected bands as indicated in Tables 6.6.3EA.2.3-1, 6.6.3EA.2.3-1A and 6.6.3EA.2.3-1B.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3EA.2.3-1: Spurious emission band limits Rel-13**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| 1 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 15 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 15, 27 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 15, 26, 27 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 30, 41, 42, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 13 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 13 |
| 4 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 23, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 18, 19 | $F_{DL_low}$ | - | $F_{DL_high}$ | -40 | 1 | 38 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 38 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 38 |
| 7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| 8 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 15, 23 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23 |
| 11 | E-UTRA Band 1, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12 | E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 26, 27, 30, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 23, 25, 26, 27, 29, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| 18 | E-UTRA Band 1, 11, 21, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 19 | E-UTRA Band 1, 11, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| 21 | E-UTRA Band 1, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 26 | E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 23, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 27 | E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 23, 25, 26, 27, 29, 30, 31, 38, 40, 41, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 28 | $F_{DL_low}$ | - | 790 | -50 | 1 | |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | |
| 28 | E-UTRA Band 1, 4, 10, 22, 42, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 25 |
| | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 24 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| 31 | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 40, 42, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| … | | | | | | | |
| 39 | E-UTRA Band 1, 8, 22, 26, 34, 40, 41, 42, 44, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | | 1855 | -40 | 1 | 33 |
| | Frequency range | 1855 | | 1880 | -15.5 | 5 | 15,26,33 |
| 41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 45, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 30 |
| | Frequency range | 1839.9 | | 1879.9 | -50 | 1 | 30 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 30 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

NOTE 3: To meet these requirements some restriction will be needed for either the operating band or protected band

NOTE 4: N/A

NOTE 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band

NOTE 6: N/A
NOTE 7: Applicable when co-existence with PHS system operating in 1884.5 -1919.6MHz.
NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.
NOTE 9: N/A
NOTE 10: N/A
NOTE 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD
NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB
NOTE 13: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.
NOTE 14: N/A
NOTE 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.
NOTE 16: N/A
NOTE 17: N/A
NOTE 18: N/A
NOTE 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.
NOTE 20: N/A
NOTE 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 22: This requirement is applicable for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
For carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.
NOTE 23: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.
NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.
NOTE 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 28: N/A
NOTE 29: N/A
NOTE 30: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz
NOTE 31: N/A
NOTE 33: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.
NOTE 34: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.

NOTE 35: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.
NOTE 36: This requirement is applicable for E-UTRA channel bandwidth allocated within 1920-1980 MHz.
NOTE 37: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980MHz.
NOTE 38: Applicable only for UE category M1 and NB1.

**Table 6.6.3EA.2.3-1A: Spurious emission band limits Rel-14**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| 1 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 15, 27 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 15, 26, 27 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 13 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 13 |
| 4 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 18, 19 | $F_{DL_low}$ | - | $F_{DL_high}$ | -40 | 1 | 39 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 39 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 39 |
| 7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| 8 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 15, 23 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 11 | E-UTRA Band 1, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 25, 26, 27, 29, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| 18 | E-UTRA Band 1, 11, 21, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 19 | E-UTRA Band 1, 11, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| 21 | E-UTRA Band 1, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 25 | E-UTRA Band 4, 5, 10,12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 26 | E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 48, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 27 | E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 25, 26, 27, 29, 30, 31, 38, 40, 41, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 28 | $F_{DL_low}$ | - | 790 | -50 | 1 | |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | |
| 28 | E-UTRA Band 1, 4, 10, 22, 42, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 25 |
| | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 24 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| 31 | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 40, 42, 43, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 470 | - | 694 | -42 | 8 | |
| 39 | E-UTRA Band 1, 8, 22, 26, 34, 40, 41, 42, 44, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | | 1855 | -40 | 1 | 33 |
| | Frequency range | 1855 | | 1880 | -15.5 | 5 | 15,26,33 |
| 40 | E-UTRA Band 1, 3, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 45, 48, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 30 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 30 |
| 66 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42, 48 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1
NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.
NOTE 3: N/A
NOTE 4: N/A
NOTE 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band
NOTE 6: N/A
NOTE 7: Applicable when co-existence with PHS system operating in 1884.5 -1919.6MHz.
NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.
NOTE 9: N/A
NOTE 10: N/A
NOTE 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD
NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB
NOTE 13: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.
NOTE 14: N/A
NOTE 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.
NOTE 16: N/A
NOTE 17: N/A
NOTE 18: N/A
NOTE 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.
NOTE 20: N/A
NOTE 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 22: This requirement is applicable for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
For carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.
NOTE 23: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.
NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.
NOTE 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 28: N/A
NOTE 29: N/A
NOTE 30: This requirement applies when the E-UTRA carrier is confined within 2545-2575 MHz or 2595-2645 MHz and the channel bandwidth is 10 or 20 MHz
NOTE 31: N/A
NOTE 32: Void
NOTE 33: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.
NOTE 34: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.
NOTE 35: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.
NOTE 36: This requirement is applicable for E-UTRA channel bandwidth allocated within 1920-1980 MHz.
NOTE 37: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980MHz.
NOTE 38: Applicable when NS_33 or NS_34 is configured by the pre-configured radio parameters.
NOTE 39: Applicable only when the assigned E-UTRA carrier is confined within 824 MHz and 849 MHz for UE category M1, M2 and UE category NB1 and NB2.
NOTE 40: In the frequency range x-5950MHz, SE requirement of -30dBm/MHz should be applied; where x = max (5925, fc + 15), where fc is the channel centre frequency.

**Table 6.6.3EA.2.3-1B: Spurious emission band limits Rel-15**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| 1 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 15, 27 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 15, 26, 27 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 50, 51, 66, 70, 71, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 50, 51, 65, 67, 68, 69, 72, 73,74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 13 |
| | E-UTRA Band 22, 42, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 13 |
| 4 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 48, 50, 51, 66, 70, 71, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 50, 51, 65, 66, 70, 71, 73, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 18, 19 | $F_{DL_low}$ | - | $F_{DL_high}$ | -40 | 1 | 39 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 39 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 39 |
| 7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| 8 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 50, 51, 65, 67, 68, 69, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 7, 22, 41, 42, 43, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 15, 23 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23 |
| 11 | E-UTRA Band 1, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48, 50, 51, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 25, 26, 27, 29, 41, 48, 50, 51, 66, 70, 71, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 48, 66, 70, 71, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| 17 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48, 50, 51, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 18 | E-UTRA Band 1, 11, 21, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 19 | E-UTRA Band 1, 11, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 20 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 68, 72, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42, 52, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 21 | E-UTRA Band 1, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 25 | E-UTRA Band 4, 5, 10,12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 66, 70, 71, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 26 | E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 48, 50, 51, 65, 66, 70, 71, 73,74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 27 | E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 25, 26, 27, 29, 30, 31, 38, 40, 41, 42, 43, 65, 66, 73, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 28 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | $F_{DL_low}$ | - | $F_{DL_high}$ | -35 | 0.00625 | |
| 28 | E-UTRA Band 1, 4, 10, 22, 42, 43, 50, 51, 52, 65, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 25 |
| | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, 41, 66, 72 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 24 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| 31 | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 40, 42, 43, 50, 51, 52, 65, 67, 68, 69, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | $F_{DL_low}$ | - | $F_{DL_high}$ | -42 | 8 | |
| 39 | E-UTRA Band 1, 8, 22, 26, 34, 40, 41, 42, 44, 45, 50, 51, 52, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | | 1855 | -40 | 1 | 33 |
| | Frequency range | 1855 | | 1880 | -15.5 | 5 | 15,26,33 |
| 40 | E-UTRA Band 1, 3, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 40, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85 | | | | | | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 30 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 30 |
| 66 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 50, 51, 66, 70, 71, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42, 48 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 71 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 29, 30, 48, 66, 71, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25, 41, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 71 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

NOTE 3: N/A

NOTE 4: N/A

NOTE 5: N/A

NOTE 6: N/A

NOTE 7: N/A

NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.

NOTE 9: N/A

NOTE 10: N/A

NOTE 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD

NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB

NOTE 13: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.

NOTE 14: N/A

NOTE 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.

NOTE 16: N/A

NOTE 17: N/A

NOTE 18: N/A

NOTE 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.

NOTE 20: N/A

NOTE 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 22: N/A

NOTE 23: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.

NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

NOTE 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 28: N/A
NOTE 29: N/A
NOTE 30: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz
NOTE 31: N/A
NOTE 32: Void
NOTE 33: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.
NOTE 34: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.
NOTE 35: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.
NOTE 36: N/A
NOTE 37: N/A
NOTE 38: N/A
NOTE 39: Applicable only when the assigned E-UTRA carrier is confined within 824 MHz and 849 MHz for UE category M1, M2 and UE category NB1 and NB2.
NOTE 40: N/A
NOTE 41: N/A
NOTE 42: N/A

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.3.2.

This test use minimum requirements from many releases of TS 36.101 [2] due to release independence defined in TS 36.307 [16]

## 6.6.3EA.2.4 Test description

### 6.6.3EA.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3EA.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.6.3EA.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment (as specified in TS 36.508 [7] subclause 4.1) | | | | NC | | | |
| Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1) (Note 6, Note 7) | | | | Low range, Mid range, High range (Note 6, 13, 16) | | | |
| Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1) | | | | Lowest, 5MHz, Highest (Note 13, 16) | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | | |
| | | FDD | TDD | | FDD | TDD | Narrowband index[1] |
| 1.4MHz | N/A for Spurious Emissions testing | | | QPSK | 6@0 | 6@0 | 0 |
| 1.4MHz | | | | QPSK | 1@0 | 1@0 | 0 |
| 1.4MHz | | | | QPSK | 1@5 | 1@5 | 0 |
| 3MHz | | | | QPSK | 6@0 | 6@0 | 0 |
| 3MHz | | | | QPSK | 6@0 | 6@0 | 1 |
| 3MHz | | | | QPSK | 1@0 | 1@0 | 0 |
| 3MHz | | | | QPSK | 1@5 | 1@5 | 1 |
| 5MHz | | | | QPSK | 6@0[8] | 6@0 | 0 |
| 5MHz | | | | QPSK | 6@0[8] | 6@0 | 3 |
| 5MHz | | | | QPSK | 1@0 | 1@0 | 0 |
| 5MHz | | | | QPSK | 1@5 | 1@5 | 3 |
| 10MHz | | | | QPSK | 6@0[9, 15] | 6@0 | 0 |
| 10MHz | | | | QPSK | 6@0[9, 15] | 6@0 | 7 |
| 10MHz | | | | QPSK | 1@0[10, 14] | 1@0 | 0 |
| 10MHz | | | | QPSK | 1@5[10, 14] | 1@5 | 7 |
| 15MHz | | | | QPSK | 6@0[3, 11] | 6@0[4, 18] | 0 |
| 15MHz | | | | QPSK | 6@0[3, 11] | 6@0[4, 18] | 11 |
| 15MHz | | | | QPSK | 1@0 | 1@0[5] | 0 |
| 15MHz | | | | QPSK | 1@5 | 1@5[5] | 11 |
| 20MHz | | | | QPSK | 6@0[3, 11] | 6@0[4, 18] | 0 |
| 20MHz | | | | QPSK | 6@0[3, 11] | 6@0[4, 18] | 15 |
| 20MHz | | | | QPSK | 1@0 | 1@0[5] | 0 |
| 20MHz | | | | QPSK | 1@5 | 1@5[5] | 15 |

Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4
Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 3: For requirements under note 21 in table 6.6.3EA.2.3-1 in high range with max narrowband index.
Note 4: Void
Note 5: Void
Note 6: Do not apply for requirements under Note 13 in Table 6.6.3EA.2.3-1. Test frequencies for these requirements are defined in Table 6.6.3EA.2.4.1-2.
Note 7: Void
Note 8: For requirements under note 23 in table 6.6.3EA.2.3-1 (high range – 10MHz) is tested at RB #0 with narrowband index 0.
Note 9: For requirements under note 23 in table 6.6.3EA.2.3-1 high range is tested at RB #0 with narrowband index 1.
Note 10: For requirements under note 23 in table 6.6.3EA.2.3-1 high range is tested at RB #3 with narrowband index 0 and at RB#2 with narrowband index 7.
Note 11: For requirements under note 27 in table 6.6.3EA.2.3-1 in low range with narrowband index 0.
Note 12: Void
Note 13: For requirements under note 31 in table 6.6.3.2.3-1C and note 34 in table 6.6.3.2.3-1D only 720.5 MHz is tested with 5 MHz and only 723 MHz is tested with 10 MHz.
Note 14: For requirements under note 34 in table 6.6.3EA.2.3-1 RB#1 with narrowband index 0 and RB#4 with narrowband index 7 are used.
Note 15: For requirements under note 34 in table 6.6.3EA.2.3-1 RB#0 with narrowband index 1 is used
Note 16: For requirements under note 35 in table 6.6.3EA.2.3-1 only low range and 728 MHz with 10 MHz is tested.
Note 17: Void
Note 18: For requirements under note 33 in table 6.6.3EA.2.3-1 (high range-7 MHz) is tested.

**Table 6.6.3EA.2.4.1-2: Test frequencies for E-UTRA channel bandwidth for operating band 3 with Note 13 (in Tables 6.6.3EA.2.3-1)**

| Bandwidth [MHz] | $N_{UL}$ | Frequency of Uplink [MHz] | $N_{DL}$ | Frequency of Downlink [MHz] |
|---|---|---|---|---|
| 5 | 19924 | 1782.4 | 1924 | 1877.4 |
| 10 | 19899 | 1779.9 | 1899 | 1874.9 |
| 15 | 19874 | 1777.4 | 1874 | 1872.4 |
| 20 | 19849 | 1774.9 | 1849 | 1869.9 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.7 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.6.3EA.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.6.3EA.2.4.3.

#### 6.6.3EA.2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.6.3EA.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at $P_{UMAX}$ level.
3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.3EA.2.3-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3EA.2.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

#### 6.6.3EA.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA.

### 6.6.3EA.2.5 Test requirement

Test requirements for Spurious Emissions UE Co-existence are the same as the minimum requirements and are not repeated in this section.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in table 6.6.3EA.2.3-1 according to the following rule:

The requirements for the UE are release specific and can be found in Tables 6.6.3EA.2.3-1. If the UE support a band, which is not defined in the table corresponding UE's release, the requirements for this band are taken from the table of earliest release where requirements for this band are defined. This has been described in following Table 6.6.3EA.2.5-1.

**Table 6.6.3EA.2.5-1: UE Requirements according to UE E-UTRA release and supported E-UTRA band**

| Band | UE Requirements per release | | |
|---|---|---|---|
| | Rel-13 | Rel-14 | Rel-15 |
| 1 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 2 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 3 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 4 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 5 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 7 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 8 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 11 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 12 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 13 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 14 | Table 6.6.3EA.2.3-1B | Table 6.6.3EA.2.3-1B | Table 6.6.3EA.2.3-1B |
| 18 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 19 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 20 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 21 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 26 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 27 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 28 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 31 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 39 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 41 | Table 6.6.3EA.2.3-1 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 66 | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1A | Table 6.6.3EA.2.3-1B |
| 71 | Table 6.6.3EA.2.3-1B | Table 6.6.3EA.2.3-1B | Table 6.6.3EA.2.3-1B |

NOTE 1: The following is applied to Note2 in Table 6.6.3EA.2.3-1. For frequency with 2nd, 3rd or 4th harmonic spurious emissions, the measurements are covered in 6.6.3.1.

NOTE 2: The restriction on the maximum uplink transmission to 36 RB in Notes 14 and 15 of Table 6.6.3EA.2.5-1 is intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future.6.6.3EA.3 Additional spurious emissions for UE category M1

## 6.6.3EA.3 Additional spurious emissions for UE category M1

Editor's note: Following aspects missing or not yet determined:

- Test configuration tables and test requirement tables FFS for NS_12

### 6.6.3EA.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

### 6.6.3EA.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

### 6.6.3EA.3.3 Minimum conformance requirements

These requirements are specified in terms of an additional spectrum emission requirement. Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

#### 6.6.3EA.3.3.1 Minimum requirement (network signalled value "NS_05")

When "NS_05" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3EA.3.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3EA.3.1-1: Additional requirements (PHS)**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | | | | Measurement bandwidth | NOTE |
|---|---|---|---|---|---|---|
| | 5 MHz | 10 MHz | 15 MHz | 20 MHz | | |
| 1884.5 ≤ f ≤1915.7 | -41 | -41 | -41 | -41 | 300 KHz | 1 |

#### 6.6.3EA.3.3.2 Minimum requirement (network signalled value "NS_07")

When "NS_07" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3EA.3.2-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3EA.3.2-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 10 MHz | |
| 769 ≤ f ≤ 775 | -57 | 6.25 kHz |
| NOTE: The emissions measurement shall be sufficiently power averaged to ensure standard deviation < 0.5 dB. | | |

#### 6.6.3EA.3.3.3 Minimum requirement (network signalled value "NS_08")

When "NS_08" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3EA.3.3.3-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3EA.3.3.3-1: Additional requirement**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | | | Measurement bandwidth |
|---|---|---|---|---|
| | 5MHz | 10MHz | 15MHz | |
| 860 ≤ f ≤ 895 | -40 | -40 | -40 | 1 MHz |

#### 6.6.3EA.3.3.4 Minimum requirement (network signalled value "NS_09")

When "NS 09" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3EA.3.3.4-1. This requirement also applies for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3EA.3.3.4-1: Additional requirement**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | | | Measurement bandwidth |
|---|---|---|---|---|
| | 5MHz | 10MHz | 15MHz | |
| 1475.9 ≤ f ≤ 1510.9 | -35 | -35 | -35 | 1 MHz |

NOTE 1: To improve measurement accuracy, A-MPR values for NS_09 specified Table 6.2.4EA -1 in sub-clause 6.2.4EA are derived based on 100 kHz RBW.

### 6.6.3EA.3.3.5 Minimum requirement (network signalled value "NS_12")

When "NS 12" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3EA.3.3.5-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3EA.3.3.5-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz | |
| 806 ≤ f ≤ 813.5 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 814.2 MHz.<br>NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

### 6.6.3EA.3.3.6 Minimum requirement (network signalled value "NS_13")

When "NS 13" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3EA.3.3.6-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3EA.3.3.6-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 1.4, 3, 5 MHz | |
| 806 ≤ f ≤ 816 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 819 MHz.<br>NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

### 6.6.3EA.3.3.7 Minimum requirement (network signalled value "NS_14")

When "NS 14" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3EA.3.3.7-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3EA.3.3.7-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 10 MHz, 15 MHz | |
| 806 ≤ f ≤ 816 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 824 MHz.<br>NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

6.6.3EA.3.3.8 Minimum requirement (network signalled value "NS_15")

When "NS 15" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3EA.3.3.8-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3EA.3.3.8-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz | |
| 851 ≤ f ≤ 859 | -53 | 6.25 kHz |
| NOTE 1: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

6.6.3EA.3.3.9 Minimum requirement (network signalled value "NS_16")

When "NS_16" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3EA.3.3.9-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3EA.3.3.9-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | NOTE |
|---|---|---|---|
| | 1.4, 3, 5, 10 MHz | | |
| 790 ≤ f ≤ 803 | -32 | 1 MHz | |

6.6.3EA.3.3.10 Minimum requirement (network signalled value "NS_17")

When "NS_17" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3EA.3.3.10-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3EA.3.3.10-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | NOTE |
|---|---|---|---|
| | 5, 10 MHz | | |
| 470 ≤ f ≤ 710 | -26.2 | 6 MHz | 1 |
| NOTE 1: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz. | | | |

#### 6.6.3EA.3.3.11 Minimum requirement (network signalled value "NS_18")

When "NS_18" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3EA.3.3.11-1. This requirement also applies for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3EA.3.3.11-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | NOTE |
|---|---|---|---|
| | 5, 10, 15, 20 MHz | | |
| 692-698 | -26.2 | 6 MHz | |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.3.3.

### 6.6.3EA.3.4 Test description

#### 6.6.3EA.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3EA.3.4.1-1 to Table 6.6.3EA.3.4.1-11. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.6.3EA.3.4.1-1: Test Configuration Table (network signalled value "NS_05")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low Range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 5MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 5MHz | | QPSK | 1 | 0 |
| 2 | 5MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.6.3EA.3.4.1-2: Test Configuration Table (network signalled value "NS_07")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 10MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A for Maximum Power Reduction (MPR) test case | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 10MHz | | QPSK | 1 | 0 |
| 2 | 10MHz | | QPSK | 4 | 0 |
| 3 | 10MHz | | QPSK | 6 | 0 |
| 4 | 10MHz | | 16QAM | 5 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.6.3EA.3.4.1-3: Test Configuration Table (network signalled value "NS_08")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | High Range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 5MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 5MHz | | QPSK | 1 | 0 |
| 2 | 5MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.6.3EA.3.4.1-4: Test Configuration Table (network signalled value "NS_09")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | High Range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 5MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 5MHz | | QPSK | 1 | 0 |
| 2 | 5MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.6.3EA.3.4.1-5: Test Configuration Table (network signalled value "NS_12")**

FFS

**Table 6.6.3EA.3.4.1-6: Test Configuration Table (network signalled value "NS_13")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | UL 819.7 MHz ($N_{UL}$ = 26747) | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 1.4MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 1.4MHz | | QPSK | 1 | 0 |
| 2 | 1.4MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.6.3EA.3.4.1-7: Test Configuration Table (network signalled value "NS_14")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | UL 829 MHz ($N_{UL}$ = 26840) | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 10MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 10MHz | | QPSK | 1 | 0 |
| 2 | 10MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.6.3EA.3.4.1-8: Test Configuration Table (network signalled value "NS_15")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Configuration ID 1-2: UL 844.3 MHz<br>Configuration ID 3-8: High range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 1.4MHz, 3MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 1.4MHz | | QPSK | 1@0, 1@5 | 0 |
| 2 | 1.4MHz | | QPSK | 6 | 0 |
| 3 | 1.4MHz | | QPSK | 1@5 | 0 |
| 4 | 1.4MHz | | QPSK | 6 | 0 |
| 5 | 3MHz | | QPSK | 1@1 | 1 |
| 6 | 3MHz | | QPSK | 1@5 | 1 |
| 7 | 3MHz | | QPSK | 6 | 1 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4 | | | | | |

**Table 6.6.3EA.3.4.1-9: Test Configuration Table (network signalled value "NS_16")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 1.4MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 1.4MHz | | QPSK | 1 | 0 |
| 2 | 1.4MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4.<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.6.3EA.3.4.1-10: Test Configuration Table (network signalled value "NS_17")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | 720.5 MHz | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 5MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 5MHz | | QPSK | 1 | 0 |
| 2 | 5MHz | | QPSK | 6 | 0 |
| | | | | | |
| | | | | | |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

**Table 6.6.3EA.3.4.1-11: Test Configuration Table (network signalled value "NS_18")**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low Range | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 5MHz | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | | **Downlink Configuration** | **Uplink Configuration** | | |
| Configuration ID | Ch BW | N/A | Mod'n | RB allocation | |
| | | | | FDD and HD-FDD | Narrowband index (Note 1) |
| 1 | 5MHz | | QPSK | 1 | 0 |
| 2 | 5MHz | | QPSK | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 3: The $RB_{start}$ of partial RB allocation shall be RB#0 and RB# (6 - RB allocation) of the narrowband. | | | | | |

1. Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.7 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL Reference Measurement channels are set according to Table 6.6.3EA.3.4.1-1 to Table 6.6.3EA.3.4.1-11.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.6.3EA.3.4.3.

### 6.6.3EA.3.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.6.3EA.3.4.1-1 to Table 6.6.3EA.3.4.1-11 depending on NS-value. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX\ level}$.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Tables 6.2.4EA.5-1 to 6.2.4EA.5-17 as appropriate. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test. For HD-FDD slots with transient periods and Half-duplex guard subframe are not under test.

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.6.3EA.3.1-1, 6.6.3EA.3.3.3-1 to 6.6.3EA.3.3.11-1, and 6.6.3EA.3.5.1-1 as appropriate. The centre frequency of the filter shall be stepped in contiguous steps according to the same table. For NS_07 measurements made in a bandwidth of 6.25kHz, measurement parameter settings defined in table 6.6.3EA.3.4.2-1 shall be used. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

**Table 6.6.3EA.3.4.2-1: Measurement setup for NS_07**

| | Option 1: Measurement with No RMS VBW available | Option2 Measurement with VBW Filtering on Power scale |
|---|---|---|
| VBW | >=62.5 kHz (10 times or more the RBW) | <=43Hz |
| RBW | <=6.25kHz | <=6.25kHz |
| Detector type | Averages signal envelope during each measurement point, such as "RMS detector" | Peak |
| Averaging mode (Trace averaging) | Power (RMS voltage) | Power (RMS voltage), as controlled by "Average Type" |
| Average Type (applies to detector) | Power (RMS voltage) (automatically occurs with "RMS detector") | Not applicable |
| Average Type (applies to VBW filter) | Not applicable | Power (RMS voltage) |
| Number of averages | 30, to reduce variance as required, or use an even longer sweep time | 1 or use an even narrower VBW filter, thus a longer sweep time |
| Sweep time | [Don't specify] | Sweep rate (span divided by sweep time) <= 0.8 * RBW*VBW |

### 6.6.3EA.3.4.3 Message contents

Message contents are same as in clause 6.2.4EA.4.3.

## 6.6.3EA.3.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Tables 6.2.4EA.5-1 to 6.2.4EA.5-17 as appropriate,

and

With the exception of NS_07, test requirements for Additional Spurious Emissions are the same as the minimum requirements and are not repeated in this section.

### 6.6.3EA.3.5.1 Test requirement (network signalled value "NS_07")

When "NS_07" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3EA.3.5.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3EA.3.5.1-1: Additional requirements**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 10 MHz | |
| 769 ≤ f ≤ 775 | -55.5 | 6.25 kHz |
| NOTE: The emissions measurement shall be sufficiently power averaged to ensure standard deviation < 0.5 dB. | | |

# 6.6.3EB Spurious emission for UE category 1bis

## 6.6.3EB.1 Transmitter Spurious emissions for UE category 1bis

### 6.6.3EB.1.1 Test purpose

Same test purpose as in clause 6.6.3.1.1.

### 6.6.3EB.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

### 6.6.3EB.1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.3.1.3.

### 6.6.3EB.1.4 Test description

#### 6.6.3EB.1.4.1 Initial conditions

Same initial conditions as in clause 6.6.3.1.4.1

- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.6.3EB.1.4.2 Test procedure

Same test procedure as in clause 6.6.3.1.4.2

#### 6.6.3EB.1.4.3 Message contents

Message contents same clause 6.6.3.1.4.3.

### 6.6.3EB.1.5 Test requirement

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.6.3EB.1.5-1.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in Table 6.6.3EB.1.5-1.

The spurious emission limits apply for the frequency ranges that are more than $\Delta f_{OOB}$ (MHz) from the edge of the channel bandwidth shown in Table 6.6.3.1.3-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3EB.1.5-1: General spurious emissions test requirements**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |

## 6.6.3EB.2 Spurious emission band UE co-existence for UE category 1bis

### 6.6.3EB.2.1 Test purpose

Same test purpose as in clause 6.6.3.2.1.

### 6.6.3EB.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

### 6.6.3EB.2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.3.2.3

### 6.6.3EB.2.4 Test description

#### 6.6.3EB.2.4.1 Initial conditions

Same initial conditions as in clause 6.6.3.2.4.1

- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.6.3EB.2.4.2 Test procedure

Same test procedure as in clause 6.6.3.2.4.2

#### 6.6.3EB.2.4.3 Message contents

Message contents same as 6.6.3.2.4.3

### 6.6.3EB.2.5 Test requirement

Test requirements for Spurious Emissions UE Co-existence are the same as the minimum requirements and are not repeated in this section.

## 6.6.3EB.3 Additional spurious emissions for UE category 1bis

### 6.6.3EB.3.1 Test purpose

Same test purpose as in clause 6.6.3.3.1.

### 6.6.3EB.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

### 6.6.3EB.3.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.6.3.3.3.

### 6.6.3EB.3.4 Test description

#### 6.6.3EB.3.4.1 Initial conditions

Same initial conditions as in clause 6.2.3.4.1.

- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

#### 6.6.3EB.3.4.2 Test procedure

Same test procedure as in clause 6.2.3.4.2

#### 6.6.3EB.3.4.3 Message contents

Same message contents as in clause 6.6.3.3.4.3.

### 6.6.3E.3.5 Test requirement

This clause specifies the requirements for the specified E-UTRA band for an additional spectrum emission requirement with protected bands as indicated from table 6.6.3.1.5-1 to table 6.6.3.2.5-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

#### 6.6.3E.3.5.1 Test requirement (network signalled value "NS_07")

When "NS_07" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.4.5-7 as appropriate,

and

- the measured average power of spurious emission, derived in step 4, shall not exceed the described value in Table 6.6.3EB.3.5.1-1. These requirements also apply for the frequency ranges that are less than $\Delta f_{OOB}$ (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

**Table 6.6.3EB.3.5.1-1: Additional requirements (network signalled value "NS_07")**

| Frequency band (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
|---|---|---|
| | 10 MHz | |
| 769 ≤ f ≤ 775 | -55.5 | 6.25 kHz |
| Note: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

## 6.6.3F Spurious emission for category NB1 and NB2

### 6.6.3F.1 Transmitter Spurious emissions for category NB1 and NB2

#### 6.6.3F.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

#### 6.6.3F.1.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

#### 6.6.3F.1.3 Minimum conformance requirements

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) from the edge of the channel bandwidth. The spurious emission limits in Table 6.6.3F.1.3-1 apply for all transmitter band configurations (NRB) and channel bandwidths.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3F.1.3-1: Spurious emissions limits**

| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |

…

When UE is configured for category NB1 or NB2 uplink transmissions the boundary between category NB1 or NB2 out of band and spurious emission domain shall be $F_{OOB}$ = 1.7 MHz.

The normative reference for this requirement is TS 36.101 [2] subclauses 6.6.3.1 and 6.6.3F.

## 6.6.3F.1.4 Test description

### 6.6.3F.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters, and are shown in table 6.6.3F.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 6.6.3F.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 8.1.1 | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.2 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | **N/A for Maximum Power Reduction (MPR) test case** | **Modulation** | **$N_{tones}$** | **Subcarrier spacing (kHz)** |
| 1 | | QPSK | 1@0 | 3.75 |
| 2 | | QPSK | 1@47 | 3.75 |
| 3 | | BPSK | 1@0 | 15 |
| 4 | | BPSK | 1@11 | 15 |
| 5 (Note 1) | | QPSK | 12@0 | 15 |
| Note 1: Applicable to UE supporting UL multi-tone transmissions | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1.1 and H.4.0.

4. The UL Reference Measurement channels are set according to Table 6.6.3F.1.4.1-1.

5. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.6.3F.1.4.3.

#### 6.6.3E.1.4.2 Test procedure

1. SS sends uplink scheduling information via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.6.3F.1.4.1-1 and with the scheduling pattern according to Annex A.2. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC

2. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.3F.1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3F.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

NOTE 1: For configuration IDs applicable to UE depending on UE capability in Test Configuration Table with different UL sub-carrier spacing, the SS shall release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the appropriate UL subcarrier spacing in Random Access Response message.

#### 6.6.3F.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6.

### 6.6.3F.1.5 Test requirement

This clause specifies the requirements for the specified E-UTRA band for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.6.3F.1.5-1.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in Table 6.6.3F.1.5-1.

The spurious emission limits apply for the frequency ranges that are more than $\Delta f_{OOB}$ (MHz) from the edge of the channel bandwidth.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3F.1.5-1: General spurious emissions test requirements**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |

## 6.6.3F.2 Spurious emission band UE co-existence for category NB1 and NB2

Editor's note: This test case contains different requirements for different UE releases

### 6.6.3F.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

### 6.6.3F.2.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

### 6.6.3F.2.3 Minimum conformance requirements

This clause specifies the requirements for the specified E-UTRA band for coexistence with protected bands as indicated in Tables 6.6.3F.2.3-1, 6.6.3F.2.3-1A and 6.6.3F.2.3-1B.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3F.2.3-1: Spurious emission band UE co-existence limits Rel-13**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| 1 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | Frequency range | 1880 | - | 1895 | -40 | 1 | 15, 27 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 15, 26, 27, 39 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 30, 41, 42, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | |
| 4 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 23, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 18, 19 | $F_{DL_low}$ | - | $F_{DL_high}$ | -40 | 1 | 38 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 38 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 38 |
| 6 | E-UTRA Band 1, 9, 11, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 875 | -37 | 1 | |
| | Frequency range | 875 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1919.6 | -41 | 0.3 | 7 |
| | | 1884.5 | - | 1915.7 | | | 8 |
| 7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| 8 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 15, 23 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23 |
| 9 | E-UTRA Band 1, 3, 11, 18, 19, 21, 26, 28, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 11 | E-UTRA Band 1, 3, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 12 | E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 26, 27, 30, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 23, 25, 26, 27, 29, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| 17 | E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 26, 27, 30, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 18 | E-UTRA Band 1, 3, 11, 21, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 19 | E-UTRA Band 1, 3, 11, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| 21 | E-UTRA Band 1, 3, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 22 | E-UTRA Band 1, 3, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 43, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 3510 | - | 3525 | -40 | 1 | 15 |
| | Frequency range | 3525 | - | 3590 | -50 | 1 | |
| 23 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 29, 30, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 24 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 29, 30, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 25 | E-UTRA Band 4, 5, 10,12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 30, 41, 42, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 26 | E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 23, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 27 | E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 23, 25, 26, 27, 29, 30, 31, 38, 40, 41, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 28 | $F_{DL_low}$ | - | 790 | -50 | 1 | |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | |
| 28 | E-UTRA Band 1, 4, 10, 22, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 25 |
| | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 24 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| 30 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 38, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 31 | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 40, 42, 43, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 470 | - | 694 | -42 | 8 | |
| … | | | | | | | |
| 33 | E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 34, 38, 40, 42, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38,39, 40, 41, 42, 43, 44, 45, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 35 | | | | | | | |
| 36 | | | | | | | |
| 37 | | | - | | | | |
| 38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 34, 40, 42, 43, 65, 66, 67, 68 | | | | | | |
| | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
| | Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| 39 | E-UTRA Band 1, 8, 22, 26, 34, 40, 41, 42, 44, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | | 1855 | -40 | 1 | 33 |
| | Frequency range | 1855 | | 1880 | -15.5 | 5 | 15,26,33 |
| 40 | E-UTRA Band 1, 3, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 45, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 30 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 30 |
| 42 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 45, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 43 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 31,32, 33, 34, 38, 40, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 44 | E-UTRA Band 1, 40, 42, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 5, 8, 34, 39, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 45 | E-UTRA Band 1, 3, 5, 8, 34, 39, 40, 41, 42.44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 65 | E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 65, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 36 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 37 |
| | Frequency range | 1900 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| 66 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 68 | E-UTRA Band 3, 7, 8, 20, 22, 28, 31, 38, 40, 42, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1
NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.
NOTE 3: N/A
NOTE 4: N/A
NOTE 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band
NOTE 6: N/A
NOTE 7: Applicable when co-existence with PHS system operating in 1884.5 -1919.6MHz.
NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.
NOTE 9: N/A
NOTE 10: N/A
NOTE 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD
NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB
NOTE 13: N/A
NOTE 14: N/A
NOTE 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.3-1 from the edge of the channel bandwidth.
NOTE 16: N/A
NOTE 17: N/A

NOTE 18: N/A
NOTE 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.
NOTE 20: N/A
NOTE 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 22: This requirement is applicable for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
For carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.
NOTE 23: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.
NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.
NOTE 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 28: N/A
NOTE 29: N/A
NOTE 30: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz
NOTE 31: N/A
NOTE 32: Void
NOTE 33: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.
NOTE 34: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.
NOTE 35: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.
NOTE 36: This requirement is applicable for E-UTRA channel bandwidth allocated within 1920-1980 MHz.
NOTE 37: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980MHz.
NOTE 38: Applicable only for UE category M1 and NB1.
NOTE 39: For category NB1 UE when carrier centre frequency is 1920.1 MHz, in case of single-tone uplink transmission the requirement is applicable only for sub-carrier index > 2.

NOTE: The restriction on the maximum uplink transmission to 54 RB in Notes 21, 22, and 27 of Table 6.6.3F.2.3-1 and the restriction on the single-tone uplink transmission to sub-carrier index > 2 in Note 39 of Table 6.6.3F.2.3-1 are intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future.

**Table 6.6.3F.2.3-1A: Spurious emission band UE co-existence limits Rel-14**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| 1 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 15, 27 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 15, 26, 27, 42 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | |
| 4 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 18, 19 | $F_{DL_low}$ | - | $F_{DL_high}$ | -40 | 1 | 39 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 39 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 39 |
| 6 | E-UTRA Band 1, 9, 11, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 875 | -37 | 1 | |
| | Frequency range | 875 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1919.6 | -41 | 0.3 | 7 |
| | | 1884.5 | - | 1915.7 | | | 8 |
| 7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| 8 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 15, 23 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23 |
| 9 | E-UTRA Band 1, 3, 11, 18, 19, 21, 26, 28, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 11 | E-UTRA Band 1, 3, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 12 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 25, 26, 27, 29, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| 17 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 18 | E-UTRA Band 1, 3, 11, 21, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 19 | E-UTRA Band 1, 3, 11, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 65, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| 21 | E-UTRA Band 1, 3, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 22 | E-UTRA Band 1, 3, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 43, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 3510 | - | 3525 | -40 | 1 | 15 |
| | Frequency range | 3525 | - | 3590 | -50 | 1 | |
| 23 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 29, 30, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 24 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 25 | E-UTRA Band 4, 5, 10,12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 26 | E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 48, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 27 | E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 25, 26, 27, 29, 30, 31, 38, 40, 41, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 28 | $F_{DL_low}$ | - | 790 | -50 | 1 | |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | |
| 28 | E-UTRA Band 1, 4, 10, 22, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 25 |
| | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 24 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| 30 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 29, 30, 38, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 31 | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 40, 42, 43, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 470 | - | 694 | -42 | 8 | |
| … | | | | | | | |
| 33 | E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 34, 38, 40, 42, 43, 65, 67, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38,39, 40, 41, 42, 43, 44, 45, 65, 67, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 35 | | | | | | | |
| 36 | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 37 | | | - | | | | |
| 38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
| | Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| 39 | E-UTRA Band 1, 8, 22, 26, 34, 40, 41, 42, 44, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | | 1855 | -40 | 1 | 33 |
| | Frequency range | 1855 | | 1880 | -15.5 | 5 | 15,26,33 |
| 40 | E-UTRA Band 1, 3, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 45, 48, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 30 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 30 |
| 42 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 45, 65, 66, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 43 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 31,32, 33, 34, 38, 40, 65, 66, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 44 | E-UTRA Band 1, 40, 42, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 5, 8, 34, 39, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 45 | E-UTRA Band 1, 3, 5, 8, 34, 39, 40, 41, 42.44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| … | | | | | | | |
| 47 | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 65, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 5925 | - | 5950 | -30 EIRP | 1 | 38, 40, 41 |
| | Frequency range | 5815 | - | 5855 | -30 EIRP | 1 | 38, 41 |
| | | | | | | | |
| 48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 66, 70 | $FD_{L_low}$ | - | $FD_{L_high}$ | -50 | 1 | |
| 65 | E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 65, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 36 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 37 |
| | Frequency range | 1900 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| 66 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42, 48 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 68 | E-UTRA Band 3, 7, 8, 20, 22, 28, 31, 38, 40, 42, 43, 47, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| … | | | | | | | |
| 70 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1
NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.
NOTE 3: N/A
NOTE 4: N/A
NOTE 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band
NOTE 6: N/A
NOTE 7: Applicable when co-existence with PHS system operating in 1884.5 -1919.6MHz.
NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.
NOTE 9: N/A
NOTE 10: N/A
NOTE 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD
NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB
NOTE 13: N/A
NOTE 14: N/A
NOTE 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.3-1 from the edge of the channel bandwidth.
NOTE 16: N/A
NOTE 17: N/A
NOTE 18: N/A
NOTE 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.
NOTE 20: N/A
NOTE 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 22: This requirement is applicable for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
For carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.
NOTE 23: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.
NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.4.2-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.4.2-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.
NOTE 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 28: N/A

NOTE 29: N/A
NOTE 30: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz
NOTE 31: N/A
NOTE 32: Void
NOTE 33: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.
NOTE 34: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.
NOTE 35: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.
NOTE 36: This requirement is applicable for E-UTRA channel bandwidth allocated within 1920-1980 MHz.
NOTE 37: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980MHz.
NOTE 38: Applicable when NS_33 or NS_34 is configured by the pre-configured radio parameters.
NOTE 39: Applicable only when the assigned E-UTRA carrier is confined within 824 MHz and 849 MHz for UE category M1, M2 and UE category NB1 and NB2.
NOTE 40: In the frequency range x-5950MHz, SE requirement of -30dBm/MHz should be applied; where x = max (5925, fc + 15), where fc is the channel centre frequency.
NOTE 41: The EIRP requirement is converted to conducted requirement depend on the supported post antenna connector gain $G_{post\ connector}$ declared by the UE following the principle described in annex I.
NOTE 42: For category NB1 and NB2 UE when carrier centre frequency is 1920.1 MHz, in case of single-tone uplink transmission the requirement is applicable only for sub-carrier index > 2.

NOTE: The restriction on the maximum uplink transmission to 54 RB in Notes 21, 22, and 27 of Table 6.6.3F.2.3-1A and the restriction on the single-tone uplink transmission to sub-carrier index > 2 in Note 42 of Table 6.6.3F.2.3-1A are intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future.

**Table 6.6.3F.2.3-1B: Spurious emission band UE co-existence limits Rel-15**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| 1 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 15, 27 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 15, 26, 27, 44 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 50, 51, 66, 70, 71, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 50, 51, 65, 67, 68, 69, 72, 73,74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 22, 42, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | |
| 4 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 48, 50, 51, 66, 70, 71, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 50, 51, 65, 66, 70, 71, 73, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 18, 19 | $F_{DL_low}$ | - | $F_{DL_high}$ | -40 | 1 | 39 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 39 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 39 |
| 6 | E-UTRA Band 1, 9, 11, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 875 | -37 | 1 | |
| | Frequency range | 875 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1919.6 | -41 | 0.3 | 7 |
| | | 1884.5 | - | 1915.7 | | | 8 |
| 7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| 8 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 50, 51, 65, 67, 68, 69, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 7, 22, 41, 42, 43, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 15, 23 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23 |
| 9 | E-UTRA Band 1, 3, 11, 18, 19, 21, 26, 28, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 10 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66, 70, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 11 | E-UTRA Band 1, 3, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | | | | | | | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 12 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48, 50, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 51, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 25, 26, 27, 29, 41, 48, 50, 51, 66, 70, 71, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 48, 66, 70, 71, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| 17 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48, 50, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 51, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 18 | E-UTRA Band 1, 3, 11, 21, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 19 | E-UTRA Band 1, 3, 11, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 68, 72, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42, 52, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| 21 | E-UTRA Band 1, 3, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 22 | E-UTRA Band 1, 3, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 43, 65, 67, 68, 69, 72, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 3510 | - | 3525 | -40 | 1 | 15 |
| | Frequency range | 3525 | - | 3590 | -50 | 1 | |
| 23 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 29, 30, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 24 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70, 71, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 25 | E-UTRA Band 4, 5, 10,12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 66, 70, 71, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 26 | E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 48, 50, 51, 65, 66, 70, 71, 73,74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 27 | E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 25, 26, 27, 29, 30, 31, 38, 40, 41, 42, 43, 65, 66, 73, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 28 | $F_{DL_low}$ | - | 790 | -50 | 1 | |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | |
| 28 | E-UTRA Band 1, 4, 10, 22, 42, 43, 50, 51, 52, 65, 66, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 25 |
| | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, 41, 72 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 24 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| 30 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 29, 30, 38, 41, 48, 66, 70, 71, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 31 | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 40, 42, 43, 50, 51, 52, 65, 67, 68, 69, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 470 | - | 694 | -42 | 8 | |
| … | | | | | | | |
| 33 | E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 34, 38, 40, 42, 43, 52, 65, 67, 69, 72, 73, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38,39, 40, 41, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 42, 43, 44, 45, 50, 51, 52, 65, 67, 69, 72, 73, 74, 75, 76 | | | | | | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 35 | | | | | | | |
| 36 | | | | | | | |
| 37 | | | - | | | | |
| 38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
| | Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| 39 | E-UTRA Band 1, 8, 22, 26, 34, 40, 41, 42, 44, 45, 50, 51, 52, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | | 1855 | -40 | 1 | 33 |
| | Frequency range | 1855 | | 1880 | -15.5 | 5 | 15,26,33 |
| 40 | E-UTRA Band 1, 3, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 30 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 30 |
| 42 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 45, 50, 51, 65, 66, 67, 68, 69, 72, 73, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 43 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 31,32, 33, 34, 38, 40, 50, 51, 65, 66, 67, 68, 69, 72, 73, 74, 75, 76, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 44 | E-UTRA Band 1, 40, 42, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 5, 8, 34, 39, 41, 73 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 45 | E-UTRA Band 1, 3, 5, 8, 34, 39, 40, 41, 42, 44, 52, 73 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| … | | | | | | | |
| 47 | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 47, 65, 68, 72, 73 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 5925 | - | 5950 | -30 EIRP | 1 | 38, 40, 43 |
| | Frequency range | 5815 | - | 5855 | -30 EIRP | 1 | 38, 43 |
| 48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 66, 70, 71, 74, 85 | $FD_{L_low}$ | - | $FD_{L_high}$ | -50 | 1 | |
| 50 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 51 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 52 | E-UTRA Band 1, 3, 5, 7, 8, 20, 28, 31, 33, 34, 38, 39, 40, 41, 45, 47, 50, 51, 68, 72, 73, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 65 | E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 50, 51, 65, 68, 69, 72, 74, 75, 76 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 36 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 37 |
| | Frequency range | 1900 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| 66 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 50, 51, 66, 70, 71, 74, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | E-UTRA Band 42, 48 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 68 | E-UTRA Band 3, 7, 8, 20, 22, 28, 31, 38, 40, 42, 43, 47, 50, 51, 65, 72, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| … | | | | | | | |
| 70 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70, 71, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 71 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 30, 48, 66, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25, 41, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 29 | $F_{DL_low}$ | - | $F_{DL_high}$ | -38 | 1 | 15 |
| | E-UTRA Band 71 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 72 | E-UTRA Band 1, 7, 20, 22, 28, 31, 32, 33, 34, 38, 42, 43, 47, 52, 65, 68, [72] | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 8, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 470 | - | 694 | -42 | 8 | |
| 73 | E-UTRA Band 1, 26, 28, 33, 34, 39, 41, 42, 43, 44, 45, 47, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 5, 8, 27, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 74 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 1400 | - | 1427 | -32 | 27 | 15, 41 |
| | Frequency range | 1475 | - | 1488 | -50 | 1 | 42 |
| | Frequency range | 1488 | - | 1518 | -50 | 1 | 15 |
| 85 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48, 51, 71, 74 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12, 85 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

NOTE 3: N/A

NOTE 4: N/A

NOTE 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band

NOTE 6: N/A

NOTE 7: Applicable when co-existence with PHS system operating in 1884.5-1919.6MHz.

NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.

NOTE 9: N/A

NOTE 10: N/A

NOTE 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD

NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB

NOTE 13: N/A

NOTE 14: N/A

NOTE 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1.3-1 and Table 6.6.3.1A.3-1 from the edge of the channel bandwidth.

NOTE 16: N/A

NOTE 17: N/A

NOTE 18: N/A

NOTE 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.

NOTE 20: N/A

NOTE 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 22: This requirement is applicable for power class 3 UE for any channel bandwidths within the range

2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. For power class 2 UE for any channel bandwidths within the range 2570 - 2615 MHz, NS_44 shall apply.
For power class 2 or 3 UE for carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.

NOTE 23: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.

NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

NOTE 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 28: N/A

NOTE 29: N/A

NOTE 30: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz

NOTE 31: N/A

NOTE 32: Void

NOTE 33: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.

NOTE 34: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.

NOTE 35: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.

NOTE 36: This requirement is applicable for E-UTRA channel bandwidth allocated within 1920-1980 MHz.

NOTE 37: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980MHz.

NOTE 38: Applicable when NS_33 or NS_34 is configured by the pre-configured radio parameters.

NOTE 39: Applicable only when the assigned E-UTRA carrier is confined within 824 MHz and 849 MHz for UE category M1, M2 and UE category NB1 and NB2.

NOTE 40: In the frequency range x-5950MHz, SE requirement of -30dBm/MHz should be applied; where x = max (5925, fc + 15), where fc is the channel centre frequency.

NOTE 41: Applicable for all bandwidths, and when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is greater than or equal to 1427 MHz + the channel BW assigned for 1.4, 3, 5 and 10 MHz bandwidth, and when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is greater than or equal to 1440 MHz for 15 and 20 MHz bandwidth. This requirement shall be verified with UE transmission power of 15 dBm.

NOTE 42: Applicable for 1.4 , 3 and 5 MHz bandwidth, and when the upper edge of the assigned E-UTRA UL channel bandwidth frequency is less than or equal to 1467 MHz assigned for10 MHz bandwidth, and when the upper edge of the assigned E-UTRA UL channel bandwidth frequency is less than or equal to 1463.8 MHz for 15 MHz bandwidth, and when the upper edge of the assigned E-UTRA UL channel bandwidth frequency is less than or equal to 1460.8 MHz for 20 MHz bandwidth.

NOTE 43: The EIRP requirement is converted to conducted requirement depend on the supported post antenna connector gain $G_{post\ connector}$ declared by the UE following the principle described in annex

| |
|---|
| I.<br>NOTE 44: For category NB1 and NB2 UE when carrier centre frequency is 1920.1 MHz, in case of single-tone uplink transmission the requirement is applicable only for sub-carrier index > 2. |

NOTE: The restriction on the maximum uplink transmission to 54 RB in Notes 21, 22, and 27 of Table 6.6.3F.2.3-1B and the restriction on the single-tone uplink transmission to sub-carrier index > 2 in Note 44 of Table 6.6.3F.2.3-1B are intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future.

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.3.2.

This test use minimum requirements from many releases of TS 36.101 [2] due to release independence defined in TS 36.307 [16]

## 6.6.3F.2.4 Test description

### 6.6.3F.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters, and are shown in Table 6.6.3F.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 6.6.3F.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 8.1.1 | | NC | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.3 (Note 2) | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A for Spurious Emissions testing | **Modulation** | **$N_{tones}$** | **Subcarrier spacing (kHz)** |
| 1 | | QPSK | 1@0 | 3.75 |
| 2 | | QPSK | 1@47 | 3.75 |
| 3 | | BPSK | 1@0 | 15 |
| 4 | | BPSK | 1@11 | 15 |
| 5 (Note 1) | | QPSK | 12@0 | 15 |
| 6 (Note 3) | | QPSK | 1@5 | 3.75 |
| 7 (Note 3) | | QPSK | 1@3 | 15 |
| Note 1: Applicable to UE supporting UL multi-tone transmissions<br>Note 2: Do not apply for requirements under Note 13 and Note 34 in Tables 6.6.3F.2.3-1 to 6.6.3F.2.3-1A. Test frequencies for these requirements are defined in Table 6.6.3F.2.4.1-2 and 6.6.3F.2.4.1-3.<br>Note 3: Only apply for requirements under Note 39 in Table 6.6.3F.2.3-1, Note 42 in Table 6.6.3F.2.3-1A and Note 44 in Table 6.6.3F.2.3-1B, replacing Configuration ID 1 and 3. | | | | |

**Table 6.6.3F.2.4.1-2: Test frequencies for E-UTRA channel bandwidth for operating band 3 with Note 13 (in Tables 6.6.3F.2.3-1 to 6.6.3F.2.3-1A)**

| **Bandwidth [kHz]** | **$N_{UL}$** | **Frequency of Uplink [MHz]** | **$N_{DL}$** | **Frequency of Downlink [MHz]** |
|---|---|---|---|---|
| 200 | 19948 | 1784.8 | 1948 | 1879.8 |

**Table 6.6.3F.2.4.1-3: Test frequencies for E-UTRA channel bandwidth for operating band 28 with Note 34 (in Tables 6.6.3F.2.3-1 to 6.6.3F.2.3-1A)**

| Bandwidth [kHz] | $N_{UL}$ | Frequency of Uplink [MHz] | $N_{DL}$ | Frequency of Downlink [MHz] |
|---|---|---|---|---|
| 200 | 27361 | 718.1 | 9361 | 773.1 |

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.7 using only main Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1.1 and H.4.0.
4. The UL Reference Measurement channels are set according to Table 6.6.3F.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.6.3F.2.4.3.

### 6.6.3F.2.4.2 Test procedure

1. SS sends uplink scheduling information via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.6.3F.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC (UE should be already transmitting $P_{UMAX}$ after Initial Conditions setting).
2. Measure the power of the transmitted signal with a measurement filter of bandwidths according to tables 6.6.3F.2.3-1 to 6.6.3F.2.3-1A. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3F.2.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

NOTE 1: For configuration IDs applicable to UE depending on UE capability in Test Configuration Table with different UL sub-carrier spacing, the SS shall release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the appropriate UL subcarrier spacing in Random Access Response message.

NOTE 2: For requirements under Note 39 in Table 6.6.3F.2.3-1, Note 42 in Table 6.6.3F.2.3-1A and Note 44 in Table 6.6.3F.2.3-1B, the resolution bandwidth is <=1 kHz to improve the measurement accuracy.

### 6.6.3F.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6.

## 6.6.3F.2.5 Test requirement

Test requirements for Spurious Emissions UE Co-existence are the same as the minimum requirements and are not repeated in this section.

The measured average power of spurious emission, derived in step 2, shall not exceed the described value in tables 6.6.3F.2.3-1 to 6.6.3F.2.3-1B according to the following rule:

The requirements for the UE are release specific and can be found in Tables 6.6.3F.2.3-1 to 6.6.3F.2.3-1B. If the UE support a band, which is not defined in the table corresponding UE's release, the requirements for this band are taken from the table of earliest release where requirements for this band are defined. This has been described in following Table 6.6.3F.2.5-1.

**Table 6.6.3F.2.5-1: UE Requirements according to UE NB-IoT release and supported NB-IoT band**

| Band | UE Requirements per release | | |
|---|---|---|---|
| | Rel-13 | Rel-14 | Rel-15 |
| 1 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 2 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 3 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 4 | Table 6.6.3F.2.3-1B | Table 6.6.3F.2.3-1B | Table 6.6.3F.2.3-1B |
| 5 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 8 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 11 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 12 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 13 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 14 | Table 6.6.3F.2.3-1B | Table 6.6.3F.2.3-1B | Table 6.6.3F.2.3-1B |
| 17 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 18 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 19 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 20 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 21 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 25 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 26 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 28 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 31 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 66 | Table 6.6.3F.2.3-1 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 70 | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1A | Table 6.6.3F.2.3-1B |
| 71 | Table 6.6.3F.2.3-1B | Table 6.6.3F.2.3-1B | Table 6.6.3F.2.3-1B |

# 6.6.3G Transmitter Spurious emissions for V2X

## 6.6.3G.1 Transmitter Spurious emissions for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 6.6.3G.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 6.6.3G.1.2 Test applicability

This test case applies to UE which support V2X Sidelink communication and Band 47.

### 6.6.3G.1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in subclause 5.2G, the transmitter spurious emissions limit in table 6.6.3G.1.3-2 apply for the frequency ranges more than $F_{OOB}$ listed in table 6.6.3G.1.3-1 from the edge of the transmission bandwidth.

**Table 6.6.3G.1.3-1: Boundary between E-UTRA out of band and spurious emission domain**

| Channel bandwidth | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
|---|---|---|---|---|---|---|
| OOB boundary $F_{OOB}$ (MHz) | 2.8 | 6 | 10 | 15 | 20 | 25 |

**Table 6.6.3G.1.3-2: Spurious emissions limits**

| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26GHz | -30dBm | 1MHz | 2 |
| NOTE 1: Applies for Band 22, Band 42, Band 43 and Band 48.<br>NOTE 2: Applies for Band 46 and Band 47. | | | |

## 6.6.3G.1.4 Test description

### 6.6.3G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2G. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.3G.1.4.1-1 the details of the V2X reference measurement channels (RMCs) are specified in sub-clause A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.6.3G.1.4.1-1: Test Configuration for V2X sidelink transmission**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | NC, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | Low range, Mid range, High range | |
| Test Channel Bandwidths<br>(as specified in subclause 5.4.2G) | Lowest, Mid, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X sidelink transmission** | |
| Ch BW | Mod'n | RB Allocation |
| 10MHz | QPSK | 1 |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 1 |
| 20MHz | QPSK | 96 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: The 1 RB allocation shall be tested at both RB #0 and RB #max of the channel bandwidth. | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508[7] Figure A.92.
2. The parameter settings for the V2X sidelink transmission over PC5 for both SS and UE are pre-configured according to TS 36.508 [7] subclause 4.10.1 with the exception specified in clause 6.6.2G.1.4.3-1.
3. The V2X reference measurement channel is set according to Table 6.6.3G.1.4.1-1
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0;
6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.6.3G.1.4.2 Test procedure

1. The V2X UE schedules the V2X RMC with transmission power at $P_{UMAX}$ level according to *SL-V2X-Preconfiguration* which is in line with the test configuration in Table 6.6.3G.1.4.1-1;

2. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.3G.1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3G.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

### 6.6.3G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exception

**Table 6.6.3G.1.4.3-1: SL-V2X-Preconfiguration-r14**

| Derivation Path: 36.508 Table 4.10.1.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-Preconfiguration-r14 ::= SEQUENCE { | | | |
| v2x-PreconfigFreqList-r14 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | One entry of v2x-PreconfigFreqInfo | | |
| SL-V2X-PreconfigFreqInfo-r14[1] ::= SEQUENCE { | | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | SL-PreconfigGeneral-r12 | |
| maxTxPower-r12 | 23 | | Power class3 |
| | 26 | | Power class2 |
| sl-bandwidth-r12 | n50 | 10Mhz | |
| | n100 | 20Mhz | |
| } | | | |
| v2x-CommPreconfigSync-r14 SEQUENCE { | | SL-PreconfigSync-r12 | |
| syncOffsetIndicators-r14 SEQUENCE { | | | |
| syncOffsetIndicator1-r14 | Not Present | Double synchronization signal transmission | |
| } | | | |
| } | | | |
| v2x-CommRxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry | | |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14-DEFAULT using condition BITMAP_6 and exception listed in Table 6.6.3G.1.4.3-2 | | |
| } | | | |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | | | |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14-DEFAULT using condition BITMAP_6 and exception listed in Table 6.6.3G.1.4.3-2 | | |
| } | | | |
| } | | | |

**Table 6.6.3G.1.4.3-2: SL-V2X-PreconfigCommPool-r14-DEFAULT**

| Derivation Path: 36.508 Table 4.6.3-20J | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResroucePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-Subframe-r14 CHOICE { | | | |
| bs20-r14 | 11111111111111111111 | | BITMAP_6 |
| } | | | |
| sizeSubchannel-r14 | N1 | | RB allocation is 1 |
| | N48 | | RB allocation is 48 |
| | N96 | | RB allocation is 96 |
| numSubchannel-r14 | n1 | | |
| dataTxParameters-r14 SEQUENCE { | | | |
| p0-r12 | 31 | It's set to the maximum value to disable its effect on transmission power. | |
| } | | | |
| } | | | |

### 6.6.3G.1.5 Test requirement

The measured average power of transmitter spurious emissions measured in step2 shall not exceed the value in table 6.6.3G.1.5-1.The spurious emission limits apply for the frequency ranges that are more than $\Delta f_{OOB}$ (MHz) from the edge of the channel bandwidth shown in Table 6.6.3G.1.3-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3G.1.5-1: General spurious emissions test requirements**

| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26GHz | -30dBm | 1MHz | 2 |
| NOTE 1: Applies for Band 22, Band 42, Band 43 and Band 48.<br>NOTE 2: Applies for Band 46 and Band 47. | | | |

## 6.6.3G.1_1 Spurious emission band UE co-existence for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 6.6.3G.1_1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

### 6.6.3G.1_1.2 Test applicability

This test case applies to UE which support V2X Sidelink communication and Band 47.

### 6.6.3G.1_1.3 Minimum conformance requirements

This clause specifies the requirements for the specified E-UTRA band for coexistence with protected bands as indicated in Tables 6.6.3G.1_1.3-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3G.1_1.3-1: Spurious emission band UE co-existence limits Rel-14**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| 1 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | Frequency range | 1880 | | 1895 | -40 | 1 | 15, 27 |
| | Frequency range | 1895 | | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | | 1920 | +1.6 | 5 | 15, 26, 27 |
| 2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2, 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 3 | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 13 |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 13 |
| 4 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 18, 19 | $F_{DL_low}$ | - | $F_{DL_high}$ | -40 | 1 | 39 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 39 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 39 |
| 6 | E-UTRA Band 1, 9, 11, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 860 | - | 875 | -37 | 1 | |
| | Frequency range | 875 | - | 895 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1919.6 | -41 | 0.3 | 7 |
| | | 1884.5 | - | 1915.7 | | | 8 |
| 7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| 8 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA band 3, 7, 22, 41, 42, 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 23 |
| | Frequency range | 860 | - | 890 | -40 | 1 | 15, 23 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 23 |
| 9 | E-UTRA Band 1, 11, 18, 19, 21, 26, 28, 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 22, 42 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 11 | E-UTRA Band 1, 11, 18, 19, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 12 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 13 | E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 25, 26, 27, 29, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 14 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 24, 30 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| 14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| 17 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 4, 10, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 12 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 18 | E-UTRA Band 1, 11, 21, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 758 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 860 | - | 890 | -40 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 19 | E-UTRA Band 1, 11, 21, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 38, 42, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| 21 | E-UTRA Band 1, 18, 19, 28, 34, 42, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| | Frequency range | 2545 | - | 2575 | -50 | 1 | |
| | Frequency range | 2595 | - | 2645 | -50 | 1 | |
| 22 | E-UTRA Band 1, 3, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 43, 65, 67, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 3510 | - | 3525 | -40 | 1 | 15 |
| | Frequency range | 3525 | - | 3590 | -50 | 1 | |
| 23 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 29, 30, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 24 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 25 | E-UTRA Band 4, 5, 10,12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 2 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 25 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 43 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 26 | E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 48, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 703 | - | 799 | -50 | 1 | |
| | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| | Frequency range | 945 | - | 960 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 27 | E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 25, 26, 27, 29, 30, 31, 38, 40, 41, 42, 43, 65, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 28 | $F_{DL_low}$ | - | 790 | -50 | 1 | |
| | Frequency range | 799 | - | 805 | -35 | 0.00625 | |
| 28 | E-UTRA Band 1, 4, 10, 22, 42, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 25 |
| | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, 41, 66 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 11, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 19, 24 |
| | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| 30 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 29, 30, 38, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 31 | E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 40, 42, 43, 65, 67, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| … | | | | | | | |
| 33 | E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 34, 38, 40, 42, 43, 65, 67, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| 34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38,39, 40, 41, 42, 43, 44, 45, 65, 67, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 5 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 35 | | | | | | | |
| 36 | | | | | | | |
| 37 | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 66, 67, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
| | Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| 39 | E-UTRA Band 1, 8, 22, 26, 34, 40, 41, 42, 44, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | | 1855 | -40 | 1 | 33 |
| | Frequency range | 1855 | | 1880 | -15.5 | 5 | 15,26,33 |
| 40 | E-UTRA Band 1, 3, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 65, 67, 68, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13 , 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 45, 48, 65, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 9, 11, 18, 19, 21 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 30 |
| | Frequency range | 1884.5 | | 1915.7 | -41 | 0.3 | 8, 30 |
| 42 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 45, 65, 66, 67, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| 43 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 31,32, 33, 34, 38, 40, 65, 66, 67, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 22 | $F_{DL_low}$ | - | $F_{DL_high}$ | [-50] | [1] | 3 |
| 44 | E-UTRA Band 1, 40, 42, 45 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 5, 8, 34, 39, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| 45 | E-UTRA Band 1, 3, 5, 8, 34, 39, 40, 41, 42.44 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| … | | | | | | | |
| 47 | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 65, 68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 5925 | - | 5950 | -30 | 1 | 38, 40 |
| | Frequency range | 5815 | - | 5855 | -30 | 1 | 38 |
| | | | | | | | |
| 48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 66, 70 | $FD_{L_low}$ | - | $FD_{L_high}$ | -50 | 1 | |
| 65 | E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 65, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 15 |
| | E-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 34 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 36 |
| | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 37 |
| | Frequency range | 1900 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
| | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| 66 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 42, 48 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| 68 | E-UTRA Band 3, 7, 8, 28, 38, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| … | | | | | | | |
| 70 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in Table 5.5-1
NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.
NOTE 3: To meet these requirements some restriction will be needed for either the operating band or protected band
NOTE 4: N/A
NOTE 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band
NOTE 6: N/A
NOTE 7: Applicable when co-existence with PHS system operating in 1884.5 -1919.6MHz.
NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.
NOTE 9: N/A
NOTE 10: N/A
NOTE 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD
NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB
NOTE 13: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.
NOTE 14: N/A
NOTE 15: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.
NOTE 16: N/A
NOTE 17: N/A
NOTE 18: N/A
NOTE 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.
NOTE 20: N/A
NOTE 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
NOTE 22: This requirement is applicable for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
For carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.
NOTE 23: This requirement is applicable only for the following cases:
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 902.5 MHz ≤ $F_c$ < 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency ($F_c$) is within the range 907.5 MHz ≤ $F_c$ ≤ 912.5 MHz without any restriction on uplink transmission bandwidth.
- for carriers of 10 MHz channel bandwidth when carrier centre frequency ($F_c$) is $F_c$ = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start}$ > 3.
NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).
NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.
NOTE 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink

transmission bandwidth less than or equal to 54 RB.
NOTE 28: N/A
NOTE 29: N/A
NOTE 30: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz
NOTE 31: N/A
NOTE 32: Void
NOTE 33: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.
NOTE 34: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart<48.
NOTE 35: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.
NOTE 36: This requirement is applicable for E-UTRA channel bandwidth allocated within 1920-1980 MHz.
NOTE 37: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980MHz.
NOTE 38: Applicable when NS_XX is configured by the pre-configured radio parameters.
NOTE 39: Applicable only when the assigned E-UTRA carrier is confined within 824 MHz and 849 MHz for UE category M1, M2 and UE category NB1 and NB2.
NOTE 40: In the frequency range x-5950MHz, SE requirement of -30dBm/MHz should be applied; where x = max (5925, fc + 15), where fc is the channel centre frequency.

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.3.2.

## 6.6.3G.1_1.4 Test description

### 6.6.3G.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2G. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.3G.1_1.4.1-1 the details of the V2X reference measurement channels (RMCs) are specified in sub-clause A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.6.3G.1_1.4.1-1: Test Configuration for V2X sidelink transmission**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment<br>(as specified in TS 36.508 [7] subclause 4.1) | | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies<br>(as specified in TS36.508 [7] subclause 4.3.1) | | Low range, Mid range, High range |
| Test Channel Bandwidths<br>(as specified in subclause 5.4.2G) | | Lowest, Mid, Highest |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X sidelink transmission** | |
| Ch BW | Mod'n | RB Allocation |
| 10MHz | QPSK | 1 |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 1 |
| 20MHz | QPSK | 96 |
| Note 1: Test Channel Bandwidths are checked separately for operating bands for V2X sidelink communication specified in 5. 2G.<br>Note 2: The 1 RB allocation shall be tested at both RB #0 and RB #max.<br>Note 3: In case test frequency is operating on Band 47, NS_33 or NS_34 and no NS_XX indication shall be tested respectively. | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508[7] Figure A.92.

2. The parameter settings for the V2X sidelink transmission over PC5 for both SS and UE are pre-configured according to TS 36.508 [7] subclause 4.10.1 with the exception specified in clause 6.6.3G.1_1.4.3-1.

3. The V2X reference measurement channel is set according to Table 6.6.3G.1_1.4.1-1

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0;

6. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.6.3G.1_1.4.2 Test procedure

TP1: General requirement, applicable to test frequency operating on Band 47 without NS_33 or NS_34 signalled

1. The V2X UE schedules the V2X RMC with transmission power at $P_{UMAX}$ level (UE should be already transmitting $P_{UMAX}$ after Initial Conditions setting following the message contents for TP1) according to *SL-V2X-Preconfiguration* which is in line with the test configuration in Table 6.6.3G.1_1.4.1-1;

2. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.3G.1_1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3G.1_1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

TP2: Additional requirement applicable to test frequency operating on Band 47 with NS_33 or NS_34 signalled

1. The V2X UE schedules the V2X RMC with transmission power at PUMAX level (UE should be already transmitting PUMAX after Initial Conditions setting following the message contents for TP2) according to SL-V2X-Preconfiguration which is in line with the test configuration in Table 6.6.3G.1_1.4.1-1;

2. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.3G.1_1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3G.1_1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

### 6.6.3G.1_1.4.3 Message contents

For TP1: Refer to clause 6.6.3G.1.4.3.

For TP2: Refer to clause 6.6.3G.1.4.3 with the exception specified in Table 6.6.3G.1_1.4.3-1.

**Table 6.6.3G.1_1.4.3-1: SL-V2X-Preconfiguration-r14**

| Derivation Path: 36.521 Table 6.6.3G.1.4.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-Preconfiguration-r14 ::= SEQUENCE { | | | |
| v2x-PreconfigFreqList-r14 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | One entry of v2x-PreconfigFreqInfo | | |
| SL-V2X-PreconfigFreqInfo-r14 [1] ::= SEQUENCE { | | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | | |
| maxTxPower-r12 | 23 | When NS_33 or NS_34 is signalled, the max tx power is restricted to 23dBm | |
| additionalSpectrumEmission-v1440 | 33 | NS_33 | Power class3 |
| | 34 | NS_34 | Power class2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

## 6.6.3G.1_1.5 Test requirement

The measured average power of spurious emission, derived in step 2, shall not exceed the described value in table 6.6.3G.1_1.5-1 for the operating bands for V2X sidelink communication specified in 5.2G.

**Table 6.6.3G.1_1.5-1: Spurious emission band UE co-existence limits Rel-14(TP2)**

| E-UTRA Band | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Protected band** | **Frequency range (MHz)** | | | **Maximum Level (dBm)** | **MBW (MHz)** | **NOTE** |
| 47 | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 65,68 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 5925 | - | 5950 | -30 | 1 | 38, 40 |
| | Frequency range | 5815 | - | 5855 | -30 | 1 | 38 |
| | | | | | | | |
| NOTE 38: Applicable when NS_XX is configured by the pre-configured radio parameters.<br>NOTE 40: In the frequency range x-5950MHz, SE requirement of -30dBm/MHz should be applied; where x = max (5925, fc + 15), where fc is the channel centre frequency. | | | | | | | |

## 6.6.3G.2 Spurious emission for V2X Communication / Sidelink simultaneous with E-UTRA uplink transmissions

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- TT statement is TBD.

### 6.6.3G.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions in case of simultaneous V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X/E-UTRAN bands specified in 36.101 [2] subclause 5.5G-2.

### 6.6.3G.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that supports V2X communication and is capable of V2X sidelink communication simultaneous with E-UTRA uplink/downlink.

### 6.6.3G.2.3 Minimum conformance requirements

In this specification the Minimum Requirements are specified as general requirements and additional requirements. Where the Requirement is specified as a general requirement, the requirement is mandated to be met in all scenarios

In terms of general spurious emission requirement, refer to clauses 6.6.3.1.3 for single carrier and 6.6.3.1A.0.

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in 36.101 [2] Table 5.5G-2, the transmitter spurious emission limit in the table 6.6.3G.2.3-2 apply for the frequency ranges more than $F_{OOB}$ listed in table 6.6.3G.2.3-1 from the edge of the transmission bandwidth as specified for the corresponding inter-band con-current operation with uplink assigned to two bands.

**Table 6.6.3G.2.3-1: Boundary between E-UTRA out of band and spurious emission domain**

| Channel bandwidth | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
|---|---|---|---|---|---|---|
| OOB boundary $F_{OOB}$ (MHz) | 2.8 | 6 | 10 | 15 | 20 | 25 |

**Table 6.6.3G.2.3-2: Spurious emissions limits**

| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26GHz | -30dBm | 1MHz | 2 |
| NOTE 1: Applies for Band 22, Band 42, Band 43 and Band 48.<br>NOTE 2: Applies for Band 46 and Band 47. | | | |

The normative reference for this requirement is TS 36.101 [2] subclause 4.2, 4.3A and 6.6.3G.

### 6.6.3G.2.4 Test description

#### 6.6.3G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on Inter-band con-current V2X configurations specified in table clauses 5.2G and 5.4.2G. All of these configurations shall be tested with applicable test parameters for each V2X con-current band Configuration, and are shown in table 6.6.3G.2.4.1-1. The details of the uplink and V2X reference measurement channels (RMCs) are specified in sub-clause A.2 and A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.6.3G.2.4.1-1 Test Configuration**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low range for E-UTRA link and V2X sidelink,<br>High range for E-UTRA link and V2X sidelink | | |
| Test Channel Bandwidth combination sets as specified in table 5.4.2G.1-2 | | | Lowest of E-UTRA link and V2X sidelink bandwidth<br>Highest of E-UTRA link and V2X sidelink bandwidth | | |
| Test Parameters configurations for simultaneous V2X sidelink and E-UTRA uplink | | | | | |
| **E-UTRA Uplink and V2X Sidelink Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | |
| E-UTRA Uplink $N_{RB}$ | E-UTRA V2X Sidelink $N_{RB}$ | E-UTRA Downlink RB allocation | | E-UTRA Uplink RB allocation($L_{CRB}$ @ $RB_{start}$) | E-UTRA V2X Sidelink RB allocation($L_{CRB}$ @ $RB_{start}$) |
| 6 | 50 | N/A | QPSK | 1@0 | 1@0 |
| 6 | 50 | | QPSK | 1@5 | 1@49 |
| 6 | 50 | | QPSK | 6@0 | 50@0 |
| 6 | 100 | | QPSK | 1@0 | 1@0 |
| 6 | 100 | | QPSK | 1@5 | 1@99 |
| 6 | 100 | | QPSK | 6@0 | 100@0 |
| 15 | 50 | | QPSK | 1@0 | 1@0 |
| 15 | 50 | | QPSK | 1@14 | 1@49 |
| 15 | 50 | | QPSK | 15@0 | 50@0 |
| 15 | 100 | | QPSK | 1@0 | 1@0 |
| 15 | 100 | | QPSK | 1@14 | 1@99 |
| 15 | 100 | | QPSK | 15@0 | 100@0 |
| 25 | 50 | | QPSK | 1@0 | 1@0 |
| 25 | 50 | | QPSK | 1@24 | 1@49 |
| 25 | 50 | | QPSK | 25@0 | 50@0 |
| 25 | 100 | | QPSK | 1@0 | 1@0 |
| 25 | 100 | | QPSK | 1@24 | 1@99 |
| 25 | 100 | | QPSK | 25@0 | 100@0 |
| 50 | 50 | | QPSK | 1@0 | 1@0 |
| 50 | 50 | | QPSK | 1@49 | 1@49 |
| 50 | 50 | | QPSK | 50@0 | 50@0 |
| 50 | 100 | | QPSK | 1@0 | 1@0 |
| 50 | 100 | | QPSK | 1@49 | 1@99 |
| 50 | 100 | | QPSK | 50@0 | 100@0 |
| 75 | 50 | | QPSK | 1@0 | 1@0 |
| 75 | 50 | | QPSK | 1@74 | 1@49 |
| 75 | 50 | | QPSK | 75@0 | 50@0 |
| 75 | 100 | | QPSK | 1@0 | 1@0 |
| 75 | 100 | | QPSK | 1@74 | 1@99 |
| 75 | 100 | | QPSK | 75@0 | 100@0 |
| 100 | 50 | | QPSK | 1@0 | 1@0 |

| | | | | | |
|---|---|---|---|---|---|
| 100 | 50 | | QPSK | 1@99 | 1@49 |
| 100 | 50 | | QPSK | 100@0 | 50@0 |
| 100 | 100 | | QPSK | 1@0 | 1@0 |
| 100 | 100 | | QPSK | 1@99 | 1@99 |
| 100 | 100 | | QPSK | 100@0 | 100@0 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.6.3G.2.4.3
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to table 6.6.3G.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in the state 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C.

#### 6.6.3G.2.4.2 Test procedure

1. SS sends RRC reconfiguration message specified in clause 6.6.3G.2.4.3 to enable PSCCH and PSSCH transmission at the $P_{UMAX}$ level.
2. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.6.3G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends MAC padding bits on the UL and V2X RMCs.
3. SS sends continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at $P_{UMAX}$ level..
4. Measure the power of the transmitted signal for E-UTRA uplink with a measurement filter of bandwidths according to table 6.6.3G.2.5-1, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.
5. Measure the power of the transmitted signal for V2X sidelink with a measurement filter of bandwidths according to table 6.6.3G.2.5-1, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

#### 6.6.3G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.6.3G.2.5 Test requirement

For frequencies $\Delta f_{OOB}$ greater than $F_{OOB}$ as specified in Table 6.6.3G.2.3-1 the measured average power of spurious emission, derived in step 4 and 5, shall not exceed the described value in Table 6.6.3G.2.5-1.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3G.2.5-1: Spurious emissions limits**

| Frequency Range | Maximum Level | Measurement Bandwidth | Notes |
|---|---|---|---|
| **Test requirements for V2X_3A-47A Configuration** | | | |
| 2285 MHz ≤ f ≤ 2505 MHz<br>4070 MHz ≤ f ≤ 4215 MHz<br>7565 MHz ≤ f ≤ 7710 MHz<br>9275 MHz ≤ f ≤ 9495 MHz<br>9925 MHz ≤ f ≤ 10140 MHz | -30 dBm | 1 MHz | |
| 13420 MHz ≤ f ≤13635 MHz | -30 dBm | 1 MHz | 2 |
| **Test requirements for V2X_5A-47A Configuration** | | | |
| 4157 MHz<=f< 4277 MHz<br>5006 MHz<=f< 5101 MHz<br>6679 MHz<=f< 6774 MHz<br>7503 MHz<=f< 7623 MHz<br>10861 MHz<=f< 11026 MHz<br>12534 MHz<=f< 12699 MHz | -30 dBm | 1 MHz | |
| **Test requirements for V2X_7A-47A Configuration** | | | |
| 715 MHz<=f< 925 MHz | -36 dBm | 100 kHz | |
| 3285 MHz<=f< 3425 MHz<br>8355 MHz<=f< 8495 MHz<br>9140 MHz<=f< 9350 MHz<br>10855 MHz<=f< 11065 MHz | -30 dBm | 1 MHz | |
| 14210 MHz<=f< 14420 MHz | -30 dBm | 1 MHz | 2 |
| **Test requirements for V2X_8A-47A Configuration** | | | |
| 4025 MHz<=f< 4165 MHz<br>4940 MHz<=f< 5045 MHz<br>6735 MHz<=f< 6840 MHz<br>7615 MHz<=f< 7755 MHz<br>10795 MHz<=f< 10970 MHz<br>12590 MHz<=f< 12765 MHz | -30 dBm | 1 MHz | |
| 12590 MHz<=f< 12765 MHz | -30 dBm | 1 MHz | 2 |
| **Test requirements for V2X_20A-47A Configuration** | | | |
| 4131 MHz<=f< 4261 MHz<br>4993 MHz<=f< 5093 MHz<br>6687 MHz<=f< 6787 MHz<br>7519 MHz<=f< 7649 MHz<br>10848 MHz<=f< 11018 MHz<br>12542 MHz<=f< 12712 MHz | -30 dBm | 1 MHz | |
| **Test requirements for V2X_28A-47A Configuration** | | | |
| 4359 MHz<=f< 4519 MHz<br>5107 MHz<=f< 5222 MHz<br>6558 MHz<=f< 6673 MHz<br>7261 MHz<=f< 7421 MHz<br>10962 MHz<=f< 11147 MHz<br>12413 MHz<=f< 12598 MHz | -30 dBm | 1 MHz | |
| **Test requirements for V2X_34A-47A Configuration** | | | |
| 1805 MHz<=f< 1905 MHz<br>3830 MHz<=f< 3915 MHz<br>7865 MHz<=f< 7950 MHz<br>9685 MHz<=f< 9840 MHz<br>9875 MHz<=f< 9975 MHz | -30 dBm | 1 MHz | |
| 13720 MHz<=f< 13875 MHz | -30 dBm | 1 MHz | 2 |
| **Test requirements for V2X_39A-47A Configuration** | | | |
| 2015 MHz<=f< 2165 MHz<br>3935 MHz<=f< 4045 MHz<br>7735 MHz<=f< 7845 MHz<br>9615 MHz<=f< 9765 MHz<br>9790 MHz<=f< 9970 MHz | -30 dBm | 1 MHz | |
| 13590 MHz<=f< 13770 MHz | -30 dBm | 1 MHz | 2 |
| **Test requirements for V2X_41A-47A Configuration** | | | |
| 475 MHz<=f< 933 MHz | -36 dBm | 100 kHz | |
| 3165 MHz<=f< 3429 MHz<br>8351 MHz<=f< 8615 MHz<br>9020 MHz<=f< 9354 MHz | -30 dBm | 1 MHz | |

| | | | |
|---|---|---|---|
| 10847 MHz<=f< 11305 MHz | | | |
| 14206 MHz<=f< 14540 MHz | -30 dBm | 1 MHz | 2 |
| **Test requirements for V2X_71A-47A Configuration** | | | |
| 4459 MHz<=f< 4599 MHz<br>5157 MHz<=f< 5262 MHz<br>6518 MHz<=f< 6623 MHz<br>7181 MHz<=f< 7321 MHz<br>11012 MHz<=f< 11187 MHz<br>12373 MHz<=f< 12548 MHz | -30 dBm | 1 MHz | |

## 6.6.3G.2_1 Spurious emission band UE co-existence for V2X Communication / Sidelink simultaneous with E-UTRA uplink transmissions

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- The specific test requirement for each inter-band con-current V2X configuration is FFS.
- The specific configuration for each inter-band con-current V2X configuration is TBD.

### 6.6.3G.2_1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions band UE co-existence in case of simultaneous V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X/E-UTRAN bands specified in 36.101 [2] subclause 5.5G-2.

### 6.6.3G.2_1.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that supports V2X communication and is capable of V2X sidelink communication simultaneous with E-UTRA uplink/downlink.

### 6.6.3G.2_1.3 Minimum conformance requirements

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in 36.101 [2] Table 5.5G-2, the UE-coexistence requirements in Table 6.6.3G.2_1.3-1 apply as specified for the corresponding inter-band con-current operation with uplink assigned to two bands.

**Table 6.6.3G.2_1.3-1: Requirements for inter-band con-current V2X operation**

| V2X con-current band Configuration | Spurious emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| V2X_3A-47A | E-UTRA Band 1, 5, 7, 8, 26, 28, 34, 39, 40, 44, 45, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 3 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 22, 41, 42, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 5925 | - | 5950 | -30 | 1 | 7,8 |
| | Frequency range | 5815 | - | 5855 | -30 | 1 | 7 |
| V2X_5A-47A | E-UTRA Band 1, 3, 5, 7, 8, 10, 12, 13, 14, 17, 40, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 26 | 859 | - | 869 | -27 | 1 | |
| | E-UTRA Band 41, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 5925 | - | 5950 | -30 | 1 | 7, 8 |
| | Frequency range | 5815 | - | 5855 | -30 | 1 | 7 |
| V2X_7A-47A | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 52, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 3, 6, 4 |
| | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 3, 6, 4 |
| | Frequency range | 2595 | - | 2620 | -40 | 1 | 3, 6 |
| | Frequency range | 5925 | - | 5950 | -30 | 1 | 7, 8 |
| | Frequency range | 5815 | - | 5855 | -30 | 1 | 7 |
| V2X_8A-47A | E-UTRA Band 1, 5, 26, 28, 34, 39, 40, 44, 45, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 7, 22, 41, 42, 52 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 3, 8 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2, 3 |
| | Frequency range | 5925 | - | 5950 | -30 | 1 | 7, 8 |
| | Frequency range | 5815 | - | 5855 | -30 | 1 | 7 |
| V2X_20A-47A | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 65, 67 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 20 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 3 |
| | E-UTRA Band 38, 42, 52, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 758 | - | 788 | -50 | 1 | |
| | Frequency range | 5925 | - | 5950 | -30 | 1 | 7, 8 |
| | Frequency range | 5815 | - | 5855 | -30 | 1 | 7 |
| V2X_28A-47A | E-UTRA Band 1, 22, 42, 43, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | E-UTRA Band 1 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 10, 11 |
| | E-UTRA Band 3, 7, 8, 20, 31, 38, 40 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 470 | - | 694 | -42 | 8 | 3, 12 |
| | Frequency range | 470 | - | 710 | -26.2 | 6 | 13 |
| | Frequency range | 662 | - | 694 | -26.2 | 6 | 3 |
| | Frequency range | 758 | - | 773 | -32 | 1 | 3 |
| | Frequency range | 773 | - | 803 | -50 | 1 | |
| | Frequency range | 5925 | - | 5950 | -30 | 1 | 7, 8 |
| | Frequency range | 5815 | - | 5855 | -30 | 1 | 7 |
| V2X_34A-47A | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 34, 38,39, 40, 41, 42, 43, 44, 45, 52, 65, 67, 69 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 9 |
| | Frequency range | 5925 | - | 5950 | -30 | 1 | 7, 8 |
| | Frequency range | 5815 | - | 5855 | -30 | 1 | 7 |
| V2X_39A-47A | E-UTRA Band 1, 3,5,7,8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 52, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | Frequency range | 1805 | - | 1855 | [-40] | 1 | 5 |
| | Frequency range | 1855 | - | 1880 | [-15.5] | 5 | 3, 4, 5 |
| | Frequency range | 5925 | - | 5950 | -30 | 1 | 7, 8 |
| | Frequency range | 5815 | - | 5855 | -30 | 1 | 7 |
| V2X_41A-47A | E-UTRA Band 1, 3, 5, 7, 8, 22, | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 26, 28, 34, 39, 40, 41, 42, 44, 45, 52, 65 | | | | | | |
| | Frequency range | 5925 | - | 5950 | -30 | 1 | 7, 8 |
| | Frequency range | 5815 | - | 5855 | -30 | 1 | 7 |
| V2X_71A-47A | E-UTRA Band 5, 26 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |
| | E-UTRA Band 41 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | 2 |
| | Frequency range | 5925 | - | 5950 | -30 | 1 | 7, 8 |
| | Frequency range | 5815 | - | 5855 | -30 | 1 | 7 |

NOTE 1: $F_{DL_low}$ and $F_{DL_high}$ refer to each E-UTRA frequency band specified in 36.101 [2] Table 5.5-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in 36.101 [2] Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. In case the exceptions are allowed due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x $L_{CRB}$ x 180kHz), where N is 2, 3 or 4 for the 2nd, 3rd or 4th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

NOTE 3: These requirements also apply for the frequency ranges that are less than $F_{OOB}$ (MHz) in 36.101 [2] Table 6.6.3.1-1 and 36.101 [2] Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

NOTE 4: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

NOTE 5: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.

NOTE 6: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see 36.101 [2] Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).

NOTE 7: Applicable when NS_33 or NS_34 is configured by the pre-configured radio parameters.

NOTE 8: In the frequency range x-5950MHz, SE requirement of -30dBm/MHz should be applied; where x = max (5925, fc + 15), where fc is the channel centre frequency.

NOTE 9: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band

The normative reference for this requirement is TS 36.101 [2] subclauses 4.3A, 6.6.3, and 6.6.3G.

## 6.6.3G.2_1.4 Test description

### 6.6.3G.2_1.4.1 Initial conditions

Refer to the subclause 6.6.3G.2.4.1 with the following exceptions:

Instead of Table 6.6.3G.2.4.1-1 → use of Table 6.6.3G.2_1.4.1-1

**Table 6.6.3G.2_1.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. |
| Test Inter-band con-current V2X bandwidth combination sets as specified in Table 5.4.2G.1-2 for the Inter-band con-current V2X configuration across bandwidth combination sets supported by the UE. | Refer to “Uplink CC NRB”and “Sidelink CC NRB ” columns |

| Test Parameters for Inter-band con-current V2X Configurations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | Inter-band con-current V2X Configuration / $N_{RB_agg}$ | | | | Uplink CC $N_{RB}$ | Sidelink CC $N_{RB}$ | DL Allocation | | | UL and SL Allocation (Note 2,3) | |
| | Inter-band con-current V2X Configuration | | | | | | CC MOD | Uplink CC & Sidelink CC RB allocation | | CC MOD | Uplink CC & Sidelink CC RB allocations ($L_{CRB}$ @ $RB_{start}$) |
| | Uplink CC | | Sidelink CC | | | | | Uplink CC | Sidelink CC | | |
| | Band | Range | Band | Range | | | | | | | |
| Default Test Settings for a Inter-band con-current V2X _XA-YA Configuration | | | | | | | | | | | |
| 1 | X | Low | Y | Low | Highest $N_{RB}$ | Highest $N_{RB}$ | QPSK | NA | QPSK | 1@0 | 1@0 |
| 2 | X | High | Y | High | Highest $N_{RB}$ | Highest $N_{RB}$ | QPSK | NA | QPSK | 1@$RB_{max}$ | 1@$RB_{max}$ |
| Test settings for V2X_3A_47A Configuration | | | | | | | | | | | |
| 1 | 3 | Low | 47 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@0 |
| 2 | 3 | High | 47 | High | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |
| 3 | 3 | Low | 47 | High | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@99 |
| Test settings for V2X_5A_47A Configuration | | | | | | | | | | | |
| 1 | 5 | Low | 47 | Low | 50 | 100 | QPSK | NA | QPSK | 1@0 | 1@0 |
| 2 | 5 | High | 47 | High | 50 | 100 | QPSK | NA | QPSK | 1@49 | 1@99 |
| Test settings for V2X_5A_47A Configuration | | | | | | | | | | | |
| 1 | 71 | Low | 47 | Low | 100 | 100 | QPSK | NA | QPSK | 1@0 | 1@0 |
| 2 | 71 | High | 47 | High | 100 | 100 | QPSK | NA | QPSK | 1@99 | 1@99 |

Note 1: Test Inter-band con-current V2X bandwidths combination sets are checked separately for each Inter-band con-current V2X Configuration.
Note 2: Use Inter-band con-current V2X Configuration – specific test points if present in the table. Otherwise use the Default Test Settings test points.
Note 3: X,Y correspond to the different bands in the Inter-band con-current V2X Configuration. E.g. for V2X_3A-47A,X=3,Y=47.

### 6.6.3G.2_1.4.2 Test procedure

Same as the subclause 6.6.3G.2.4.2, with the following exceptions:

Instead of Table 6.6.3G.2.5-1 → use Table [6.6.3G.2_1.5-1]

### 6.6.3G.2_1.4.3 Message contents

Refer to the subclause 6.6.3G.2.4.3

## 6.6.3G.2_1.5 Test requirement

The measurement average power of spurious emission, derived in step 4 and 5, shall not exceed the described value [FFS].

## 6.6.3G.2_2 Additional Spurious emission band UE co-existence for V2X Communication / Sidelink simultaneous with E-UTRA uplink transmissions

### 6.6.3G.2_2.1 Test purpose

Same test purpose as specified in clause 6.6.3G.2_1.1

### 6.6.3G.2_2.2 Test applicability

Same test applicability as specified in clause 6.6.3G. 2_1.2

### 6.6.3G.2_2.3 Minimum conformance requirements

Same minimum conformance requirements as specified in clause 6.6.3G. 2_1.3

### 6.6.3G.2_2.4 Test description

#### 6.6.3G.2_2.4.1 Initial conditions

Refer to the subclause 6.6.3G.2.4 with the following exceptions:

Instead of Table 6.6.3G.2.4.1-1 → use of Table 6.6.3G.2_2.4.1-1 for additional spurious emission requirements test;

**Table 6.6.3G.2_2.4.1-1: Test Configuration Table for Additional Spurious Emission Requirements**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different operating bands. | For test frequencies refer to "Range" columns. |
| Test Inter-band con-current V2X bandwidth combination sets as specified in Table 5.4.2G.1-2 for the Inter-band con-current V2X configuration across bandwidth combination sets supported by the UE. | Refer to "Uplink CC $N_{RB}$" and "Sidelink CC $N_{RB}$ " columns |

| Test Parameters for Inter-band con-current V2X Configurations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ID** | **Inter-band con-current V2X Configuration / $N_{RB_agg}$** | | | | **Uplink CC $N_{RB}$** | **Sidelink CC $N_{RB}$** | **DL Allocation** | | **UL and SL Allocation (Note 2,3)** | | |
| | **Inter-band con-current V2X Configuration** | | | | | | **CC MOD** | **Uplink CC & Sidelink CC RB allocation** | **CC MOD** | **Uplink CC & Sidelink CC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| | **Uplink CC** | | **Sidelink CC** | | | | | **Uplink CC** | **Sidelink CC** | | |
| | **Band** | **Range** | **Band** | **Range** | | | | | | | |
| **Default Test Settings for a Inter-band con-current V2X _XA-YA Configuration** | | | | | | | | | | | |
| **1** | X | Low | Y | Low | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | X | High | Y | High | 100 | 50 | QPSK | NA | QPSK | 1@$RB_{max}$ | 1@$RB_{max}$ |
| Test settings for V2X_3A_47A Configuration | | | | | | | | | | | |
| **1** | 3 | Low | 47 | Low | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 3 | High | 47 | High | 100 | 50 | QPSK | NA | QPSK | 1@99 | 1@49 |
| Test settings for V2X_5A_47A Configuration | | | | | | | | | | | |
| **1** | 5 | Low | 47 | Low | 50 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 5 | High | 47 | High | 50 | 50 | QPSK | NA | QPSK | 1@49 | 1@49 |
| Test settings for V2X_71A_47A Configuration | | | | | | | | | | | |
| **1** | 71 | Low | 47 | Low | 100 | 50 | QPSK | NA | QPSK | 1@0 | 1@0 |
| **2** | 71 | High | 47 | High | 100 | 50 | QPSK | NA | QPSK | 1@99 | 1@49 |

Note 1: Test Inter-band con-current V2X bandwidths combination sets are checked separately for each Inter-band con-current V2X Configuration.
Note 2: Use Inter-band con-current V2X Configuration – specific test points if present in the table. Otherwise use the Default Test Settings test points.
Note 3: X,Y correspond to the different bands in the Inter-band con-current V2X Configuration. E.g. for V2X_3A-47A,X=3,Y=47.

### 6.6.3G.2_2.4.2 Test procedure

Same as the subclause 6.6.3G.2.4.2, with the following exceptions:

Instead of Table 6.6.3G.2.5-1 → use Table [6.6.3G.2_2.5-1]

### 6.6.3G.2_2.4.3 Message contents

Refer to the subclause 6.2.4G.2.4.3.

## 6.6.3G.2_2.5 Test requirement

The measurement average power of spurious emission, derived in step 4 and 5, shall not exceed the described value [FFS].

## 6.6.3G.3 Spurious emission for V2X Communication / Intra-band contiguous MCC operation

### 6.6.3G.3.1 Test purpose

To verify that transmitter of UE that support V2X MCC operation does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

### 6.6.3G.3.2 Test applicability

This test case applies to UE which support Intra-band contiguous multi-carrier operation V2X Sidelink communication and Band 47.

### 6.6.3G.3.3 Minimum conformance requirements

For intra-band contiguous carrier aggregation the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Table 6.6.3G.3.3-1from the edge of the aggregated channel bandwidth (Table 5.6A-1). For frequencies ΔfOOB greater than FOOB the spurious emission requirements in Table 6.6.3G.3.3-2 are applicable.

**Table 6.6.3G.3.3-1: Boundary between E-UTRA out of band and spurious emission domain for intra-band contiguous carrier aggregation**

| CA Bandwidth Class | OOB boundary $F_{OOB}$ (MHz) |
|---|---|
| A | Table 6.6.3.1.3-1 |
| B | $BW_{Channel_CA}$ + 5 |
| C | $BW_{Channel_CA}$ + 5 |

**Table 6.6.3G.3.3-2: Spurious emissions limits**

| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
|---|---|---|---|
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz | |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz | |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz | |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26GHz | -30dBm | 1MHz | 2 |
| NOTE 1: Applies for Band 22, Band 42, Band 43 and Band 48.<br>NOTE 2: Applies for Band 46 and Band 47. | | | |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.3G.

### 6.6.3G.3.4 Test description

#### 6.6.3G.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2G. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.3G.3.4.1-1 the details of the V2X reference measurement channels (RMCs) are specified in sub-clause A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.6.3G.3.4.1-1: Test Configuration for V2X sidelink transmission**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low range, High range | | | |
| Test Channel Bandwidths as specified in subclause 5.4.2G | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | |
| **Test Parameters for V2X MCC Configuration** | | | | | | |
| **V2X MCC Channel Bandwidth** | | | **V2X Sidelink Configuration** | | | |
| **Configuration ID** | **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **$N_{RB_agg}$** | **CC1 and CC2 RB Allocation (LCRB @ RBstart)** | |
| 1 | 50 | 50 | QPSK | 48 | CC1_48@0 | CC2_0@0 |
| 2 | 50 | 50 | QPSK | 1 | CC1_1@0 | CC2_0@0 |
| 3 | 50 | 50 | QPSK | 1 | CC1_1@49 | CC2_0@0 |
| 4 | 50 | 50 | QPSK | 2 | CC1_1@0 | CC2_1@49 |
| 5 | 50 | 50 | QPSK | 96 | CC1_48@0 | CC2_48@2 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Figure A.89a.

2. Propagation conditions are set according to Annex B.0

3. Set the V2X sidelink communication parameters for both the V2X sidelink capable UE (hereinafter referred to as V2X UE) and SS according to SL-V2X-Preconfiguration in TS36.508 [7] subclause Table 6.8.2.1-1A with the exception specified in table 6.6.3G.3.4.3-1;

3a The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. Ensure the UE is in Side link State 5A-V2X in Transmit Mode, according to TS 36.508 [7] clause 4.5.9. Message contents are defined in clause 6.6.3G.3.4.3.

5. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.6.3G.3.4.2 Test procedure

1. The V2X UE schedules the V2X RMC with transmission power at $P_{UMAX}$ level according to *SL-V2X-Preconfiguration* which is in line with the test configuration in Table 6.6.3G.3.4.1-1;

2. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.3G.3.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3G.3.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

### 6.6.3G.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with following exceptions.

**Table 6.6.3G.3.4.3-1: SL-V2X-PreconfigFreqInfo-r14-DEFAULT for CC1 & CC2**

| Derivation Path: 36.331 clause 9.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-Preconfiguration-r14 ::= SEQUENCE { | | | |
| v2x-PreconfigFreqList-r14 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE { | One entry of v2x-PreconfigFreqInfo | | |
| v2x-CommPreconfigGeneral-r14 SEQUENCE { | | SL-PreconfigGeneral-r12 | |
| maxTxPower-r12 | 23 | | Power class3 |
| sl-bandwidth-r12 | n50 | 10Mhz | |
| } | | | |
| } | | | |
| v2x-CommPreconfigSync-r14 SEQUENCE { | | SL-PreconfigSync-r12 | |
| syncOffsetIndicators-r14 SEQUENCE { | | | |
| syncOffsetIndicator1-r14 | Not Present | Double synchronization signal transmission | |
| } | | | |
| } | | | |
| v2x-CommRxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-RxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | 1 entry | | |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14-DEFAULT using condition BITMAP_6 and exception listed in Table 6.6.3G.3.4.3-2 | | |
| } | | | |
| v2x-CommTxPoolList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-PreconfigCommPool-r14 { | | | |
| SL-V2X-PreconfigCommPool-r14[1] | SL-V2X-PreconfigCommPool-r14-DEFAULT using condition BITMAP_6 and exception listed in Table 6.6.3G.3.4.3-2 | | |
| } | | | |
| } | | | |

**Table 6.6.3G.3.4.3-2: SL-V2X-PreconfigCommPool-r14-DEFAULT**

| Derivation Path: 36.331 clause 6.3.8 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-CommResroucePoolV2X-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-Subframe-r14 CHOICE { | | | |
| bs20-r14 | 11111111111111111111 | | BITMAP_6 |
| } | | | |
| sizeSubchannel-r14 | As required in Table 6.6.3G.3.4.1-1 | | BW10 |
| numSubchannel-r14 | n1 | | |
| dataTxParameters-r14 SEQUENCE { | | | |
| p0-r12 | 31 | It's set to the maximum value to disable its effect on transmission power | PSSCH+PSCCH TP1, PSSCH+PSCCH TP2, PSSCH+PSCCH TP3 |
| } | | | |
| syncAllowed-r14 ::= SEQUENCE { | | | |
| gnss-Sync-r14 | True | The resource of CC1 can be used if the UE is directly or indirectly synchronized to GNSS | CC with LCRB >0 |
| enb-Sync-r14 | True | The resource of CC1 can be used if the UE is directly or indirectly synchronized to enb | CC with LCRB =0 |
| } | | | |
| } | | | |

### 6.6.3G.3.5 Test requirement

The measured average power of transmitter spurious emissions measured in step2 shall not exceed the value in table 6.6.3G.3.3-1.The spurious emission limits apply for the frequency ranges that are more than $\Delta f_{OOB}$ (MHz) from the edge of the channel bandwidth shown in Table 6.6.3G.3.3-2.

## 6.6.3G.3_1 Spurious emission band UE co-existence for V2X Communication / Intra-band contiguous MCC operation

### 6.6.3G.3_1.1 Test purpose

To verify that V2X UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions, when UE is configured for E-UTRA V2X sidelink transmissions with Intra-band contiguous MCC operation.

### 6.6.3G.3_1.2 Test Applicability

This test case applies to UE which support Intra-band contiguous multi-carrier operation V2X Sidelink communication and Band 47.

### 6.6.3G.3_1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions with Intra-band contiguous MCC operation, for intra-band contiguous multi-carrier operation, the spurious emission requirements in Table 6.6.3G.3_1.3-1 shall apply for coexistence with protected bands.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

**Table 6.6.3G.3_1.3-1: Requirements for intraband multi-carrier V2X operation**

| V2X multi-carrier Configuration | Spurious emission | | | | | |
|---|---|---|---|---|---|---|
| | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| V2X_47B | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 65 | $F_{DL_low}$ | - | $F_{DL_high}$ | -50 | 1 | |

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.3G.

## 6.6.3G.3_1.4 Test Description

### 6.6.3G.3_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2G. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.3G.3_1.4.1-1 the details of the V2X reference measurement channels (RMCs) are specified in sub-clause A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.6.3G.3_1.4-1: Test Configuration for V2X sidelink transmission**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Low range, High range | | | | | |
| Test Channel Bandwidths as specified in subclause 5.4.2G | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | | | |
| **Test Parameters for V2X MCC Configuration** | | | | | | |
| **V2X MCC Channel Bandwidth** | | | **V2X Sidelink Configuration** | | | |
| **Configuration ID** | **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **$N_{RB_agg}$** | **CC1 and CC2 RB Allocation (LCRB @ RBstart)** | |
| 1 | 50 | 50 | QPSK | 48 | CC1_48@0 | CC2_0@0 |
| 2 | 50 | 50 | QPSK | 1 | CC1_1@0 | CC2_0@0 |
| 3 | 50 | 50 | QPSK | 1 | CC1_1@49 | CC2_0@0 |
| 4 | 50 | 50 | QPSK | 2 | CC1_1@0 | CC2_1@49 |
| 5 | 50 | 50 | QPSK | 96 | CC1_48@0 | CC2_48@49 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 36.508 [7] Figure A.89a.

2. Propagation conditions are set according to Annex B.0

3. Set the V2X sidelink communication parameters for both the V2X sidelink capable UE (hereinafter referred to as V2X UE) and SS according to SL-V2X-Preconfiguration in TS36.508 [7] subclause Table [6.8.2.1-1A] with the exception specified in subclause 6.6.3G.3_1.4.3.

3a The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. Ensure the UE is in Side link State 5A-V2X, according to TS 36.508 [7] clause 4.5.9.

5. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 6.6.3G.3_1.4.2 Test procedure

1. The V2X UE schedules the V2X RMC with transmission power at $P_{UMAX}$ level according to *SL-V2X-Preconfiguration* which is in line with the test configuration in Table 6.6.3G.3_1.4.1-1;

2. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.3G.3_1.4-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.6.3G.3_1.4-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

#### 6.6.3G.3_1.4.3 Message contents

The message contents are the same as in clause 6.6.3G.3.4.3

### 6.6.3G.3_1.5 Test requirement

The measured average power of transmitter spurious emissions measured in step2 shall not exceed the value in table 6.6.3G.3_1.3-1.

# 6.7 Transmit intermodulation

## 6.7.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement.

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

## 6.7.2 Test applicability

This test applies to all types of E-UTRA UE release 8 and forward.

## 6.7.3 Minimum conformance requirements

User Equipment(s) transmitting in close vicinity of each other can produce intermodulation products, which can fall into the UE, or eNode B receive band as an unwanted interfering signal. The UE intermodulation attenuation is defined by the ratio of the mean power of the wanted signal to the mean power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal at each of the transmitter antenna port with the other antenna port(s) if any is terminated. Both the wanted signal power and the intermodulation product power are measured through E-UTRA rectangular filter with measurement bandwidth shown in Table 6.7.3-1.

The requirement of transmitting intermodulation is prescribed in Table 6.7.3-1.

**Table 6.7.3-1: Transmit Intermodulation**

| BWChannel (UL) | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
|---|---|---|---|---|---|---|---|---|
| Interference Signal Frequency Offset | 5MHz | 10MHz | 10MHz | 20MHz | 15MHz | 30MHz | 20MHz | 40MHz |
| Interference CW Signal Level | -40dBc | | | | | | | |
| Intermodulation Product | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc |
| Measurement bandwidth | 4.5MHz | 4.5MHz | 9.0MHz | 9.0MHz | 13.5MHz | 13.5MHz | 18MHz | 18MHz |

The normative reference for this requirement is TS 36.101 [2] clause 6.7.1.

## 6.7.4 Test description

### 6.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.7.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.7.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz and Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Transmit Intermodulation | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.2.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.7.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.7.4.3.

### 6.7.4.3 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.7.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands to the UE until the UE transmits at its $P_{UMAX}$ level.
3. Measure the rectangular filtered mean power of the UE. For TDD slots with transient periods are not under test for the wanted signal and for the intermodulation product.
4. Set the interference signal frequency below the UL carrier frequency using the first offset in table 6.7.5-1.
5. Set the interference CW signal level according to table 6.7.5-1.
6. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.
7. Set the interference signal frequency above the UL carrier frequency using the first offset in table 6.7.5-1.
8. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.

Repeat the measurement using the second offset in table 6.7.5-1.

### 6.7.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 6.7.5 Test requirement

The ratio derived in step 5 and 7, shall not exceed the described value in table 6.7.5-1.

**Table 6.7.5-1: Transmit Intermodulation**

| BWChannel (UL) | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
|---|---|---|---|---|---|---|---|---|
| Interference Signal Frequency Offset | 5MHz | 10MHz | 10MHz | 20MHz | 15MHz | 30MHz | 20MHz | 40MHz |
| Interference CW Signal Level | -40dBc | | | | | | | |
| Intermodulation Product | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc |
| Measurement bandwidth | 4.5MHz | 4.5MHz | 9.0MHz | 9.0MHz | 13.5MHz | 13.5MHz | 18MHz | 18MHz |
| Note 1: The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of the downlink signal. | | | | | | | | |

# 6.7A Transmit intermodulation for CA

## 6.7A.0 Minimum conformance requirements

User Equipment(s) transmitting in close vicinity of each other can produce intermodulation products, which can fall into the UE, or eNode B receive band as an unwanted interfering signal. The UE intermodulation attenuation is defined by the ratio of the mean power of the wanted signal to the mean power of the intermodulation product on both component carriers when an interfering CW signal is added at a level below the wanted signal at each of the transmitter antenna port with the other antenna port(s) if any is terminated. Both the wanted signal power and the intermodulation product power are measured through rectangular filter with measurement bandwidth shown in Table 6.7A.0-1.

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the requirement is specified in Table 6.7.3-1 which shall apply on each component carrier with both component carriers active.

For intra-band contiguous carrier aggregation the requirement of transmitting intermodulation is specified in Table 6.7A.0-1.

**Table 6.7A.0-1: Transmit Intermodulation**

| CA bandwidth class(UL) | B and C | |
|---|---|---|
| Interference Signal Frequency Offset | $BW_{Channel_CA}$ | $2*BW_{Channel_CA}$ |
| Interference CW Signal Level | -40dBc | |
| Intermodulation Product | -29dBc | -35dBc |
| Measurement bandwidth | $BW_{Channel_CA}$- 2* $BW_{GB}$ | |

The normative reference for this requirement is TS 36.101 [2] clause 6.7.1A.

# 6.7A.1 Transmit intermodulation for CA (intra-band contiguous DL CA and UL CA)

## 6.7A.1.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement.

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

## 6.7A.1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that supports intra-band contiguous DL CA and UL CA.

## 6.7A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.7A.0.

## 6.7A.1.4 Test description

### 6.7A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.7A.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.7A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | | Mid range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 50 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 50 | 50 | | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 75 | 75 | | QPSK | 16 | P_16@0 | S_0@0 | - | - |
| 100 | 25 | | QPSK | 8 | P_8@0 | S_0@0 | - | - |
| 100 | 50 | N/A | QPSK | 12 | P_12@0 | S_0@0 | - | - |
| 100 | 100 | | QPSK | 18 | P_18@0 | S_0@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.37 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.7A.1.4.3.

### 6.7A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.7A.1.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.7A.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands on PCC and SCC to the UE until the UE transmits at its $P_{UMAX}$ level; allow at least 200ms for the UE to reach PUMAX level.

6. Measure the rectangular filtered mean power of the UE. For TDD slots with transient periods are not under test for the wanted signal and for the intermodulation product.
7. Set the interference signal frequency below $F_{CA_low}$ using the first offset in table 6.7A.0-1.
8. Set the interference CW signal level according to table 6.7A.0-1.
9. Search the intermodulation product signals below and above the aggregated UL carrier, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 6.
10. Set the interference signal frequency above $F_{CA_high}$ using the first offset in table 6.7A.0-1.
11. Search the intermodulation product signals below and above the aggregated UL carrier, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 6.
12. Repeat the measurement using the second offset in table 6.7A.0-1.

#### 6.7A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 6.7A.1.5 Test requirement

The ratio derived in step 9 and 11, shall not exceed the described value in table 6.7A.1.5-1.

**Table 6.7A.1.5-1: Transmit Intermodulation**

| CA bandwidth class(UL) | B and C | |
|---|---|---|
| Interference Signal Frequency Offset | $BW_{Channel_CA}$ | $2*BW_{Channel_CA}$ |
| Interference CW Signal Level | -40dBc | |
| Intermodulation Product | -29dBc | -35dBc |
| Measurement bandwidth | $BW_{Channel_CA}$- 2* $BW_{GB}$ | |
| Note 1: The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of any downlink CC. | | |

## 6.7A.2 Transmit intermodulation for CA (inter-band DL CA and UL CA)

### 6.7A.2.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement.

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

### 6.7A.2.2 Test applicability

This test applies to all types of E-UTRA UE release 11 and forward that supports inter-band DL CA and UL CA.

### 6.7A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.7A.0.

## 6.7A.2.4 Test description

### 6.7A.2.4.1 Initial conditions

Same as in clause 6.7A.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1 → use Table 5.4.2A.1-2 for CA configurations with two bands or Table 5.4.2A.1-2a for CA configurations with three bands.
- Instead of Table 6.7A.1.4.1-1 → use Table 6.7A.2.4.1-1.
- Instead of clause 6.7A.1.4.3 → use clause 6.7A.2.4.3.

**Table 6.7A.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | Mid range for PCC and SCC | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2, 3) | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| | | N/A for this test | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| 25 | 25 | | QPSK | 16 | P_8@0 | S_8@0 | - | - |
| 25 | 50 | | QPSK | 20 | P_8@0 | S_12@0 | - | - |
| | | | | | | | | |
| | | | | | | | | |
| 50 | 25 | | QPSK | 20 | P_12@0 | S_8@0 | - | - |
| 50 | 50 | | QPSK | 24 | P_12@0 | S_12@0 | - | - |
| 50 | 75 | | QPSK | 28 | P_12@0 | S_16@0 | - | - |
| 50 | 100 | | QPSK | 30 | P_12@0 | S_18@0 | - | - |
| 75 | 25 | | QPSK | 24 | P_16@0 | S_8@0 | - | - |
| 75 | 50 | | QPSK | 28 | P_16@0 | S_12@0 | - | - |
| 75 | 75 | | QPSK | 32 | P_16@0 | S_16@0 | - | - |
| 75 | 100 | | QPSK | 34 | P_16@0 | S_18@0 | - | - |
| 100 | 50 | | QPSK | 30 | P_18@0 | S_12@0 | - | - |
| 100 | 75 | | QPSK | 34 | P_18@0 | S_16@0 | - | - |
| 100 | 100 | | QPSK | 36 | P_18@0 | S_18@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2 | | | | | | | | |
| Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |
| Note 3: If in the CA Configuration UE supports CC Combinations with channel BW below 5MHz on at least one CC, these CC Combinations are disregarded for Lowest $N_{RB_agg}$. Only CC Combinations which have channel BW 5MHz or above on both component carriers are considered for Lowest $N_{RB_agg}$. | | | | | | | | |

### 6.7A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.7A.2.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.7A.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
5. Send continuously uplink power control "up" commands on PCC and SCC to the UE until the UE transmits at its $P_{UMAX}$ level; allow at least 200ms for the UE to reach PUMAX level.
6. Measure the rectangular filtered mean power of the UE. For TDD slots with transient periods are not under test for the wanted signal and for the intermodulation product.
7. Set the interference signal frequency below the UL carrier frequency of the PCC using the first offset in table 6.7.3-1.
8. Set the interference CW signal level according to table 6.7.3-1.
9. Search the intermodulation product signals below and above the UL carrier of the PCC, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 6.
10. Set the interference signal frequency above the UL carrier frequency of the PCC using the first offset in table 6.7.3-1.
11. Search the intermodulation product signals below and above the UL carrier of the PCC, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 6.
12. Set the interference signal frequency below the UL carrier frequency of the SCC using the first offset in table 6.7.3-1.
13. Search the intermodulation product signals below and above the UL carrier of the SCC, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 6.
14. Set the interference signal frequency above the UL carrier frequency of the SCC using the first offset in table 6.7.3-1.
15. Search the intermodulation product signals below and above the UL carrier of the SCC, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 6.
16. Repeat the measurement using the second offset in table 6.7.3-1.

### 6.7A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

## 6.7A.2.5 Test requirement

The ratio derived in step 9, 11, 13 and 15, shall not exceed the described value in table 6.7A.2.5-1.

**Table 6.7A.2.5-1: Transmit Intermodulation**

| BWChannel (UL) | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
|---|---|---|---|---|---|---|---|---|
| Interference Signal Frequency Offset | 5MHz | 10MHz | 10MHz | 20MHz | 15MHz | 30MHz | 20MHz | 40MHz |
| Interference CW Signal Level | -40dBc | | | | | | | |
| Intermodulation Product | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc |
| Measurement bandwidth | 4.5MHz | 4.5MHz | 9.0MHz | 9.0MHz | 13.5MHz | 13.5MHz | 18MHz | 18MHz |
| Note 1: The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of any downlink CC. | | | | | | | | |

## 6.7A.3

## 6.7A.4 Transmit intermodulation for CA (3DL CA and 3UL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Table 6.6.1A.4.4.1-1 needs to be updated for Intra-band contiguous only CA configuration. This issue is under investigation.

-Intermodulation Product for intra-band contiguous only in Test Requirements Table is not specified

-The test applicability needs to be added to TS36.521-2

### 6.7A.4.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement.

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non-linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

### 6.7A.4.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward that supports 3DL CA and 3UL CA.

### 6.7A.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.7A.0.

### 6.7A.4.4 Test description

#### 6.7A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1, 5.4.2.A1-2 and 5.4.2.A1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.7A.4.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.7A.4.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | Normal | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 6.1-2. | | Mid range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 2, 3) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | **CC MOD** | **UL Allocation** | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **PCC & SCC RB allocation** | | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 25 | 25 | N/A for this test | QPSK | 24 | P_8@0 | S_8@0 | S_8@0 | - |
| 25 | 50 | | QPSK | 32 | P_8@0 | S_12@0 | S_12@0 | - |
| 50 | 25 | | QPSK | 28 | P_12@0 | S_8@0 | S_8@0 | - |
| 50 | 50 | | QPSK | 36 | P_12@0 | S_12@0 | S_12@0 | - |
| 50 | 75 | | QPSK | 44 | P_12@0 | S_16@0 | S_16@0 | - |
| 50 | 100 | | QPSK | 42 | P_12@0 | S_18@0 | S_18@0 | - |
| 75 | 50 | | QPSK | 40 | P_16@0 | S_12@0 | S_12@0 | - |
| 75 | 75 | | QPSK | 48 | P_16@0 | S_16@0 | S_16@0 | - |
| 75 | 100 | | QPSK | 52 | P_16@0 | S_18@0 | S_18@0 | - |
| 100 | 50 | | QPSK | 42 | P_18@0 | S_12@0 | S_12@0 | - |
| 100 | 75 | | QPSK | 50 | P_18@0 | S_16@0 | S_16@0 | - |
| 100 | 100 | | QPSK | 54 | P_18@0 | S_18@0 | S_18@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1, 5.4.2.A1-2 and 5.4.2.A1-2a.<br>Note 2: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.37 as appropriate.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.7A.4.1.4.3.

### 6.7A.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.0 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 6.7A.4.1.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.7A.4.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands on PCC and SCC to the UE until the UE transmits at its $P_{UMAX}$ level; allow at least 200ms for the UE to reach PUMAX level.

6. Measure the rectangular filtered mean power of the UE. For TDD slots with transient periods are not under test for the wanted signal and for the intermodulation product.

7. Set the interference signal frequency below $F_{CA_low}$ using the first offset in table 6.7A.0-1.

8. Set the interference CW signal level according to table 6.7A.0-1.

9. Search the intermodulation product signals below and above the aggregated UL carrier, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 6.

10. Set the interference signal frequency above $F_{CA_high}$ using the first offset in table 6.7A.0-1.

11. Search the intermodulation product signals below and above the aggregated UL carrier, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 6.

12. Repeat the measurement using the second offset in table 6.7A.0-1.

### 6.7A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

## 6.7A.4.5 Test requirement

The ratio derived in step 9 and 11, shall not exceed the described value in table 6.7A.4.1.5-2 for interband. For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per band) transmit intermodulations is defined as follows. For the E-UTRA band supporting one component carrier the requirement specified in Table 6.7A.4.1.5-2 apply. For the E-UTRA band supporting two contiguous component carriers the requirements specified in Table 6.7A.4.1.5-1 apply.

**Table 6.7A.4.1.5-1: Transmit Intermodulation for intra-band contiguous part**

| CA bandwidth class(UL) | B and C | |
|---|---|---|
| Interference Signal Frequency Offset | $BW_{Channel_CA}$ | $2*BW_{Channel_CA}$ |
| Interference CW Signal Level | -40dBc | |
| Intermodulation Product | -29dBc | -35dBc |
| Measurement bandwidth | $BW_{Channel_CA}$- 2* $BW_{GB}$ | |

**Table 6.7A.4.1.5-2 : Transmit Intermodulation for inter-band part**

| BWChannel (UL) | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
|---|---|---|---|---|---|---|---|---|
| Interference Signal Frequency Offset | 5MHz | 10MHz | 10MHz | 20MHz | 15MHz | 30MHz | 20MHz | 40MHz |
| Interference CW Signal Level | -40dBc | | | | | | | |
| Intermodulation Product | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc |
| Measurement bandwidth | 4.5MHz | 4.5MHz | 9.0MHz | 9.0MHz | 13.5MHz | 13.5MHz | 18MHz | 18MHz |
| Note 1: The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of any downlink CC. | | | | | | | | |

# 6.7B Transmit intermodulation for UL-MIMO

## 6.7B.1 Test purpose

To verify that the UE transmit intermodulation at each transmit antenna does not exceed the described value in the test requirement.

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

## 6.7B.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

## 6.7B.3 Minimum conformance requirements

For UE with multiple antenna transmit connectors, the transmit intermodulation requirements are specified at each transmit antenna connector and the wanted signal is defined as the sum of output power at each transmit antenna connector.

For UEs with two transmit antenna connectors supporting dual-layer transmission, the requirements in subclause 6.7.3-1 apply to each transmit antenna connector with the UL-MIMO configurations specified in Table 6.2.2B.3-2.

The normative reference for this requirement is TS 36.101 [2] clause 6.7.1B.

## 6.7B.4 Test description

### 6.7B.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.7B.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.7B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | Normal | | |
| Test Frequencies as specified in **TS36.508 [7] subclause 4.3.1** | | Mid range | | |
| Test Channel Bandwidths as specified in **TS 36.508 [7] subclause 4.3.1** | | 5MHz and Highest | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A for Transmit Intermodulation | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 5MHz | | QPSK | 8 | 8 |
| 10MHz | | QPSK | 12 | 12 |
| 15MHz | | QPSK | 16 | 16 |
| 20MHz | | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.39.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.7B.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.7B.4.3.

## 6.7B.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.7B.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands to the UE until the UE transmits at its $P_{UMAX}$ level.
3. Measure the rectangular filtered mean power of the UE. For TDD slots with transient periods are not under test for the wanted signal and for the intermodulation product.
4. Set the interference signal frequency below the UL carrier frequency using the first offset in table 6.7B.5-1.
5. Set the interference CW signal level according to table 6.7B.5-1.
6. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.
7. Set the interference signal frequency above the UL carrier frequency using the first offset in table 6.7B.5-1.
8. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.
9. Repeat the measurement using the second offset in table 6.7B.5-1.
10. Repeat step 3) until 9) for each of transmit antenna of the UE.

### 6.7B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.6.7B.5 Test requirement

The ratio derived in step 5 and 7 at each transmit antenna of UE shall not exceed the described value in table 6.7B.5-1.

**Table 6.7B.5-1: Transmit Intermodulation**

| **BWChannel (UL)** | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
|---|---|---|---|---|---|---|---|---|
| **Interference Signal Frequency Offset** | 5MHz | 10MHz | 10MHz | 20MHz | 15MHz | 30MHz | 20MHz | 40MHz (Note 1) |
| **Interference CW Signal Level** | -40dBc | | | | | | | |
| **Intermodulation Product** | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc |
| **Measurement bandwidth** | 4.5MHz | 4.5MHz | 9.0MHz | 9.0MHz | 13.5MHz | 13.5MHz | 18MHz | 18MHz |
| Note 1: For Band 20, only applicable for interference signal frequency above the UL carrier frequency. | | | | | | | | |

## 6.7E Transmit intermodulation for UE category 0

### 6.7E.1 Test purpose

Same test purpose as in clause 6.7.1.

### 6.7E.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 6.7E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.7.3.

### 6.7E.4 Test description

#### 6.7E.4.1 Initial conditions

Same initial conditions as in clause 6.7.4.1 with following exceptions for HD-FDD:

- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.4 using only main UE Tx/Rx antenna.

#### 6.7E.4.2 Test procedure

Same test procedure as in clause 6.7.4.2 with following exception for HD-FDD:

- In step 3, slots with transient periods are not under test. Half-duplex guard subframe are not under test.

#### 6.7E.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.7E.5 Test requirement

The ratio derived in step 5 and 7, shall not exceed the described value in table 6.7E.5-1

**Table 6.7E.5-1: Transmit Intermodulation**

| BWChannel (UL) | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
|---|---|---|---|---|---|---|---|---|
| Interference Signal Frequency Offset | 5MHz | 10MHz | 10MHz | 20MHz | 15MHz | 30MHz | 20MHz | 40MHz (Note 1) |
| Interference CW Signal Level | -40dBc | | | | | | | |
| Intermodulation Product | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc |
| Measurement bandwidth | 4.5MHz | 4.5MHz | 9.0MHz | 9.0MHz | 13.5MHz | 13.5MHz | 18MHz | 18MHz |
| Note 1: For Band 20, only applicable for interference signal frequency above the UL carrier frequency. | | | | | | | | |

# 6.7EA Transmit intermodulation for UE category M1

## 6.7EA.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement.

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

## 6.7EA.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category M1.

## 6.7EA.3 Minimum conformance requirements

User Equipment(s) transmitting in close vicinity of each other can produce intermodulation products, which can fall into the UE, or eNode B receive band as an unwanted interfering signal. The UE intermodulation attenuation is defined by the ratio of the mean power of the wanted signal to the mean power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal at each of the transmitter antenna port with the other antenna port(s) if any is terminated. Both the wanted signal power and the intermodulation product power are measured through E-UTRA rectangular filter with measurement bandwidth shown in Table 6.7EA.3-1.

The requirement of transmitting intermodulation is prescribed in Table 6.7EA.3-1.

**Table 6.7EA.3-1: Transmit Intermodulation**

| BWChannel (UL) | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
|---|---|---|---|---|---|---|---|---|
| Interference Signal Frequency Offset | 5MHz | 10MHz | 10MHz | 20MHz | 15MHz | 30MHz | 20MHz | 40MHz |
| Interference CW Signal Level | -40dBc | | | | | | | |
| Intermodulation Product | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc |
| Measurement bandwidth | 4.5MHz | 4.5MHz | 9.0MHz | 9.0MHz | 13.5MHz | 13.5MHz | 18MHz | 18MHz |

The normative reference for this requirement is TS 36.101 [2] clause 6.7.1.

# 6.7EA.4 Test description

## 6.7EA.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in sub-clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.7EA.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 6.7EA.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause [4.3.1] | Mid range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause [4.3.1] | 5MHz and Highest | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | | |
| Ch BW | N/A for Transmit Intermodulation test case | Mod'n | RB allocation | | |
| | | | FDD and HD-FDD | TDD | Narrowband index[1] |
| **Low range, Mid range** | | | | | |
| 5MHz | | QPSK | 6 | 6 | 0 |
| 10MHz | | QPSK | 6 | 6 | 0 |
| 15MHz | | QPSK | 6 | 6 | 0 |
| 20MHz | | QPSK | 6 | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4<br>Note 2: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.2 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to Table 6.7EA.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 6.7EA.4.3.

## 6.7EA.4.2 Test procedure

1. SS sends uplink scheduling information via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 6.7EA.4.1-1. Since the UE has no payload and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.
2. Send continuously uplink power control "up" commands to the UE until the UE transmits at its $P_{UMAX}$ level.
3. Measure the rectangular filtered mean power of the UE. For TDD slots with transient periods are not under test for the wanted signal and for the intermodulation product. For HD-FDD slots with transient periods and Half-duplex guard subframe are not under test.

4. Set the interference signal frequency below the UL carrier frequency using the first offset in table 6.7EA.5-1.
5. Set the interference CW signal level according to table 6.7EA.5-1.
6. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.
7. Set the interference signal frequency above the UL carrier frequency using the first offset in table 6.7EA.5-1.
8. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.

Repeat the measurement using the second offset in table 6.7EA.5-1.

### 6.7EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA.

## 6.7EA.5 Test requirement

The ratio derived in step 5 and 7, shall not exceed the described value in table 6.7EA.5-1

**Table 6.7EA.5-1: Transmit Intermodulation**

| BWChannel (UL) | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
|---|---|---|---|---|---|---|---|---|
| Interference Signal Frequency Offset | 5MHz | 10MHz | 10MHz | 20MHz | 15MHz | 30MHz | 20MHz | 40MHz (Note 1) |
| Interference CW Signal Level | -40dBc | | | | | | | |
| Intermodulation Product | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc |
| Measurement bandwidth | 4.5MHz | 4.5MHz | 9.0MHz | 9.0MHz | 13.5MHz | 13.5MHz | 18MHz | 18MHz |
| Note 1: The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of the downlink signal | | | | | | | | |

# 6.7EB Transmit intermodulation for UE category 1bis

## 6.7EB.1 Test purpose

Same test purpose as in clause 6.7.1.

## 6.7EB.2 Test applicability

This test case applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

## 6.7EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.7.3.

## 6.7EB.4 Test description

### 6.7EB.4.1 Initial conditions

Same initial conditions as in clause 6.7.4.1 with following exception.

- Connect SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

### 6.7EB.4.2 Test procedure

Same test procedure as in clause 6.7.4.2

### 6.7EB.4.3 Message contents

Message contents same as 6.7.4.3.

## 6.7EB.5 Test requirement

The ratio derived in step 5 and 7, shall not exceed the described value in table 6.7EB.5-1

**Table 6.7EB.5-1: Transmit Intermodulation**

| BWChannel (UL) | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
|---|---|---|---|---|---|---|---|---|
| Interference Signal Frequency Offset | 5MHz | 10MHz | 10MHz | 20MHz | 15MHz | 30MHz | 20MHz | 40MHz (Note 1) |
| Interference CW Signal Level | -40dBc | | | | | | | |
| Intermodulation Product | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc |
| Measurement bandwidth | 4.5MHz | 4.5MHz | 9.0MHz | 9.0MHz | 13.5MHz | 13.5MHz | 18MHz | 18MHz |
| Note 1: For Band 20, only applicable for interference signal frequency above the UL carrier frequency. | | | | | | | | |

# 6.7F Transmit intermodulation for category NB1 and NB2

## 6.7F.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement.

## 6.7F.2 Test applicability

This test case applies to all types of UE release 13 and forward of UE category NB1.

This test case applies to all types of UE release 14 and forward of UE category NB2.

## 6.7F.3 Minimum conformance requirements

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

The UE category NB1 and NB2 transmitter intermodulation attenuation is defined by the ratio of the mean power of the wanted signal to the mean power of the intermodulation product as defined in Table 6.7F.3-1 when an interfering CW signal is added at a level below the wanted signal at the transmitter antenna port. Both the wanted signal power and the intermodulation product power are measured through rectangular filter with measurement bandwidth shown in Table 6.7F.3-1.

**Table 6.7F.3-1: UE category NB1 and NB2 transmitter IM requirement**

| Parameters for transmitter intermodulation | | |
|---|---|---|
| BW Channel (UL) | 15 kHz (1 tone at sub-carrier 5 or 6) | |
| Interference Signal Frequency Offset | 180 kHz | 360 kHz |
| Interference CW Signal Level | -40dBc | |
| Intermodulation Product | -20 dBc | -39 dBc |
| Measurement bandwidth | 30 kHz | 30 kHz |

The normative reference for this requirement is TS 36.101 [2] clause 6.7.1F.

## 6.7F.4 Test description

### 6.7F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters shown in table 6.7F.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2.4. Configurations of NPDSCH and NPDCCH before measurement are specified in [Annex C.2].

**Table 6.7F.4.1-1: Test Configuration Table**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 8.1.1 | | Normal | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 8.1.3.1 | | Frequency ranges defined in Annex K.1.1 | | |
| **Test Parameters** | | | | |
| **Configuration ID** | **Downlink Configuration** | **Uplink Configuration** | | |
| | N/A | Modulation | $N_{tones}$ | Sub-carrier spacing (kHz) |
| 1 | | QPSK | 1@5 | 15kHz |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.2 using only main Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1.1 and H.4.0.
4. The UL Reference Measurement channels are set according to Table 6.7F.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 6.7F.4.3.

### 6.7F.4.3 Test procedure

1. SS sends uplink scheduling information for the UL HARQ process via NPDCCH DCI format N0 for C_RNTI to schedule the UL RMC according to Table 6.7F.4.1-1. Since the UE has no payload and no loopback data to send

the UE sends uplink MAC padding bits on the UL RMC. (UE should be already transmitting $P_{UMAX}$ after Initial Conditions setting).

2. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.3F.5-1. The measurement period is at least one sub-frame **(**1ms) for 15 KHz channel spacing.

3. Set the interference signal frequency below the UL carrier frequency using the first offset in table 6.7F.5-1.

4. Set the interference CW signal level according to table 6.7F.5-1.

5. Measure the rectangular filtered mean power of transmitting intermodulation product signals below and above the UL carrier frequency, and calculate the ratios with the power measured in step 2. The centre frequency of the measurement filter shall be (Interference signal frequency - Interference Signal Frequency Offset + 7.5kHz) and (UL carrier frequency - 15 kHz + Interference Signal Frequency Offset), respectively.

6. Set the interference signal frequency above the UL carrier frequency using the first offset in table 6.7F.5-1.

7. Measure the rectangular filtered mean power of transmitting intermodulation product signals below and above the UL carrier frequency, and calculate the ratios with the power measured in step 2. The centre frequency of the measurement filter shall be (UL carrier frequency - 15 kHz - Interference Signal Frequency Offset) and (Interference signal frequency + Interference Signal Frequency Offset + 7.5kHz) respectively.

Repeat the measurement using the second offset in table 6.7F.5-1.

### 6.7F.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6.

## 6.7F.5 Test requirement

The ratio derived in step 5 and 7, shall not exceed the described value in table 6.7F.5-1

**Table 6.7F.5-1: Transmit Intermodulation**

| BW Channel (UL) | 15 kHz (1 tone) | |
|---|---|---|
| Interference Signal Frequency Offset | 180 kHz | 360 kHz |
| Interference CW Signal Level | -40dBc | |
| Intermodulation Product | -20 dBc | -39 dBc |
| Measurement bandwidth | 30 kHz | 30 kHz |

# 6.7G Transmit intermodulation for V2X Communication

## 6.7G.1 Transmit intermodulation for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 6.7G.1.1 Test purpose

Same test purpose as in clause 6.7.1.

### 6.7G.1.2 Test applicability

This test case applies to all types of UE that support V2X Sidelink communication and Band 47.

## 6.7G.1.3 Minimum conformance requirements

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.5G-1, the requirements in subclause 6.7.1 apply for E-UTRA V2X sidelink transmission.

The normative reference for this requirement is TS 36.101 [2] clause 6.7.1G.

## 6.7G.1.4 Test description

### 6.7G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.7G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annexes A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.7G.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 96 |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.92.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 6.7G.1.4.3.

3. The V2X reference measurement channel is set according to Table 6.7G.1.4.1-1.

3a The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.

6. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.7G.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.2. Send continuously uplink power control "up" commands to the UE until the UE transmits at its $P_{UMAX}$ level.

2. Measure the rectangular filtered mean power of the UE. For TDD slots with transient periods are not under test for the wanted signal and for the intermodulation product.

3. Set the interference signal frequency below the UL carrier frequency using the first offset in table 6.7G.1.5-1.
4. Set the interference CW signal level according to table 6.7G.1.5-1.
5. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.
6. Set the interference signal frequency above the UL carrier frequency using the first offset in table 6.7G.1.5-1.
7. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 2.

Repeat the measurement using the second offset in table 6.7G.1.5-1.

#### 6.7G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.7.I and 4.10.

### 6.7G.1.5 Test requirements

The ratio derived in step 5 and 7, shall not exceed the described value in table 6.7G.1.5-1.

**Table 6.7G.1.5-1: Transmit Intermodulation**

| BW Channel (UL) | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
|---|---|---|---|---|---|---|---|---|
| Interference Signal Frequency Offset | 5MHz | 10MHz | 10MHz | 20MHz | 15MHz | 30MHz | 20MHz | 40MHz |
| Interference CW Signal Level | -40dBc | | | | | | | |
| Intermodulation Product | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc |
| Measurement bandwidth | 4.5MHz | 4.5MHz | 9.0MHz | 9.0MHz | 13.5MHz | 13.5MHz | 18MHz | 18MHz |

## 6.7G.2 Transmit intermodulation for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

### 6.7G.2.1 Test purpose

Same test purpose as in clause 6.7.1.

### 6.7G.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support E-UTRA and V2X sidelink communication.

### 6.7G.2.3 Minimum conformance requirements

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.5G-2, the requirements in subclause 6.7.1 apply for V2X sidelink transmission and the E-UTRA uplink transmission.

The normative reference for this requirement is TS 36.101 [2] clause 6.7.1G.

## 6.7G.2.4 Test description

### 6.7G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.7G.2.4.1-1. The details of the uplink and V2X reference measurement channels (RMCs) are specified in Annexes A.2 and Annexes A.8.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.7G.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | Normal | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Mid range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink** | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | N/A for Occupied bandwidth | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 5 MHz | | QPSK | 8 | 10 MHz | QPSK | [48] |
| 10 MHz | | QPSK | 12 | 20 MHz | QPSK | [96] |
| 15 MHz | | QPSK | 16 | | | |
| 20 MHz | | QPSK | 18 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure 93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 6.7G.2.4.3.
3 Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X reference measurement channel is set according to Table 6.7G.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C.

### 6.7G.2.4.2 Test procedure

1. The SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 6.7G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.
2. Send continuously uplink power control "up" commands to the UE until the UE transmits at its $P_{UMAX}$ level. Configure the UE to transmit PSCCH and PSSCH with the $P_{UMAX}$ level of each test points.
3. Measure the rectangular filtered mean power of the UE. For TDD slots with transient periods are not under test for the wanted signal and for the intermodulation product.
4. Set the interference signal frequency below the UL carrier frequency using the first offset in table 6.7G.2.5-1.
5. Set the interference CW signal level according to table 6.7G.2.5-1.

6. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.

7. Set the interference signal frequency above the UL carrier frequency using the first offset in table 6.7G.2.5-1.

8. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.

Repeat the measurement using the second offset in table 6.7G.2.5-1.

#### 6.7G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 6.7G.2.5 Test requirements

The ratio derived in step 6 and 8, shall not exceed the described value in table 6.7G.2.5-1.

**Table 6.7G.2.5-1: Transmit Intermodulation**

| BW Channel (UL) | 5MHz | | 10MHz | | 15MHz | | 20MHz | |
|---|---|---|---|---|---|---|---|---|
| Interference Signal Frequency Offset | 5MHz | 10MHz | 10MHz | 20MHz | 15MHz | 30MHz | 20MHz | 40MHz |
| Interference CW Signal Level | -40dBc | | | | | | | |
| Intermodulation Product | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc | -29dBc | -35dBc |
| Measurement bandwidth | 4.5MHz | 4.5MHz | 9.0MHz | 9.0MHz | 13.5MHz | 13.5MHz | 18MHz | 18MHz |

## 6.7G.3 Transmit intermodulation for V2X Communication / Intra-band contiguous multi-carrier operation

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- Applicability spec

### 6.7G.3.1 Test purpose

Same as in clause 6.7.1.

### 6.7G.3.2 Test applicability.

This test case applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 6.7G.3.3 Minimum conformance requirements

For intra-band contiguous MCC operation the transmit intermodulation requirement for Bandwidth Class B specified in subclause 6.7.1A shall apply.

The normative reference for this requirement is TS 36.101 [2] clause 6.7.1G.

## 6.7G.3.4 Test description

### 6.7G.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.7G.3.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annexes A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 6.7G.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Mid range | | | |
| Test Channel Bandwidths as specified in subclause 5.4.2G | | | Lowest, Highest | | | |
| **Test Parameters for V2X MCC Configuration** | | | | | | |
| **V2X MCC Channel Bandwidth** | | | **V2X Sidelink Configuration** | | | |
| **Configuration ID** | **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **$N_{RB_agg}$** | **CC1 and CC2 RB Allocation (LCRB @ RBstart)** | |
| 1 | 50 | 50 | QPSK | 48 | CC1_48@0 | CC2_0@0 |
| 2 | 50 | 50 | QPSK | 96 | CC1_48@0 | CC2_48@2 |
| Note1: The starting resource block shall be RB #0 and RB# (max+1 - RB allocation) of the aggregated channel bandwidth, each correspond to configuration ID 1 or 2. | | | | | | |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RXantenna connector as shown in TS 36.508 [7] Annex A, in Figure A.89a.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause4.10.1. Message content exceptions are defined in clause 6.7G.3.4.3.

3. The V2X Reference Measurement Channels are set according to Table 6.7G.3.4.1-1

3a The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 5A-V2X according to TS 36.508 [7] clause 4.5.9.

6. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 6.7G.3.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMCs.

2. Measure the rectangular filtered mean power of the UE. For TDD slots with transient periods are not under test for the wanted signal and for the intermodulation product.

3. Set the interference signal frequency below the UL carrier frequency using the first offset in table 6.7G.3.5-1.

4. Set the interference CW signal level according to table 6.7G.3.5-1.

5. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.

6. Set the interference signal frequency above the UL carrier frequency using the first offset in table 6.7G.3.5-1.

7. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 2.

Repeat the measurement using the second offset in table 6.7G.3.5-1.

#### 6.7G.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, 4.7.I and 4.10 with the following exceptions:

**Table 6.7G.3.4.3-0: +CCUTLE (Initial condition)**

| Derivation Path: 36.508 Table 4.7I-2: +CCUTLE, condition Close and Transmit |
|---|

### 6.7G.3.5 Test requirement

The ratio derived shall not exceed the described value in table 6.7G.3.5-1

**Table 6.7G.3.5-1: Transmit Intermodulation**

| CA bandwidth class(UL) | B and C | |
|---|---|---|
| Interference Signal Frequency Offset | $BW_{Channel_CA}$ | 2*$BW_{Channel_CA}$ |
| Interference CW Signal Level | -40dBc | |
| Intermodulation Product | -29dBc | -35dBc |
| Measurement bandwidth | $BW_{Channel_CA}$- 2* $BW_{GB}$ | |

## 6.8 Time alignment

FFS.

### 6.8.1 Void

## 6.8A Void

## 6.8B Time alignment error for UL-MIMO

### 6.8B.1 Test purpose

To verify that the error of time alignment in UL MIMO does not exceed the range prescribed by the specified UL MIMO Time Alignment Error (TAE) and tolerance.

An excess time alignment error has the possibility to interfere to other channels or other systems and decrease UL MIMO performance because of the timing unsynchronization.

### 6.8B.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support UL MIMO.

## 6.8B.3 Minimum conformance requirements

For UE(s) with multiple transmit antenna connectors, the Time Alignment Error (TAE) shall not exceed 130 ns.

**Table 6.8B.3-1: UL-MIMO configuration in closed-loop spatial multiplexing scheme**

| Transmission mode | DCI format | Codebook Index |
|---|---|---|
| Mode 2 | DCI format 4 | Codebook index 0 |

The normative reference for this requirement is TS 36.101 [2] clause 6.8B.

## 6.8B.4 Test description

### 6.8B.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.8B.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 6.8B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | Normal | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 | Mid range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3.1 | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | |
| | **Downlink Configuration** | **Uplink Configuration** | | |
| Ch BW | N/A | Mod'n | RB allocation | |
| | | | FDD | TDD |
| 1.4MHz | | QPSK | 6 | 6 |
| 3MHz | | QPSK | 15 | 15 |
| 5MHz | | QPSK | 25 | 25 |
| 10MHz | | QPSK | 50 | 50 |
| 15MHz | | QPSK | 75 | 75 |
| 20MHz | | QPSK | 100 | 100 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channel is set according to Table 6.8B.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 6.8B.4.3.

### 6.8B.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 6.8B.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms for the UE to reach PUMAX level for UE.

3. Measure the timing of one sub-frame at each antenna connector.

### 6.8B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

## 6.8B.5 Test requirements

For UE(s) with multiple transmit antenna connectors, the Time Alignment Error (TAE) shall not exceed 155 ns.

# 7 Receiver Characteristics

## 7.1 General

Unless otherwise stated the receiver characteristics are specified at the antenna connector(s) of the UE. For UE(s) with an integral antenna only, a reference antenna(s) with a gain of 0 dBi is assumed for each antenna port(s). UE with an integral antenna(s) may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna. For UEs with more than one receiver antenna connector, identical interfering signals shall be applied to each receiver antenna port if more than one of these is used (diversity).

Unless otherwise stated, the test signal levels are defined at each antenna port, and specified in the respective sections below. Any specific test conditions are defined in the paragraph for each test. Unless stated otherwise, power control of the Downlink is OFF.

In general, the UE is set into the correct state in the "Initial conditions" part of the test, using normal SS signalling procedures over the air interface under easy radio conditions to ensure reliable message exchange. In the "Test procedure" part of the test, specific radio conditions are applied according to the test requirement and the desired measurement is made or the desired response is tested.

The ACS, blocking, spurious emissions and intermodulation requirements in sections 7.5, 7.6, 7.7 and 7.8 are defined for full band width signals i.e. for signals where all resource blocks are allocated for a specific user.

With the exception of Clause 7.3, the requirements shall be verified with the network signalling value NS_01 configured (Table 6.2.4.3-1).

All the parameters in clause 7 are defined using the UL reference measurement channels specified in Annexes A.2.2 and A.2.3, the DL reference measurement channels specified in Annex A.3.2 and using the set-up specified in Annex C.3.1.

For the additional requirements for intra-band non-contiguous carrier aggregation of two component carriers (one component carrier per sub-block), an in-gap test refers to the case when the interfering signal is located at a negative offset with respect to the assigned channel frequency of the highest carrier frequency and located at a positive offset with respect to the assigned channel frequency of the lowest carrier frequency.

For the additional requirements for intra-band non-contiguous carrier aggregation of two component carriers (one component carrier per sub-block), an out-of-gap test refers to the case when the interfering signal(s) is (are) located at a positive offset with respect to the assigned channel frequency of the highest carrier frequency, or located at a negative offset with respect to the assigned channel frequency of the lowest carrier frequency.

For the additional requirements for intra-band non-contiguous carrier aggregation of two component carriers with channel bandwidth larger than or equal to 5 MHz (one component carrier per sub-block), the existing adjacent channel selectivity requirements, in-band blocking requirements (for each case), and narrow band blocking requirements apply for in-gap tests only if the corresponding interferer frequency offsets with respect to the two measured carriers satisfy the following condition in relation to the sub-block gap size $W_{gap}$ for at least one of these carriers *j*, *j* = 1,2, so that the interferer frequency position does not change the nature of the core requirement tested:

$$Wgap \geq 2 \cdot |FInterferer\ (offset)_j| - BWChannel(_j)$$

where $F_{Interferer\ (offset),j}$ is the interferer frequency offset with respect to carrier *j* as specified in subclause 7.5.1A, subclause 7.6.1A and subclause 7.6.3A for the respective requirement and $BW_{Channel(j)}$ the channel bandwidth of carrier *j*. The interferer frequency offsets for adjacent channel selectivity, each in-band blocking case and narrow- band blocking shall be tested separately with a single in-gap interferer at a time.

For a ProSe UE that supports both ProSe Direct Discovery and ProSe Direct Communication, the receiver characteristics specified in clause 7 for ProSe Direct Communication shall apply.

For ProSe Direct Discovery and ProSe Direct Communication on E-UTRA ProSe operating bands that correspond to TDD E-UTRA operating bands as specified in clause 5.2D, the only additional requirement for ProSe specified in clause 7.4.1D is applicable.

For CA tests, Cell ID = 0 applies to P-Cell, and Cell ID = n (where n is 1,2,3..) applies to S-Celln (where n is 1,2,3..), respectively.

Parameters given in table 7.1-1 are used throughout this section for CA, unless otherwise stated by the test case.

**Table 7.1-1: Common Test Parameters**

| Parameter | Value | Comments |
|---|---|---|
| Cross carrier scheduling | Not configured | |

For CA testing, unless otherwise stated, the logical carriers PCC / SCCs are mapped to physical frequencies as defined in Table 7.1-2.

**Table 7.1-2: PCC/SCCs frequency mapping**

| CA Configuration | PCC-SCC mapping | Notes |
|---|---|---|
| Intra-band contiguous CA | CC1-CC2 (Note 4) or CC2-CC1 (Note 5) | 1 |
| Inter-band CA (CA_x-y) | Bx-By and By-Bx | 2, 3 |
| Intra-band non-contiguous CA | CC2-CC1 (Note 4) or CC1-CC2 (Note 5) | 1 |
| Note 1: Notation CCi-CCj means PCC on component carrier CCi and SCC on component carrier CCj, with CCi/j frequencies defined in the corresponding intra-band contiguous / non-contiguous CA band in TS36.508 [7].<br>Note 2: Notation Bi–Bj means PCC on component Band i and SCC on component Band j, with single Band i/j frequencies defined in TS36.508 [7].<br>Note 3: Applicable for UE declared capability of UL support (within CA operation) in the individual bands. If UE does not support both PCC-SCC mappings, only the supported mapping is applicable.<br>Note 4: Applicable for TDD CA and FDD CA bands with UL frequency < DL frequency.<br>Note 5: Applicable for FDD CA bands with UL frequency > DL frequency and intra-band non-contiguous CA bands with wider DL operating bandwidth than UL. | | |

For naming of 5DL CA combination on test configuration table, test applicability and related release, unless otherwise stated, it is defined in Table 7.1-2a.

Editor's Note : The CA band for intra-band non-contiguous with 3 sub-blocks is defined in TS36.101 (v15.1.0), but not define the release in TS36.307. Applicable release version for CA band combinations with 3 sub-blocks is FFS in the Table 7.1-2a

**Table 7.1-2a: 3DL CA Name/Release mapping**

| Number of Bands | 3CA Band Combinations | Release for test applicability | Name |
|---|---|---|---|
| 1 | CA_XD | Rel-10 | 3DL CA with FDD CA_XD |
| | CA_XD | Rel-10 | 3DL CA with TDD CA_XD |
| 1 | CA_XA-XB | Rel-11 | 3DL CA with FDD CA_XA-XB |
| | CA_XA-XB | Rel-11 | 3DL CA with TDD CA_XA-XB |
| 1 | CA_XA-XC | Rel-11 | 3DL CA with FDD CA_XA-XC |
| | CA_XA-XC | Rel-11 | 3DL CA with TDD CA_XA-XC |
| 2 | CA_XA-YB | Rel-11 | 3DL CA with FDD CA_XA-YB |
| | CA_XA-YB | Rel-11 | 3DL CA with TDD CA_XA-YB |
| | CA_XA-YB | Rel-12 | 3DL CA with FDD-TDD CA_XA-YB |
| 2 | CA_XA-YC | Rel-11 | 3DL CA with FDD CA_XA-YC |
| | CA_XA-YC | Rel-11 | 3DL CA with TDD CA_XA-YC |
| | CA_XA-YC | Rel-12 | 3DL CA with FDD-TDD CA_XA-YC |
| 3 | CA_XA-YA-ZA | Rel-10 | 3DL CA with FDD CA_XA-YA-ZA |
| | | Rel-10 | 3DL CA with TDD CA_XA-YA-ZA |
| | | Rel-12 | 3DL CA with FDD-TDD CA_XA-YA-ZA |
| 2 | CA_XA-XA-YA | Rel-11 | 3DL CA with FDD CA_XA-XA-YA |
| 1 | CA_XA-XA-XA | Rel-11 | 3DL CA with FDD CA_XA-XA-XA |

**Table 7.1-2b: 4DL CA Name/Release mapping**

| Number of Bands | 4CA Band Combinations | Release for test applicability | Name |
|---|---|---|---|
| 1 | CA_XE | Rel-11 | 4DL CA with TDD CA_XE |
| 2 | CA_XA-XD | Rel-11 | 4DL CA with FDD CA_XA-XD |
| | | Rel-11 | 4DL CA with TDD CA_XA-XD |
| | | Rel-12 | 4DL CA with FDD-TDD CA_XA-XD |
| 2 | CA_XB-YB | Rel-10 | 4DL CA with FDD CA_XB-YB |
| | CA_XC-YB | Rel-10 | 4DL CA with FDD CA_XC-YB |
| | | Rel-12 | 4DL CA with FDD-TDD CA_XC-YB |
| 2 | CA_XC-YC | Rel-10 | 4DL CA with FDD CA_XC-YC |
| | | Rel-10 | 4DL CA with TDD CA_XC-YC |
| 1 | CA_XC-XC | Rel-11 | 4DL CA with TDD CA_XC-XC |
| 2 | CA_XA-XA-YB | Rel-11 | 4DL CA with FDD CA_XA-XA-YB |
| | CA_XA-YA-YB | Rel-11 | 4DL CA with FDD CA_XA-YA-YB |
| 3 | CA_XA-YA-ZB | Rel-11 | 4DL CA with FDD CA_XA-YA-ZB |
| 3 | CA_XA-YA-ZC | Rel-11 | 4DL CA with FDD CA_XA-YA-ZC |
| | | Rel-12 | 4DL CA with FDD-TDD CA_XA-YA-ZC |
| 2 | CA_XA-YA-YC | Rel-11 | 4DL CA with FDD CA_XA-YA-YC |
| | | Rel-12 | 4DL CA with FDD-TDD CA_XA-YA-YC |
| 2 | CA_XA-XC-YA | Rel-12 | 4DL CA with FDD-TDD CA_XA-XC-YA |
| 3 | CA_XA-YA-ZC | Rel-12 | 4DL CA with FDD-TDD_XA-YA-ZC |
| 2 | CA_XA-XA-YA-YA | Rel-11 | 4DL CA with FDD CA_XA-XA-YA-YA |
| 3 | CA_XA-YA-YA-ZA | Rel-11 | 4DL CA with FDD CA_XA-YA-YA-ZA |
| | | Rel-12 | 4DL CA with FDD-TDD CA_XA-YA-YA-ZA |
| 4 | CA_XA-YA-ZA-RA | Rel-11 | 4DL CA with FDD CA_XA-YA-ZA-RA |
| | | Rel-12 | 4DL CA with FDD-TDD CA_XA-YA-ZA-RA |

**Table 7.1-2c: 5DL CA Name/Release mapping**

| Number of Bands | 5CA Band Combinations | Release for test applicability | Name |
|---|---|---|---|
| 1 | CA_XF | Rel-12 | 5DL CA with TDD CA_XF |
| 1 | CA_XA-XE | Rel-11 | 5DL CA with TDD CA_XA-XE |
| 1 | CA_XC-XD | Rel-11 | 5DL CA with FDD CA_XC-XD |
| | | Rel-11 | 5DL CA with TDD CA_XC-XD |
| 1 | CA_XA-XA-XD | FFS | 5DL CA with FDD CA_XA-XA-XD |
| | | FFS | 5DL CA with TDD CA_XA-XA-XD |
| 1 | CA_XA-XC-XC | FFS | 5DL CA with FDD CA_XA-XC-XC |
| | | FFS | 5DL CA with TDD CA_XA-XC-XC |
| 2 | CA_XA-YE | Rel-11 | 5DL CA with TDD CA_XA-YE |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-YE |
| 2 | CA_XC-YD | Rel-11 | 5DL CA with FDD CA_XC-YD |
| | | Rel-11 | 5DL CA with TDD CA_XC-YD |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XC-YD |
| 2 | CA_XA-YA-YD | Rel-11 | 5DL CA with TDD CA_XA-YA-YD |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-YA-YD |
| 2 | CA_XA-YC-YC | Rel-11 | 5DL CA with FDD CA_XA-YC-YC |
| | | Rel-11 | 5DL CA with TDD CA_XA-YC-YC |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-YC-YC |
| 2 | CA_XA-YA-YA-YC | FFS | 5DL CA with FDD CA_XA-XA-XA-YC |
| | | FFS | 5DL CA with TDD CA_XA-XA-XA-YC |
| | | FFS | 5DL CA with FDD-TDD CA_XA-XA-XA-YC |
| 2 | CA_XA-XA-YD | Rel-11 | 5DL CA with TDD CA_XA-XA-YD |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-XA-YD |
| 2 | CA_XA-XC-YC | Rel-10 | 5DL CA with FDD CA_XA-XC-YC |
| | | Rel-10 | 5DL CA with TDD CA_XA-XC-YC |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-XC-YC |
| 2 | CA_XA-XA-YA-YC | Rel-11 | 5DL CA with FDD CA_XA-XA-YA-YC |
| | | Rel-11 | 5DL CA with TDD CA_XA-XA-YA-YC |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-XA-YA-YC |
| 2 | CA_XA-XA-YA-YA-YA | FFS | 5DL CA with FDD CA_XA-XA-YA-YA-YA |
| | | FFS | 5DL CA with TDD CA_XA-XA-YA-YA-YA |
| | | FFS | 5DL CA with FDD-TDD CA_XA-XA-YA-YA-YA |
| 2 | CA_XA-XA-XA-YC | FFS | 5DL CA with FDD CA_XA-XA-XA-YC |
| | | FFS | 5DL CA with TDD CA_XA-XA-XA-YC |
| | | FFS | 5DL CA with FDD-TDD CA_XA-XA-XA-YC |
| 3 | CA_XA-YA-ZD | Rel-11 | 5DL CA with TDD CA_XA-YA-ZD |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-YA-ZD |
| 3 | CA_XA-YC-ZC | Rel-11 | 5DL CA with FDD CA_XA-YC-ZC |
| | | Rel-11 | 5DL CA with TDD CA_XA-YC-ZC |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-YC-ZC |
| 3 | CA_XA-YA-ZA-ZC | Rel-11 | 5DL CA with FDD CA_XA-YA-ZA-ZC |
| | | Rel-11 | 5DL CA with TDD CA_XA-YA-ZA-ZC |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-YA-ZA-ZC |

| Number of Bands | 5CA Band Combinations | Release for test applicability | Name |
|---|---|---|---|
| 3 | CA_XA-YA-ZA-ZA-ZA | FFS | 5DL CA with FDD CA_XA-YA-ZA-ZA-ZA |
| | | FFS | 5DL CA with TDD CA_XA-YA-ZA-ZA-ZA |
| | | FFS | 5DL CA with FDD-TDD CA_XA-YA-ZA-ZA-ZA |
| 3 | CA_XA-YA-YA-ZC | Rel-11 | 5DL CA with FDD CA_XA-YA-YA-ZC |
| | | Rel-11 | 5DL CA with TDD CA_XA-YA-YA-ZC |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-YA-YA-ZC |
| 3 | CA_XA-YA-YA-ZA-ZA | Rel-11 | 5DL CA with FDD CA_XA-YA-YA-ZA-ZA |
| | | Rel-11 | 5DL CA with TDD CA_XA-YA-YA-ZA-ZA |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-YA-YA-ZA-ZA |
| 4 | CA_XA-YA-ZA-RC | Rel-11 | 5DL CA with FDD CA_XA-YA-ZA-RC |
| | | Rel-11 | 5DL CA with TDD CA_XA-YA-ZA-RC |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-YA-ZA-RC |
| 4 | CA_XA-YA-ZA-RA-RA | Rel-11 | 5DL CA with FDD CA_XA-YA-ZA-RA-RA |
| | | Rel-11 | 5DL CA with TDD CA_XA-YA-ZA-RA-RA |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-YA-ZA-RA-RA |
| 5 | CA_XA-YA-ZA-RA-SA | Rel-12 | 5DL CA with FDD CA_XA-YA-ZA-RA-SA |
| | | Rel-12 | 5DL CA with TDD CA_XA-YA-ZA-RA-SA |
| | | Rel-12 | 5DL CA with FDD-TDD CA_XA-YA-ZA-RA-SA |
| Note 1: X, Y, Z, R and S in this table correspond to different bands i.e. X != Y != Z != R != S.<br>Note 2: The band combinations with difference appearance order of bands/sub-blocks in the band combination string are not distinguished. E.g. CA_XA-YA-YD represents the set of CA_XA-YD-YA, YD-YA-XA, YA-XA-YD and YA-YD-XA | | | |

For testing of category 0 HD-FDD UE in FDD operating bands, the SS shall ensure downlink transmission is only configured in downlink subframes and that UL grants are given to ensure UE is transmitting only in uplink subframes throughout the test. The subframes reserved for uplink and downlink respectively are specified in the RMC definition in Annex A.2 for uplink and Annex A.3 for downlink.

For ProSe testing, DRX configuration specified in Table 7.1-3 is used, so that Sidelink traffic takes place only in the DRX off part of the DRX cycle.

**Table 7.1-3: Reference DRX configuration**

| Parameter | Value | Comments |
|---|---|---|
| onDurationTimer | psf1 | |
| drx-InactivityTimer | psf1 | |
| drx-RetransmissionTimer | psf1 | |
| longDRX-CycleStartOffset | sf2560, 0 | |
| shortDRX | disabled | |
| NOTE: For further information see clause 6.3.2 in TS 36.331. | | |

For testing of category NB1 in all operation bands, standalone is used as default operation mode unless otherwise stated by the test case.

# 7.2 Diversity characteristics

The requirements in Section 7 assume that the receiver is equipped with two Rx port as a baseline. These requirements apply to all UE categories unless stated otherwise. Additional requirements apply for UE(s) equipped with four Rx ports. With the exception of clause 7.9, all requirements shall be verified by using both (all) antenna ports simultaneously.

NOTE 1: for an operating band in which the UE can operate using up to four Rx ports, it suffices to verify for conformance the additional requirements applicable for four Rx ports [except for REFSENS].

NOTE 2: Implementation of 4 antenna ports for all operating bands supported by the UE is not mandated.

For a category category 0, a category [M1], category 1bis, NB1 and NB2 UE the requirements in Section 7 assume that the receiver is equipped with single Rx port.

# 7.3 Reference sensitivity level

Editor's note: FDD/TDD aspects missing or not yet determined:

- The Maximum Sensitivity Degradation figures for large transmission configurations are not finalised in the core specification.

- This clause is also incomplete for CA_42A-46A and CA_7A-8A-20.

- $\Delta R_{IB,c}$ is in square brackets (awaiting for RAN4 decision).

- Clarification to the use of signalling the non-default Tx-Rx separation of 295MHz for Band 70 testing is under discussion.

## 7.3.1 Test purpose

To verify the UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area of an e-NodeB.

## 7.3.2 Test applicability

This test applies to all types of E-UTRA UE release 8 and forward.

## 7.3.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.3-1 and Table 7.3.3-2.

**Table 7.3.3-1: Reference sensitivity QPSK $P_{REFSENS}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| E-UTRA Band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| 1 | | | -100 | -97 | -95.2 | -94 | FDD |
| 2 | -102.7 | -99.7 | -98 | -95 | -93.2 | -92 | FDD |
| 3 | -101.7 | -98.7 | -97 | -94 | -92.2 | -91 | FDD |
| 4 | -104.7 | -101.7 | -100 | -97 | -95.2 | -94 | FDD |
| 5 | -103.2 | -100.2 | -98 | -95 | | | FDD |
| 6 | | | -100 | -97 | | | FDD |
| 7 | | | -98 | -95 | -93.2 | -92 | FDD |
| 8 | -102.2 | -99.2 | -97 | -94 | | | FDD |
| 9 | | | -99 | -96 | -94.2 | -93 | FDD |
| 10 | | | -100 | -97 | -95.2 | -94 | FDD |
| 11 | | | -100 | -97 | | | FDD |
| 12 | -101.7 | -98.7 | -97 | -94 | | | FDD |
| 13 | | | -97 | -94 | | | FDD |
| 14 | | | -97 | -94 | | | FDD |
| ... | | | | | | | |
| 17 | | | -97 | -94 | | | FDD |
| 18 | | | -100[7] | -97[7] | -95.2[7] | | FDD |
| 19 | | | -100 | -97 | -95.2 | | FDD |
| 20 | | | -97 | -94 | -91.2 | -90 | FDD |
| 21 | | | -100 | -97 | -95.2 | | FDD |
| 22 | | | -97 | -94 | -92.2 | -91 | FDD |
| 23 | -104.7 | -101.7 | -100 | -97 | -95.2 | -94 | FDD |
| 24 | | | -100 | -97 | | | FDD |
| 25 | -101.2 | -98.2 | -96.5 | -93.5 | -91.7 | -90.5 | FDD |
| 26 | -102.7 | -99.7 | -97.5[6] | -94.5[6] | -92.7[6] | | FDD |
| 27 | -103.2 | -100.2 | -98 | -95 | | | FDD |
| 28 | | -100.2 | -98.5 | -95.5 | -93.7 | -91 | FDD |
| 30 | | | -99 | -96 | | | FDD |
| 31 | -99.0 | -95.7 | -93.5 | | | | FDD |
| ... | | | | | | | |
| 33 | | | -100 | -97 | -95.2 | -94 | TDD |
| 34 | | | -100 | -97 | -95.2 | | TDD |
| 35 | -106.2 | -102.2 | -100 | -97 | -95.2 | -94 | TDD |
| 36 | -106.2 | -102.2 | -100 | -97 | -95.2 | -94 | TDD |
| 37 | | | -100 | -97 | -95.2 | -94 | TDD |
| 38 | | | -100 | -97 | -95.2 | -94 | TDD |
| 39 | | | -100 | -97 | -95.2 | -94 | TDD |
| 40 | | | -100 | -97 | -95.2 | -94 | TDD |
| 41 | | | -98 | -95 | -93.2 | -92 | TDD |
| 42 | | | -99 | -96 | -94.2 | -93 | TDD |
| 43 | | | -99 | -96 | -94.2 | -93 | TDD |
| 44 | | [-100.2] | [-98] | [-95] | [-93.2] | [-92] | TDD |
| 45 | | | -100 | -97 | -95.2 | -94 | TDD |
| 48 | | | -99 | -96 | -94.2 | -93 | TDD |
| 50 | | -102.2 | -100 | -97 | -95.2 | -94 | TDD |
| 51 | | -102.2 | -100 | | | | TDD |
| 52 | | | -99 | -96 | -94.2 | -93 | TDD |
| … | | | | | | | |
| 65 | -104.2 | -101.2 | -99.5 | -96.5 | -94.7 | -93.5 | FDD |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 66 | -104.2 | -101.2 | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| 68 | | | -98.5 | -95.5 | -93.7 | | FDD |
| … | | | | | | | |
| 70 | | | -100 | -97 | -95.2 | -94 | FDD |
| 71 | | | -97.2 | -94.2 | -92.0 | -87.5 | FDD |
| 72 | -99 | -95.7 | -93.5 | | | | FDD |
| 73 | -99.0 | -95.7 | -93.5 | | | | FDD |
| 74 | -104.7[8] | -101.7[8] | -99.5[8] | -96.5[8] | -94.7[8] | -93.5[8] | FDD |
| 85 | | | -97 | -94 | | | FDD |

Note 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5.
Note 2: The Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
Note 3: The signal power is specified per port
Note 4: For the UE which supports both Band 3 and Band 9 the reference sensitivity level is FFS.
Note 5: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
Note 6: [6] indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.
Note 7: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.
Note 8: [8] indicates that the requirement is modified by -0.5 dB when the assigned E-UTRA channel bandwidth is confined within 1475.9-1510.9 MHz.

For UE(s) equipped with 4 antenna ports, the minimum requirement for reference sensitivity in Table 7.3.3-1 shall be modified by the amount given in $\Delta R_{IB,4R}$ in Table 7.3.3-1a for the applicable E-UTRA bands.

**Table 7.3.3-1a: $\Delta R_{IB,4R}$**

| E-UTRA Band | $\Delta R_{IB,4R}$ [dB] |
|---|---|
| 1, 2, 3, 4, 7, 20, 21, 25, 34, 39, 40, 41, 66 | - 2.7 |
| 42, 43, 52 | - 2.2 |

For UE(s) equipped with 8 antenna ports, the minimum requirement for reference sensitivity in Table 7.3.3-1 shall be modified by the amount given in $\Delta R_{IB,8R}$ in Table 7.3.3-1aa for the applicable E-UTRA bands.

**Table 7.3.3-1aa: $\Delta R_{IB,8R}$**

| E-UTRA Band | $\Delta R_{IB,8R}$ [dB] |
|---|---|
| 41, 42, 43 | - 4 |

The reference receive sensitivity (REFSENS) requirement specified in Table 7.3.3-1 (two antenna ports) and Table 7.3.3-1a (four antenna ports) shall be met for an uplink transmission bandwidth less than or equal to that specified in Table 7.3.3-2.

NOTE: Table 7.3.3-2 is intended for conformance tests and does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors. Typical receiver sensitivity performance with HARQ retransmission enabled and using a residual BLER metric relevant for e.g. Speech Services is given in the Annex G of TS 36.101 [2] (informative).

For the UE which supports inter-band carrier aggregation configuration with the uplink in one or two E-UTRA bands, the minimum requirement for reference sensitivity in Table 7.3.3-1 and Table 7.3.3-1a shall be increased by the amount given in $\Delta R_{IB,c}$ in Table 7.3.3-1A, Table 7.3.3-1B and Table 7.3.3-1C for the applicable E-UTRA bands where unless otherwise stated, the same $\Delta R_{IB,c}$ is applicable to E-UTRA band(s) part for CA configurations which have the same E-UTRA operating band combination..

**Table 7.3.3-1A: $\Delta R_{IB,c}$ (two bands)**

| E-UTRA operating band combination | E-UTRA Band | $\Delta R_{IB,c}$ [dB] |
|---|---|---|
| CA_1-3, CA_1-1-3, CA_1-3-3 | 1 | 0 |
| | 3 | 0 |
| CA_1-5, CA_1-1-5 | 1 | 0 |
| | 5 | 0 |
| CA_1-7, CA_1-1-7, CA_1-7-7 | 1 | 0 |
| | 7 | 0 |
| CA_1-8 | 1 | 0 |
| | 8 | 0 |
| CA_1-11 | 1 | 0 |
| | 11 | 0 |
| CA_1-18 | 1 | 0 |
| | 18 | 0 |
| CA_1-19 | 1 | 0 |
| | 19 | 0 |
| CA_1-20 | 1 | 0 |
| | 20 | 0 |
| CA_1-21 | 1 | 0 |
| | 21 | 0 |
| CA_1-26 | 1 | 0 |
| | 26 | 0 |
| CA_1-28, CA_1-1-28 | 1 | 0 |
| | 28 | 0.2 |
| CA_1-32 | 1 | 0 |
| | 32 | 0 |
| CA_1-38 | 1 | 0 |
| | 38 | 0 |
| CA_1-40 | 1 | 0 |
| | 40 | 0 |
| CA_1-41[8] | 1 | 0 |
| | 41 | 0 |
| CA_1-42, CA_1-42-42 | 1 | 0 |
| | 42 | 0.5 |
| CA_1-43 | 1 | 0 |
| | 43 | 0.5 |
| CA_1-46 | 1 | 0 |
| CA_2-4, CA_2-2-4, CA_2-4-4, CA_2-2-4-4 | 2 | 0.3 |
| | 4 | 0.3 |
| CA_2-5, CA_2-2-5 | 2 | 0 |
| | 5 | 0 |
| CA_2-7, CA_2-2-7, CA_2-7-7 | 2 | 0 |
| | 7 | 0 |
| CA_2-12, CA_2-2-12, CA_2-12-12, CA_2-2-12-12 | 2 | 0 |
| | 12 | 0 |
| CA_2-13, CA_2-2-13 | 2 | 0 |
| | 13 | 0 |
| CA_2-14, CA_2-2-14 | 2 | 0 |
| | 14 | 0 |
| CA_2-17 | 2 | 0 |
| | 17 | 0.5 |
| CA_2-28 | 2 | 0 |
| | 28 | 0 |
| CA_2-29, CA_2-2-29 | 2 | 0 |
| CA_2-30, CA_2-2-30 | 2 | 0.4 |
| | 30 | 0.5 |
| CA_2-46, CA_2-2-46 | 2 | 0 |
| CA_2-48, | 2 | 0.2 |

| | | |
|---|---|---|
| CA_2-48-48 | 48 | 0.5 |
| CA_2-49 | 2 | 0.2 |
| CA_2-66, CA_2-2-66, CA_2-66-66, CA_2-2-66-66, CA_2-66-66-66 | 2 | 0.3 |
| | 66 | 0.3 |
| CA_2-71, CA_2-2-71 | 2 | 0 |
| | 71 | 0 |
| CA_3-5 | 3 | 0 |
| | 5 | 0 |
| CA_3-7, CA_3-3-7, CA_3-7-7, CA_3-3-7-7 | 3 | 0 |
| | 7 | 0 |
| CA_3-8, CA_3-3-8 | 3 | 0 |
| | 8 | 0 |
| CA_3-11 | 3 | 0.3 |
| | 11 | 0.5 |
| CA_3A-18A | 3 | 0 |
| | 18 | 0 |
| CA_3-19, CA_3-3-19 | 3 | 0 |
| | 19 | 0 |
| CA_3-20, CA_3-3-20 | 3 | 0 |
| | 20 | 0 |
| CA_3-21, CA_3-3-21 | 3 | 0.3 |
| | 21 | 0.5 |
| CA_3-26 | 3 | 0 |
| | 26 | 0 |
| CA_3-27 | 3 | 0 |
| | 27 | 0 |
| CA_3-28 | 3 | 0 |
| | 28 | 0 |
| CA_3-31 | 3 | 0 |
| | 31 | 0.2 |
| CA_3-32 | 3 | 0 |
| | 32 | 0 |
| CA_3-38 | 3 | 0 |
| | 38 | 0 |
| CA_3-40, CA_3-40-40 | 3 | 0 |
| | 40 | 0 |
| CA_3-41, CA_3-3-41 | 3 | 0 |
| | 41 | 0[10] |
| | | 0.5[11] |
| CA_3-42, CA_3-3-42, CA_3-42-42 | 3 | 0.2 |
| | 42 | 0.5 |
| CA_3-43 | 3 | 0 |
| | 43 | 0.5 |
| CA_3-46, CA_3-3-46 | 3 | 0 |
| CA_4-5, CA_4-4-5 | 4 | 0 |
| | 5 | 0 |
| CA_4-7, CA_4-4-7, CA_4-7-7 | 4 | 0.5 |
| | 7 | 0.5 |
| CA_4-12, CA_4-4-12, CA_4-12-12, CA_4-4-12-12 | 4 | 0 |
| | 12 | 0.5 |
| CA_4-13, CA_4-4-13 | 4 | 0 |
| | 13 | 0 |
| CA_4-17 | 4 | 0 |
| | 17 | 0.5 |
| CA_4-27 | 4 | 0 |
| | 27 | 0 |
| CA_4-28 | 4 | 0 |
| | 28 | 0.2 |

| | | |
|---|---|---|
| CA_4-29, CA_4-4-29 | 4 | 0 |
| CA_4-30, CA_4-4-30 | 4 | 0.4 |
| | 30 | 0.5 |
| CA_4-46 | 4 | 0 |
| CA_4-48 | 4 | 0 |
| | 48 | 0.5 |
| CA_4-71, CA_4-4-71 | 4 | 0 |
| | 71 | 0 |
| CA_5-7, CA_5-7-7 | 5 | 0 |
| | 7 | 0 |
| CA_5-12, CA_5-12-12 | 5 | 0.5 |
| | 12 | 0.3 |
| CA_5-13 | 5 | 0 |
| | 13 | 0 |
| CA_5-17 | 5 | 0.5 |
| | 17 | 0.3 |
| CA_5-25 | 5 | 0 |
| | 25 | 0 |
| CA_5-28 | 5 | 0 |
| | 28 | 0 |
| CA_5-29 | 5 | 0 |
| CA_5-30 | 5 | 0 |
| | 30 | 0 |
| CA_5-38 | 5 | 0 |
| | 38 | 0 |
| CA_5-40, CA_5-5-40, CA_5-40-40 | 5 | 0 |
| | 40 | 0 |
| CA_5-41 | 5 | 0 |
| | 41 | 0 |
| CA_5-48 | 5 | 0 |
| | 48 | 0 |
| CA_5-66, CA_5-5-66, CA_5-66-66, CA_5-5-66-66 | 5 | 0 |
| | 66 | 0 |
| CA_7-8, CA_7-7-8 | 7 | 0 |
| | 8 | 0.2 |
| CA_7-12 | 7 | 0 |
| | 12 | 0 |
| CA_7-20 | 7 | 0 |
| | 20 | 0 |
| CA_7-22 | 7 | 0 |
| | 22 | 0.5 |
| CA_7-26, CA_7-7-26 | 7 | 0 |
| | 26 | 0 |
| CA_7-28 | 7 | 0 |
| | 28 | 0 |
| CA_7-30 | 7 | 0.5 |
| | 30 | 0.5 |
| CA_7-32 | 7 | 0 |
| | 32 | 0 |
| CA_7-40 | 7 | 0 |
| | 40 | 0.5 |
| CA_7-42, CA_7-42-42 | 7 | 0 |
| | 42 | 0.5 |
| CA_7-46, CA_7-7-46 | 7 | 0 |
| CA_7-66, CA_7-7-66, CA_7-66-66, CA_7-7-66-66 | 7 | 0.5 |
| | 66 | 0.5 |
| CA_8-11 | 8 | 0 |
| | 11 | 0 |
| CA_8-20 | 8 | 0 |

| | | |
|---|---|---|
| | 20 | 0 |
| CA_8-27 | 8 | 0.3 |
| | 27 | 0.3 |
| CA_8-28[13] | 8 | 0.2 |
| | 28 | 0.1 |
| CA_8-32 | 8 | 0 |
| | 32 | 0 |
| CA_8-38 | 8 | 0 |
| | 38 | 0 |
| CA_8-39 | 8 | 0 |
| | 39 | 0 |
| CA_8-40 | 8 | 0 |
| | 40 | 0 |
| CA_8-41 | 8 | 0 |
| | 41 | 0 |
| CA_8-42 | 8 | 0.2 |
| | 42 | 0.5 |
| CA_8-46 | 8 | 0 |
| CA_11-18 | 11 | 0 |
| | 18 | 0 |
| CA_11-26 | 11 | 0 |
| | 26 | 0 |
| CA_11-28 | 11 | 0 |
| | 28 | 0.2 |
| CA_11-41 | 11 | 0 |
| | 41 | 0 |
| CA_11-42 | 11 | 0 |
| | 42 | 0.5 |
| CA_11-46 | 11 | 0 |
| CA_12-25 | 12 | 0 |
| | 25 | 0 |
| CA_12-30 | 12 | 0 |
| | 30 | 0 |
| CA_12-46 | 12 | 0 |
| | 46 | 0 |
| CA_12-48 | 12 | 0 |
| | 48 | 0 |
| CA_12-66, CA_12-66-66 | 12 | 0.5 |
| | 66 | 0 |
| CA_13-48, CA_13-48-48 | 13 | 0 |
| | 48 | 0 |
| CA_13-66, CA_13-66-66 | 13 | 0 |
| | 66 | 0 |
| CA_14-30 | 14 | 0 |
| | 30 | 0 |
| CA_14-66, CA_14-66-66, CA_14-66-66-66 | 14 | 0 |
| | 66 | 0 |
| CA_18-28[9] | 18 | 0 |
| | 28 | 0 |
| CA_19-21 | 19 | 0 |
| | 21 | 0 |
| CA_19-28[9] | 19 | 0 |
| | 28 | 0 |
| CA_19-42 | 19 | 0 |
| | 42 | 0.5 |
| CA_19-46 | 19 | 0 |
| CA_20-28 | 20 | 0 |
| | 28 | 0 |
| CA_20-31 | 20 | 0 |
| | 31 | 0 |
| CA_20-32 | 20 | 0 |
| CA_20-38 | 20 | 0 |
| | 38 | 0 |

| | | |
|---|---|---|
| CA_20-40, CA_20-40-40 | 20 | 0 |
| | 40 | 0 |
| CA_20-42, CA_20-42-42 | 20 | 0 |
| | 42 | 0.5 |
| CA_20-43 | 20 | 0 |
| | 43 | 0.5 |
| CA_20-67 | 20 | 0 |
| CA_20-75 | 20 | 0 |
| CA_20-76 | 20 | 0 |
| CA_21-28 | 21 | 0 |
| | 28 | 0 |
| CA_21-42 | 21 | 0 |
| | 42 | 0.5 |
| CA_21-46 | 21 | 0 |
| CA_23-29 | 23 | 0 |
| CA_25-26, CA_25-25-26 | 25 | 0 |
| | 26 | 0 |
| CA_25-41[8], CA_25-25-41[8] | 25 | 0 |
| | 41 | 0 |
| CA_25-46 | 25 | 0 |
| | 46 | 0 |
| CA_26-41 | 26 | 0 |
| | 41 | 0 |
| CA_26-46 | 26 | 0 |
| CA_26-48, CA_26-48-48 | 26 | 0 |
| | 48 | 0 |
| CA_28-38 | 28 | 0 |
| | 38 | 0 |
| CA_28-40 | 28 | 0 |
| | 40 | 0 |
| CA_28-41 | 28 | 0 |
| | 41 | 0 |
| CA_28-42 | 28 | 0.2 |
| | 42 | 0.5 |
| CA_28-46 | 28 | 0 |
| CA_29-30 | 30 | 0 |
| CA_29-66, CA_29-66-66 | 66 | 0 |
| CA_29-70 | 70 | 0 |
| CA_30-66, CA_30-66-66 | 30 | 0.5 |
| | 66 | 0.4 |
| CA_32-42 | 42 | 0.5 |
| CA_32-43 | 43 | 0.5 |
| CA_34-39 | 34 | 0.2[1] |
| | 39 | 0.2[1] |
| CA_34-41 | 34 | 0.2[1] |
| | 41 | 0.2[1] |
| CA_38-40, CA_38-40-40 | 38 | 0.5[4] |
| | 40 | 0.5[4] |
| CA_39-40 | 39 | 0.3[4] |
| | 40 | 0.3[4] |
| CA_39-41 | 39 | 0.2[4] |
| | 41 | 0.2[4] |
| CA_39-41 | 39 | 0.2[7] |
| | 41 | 0.2[7] |
| CA_39-42 | 39 | 0[4] |
| | 42 | 0.5[4] |
| CA_39-46 | 39 | 0 |
| CA_40-41 | 40 | 0[4] |
| | 41 | 0[4] |
| CA_40-42 | 40 | 0.4[4] |
| | 42 | 0.5[4] |
| CA_40-43 | 40 | 0.4[4] |
| | 43 | 0.5[4] |
| CA_40-46 | 40 | 0 |

| | | |
|---|---|---|
| CA_41-42 | 41 | 0.4[4] |
| | 42 | 0.5[4] |
| CA_41-42 | 41 | 0[7] |
| | 42 | 0.5[7] |
| CA_41-46 | 41 | 0 |
| CA_41-48 | 41 | 0[4] |
| | 48 | 0.5[4] |
| CA_42-43 | 42 | 0[4] |
| | 43 | 0[4] |
| CA_42-46 | 42 | [0] |
| CA_46-48, CA_46-48-48 | 48 | 0.5 |
| CA_46-66, CA_46-66-66 | 66 | 0 |
| CA_46-70 | 70 | 0 |
| CA_46-71 | 71 | 0 |
| CA_48-66, CA_48-48-66, CA_48-66-66, CA_48-48-66-66 | 48 | 0.5 |
| | 66 | 0.2 |
| CA_48-71, CA_48-48-71 | 48 | 0 |
| | 71 | 0 |
| CA_66-70, CA_66-66-70 | 66 | 0 |
| | 70 | 0 |
| CA_66-71, CA_66-66-71 | 66 | 0 |
| | 71 | 0 |
| CA_70-71 | 70 | 0 |
| | 71 | 0 |

NOTE 1: The above additional tolerances are only applicable for the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations

NOTE 2: The above additional tolerances also apply in intra-band and non-aggregated operation for the supported E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.

NOTE 3: In case the UE supports more than one of the above 2DL inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one 2DL inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the 2DL tolerances in Table 7.3.3-1A, truncated to one decimal place that would apply for that operating band among the supported 2DL CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 2DL carrier aggregation configurations involving such band shall be applied
- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum 2DL tolerance in Table 7.3.3-1A that would apply for that operating band among the supported 2DL CA configurations

NOTE 4: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRA band and without simultaneous Rx/Tx.

NOTE 5: Unless otherwise specified, in case the UE supports more than one of the above 3DL inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one 3DL inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz and the tolerances are the same, the value applies to the band. If the tolerances are different, the applicable additional 3DL tolerance is FFS. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 3DL carrier aggregation configurations involving such band shall be applied.
- When the E-UTRA operating band frequency range is >1GHz, the applicable additional 3DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 3DL CA configurations.

NOTE 6: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation

configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.
NOTE 7: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx.
NOTE 8: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in the FDD band.
NOTE 9: For Band 28, the requirements only apply for the restricted frequency range specified for this CA configuration (Table 5.2A-2).
NOTE 10: The requirement is applied for UE transmitting on the frequency range of 2545-2690MHz.
NOTE 11: The requirement is applied for UE transmitting on the frequency range of 2496-2545MHz.
NOTE 12: For UE supporting E-UTRA band 42, 43 or 48 and CA configurations including Band 42, 43 or 48, the applicable $\Delta R_{IB,c}$ in Band 42, 43, or 48 is the max(Band 42 $\Delta R_{IB,c}$ , Band 43 $\Delta R_{IB,c}$, Band 48 $\Delta R_{IB,c}$).
NOTE 13: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 8.

NOTE: To meet the $\Delta R_{IB,c}$ requirements for CA_20A-28A state-of-the-art filter combiner technology is needed.

**Table 7.3.3-1B: $\Delta R_{IB,c}$ (three bands)**

| E-UTRA operating band combination | E-UTRA Band | $\Delta R_{IB,c}$ [dB] |
|---|---|---|
| CA_1-3-5, CA_1-1-3-5 | 1 | 0 |
| | 3 | 0 |
| | 5 | 0 |
| CA_1-3-7, CA_1-1-3-7, CA_1-3-3-7, CA_1-3-7-7, CA_1-3-3-7-7 | 1 | 0 |
| | 3 | 0 |
| | 7 | 0 |
| CA_1-3-8, CA_1-3-3-8 | 1 | 0 |
| | 3 | 0 |
| | 8 | 0 |
| CA_1-3-11 | 1 | 0 |
| | 3 | 0.3 |
| | 11 | 0.5 |

| | | |
|---|---|---|
| CA_1-3-18 | 1 | 0 |
| | 3 | 0 |
| | 18 | 0 |
| CA_1-3-19, CA_1-3-3-19 | 1 | 0 |
| | 3 | 0 |
| | 19 | 0 |
| CA_1-3-20, CA_1-3-3-20 | 1 | 0 |
| | 3 | 0 |
| | 20 | 0 |
| CA_1-3-21, CA_1-3-3-21 | 1 | 0 |
| | 3 | 0.3 |
| | 21 | 0.5 |
| CA_1-3-26 | 1 | 0 |
| | 3 | 0 |
| | 26 | 0 |
| CA_1-3-28, CA_1-1-3-28, CA_1-3-3-28 | 1 | 0 |
| | 3 | 0 |
| | 28 | 0.2 |
| CA_1-3-32 | 1 | 0 |
| | 3 | 0 |
| | 32 | 0 |
| CA_1-3-38 | 1 | 0 |
| | 3 | 0 |
| | 38 | 0 |
| CA_1-3-40 | 1 | 0 |
| | 3 | 0 |
| | 40 | 0 |
| CA_1-3-41 | 1 | 0 |
| | 3 | 0 |
| | 41 | $0^5$/$0.5^6$ |
| CA_1-3-42, CA_1-3-3-42 | 1 | 0.2 |
| | 3 | 0.2 |
| | 42 | 0.5 |
| CA_1-3-43 | 1 | 0 |
| | 3 | 0 |
| | 43 | 0.5 |
| CA_1-5-7, CA_1-5-7-7 | 1 | 0 |
| | 5 | 0 |
| | 7 | 0 |
| CA_1-5-40 | 1 | 0 |
| | 5 | 0 |
| | 40 | 0 |
| CA_1-5-41 | 1 | 0 |
| | 5 | 0 |
| | 41 | 0 |
| CA_1-5-46 | 1 | 0 |
| | 5 | 0 |
| CA_1-7-8, CA_1-7-7-8 | 1 | 0 |
| | 7 | 0 |
| | 8 | 0.2 |
| CA_1-7-20 | 1 | 0 |
| | 7 | 0 |
| | 20 | 0 |
| CA_1-7-26, CA_1-7-7-26 | 1 | 0 |
| | 7 | 0 |
| | 26 | 0 |
| CA_1-7-28 | 1 | 0 |
| | 7 | 0 |
| | 28 | 0.2 |
| CA_1-7-32 | 1 | 0 |
| | 7 | 0 |
| | 32 | 0 |
| CA_1-7-40 | 1 | 0 |
| | 7 | 0.3 |
| | 40 | 0.8 |

| | | |
|---|---|---|
| CA_1-7-42 | 1 | 0.2 |
| | 7 | 0.2 |
| | 42 | 0.5 |
| CA_1-7-46 | 1 | 0 |
| | 7 | 0 |
| CA_1-8-11 | 1 | 0 |
| | 8 | 0 |
| | 11 | 0 |
| CA_1-8-20 | 1 | 0 |
| | 8 | 0 |
| | 20 | 0 |
| CA_1-8-28[10] | 1 | 0 |
| | 8 | 0.2 |
| | 28 | 0.2 |
| CA_1-8-38 | 1 | 0 |
| | 8 | 0 |
| | 38 | 0 |
| CA_1-8-40 | 1 | 0 |
| | 8 | 0 |
| | 40 | 0 |
| CA_1-11-18 | 1 | 0 |
| | 11 | 0 |
| | 18 | 0 |
| CA_1-11-28 | 1 | 0 |
| | 11 | 0 |
| | 28 | 0.2 |
| CA_1-18-28 | 1 | 0 |
| | 18 | 0 |
| | 28 | 0 |
| CA_1-19-21 | 1 | 0 |
| | 19 | 0 |
| | 21 | 0 |
| CA_1-19-28 | 1 | 0 |
| | 19 | 0 |
| | 28 | 0 |
| CA_1-19-42 | 1 | 0 |
| | 19 | 0 |
| | 42 | 0.5 |
| CA_1-20-28 | 1 | 0 |
| | 20 | 0.2 |
| | 28 | 0.2 |
| CA_1-20-32 | 1 | 0 |
| | 20 | 0 |
| | 32 | 0 |
| CA_1-20-42 | 1 | 0 |
| | 20 | 0 |
| | 42 | 0.5 |
| CA_1-20-43 | 1 | 0 |
| | 20 | 0 |
| | 43 | 0.5 |
| CA_1-21-28 | 1 | 0 |
| | 21 | 0 |
| | 28 | 0.2 |
| CA_1-21-42 | 1 | 0 |
| | 21 | 0 |
| | 42 | 0.5 |
| CA_1-28-42 | 1 | 0 |
| | 28 | 0.2 |
| | 42 | 0.5 |
| CA_1-32-42 | 1 | 0 |
| | 42 | 0.5 |
| CA_1-32-43 | 1 | 0 |
| | 43 | 0.5 |
| CA_1-41-42[7, 12] | 1 | 0 |
| | 41 | 0 |

| | | |
|---|---|---|
| | 42 | 0.5 |
| CA_1-42-43[13] | 1 | 0 |
| | 42 | 0.5 |
| | 43 | 0.5 |
| CA_2-2-12-66-66 | 2 | 0.3 |
| | 12 | 0.5 |
| | 66 | 0.3 |
| CA_2-4-5, CA_2-2-4-5, CA_2-4-4-5 | 2 | 0.3 |
| | 4 | 0.3 |
| | 5 | 0 |
| CA_2-4-7, CA_2-4-7-7 | 2 | 0.3 |
| | 4 | 0.5 |
| | 7 | 0.5 |
| CA_2-4-12, CA_2-2-4-12, CA_2-4-4-12, CA_2-4-12-12 | 2 | 0.3 |
| | 4 | 0.3 |
| | 12 | 0.5 |
| CA_2-4-13 | 2 | 0.3 |
| | 4 | 0.3 |
| | 13 | 0 |
| CA_2-4-28 | 2 | 0.3 |
| | 4 | 0.3 |
| | 28 | 0.5 |
| CA_2-4-29 | 2 | 0.3 |
| | 4 | 0.3 |
| CA_2-4-30 | 2 | 0.4 |
| | 4 | 0.4 |
| | 30 | 0.5 |
| CA_2-4-71, CA_2-2-4-71 | 2 | 0.3 |
| | 4 | 0.3 |
| | 71 | 0 |
| CA_2-5-12, CA_2-2-5-12, CA_2-5-12-12 | 2 | 0 |
| | 5 | 0.5 |
| | 12 | 0.3 |
| CA_2-5-7 | 2 | 0 |
| | 5 | 0 |
| | 7 | 0 |
| CA_2-5-13 | 2 | 0 |
| | 5 | 0 |
| | 13 | 0 |
| CA_2-5-28 | 2 | 0 |
| | 5 | 0.5 |
| | 28 | 0.3 |
| CA_2-5-29 | 2 | 0 |
| | 5 | 0 |
| CA_2-5-30 CA_2-2-5-30 | 2 | 0.4 |
| | 5 | 0 |
| | 30 | 0.5 |
| CA_2-5-46 | 2 | 0 |
| | 5 | 0 |
| CA_2-5-66, CA_2-2-5-66, CA_2-5-66-66, CA_2-2-5-66-66 | 2 | 0.3 |
| | 5 | 0 |
| | 66 | 0.3 |
| CA_2-7-12, CA_2-2-7-12 | 2 | 0 |
| | 7 | 0 |
| | 12 | 0 |
| CA_2-7-28 | 2 | 0 |
| | 7 | 0 |
| | 28 | 0 |
| CA_2-7-30 | 2 | 0.4 |
| | 7 | 0 |
| | 30 | 0.5 |
| CA_2-7-46 | 2 | 0 |
| | 7 | 0 |
| CA_2-7-66, | 2 | 0.3 |

| | | |
|---|---|---|
| CA_2-2-7-66, CA_2-7-7-66, CA_2-7-66-66 | 7 | 0.5 |
| | 66 | 0.5 |
| CA_2-12-30, CA_2-2-12-30 | 2 | 0.4 |
| | 12 | 0 |
| | 30 | 0.5 |
| CA_2-12-66, CA_2-2-12-66, CA_2-2-12-66-66, CA_2-12-66-66 | 2 | 0.3 |
| | 12 | 0.5 |
| | 66 | 0.3 |
| CA_2-13-46 | 2 | 0 |
| | 13 | 0 |
| CA_2-13-48, CA_2-13-48-48 | 2 | 0.2 |
| | 13 | 0 |
| | 48 | 0.5 |
| CA_2-13-66, CA_2-2-13-66, CA_2-13-66-66 | 2 | 0.3 |
| | 13 | 0 |
| | 66 | 0.3 |
| CA_2-14-30, CA_2-2-14-30 | 2 | 0.3 |
| | 14 | 0 |
| | 30 | 0.3 |
| CA_2-14-66, CA_2-2-14-66, CA_2-2-14-66-66, CA_2-14-66-66-66 | 2 | 0.3 |
| | 14 | 0 |
| | 66 | 0.3 |
| CA_2-29-30, CA_2-2-29-30 | 2 | 0.4 |
| | 30 | 0.5 |
| CA_2-29-66 | 2 | 0.3 |
| | 66 | 0.3 |
| CA_2-30-66, CA_2-2-30-66, CA_2-30-66-66 | 2 | 0.4 |
| | 30 | 0.5 |
| | 66 | 0.4 |
| CA_2-46-48 | 2 | 0.3 |
| | 48 | 0.5 |
| CA_2-46-66, CA_2-46-46-66 | 2 | 0 |
| | 66 | 0 |
| CA_2-48-66, CA_2-48-48-66 | 2 | 0.3 |
| | 48 | 0.5 |
| | 66 | 0.3 |
| CA_2-66-71, CA_2-2-66-71, CA_2-66-66-71 | 2 | 0.3 |
| | 66 | 0.3 |
| | 71 | 0 |
| CA_3-5-7, CA_3-5-7-7 | 3 | 0 |
| | 5 | 0 |
| | 7 | 0 |
| CA_3-5-40, CA_3-5-40-40 | 3 | 0 |
| | 5 | 0 |
| | 40 | 0 |
| CA_3-5-41 | 3 | 0 |
| | 5 | 0 |
| | 41 | 0[5] |
| | | 0.5[6] |
| CA_3-7-8, CA_3-3-7-8, CA_3-7-7-8, CA_3-3-7-7-8 | 3 | 0 |
| | 7 | 0 |
| | 8 | 0.2 |
| CA_3-7-20, CA_3-3-7-20 | 3 | 0 |
| | 7 | 0 |
| | 20 | 0 |
| CA_3-7-26 | 3 | 0 |
| | 7 | 0 |
| | 26 | 0 |
| CA_3-7-28, CA_3-3-7-2 | 3 | 0 |
| | 7 | 0 |

| | | |
|---|---|---|
| | 28 | 0 |
| CA_3-7-32 | 3 | 0 |
| | 7 | 0 |
| CA_3-7-38 | 3 | 0 |
| | 7 | 0 |
| | 38 | 0.2 |
| CA_3-7-40 | 3 | 0 |
| | 7 | 0.3 |
| | 40 | 0.8 |
| CA_3-7-42 | 3 | 0.2 |
| | 7 | 0.2 |
| | 42 | 0.5 |
| CA_3-7-46 | 3 | 0 |
| | 7 | 0 |
| CA_3-8-11 | 3 | 0.3 |
| | 8 | 0 |
| | 11 | 0.5 |
| CA_3-8-20 | 3 | 0 |
| | 8 | 0 |
| | 20 | 0 |
| CA_3-8-28[11] | 3 | 0 |
| | 8 | 0.2 |
| | 28 | 0.1 |
| CA_3-8-32 | 3 | 0.3 |
| | 8 | 0 |
| | 32 | 0.5 |
| CA_3-8-38 | 3 | 0 |
| | 8 | 0 |
| | 38 | 0 |
| CA_3-8-40 | 3 | 0 |
| | 8 | 0 |
| | 40 | 0 |
| CA_3-11-18 | 3 | 0.3 |
| | 11 | 0.5 |
| | 18 | 0 |
| CA_3-11-26 | 3 | 0.3 |
| | 11 | 0.5 |
| | 26 | 0 |
| CA_3-11-28 | 3 | 0.3 |
| | 11 | 0.5 |
| | 28 | 0.2 |
| CA_3-19-21 | 3 | 0.3 |
| | 19 | 0 |
| | 21 | 0.5 |
| CA_3-19-42 | 3 | 0.2 |
| | 19 | 0 |
| | 42 | 0.5 |
| CA_3-20-28, CA-3-3-20-28 | 3 | 0 |
| | 20 | 0.1 |
| | 28 | 0.1 |
| CA_3-20-32 | 3 | 0 |
| | 20 | 0 |
| | 32 | 0 |
| CA_3-20-42 | 3 | 0.2 |
| | 20 | 0 |
| | 42 | 0.5 |
| CA_3-20-43 | 3 | 0 |
| | 20 | 0 |
| | 43 | 0.5 |
| CA_3-21-28 | 3 | 0.3 |
| | 21 | 0.5 |
| | 28 | 0 |
| CA_3-21-42 | 3 | 0.3 |
| | 21 | 0.5 |
| | 42 | 0.5 |

| | | |
|---|---|---|
| CA_3-28-38 | 3 | 0 |
| | 28 | 0 |
| | 38 | 0.2 |
| CA_3-28-40 | 3 | 0 |
| | 28 | 0 |
| | 40 | 0 |
| CA_3-28-41 | 3 | 0 |
| | 28 | 0 |
| | 41 | 0[5]/0.5[6] |
| CA_3-28-42 | 3 | 0.2 |
| | 28 | 0.2 |
| | 42 | 0.5 |
| CA_3-32-42 | 3 | 0.2 |
| | 32 | 0 |
| | 42 | 0.5 |
| CA_3-32-43 | 3 | 0 |
| | 32 | 0 |
| | 43 | 0.5 |
| CA_3-41-42[13] | 3 | 0.5 |
| | 41 | 0[5]/0.5[6] |
| | 42 | 0.5 |
| CA_3-42-43[13] | 3 | 0.2 |
| | 42 | 0.5 |
| | 43 | 0.5 |
| CA_4-5-12, CA_4-4-5-12, CA_4-5-12-12 | 4 | 0 |
| | 5 | 0.5 |
| | 12 | 0.5 |
| CA_4-5-13 | 4 | 0 |
| | 5 | 0 |
| | 13 | 0 |
| CA_4-5-29 | 4 | 0 |
| | 5 | 0 |
| CA_4-5-30, CA_4-4-5-30 | 4 | 0.4 |
| | 5 | 0 |
| | 30 | 0.5 |
| CA_4-7-12 | 4 | 0.5 |
| | 7 | 0.5 |
| | 12 | 0.5 |
| CA_4-7-28 | 4 | 0.5 |
| | 7 | 0.5 |
| | 28 | 0.2 |
| CA_4-12-30, CA_4-4-12-30 | 4 | 0.4 |
| | 12 | 0.5 |
| | 30 | 0.5 |
| CA_4-29-30, CA_4-4-29-30 | 4 | 0.4 |
| | 30 | 0.5 |
| CA_5-7-28 | 5 | 0 |
| | 7 | 0 |
| | 28 | 0 |
| CA_5-7-46 | 5 | 0 |
| | 7 | 0 |
| CA_5-12-46 | 5 | 0.5 |
| | 12 | 0.3 |
| CA_5-12-48 | 5 | 0.5 |
| | 12 | 0.3 |
| | 48 | 0 |
| CA_5-12-66 | 5 | 0 |
| | 12 | 0.5 |
| | 66 | 0.5 |
| CA_5-30-66, CA_5-30-66-66 | 5 | 0 |
| | 30 | 0.5 |
| | 66 | 0.4 |
| CA_5-40-41 | 5 | 0 |
| | 40 | 0 |
| | 41 | 0 |

| | | |
|---|---|---|
| CA_5-46-66 | 5 | 0 |
| | 66 | 0 |
| CA_7-8-20 | 7 | 0 |
| | 8 | 0.2 |
| | 20 | [0.2] |
| CA_7-8-38 | 7 | 0 |
| | 8 | 0 |
| | 38 | 0.2 |
| CA_7-8-40 | 7 | 0 |
| | 8 | 0.2 |
| | 40 | 0.5 |
| CA_7-12-66 | 7 | 0.5 |
| | 12 | 0.5 |
| | 66 | 0.5 |
| CA_7-20-28 | 7 | 0 |
| | 20 | 0.2 |
| | 28 | 0.2 |
| CA_7-20-32 | 7 | 0 |
| | 20 | 0 |
| | 32 | 0 |
| CA_7-20-38 | 7 | 0 |
| | 20 | 0 |
| | 38 | 0.2 |
| CA_7-20-42 | 7 | 0 |
| | 20 | 0 |
| | 42 | 0.5 |
| CA_7-28-38 | 7 | 0 |
| | 28 | 0 |
| | 38 | 0.2 |
| CA_7-30-66 | 7 | 0.5 |
| | 30 | 0.5 |
| | 66 | 0.5 |
| CA_7-46-66 | 7 | 0.5 |
| | 66 | 0.5 |
| CA_8-11-28[16] | 8 | 0.2 |
| | 11 | 0 |
| | 28 | 0.2 |
| CA_8-20-28 | 8 | 0 |
| | 20 | 0 |
| | 28 | 0 |
| CA_8-28-41[14] | 8 | 0.2 |
| | 28 | 0.1 |
| | 41 | 0 |
| CA_8-39-41 | 8 | 0 |
| | 39 | 0.2[17] |
| | 41 | 0.2[17] |
| CA_12-30-66, CA_12-30-66-66 | 12 | 0.5 |
| | 30 | 0.5 |
| | 66 | 0.4 |
| CA_13-46-66 | 13 | 0 |
| | 66 | 0 |
| CA_13-48-66, CA_13-48-48-66 | 13 | 0 |
| | 48 | 0.5 |
| | 66 | 0.2 |
| CA_14-30-66, CA_14-30-66-66 | 14 | 0 |
| | 30 | 0.5 |
| | 66 | 0.4 |
| CA_19-21-42 | 19 | 0 |
| | 21 | 0 |
| | 42 | 0.5 |
| CA_20-32-42 | 20 | 0 |
| | 32 | 0 |
| | 42 | 0.5 |
| CA_20-32-43 | 20 | 0 |
| | 32 | 0 |

| | | |
|---|---|---|
| | 43 | 0.5 |
| CA_20-38-40, CA_20-38-40-40[18] | 20 | 0 |
| | 38 | 0.5 |
| | 40 | 0.5 |
| CA_21-28-42 | 21 | 0 |
| | 28 | 0.2 |
| | 42 | 0.5 |
| CA_25-26-41, CA_25-25-26-41 | 25 | 0 |
| | 26 | 0 |
| | 41 | 0.5 |
| CA_28-41-42[9] | 28 | 0.2 |
| | 41 | 0.4[1] |
| | 42 | 0.5[1] |
| CA_29-30-66, CA_29-30-66-66 | 30 | 0.5 |
| | 66 | 0.4 |
| CA_29-46-66 | 66 | 0 |
| CA_29-66-70, CA_29-66-66-70 | 66 | 0 |
| | 70 | 0 |
| CA_32A-42A-43A[13] | 32 | 0 |
| | 42 | 0.5 |
| | 43 | 0.5 |
| CA_46-48-66 | 48 | 0.5 |
| | 66 | 0.3 |
| CA_46-48-71, CA_46-48-48-71 | 4646 | 0 |
| | 4848 | 0.5 |
| | 7171 | 0 |
| CA_66-70-71, CA_66-66-70-71 | 66 | 0 |
| | 70 | 0 |
| | 71 | 0 |

NOTE 1: The above additional tolerances are only applicable for the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.

NOTE 2: The above additional tolerances also apply in intra-band and non-aggregated operation for the supported E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.

NOTE 3: Unless otherwise specified, in case the UE supports more than one of the above 3DL inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one 3DL inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz and the tolerances are the same, the value applies to the band. If the tolerances are different, the applicable additional 3DL tolerance is FFS. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 3DL carrier aggregation configurations involving such band shall be applied.
- When the E-UTRA operating band frequency range is >1GHz, the applicable additional 3DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 3DL CA configurations.

NOTE 4: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.

NOTE 5: The requirement is specified for the frequency range of 2545-2690MHz.

NOTE 6: The requirement is specified for the frequency range of 2496-2545MHz.

NOTE 7: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 1 or Band 42.

NOTE 8: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRA band and without simultaneous Rx/Tx on Band 41 and Band 42.

NOTE 9: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx among TDD bands.

NOTE 10: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 1 or Band 8.

NOTE 11: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 3 or Band 8.

NOTE 12: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx among TDD bands.

NOTE 13: Applicable for UE supporting inter-band carrier aggregation without

simultaneous Rx/Tx among TDD bands.

NOTE 14: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 8 or Band 41.

NOTE 15: For UE supporting E-UTRA band 42, 43 or 48 and CA configurations including Band 42, 43 or 48, the applicable $\Delta R_{IB,c}$ in Band 42, 43, or 48 is the max(Band 42 $\Delta R_{IB,c}$ , Band 43 $\Delta R_{IB,c}$, Band 48 $\Delta R_{IB,c}$).

NOTE 16: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 8 or Band 11.

NOTE17: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRAN band and without simultaneous Rx/Tx on Band 39 and Band 41.

NOTE 18: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRA band and without simultaneous Rx/Tx among TDD bands.

**Table 7.3.3-1C: $\Delta R_{IB,c}$ (four bands)**

| E-UTRA operating band combination | E-UTRA Band | $\Delta R_{IB,c}$ [dB] |
|---|---|---|
| CA_1-3-5-7, CA_1-3-5-7-7 | 1 | 0 |
| | 3 | 0 |
| | 5 | 0 |
| | 7 | 0 |
| CA_1-3-5-40 | 1 | 0 |
| | 3 | 0 |
| | 5 | 0 |
| | 40 | 0 |
| CA_1-3-5-41 | 1 | 0 |
| | 3 | 0 |
| | 5 | 0 |
| | 41 | 0[6] |
| | | 0.5[7] |
| CA_1-3-7-8 | 1 | 0 |
| | 3 | 0 |
| | 7 | 0 |
| | 8 | 0.2 |
| CA_1-3-7-20, CA_1-3-3-7-20 | 1 | 0 |
| | 3 | 0 |
| | 7 | 0 |
| | 20 | 0 |
| CA_1-3-7-26, CA_1-3-7-7-26 | 1 | 0 |
| | 3 | 0 |
| | 7 | 0 |
| | 26 | 0 |
| CA_1-3-7-28, CA_1-3-3-7-28 | 1 | 0 |
| | 3 | 0 |
| | 7 | 0 |
| | 28 | 0.2 |
| CA_1-3-7-32 | 1 | 0 |
| | 3 | 0 |
| | 7 | 0 |
| | 32 | 0 |
| CA_1-3-7-40 | 1 | 0 |
| | 3 | 0 |
| | 7 | 0.3 |
| | 40 | 0.8 |
| CA_1-3-7-42 | 1 | 0.3 |
| | 3 | 0.3 |
| | 7 | 0.3 |
| | 42 | 0.5 |
| CA_1-3-8-11 | 1 | 0 |
| | 3 | 0.3 |
| | 8 | 0 |
| | 11 | 0.5 |
| CA_1-3-8-20 | 1 | 0 |
| | 3 | 0 |
| | 8 | 0 |
| | 20 | 0 |
| CA_1-3-8-28[8] | 1 | 0 |
| | 3 | 0 |
| | 8 | 0.2 |
| | 28 | 0.2 |
| CA_1-3-8-38 | 1 | 0 |
| | 3 | 0 |
| | 8 | 0 |
| | 38 | 0 |
| CA_1-3-11-28 | 1 | 0 |
| | 3 | 0.3 |
| | 11 | 0.5 |
| | 28 | 0.2 |

| | | |
|---|---|---|
| CA_1-3-8-40 | 1 | 0 |
| | 3 | 0 |
| | 8 | 0 |
| | 40 | 0 |
| CA_1-3-19-21, CA_1-3-3-19-21 | 1 | 0 |
| | 3 | 0.3 |
| | 19 | 0 |
| | 21 | 0.5 |
| CA_1-3-19-42 | 1 | 0.2 |
| | 3 | 0.2 |
| | 19 | 0 |
| | 42 | 0.5 |
| CA_1-3-20-28, CA_1-3-3-20-28 | 1 | 0 |
| | 3 | 0 |
| | 20 | 0.2 |
| | 28 | 0.2 |
| CA_1-3-20-32 | 1 | 0 |
| | 3 | 0 |
| | 20 | 0 |
| | 32 | 0 |
| CA_1-3-20-42 | 1 | 0.2 |
| | 3 | 0.2 |
| | 20 | 0 |
| | 42 | 0.5 |
| CA_1-3-20-43 | 1 | 0 |
| | 3 | 0 |
| | 20 | 0 |
| | 43 | 0.5 |
| CA_1-3-21-28 | 1 | 0 |
| | 3 | 0.3 |
| | 21 | 0.5 |
| | 28 | 0.2 |
| CA_1-3-21-42 | 1 | 0.2 |
| | 3 | 0.3 |
| | 21 | 0.5 |
| | 42 | 0.5 |
| CA_1-3-28-42 | 1 | 0.2 |
| | 3 | 0.2 |
| | 28 | 0.2 |
| | 42 | 0.5 |
| CA_1-3-32-42 | 1 | 0.2 |
| | 3 | 0.2 |
| | 32 | 0 |
| | 42 | 0.5 |
| CA_1-3-32-43 | 1 | 0 |
| | 3 | 0 |
| | 32 | 0 |
| | 43 | 0.5 |
| CA_1-3-42-43[11] | 1 | 0.2 |
| | 3 | 0.2 |
| | 42 | 0.5 |
| | 43 | 0.5 |
| CA_1-5-7-46 | 1 | 0 |
| | 5 | 0 |
| | 7 | 0 |
| CA_1-7-8-20 | 1 | 0 |
| | 7 | 0 |
| | 8 | 0.2 |
| | 20 | 0.2 |
| CA_1-7-8-40 | 1 | 0 |
| | 7 | 0.3 |
| | 8 | 0.2 |
| | 40 | 0.8 |
| CA_1-7-20-28 | 1 | 0 |
| | 7 | 0 |

| | | |
|---|---|---|
| | 20 | 0.2 |
| | 28 | 0.2 |
| CA_1-7-20-32 | 1 | 0 |
| | 7 | 0 |
| | 20 | 0 |
| | 32 | 0 |
| CA_1-7-20-42 | 1 | 0.2 |
| | 7 | 0.2 |
| | 20 | 0.2 |
| | 42 | 0.5 |
| CA_1-8-11-28[9] | 1 | 0 |
| | 8 | 0.2 |
| | 11 | 0 |
| | 28 | 0.2 |
| CA_1-8-20-28 | 1 | 0 |
| | 8 | 0.2 |
| | 20 | 0.2 |
| | 28 | 0.2 |
| CA_1-19-21-42 | 1 | 0 |
| | 19 | 0 |
| | 21 | 0 |
| | 42 | 0.5 |
| CA_1-20-32-42 | 1 | 0 |
| | 20 | 0 |
| | 32 | 0 |
| | 42 | 0.5 |
| CA_1-20-32-43 | 1 | 0 |
| | 20 | 0 |
| | 32 | 0 |
| | 43 | 0.5 |
| CA_1-21-28-42 | 1 | 0 |
| | 21 | 0 |
| | 28 | 0.2 |
| | 42 | 0.5 |
| CA_1-32-42-43[11] | 1 | 0 |
| | 32 | 0 |
| | 42 | 0.5 |
| | 43 | 0.5 |
| CA_2-4-5-12 | 2 | 0.3 |
| | 4 | 0.3 |
| | 5 | 0.5 |
| | 12 | 0.5 |
| CA_2-4-5-29 | 2 | 0.3 |
| | 4 | 0.3 |
| | 5 | 0 |
| CA_2-4-5-30 | 2 | 0.4 |
| | 4 | 0.4 |
| | 5 | 0 |
| | 30 | 0.5 |
| CA_2-4-7-12 | 2 | 0.3 |
| | 4 | 0.3 |
| | 7 | 0.5 |
| | 12 | 0.5 |
| CA_2-4-12-30 | 2 | 0.4 |
| | *4* | 0.4 |
| | 12 | 0.5 |
| | 30 | 0.5 |
| CA_2-4-29-30 | 2 | 0.4 |
| | 4 | 0.4 |
| | 30 | 0.5 |
| CA_2-5-7-28 | 2 | 0 |
| | 5 | 0.2 |
| | 7 | 0 |
| | 28 | 0.2 |
| CA_2-5-12-66, | 2 | 0.3 |

| | | |
|---|---|---|
| CA_2-2-5-12-66 | 5 | 0.5 |
| | 12 | 0.5 |
| | 66 | 0.3 |
| CA_2-5-30-66, CA_2-2-5-30-66, CA_2-5-30-66-66 | 2 | 0.4 |
| | 5 | 0 |
| | 30 | 0.5 |
| | 66 | 0.4 |
| CA_2-7-12-66, CA_2-2-7-12-66 | 2 | 0.3 |
| | 7 | 0.5 |
| | 12 | 0.5 |
| | 66 | 0.3 |
| CA_2-7-46-66 | 2 | 0.3 |
| | 7 | 0.5 |
| | 46 | 0 |
| | 66 | 0.5 |
| CA_2-12-30-66, CA_2-2-12-30-66, CA_2-12-30-66-66 | 2 | 0.4 |
| | 12 | 0.5 |
| | 30 | 0.5 |
| | 66 | 0.4 |
| CA_2-13-48-66, CA_2-13-48-48-66 | 2 | 0.3 |
| | 13 | 0 |
| | 48 | 0.5 |
| | 66 | 0.3 |
| CA_2-14-30-66, CA_2-2-14-30-66, CA_2-14-30-66-66 | 2 | 0.4 |
| | 14 | 0 |
| | 30 | 0.5 |
| | 66 | 0.4 |
| CA_2-29-30-66 | 2 | 0.4 |
| | 30 | 0.5 |
| | 66 | 0.4 |
| CA_2-46-48-66 | 2 | 0.3 |
| | 48 | 0.5 |
| | 66 | 0.3 |
| CA_3-7-8-20 | 3 | 0 |
| | 7 | 0 |
| | 8 | 0 |
| | 20 | 0 |
| CA_3-7-8-38 | 3 | 0 |
| | 7 | 0 |
| | 8 | 0 |
| | 38 | 0.2 |
| CA_3-7-8-40 | 3 | 0 |
| | 7 | 0.3 |
| | 8 | 0.2 |
| | 40 | 0.8 |
| CA_3-7-20-28 | 3 | 0 |
| | 7 | 0 |
| | 20 | 0.2 |
| | 28 | 0.1 |
| CA_3-7-20-32 | 3 | 0 |
| | 7 | 0 |
| | 20 | 0 |
| | 32 | 0 |
| CA_3-7-20-42 | 3 | 0.2 |
| | 7 | 0.2 |
| | 20 | 0 |
| | 42 | 0.5 |
| CA_3-7-28-38 | 3 | 0 |
| | 7 | 0 |
| | 28 | 0 |
| | 38 | 0.2 |
| CA_3-8-11-28[10] | 3 | 0.3 |
| | 8 | 0.2 |
| | 11 | 0.5 |
| | 28 | 0.2 |

| | | |
|---|---|---|
| CA_3-8-20-28 | 3 | 0 |
| | 8 | 0.2 |
| | 20 | 0.1 |
| | 28 | 0.1 |
| CA_3-19-21-42 | 3 | 0.3 |
| | 19 | 0 |
| | 21 | 0.5 |
| | 42 | 0.5 |
| CA_3-20-32-42 | 3 | 0.2 |
| | 20 | 0 |
| | 32 | 0 |
| | 42 | 0.5 |
| CA_3-20-32-43 | 3 | 0 |
| | 20 | 0 |
| | 32 | 0 |
| | 43 | 0.5 |
| CA_3-21-28-42 | 3 | 0.3 |
| | 21 | 0.5 |
| | 28 | 0.2 |
| | 42 | 0.5 |
| CA_3-28-41-42 | 3 | 0.5 |
| | 28 | 0.2 |
| | 41 | 0.4[5]/0.5[7] |
| | 42 | 0.5 |
| CA_3-32-42-43[11] | 3 | 0.2 |
| | 32 | 0 |
| | 42 | 0.5 |
| | 43 | 0.5 |

NOTE 1: The above additional tolerances are only applicable for the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.
NOTE 2: The above additional tolerances also apply in intra-band and non-aggregated operation for the supported E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.
NOTE 3: Tolerances for a UE supporting multiple 4DL inter-band CA configurations are FFS.
NOTE 4: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.
NOTE 5: For UE supporting E-UTRA band 42, 43 or 48 and CA configurations including Band 42, 43 or 48, the applicable $\Delta R_{IB,c}$ in Band 42, 43, or 48 is the max(Band 42 $\Delta R_{IB,c}$ , Band 43 $\Delta R_{IB,c}$, Band 48 $\Delta R_{IB,c}$).
NOTE 6: The requirement is applied for UE transmitting on the frequency range of 2545-2690MHz.
NOTE 7: The requirement is applied for UE transmitting on the frequency range of 2496-2545MHz.
NOTE 8: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 1, Band 3 or Band 8.
NOTE 9: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 1, Band 8 or Band 11.
NOTE 10: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in Band 3, Band 8 or Band 11.
NOTE 11: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx among TDD bands.

**Table 7.3.3-1D: $\Delta R_{IB,c}$ (five bands)**

| E-UTRA operating band combination | E-UTRA Band | $\Delta R_{IB,c}$ [dB] |
|---|---|---|
| CA_1-3-7-20-28 | 1 | 0 |
| | 3 | 0 |
| | 7 | 0 |
| | 20 | 0.2 |
| | 28 | 0.2 |
| CA_1-3-7-20-42 | 1 | 0.2 |
| | 3 | 0.2 |
| | 7 | 0.2 |
| | 20 | 0 |
| | 42 | 0.5 |
| CA_1-3-8-11-28 | 1 | 0 |
| | 3 | 0.3 |
| | 8 | 0.2 |
| | 11 | 0.5 |
| | 28 | 0.2 |
| CA_1-3-20-32-42 | 1 | 0.2 |
| | 3 | 0.2 |
| | 20 | 0 |
| | 32 | 0 |
| | 42 | 0.5 |
| CA_1-3-20-32-43 | 1 | 0 |
| | 3 | 0 |
| | 20 | 0 |
| | 32 | 0 |
| | 43 | 0.5 |
| CA_1-3-32-42-43 | 1 | 0.2 |
| | 3 | 0.2 |
| | 32 | 0 |
| | 42 | 0.5 |
| | 43 | 0.5 |

NOTE 1: The above additional tolerances are only applicable for the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.
NOTE 2: The above additional tolerances also apply in intra-band and non-aggregated operation for the supported E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.
NOTE 3: Tolerances for a UE supporting multiple 5DL inter-band CA configurations are FFS.
NOTE 4: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.

NOTE: The above additional tolerances do not apply to supported UTRA operating bands with frequency range below 1 GHz that correspond to the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations when such bands are belonging only to band combination(s) where one band is <1GHz and other bands are >1.7GHz and there is no harmonic relationship between the low band UL and high band DL. Otherwise the above additional tolerances also apply to supported UTRA operating bands that correspond to the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.

**Table 7.3.3-2: Uplink configuration for reference sensitivity**

| E-UTRA Band / Channel bandwidth / $N_{RB}$ / Duplex mode | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA Band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Duplex Mode** |
| 1 | | | 25 | 50 | 75 | 100 | FDD |
| 2 | 6 | 15 | 25 | 50 | 50[1] | 50[1] | FDD |
| 3 | 6 | 15 | 25 | 50 | 50[1] | 50[1] | FDD |
| 4 | 6 | 15 | 25 | 50 | 75 | 100 | FDD |
| 5 | 6 | 15 | 25 | 25[1] | | | FDD |
| 6 | | | 25 | 25[1] | | | FDD |
| 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| 8 | 6 | 15 | 25 | 25[1] | | | FDD |
| 9 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| 10 | | | 25 | 50 | 75 | 100 | FDD |
| 11 | | | 25 | 25[1] | | | FDD |
| 12 | 6 | 15 | 20[1] | 20[1] | | | FDD |
| 13 | | | 20[1] | 20[1] | | | FDD |
| 14 | | | 15[1] | 15[1] | | | FDD |
| ... | | | | | | | |
| 17 | | | 20[1] | 20[1] | | | FDD |
| 18 | | | 25 | 25[1] | 25[1] | | FDD |
| 19 | | | 25 | 25[1] | 25[1] | | FDD |
| 20 | | | 25 | 20[1] | 20[3] | 20[3] | FDD |
| 21 | | | 25 | 25[1] | 25[1] | | FDD |
| 22 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| 23 | 6 | 15 | 25 | 50 | 75 | 100 | FDD |
| 24 | | | 25 | 50 | | | FDD |
| 25 | 6 | 15 | 25 | 50 | 50[1] | 50[1] | FDD |
| 26 | 6 | 15 | 25 | 25[1] | 25[1] | | FDD |
| 27 | 6 | 15 | 25 | 25[1] | | | FDD |
| 28 | | 15 | 25 | 25[1] | 25[1] | 25[1] | FDD |
| 30 | | | 25 | 25[1] | | | FDD |
| 31 | 6 | 5[4] | 5[4] | | | | FDD |
| ... | | | | | | | |
| 33 | | | 25 | 50 | 75 | 100 | TDD |
| 34 | | | 25 | 50 | 75 | | TDD |
| 35 | 6 | 15 | 25 | 50 | 75 | 100 | TDD |
| 36 | 6 | 15 | 25 | 50 | 75 | 100 | TDD |
| 37 | | | 25 | 50 | 75 | 100 | TDD |
| 38 | | | 25 | 50 | 75 | 100 | TDD |
| 39 | | | 25 | 50 | 75 | 100 | TDD |
| 40 | | | 25 | 50 | 75 | 100 | TDD |
| 41 | | | 25 | 50 | 75 | 100 | TDD |
| 42 | | | 25 | 50 | 75 | 100 | TDD |
| 43 | | | 25 | 50 | 75 | 100 | TDD |
| 44 | | 15 | 25 | 50 | 75 | 100 | TDD |
| 45 | | | 25 | 50 | 75 | 100 | TDD |
| 50 | | 15 | 25 | 50 | 75 | 100 | TDD |
| 51 | | 15 | 25 | | | | TDD |
| 52 | | | 25 | 50 | 75 | 100 | TDD |
| … | | | | | | | |
| 65 | 6 | 15 | 25 | 50 | 75 | 100 | FDD |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 66 | 6 | 15 | 25 | 50 | 75 | 100 | FDD |
| 68 | | | 25 | 25[1] | 25[1] | | FDD |
| … | | | | | | | |
| 70 | | | 25 | 50 | 75 | | FDD |
| 71 | | | 25 | 25[1] | 20[1] | 20[1] | FDD |
| 72 | 6 | 5[4] | 5[4] | | | | FDD |
| 73 | 6 | 54 | 54 | | | | FDD |
| 74 | 6 | 15 | 25 | 25[1] | 25[1] | 25[1] | FDD |
| 85 | | | 20[1] | 20[1] | | | FDD |

Note 1: refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).

Note 2: For the UE which supports both Band 11 and Band 21 the uplink configuration for reference sensitivity is FFS.

Note 3: refers to Band 20; in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$=11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$=16.

Note 4: refers to Bands 31 and 72; in the case of 3 MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 9 and in the case of 5 MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 10.

Unless given by Table 7.3.3-3, the minimum requirements specified in Tables 7.3.3-1, 7.3.3-1a and 7.3.3-2 shall be verified with the network signalling value NS_01 (Table 6.2.4.3-1) configured.

**Table 7.3.3-3: Network Signalling Value for reference sensitivity**

| E-UTRA Band | Network Signalling value |
|---|---|
| 2 | NS_03 |
| 4 | NS_03 |
| 10 | NS_03 |
| 12 | NS_06 |
| 13 | NS_06 |
| 14 | NS_06 |
| 17 | NS_06 |
| 19 | NS_08 |
| 21 | NS_09 |
| 23 | NS_03 |
| 30 | NS_21 |
| 48 | NS_27 |
| 66 | NS_03 |
| 70 | NS_03 |
| 71 | NS_35 |
| 85 | NS_06 |

The normative reference for this requirement is TS 36.101 [2] clause 7.3.1.

## 7.3.4 Test description

### 7.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in tables 7.3.4.1-1 and 7.3.4.1-2. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | | | Low range, Mid range, High range | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Lowest, 5MHz, Highest | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[4] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2. Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).

Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used.

Note 4: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2).

**Table 7.3.4.1-2: Additional Test Configuration Table for Band 70**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | | | Refer to $F_{UL}$ and $F_{DL}$ in test parameters | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 5MHz, 10MHz | | |
| **Test Parameters for Channel Bandwidths** | | | | | |
| | | **Downlink Configuration** | | **Uplink Configuration** | |
| **Ch BW** | **Mod'n** | **$F_{DL}$** | **RB allocation FDD** | **$F_{UL}$** | **RB allocation FDD** |
| 5MHz | QPSK | Low | 6 | Mid | 6 |
| 5MHz | QPSK | Mid | 15 | High | 15 |
| 10MHz | QPSK | Low | 25 | High | 25 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2. The UL allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).<br>Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used.<br>Note 4: The additional configurations shall verify reference sensitivity requirements with the UE TX-RX frequency separation of 295MHz (table 5.3-1). | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Tables 7.3.4.1-1 and 7.3.4.1-2.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.3.4.3.

## 7.3.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Tables 7.3.4.1-1 and 7.3.4.1-2. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3.5-1. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the Throughput measurement.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

## 7.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions.

### 7.3.4.3.1 Message contents exceptions (network signalled value "NS_01")

Message contents according to TS 36.508 [7] subclause 4.6 can be used without exceptions.

7.3.4.3.2 Message contents exceptions (network signalled value "NS_03")

1. Information element additionalSpectrumEmission is set to NS_03. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3.4.3.2-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_03"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 3 (NS_03) | | |

7.3.4.3.3 Message contents exceptions (network signalled value "NS_06")

1. Information element additionalSpectrumEmission is set to NS_06. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3.4.3.3-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_06"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 6 (NS_06) | | |

7.3.4.3.4 Message contents exceptions (network signalled value "NS_09")

1. Information element additionalSpectrumEmission is set to NS_09. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3.4.3.4-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_09"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 9 (NS_09) | | |

7.3.4.3.5 Message contents exceptions (network signalled value "NS_08")

1. Information element additionalSpectrumEmission is set to NS_08. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3.4.3.5-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_08"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 8 (NS_08) | | |

7.3.4.3.6 Message contents exceptions (network signalled value "NS_21")

1. Information element additionalSpectrumEmission is set to NS_21. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3.4.3.6-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_21"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 21 (NS_21) | | |

7.3.4.3.7 Message contents exceptions (network signalled value "NS_27")

1. Information element additionalSpectrumEmission is set to NS_27. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3.4.3.7-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_27"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 27 (NS_27) | | |

7.3.4.3.8 Message contents exceptions (Additional Band 70 test configurations in Table 7.3.4 for Tx-Rx frequency separation of 295 MHz)

1. Information element ul-CarrierFreq is set to UL EARFCN according to the test configuration ID. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the reference sensitivity requirement for a specific deployment scenario using a non-default Tx-Rx frequency separation of 295 MHz.

**Table 7.3.4.3.8-1: *SystemInformationBlockType2*: UL carrier frequency test requirement for test configuration ID "1"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ul-CarrierFreq-v9e0 | 133047 (5 MHz) | Paired Mid Range | |

**Table 7.3.4.3.8-2: *SystemInformationBlockType2*: UL carrier frequency test requirement for test configuration ID "2"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ul-CarrierFreq-v9e0 | 133097 (5 MHz) | Paired High Range | |

**Table 7.3.4.3.8-3: *SystemInformationBlockType2*: UL carrier frequency test requirement for test configuration ID "3"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| ul-CarrierFreq-v9e0 | 133072 (10 MHz) | Paired High Range | |

7.3.4.3.9 Message contents exceptions (network signalled value "NS_35")

1. Information element additionalSpectrumEmission is set to NS_35. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3.4.3.9-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_35"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 32 | When IE AdditionalSpectrumEmission - v10l0 is used, 32 should be set to IE AdditionalSpectrumEmission. | |
| AdditionalSpectrumEmission-v10l0 | 35 (NS_35) | | |

## 7.3.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.3.5-1 and Table 7.3.5-2.

**Table 7.3.5-1: Reference sensitivity QPSK $P_{REFSENS}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| E-UTRA Band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| 2 | -102.0 | -99.0 | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| 3 | -101.0 | -98.0 | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| 4 | -104.0 | -101 | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| 5 | -102.5 | -99.5 | -97.3 | -94.3 | | | FDD |
| 6 | - | - | -99.3 | -96.3 | | | FDD |
| 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| 8 | -101.5 | -98.5 | -96.3 | -93.3 | | | FDD |
| 9 | - | - | -98.3 | -95.3 | -93.5 | -92.3 | FDD |
| 10 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| 11 | - | - | -99.3 | -96.3 | | | FDD |
| 12 | -101.0 | -98.0 | -96.3 | -93.3 | | | FDD |
| 13 | | | -96.3 | -93.3 | | | FDD |
| 14 | | - | -96.3 | -93.3 | | | FDD |
| ... | | | | | | | |
| 17 | - | - | -96.3 | -93.3 | | | FDD |
| 18 | - | - | -99.3[7] | -96.3[7] | -94.5[7] | - | FDD |
| 19 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| 20 | | | -96.3 | -93.3 | -90.5 | -89.3 | FDD |
| 21 | | | -99.3 | -96.3 | -94.5 | | FDD |
| 22 | | | -96.0 | -93.0 | -91.2 | -90.0 | FDD |
| 23 | -104.0 | -101 | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| 24 | | | -99.3 | -96.3 | | | FDD |
| 25 | -100.5 | -97.5 | -95.8 | -92.8 | -91.0 | -89.8 | FDD |
| 26 | -102 | -99 | -96.8[6] | -93.8[6] | -92[6] | | FDD |
| 27 | -102.5 | -99.5 | -97.3 | -94.3 | | | FDD |
| 28 | | -99.5 | -97.8 | -94.8 | -93.0 | -90.3 | FDD |
| 30 | - | - | -98.3 | -95.3 | - | - | FDD |
| 31 | -98.3 | -95.0 | -92.8 | | | | FDD |
| ... | | | | | | | |
| 33 | - | - | -99,3 | -96.3 | -94.5 | -93.3 | TDD |
| 34 | - | - | -99.3 | -96.3 | -94.5 | - | TDD |
| 35 | -105.5 | -101.5 | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| 36 | -105.5 | -101.5 | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| 37 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| 38 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| 39 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| 41 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| 42 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| 43 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| 44 | | [-99.5] | [-97.3] | [-94.3] | [-92.5] | [-91.3] | TDD |
| 45 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| … | | | | | | | |
| 48 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| … | | | | | | | |
| 65 | -103.5 | -100.5 | -99.5 | -96.5 | -94 | -92.8 | FDD |
| 66 | -103.5 | -100.5 | -98.8 | -95.8 | -94 | -92.8 | FDD |
| … | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 68 | | | -97.8 | -94.8 | -93.0 | | FDD |
| … | | | | | | | |
| 70 | | | -99.3 | -96.3 | -94.5 | | FDD |
| 71 | | | -96.5 | -93.5 | -91.3 | -86.8 | FDD |
| 72 | -98.3 | -95.0 | -92.8 | | | | FDD |
| … | | | | | | | |
| 74 | -104.0[8] | -101.0[8] | -98.8[8] | -95.8[8] | -94.0[8] | -92.8[8] | FDD |

Note 1: The transmitter shall be set to maximum output power level (Table 7.3.5-2)
Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
Note 3: The signal power is specified per port
Note 4: For the UE which supports both Band 3 and Band 9 the reference sensitivity level is FFS.
Note 5: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
Note 6: [6] indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.
Note 7: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.
Note 8: [8] indicates that the requirement is modified by -0.5 dB when the assigned E-UTRA channel bandwidth is confined within 1475.9-1510.9 MHz.

For the UE which supports inter-band carrier aggregation configurations the $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C shall be applied for applicable bands.

In case the UE supports more than one of the inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 7.3.3-1A, truncated to one decimal place that would apply for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL (i.e. bands listed in Table 7.3A.0-0a), then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 7.3.3-1A that would apply for that operating band among the supported CA configurations

NOTE 1: The relation to the received PSD is $\left\langle \mathrm{REF}\,\hat{I}_{or} \right\rangle = P_{REFSENS}\left(N_{sc}^{RB} N_{RB} \Delta f\right)^{-1}$ with $N_{\mathrm{RB}}$ is the transmission bandwidth configuration according to Table 5.4.2-1.

The reference receive sensitivity (REFSENS) requirement specified in Table 7.3.5-1 shall be met for an uplink transmission bandwidth less than or equal to that specified in Table 7.3.5-2.

NOTE 2: Table 7.3.5-2 does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors.

**Table 7.3.5-2: Uplink configuration for reference sensitivity, $L_{CRB}$ @ $RB_{start}$ format**

| E-UTRA Band / Channel bandwidth / $N_{RB}$ / Duplex mode | | | | | | | |
|---|---|---|---|---|---|---|---|
| E-UTRA Band | 1.4 MHz / 6 | 3 MHz / 15 | 5 MHz / 25 | 10 MHz / 50 | 15 MHz / 75 | 20 MHz / 100 | Duplex Mode |
| 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| 2 | 6@0 | 15@0 | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| 3 | 6@0 | 15@0 | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| 4 | 6@0 | 15@0 | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| 5 | 6@0 | 15@0 | 25@0 | 25@25 | - | - | FDD |
| 6 | - | - | 25@0 | 25@25 | - | - | FDD |
| 7 | - | - | 25@0 | 50@0 | 75@0 | 75@25 | FDD |
| 8 | 6@0 | 15@0 | 25@0 | 25@25 | - | - | FDD |
| 9 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| 10 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| 11 | - | - | 25@0 | 25@25 | - | - | FDD |
| 12 | 6@0 | 15@0 | 20@5 | 20@30 | - | - | FDD |
| 13 | - | - | 20@0 | 20@0 | - | - | FDD |
| 14 | - | - | 15@0 | 15@0 | - | - | FDD |
| ... | | | | | | | |
| 17 | - | - | 20@5 | 20@30 | - | - | FDD |
| 18 | - | - | 25@0 | 25@25 | 25@50 | - | FDD |
| 19 | - | - | 25@0 | 25@25 | 25@50 | - | FDD |
| 20 | - | - | 25@0 | 20@0 | 20@11 | 20@16 | FDD |
| 21 | - | - | 25@0 | 25@25 | 25@50 | - | FDD |
| 22 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| 23 | 6@0 | 15@0 | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| 24 | - | - | 25@0 | 50@0 | - | - | FDD |
| 25 | 6@0 | 15@0 | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| 26 | 6@0 | 15@0 | 25@0 | 25@25 | 25@50 | - | FDD |
| 27 | 6@0 | 15@0 | 25@0 | 25@25 | - | - | FDD |
| 28 | | 15@0 | 25@0 | 25@25 | 25@50 | 25@75 | FDD |
| 30 | - | - | 25@0 | 25@25 | - | - | FDD |
| 31 | 6@0 | 5@9 | 5@10 | - | - | - | FDD |
| … | | | | | | | |
| 33 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| 34 | - | - | 25@0 | 50@0 | 75@0 | - | TDD |
| 35 | 6@0 | 15@0 | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| 36 | 6@0 | 15@0 | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| 37 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| 38 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| 39 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| 40 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| 41 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| 42 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| 43 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| 44 | - | 15@0 | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| 45 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| … | | | | | | | |
| 48 | | | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| … | | | | | | | |
| 65 | 6@0 | 15@0 | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| 66 | 6@0 | 15@0 | 25@0 | 50@0 | 75@0 | 100@0 | FDD |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| … | | | | | | | |
| 68 | | | 25@0 | 25@25 | 25@50 | | FDD |
| … | | | | | | | |
| 70 | | | 25@0 | 50@0 | 75@0 | | FDD |
| 71 | | | 25@0 | 25@0 | 20@0 | 20@0 | FDD |
| 72 | 6@0 | 5@9 | 5@10 | - | - | - | FDD |
| … | | | | | | | |
| 74 | 6@0 | 15@0 | 25@0 | 25@0 | 25@0 | 25@0 | FDD |

# 7.3_1 Reference sensitivity level with 4 Rx antenna ports

## 7.3_1.1 Test purpose

To verify the ability of UE that supports 4 Rx antenna ports to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area of an e-NodeB.

## 7.3_1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that supports 4 Rx antenna ports.

## 7.3_1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3.3.

## 7.3_1.4 Test description

### 7.3_1.4.1 Initial conditions

Same as in clause 7.3.4.1 with following exceptions:

- Instead of Table 7.3.4.1-1→ use Table 7.3_1.4.1-1.
- Instead of Figure A.3→ use Figure A.69.
- Instead of clause 7.3.4.3→ use clause 7.3_1.4.3.

**Table 7.3_1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | QPSK | 6 | N/A | QPSK | 6 | N/A |
| 3MHz | QPSK | 15 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 50 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 75 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2. Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |

## 7.3_1.4.2 Test procedure

Same as in clause 7.3.4.2 with following exceptions:

- Instead of Table 7.3.4.1-1→ use Table 7.3_1.4.1-1.
- Instead of Table 7.3.5-1 → use Table 7.3_1.5-1.

## 7.3_1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions.

### 7.3_1.4.3.1 Message contents exceptions (network signalled value "NS_01")

Message contents according to TS 36.508 [7] subclause 4.6 can be used without exceptions.

### 7.3_1.4.3.2 Message contents exceptions (network signalled value "NS_03")

1. Information element additionalSpectrumEmission is set to NS_03. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3_1.4.3.2-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_03"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 3 (NS_03) | | |

7.3_1.4.3.3 Message contents exceptions (network signalled value "NS_09")

1. Information element additionalSpectrumEmission is set to NS_09. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3_1.4.3.3-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_09"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 9 (NS_09) | | |

## 7.3_1.5 Test requirement

Same as in clause 7.3.5 with the following exceptions:

- Instead of Table 7.3.5-1→ use Table 7.3_1.5-1.

**Table 7.3_1.5-1: Reference sensitivity QPSK $P_{REFSENS}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| 1 | | | -102.0 | -99.0 | -97.2 | -96.0 | FDD |
| 2 | -104.7 | -101.7 | -100.0 | -97.0 | -95.2 | -94.0 | FDD |
| 3 | -103.7 | -100.7 | -99.0 | -96.0 | -94.2 | -93.0 | FDD |
| 4 | -106.7 | -103.7 | -102 | -99 | -97.2 | -96 | FDD |
| … | | | | | | | |
| 7 | | | -100.0 | -97.0 | -95.2 | -94.0 | FDD |
| … | | | | | | | |
| 20 | | | -99.0 | -96.0 | -93.2 | -92.0 | FDD |
| 21 | | | -102.0 | -99.0 | -97.2 | | FDD |
| 25 | -103.2 | -100.2 | -98.5 | -95.5 | -93.7 | -92.5 | FDD |
| … | | | | | | | |
| 39 | | | -102.0 | -99.0 | -97.2 | -96.0 | TDD |
| 40 | | | -102.0 | -99.0 | -97.2 | -96.0 | TDD |
| … | | | | | | | |
| 41 | | | -100.0 | -97.0 | -95.2 | -94.0 | TDD |
| 42 | | | -100.2 | -97.2 | -95.4 | -94.2 | TDD |
| … | | | | | | | |
| 66 | -106.2 | -103.2 | -101.5 | -98.5 | -96.7 | -95.5 | FDD |
| NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5<br>NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1<br>NOTE 3: The signal power is specified per port. | | | | | | | |

# 7.3A Reference sensitivity level for CA

## 7.3A.0 Minimum conformance requirements

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.3-1, Table 7.3.3-1a and Table 7.3.3-2. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active. The uplink resource blocks shall be located as close as possible to the primary downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). The primary

downlink operating band is the downlink band of the active uplink operating band. The UE shall meet the requirements specified in subclause 7.3.3 with the following exceptions.

For the bands supporting 4 antenna ports which are in Table 7.3.3-1a, the minimum requirements for reference sensitivity in the reference sensitivity exception tables shall be modified by the amount given in $\Delta R_{IB,4R}$ in Table 7.3.3-1a for the applicable E-UTRA bands unless otherwise specified.

For the bands supporting 8 antenna ports which are in Table 7.3.3-1aa, the minimum requirements for reference sensitivity in the reference sensitivity exception tables shall be modified by the amount given in $\Delta R_{IB,8R}$ in Table 7.3.3-1aa for the applicable E-UTRA bands unless otherwise specified.

For the UE that supports any of the E-UTRA CA configurations given in Table 7.3A.0-0a, exceptions to the requirements for band(s) specified in subclause 7.3.3 are allowed when the band(s) is impacted by harmonic interference from the uplink transmission in a lower-frequency band of the same CA configuration. For these exceptions, the UE shall meet the requirements specified in Table 7.3A.0-0a and Table 7.3A.0-0b.

**Table 7.3A.0-0a: Reference sensitivity for carrier aggregation QPSK $P_{REFSENS, CA}$ (exceptions due to harmonic issue)**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA_1A-3A-5A-41A[28] | 41 | | | | | | N/A | TDD |
| CA_1A-3A-7A-8A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_1A-3A-7A-8A[4,5,6] | 7[33] | | | -88 | -87.4 | -87 | -86.7 | FDD |
| CA_1A-3C-7A-8A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_1A-3C-7A-8A[5,6] | 7[33] | | | -88 | -87.4 | -87 | -86.7 | FDD |
| CA_1A-3A-7A-20A-28A[5,6] | 1[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-3A-7A-20A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-7A-20A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-7A-28A[5,6] | 1[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-3A-7A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-7A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-8A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_1A-3A-8A-11A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_1A-3A-8A-20A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_1A-3A-8A-11A-28A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_1A-3A-8A-28A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_1A-3A-8A-38A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_1A-3A-11A-28A[5,6] | 1[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-3A-11A-28A[9,10] | 11 | | | -75.2 | -75.2 | | | FDD |
| CA_1A-3A-8A-40A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_1A-3A-19A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-19A-42A[11] | 42 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-20A-28A[5,6] | 1[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-3A-20A-32A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-20A-32A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-20A-32A-42A[12,13] | 42[33] | | | -84.8 | -84.7 | -84.6 | -84.5 | TDD |
| CA_1A-3A-21A-28A[4,21] | 21 | | | N/A | N/A | N/A | | FDD |
| CA_1A-3A-21A-42A[22,23] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-21A-42A[24] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-28A-42A[22,23] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-28A-42A[24] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-28A[5,6] CA_1A-1A-3A-28A CA_1A-3A-3A-28A | 1[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-3A-32A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-32A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-42A-43A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-42A-43A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-32A-42A-43A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-32A-42A-43A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-3A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-3A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_1A-5A-41A[8] | 41 | | | | | | N/A | TDD |
| CA_1A-7A-8A[5,6], CA_1A-7A-7A-8A[5,6] | 7[33] | | | -88 | -87.4 | -87 | -86.7 | FDD |
| CA_1A-7A-8A-20A | 1[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-7A-8A-40A[5,6] | 7[33] | | | | -87.1 | -86.7 | -86.4 | FDD |
| CA_1A-7A-20A-28A[5,6] | 1[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-7A-28A[5,6] | 1[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-8A-20A-28A[5,6] | 1[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-11A-28A[5,6] | 1[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-11A-28A[9,10] | 11 | | | -75.2 | -75.2 | | | FDD |
| CA_1A-18A-28A[14] | 1 | | | N/A | N/A | N/A | N/A | FDD |
| CA_1A-19A-28A[14] | 1[33] | | | N/A | N/A | N/A | N/A | FDD |
| CA_1A-20A-28A | 1[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-20A-32A-42A[12,13] | 42[33] | | | -84.8 | -84.7 | -84.6 | -84.5 | TDD |
| CA_1A-21A-28A[4,21] | 21 | | | N/A | N/A | N/A | | FDD |
| CA_1A-21A-28A-42A[4,21] | 21 | | | N/A | N/A | N/A | | FDD |
| CA_1A-28A[5,6,14] | 1[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-1A-28A[5,6,14] | 1 | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-28A-42A[5,6,17,18] | 1[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| | 42[33] | | | -85.7 | -85.4 | -85.1 | -84.9 | TDD |
| CA_2A-46A[15,16] | 2 | | | -70 | -67 | -65.2 | -64 | FDD |
| CA_2A-2A-46A[15,16] | 2 | | | -70 | -67 | -65.2 | -64 | FDD |
| CA_2A-48A[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-48A[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-71A[36] | 2 | | | -93.4 | -94 | -92.5 | -91.4 | FDD |
| CA_2A-71A[37] | 2 | | | -96.8 | -94 | -92.5 | -91.4 | FDD |
| CA_2A-71A[15,16] | 71 | | | -70.4 | -70.4 | -70.4 | -70.4 | FDD |
| CA_2A-2A-71A[36] | 2 | | | -93.4 | -94 | -92.5 | -91.4 | FDD |
| CA_2A-2A-71A[37] | 2 | | | -96.8 | -94 | -92.5 | -91.4 | FDD |
| CA_2A-2A-71A[15,16] | 71 | | | -70.4 | -70.4 | -70.4 | -70.4 | FDD |
| CA_2A-4A-12A[5,6] | 4[33] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_2A-4A-28A[5,6] | 4[33] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_2A-4A-71A[36], CA_2A-2A-4A-71A[36] | 2 | | | -93.1 | -93.7 | -92.2 | -91.1 | FDD |
| CA_2A-4A-71A[37], CA_2A-2A-4A-71A[37] | 2 | | | -96.5 | -93.7 | -92.2 | -91.1 | FDD |
| CA_2A-4A-71A[15,16], CA_2A-2A-4A-71A[15,16] | 71 | | | -70.4 | -70.4 | -70.4 | -70.4 | FDD |
| CA_2A-4A-5A-12A[5,6] | 4[33] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_2A-4A-7A-12A[5,6] | 4[33] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_2A-4A-12A-30A[5,6] | 4[33] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_2A-5A-12A-66A [5,6] | 66 | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-7A-12A-66A[5,6] | 66[33] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-12A-66A[5,6] | 66[33] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-13A-48A[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-13A-48A[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-13A-48A-66A[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-13A-48A-66A[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-48A-48A[10,31] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-48A-48A[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-48A-48C[10,31] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-48A-48C[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-48C[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-48C[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-48D[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-48D[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-48A-66A[10,32,] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_2A-48C-66A[10,32] | | | | | | | | |
| CA_2A-48A-66A[11], CA_2A-48C-66A[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-66A-71A[36] CA_2A-2A-66A-71A[36] CA_2A-66A-66A-71A[36] CA_2A-66C-71A[36] | 2 | | | -93.1 | -93.7 | -92.2 | -91.1 | FDD |
| CA_2A-66A-71A[37] CA_2A-2A-66A-71A[37] CA_2A-66A-66A-71A[37] CA_2A-66C-71A[37] | 2 | | | -96.5 | -93.7 | -92.2 | -91.1 | FDD |
| CA_2A-66A-71A[15,16] CA_2A-2A-66A-71A[15,16] CA_2A-66A-66A-71A[15,16] CA_2A-66C-71A[15,16] | 71 | | | -70.4 | -70.4 | -70.4 | -70.4 | FDD |
| CA_3A-5A-41A[28] | 41 | | | | | | N/A | TDD |
| CA_3A-7A-8A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-7A-8A[5,6] | 7[33] | | | -88 | -87.4 | -87 | -86.7 | FDD |
| CA_3C-7A-8A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3C-7A-8A[5,6] | 7[33] | | | -88 | -87.4 | -87 | -86.7 | FDD |
| CA_3A-7A-8A-20A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-7A-8A-20A[5,6] | 7[33] | | | -88 | -87.4 | -87 | -86.7 | FDD |
| CA_1A-3A-8A-20A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-7A-8A-38A [4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-7A-8A-40A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-7A-8A-40A[5,6] | 7[33] | | | | -87.1 | -86.7 | -86.4 | FDD |
| CA_3A-7A-20A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-7A-20A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-7A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-7A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-8A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-8A-11A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-8A-11A-28A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-8A-32A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-8A-38A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3C-8A-38A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-8A-40A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-8A-40C[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-11A-28A[9,10] | 11 | | | -75.2 | -75.2 | | | FDD |
| CA_3A-19A-21A-42A[25,26] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-19A-21A-42A[27] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-19A-21A-42C[25,26] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-19A-21A-42C[27] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-19A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-19A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-20A-32A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-20A-32A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-20A-32A-42A[12,13] | 42[33] | | | -84.8 | -84.7 | -84.6 | -84.5 | TDD |
| CA_3A-20A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-20A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-21A-28A[4,21] | 21 | | | N/A | N/A | N/A | | FDD |
| CA_3A-21A-28A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-21A-28A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-21A-28A- | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 42C[9,10] | | | | | | | | |
| CA_3A-21A-28A-42C[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-21A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-21A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-28A-40A[15,16] | 28 | | | -60.7 | -60.7 | -60.7 | -60.7 | FDD |
| CA_3A-28A-41A-42A[9,10,29] | 41 | | | | -94.5 | -92.7 | -91.5 | TDD |
| | 42[33] | | | | -71.7 | -71.7 | -71.7 | |
| CA_3A-28A-41A-42A[11,29] | 41 | | | | -94.5 | -92.7 | -91.5 | TDD |
| | 42[33] | | | | -94.7 | -93.2 | -92.5 | |
| CA_3A-28A-41A-42A[17,18, 29] | 41 | | | | -94.5 | -92.7 | -91.5 | TDD |
| | 42[33] | | | | -85.4 | -85.1 | -84.9 | |
| CA_3A-28A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-28A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-28A-42A[17,18] | 42[33] | | | -85.7 | -85.4 | -85.1 | -84.9 | TDD |
| CA_3A-31A[12,13] | 3[33] | | | -86.9 | -86.4 | -86 | -85.6 | FDD |
| CA_3A-32A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-32A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-42A-42A[9,10] | 42[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-42A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-3A-42A[11] | 42[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-42A-43A[9. 10] | 42 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-42A-43A[11] | 42 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-32A-42A-43A[9. 10] | 42 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-32A-42A-43A[11] | 42 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_4A-5A-12A[5,6] | 4[33] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_4A-7A-12A[5,6] | 4[33] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_4A-7A -28A[5,6] | 4[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_4A-12A[5,6] | 4[33] | -89.2 | -89.2 | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_4A-12A-30A[5,6] | 4[33] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_4A-17A[5,6] | 4[33] | | | -90 | -89.5 | | | FDD |
| CA_4A-28A[5,6] | 4[33] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_5A-12A-66A[5,6] | 66[33] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_5A-38A[19] | 38 | | | N/A | N/A | N/A | N/A | TDD |
| CA_5A-41A[8,19] | 41 | | | | | | N/A | TDD |
| CA_5A-40A-41A[8] | 41 | | | | | | N/A | TDD |
| CA_7A-8A[5,6] | 7[33] | | | -88 | -87.4 | -87 | -86.7 | FDD |
| CA_7A-8A-20A[5,6] | 7[33] | | | | -87.4 | -87 | -86.7 | FDD |
| CA_7A-12A-66A[5,6] | 66[33] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_7A-12B-66A[5,6] | 66[33] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_7A-20A-38A[19] | 38 | | | N/A | N/A | N/A | N/A | TDD |
| CA_8A-28A-41A[28] | 41 | | | N/A | N/A | N/A | N/A | TDD |
| CA_8A-39A-41A[4] | 41 | | | | | | N/A | TDD |
| CA_8A-41A[8] | 41 | | | N/A | N/A | N/A | N/A | TDD |
| CA_8A-42A[12,13] | 42[33] | | | -84.8 | -84.7 | -84.6 | -84.5 | TDD |
| CA_11A-28A[9,10] | 11[33] | | | -75.2 | -75.2 | | | FDD |
| CA_12A-30A-66A[5,6] | 66[33] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_12A-66A[5,6] | 66[33] | -88.7 | -88.7 | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_13A-48A-66A[9,10]<br>CA_13A-48A-66B[9,10]<br>CA_13A-48A-66C[9,10] | 48[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_13A-48A-66A[11]<br>CA_13A-48A-66B[11]<br>CA_13A-48A-66C[11] | 48[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_13A-48A-48A-66A[9,10] | 48[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_13A-48A-48A-66A[11] | 48[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_13A-48C-66A[9,10] | 48[33] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_13A-48C-66A[11] | 48[33] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_20A-32A-42A[12,13] | 20 | | | -97 | | | | FDD |
| | 32 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 42[33] | | | -84.8 | -84.7 | -84.6 | -84.5 | TDD |
| CA_20A-38A[19] | 20 | | | N/A | N/A | N/A | N/A | FDD |
| CA_20A-38A-40D[15,16] | 20 | | | -60.7 | -60.7 | -60.7 | | FDD |
| CA_20A-38C[19] | 38 | | | N/A | N/A | N/A | N/A | TDD |
| CA_20A-40A[15,16] | 20[33] | | | -60.7 | -60.7 | -60.7 | -60.7 | FDD |
| CA_20A-40A-40A[15,16] | 20[33] | | | -60.7 | -60.7 | -60.7 | | FDD |
| CA_20A-38A-40A[15,16] | 20[33] | | | -60.7 | -60.7 | -60.7 | | FDD |
| CA_20A-40C[15,16] | 20[33] | | | -60.7 | -60.7 | -60.7 | | FDD |
| CA_20A-40D[15,16] | 20 | | | -60.7 | -60.7 | -60.7 | | FDD |
| CA_20A-38A-40A-40A[15,16] | 20 | | | -60.7 | -60.7 | -60.7 | | FDD |
| CA_20A-38A-40C[15,16] | 20 | | | -60.7 | -60.7 | -60.7 | | FDD |
| CA_20A-42A[12,13], CA_20A-42A-42A[12,13] | 42[33] | | | -84.8 | -84.7 | -84.6 | -84.5 | TDD |
| CA_21A-28A[4,21] | 21 | | | N/A | N/A | N/A | | FDD |
| CA_21A-28A-42A[4,21] | 21 | | | N/A | N/A | N/A | N/A | FDD |
| CA_25A-26A-41A[38] | 41 | | | N/A | N/A | N/A | N/A | TDD |
| CA_25A-25A-26A-41A[8] CA_25A-26A-41C[8] | 41 | | | N/A | N/A | N/A | N/A | TDD |
| CA_26A-41A[8,19] | 41 | | | N/A | N/A | N/A | N/A | TDD |
| CA_28A-40A[15,16] | 28 | | | -60.7 | -60.7 | -60.7 | -60.7 | FDD |
| CA_28A-41A-42A[17,18] | 42[33] | | | | -85.4 | -85.1 | -84.9 | TDD |
| CA_28A-42A[17,18] | 42[33] | | | -85.7 | -85.4 | -85.1 | -84.9 | TDD |
| CA_48A-66A[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48A-66A[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48A-66B[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48A-66B[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48A-66C[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48A-66C[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48A-48A-66A[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48A-48A-66A[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48A-66A-66A[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48A-66A-66A[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48A-48A-66A-66A[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48A-48A-66A-66A[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48A-48A-66B[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48A-48A-66B[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48A-48A-66C[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48A-48A-66C[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48C-66A-66A[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| | 66 | | | -99.3 | -96.3 | -94.5 | -93.2 | FDD |
| CA_48C-66A-66A[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| | 66 | | | -99.3 | -96.3 | -94.5 | -93.2 | FDD |
| CA_48C-66B[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48C-66B[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48C-66C[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48C-66C[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48C-66A[9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48C-66A[11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48E-66A [9,10] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48E-66A [11] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_66A-70A-71A[5,6] | 70 | | | -90 | -89.5 | -89.2 | | FDD |
| CA_66A-66A-70A-71A[5,6] | 70 | | | -90 | -89.5 | -89.2 | | FDD |
| CA_66A-70C-71A[5,6, 35] | 70 | | | -90 | -89.5 | -89.2 | -89 | FDD |
| CA_66A-66A-70C-71A[5,6,35] | 70 | | | -90 | -89.5 | -89.2 | -89 | FDD |
| CA_66C-70A-71A[5,6] | 70 | | | -90 | -89.5 | -89.2 | | FDD |
| CA_66C-70C-71A[5,6,35] | 70 | | | -90 | -89.5 | -89.2 | -89 | FDD |
| CA_70A-71A[5,6] | 70 | | | -90 | -89.5 | -89.2 | | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_70C-71A[5,6,35] | 70 | | | -90 | -89.5 | -89.2 | -89 | FDD |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.

NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.4.1.

NOTE 3: The signal power is specified per port

NOTE 4: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity for all active downlink component carriers is only verified when this is not the case (the requirements specified in clause 7.3.3 apply unless otherwise specified).

NOTE 5: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of a high band.

NOTE 6: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.3 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{HB}$ the carrier frequency of a high band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the low band.

NOTE 7: Void.

NOTE 8: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity is only verified when this is not the case (the requirements specified in clause 7.3.3 apply).

NOTE 9: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range $\Delta F_{HD}$ above and below the edge of this downlink transmission bandwidth. The value $\Delta F_{HD}$ depends on the E-UTRA configuration: $\Delta F_{HD}$ = 10 MHz for CA_3A-42A, CA_3A-3A-42A, CA_3A-42A-42A, CA_1A-3A-20A-32A-42A, CA_3A-42A-43A, CA_3A-32A-42A-43A, CA_1A-3A-42A, CA_2A-13A-48A-66A, CA_2A-48A, CA_2A-48C, CA_2A-48D, CA_48A-66A, CA_3A-7A-42A, CA_3A-19A-42A, CA_3A-20A-42A, CA_3A-28A-42A, CA_1A-3A-7A-42A, CA_13A-48A-66A, CA_13A-48A-66B, CA_13A-48A-66C, CA_13A-48A-48A-66A, CA_13A-48C-66A, CA_48A-66A-66A, CA_48A-66B , CA_48A-66C, CA_48A-48A-66A, CA_48C-66A, CA_48A-48A-66A-66A, CA_48A-48A-66B, CA_48A-48A-66C, CA_48C-66B, CA_48C-66C, CA_48E-66A, CA_1A-3A-19A-42A, CA_1A-3A-32A-42A, CA_3A-7A-20A-42A, CA_3A-20A-32A-42A and CA_3A-28A-41A-42A. $\Delta F_{HD}$ = 0MHz for CA_11A-28A, CA_1A-11A-28A and CA_3A-11A-28A.

NOTE 10: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.2 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{HB}$ carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.

NOTE 11: The requirements are only applicable to channel bandwidths with a carrier frequency at $\pm(20 + BW_{Channel}^{HB} / 2)$ MHz offset from $2 f_{UL}^{LB}$ in the victim (higher band) with $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$, where $BW_{Channel}^{LB}$ and $BW_{Channel}^{HB}$ are the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.

NOTE 12: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 4th transmitter harmonic is within the downlink transmission bandwidth of a high band.

NOTE 13: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.4 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{HB}$ the carrier frequency of a high band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the low band.

NOTE 14: For the UE that supports CA_1A-18A-28A or CA_1A-19A-28A, no requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity should only be verified when this is not the case (the requirements specified in clause 7.3.3 apply).

NOTE 15: These requirements apply when there is at least one individual RE within the downlink transmission bandwidth of the victim (lower) band for which the 3rd harmonic is within the uplink transmission bandwidth or the uplink adjacent channel's transmission bandwidth of an aggressor (higher) band.

NOTE 16: The requirements should be verified for UL EARFCN of the aggressor (higher) band (superscript HB) such that $f_{DL}^{LB} = \lfloor f_{UL}^{HB} / 0.3 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{LB}$ the carrier frequency in the victim (lower) band and $BW_{Channel}^{HB}$ the channel bandwidth configured in the higher band.

NOTE 17: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 5th transmitter harmonic is within the downlink transmission bandwidth of a high band.

NOTE 18: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that

$f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.5 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \leq f_{UL}^{LB} \leq F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{HB}$ the carrier frequency of a high band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the low band.

NOTE 19: No requirements apply for the case that there is at least one individual RE within the uplink transmission bandwidth of the relative higher band and when the frequency range of relative higher band's uplink channel bandwidth or uplink 1st adjacent channel bandwidth is fully or partially overlapped with the 3 times of the frequency range of the relative lower band's downlink channel bandwidth. The reference sensitivity is only verified when this is not the case (the requirements specified in clause 7.3.3 apply).

NOTE 20: Void

NOTE 21: No requirements apply when there is at least one individual RE on band 28 uplink outside frequencies 728 – 738 MHz. The reference sensitivity is only verified when all configured RE's are confined within frequencies 728 – 738 MHz (the requirements specified in clause 7.3.3 apply).

NOTE 22: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range $\Delta F_{HD}$ above and below the edge of this downlink transmission bandwidth. The value $\Delta F_{HD}$ depends on the E-UTRA configuration: $\Delta F_{HD}$ = 10 MHz for CA_1A-3A-21A-42A.

NOTE 23: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.2 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB}/2 < f_{UL}^{LB} < F_{UL_high}^{LB} - BW_{Channel}^{LB}/2$ with $f_{DL}^{HB}$ carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.

NOTE 24: The requirements are only applicable to channel bandwidths with a carrier frequency at $\pm(20 + BW_{Channel}^{HB} / 2)$ MHz offset from $2 f_{UL}^{LB}$ in the victim (higher band) with $F_{UL_low}^{LB} + BW_{Channel}^{LB}/2 < f_{UL}^{LB} < F_{UL_high}^{LB} - BW_{Channel}^{LB}/2$, where $BW_{Channel}^{LB}$ and $BW_{Channel}^{HB}$ are the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.

NOTE 25: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range $\Delta F_{HD}$ above and below the edge of this downlink transmission bandwidth. The value $\Delta F_{HD}$ depends on the E-UTRA configuration: $\Delta F_{HD}$ = 10 MHz for CA_3A-19A-21A-42A.

NOTE 26: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.2 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB}/2 < f_{UL}^{LB} < F_{UL_high}^{LB} - BW_{Channel}^{LB}/2$ with $f_{DL}^{HB}$ carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.

NOTE 27: The requirements are only applicable to channel bandwidths with a carrier frequency at $\pm(20 + BW_{Channel}^{HB} / 2)$ MHz offset from $2 f_{UL}^{LB}$ in the victim (higher band) with $F_{UL_low}^{LB} + BW_{Channel}^{LB}/2 < f_{UL}^{LB} < F_{UL_high}^{LB} - BW_{Channel}^{LB}/2$, where $BW_{Channel}^{LB}$ and $BW_{Channel}^{HB}$ are the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.

NOTE 28: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of either Band 5 or Band 8 for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of Band 41. The reference sensitivity for all active downlink component carriers is only verified when this is not the case (the requirements specified in clause 7.3.3 apply).

NOTE 29: The B41 requirements are modified by -0.1dB when carrier frequency of the assigned E-UTRA channel bandwidth is within 2545-2690 MHz.

NOTE 30: Void

NOTE 31: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range $\Delta F_{HD}$ above and below the edge of this downlink transmission bandwidth. The value $\Delta F_{HD}$ depends on the E-UTRA configuration: $\Delta F_{HD}$ = 10 MHz for CA_2A-48A-48A and CA_2A-48A-48C

NOTE 32: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range $\Delta F_{HD}$ above and below the edge of this downlink transmission bandwidth. The value $\Delta F_{HD}$ depends on the E-UTRA configuration: $\Delta F_{HD}$ = 10 MHz for CA_2A-48A-66A and CA_2A-48C-66A

NOTE 33: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured.

NOTE 34: Void

NOTE 35: These exceptions for the intra-band class C carriers should be verified one carrier at a time, according to note 6 frequency arrangements. No exceptions apply for the carrier which is not under REFSENS exception test.

NOTE 36: These requirements apply when the lower edge frequency of the 5 MHz uplink channel in Band 71 is located at or below 668 MHz and the downlink channel in Band 2 is located with its upper edge at 1990 MHz.

NOTE 37: These requirements apply when the lower edge frequency of the 10 MHz, 15 MHz, or 20 MHz uplink channel in Band 71 is located at or below 668 MHz and the downlink channel in Band 2 is located with its upper edge

at 1990 MHz.

Note 38: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 3nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range $\Delta F_{HD}$ above and below the edge of this downlink transmission bandwidth. The value $\Delta F_{HD}$ depends on the E-UTRA configuration: $\Delta F_{HD}$ = 15 MHz for CA_26A-41A, CA_25A-26A-41A.

**Table 7.3A.0-0b: Uplink configuration for the low band (exceptions due to harmonic issue)**

| E-UTRA Band / Channel bandwidth of the high band / NRB / Duplex mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **UL band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Duplex mode** |
| CA_1A-3A-7A-8A | 8 | | | | 16 | 25 | 25 | FDD |
| CA_1A-3C-7A-8A | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-3A-7A-20A-28A | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-3A-7A-20A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-3A-7A-28A | 28 | | | | 16 | 25 | 25 | FDD |
| CA_1A-3A-7A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-3A-11A-28A[4] | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-3A-11A-28A[5] | 28 | | | 12 | 25 | | | FDD |
| CA_1A-3A-19A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-3A-28A<br>CA_1A-1A-3A-28A<br>CA_1A-3A-3A-28A | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-3A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-3A-3A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-3A-20A-28A | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-3A-21A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-3A-28A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-7A-8A | 8 | | | | 16 | 25 | 25 | FDD |
| CA_1A-3A-32A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-3A-42A-43A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-7A-8A-20A<br>CA_1A-7A-7A-8A | 8 | | | 8 | 16 | | | FDD |
| CA_1A-7A-8A-40A | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-7A-20A-28A | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-7A-28A | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-8A-20A-28A | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-11A-28A[4] | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-11A-28A[5] | 28 | | | 12 | 25 | | | FDD |
| CA_1A-20A-28A | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-20A-32A-42A | 20 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-3A-20A-32A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| | 20 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-3A-32A-42A-43A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-28A | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-1A-28A | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-28A-42A | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_2A-46A | 46 | | | | | | 100 | TDD |
| CA_2A-2A-46A | 46 | | | | | | 100 | TDD |
| CA_2A-71A | 71 | | | 25 | 25[1] | 20[1] | 20[1] | FDD |
| CA_2A-71A | 2 | | | 25 | 50 | 50 | 50 | FDD |
| CA_2A-2A-71A | 71 | | | 25 | 50 | 50 | 50 | FDD |
| CA_2A-4A-12A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_2A-4A-28A | 28 | | | 8 | 16 | 25 | | FDD |
| CA_2A-4A-71A<br>CA_2A-2A-4A-71A | 71 | | | 25 | 50 | 50 | 50 | FDD |
| CA_2A-4A-5A-12A | 12 | | | 8 | 16 | | | FDD |
| CA_2A-4A-7A-12A | 12 | | | 8 | 16 | | | FDD |
| CA_2A-4A-12A-30A | 12 | | | 8 | 16 | | | FDD |
| CA_2A-5A-12A-66A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_2A-7A-12A-66A | 12 | | | 8 | 16 | | | FDD |
| CA_2A-12A-66A | 12 | | | 8 | 16 | | | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_2A-13A-48A | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_2A-13A-48A-66A | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 66 | | | 12[1] | 25[1] | 36[1] | 50[1] | FDD |
| CA_2A-48A<br>CA_2A-48A-48A<br>CA_2A-48A-48C<br>CA_2A-48D | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_2A-48A-66A<br>CA_2A-48C-66A | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 66 | | | 12[1] | 25[1] | 36[1] | 50[1] | FDD |
| CA_2A-66A-71A<br>CA_2A-2A-66A-71A<br>CA_2A-66A-66A-71A<br>CA_2A-66C-71A | 71 | | | 25 | 50 | 50 | 50 | FDD |
| CA_3A-7A-8A | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_3C-7A-8A | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_3A-7A-20A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-7A-8A-40A | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_3A-7A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-8A-32A | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_3A-11A-28A | 28 | | | 12 | 25 | | | FDD |
| CA_3A-19A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-19A-21A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-20A-32A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| | 20 | | | 8 | 16 | 25 | 25 | FDD |
| CA_3A-19A-21A-42C | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-20A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-21A-28A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-21A-28A-42C | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-21A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-28A-40A | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-28A-41A-42A | 3 | | | | 25 | 36 | 50 | FDD |
| CA_3A-28A-41A-42A | 28 | | | | 10 | 15 | 20 | FDD |
| CA_3A-31A | 31 | | | 5 | 5 | 5 | 5 | FDD |
| CA_3A-32A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-32A-42A-43A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-3A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-42A-42A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-42A-43A | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_4A-5A-12A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_4A-7A-12A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_4A-7A-28A | 28 | | | [8] | [16] | [25] | [25] | FDD |
| CA_4A-12A | 12 | 2 | 5 | 8 | 16 | 20 | 20 | FDD |
| CA_4A-12A-30A | 12 | | | 8 | 16 | | | FDD |
| CA_4A-17A | 17 | | | 8 | 16 | | | FDD |
| CA_4A-28A | 28 | | | [8] | [16] | [25] | [25] | FDD |
| CA_5A-12A-66A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_7A-8A | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_7A-8A-20A | 8 | | | | 16 | 25 | 25 | FDD |
| CA_7A-12A-66A | 12 | | | 8 | 16 | | | FDD |
| CA_7A-12B-66A | 12 | | | 8 | 16 | | | FDD |
| CA_8A-42A | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_11A-28A | 28 | | | 12 | 25 | | | FDD |
| CA_12A-30A-66A | 12 | | | 8 | 16 | | | FDD |
| CA_12A-66A | 12 | 2 | 5 | 8 | 16 | 20 | 20 | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_13A-48A-66A<br>CA_13A-48A-66B<br>CA_13A-48A-66C | 66 | | | 12[1] | 25[1] | 36[1] | 50[1] | FDD |
| CA_13A-48A-48A-66A | 66 | | | 12[1] | 25[1] | 36[1] | 50[1] | FDD |
| CA_13A-48C-66A | 66 | | | 12[1] | 25[1] | 36[1] | 50[1] | FDD |
| CA_20A-32A-42A | 20 | | | 8 | 16 | 25 | 25 | FDD |
| CA_20A-40A[3]<br>CA_20A-40D[3]<br>CA_20A-38A-40A-40A[3]<br>CA_20A-38A-40C[3] | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_20A-40C[3] | 40 | | | 25 | 50 | 75 | | TDD |
| CA_20A-40A-40A[3] | 40 | | | 25 | 50 | 75 | | TDD |
| CA_20A-38A-40A[3] | 40 | | | 25 | 50 | 75 | | TDD |
| CA_20A-38A-40D[3] | 40 | | | 25 | 50 | 75 | | TDD |
| CA_20A-42A,<br>CA_20A-42A-42A | 20 | | | 8 | 16 | 25 | 25 | FDD |
| CA_28A-40A | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_28A-41A-42A | 28 | | | | 10 | 15 | 20 | FDD |
| CA_28A-42A | 28 | | | 5 | 10 | 15 | 20 | FDD |
| CA_48A-66A | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_48A-48A-66A | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_48A-48A-66A-66A | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_48A-48A-66B | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_48A-48A-66C | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_48C-66A-66A | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_48C-66B | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_48C-66C | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_48A-66A-66A | 66 | | | 12[1] | 25[1] | 36[1] | 50[1] | FDD |
| CA_48A-66B | 66 | | | 12[1] | 25[1] | 36[1] | 50[1] | FDD |
| CA_48A-66C | 66 | | | 12[1] | 25[1] | 36[1] | 50[1] | FDD |
| CA_48C-66A | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_48E-66A | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_66A-70A-71A | 71 | | | 8 | 16 | 20 | | FDD |
| CA_66A-66A-70A-71A | 71 | | | 8 | 16 | 20 | | FDD |
| CA_66A-70C-71A | 71 | | | 8 | 16 | 20 | 20 | FDD |
| CA_66A-66A-70C-71A | 71 | | | 8 | 16 | 20 | 20 | FDD |
| CA_66C-70A-71A | 71 | | | 8 | 16 | 20 | | FDD |
| CA_66C-70C-71A | 71 | | | 8 | 16 | 20 | 20 | FDD |
| CA_70A-71A | 71 | | | 8 | 16 | 20 | | FDD |
| CA_70C-71A | 71 | | | 8 | 16 | 20 | 20 | FDD |

Note 1: refers to the UL resource blocks, which shall be centred within the transmission bandwidth configuration for the channel bandwidth

Note 2: the UL configuration applies regardless of the channel bandwidth of the low band unless the UL resource blocks exceed that specified in Table 7.3.3-2 for the uplink bandwidth in which case the allocation according to Table 7.3.3-2 applies.

Note 3: refers to the UL resource blocks shall be located between 2373-2400MHz.

NOTE 4: These configurations apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of a high band.

NOTE 5: These configurations apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a high band.

For the UE that supports any of the E-UTRA CA configurations given in Table 7.3A.0-0bA, exceptions to the requirements for a band(s) specified in subclause 7.3.3 are allowed when the band(s) is impacted by the uplink being active within a specified frequency range as noted in Table 7.3A.0-0bA. For these exceptions, the UE shall meet the requirements specified in Table 7.3A.0-0bA and Table 7.3A.0-0bB.

**Table 7.3A.0-0bA: Reference sensitivity for carrier aggregation QPSK $P_{REFSENS, CA}$ (exceptions for two bands due to close proximity of UL to DL channel)**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **EUTRA band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex mode** |
| CA_1A-3A[4] | 3[9] | | [-95.7] | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A[5] | 3 | | -98.7 | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-1A-3A[4] | 3 | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-1A-3A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-3A[4] | 3[9] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-3A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3C[4] | 3[9] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3C[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-1A-3C[4] | 3 | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-1A-3C[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1C-3A[4] | 3[9] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1C-3A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_18A-28A[6] | 28 | | | -94 | -92.5 | | | FDD |
| CA_19A-28A[7] | 28 | | | -94 | -92 | | | FDD |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: The signal power is specified per port
NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in Band 3, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in Band 3, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 6: These requirements apply when the uplink is active in Band 18 and the downlink channels in Band 28 are confined within the restricted frequency range specified for this CA configuration (Table 5.2A-2). For each channel bandwidth in Band 28, the requirement applies regardless of channel bandwidth in Band 18.
NOTE 7: These requirements apply when the uplink is active in Band 19 and the downlink channels in Band 28 are allocated at the middle of the restricted frequency range specified for this CA configuration (Table 5.2A-2). For each channel bandwidth in Band 28, the requirement applies regardless of channel bandwidth in Band 19.
NOTE 8: Void
NOTE 9: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured.

**Table 7.3A.0-0bB: Uplink configuration for the uplink band (exceptions for two bands due to close proximity of UL to DL channel)**

| E-UTRA Band / Channel bandwidth / $N_{RB}$ / Duplex mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **UL band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Duplex mode** |
| CA_1A-3A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-1A-3A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-1A-3A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3C[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3C[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-1A-3C[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-1A-3C[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1C-3A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1C-3A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_18A-28A[4] | 18 | | | 18 | 18 | | | FDD |
| CA_19A-28A[4] | 19 | | | 18 | 18 | | | FDD |

NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1) in the uplink channel in Band 1.
NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz
NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz.
NOTE 4: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 28 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).

For the UE that supports any of the E-UTRA CA configurations given in Table 7.3A.0-0bC, exceptions to the requirements for a band(s) specified in subclause 7.3.3 are allowed when the bands(s) is impacted by the uplink being active within a specified frequency range as noted in Table 7.3A.0-0bC. For these exceptions, the UE shall meet the requirements specified in Table 7.3A.0-0bC and Table 7.3A.0-0bD.

**Table 7.3A.0-0bC: Reference sensitivity for carrier aggregation QPSK $P_{REFSENS, CA}$ (exceptions for three bands due to close proximity of UL to DL channel)**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **EUTRA band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex mode** |
| CA_1A-3A-5A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-5A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-1A-3A-5A[4] | 3 | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-1A-3A-5A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1C-3A-5A[4] | 3 | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1C-3A-5A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| | | | | [-99.7][12] | [-96.7][12] | [-94.9][12] | [-93.7][12] | |
| CA_1A-3A-3A-7A-7A | 3[4] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_1A-3C-5A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3C-5A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-7A[9] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-7A[10] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-1A-3A-7A[9] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-1A-3A-7A[10] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-3A-7A | 3[9,12] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[10] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3A-7A-7A | 3[9,12] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[10] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3A-7C[9] | 3[12] | | | | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-7C[10] | 3 | | | | -94 | -92.2 | -91 | FDD |
| CA_1A-3C-7A[9] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3C-7A[10] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-1A-3C-7A[9] | 3 | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-1A-3C-7A[10] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3C-7C | 3[9,12] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[10] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3A-8A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-8A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-3A-8A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-3A-8A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3C-8A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3C-8A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-11A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-11A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-19A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-19A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-3A-19A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-3A-19A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-20A[4]<br>CA_1A-3A-3A-20A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-20A[5]<br>CA_1A-3A-3A-20A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3C-20A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3C-20A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-21A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-21A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-3A-21A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-3A-21A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-26A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-26A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-28A[4]<br>CA_1A-1A-3A-28A[4]<br>CA_1A-3A-3A-28A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-28A[5]<br>CA_1A-1A-3A-28A[5]<br>CA_1A-3A-3A-28A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3C-28A[4] | 3[12] | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3C-28A[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-40A | 3[4,12] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| | 40 | | | [-93.4] | -91.3 | -90 | -88.9 | TDD |
| CA_1A-3A-40C | 3[4,12] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 40 | | | [-93.4] | -91.3 | -90 | -88.9 | TDD |
| CA_1A-3C-40A | 3[4,12] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| | 40 | | | [-93.4] | -91.3 | -90 | -88.9 | TDD |
| CA_1A-3C-40C | 3[4,12] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| | 40 | | | [-93.4] | -91.3 | -90 | -88.9 | TDD |
| CA_1A-3A-42A[4] | 3[12] | | | -93.8 | -91.3 | -89.8 | -88.8 | FDD |
| CA_1A-3A-42A[5] | 3 | | | -96.8 | -93.8 | -92 | -90.8 | FDD |
| CA_1A-3A-3A-42A[4] | 3[12] | | | -93.8 | -91.3 | -89.8 | -88.8 | FDD |
| CA_1A-3A-3A-42A[5] | 3 | | | -96.8 | -93.8 | -92 | -90.8 | FDD |
| CA_1A-3A-42C[4] | 3[12] | | | -93.8 | -91.3 | -89.8 | -88.8 | FDD |
| CA_1A-3A-42C[5] | 3 | | | -96.8 | -93.8 | -92 | -90.8 | FDD |
| CA_1A-3A-3A-42C[4] | 3 | | | -94 | -91.5 | -90 | -89 | FDD |
| CA_1A-3A-3A-42C[5] | 3 | | | -96.8 | -93.8 | -92 | -90.8 | FDD |
| CA_1A-18A-28A[6] | 28 | | | -94 | -92.5 | | | FDD |
| CA_1A-19A-28A[8] | 28 | | | -94 | -92 | | | FDD |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: The signal power is specified per port
NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the Bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the Bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 6: These requirements apply when the uplink is active in Band 18 and the downlink channels in Band 28 are confined within the restricted frequency range specified for this CA configuration (Table 5.2A-2). For each channel bandwidth in Band 28, the requirement applies regardless of channel bandwidth in Band 18.
NOTE 7: Void
NOTE 8: These requirements apply when the uplink is active in Band 19 and the downlink channels in Band 28 are allocated at the middle of the restricted frequency range specified for this CA configuration (Table 5.2A-2). For each channel bandwidth in Band 28, the requirement applies regardless of channel bandwidth in Band 19.
NOTE 9: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in Band 3 and Band 7, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 10: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in Band 3 and Band 7, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 11: Void
NOTE 12: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured.

**Table 7.3A.0-0bD: Uplink configuration for the uplink band (exceptions for three bands due to close proximity of UL to DL channel)**

| E-UTRA Band / Channel bandwidth / $N_{RB}$ / Duplex mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **UL band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Duplex mode** |
| CA_1A-3A-5A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-5A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-1A-3A-5A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-1A-3A-5A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1C-3A-5A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1C-3A-5A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-3A-7A-7A | 1[1,2] | | | 25 | 25 | 25 | 25 | FDD |
| | 1[1,3] | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3C-5A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3C-5A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-7A[**1, 2**] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-7A[**1, 3**] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-1A-3A-7A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-1A-3A-7A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-1A-3C-7A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-1A-3C-7A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-3A-7A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-3A-7A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-7A-7A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-7A-7A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3C-7A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3C-7A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-7C[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-7C[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3C-7C[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3C-7C[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-8A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-8A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-3A-8A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-3A-8A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3C-8A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_1A-3C-8A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-11A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-11A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-19A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-19A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-3A-19A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-3A-19A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-20A[1, 2]<br>CA_1A-3A-3A-20A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-20A[1, 3]<br>CA_1A-3A-3A-20A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3C-20A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3C-20A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-21A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-21A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-3A-21A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-3A-21A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-26A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-26A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-28A[1, 2]<br>CA_1A-1A-3A-28A[1, 2]<br>CA_1A-3A-3A-28A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-28A[1, 3]<br>CA_1A-1A-3A-28A[1, 3]<br>CA_1A-3A-3A-28A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3C-28A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3C-28A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-40A<br>CA_1A-3A-40C<br>CA_1A-3C-40A<br>CA_1A-3C-40C | 1[1,2] | | | 25 | 25 | 25 | 25 | FDD |
| | 1[1,3] | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-42A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-42A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_1A-3A-3A-42A[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-3A-42A[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-42C[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-42C[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-3A-3A-42C[1, 2] | 1 | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-3A-42C[1, 3] | 1 | | | 25 | 45 | 45 | 45 | FDD |
| CA_1A-18A-28A[4] | 18 | | | 18 | 18 | | | FDD |
| CA_1A-19A-28A[4] | 19 | | | 18 | 18 | | | FDD |

NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1) in the uplink channel in Band 1.
NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz.
NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz.
NOTE 4: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band28 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).

For the UE that supports any of the E-UTRA CA configurations given in Table 7.3A.0-0bD1, exceptions to the requirements for a band(s) specified in subclause 7.3.3 are allowed when the band(s) is impacted by the uplink being active within a specified frequency range as noted in Table 7.3A.0-0bD1. For these exceptions, the UE shall meet the requirements specified in Table 7.3A.0-0bD1 and Table 7.3A.0-0bD2.

**Table 7.3A.0-0bD1: Reference sensitivity for carrier aggregation QPSK $P_{REFSENS, CA}$ (exceptions for four bands due to close proximity of UL to DL channel)**

| | | Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **EUTRA band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex mode** |
| CA_1A-3A-5A-7A | 3[4,9] | | | | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | | -94 | -92.2 | -91 | |
| CA_1A-3A-5A-7A-7A | 3[4,9] | | | | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | | -94 | -92.2 | -91 | |
| CA_1A-3A-5A-40A | 3[4,9] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| | 40 | | | | -91.9 | -90.4 | -89.4 | TDD |
| CA_1A-3A-5A-41A[7,8] | 3[4] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| | 41 | | | | | | [88.1] | TDD |
| CA_1A-3C-7A-8A | 3[4] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3C-7A-20A | 3[4] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3A-7A-7A-26A | 3[4] | | | | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3A-7A-8A | 3[4,9] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3A-7A-20A | 3[4,9] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3A-3A-7A-20A | 3[4,9] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_1A-3A-7A-26A | 3[4] | | | | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3A-7A-28A | 3[4,9] | | | | [-91.5] | [-90] | [-89] | FDD |
| | 3[5] | | | | -94 | -92.2 | -91 | |
| CA_1A-3A-7C-28A | 3[4,9] | | | | [-91.5] | [-90] | [-89] | FDD |
| | 3[5] | | | | -94 | -92.2 | -91 | |
| CA_1A-3A-7A-42A | 3[4,9] | | | -93.8 | -91.3 | -89.8 | -88.8 | FDD |
| | 3[5] | | | -96.8 | -93.8 | -92 | -90.8 | |
| CA_1A-3A-8A-11A | 3[4,9] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3A-8A-28A | 3[4,9] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3A-8A-38A | 3[4,9] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3A-11A-28A | 3[4,9] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3A-8A-40A | 3[4,9] | | | -94 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| | 40 | | | [-93.4] | -91.9 | -90.4 | -89.4 | TDD |
| CA_1A-3A-19A-21A[4] | 3[9] | | | -93.7 | -91.2 | -89.7 | -88.7 | FDD |
| CA_1A-3A-19A-21A[5] | 3 | | | -96.7 | -93.7 | -91.9 | -90.7 | FDD |
| CA_1A-3A-3A-19A-21A[4] | 3 | | | -93.7 | -91.2 | -89.7 | -88.7 | FDD |
| CA_1A-3A-3A-19A-21A[5] | 3 | | | -96.7 | -93.7 | -91.9 | -90.7 | FDD |
| CA_1A-3A-7A-40C[4] | 3 | | | -94 | -91.5 | -90 | -89 | FDD |
| | 40 | | | -92.6 | -90.5 | -89.2 | -88.1 | TDD |
| CA_1A-3A-7A-40C[5] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| | 40 | | | -92.6 | -90.5 | -89.2 | -88.1 | TDD |
| CA_1A-3A-19A-42A | 3[4,9] | | | -93.8 | -91.3 | -89.8 | -88.8 | FDD |
| | 3[5] | | | -96.8 | -93.8 | -92 | -90.8 | |
| CA_1A-3A-19A-42C | 3[4,9] | | | -93.8 | -91.3 | -89.8 | -88.8 | FDD |
| | 3[5] | | | -96.8 | -93.8 | -92 | -90.8 | |
| CA_1A-3A-20A-28A | 3[4] | | | -94,3 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |
| CA_1A-3A-3A-20A-28A | 3[4] | | | -94,3 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | FDD |
| CA_1A-3A-20A-42A | 3[4,9] | | | -93.8 | -91.3 | -89.8 | -88.8 | FDD |
| | 3[5] | | | -96.8 | -93.8 | -92 | -90.8 | |
| CA_1A-3A-20A-43A | 3[4,9] | | | -94 | -91.5 | -90 | | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | | |
| CA_1A-3A-21A-28A[4] | 3[9] | | | -93.7 | -91.2 | -89.7 | -88.7 | FDD |
| CA_1A-3A-21A-28A[5] | 3 | | | -96.7 | -93.7 | -91.9 | -90.7 | FDD |
| CA_1A-3A-21A-42A[4] | 3[9] | | | -93.7 | -91.2 | -89.7 | -88.7 | FDD |
| CA_1A-3A-21A-42A[5] | 3 | | | -96.7 | -93.7 | -91.9 | -90.7 | FDD |
| CA_1A-3A-21A-42C | 3[4,9] | | | -93.7 | -91.2 | -89.7 | -88.7 | FDD |
| | 3[5] | | | -96.7 | -93.7 | -91.9 | -90.7 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_1A-3A-28A-42A[4] | 3[9] | | | -93.8 | -91.3 | -89.8 | -88.8 | FDD |
| CA_1A-3A-28A-42A[5] | 3 | | | -96.8 | -93.8 | -92 | -90.8 | FDD |
| CA_1A-3A-28A-42C | 3[4,9] | | | -93.8 | -91.3 | -89.8 | -88.8 | FDD |
| | 3[5] | | | -96.8 | -93.8 | -92 | -90.8 | |
| CA_1A-3A-32A-42A | 3[4,9] | | | -93.8 | -91.3 | -89.8 | | FDD |
| | 3[5] | | | -96.8 | -93.8 | -92 | | |
| CA_1A-3A-32A-43A | 3[4,9] | | | -94 | -91.5 | -90 | | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | | |
| CA_1A-3A-42A-43A | 3[4,9] | | | -93.8 | -91.3 | -89.8 | | FDD |
| | 3[5] | | | -96.8 | -93.8 | -92 | | |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: The signal power is specified per port
NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 6: Void
NOTE 7: The Band 41 requirements are modified by -0.5dB when carrier frequency of the assigned E-UTRA channel bandwidth is within 2545-2690MHz.
NOTE 8: The Band 41 requirements also apply to the supported CA_1A-41A.
NOTE 9: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured.

**Table 7.3A.0-0bD2: Uplink configuration for the low band (exceptions for four bands due to close proximity of UL to DL channel)**

| E-UTRA Band / Channel bandwidth / $N_{RB}$ / Duplex mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **UL band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Duplex mode** |
| CA_1A-3A-5A-7A | 1[1,2] | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-5A-7A-7A<br>CA_1A-3A-5A-40A<br>CA_1A-3A-5A-41A<br>CA_1A-3A-7A-7A-26A CA_1A-3A-7A-8A<br>CA_1A-3C-7A-8A<br>CA_1A-3A-7A-20A<br>CA_1A-3C-7A-20A<br>CA_1A-3A-3A-7A-20A<br>CA_1A-3A-7A-26A<br>CA_1A-3A-7A-28A<br>CA_1A-3A-7C-28A<br>CA_1A-3A-7A-40C<br>CA_1A-3A-7A-42A<br>CA_1A-3A-8A-11A<br>CA_1A-3A-8A-28A<br>CA_1A-3A-8A-38A<br>CA_1A-3A-11A-28A<br>CA_1A-3A-8A-40A<br>CA_1A-3A-19A-21A<br>CA_1A-3A-3A-19A-21A<br>CA_1A-3A-19A-42A<br>CA_1A-3A-19A-42C<br>CA_1A-3A-20A-28A<br>CA_1A-3A-3A-20A-28A<br>CA_1A-3A-20A-42A<br>CA_1A-3A-20A-43A<br>CA_1A-3A-21A-28A<br>CA_1A-3A-21A-42A<br>CA_1A-3A-21A-42C<br>CA_1A-3A-28A-42A<br>CA_1A-3A-32A-42A<br>CA_1A-3A-32A-43A<br>CA_1A-3A-42A-43A | 1[1,3] | | | 25 | 45 | 45 | 45 | |

NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1) in the uplink channel in Band 1.
NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz
NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz.

For the UE that supports any of the E-UTRA CA configurations given in Table 7.3A.0-0bD3, exceptions are allowed when the uplink is active within a specified frequency range as noted in Table 7.3A.0-0bD3. For these exceptions, the UE shall meet the requirements specified in Table 7.3A.0-0bD3 and Table 7.3A.0-0bD4.

**Table 7.3.0-0bD3: Reference sensitivity for carrier aggregation QPSK $P_{REFSENS, CA}$ (exceptions for five bands due to close proximity of UL to DL channel)**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **EUTRA band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex mode** |
| CA_1A-3A-7A-20A-28A | 3[4] | | | -94,3 | -91.5 | -90 | -89 | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | -91 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_1A-3A-7A-20A-42A | 3[4,7] | | | -93.8 | -91.3 | -89.8 | -88.8 | FDD |
| | 3[5] | | | -96.8 | -93.8 | -92 | -90.8 | |
| CA_1A-3A-20A-32A-42A | 3[4,7] | | | -93.8 | -91.3 | -89.8 | | FDD |
| | 3[5] | | | -96.8 | -93.8 | -92 | | |
| CA_1A-3A-20A-32A-43A | 3[4,7] | | | -94 | -91.5 | -90 | | FDD |
| | 3[5] | | | -97 | -94 | -92.2 | | |
| CA_1A-3A-32A-42A-43A | 3[4,7] | | | -93.8 | -91.3 | -89.8 | | FDD |
| | 3[5] | | | -96.8 | -93.8 | -92 | | |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: The signal power is specified per port
NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 6: Void
NOTE 7: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured.

**Table 7.3.0-0bD4: Uplink configuration for the low band (exceptions for five bands due to close proximity of UL to DL channel)**

| E-UTRA Band / Channel bandwidth / $N_{RB}$ / Duplex mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **UL band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Duplex mode** |
| CA_1A-3A-7A-20A-28A | 1[1,2] | | | 25 | 25 | 25 | 25 | FDD |
| CA_1A-3A-7A-20A-42A<br>CA_1A-3A-20A-32A-42A<br>CA_1A-3A-20A-32A-43A<br>CA_1A-3A-32A-42A-43A | 1[1,3] | | | 25 | 45 | 45 | 45 | |

NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1) in the uplink channel in Band 1.
NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz.
NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz.

For the UE that supports any of the E-UTRA CA configurations given in Table 7.3A.0-0bE, exceptions to the requirements for a band(s) specified in subclause 7.3.3 are allowed when the band(s) is impacted by the uplink being active in the applicable active UL bands of the same CA configuration in Table 7.3A.0-0bE. For these exceptions, the UE shall meet the reference sensitivities specified in Table 7.3A.0-0bE and Table 7.3A.0-0bF.

**Table 7.3A.0-0bE: Reference sensitivity for carrier aggregation QPSK $P_{REFSENS, CA}$ (exceptions due to cross band isolation issues of TDD and FDD bands)**

| **EUTRA CA Configuration** | **EUTRA band** | **Channel bandwidth** | | | | | | **Duplex mode** | **Applicable active UL band** |
|---|---|---|---|---|---|---|---|---|---|
| | | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CA_1A-3A-5A-40A | 40[19] | | | | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_1A-3A-5A-40A | 1[19] | | | -91.7 | [-89.5] | [-87.9] | [-86.9] | FDD | 40 |
| | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | | |
| CA_1A-3A-5A-41A[5] | 41 | | | | | | [-88.1] | TDD | 3 |
| CA_1A-3A-7A-20A-42A | 42[19] | | | -95.6 | -93 | -91.5 | -90.4 | TDD | 7 |
| CA_1A-3A-7A-20A-42A | 7[19] | | | | -93 | -91.3 | -90.1 | FDD | 42 |
| CA_1A-3A-7A-40A[15] | 3[19] | | | -94 | -91.5 | -90 | -89 | FDD | 1 |
| | 40[19] | | | -92.6 | -90.5 | -89.2 | -88.1 | TDD | |
| CA_1A-3A-7A-40A[16] | 3 | | | -97 | -94 | -92.2 | -91 | FDD | 1 |
| | 40[19] | | | -92.6 | -90.5 | -89.2 | -88.1 | TDD | |
| CA_1A-3A-7A-40A | 40[19] | | | -94.6 | -92.1 | -90.5 | -89.4 | TDD | 3 |
| CA_1A-3A-7A-40A | 40[19] | | | -96 | -93.3 | -91.7 | -90.6 | TDD | 7 |
| CA_1A-3A-7A-40A | 1[19] | | | -91.7 | -89.5 | -87.9 | -86.9 | FDD | 40 |
| | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | | |
| | 7[19] | | | | -94 | -92.4 | -91.2 | | |
| CA_1A-3A-7A-40C | 40 | | | -94.6 | -92.1 | -90.5 | -89.4 | TDD | 3 |
| CA_1A-3A-7A-40C | 40 | | | -96 | -93.3 | -91.7 | -90.6 | TDD | 7 |
| CA_1A-3A-7A-40C | 1 | | | -91.7 | -89.5 | -87.9 | -86.9 | FDD | 40 |
| | 3 | | | -94.2 | -91.2 | -89.5 | -88.3 | | |
| | 7 | | | | -94 | -92.4 | -91.2 | | |
| CA_1A-3A-7A-42A | 42[19] | | | -95.6 | -93 | -91.5 | -90.4 | TDD | 7 |
| | 7[19] | | | | -93 | -91.3 | -90.1 | FDD | 42 |
| | 42 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD | |
| CA_1A-3A-8A-40A | 40[19] | | | -95.4 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_1A-3A-8A-40A | 1[19] | | | -91.7 | [-89.5] | [-87.9] | [-86.9] | FDD | 40 |
| | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | | |
| CA_1A-3A-38A[12] | 3[19] | | | -94 | -91.5 | -90 | -89 | FDD | 1 |
| | 38 | | | -97.1 | -94.4 | -92.8 | -91.7 | TDD | |
| | 38 | | | -97.1 | -94.4 | -92.8 | -91.7 | TDD | 3 |
| | 1[19] | | | -98.1 | -95.1 | -93.3 | -92.1 | FDD | 38 |
| | 3[19] | | | -95.1 | -92.1 | -90.3 | -89.1 | | |
| CA_1A-3A-38A[13] | 3 | | | -97 | -94 | -92.2 | -91 | FDD | 1 |
| | 38 | | | -97.1 | -94.4 | -92.8 | -91.7 | TDD | |
| | 38 | | | -97.1 | -94.4 | -92.8 | -91.7 | TDD | 3 |
| | 1[19] | | | -98.1 | -95.1 | -93.3 | -92.1 | FDD | 38 |
| | 3[19] | | | -95.1 | -92.1 | -90.3 | -89.1 | | |
| CA_1A-3A-40A | 40[19] | | | -100 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_1A-3A-40A | 1[19] | | | -91.7 | [-89.5] | [-87.9] | [-86.9] | FDD | 40 |
| | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | | |
| CA_1A-3A-40C | 40[19] | | | -100 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_1A-3A-40C | 1[19] | | | -91.7 | [-89.5] | [-87.9] | [-86.9] | FDD | 40 |
| | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | | |
| CA_1A-3C-40A | 40[19] | | | -100 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_1A-3C-40A | 1[19] | | | -91.7 | [-89.5] | [-87.9] | [-86.9] | FDD | 40 |
| | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | | |
| CA_1A-3A-41A[12,14] CA_1A-3A-41C[12,14] CA_1A-3A-41D[12,14] | 3[19] | | | -94 | -91.5 | -90 | -89 | FDD | 1 |
| | 41[19] | | | -93.3 | -90.7 | -89.2 | -88.1 | TDD | |
| | 41[19] | | | -93.3 | -90.7 | -89.2 | -88.1 | TDD | 3 |
| CA_1A-3A-41A[13,14] CA_1A-3A-41C[13,14] CA_1A-3A-41D[13,14] | 3 | | | -97 | -94 | -92.2 | -91 | FDD | 1 |
| | 41[19] | | | -93.3 | -90.7 | -89.2 | -88.1 | TDD | |
| | 41[19] | | | -93.3 | -90.7 | -89.2 | -88.1 | TDD | 3 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CA_1A-3C-40C | 40[19] | | | -100 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_1A-3C-40C | 1[19] | | | -91.7 | [-89.5] | [-87.9] | [-86.9] | FDD | 40 |
| | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | | |
| CA_1A-5A-40A | 40[19] | | | | -91.9 | -90.4 | -89.4 | TDD | 1 |
| CA_1A-5A-40A | 1[19] | | | -91.7 | [-89.5] | [-87.9] | [-86.9] | FDD | 40 |
| CA_1A-7A-8A-40A | 40[19] | | | -92.6 | -90.5 | -89.2 | -88.1 | TDD | 1 |
| CA_1A-7A-8A-40A | 40[19] | | | -96 | -93.3 | -91.7 | -90.6 | TDD | 7 |
| CA_1A-7A-8A-40A | 1[19] | | | -91.7 | -89.5 | -87.9 | -86.9 | FDD | 40 |
| | 7[19] | | | | -94 | -92.4 | -91.2 | | |
| CA_1A-7A-8A-40C | 40[19] | | | -92.6 | -90.5 | -89.2 | -88.1 | TDD | 1 |
| CA_1A-7A-8A-40C | 40[19] | | | -96 | -93.3 | -91.7 | -90.6 | TDD | 7 |
| CA_1A-7A-8A-40C | 1[19] | | | -91.7 | -89.5 | -87.9 | -86.9 | FDD | 40 |
| | 7[19] | | | | -94 | -92.4 | -91.2 | | |
| CA_1A-7A-20A-42A | 42[19] | | | -95.6 | -93 | -91.5 | -90.4 | TDD | 7 |
| CA_1A-7A-20A-42A | 7[19] | | | -96.2 | -93.2 | -91.5 | -90.3 | FDD | 42 |
| CA_1A-7A-40A | 40[19] | | | -92.6 | -90.5 | -89.2 | -88.1 | TDD | 1 |
| CA_1A-7A-40A | 40[19] | | | -96 | -93.3 | -91.7 | -90.6 | TDD | 7 |
| CA_1A-7A-40A | 1[19] | | | -91.7 | -89.5 | -87.9 | -86.9 | FDD | 40 |
| | 7[19] | | | | -94 | -92.4 | -91.2 | | |
| CA_1A-7A-40C | 40[19] | | | -92.6 | -90.5 | -89.2 | -88.1 | TDD | 1 |
| CA_1A-7A-40C | 40[19] | | | -96 | -93.3 | -91.7 | -90.6 | TDD | 7 |
| CA_1A-7A-40C | 1[19] | | | -91.7 | -89.5 | -87.9 | -86.9 | FDD | 40 |
| | 7[19] | | | | -94 | -92.4 | -91.2 | | |
| CA_1A-7A-42A | 42[19] | | | -95.6 | -93 | -91.5 | -90.4 | TDD | 7 |
| | 7[19] | | | -96.2 | -93.2 | -91.5 | -90.3 | FDD | 42 |
| CA_1A-8A-40A | 40[19] | | | [-93.4] | -91.9 | -90.4 | -89.4 | TDD | 1 |
| CA_1A-8A-40A | 1[19] | | | -91.7 | [-89.5] | [-87.9] | [-86.9] | FDD | 40 |
| CA_1A-8A-40C | 40[19] | | | [-93.4] | -91.9 | -90.4 | -89.4 | TDD | 1 |
| CA_1A-8A-40C | 1[19] | | | -91.7 | [-89.5] | [-87.9] | [-86.9] | FDD | 40 |
| CA_1A-40A | 40[19] | | | [-93.4] | -91.9 | -90.4 | -89.4 | TDD | 1 |
| CA_1A-40A | 1[19] | | | -91.7 | [-89.5] | [-87.9] | [-86.9] | FDD | 40 |
| CA_1A-40C | 40[19] | | | [-93.4] | -91.9 | -90.4 | -89.4 | TDD | 1 |
| CA_1A-40C | 1[19] | | | -91.7 | [-89.5] | [-87.9] | [-86.9] | FDD | 40 |
| CA_3A-5A-40A | 40[19] | | | | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_3A-5A-40A | 3[19] | | [-95.3] | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| CA_3A-5A-41A[5] | 41 | | | | | | [-88.1] | TDD | 3 |
| CA_3A-5A-41A[5,18] | 3 | | | [-94] | [-91] | [-89.2] | [-87.9] | FDD | 41 |
| | 41 | | | | | | -91.5 | TDD | |
| CA_3A-7A-8A-38A | 7[19] | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | FDD | 3 |
| | 38 | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | TDD | |
| CA_3A-7A-8A-38A | 7[19] | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | FDD | 8 |
| | 38 | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | TDD | |
| CA_3C-7A-8A-38A | 7[19] | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | FDD | 3 |
| | 38 | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | TDD | |
| CA_3C-7A-8A-38A | 7[19] | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | | 3 |
| | 38 | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | | |
| CA_3A-7A-8A-40A | 40[19] | | | -94.6 | -92.1 | -90.5 | -89.4 | TDD | 3 |
| CA_3A-7A-8A-40A | 40[19] | | | -96 | -93.3 | -91.7 | -90.6 | TDD | 7 |
| CA_3A-7A-8A-40C | 40[19] | | | -94.6 | -92.1 | -90.5 | -89.4 | TDD | 3 |
| CA_3A-7A-8A-40C | 40[19] | | | -96 | -93.3 | -91.7 | -90.6 | TDD | 7 |
| CA_3A-7A-8A-40A | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| | 7[19] | | | | -94 | -92.4 | -91.2 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CA_3A-7A-8A-40C | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| | 7[19] | | | | -94 | -92.4 | -91.2 | | |
| CA_3A-7A-28A-38A | 7[19] | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | FDD | 3 |
| | 38 | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | TDD | |
| CA_3A-7A-28A-38A | 7[19] | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | FDD | 28 |
| | 38 | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | TDD | |
| CA_3C-7A-28A-38A | 7[19] | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | FDD | 3 |
| | 38 | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | TDD | |
| CA_3C-7A-28A-38A | 7[19] | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | FDD | 3 |
| | 38 | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | TDD | |
| CA_3A-7A-38A | 7[19] | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | FDD | 3 |
| | 38 | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | TDD | |
| CA_3C-7A-38A | 7[19] | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | FDD | 3 |
| | 38 | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | TDD | |
| CA_3A-7A-40A | 40[19] | | | -94.6 | -92.1 | -90.5 | -89.4 | TDD | 3 |
| CA_3A-7A-40A | 40[19] | | | -96 | -93.3 | -91.7 | -90.6 | TDD | 7 |
| CA_3A-7A-40A | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| | 7[19] | | | -96.8 | -94 | -92.4 | -91.2 | | |
| CA_3A-7A-40C | 40[19] | | | -94.6 | -92.1 | -90.5 | -89.4 | TDD | 3 |
| CA_3A-7A-40C | 40[19] | | | -96 | -93.3 | -91.7 | -90.6 | TDD | 7 |
| CA_3A-7A-40C | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| | 7[19] | | | -96.8 | -94 | -92.4 | -91.2 | | |
| CA_3A-7A-42A | 42[19] | | | -95.6 | -93 | -91.5 | -90.4 | TDD | 7 |
| | 3 | | | [-96.6] | [-93.6] | [-91.8] | [-90.6] | FDD | 42 |
| | 7[19] | | | -96.2 | -93.2 | -91.5 | -90.3 | | |
| CA_3A-8A-40A | 40[19] | | | -95.4 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_3A-8A-40C | 40[19] | | | -95.4 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_3A-8A-40C | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| CA_3A-8A-40A | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| CA_3A-20A-32A | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD | 3 |
| CA_3A-28A-40A | 40[19] | | | -95.4 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_3A-28A-40A | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| CA_3A-28A-40A | 40[19] | | | -95.1 | -92.9 | -91.4 | -90.5 | TDD | 28 |
| CA_3A-28A-40C | 40[19] | | | -95.4 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_3A-28A-40C | 40[19] | | | -95.1 | -92.9 | -91.4 | -90.5 | TDD | 28 |
| CA_3A-28A-40C | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| | 28 | | | -96.8 | -94.1 | -92.5 | -89.8 | | |
| CA_3A-28A-40D | 40[19] | | | | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_3A-28A-40D | 40[19] | | | | -92.9 | -91.4 | -90.5 | TDD | 28 |
| CA_3A-28A-40D | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| | 28 | | | -96.8 | -94.1 | -92.5 | -89.8 | | |
| CA_3A-28A-41A[5] | 41[19] | | | [-93.3] | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| | 3[19] | | | [-94] | [-91] | [-89.2] | [-87.9] | FDD | 41 |
| CA_3A-28A-41C[5] | 41[19] | | | [-93.3] | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| | 3[19] | | | [-94] | [-91] | [-89.2] | [-87.9] | FDD | 41 |
| CA_3A-28A-41A-42A | 3[19] | | | [-94] | [-91] | [-89.2] | [-87.9] | FDD | 41 |
| | 41 | | | | -94.5[17] | -92.7[17] | -91.5[17] | TDD | |
| | 41[19] | | | | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| CA_3A-28A-41A-42C | 41[19] | | | | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| | 3[19] | | | [-94] | [-91] | [-89.2] | [-87.9] | FDD | 41 |
| | 41 | | | | -94.5[17] | -92.7[17] | -91.5[17] | TDD | |
| CA_3A-28A-41C-42A | 41[19] | | | | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| | 3[19] | | | [-94] | [-91] | [-89.2] | [-87.9] | FDD | 41 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 41 | | | | -94.5[17] | -92.7[17] | -91.5[17] | TDD | |
| CA_3A-40A | 40[19] | | | -95.4 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_3A-40A | 3[19] | [-97.4] | [-95.3] | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| CA_3A-40A-40A | 40[19] | | | | -92.9 | | -90.2 | TDD | 3 |
| CA_3A-40A-40A | 3[19] | | | -94.2 | -91.2 | | | FDD | 40 |
| CA_3A-40C | 40[19] | | | -95.4 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_3A-40D | 40[19] | | | -95.4 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_3A-40D | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| CA_3A-40E | 40[19] | | | | | -91.3 | -90.2 | TDD | 3 |
| CA_3A-40E | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| CA_3A-40C | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| CA_3C-40A | 40[19] | | | -95.4 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_3C-40A | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| CA_3C-40C | 40[19] | | | -95.4 | -92.9 | -91.3 | -90.2 | TDD | 3 |
| CA_3C-40C | 3[19] | | | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| CA_3A-41A[5] | 3[19] | | [-95.3] | [-94] | [-91] | [-89.2] | [-87.9] | FDD | 41 |
| | 41[19] | | | [-93.3] | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| CA_3A-41C[5] | 3[19] | | | [-94] | [-91] | [-89.2] | [-87.9] | FDD | 41 |
| | 41[19] | | | [-93.3] | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| CA_3A-41D[5] | 3[19] | | | [-94] | [-91] | [-89.2] | [-87.9] | FDD | 41 |
| | 41[19] | | | [-93.3] | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| CA_3A-3A-41A | 3 | | [-95.3] | [-94] | [-91] | [-89.2] | [-87.9] | FDD | 41 |
| | 41 | | | [-93.3] | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| CA_3C-41A[5] | 3[19] | | | [-94] | [-91] | [-89.2] | [-87.9] | FDD | 41 |
| | 41[19] | | | [-93.3] | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| CA_3C-41C[5] | 3[19] | | | [-94] | [-91] | [-89.2] | [-87.9] | FDD | 41 |
| | 41[19] | | | [-93.3] | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| CA_3C-41D[5] | 3[19] | | | [-94] | [-91] | [-89.2] | [-87.9] | FDD | 41 |
| | 41[19] | | | [-93.3] | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| CA_3A-41A-42A[5,6,7,8] | 41[19] | | | [-93.3] | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| | 42[19] | | | -71.7 | -71.7 | -71.7 | -71.7 | | |
| CA_3A-41A-42A[5,6,9] | 41[19] | | | [-93.3] | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| | 42[19] | | | -97.1 | -94.7 | -93.2 | -92.5 | | |
| CA_3A-41A-42A[5,6,10] | 3[19] | | | [-93.5] | [-90.5] | [-88.7] | [-87.4] | FDD | 41 |
| CA_3A-41A-42C[5,6,7,8] | 41[19] | | | | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| | 42[19] | | | | -71.7 | -71.7 | -71.7 | | |
| CA_3A-41A-42C[5,6,9] | 41[19] | | | | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| | 42[19] | | | | -94.7 | -93.2 | -92.5 | | |
| CA_3A-41A-42C[5,6,10] | 3[19] | | | [-93.5] | [-90.5] | [-88.7] | [-87.4] | FDD | 41 |
| | 42 | | | | -95.5 | -93.7 | -92.5 | TDD | |
| CA_3A-41C-42A[5,6,7,8] | 41[19] | | | | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| | 42[19] | | | | -71.7 | -71.7 | -71.7 | | |
| CA_3A-41C-42A[5,6,9] | 41[19] | | | | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| | 42 | | | | -94.7 | -93.2 | -92.5 | | |
| CA_3A-41C-42A[5,6,10] | 3[19] | | | [-93.5] | [-90.5] | [-88.7] | [-87.4] | FDD | 41 |
| CA_3A-41C-42C[5,6,7,8] | 41[19] | | | [-93.3] | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| | 42[19] | | | -71.7 | -71.7 | -71.7 | -71.7 | | |
| CA_3A-41C-42C[5,6,9] | 41[19] | | | [-93.3] | [-90.7] | [-89.2] | [-88.1] | TDD | 3 |
| | 42[19] | | | -97.1 | -94.7 | -93.2 | -92.5 | | |
| CA_3A-41C-42C[5,6,10] | 3[19] | | | [-93.5] | [-90.5] | [-88.7] | [-87.4] | FDD | 41 |
| CA_7A-8A-38A | 7[19] | | | | [-91.2] | [-89.7] | [-88.6] | FDD | 8 |
| | 38 | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | TDD | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CA_7A-8A-40A | 40[19] | | | -96.3 | -93.6 | -92 | -90.9 | TDD | 7 |
| | 7[19] | | | -88 | -87.4 | -87 | -86.7 | FDD | 8 |
| | 7[19] | | | -97.1 | -94.3 | -92.7 | -91.5 | FDD | 40 |
| CA_7A-8A-40C | 40[19] | | | -96.3 | -93.6 | -92 | -90.9 | TDD | 7 |
| | 7[19] | | | -88 | -87.4 | -87 | -86.7 | FDD | 8 |
| | 7[19] | | | -97.1 | -94.3 | -92.7 | -91.5 | FDD | 40 |
| CA_7A-20A-42A | 42[19] | | | -95.6 | -93 | -91.5 | -90.4 | TDD | 7 |
| | 7[19] | | | -96.2 | -93.2 | -91.5 | -90.3 | FDD | 42 |
| CA_7A-28A-38A | 7[19] | | | | [-91.2] | [-89.7] | [-88.6] | FDD | 8 |
| | 38 | | | [-93.8] | [-91.2] | [-89.7] | [-88.6] | TDD | |
| CA_7A-40A | 40[19] | | | -96.3 | -93.6 | -92 | -90.9 | TDD | 7 |
| | 7[19] | | | -97.1 | -94.3 | -92.7 | -91.5 | FDD | 40 |
| CA_7A-40C | 40[19] | | | -96.3 | -93.6 | -92 | -90.9 | TDD | 7 |
| | 7[19] | | | -97.1 | -94.3 | -92.7 | -91.5 | FDD | 40 |
| CA_7A-40D | 40[19] | | | -96.3 | -93.6 | -92 | -90.9 | TDD | 7 |
| | 7[19] | | | -97.1 | -94.3 | -92.7 | -91.5 | FDD | 40 |
| CA_7A-40E | 40[19] | | | -96.3 | -93.6 | -92 | -90.9 | TDD | 7 |
| | 7[19] | | | -97.1 | -94.3 | -92.7 | -91.5 | FDD | 40 |
| CA_7A-42A | 42[19] | | | -95.6 | -93 | -91.5 | -90.4 | TDD | 7 |
| | 7[19] | | | -96.2 | -93.2 | -91.5 | -90.3 | FDD | 42 |
| CA_7A-42A-42A | 42[19] | | | -95.6 | -93 | -91.5 | -90.4 | TDD | 7 |
| | 7[19] | | | -96.2 | -93.2 | -91.5 | -90.3 | FDD | 42 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CA_28A-40A | 40 | | | -95.1 | -92.9 | -91.4 | -90.5 | TDD | 28 |
| CA_28A-40A | 28 | | | -96.8 | -94.1 | -92.5 | -89.8 | FDD | 40 |
| CA_28A-40C | 40 | | | -95.1 | -92.9 | -91.4 | -90.5 | TDD | 28 |
| CA_28A-40C | 28 | | | -96.8 | -94.1 | -92.5 | -89.8 | FDD | 40 |
| CA_28A-40D | 40 | | | -95.1 | -92.9 | -91.4 | -90.5 | TDD | 28 |
| CA_28A-40D | 28 | | | -96.8 | -94.1 | -92.5 | -89.8 | FDD | 40 |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: The signal power is specified per port
NOTE 4: These requirements apply regardless of the channel bandwidth and the location of UL band.
NOTE 5: The B41 requirements are modified by -0.5dB when carrier frequency of the assigned E-UTRA channel bandwidth is within 2545-2690 MHz.
NOTE 6: The antenna isolation for MSD calculation is assumed as 10 dB. For conducted mode REFSENS test such antenna isolation is not observed as the antennas are disconnected. Additionally antenna isolation assumption is under discussion depending on the frequency range
NOTE 7: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range $\Delta F_{HD}$ above and below the edge of this downlink transmission bandwidth. The value $\Delta F_{HD}$ depends on the E-UTRA configuration: $\Delta F_{HD}$ = 10 MHz for CA_3A-42A, CA_3A-42C, CA_3A-42D, CA_3A-3A-42C, CA_3A-42A-42C, CA_1A-3A-42A, CA_1A-3A-42C, CA_3A-19A-42A, CA_3A-19A-42C, CA_1A-3A-19A-42A, CA 3A-41A-42A, CA_3A-41A-42C, CA_3A-41C-42A, and CA_3A-41C-42C.
NOTE 8: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.2 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{HB}$ carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.
NOTE 9: The requirements are only applicable to channel bandwidths with a carrier frequency at $\pm(20 + BW_{Channel}^{HB} / 2)$ MHz offset from $2 f_{UL}^{LB}$ in the victim (higher band) with $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$, where $BW_{Channel}^{LB}$ and $BW_{Channel}^{HB}$ are the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.
NOTE 10: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRA band and without simultaneous Rx/Tx.
NOTE 11: Void
NOTE 12: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in Band 3 and Band 41, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 13: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in Band 3 and Band 41, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 14: The B41 requirements also apply to the supported CA_1A-41A.
NOTE 15: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth other than Band 1, the requirement applies regardless of channel bandwidth in Band 1
NOTE 16: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 17: The B41 requirements are modified by -0.1dB when carrier frequency of the assigned E-UTRA channel bandwidth is within 2545-2690 MHz.
NOTE 18: No requirements apply when there is at least one individual RE within the downlink transmission bandwidth of band5 for which the 3rd receiver harmonic is within the uplink transmission bandwidth of band41. The reference sensitivity is only verified when this is not the case (the requirements specified in clause 7.3.3 apply).
NOTE 19: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured.

**Table 7.3A.0-0bF: Uplink configuration for reference sensitivity (exceptions due to cross band isolation issues of TDD and FDD bands)**

| E-UTRA Band / Channel bandwidth of the affected DL band / $N_{RB}$ / Duplex mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **E-UTRA Band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Duplex Mode** |
| CA_1A-3A-5A-41A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_1A-3A-7A-20A-42A | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 42 | | | 25 | 50 | 75 | 100 | FDD |
| CA_1A-3A-7A-40A<br>CA_1A-3A-7A-40C | 1[1,3] | | | 25 | 25 | 25 | 25 | FDD |
| | 1[1,4] | | | 25 | 45 | 45 | 45 | FDD |
| | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_1A-3A-7A-42A | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 42 | | | 25 | 50 | 75 | 100 | TDD |
| CA_1A-3A-38A | 1[1,3] | | | 25 | 25 | 25 | 25 | FDD |
| | 1[1,4] | | | 25 | 45 | 45 | 45 | FDD |
| | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 38 | | | 25 | 50 | 75 | 100 | TDD |
| CA_1A-3A-41A<br>CA_1A-3A-41C<br>CA_1A-3A-41D | 1 | | | 25[3] | 25[1,3] | 25[1,3] | 25[1,3] | FDD |
| | | | | 25[4] | 45[1,4] | 45[1,4] | 45[1,4] | FDD |
| | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_1A-5A-40A | 1 | | | 25 | 50 | 75 | 100 | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_1A-7A-8A-40A | 1 | | | 25 | 50 | 75 | 100 | FDD |
| | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_1A-7A-8A-40C | 1 | | | 25 | 50 | 75 | 100 | FDD |
| | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_1A-8A-40A | 1 | | | 25 | 50 | 75 | 100 | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_1A-8A-40C | 1 | | | 25 | 50 | 75 | 100 | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_1A-7A-20A-42A | 1 | | | 25 | 50 | 75 | 100 | FDD |
| | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 20 | | | 25 | 20[1] | 20[5] | 20[5] | FDD |
| | 42 | | | 25 | 50 | 75 | 100 | TDD |
| CA_1A-7A-40A | 1 | | | 25 | 50 | 75 | 100 | FDD |
| | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_1A-7A-40C | 1 | | | 25 | 50 | 75 | 100 | FDD |
| | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_1A-7A-42A | 1 | | | 25 | 50 | 75 | 100 | FDD |
| | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 42 | | | 25 | 50 | 75 | 100 | TDD |
| CA_1A-40A | 1 | | | 25 | 50 | 75 | 100 | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-5A-41A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 41 | | | | | | 100 | TDD |
| CA_3A-7A-8A-38A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_3C-7A-8A-38A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_3A-7A-8A-40A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-7A-8A-40C | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-7A-28A-38A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_3C-7A-28A-38A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_3A-7A-38A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_3C-7A-38A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_3A-7A-40A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-7A-40C | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-7A-42A | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 42 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-8A-40A | 3 | 6 | 15 | 25 | 50 | 50[1] | 50[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-8A-40C | 3 | 6 | 15 | 25 | 50 | 50[1] | 50[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-28A-41A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 28 | | | 25 | 25[1] | 25[1] | 25[1] | FDD |
| | 41 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-28A-41C | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 28 | | | 25 | 25[1] | 25[1] | 25[1] | FDD |
| | 41 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-28A-41A-42A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 28 | | | 25 | 25[1] | | | FDD |
| | 41 | | | | 50 | 75 | 100 | TDD |
| | 42 | | | | 50 | 75 | 100 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_3A-28A-41A-42C | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 41 | | | | 50 | 75 | 100 | TDD |
| CA_3A-28A-41C-42A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 41 | | | | 50 | 75 | 100 | TDD |
| CA_3A-40A<br>CA_3A-40C<br>CA_3A-40D<br>CA_3A-40E<br>CA_1A-3A-40A<br>CA_1A-3C-40A<br>CA_1A-3A-40C<br>CA_1A-3C-40C<br>CA_3A-5A-40A<br>CA_3A-28A-40A<br>CA_3A-28A-40C<br>CA_1A-3A-5A-40A<br>CA_1A-3A-8A-40A | 3 | 6 | 15 | 25 | 50 | 50[1] | 50[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-40A-40A | 3 | | | 25 | 50 | | | FDD |
| | 40 | | | | 50 | | 100 | TDD |
| CA_3A-41A<br>CA_3A-3A-41A | 3 | | 15 | 25 | 50 | 50[1] | 50[1] | FDD |
| | 41 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-41C<br>CA_3C-41A<br>CA_3C-41D | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 41 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-41D | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 41 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3C-41C | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 41 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-41A-42A | 3 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 41 | | | 25 | 50 | 75 | 100 | TDD |
| CA_7A-8A-38A | 8 | | | 25 | 50 | | | FDD |
| CA_7A-8A-40A | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 8 | | | 8 | 16 | | | |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_7A-8A-40C | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 8 | | | 8 | 16 | | | |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_7A-20A-42A | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 20 | | | 25 | 50 | 75 | 100 | |
| | 42 | | | 25 | 50 | 75 | 100 | TDD |
| CA_7A-28A-38A | 28 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_7A-40A,<br>CA_7A-40C,<br>CA_7A-40D,<br>CA_7A-40E | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_7A-42A,<br>CA_7A-42A-42A | 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| | 42 | | | 25 | 50 | 75 | 100 | TDD |
| CA_28A-40A,<br>CA_28A-40C | 28 | | | 25 | 25[1] | 25[1] | 25[1] | FDD |
| | 40 | | | 25 | 50 | 75 | 100 | TDD |

NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).

NOTE 2: the UL configuration applies regardless of the channel bandwidth of the low band unless the UL resource blocks exceed that specified in Table 7.3.1-2 for the uplink bandwidth in which case the allocation according to Table 7.3.1-2 applies.

NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz.

NOTE 4: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz.
NOTE 5: refers to Band 20; in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 16

For band combinations including operating bands without uplink band (as noted in Table 5.2-1), the requirements are specified in Table 7.3A.0-0d and for any uplink band with uplink configuration specified in Table 7.3.3-2.

**Table 7.3A.0-0d: Reference sensitivity QPSK $P_{REFSENS}$ (CA with a SDL band)**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **EUTRA band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex mode** |
| CA_1A-3A-20A-32A[6] | 1 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 3 | | | -94 | -91.5 | -90 | -89 | |
| | 20 | | | -97 | -94 | -91.2 | -90 | |
| | 32 | | | -100 | -97 | -95.2 | -94 | |
| CA_1A-3A-20A-32A-42A | 1 | | | -100 | -97 | -95.2 | | FDD |
| | 3 | | | -97 | -94 | -92.2 | | FDD |
| | 20 | | | -97 | | | | FDD |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| | 42 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_1A-3A-20A-32A-43A | 1 | | | -100 | -97 | -95.2 | | FDD |
| | 3 | | | -97 | -94 | -92.2 | | FDD |
| | 20 | | | -97 | | | | FDD |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| | 43 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_1A-3A-20A-32A[7] | 1 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 3 | | | -97 | -94 | -92.2 | -91 | |
| | 20 | | | -97 | -94 | -91.2 | -90 | |
| | 32 | | | -100 | -97 | -95.2 | -94 | |
| CA_1A-3A-32A[6] | 1 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 3 | | | -94 | -91.5 | -90 | -89 | |
| | 32 | | | -100 | -97 | -95.2 | -94 | |
| CA_1A-3A-32A[7] | 1 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 3 | | | -97 | -94 | -92.2 | -91 | |
| | 32 | | | -100 | -97 | -95.2 | -94 | |
| CA_1A-3A-7A-32A[6] | 1 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 3 | | | -94 | -91.5 | -90 | -89 | |
| | 7 | | | -98 | -95 | -93.2 | -92 | |
| | 32 | | | -100 | -97 | -95.2 | -94 | |
| CA_1A-3A-7A-32A[7] | 1 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 3 | | | -97 | -94 | -92.2 | -91 | |
| | 7 | | | -98 | -95 | -93.2 | -92 | |
| | 32 | | | -100 | -97 | -95.2 | -94 | |
| CA_1A-3A-32A-42A[7] | 1 | | | -99.8 | -96.8 | -95 | | FDD |
| | 3 | | | -96.8 | -93.8 | -92 | | |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| | 42 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_1A-3A-32A-43A[7] | 1 | | | -100 | -97 | -95.2 | | FDD |
| | 3 | | | -97 | -94 | -92.2 | | |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| | 43 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_1A-3A-32A-42A-43A | 1 | | | -99.8 | -96.8 | -95 | | FDD |
| | 3 | | | -96.8 | -93.8 | -92 | | FDD |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| | 42 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| | 43 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_1A-20A-32A-42A | 1 | | | -100 | -97 | -95.2 | | FDD |
| | 20 | | | -97 | | | | |
| | 32 | | | -100 | -97 | -95.2 | -94 | |
| | 42 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_1A-20A-32A-43A | 1 | | | -100 | -97 | -95.2 | | FDD |
| | 20 | | | -97 | | | | |
| | 32 | | | -100 | -97 | -95.2 | -94 | |
| | 43 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_1A-32A-42A | 1 | | | -100 | -97 | -95.2 | | FDD |
| | 32 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 42 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_1A-32A-43A | 1 | | | -100 | -97 | -95.2 | | FDD |
| | 32 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 43 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_1A-32A-42A-43A | 1 | | | -100 | -97 | -95.2 | | FDD |
| | 32 | | | -100 | -97 | -95.2 | -94 | |
| | 42 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| | 43 | | | -98.5 | -95.5 | -93.7 | -92.5 | |
| CA_2A-4A-5A-29A | 2 | | | -97.7 | -94.7 | -92.9 | -91.7 | FDD |
| | 4 | | | -99.7 | -96.7 | -94.9 | -93.7 | |
| | 5 | | | -98 | -95 | | | |
| | 29 | | | -97 | -94 | | | |
| CA_2A-4A-29A | 2 | | | -97.7 | -94.7 | -92.9 | -91.7 | FDD |
| | 4 | | | -99.7 | -96.7 | -94.9 | -93.7 | |
| | 29 | | | -97 | -94 | | | |
| CA_2A-4A-29A-30A | 2 | | | -97.6 | -94.6 | -92.8 | -91.6 | FDD |
| | 4 | | | -99.6 | -96.6 | -94.8 | -93.6 | |
| | 29 | | | -97 | -94 | | | |
| | 30 | | | -98.5 | -95.5 | | | |
| CA_2A-5A-29A | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 5 | | | -98 | -95 | | | |
| | 29 | | | -97 | -94 | | | |
| CA_2A-29A | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 29 | | -98.7 | -97 | -94 | | | |
| CA_2A-2A-29A | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 29 | | | -97 | -94 | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_2C-29A | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 29 | | | -97 | -94 | | | |
| CA_2A-29A-30A | 2 | | | -97.6 | -94.6 | -92.8 | -91.6 | FDD |
| | 29 | | | -97 | -94 | | | |
| | 30 | | | -98.5 | -95.5 | | | |
| CA_2A-2A-29A-30A | 2 | | | -97.6 | -94.6 | -92.8 | -91.6 | FDD |
| | 29 | | | -97 | -94 | | | |
| | 30 | | | -98.5 | -95.5 | | | |
| CA_2C-29A-30A | 2 | | | -97.6 | -94.6 | -92.8 | -91.6 | FDD |
| | 29 | | | -97 | -94 | | | |
| | 30 | | | -98.5 | -95.5 | | | |
| CA_2A-29A-30A-66A | 2 | | | -97.6 | -94.6 | -92.8 | -91.6 | FDD |
| | 29 | | | -97 | -94 | | | |
| | 30 | | | -98.5 | -95.5 | | | |
| | 66 | | | -99.1 | -96.1 | -94.3 | -93.1 | |
| CA_2A-29A-66A | 2 | | | -97.7 | -94.7 | -92.9 | -91.7 | FDD |
| | 29 | | | -97 | -94 | | | |
| | 66 | | | -99.2 | -96.2 | -94.4 | -93.2 | |
| CA_4A-4A-29A | 4 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 29 | | | -97 | -94 | | | |
| CA_3A-7A-20A-32A | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| | 7 | | | -98 | -95 | -93.2 | -92 | |
| | 20 | | | -97 | -94 | -91.2 | -90 | |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| CA_3A-7A-32A | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| | 7 | | | -98 | -95 | -93.2 | -92 | |
| | 32 | | | -100 | -97 | -95.2 | -94 | |
| CA_3A-20A-32A-42A | 3 | | | -96.8 | -93.8 | -92 | | FDD |
| | 20 | | | -97 | | | | |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| | 42 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_3A-20A-32A-43A | 3 | | | -97 | -94 | -92.2 | | FDD |
| | 20 | | | -97 | | | | |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| | 43 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_3A-32A | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| CA_3C-32A | 3[5] | | | -97 | -94 | -92.2 | -91 | FDD |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| CA_3A-32A-42A | 3 | | | -96.8 | -93.8 | -92 | | FDD |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| | 42 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_3A-32A-43A | 3 | | | -97 | -94 | -92.2 | | FDD |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| | 43 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_3A-32A-42A-43A | 3 | | | -96.8 | -93.8 | -92 | | FDD |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| | 42 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| | 43 | | | -98.5 | -95.5 | -93.7 | -92.5 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_3A-69A | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| | 69 | | | -100 | -97 | -95.2 | -94 | |
| CA_4A-4A-29A-30A | 4 | | | -99.6 | -96.6 | -94.8 | -93.6 | FDD |
| | 29 | | | -97 | -94 | | | |
| | 30 | | | -98.5 | -95.5 | | | |
| CA_4A-5A-29A | 4 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 5 | | | -98 | -95 | | | |
| | 29 | | | -97 | -94 | | | |
| CA_4A-29A | 4 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 29 | | -98.7 | -97 | -94 | | | |
| CA_4A-29A-30A | 4 | | | -99.6 | -96.6 | -94.8 | -93.6 | FDD |
| | 29 | | | -97 | -94 | | | |
| | 30 | | | -98.5 | -95.5 | | | |
| CA_5A-29A | 5 | | | -98 | -95 | | | FDD |
| | 29 | | | -97 | -94 | | | |
| CA_7A-20A-32A | 7 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 20 | | | -97 | -94 | -91.2 | -90 | |
| | 32 | | | -100 | -97 | -95.2 | -94 | |
| CA_7A-32A | 7 | | | | -95 | -93.2 | -92 | FDD |
| | 32 | | | -100 | -97 | -95.2 | -94 | |
| CA_20A-32A | 20 | | | -97 | -94 | -91.2 | -90 | FDD |
| | 32 | | | -100 | -97 | -95.2 | -94 | |
| CA_20A-32A-42A | 20 | | | -97 | | | | FDD |
| | 32 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 42 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_20A-32A-43A | 20 | | | -97 | | | | FDD |
| | 32 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 43 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_20A-75A | 20 | | | -97 | -94 | -91.2 | -90 | FDD |
| | 75 | | | -100 | -97 | -95.2 | -94 | |
| CA_20A-76A | 20 | | | -97 | -94 | -91.2 | -90 | FDD |
| | 76 | | | -100 | | | | |
| CA_20A-67A | 20 | | | -97 | -94 | -91.2 | -90 | FDD |
| | 67 | | | -100 | -97 | -95.2 | -94 | |
| CA_23A-29A | 23 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 29 | | -98.7 | -97 | -94 | | | |
| CA_29A-30A | 29 | | | -97 | -94 | | | FDD |
| | 30 | | | -99 | -96 | | | |
| CA_29A-30A-66A<br>CA_29A-30A-66A-66A | 29 | | | -97 | -94 | | | FDD |
| | 30 | | | -98.5 | -95.5 | | | |
| | 66 | | | -99.1 | -96.1 | -94.3 | -93.1 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_29A-66A | 29 | | | -97 | -94 | | | FDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| CA_29A-66C | 29 | | | -97 | -94 | | | FDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| CA_29A-66A-66A | 29 | | | -97 | -94 | | | FDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| CA_29A-66A-70A | 29 | | | -97 | -94 | | | FDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| | 70 | | | -100 | -97 | -95.2 | | |
| CA_29A-66A-70C | 29 | | | -97 | -94 | | | FDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| | 70 | | | -100 | -97 | -95.2 | -94 | |
| CA_29A-66C-70A | 29 | | | -97 | -94 | | | FDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| | 70 | | | -100 | -97 | -95.2 | | |
| CA_29A-66A-66A-70A | 29 | | | -97 | -94 | | | FDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| | 70 | | | -100 | -97 | -95.2 | | |
| CA_29A-66C-70C | 29 | | | -97 | -94 | | | FDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| | 70 | | | -100 | -97 | -95.2 | -94 | |
| CA_29A-66A-66A-70C | 29 | | | -97 | -94 | | | FDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| | 70 | | | -100 | -97 | -95.2 | -94 | |
| CA_29A-70A | 29 | | | -97 | -94 | | | FDD |
| | 70 | | | -100 | -97 | -95.2 | -94 | |
| CA_29A-70C | 29 | | | -97 | -94 | | | FDD |
| | 70 | | | -100 | -97 | -95.2 | -94 | |
| CA_32A-42A | 32 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 42 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_32A-43A | 32 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 43 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| CA_32A-42A-43A | 32 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 42 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |
| | 43 | | | -98.5 | -95.5 | -93.7 | -92.5 | TDD |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: The signal power is specified per port.
NOTE 4: Void
NOTE 5: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
NOTE 6: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in Band 3, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 7: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in Band 3, the requirement applies regardless of channel bandwidth in Band 1.

**Table 7.3A.0-0e: Void**

For band combinations including operating band 46 (Table 5.2-1), the requirements are specified in Table 7.3A.0-0eA for the uplink in any band other than band 46 with the uplink configuration specified in Table 7.3.3-2 and Table 7.3A.0-0eC.

For band combinations including operating band 49 (Table 5.5-1), the requirements are specified in Table 7.3A.0-0eA for the uplink in any band other than Band 49 with uplink configurations specified in Table 7.3.3-2 and measurement exclusion region in Table 7.3A.0-0eD.

**Table 7.3A.0-0eA: Reference sensitivity QPSK $P_{REFSENS}$ (CA with band 46)**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **EUTRA band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex mode** |
| CA_1A-5A-7A-46A<br>CA_1A-5A-7A-46C | 1 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 5 | | | -98 | -95 | | | |
| | 7 | | | | -95 | -93.2 | -92 | |
| | 46 | | | | | | -90 | TDD |
| CA_1A-5A-46A<br>CA_1A-5A-46C<br>CA_1A-5A-46D | 1 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 5 | | | -98 | -95 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_2A-5A-46A | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 5 | | | -98 | -95 | | | |
| | 46 | | | | | | -90 | |
| CA_2A-7A-46A-66A | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 7 | | | -98 | -95 | -93.2 | -92 | |
| | 46 | | | | -93 | | -90 | TDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_2A-13A-46A | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 13 | | | -97 | -94 | | | |
| | 46 | | | | | | -90 | TDD |
| CA_1A-7A-46A<br>CA_1A-7A-46C<br>CA_1A-7A-46D | 1 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 7 | | | | -95 | -93.2 | -92 | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_1A-46A<br>CA_1A-46C<br>CA_1A-46D<br>CA_1A-46E | 1 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 46 | | | | -93 | | -90 | TDD |
| CA_2A-5A-46C | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 5 | | | -98 | -95 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_2A-5A-46D | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 5 | | | -98 | -95 | | | |
| | 46 | | | | | | -90 | |
| CA_2A-7A-46A | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 7 | | | -98 | -95 | -93.2 | -92 | |
| | 46 | | | | -93 | | -90 | TDD |
| CA_2A-13A-46C | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 13 | | | -97 | -94 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_2A-46A<br>CA_2A-46E | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| CA_2A-2A-46A<br>CA_2A-2A-46D<br>CA_2A-46C<br>CA_2A-46A-46A<br>CA_2A-2A-46C<br>CA_2A-46A-46C<br>CA_2A-46D<br>CA_2A-46A-46D | 46 | | | | | | -90 | TDD |
| CA_2A-46A-48A[10,11] | 2 | | | -97.8 | -94.8 | -93.0 | -91.7 | FDD |
| | 46 | | | | | | -83 | TDD |
| CA_2A-46A-48C[10,11]<br>CA_2A-46A-48D[10,11]<br>CA_2A-46A-48E[10,11]<br>CA_2A-46C-48A[10,11]<br>CA_2A-46C-48C[10,11]<br>CA_2A-46C-48D[10,11]<br>CA_2A-46C-48E[10,11]<br>CA_2A-46D-48A[10,11]<br>CA_2A-46D-48C[10,11]<br>CA_2A-46E-48A[10,11]<br>CA_2A-46E- | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 48C[10,11] | | | | | | | | |
| CA_2A-46A-48A[12]<br>CA_2A-46A-48C[12]<br>CA_2A-46A-48D[12]<br>CA_2A-46A-48E[12]<br>CA_2A-46C-48A[12]<br>CA_2A-46C-48C[12]<br>CA_2A-46C-48D[12]<br>CA_2A-46C-48E[12]<br>CA_2A-46D-48A[12]<br>CA_2A-46E-48A[12]<br>CA_2A-46D-48C[12]<br>CA_2A-46E-48C[12] | 2 | | | -97.8 | -94.8 | -93.0 | -91.7 | FDD |
| | 46 | | | | | | -83 | TDD |
| | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-46A-48A-66A[10,11]<br>CA_2A-46A-48C-66A[10,11]<br>CA_2A-46A-48D-66A[10,11]<br>CA_2A-46C-48A-66A[10,11]<br>CA_2A-46C-48C-66A[10,11]<br>CA_2A-46C-48D-66A[10,11]<br>CA_2A-46D-48A-66A[10,11]<br>CA_2A-46D-48C-66A[10,11] | 2 | | | -97.7 | -94.7 | -92.9 | -91.7 | FDD |
| | 46 | | | | | | -83 | TDD |
| | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| | 66 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| CA_2A-46A-48A-66A[12]<br>CA_2A-46A-48D-66A[12]<br>CA_2A-46C-48C-66A[12]<br>CA_2A-46C-48D-66A[12]<br>CA_2A-46D-48A-66A [12]<br>CA_2A-46D-48C-66A[12] | 2 | | | -97.7 | -94.7 | -92.9 | -91.7 | FDD |
| | 46 | | | | | | -83 | TDD |
| | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| | 66 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| CA_2A-46A-48C-66A[12]<br>CA_2A-46C-48A-66A[12] | 2 | | | -97.7 | -94.7 | -92.9 | -91.7 | FDD |
| | 46 | | | | | | -83 | TDD |
| | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| | 66 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| CA_2A-46A-66A | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 46 | | | | | | -90 | TDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| CA_2A-46A-46A-66A<br>CA_2A-46C-66A | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 46 | | | | | | -90 | TDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_2A-46A-46C-66A CA_2A-46D-66A CA_2A-46E-66A | 2 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 46 | | | | | | -90 | TDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| CA_2A-49A[9] | 2 | | | -97.8 | -94.8 | -93.0 | -91.7 | FDD |
| | 49 | | | | -95.5 | | -92.5 | TDD |
| CA_3A-7A-46C | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| | 7 | | | -98 | -95 | -93.2 | -92 | |
| | 46 | | | | | | -90 | TDD |
| CA_3A-7A-46D | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| | 7 | | | -98 | -95 | -93.2 | -92 | |
| | 46 | | | | | | -90 | TDD |
| CA_3A-46A CA_3A-46C CA_3A-46D CA_3A-46E | 3 | | -98.7 | -97 | -94 | -92.2 | -91 | FDD |
| | 46 | | | | -93 | | -90 | TDD |
| CA_3C-46A | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_3A-3A-46A CA_3C-46C CA_3C-46D | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_3A-7A-46A | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| | 7 | | | -98 | -95 | -93.2 | -92 | |
| | 46 | | | | | | -90 | TDD |
| CA_4A-46A CA_4A-46C CA_4A-46A-46A CA_4A-46A-46C CA_4A-46D CA_4A-46A-46D | 4 | | | -100 | -97 | -95.2 | -94 | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_5A-7A-46A CA_5A-7A-46C CA_5A-7A-46D | 5 | | | -98 | -95 | | | FDD |
| | 7 | | | | -95 | -93.2 | -92 | FDD |
| | 46 | | | | | | -90 | TDD |
| | 46 | | | | | | -90 | TDD |
| CA_5A-12A-46A, CA_5A-12A-46C, CA_5A-12A-46D | 5 | | | -98 | -95 | | | FDD |
| | 12 | | | -97 | -94 | | | |
| | 46 | | | | | | -90 | TDD |
| CA_5A-46A CA_5A-46C CA_5A-46D CA_5A-46E | 5 | | | -98 | -95 | | | FDD |
| | 46 | | | | -93 | | -90 | TDD |
| CA_5A-46A-66A | 5 | | | -98 | -95 | | | FDD |
| | 46 | | | | | | -90 | |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| CA_5A-46C-66A | 5 | | | -98 | -95 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| CA_5A-46D-66A | 5 | | | -98 | -95 | | | FDD |
| | 46 | | | | | | -90 | |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | |
| CA_7A-46A | 7 | | | -98 | -95 | -93.2 | -92 | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_7A-46C<br>CA_7A-7A-46C<br>CA_7A-46D<br>CA_7A-46E<br>CA_7C-46A<br>CA_7C-46C<br>CA_7C-46D | 46 | | | | -93 | | -90 | TDD |
| CA_7A-7A-46A<br>CA_7A-7A-46D | 7 | | | -98 | -95 | -93.2 | -92 | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_7A-46A-66A | 7 | | | -97.5 | -94.5 | -92.7 | -91.5 | FDD |
| | 46 | | | | -93 | | -90 | TDD |
| | 66 | | | -99 | -96 | -94.2 | -93 | FDD |
| CA_8A-46A<br>CA_8A-46D<br>CA_8A-46E<br>CA_8B-46C<br>CA_8B-46D | 8 | -102.2 | -99.2 | -97 | -94 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_8A-46C | 8 | -102.2 | -99.2 | -97 | -94 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_8B-46A | 8 | -102.2 | -99.2 | -97 | -94 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_11A-46A | 11 | | | -100 | -97 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_11A-46C | 11 | | | -100 | -97 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_11A-46D | 11 | | | -100 | -97 | -95.2 | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_11A-46E | 11 | | | -100 | -97 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_12A-46A<br>CA_12A-46C<br>CA_12A-46D | 12 | | | -97 | -94 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_12A-46E | 12 | | | -97 | -94 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_13A-46A<br>CA_13A-46D<br>CA_13A-46E | 13 | | | -97 | -94 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_13A-46A-66A | 13 | | | -97 | -94 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| CA_13A-46C | 13 | | | -97 | -94 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_13A-46C-66A | 13 | | | -97 | -94 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| CA_13A-46D-66A | 13 | | | -97 | -94 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| CA_19A-46A<br>CA_19A-46C<br>CA_19A-46D<br>CA_19A-46E | 19 | | | -100 | -97 | -95.2 | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_21A-46A<br>CA_21A-46C<br>CA_21A-46D<br>CA_21A-46E | 21 | | | -100 | -97 | -95.2 | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_25A-46A | 25 | -101.2 | -98.2 | -96.5 | -93.5 | -91.7 | -90.5 | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_25A-46C<br>CA_25A-46D | 46 | | | | -93 | | -90 | TDD |
| CA_26A-46A | 26 | | -99.7 | -97.5[7] | -94.5[7] | | | FDD |
| | 46 | | | | | | -90 | TDD |
| CA_28A-46A<br>CA_28A-46C<br>CA_28A-46D<br>CA_28A-46E | 28 | | | -98.5 | -95.5 | -93.7 | -91 | FDD |
| | 46 | | | | -93 | | -90 | TDD |
| CA_29A-46A-66A | 29 | | | -97 | -94 | | | FDD |
| | 46 | | | | | | -90 | TDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| CA_39A-46A | 39 | | | -100 | -97 | -95.2 | -94 | TDD |
| | 46 | | | | | | -90 | TDD |
| CA_39A-46C | 39 | | | -100 | -97 | -95.2 | -94 | TDD |
| | 46 | | | | | | -90 | TDD |
| CA_39C-46A | 39 | | | -100 | -97 | -95.2 | -94 | TDD |
| | 46 | | | | | | -90 | TDD |
| CA_39A-46E<br>CA_39C-46C<br>CA_39C-46D | 39 | | | -100 | -97 | -95.2 | -94 | TDD |
| | 46 | | | | | | -90 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_40A-46A<br>CA_40A-46D<br>CA_40A-46E<br>CA_40C-46C<br>CA_40C-46D<br>CA_40D-46A<br>CA_40D-46C | 40 | | | -100 | -97 | -95.2 | -94 | TDD |
| | 46 | | | | -93 | | -90 | TDD |
| CA_40A-46C | 40 | | | -100 | -97 | -95.2 | -94 | TDD |
| | 46 | | | | | | -90 | TDD |
| CA_40C-46A | 40 | | | -100 | -97 | -95.2 | -94 | TDD |
| | 46 | | | | | | -90 | TDD |
| CA_41A-46A | 41 | | | -98 | -95 | -93.2 | -92 | TDD |
| CA_41A-46C<br>CA_41A-46D<br>CA_41A-46E<br>CA_41C-46A<br>CA_41C-46C<br>CA_41C-46D<br>CA_41D-46A<br>CA_41D-46C | 46 | | | | | | -90 | TDD |
| CA_42A-46A | 42 | | | -99 | -96 | -94.2 | -93 | TDD |
| | 46 | | | | | | -83 | TDD |
| CA_46A-48A | 46 | | | | | | -83 | TDD |
| CA_46A-48A-48A<br>CA_46A-48C<br>CA_46A-48D<br>CA_46A-48E<br>CA_46C-48A<br>CA_46C-48A-48A<br>CA_46C-48C<br>CA_46C-48D<br>CA_46C-48E<br>CA_46D-48A<br>CA_46D-48C<br>CA_46D-48A-48A<br>CA_46E-48A<br>CA_46E-48C | 48 | | | -99 | -96 | -94.2 | -93 | TDD |
| CA_46A-48A-66A[10,11]<br>CA_46A-48C-66A[10,11]<br>CA_46A-48D-66A[10,11]<br>CA_46A-48E-66A[10,11]<br>CA_46C-48A-66A[10,11]<br>CA_46C-48C-66A[10,11]<br>CA_46C-48D-66A[10, 11]<br>CA_46C-48E-66A[10,11]<br>CA_46D-48A-66A[10,11]<br>CA_46D-48C-66A [10,11]<br>CA_46E-48A-66A[10,11]<br>CA_46E-48C-66A[10,11] | 46 | | | | | | -83 | FDD |
| | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| | 66 | | | -99.3 | -96.3 | -94.5 | -93.2 | FDD |
| CA_46A-48A-66A[12]<br>CA_46A-48C- | 46 | | | | | | -83 | FDD |
| | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| | 66 | | | -99.3 | -96.3 | -94.5 | -93.2 | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 66A[12]<br>CA_46A-48D-66A[12]<br>CA_46A-48E-66A[12]<br>CA_46C-48A-66A[12]<br>CA_46C-48C-66A[12]<br>CA_46C-48D-66A[12]<br>CA_46C-48E-66A[12]<br>CA_46D-48A-66A[12]<br>CA_46D-48C-66A [12]<br>CA_46E-48A-66A[12]<br>CA_46E-48C-66A[12] | | | | | | | | |
| CA_46A-48A-71A<br>CA_46A-48A-48A-71A<br>CA_46A-48C-71A<br>CA_46C-48A-71A<br>CA_46C-48C-71A<br>CA_46C-48A-48A-71A | 46 | | | | | | -83 | TDD |
| | 48 | | | -99 | -96 | -94.2 | -93 | TDD |
| | 71 | | | -97.2 | -94.2 | -92.0 | -87.5 | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_46A-66A<br>CA_46A-46A-66A<br>CA_46A-66A-66A<br>CA_46A-66C<br>CA_46A-46C-66A<br>CA_46A-46D-66A<br>CA_46C-66A<br>CA_46C-66A-66A<br>CA_46D-66A<br>CA_46D-66A-66A<br>CA_46E-66A | 46 | | | | | | -90 | TDD |
| | 66 | | | -99.5 | -96.5 | -94.7 | -93.5 | FDD |
| CA_46A-70A | 46 | | | | | | -90 | TDD |
| | 70 | | | -100 | -97 | -95.2 | | FDD |
| CA_46A-71A<br>CA_46C-71A<br>CA_46D-71A | 46 | | | | | | -90 | FDD |
| | 71 | | | -97.2 | -94.2 | -92.0 | -87.5 | TDD |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.4.1.
NOTE 3: The signal power is specified per port.
NOTE 4: Void
NOTE 5: The requirement for B46 does not apply when there is at least one individual RE within the B46 downlink transmission bandwidth which falls into the reference sensitivity exclusion region as specified in Table 7.3A.0-0eC.
NOTE 6: Void
NOTE 7: [7] indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.
NOTE 8: When Band 46 have self interference problems by dual uplink CA, then the requirements not apply in exclusion zone which is frequency range within (harmonics frequency region + $\Delta F_{HD}$) and IMD frequency region as follow.
NOTE 9: The requirement for B49 does not apply when there is at least one individual RE within the B49 downlink transmission bandwidth which falls into the reference sensitivity exclusion region as specified in Table 7.3A.0-0eD.
NOTE 10: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band which excludes band 46 and a range ΔFHD above and below the edge of this downlink transmission bandwidth. The value ΔFHD depends on the E-UTRA configuration: ΔFHD = 10 MHz for CA_2-46-48, CA_46-48-66, and CA_2-46-48-66. For harmonic issue not related with band 46, the uplink configuration of CA_2-48, CA_48-66 and CA_2-48-66 in Table 7.3A.0-0b can be used.
NOTE 11: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.2 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{HB}$ carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.
NOTE 12: The requirements are only applicable to channel bandwidths with a carrier frequency at $\pm\left(20 + BW_{Channel}^{HB} / 2\right)$ MHz offset from $2 f_{UL}^{LB}$ in the victim (higher band) with $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$, where $BW_{Channel}^{LB}$ and $BW_{Channel}^{HB}$ are the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.

IMD frequency range

| DL_CA configuration | UL_CA configuration | Exclusion zone center frequency | Exclusion zone BW |
|---|---|---|---|
| CA_1A-5A-46A | CA_1A-5A | 2*fc_1A + 2*fc_5A | 2*BW_1A + 2*BW_5A |
| CA_1A-7A-46A | CA_1A-7A | 3*fc_7A - fc_1A | 3*BW_7A + BW_1A |
| CA_5A-7A-46A | CA_5A-7A | 2*fc_7A + fc_5A | 2*BW_7A + BW_5A |

**Table 7.3A.0-0eB: Void**

Table 7.3A.0-0eC specifies the Band 46 reference measurement exclusion region for different licensed component carriers and channel bandwidth. The exclusion region is defined according to the licensed component carrier channel bandwidth. The UL configurations to be adopted for the test are specified in Table 7.3.3-2. The exclusion region in Table 7.3A.0-0eC is specified for the case of 10MHz and 20MHz channel bandwidth in Band 46..

**Table 7.3A.0-0eC: Band 46 Reference sensitivity measurement exclusion region in MHz**

| Licensed Component Carriers / E-UTRA Band / Harmonic order / Channel BW in UL | | | | | |
|---|---|---|---|---|---|
| **Licensed Component Carriers** | **Harmonic order** | **5MHz** | **10MHz** | **15MHz** | **20MHz** |
| 1 | 3 | +/- 11.25 | +/- 22.5 | +/- 33.75 | +/- 45 |
| 2 | 3 | +/- 11.25 | +/- 22.5 | +/- 33.75 | +/- 45 |
| 3 | 3 | +/- 11.25 | +/- 22.5 | +/- 33.75 | +/- 45 |
| 4 | 3 | +/- 11.25 | +/- 22.5 | +/- 33.75 | +/- 45 |
| 5 | 7 | +/- 10 | +/- 20 | | |
| 7[1] | 2 | +/- 12.5 | +/- 25 | +/- 37.5 | +/- 50 |
| 8 | 6 | +/- 10 | +/- 20 | | |
| 11 | 4 | +/- 12.5 | +/- 25 | | |
| 13 | 7 | +/- 10 | +/- 20 | | |
| 19 | 7 | +/- 10 | +/- 20 | +/- 30 | |
| 21 | 4 | +/- 12.5 | +/- 25 | +/- 37.5 | |
| 26 | 7 | +/- 10 | +/- 20 | +/- 30 | |
| 28 | 7 | +/- 10 | +/- 20 | +/- 30 | +/- 40 |
| 28 | 8 | +/- 10 | +/- 20 | +/- 30 | +/- 40 |
| 39 | 3 | +/- 11.25 | +/- 22.5 | +/- 33.75 | +/- 45 |
| 41 | 2 | +/- 12.5 | +/- 25 | +/- 37.5 | +/- 50 |
| 66 | 3 | +/- 11.25 | +/- 22.5 | +/- 33.75 | +/- 45 |
| NOTE 1: Even though UL harmonic does not fall directly into Band 46 the exclusion region still applies.<br>NOTE 2: The centre of the exclusion region is obtained by multiplying the UL channel centre frequency by the harmonic order. | | | | | |

Table 7.3A.0-0eD specifies the Band 49 reference measurement exclusion region for different licensed component carriers and channel bandwidth. The exclusion region is defined according to the licensed component carrier channel bandwidth. The UL configurations to be adopted for the test are specified in Table 7.3.3-2.

**Table 7.3A.0-0eD: Band 49 reference sensitivity measurement exclusion region in MHz.**

| Licensed Component Carriers / E-UTRA Band / Harmonic order / Channel BW in UL | | | | | |
|---|---|---|---|---|---|
| **Licensed Component Carriers** | **Harmonic order** | **5MHz** | **10MHz** | **15MHz** | **20MHz** |
| 2[1] | 2 | +/- 12.5 | +/- 25 | +/- 37.5 | +/- 50 |
| NOTE 1: Even though UL harmonic does not fall directly into Band 49 the exclusion region still applies.<br>NOTE 2: The center of the exclusion region is obtained by multiplying the UL channel center frequency by the harmonic order. | | | | | |

In all cases for single uplink inter-band CA, unless given by Table 7.3.3-3 for the band with the active uplink carrier, the applicable reference sensitivity requirements shall be verified with the network signalling value NS_01 (Table 6.2.4.3-1) configured.

For inter-band carrier aggregation with one component carrier per operating band (up to four downlinks) and the uplink assigned to two E-UTRA bands the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.3-1, Table 7.3.3-1a and Table 7.3.3-2. The reference sensitivity is defined to be met with all downlink component carriers active and both of the uplink carriers active.

For E-UTRA CA configurations with uplink and downlink assigned to two E-UTRA bands given in Table 7.3A.0-0f the reference sensitivity is defined only for the specific uplink and downlink test points which are specified in Table 7.3A.0-0f. For E-UTRA CA configurations with uplink assigned to two E-UTRA bands and downlink assigned to three E-UTRA bands given in Table 7.3.1A-0g the reference sensitivity is defined only for the specific uplink and downlink test points which are specified in Table 7.3.1A-0g. For these test points the reference sensitivity requirement specified in Table 7.3.3-1 and Table 7.3.3-1a are relaxed by the amount of the corresponding parameter MSD given in Table 7.3A.0-0f and Table 7.3A.0-0g.

The allowed exceptions defined in Table 7.3A.0-0a and Table 7.3A.0-0b for inter-band carrier aggregation with a single active uplink are also applicable for dual uplink operation.

**Table 7.3A.0-0f: 2DL/2UL interband Reference sensitivity QPSK $P_{REFSENS}$ and uplink/downlink configurations**

| E-UTRA Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
|---|---|---|---|---|---|---|---|---|
| EUTRA CA Configuration | EUTRA band | UL $F_c$ (MHz) | UL/DL BW (MHz) | UL $C_{LRB}$ | DL $F_c$ (MHz) | MSD (dB) | Duplex mode | |
| CA_1A-3A | 1 | 1950 | 5 | 25 | 2140 | 23 | FDD | IMD3 |
| | 3 | 1760 | 5 | 25 | 1855 | N/A | | N/A |
| CA_1A-8A | 1 | 1965 | 5 | 25 | 2155 | 6 | FDD | IMD4 |
| | 8 | 887.5 | 5 | 25 | 932.5 | N/A | | N/A |
| CA_2A-4A | 2 | 1860 | 20 | 50[2] | 1940 | 5 | FDD | IMD3 |
| | 4 | 1752.5 | 5 | 25 | 2152.5 | N/A | | N/A |
| CA_2A-4A | 2 | 1868.3 | 5 | 25 | 1948.3 | N/A | FDD | N/A |
| | 4 | 1735 | 5 | 25 | 2135 | 5 | | IMD5 |
| CA_2A-46A | 2 | 1880 | 5 | 25 | 1960 | 12.0 | FDD | IMD3[4] |
| | 46 | 5720 | 20 | 100 | 5720 | N/A | | N/A |
| CA_2A-49A | 2 | 1852.5 | 5 | 25 | 1932.5 | [12] | FDD | IMD4 |
| | 49 | 3625 | 20 | 100 | 3625 | N/A | TDD | N/A |
| CA_2A-66A | 2 | 1855 | 5 | 25 | 1935 | 20 | FDD | IMD3 |
| | 66 | 1775 | 5 | 25 | 2175 | N/A | | N/A |
| CA_2A-66A | 2 | 1883.3 | 5 | 25 | 1963.3 | N/A | FDD | N/A |
| | 66 | 1750 | 5 | 25 | 2150 | 4 | | IMD5 |
| CA_3A-5A | 3 | 1771 | 10 | 50 | 1866 | 4 | FDD | IMD4 |
| | 5 | 838 | 5 | 25 | 883 | N/A | | N/A |
| CA_3A-5A | 3 | 1721 | 10 | 50 | 1816 | N/A | FDD | N/A |
| | 5 | 838 | 5 | 25 | 883 | 24 | | IMD2[4] |
| CA_3A-7A | 3 | 1730 | 5 | 25 | 1825 | N/A | FDD | N/A |
| | 7 | 2535 | 10 | 50 | 2655 | 13 | | IMD4 |
| CA_3A-8A | 3 | 1755 | 10 | 50 | 1850 | N/A | FDD | N/A |
| | 8 | 900 | 5 | 25 | 945 | 8 | | IMD4[4] |
| CA_3A-8A | 3 | 1747.5 | 10 | 50 | 1842.5 | 6.4 | FDD | IMD5 |
| | 8 | 897.5 | 5 | 25 | 942.5 | N/A | | N/A |
| CA_3A-18A | 3 | 1721 | 5 | 25 | 1816 | 4 | FDD | IMD4 |
| | 18 | 823 | 5 | 25 | 868 | N/A | | N/A |
| CA_3A-19A | 3 | 1771 | 5 | 25 | 1866 | 4 | FDD | IMD4 |
| | 19 | 838 | 5 | 25 | 883 | N/A | | N/A |
| CA_3A-19A | 3 | 1721 | 5 | 25 | 1816 | N/A | FDD | N/A |
| | 19 | 838 | 5 | 25 | 883 | 27 | | IMD2[4] |
| CA_3A-20A | 3 | 1775 | 5 | 25 | 1870 | 4 | FDD | IMD4 |
| | 20 | 840 | 5 | 25 | 799 | N/A | | N/A |
| CA_3A-20A | 3 | 1735 | 5 | 25 | 1830 | N/A | FDD | N/A |
| | 20 | 847 | 5 | 25 | 806 | 9 | | IMD4 |
| CA_3A-26A | 3 | 1771 | 5 | 25 | 1866 | 4 | FDD | IMD4 |
| | 26 | 838 | 5 | 25 | 883 | N/A | | N/A |
| CA_3A-26A | 3 | 1721 | 5 | 25 | 1816 | N/A | FDD | N/A |
| | 26 | 838 | 5 | 25 | 883 | 26 | | IMD2[4] |
| CA_3A-41A | 3 | 1740 | 5 | 25 | 1835 | 8.2 | FDD | IMD4 |
| | 41 | 2657.5 | 5 | 25 | 2657.5 | N/A | TDD | N/A |
| CA_3A-42A | 3 | 1740 | 5 | 25 | 1835 | 29.8 | FDD | IMD2[4] |
| | 42 | 3575 | 5 | 25 | 3575 | N/A | TDD | N/A |
| CA_3A-42A | 3 | 1765 | 5 | 25 | 1860 | 8.0 | FDD | IMD4[4] |
| | 42 | 3435 | 5 | 25 | 3435 | N/A | TDD | N/A |
| CA_4A-5A | 4 | 1721 | 5 | 25 | 2121 | N/A | FDD | N/A |
| | 5 | 838 | 5 | 25 | 883 | 26 | | IMD2[4] |
| CA_4A-7A | 4 | 1730 | 5 | 25 | 2130 | N/A | FDD | N/A |
| | 7 | 2535 | 5 | 25 | 2655 | 15 | | IMD4 |
| CA_5A-7A | 5 | 834 | 5 | 25 | 879 | 12 | FDD | IMD3[4] |
| | 7 | 2547 | 10 | 50 | 2667 | N/A | | N/A |
| CA_5A-66A | 5 | 838 | 5 | 25 | 883 | 30 | FDD | IMD2[4] |
| | 66 | 1721 | 5 | 25 | 2121 | N/A | | N/A |
| CA_7A-20A | 7 | 2512 | 10 | 50 | 2632 | N/A | FDD | N/A |
| | 20 | 851 | 5 | 25 | 810 | 12 | | IMD3[4] |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_7A-26A | 7 | 2556 | 5 | 25 | 2676 | N/A | FDD-FDD | N/A |
| | 26 | 837 | 5 | 25 | 882 | 16.0 | | IMD3 |
| | 7 | 2567.5 | 5 | 25 | 2687.5 | 2.5 | FDD-FDD | IMD5 |
| | 26 | 816.5 | 5 | 25 | 861.5 | N/A | | N/A |
| CA_8A-41A | 8 | 882.5 | 5 | 25 | 927.5 | 12.1 | FDD | IMD3[4] |
| | 41 | 2685 | 10 | 50 | 2685 | N/A | TDD | N/A |
| CA_19A-42A[3] | 19 | N/A | N/A | N/A | N/A | N/A | FDD | N/A |
| | 42 | N/A | N/A | N/A | N/A | N/A | TDD | N/A |
| CA_21A-28A | 21 | 1450.4 | 5 | 25 | 1498.4 | [2.5] | FDD | IMD5 |
| | 28 | 735.5 | 5 | 25 | 790.5 | N/A | TDD | N/A |
| CA_21A-42A[3] | 21 | N/A | N/A | N/A | N/A | N/A | FDD | N/A |
| | 42 | N/A | N/A | N/A | N/A | N/A | TDD | N/A |
| CA_28A-42A | 28 | 705.5 | 5 | 25 | 760.5 | [5.5] | FDD | IMD5 |
| | 42 | 3582.5 | 5 | 25 | 3582.5 | N/A | TDD | N/A |
| CA_40A-42A | 40 | 2350 | 5 | 25 | 2350 | N/A | TDD | N/A |
| | 42 | 3500 | 5 | 25 | 3550 | 5 | | IMD4 |
| | 40 | 2350 | 5 | 25 | 2350 | 5 | TDD | IMD4 |
| | 42 | 3525 | 5 | 25 | 3525 | N/A | | N/A |

NOTE 1: Both of the transmitters shall be set min(+20 dBm, $P_{CMAX_L,c}$) as defined in subclause 6.2.5A
NOTE 2: $RB_{START}$ = 0
NOTE 3: No requirements apply when there is at least one individual RE within the intermodulation generated by the dual uplink is within the downlink transmission bandwidth of the FDD band. The reference sensitivity should only be verified when this is not the case (the requirements specified in clause 7.3.3 apply).
NOTE 4: This band is subject to IMD5 also which MSD is not specified.
NOTE 5: Void
NOTE 6: For operations with 4 antenna ports, the MSD in the applicable bands shall be modified by the absolute value of $\Delta R_{IB,4R}$ in Table 7.3.3-1a when MSD > 0.

**Table 7.3A.0-0g: 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations**

| E-UTRA Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | | | Source of IMD |
|---|---|---|---|---|---|---|---|---|---|---|
| EUTRA CA | EUTRA CA | EUTRA band | UL $F_c$ | UL BW | UL | DL $F_c$ | DL BW | MSD | Duplex mode | |
| DL Configuration | UL Configuration | | (MHz) | (MHz) | $C_{LRB}$ | (MHz) | (MHz) | (dB) | | |
| CA_1A-3A-28A | CA_1A-28A | 1 | 1975 | 5 | 25 | 2165 | 5 | N/A | FDD | N/A |
| | | 28 | 710.5 | 5 | 25 | 765.5 | 5 | N/A | | N/A |
| | | 3 | 1723.5 | 5 | 25 | 1818.5 | 5 | 4.0 | | IMD5 |
| | CA_3A-28A | 3 | 1780 | 5 | 25 | 1875 | 5 | N/A | FDD | N/A |
| | | 28 | 710.5 | 5 | 25 | 765.5 | 5 | N/A | | N/A |
| | | 1 | 1949 | 5 | 25 | 2139 | 5 | 11.0 | | IMD4 |
| CA_1A-3A-40A | CA_1A-3A | 1 | 1950 | 5 | 25 | 2140 | 5 | N/A | FDD | N/A |
| | | 3 | 1735 | 5 | 25 | 1830 | 5 | N/A | FDD | N/A |
| | | 40 | 2380 | 5 | 25 | 2380 | 5 | 8.0 | TDD | IMD5 |
| CA_1A-3A-41A | CA_1A-3A | 1 | 1977.5 | 5 | 25 | 2167.5 | 5 | N/A | FDD | N/A |
| | | 3 | 1712.5 | 5 | 25 | 1807.5 | 5 | N/A | FDD | N/A |
| | | 41 | 2507.5 | 5 | 25 | 2507.5 | 5 | 5.0 | TDD | IMD5 |
| CA_1A-3A-42A | CA_1A-3A | 1 | 1922.5 | 5 | 25 | 2112.5 | 5 | N/A | FDD | N/A |
| | | 3 | 1782.5 | 5 | 25 | 1877.5 | 5 | N/A | FDD | N/A |
| | | 42 | | | | 3425 | 5 | 13.0 | TDD | IMD4 |
| CA_1A-5A-7A | CA_1A-7A | 1 | 1968 | 5 | 25 | 2158 | 5 | N/A | FDD | N/A |
| | | 7 | 2512 | 10 | 50 | 2632 | 10 | N/A | | N/A |
| | | 5 | 835 | 5 | 25 | 880 | 5 | 1.0 | | IMD5 |
| CA_1A-5A-40A | CA_1A-5A | 1 | 1977.5 | 5 | 25 | 2167.5 | 5 | N/A | FDD | N/A |
| | | 5 | 826.5 | 5 | 25 | 871.5 | 5 | N/A | FDD | N/A |
| | | 40 | 2305 | 10 | 50 | 2305 | 10 | 9.0 | TDD | IMD4 |
| CA_1A-7A-26A | CA_1A-7A | 1 | 1965 | 5 | 25 | 2155 | 5 | N/A | FDD | N/A |
| | | 7 | 2510 | 10 | 50 | 2630 | 10 | N/A | | N/A |
| | | 26 | 830 | 5 | 50 | 875 | 5 | 3.5 | | IMD5 |
| CA_1A-7A-28A | CA_1A-7A | 1 | 1935 | 5 | 25 | 2125 | 5 | N/A | FDD | N/A |
| | | 7 | 2510 | 10 | 50 | 2630 | 10 | N/A | | N/A |
| | | 28 | 730 | 10 | 50 | 785 | 10 | 4.5 | | IMD5 |
| | CA_1A-28A | 1 | 1935 | 5 | 25 | 2125 | 5 | N/A | FDD | N/A |
| | | 28 | 730 | 10 | 50 | 785 | 10 | N/A | | N/A |
| | | 7 | 2545 | 10 | 50 | 2665 | 10 | 28.0 | | IMD2 |
| CA_1A-28A-42A | CA_1A-28A | 1 | 1955 | 5 | 25 | 2145 | 5 | N/A | FDD | N/A |
| | | 28 | 735 | 5 | 25 | 790 | 5 | N/A | FDD | N/A |
| | | 42 | 3425 | 5 | 25 | 3425 | 5 | 15.0 | TDD | IMD3 |
| | CA_28A-42A | 28 | 710.5 | 5 | 25 | 765.5 | 5 | N/A | FDD | N/A |
| | | 42 | 3560 | 5 | 25 | 3560 | 5 | N/A | TDD | N/A |
| | | 1 | 1949 | 5 | 25 | 2139 | 5 | 11.0 | FDD | IMD3 |
| CA_2A-12A-30A | CA_2A-12A | 2 | 1885 | 5 | 25 | 1965 | 5 | N/A | FDD | N/A |
| | | 12 | 708.5 | 5 | 25 | 738.5 | 5 | N/A | | N/A |
| | | 30 | 2308 | 5 | 25 | 2353 | 5 | 12.0 | | IMD4 |
| CA_3A-5A-7A | CA_3A-5A | 3 | 1780 | 10 | 50 | 1875 | 10 | N/A | FDD | N/A |
| | | 5 | 845 | 5 | 25 | 890 | 5 | N/A | | N/A |
| | | 7 | 2505 | 10 | 50 | 2625 | 10 | 30.0 | | IMD2[1] |
| | CA_3A-7A | 3 | 1725 | 10 | 50 | 1820 | 10 | N/A | FDD | N/A |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 7 | 2565 | 10 | 50 | 2685 | 10 | N/A | | N/A |
| | | 5 | 840 | 5 | 25 | 885 | 5 | 19.0 | | IMD3 |
| CA_3A-7A-8A | CA_3A-7A | 3 | 1735 | 5 | 25 | 1830 | 5 | N/A | FDD | N/A |
| | | 7 | 2530 | 10 | 50 | 2650 | 10 | | | N/A |
| | | 8 | 895 | 5 | 25 | 940 | 5 | 18.0 | | IMD3 |
| | CA_3A-8A | 3 | 1780 | 5 | 25 | 1875 | 5 | N/A | FDD | N/A |
| | | 8 | 890 | 5 | 25 | 935 | 5 | | | N/A |
| | | 7 | 2550 | 10 | 50 | 2670 | 10 | 29.0 | | IMD2+IMD3[4] |
| CA_3A-7A-20A | CA_3A-7A | 3 | 1737 | 5 | 25 | 1832 | 5 | N/A | FDD | N/A |
| | | 7 | 2543 | 10 | 50 | 2663 | 10 | N/A | | N/A |
| | | 20 | 847 | 10 | 20 | 806 | 10 | 10.5 | | IMD2 |
| | CA_3A-20A | 3 | 1775 | 10 | 50 | 1870 | 10 | N/A | FDD | N/A |
| | | 20 | 855 | 5 | 25 | 896 | 5 | N/A | | N/A |
| | | 7 | 2510 | 10 | 50 | 2630 | 10 | 26.0 | | IMD2[1] |
| CA_3A-7A-26A | CA_3A-7A | 3 | 1720 | 5 | 25 | 1815 | 5 | N/A | FDD | N/A |
| | | 7 | 2560 | 10 | 50 | 2680 | 10 | N/A | | N/A |
| | | 26 | 835 | 5 | 25 | 880 | 5 | 17.5 | | IMD3 |
| CA_3A-7A-26A | CA_3A-26A | 3 | 1780 | 5 | 25 | 1875 | 5 | N/A | FDD | N/A |
| | | 26 | 845 | 5 | 25 | 890 | 5 | N/A | | N/A |
| | | 7 | 2505 | 10 | 50 | 2625 | 10 | 29.0 | | IMD2[1] |
| CA_3A-7A-28A | CA_3A-7A | 3 | 1747 | 5 | 25 | 1842 | 5 | N/A | FDD | N/A |
| | | 7 | 2543 | 5 | 25 | 2663 | 5 | N/A | | N/A |
| | | 28 | 741 | 5 | 25 | 796.0 | 5 | 20.0 | | IMD2 |
| | CA_3A-28A | 3 | 1712.5 | 5 | 25 | 1807.5 | 5 | N/A | FDD | N/A |
| | | 28 | 743 | 5 | 25 | 798 | 5 | N/A | | N/A |
| | | 7 | 2562 | 5 | 25 | 2682 | 5 | 17.0 | | IMD3 |
| | CA_7A-28A | 7 | 2543 | 5 | 25 | 2663 | 5 | N/A | FDD | N/A |
| | | 28 | 710.5 | 5 | 25 | 765.5 | 5 | N/A | | N/A |
| | | 3 | 1737.5 | 5 | 25 | 1832.5 | 5 | 26.0 | | IMD2 |
| CA_3A-7A-32A | CA_3A-7A | 3 | 1775 | 5 | 25 | 1870 | 5 | N/A | FDD | N/A |
| | | 7 | 2510 | 10 | 50 | 2630 | 10 | N/A | | N/A |
| | | 32 | - | - | - | 1470 | 5 | 10.5 | | IMD4 |
| CA_3A-11A-18A | CA_3A-11A | 3 | 1725 | 5 | 25 | 1820 | 5 | N/A | FDD | N/A |
| | | 11 | 1440 | 5 | 25 | 1448 | 5 | N/A | | N/A |
| | | 18 | 825 | 5 | 25 | 870 | 5 | 5.0 | | IMD5 |
| | CA_11A-18A | 11 | 1432 | 5 | 25 | 1481 | 5 | N/A | FDD | N/A |
| | | 18 | 820 | 5 | 25 | 865 | 5 | N/A | | N/A |
| | | 3 | 1753 | 5 | 25 | 1848 | 5 | 4.0 | | IMD5 |
| CA_3A-11A-26A | CA_3A-11A | 3 | 1720 | 5 | 25 | 1815 | 5 | N/A | FDD | N/A |
| | | 11 | 1438 | 5 | 25 | 1486 | 5 | N/A | | N/A |
| | | 26 | 829 | 5 | 25 | 874 | 5 | 5.0 | | IMD5 |
| | CA_3A-26A | 3 | 1782.5 | 5 | 25 | 1877.5 | 5 | N/A | FDD | N/A |
| | | 26 | 816.5 | 5 | 25 | 861.5 | 5 | N/A | | N/A |
| | | 11 | 1435.5 | 5 | 25 | 1483.5 | 5 | 5.0 | | IMD5 |
| | CA_11A-26A | 11 | 1440 | 5 | 25 | 1488 | 5 | N/A | FDD | N/A |
| | | 26 | 824 | 5 | 25 | 869 | 5 | N/A | | N/A |
| | | 3 | 1761 | 5 | 25 | 1856 | 5 | 4.5 | | IMD5 |
| CA_3A-19A- | CA_19A-21A | 19 | 832.5 | 5 | 25 | 877.5 | 5 | N/A | FDD | N/A |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 21A | | 21 | 1460.4 | 5 | 25 | 1508.4 | 5 | N/A | | N/A |
| | | 3 | 1774.6 | 5 | 25 | 1869.6 | 5 | 4.0 | | IMD5 |
| CA_3A-21A-28A | CA_3A-21A | 3 | 1782 | 5 | 25 | 1877 | 5 | N/A | FDD | N/A |
| | | 21 | 1451 | 5 | 25 | 1499 | 5 | N/A | | N/A |
| | | 28 | 734 | 5 | 25 | 789 | 5 | 3.0 | | IMD5 |
| CA_3A-28A-41A | CA_3A-41 | 3 | 1720 | 5 | 25 | 1815 | 5 | N/A | FDD | N/A |
| | | 41 | 2510 | 5 | 25 | 2510 | 5 | N/A | TDD | N/A |
| | | 28 | 735 | 5 | 25 | 790 | 5 | 26.0 | FDD | IMD2[1] |
| CA_3A-41A-42A | CA_41A-42A | 41 | 2640 | 10 | 50 | 2640 | 10 | N/A | TDD | N/A |
| | | 42 | 3425 | 10 | 50 | 3425 | 10 | | TDD | N/A |
| | | 3 | 1760 | 5 | 25 | 1855 | 5 | 16.0 | FDD | IMD3 |
| CA_19A-21A-42A | CA_19A-21A | 19 | 842.5 | 5 | 25 | 887.5 | 5 | N/A | FDD | N/A |
| | | 21 | 1450.4 | 5 | 25 | 1498.4 | 5 | N/A | FDD | N/A |
| | | 42 | 3508.7 | 5 | 25 | 3508.7 | 5 | 13.0 | TDD | IMD4 |
| | CA_21A-42A | 21 | 1460.4 | 5 | 25 | 1508.4 | 5 | N/A | FDD | N/A |
| | | 42 | 3500 | 5 | 25 | 3500 | 5 | N/A | FDD | N/A |
| | | 19 | 836.2 | 5 | 25 | 881.2 | 5 | 13.0 | TDD | IMD4 |
| CA_28A-41A-42A | CA_41A-42A | 41 | 2672 | 10 | 50 | 2672 | 10 | N/A | TDD | N/A |
| | | 42 | 3460 | 10 | 50 | 3460 | 10 | | TDD | N/A |
| | | 28 | 733 | 5 | 25 | 788 | 5 | 26.0 | FDD | IMD2 |
| CA_1A-21A-42A[6] | CA_1A-42A | 1 | | | | | | | FDD | N/A |
| | | 42 | | | | | | | TDD | N/A |
| | | 21 | | | | | | | FDD | N/A |

NOTE 1: This band is subject to IMD3 also which MSD is not specified.
NOTE 1: Both of the transmitters shall be set min(+20 dBm, $P_{CMAX_L,c}$) as defined in subclause 6.2.5A
NOTE 2: $RB_{START}$ = 0
NOTE 3: Void
NOTE 4: This MSD requirement apply with both IMD2 and IMD3 products should be generated.
NOTE 5: For operations with 4 antenna ports, the MSD in the applicable bands shall be modified by the absolute value of $\Delta R_{IB,4R}$ in Table 7.3.3-1a when MSD > 0.
NOTE 6: Due to the spectrum holdings of the operator, the deployed frequency ranges do not result MSD to interested downlink channel. Therefore, no requirements apply for this CA configuration.

For intra-band contiguous carrier aggregation the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.3-1, Table 7.3.3-1a, Table 7.3.3-1A, Table 7.3.3-1B, Table 7.3.3-1C, Table 7.3A.0-0h and Table 7.3A.0-1. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the power levels in Table 7.3.1-1 and Table 7.3.3-1a also apply for an SCC assigned in the unpaired part. The requirement is verified using an uplink CA configuration with the largest number of carriers supported by the UE. Table 7.3A.0-0h, Table 7.3A.0-1 and Table 7.3A.0-2 specify the maximum number of allocated uplink resource blocks for which the intra-band contiguous carrier aggregation reference sensitivity requirement shall be met. The PCC and SCC allocations as defined in Table 7.3A.0-0h, Table 7.3A.0-1 and Table 7.3A.0-2 form a contiguous allocation where TX–RX frequency separations of the component carriers are as defined in Table 5.3-1. In case downlink CA configuration has additional SCC(s) compared to uplink CA configuration those are configured furthers away from uplink band. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.3-2 and the downlink PCC carrier center frequency shall be configured closer to uplink operating band than any of the downlink SCC centre frequency. Unless given by Table 7.3.3-3, the reference sensitivity requirements shall be verified with the network signalling value NS_01 (Table 6.2.4.3-1) configured.

**Table 7.3A.0-0h: Intra-band contiguous CA uplink configuration for reference sensitivity for Bandwidth Class B**

| CA configuration / CC combination / $N_{RB_agg}$ / Duplex mode | | | | | |
|---|---|---|---|---|---|
| Uplink CA configuration | 50RB+25RB | | 50RB+50RB | | Duplex Mode |
| | PCC | SCC | PCC | SCC | |
| CA_5B | 25 | 0 | 25 | 0 | FDD |
| CA_8B | 25 | 0 | 25 | 0 | FDD |

NOTE 1: The carrier centre frequency of SCC in the UL operating band is configured closer to the DL operating band.
NOTE 2: The transmitted power over both PCC and SCC shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 3: The UL resource blocks in both PCC and SCC shall be confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).
NOTE 4: The UL resource blocks in PCC shall be located as close as possible to the downlink operating band, while the UL resource blocks in SCC shall be located as far as possible from the downlink operating band.
NOTE 5: In case a CA configuration consists of CC channel bandwidths which are unequal in bandwidth the PCC channel bandwidth shall be the larger one for reference sensitivity test.

**Table 7.3A.0-1: Intra-band contiguous CA uplink configuration for reference sensitivity for Bandwidth Class C**

| CA configuration / CC combination / $N_{RB_agg}$ / Duplex mode | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Uplink CA configuration | 100RB+25RB | | 100RB+50RB | | 75RB+75RB | | 75RB+50RB | | 100RB+75RB | | 100RB+100RB | | Duplex Mode |
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | |
| CA_1C | N/A | N/A | N/A | N/A | 75 | 54 | N/A | N/A | N/A | N/A | 100 | 30 | FDD |
| CA_3C | 50 | 0 | 50 | 0 | N/A | N/A | N/A | N/A | 50 | 0 | 50 | 0 | FDD |
| CA_7C | N/A | N/A | 75 | 0 | 75 | 0 | 75 | 0 | 75 | 0 | 75 | 0 | FDD |
| CA_38C | N/A | N/A | N/A | N/A | 75 | 75 | N/A | N/A | N/A | N/A | 100 | 100 | TDD |
| CA_39C | 100 | 25 | 100 | 50 | N/A | N/A | N/A | N/A | 100 | 75 | N/A | N/A | TDD |
| CA_40C | N/A | N/A | 100 | 50 | 75 | 75 | N/A | N/A | 100 | 75 | 100 | 100 | TDD |
| CA_41C | 100 | 25 | 100 | 50 | 75 | 75 | 75 | 50 | 100 | 75 | 100 | 100 | TDD |
| CA_42C | 100 | 25 | 100 | 50 | N/A | N/A | N/A | N/A | 100 | 75 | 100 | 100 | TDD |

NOTE 1: The carrier centre frequency of SCC in the UL operating band is configured closer to the DL operating band.
NOTE 2: The transmitted power over both PCC and SCC shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 3: The UL resource blocks in both PCC and SCC shall be confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).
NOTE 4: The UL resource blocks in PCC shall be located as close as possible to the downlink operating band, while the UL resource blocks in SCC shall be located as far as possible from the downlink operating band.
NOTE 5: In case a CA configuration consists of CC channel bandwidths which are unequal in bandwidth the PCC channel bandwidth shall be the larger one for reference sensitivity test.
NOTE 6: Void.
NOTE 7: Void.

**Table 7.3A.0-2: Intra-band contiguous CA uplink configuration for reference sensitivity for Bandwidth Class D**

| CA configuration / CC combination / $N_{RB_agg}$ / Duplex mode | | | | |
|---|---|---|---|---|
| Uplink CA configuration | CC combination | Number of uplink resource blocks per CC | | |
| | | PCC | SCC | SCC |
| CA_40D | 75RB+75RB+75RB<br>100RB+75RB+75RB<br>100RB+100RB+50RB<br>100RB+100RB+75RB<br>100RB+100RB+100RB | NOTE 6 | | |

NOTE 1: The carrier centre frequency of SCC in the UL operating band is configured closer to the DL operating band.
NOTE 2: The transmitted power over both PCC and SCC shall be set to PUMAX as defined in subclause 6.2.5A.
NOTE 3: The UL resource blocks in both PCC and SCC shall be confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).
NOTE 4: The UL resource blocks in PCC shall be located as close as possible to the downlink operating band, while the UL resource blocks in SCC shall be located as far as possible from the downlink operating band.
NOTE 5: In case a CA configuration consists of CC channel bandwidths which are unequal in bandwidth the PCC channel bandwidth shall be the larger one for reference sensitivity test.
NOTE 6: All uplink CCs are fully allocated

For intra-band non-contiguous carrier aggregation with one uplink carrier and or more two downlink sub-blocks, the throughput of each downlink component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) and parameters specified in Table 7.3.3-1, Table 7.3.3-1a, Table 7.3.3-1A, Table 7.3.3-1B, Table 7.3.3-1C and Table7.3A.0-3 with the reference sensitivity power level increased by $\Delta R_{IBNC}$ given in Table 7.3A.0-3 for the SCC(s). For aggregation of more than two downlink FDD carriers with one uplink carrier the reference sensitivity is defined only for the specific uplink and downlink test points which are specified in Table 7.3A.0-3. The requirements apply with all downlink carriers active. Unless given by Table 7.3.3-3, the reference sensitivity requirements shall be verified with the network signalling value NS_01 (Table 6.2.4.3-1) configured.

**Table 7.3A.0-3: Intra-band non-contiguous CA with one uplink configuration for reference sensitivity**

| CA configuration | Aggregated channel bandwidth (PCC+SCC) | Wgap / [MHz] | UL PCC allocation | ΔRIBNC (dB) | Duplex mode |
|---|---|---|---|---|---|
| CA_1A-1A | 25RB + 25RB | 0.0 < Wgap ≤ 50.0 | 251 | 0.5 | FDD |
| | 25RB + 50RB | 0.0 < Wgap ≤ 45.0 | 251 | 0.5 | |
| | 25RB + 75RB | 0.0 < Wgap ≤ 40.0 | 251 | 0.5 | |
| | 25RB + 100RB | 0.0 < Wgap ≤ 35.0 | 251 | 0.5 | |
| | 50RB + 25RB | 0.0 < Wgap ≤ 45.0 | 501 | 0.5 | |
| | 50RB + 50RB | 0.0 < Wgap ≤ 40.0 | 501 | 0.5 | |
| | 50RB + 75RB | 0.0 < Wgap ≤ 35.0 | 501 | 0.5 | |
| | 50RB + 100RB | 0.0 < Wgap ≤ 30.0 | 501 | 0.5 | |
| | 75RB + 25RB | 0.0 < Wgap ≤ 40.0 | 751 | 0.5 | |
| | 75RB + 50RB | 0.0 < Wgap ≤ 35.0 | 751 | 0.5 | |
| | 75RB + 75RB | 0.0 < Wgap ≤ 30.0 | 751 | 0.5 | |
| | 75RB + 100RB | 0.0 < Wgap ≤ 25.0 | 751 | 0.5 | |
| | 100RB + 25RB | 20.0 < Wgap ≤ 35.0 | 901 | 0.5 | |
| | | 0.0 < Wgap ≤ 20.0 | 1001 | 0.5 | |
| | 100RB + 50RB | 15.0 < Wgap ≤ 30.0 | 901 | 0.5 | |
| | | 0.0 < Wgap ≤ 15.0 | 1001 | 0.5 | |
| | 100RB + 75RB | 10.0 < Wgap ≤ 25.0 | 901 | 0.5 | |
| | | 0.0 < Wgap ≤ 10.0 | 1001 | 0.5 | |

| | | | | | |
|---|---|---|---|---|---|
| | 100RB + 100RB | 5.0 < Wgap ≤ 20.0 | 901 | 0.5 | |
| | | 0.0 < Wgap ≤ 5.0 | 1001 | 0.5 | |
| CA_2A-2A | 25RB+25RB | 30.0 < Wgap ≤ 50.0 | 121 | 5.3 | FDD |
| | | 0.0 < Wgap ≤ 30.0 | 251 | 0 | |
| | 25RB+50RB | 25.0 < Wgap ≤ 45.0 | 121 | 4.4 | |
| | | 0.0 < Wgap ≤ 25.0 | 251 | 0 | |
| | 25RB+75RB | 20.0 < Wgap ≤ 40.0 | 121 | 4.2 | |
| | | 0.0 < Wgap ≤ 20.0 | 251 | 0 | |
| | 25RB+100RB | 15.0 < Wgap ≤ 35.0 | 121 | 3.8 | |
| | | 0.0 < Wgap ≤ 15.0 | 251 | 0 | |
| | 50RB+25RB | 15.0 < Wgap ≤ 45.0 | 121 | 5.9 | |
| | | 0.0 < Wgap ≤ 15.0 | 321 | 0 | |
| | 50RB+50RB | 10.0 < Wgap ≤ 40.0 | 121 | 4.6 | |
| | | 0.0 < Wgap ≤ 10.0 | 321 | 0 | |
| | 50RB+75RB | 5.0 < Wgap ≤ 35.0 | 121 | 4.1 | |
| | | 0.0 < Wgap ≤ 5.0 | 321 | 0 | |
| | 50RB+100RB | 0.0 < Wgap ≤ 30.0 | 121 | 4.0 | |
| | 75RB+25RB | 10.0 < Wgap ≤ 40.0 | 1212 | 6.7 | |
| | | 0.0 < Wgap ≤ 10.0 | 361 | 0 | |
| | 75RB+50RB | 5.0 < Wgap ≤ 35.0 | 1212 | 5.4 | |

| | | | | | |
|---|---|---|---|---|---|
| | | 0.0 < Wgap ≤ 5.0 | 361 | 0 | |
| | 75RB+75RB | 0.0 < Wgap ≤ 30.0 | 1212 | 4.6 | |
| | 75RB+100RB | 0.0 < Wgap ≤ 25.0 | 1212 | 4.2 | |
| | 100RB+25RB | 0.0 < Wgap ≤ 35.0 | 1613 | 7.2 | |
| | 100RB+50RB | 0.0 < Wgap ≤ 30.0 | 1613 | 5.8 | |
| | 100RB+75RB | 0.0 < Wgap ≤ 25.0 | 1613 | 5.0 | |
| | 100RB+100RB | 0.0 < Wgap ≤ 20.0 | 1613 | 4.6 | |
| CA_3A-3A | 15RB+25RB | 47.0 < Wgap ≤ 67.0 | 121 | 4.5 | FDD |
| | | 0.0 < Wgap ≤ 47.0 | 151 | 0 | |
| | 25RB+15RB | 47.0 < Wgap ≤ 67.0 | 121 | 4.9 | |
| | | 0.0 < Wgap ≤ 47.0 | 251 | 0 | |
| | 25RB+25RB | 45.0 < Wgap ≤ 65.0 | 121 | 4.7 | |
| | | 0.0 < Wgap ≤ 45.0 | 251 | 0 | |
| | 25RB+50RB | 40.0 < Wgap ≤ 60.0 | 121 | 3.8 | |
| | | 0.0 < Wgap ≤ 40.0 | 251 | 0 | |
| | 25RB+75RB | 35.0 < Wgap ≤ 55.0 | 121 | 3.6 | |
| | | 0.0 < Wgap ≤ 35.0 | 251 | 0 | |
| | 25RB+100RB | 30.0 < Wgap ≤ 50.0 | 121 | 3.4 | |
| | | 0.0 < Wgap ≤ 30.0 | 251 | 0 | |
| | 50RB+25RB | 30.0 < Wgap ≤ 60.0 | 129 | 5.1 | |

| | | | | | |
|---|---|---|---|---|---|
| | | 0.0 < Wgap ≤ 30.0 | 321 | 0 | |
| | 50RB+50RB | 25.0 < Wgap ≤ 55.0 | 129 | 4.3 | |
| | | 0.0 < Wgap ≤ 25.0 | 321 | 0 | |
| | 50RB+75RB | 20.0 < Wgap ≤ 50.0 | 129 | 3.8 | |
| | | 0.0 < Wgap ≤ 20.0 | 321 | 0 | |
| | 50RB+100RB | 15.0 < Wgap ≤ 45.0 | 129 | 3.4 | |
| | | 0.0 < Wgap ≤ 15.0 | 321 | 0 | |
| | 75RB+25RB | 25.0 < Wgap ≤ 55.0 | 1210 | 6.0 | |
| | | 0.0 < Wgap ≤ 25.0 | 321 | 0 | |
| | 75RB+50RB | 20.0 < Wgap ≤ 50.0 | 1210 | 4.7 | |
| | | 0.0 < Wgap ≤ 20.0 | 321 | 0 | |
| | 75RB+75RB | 15.0 < Wgap ≤ 45.0 | 1210 | 4.2 | |
| | | 0.0 < Wgap ≤ 15.0 | 321 | 0 | |
| | 75RB+100RB | 10.0 < Wgap ≤ 40.0 | 1210 | 3.8 | |
| | | 0.0 < Wgap ≤ 10.0 | 321 | 0 | |
| | 100RB+25RB | 15.0 < Wgap ≤ 50.0 | 1611 | 6.5 | |
| | | 0.0 < Wgap ≤ 15.0 | 321 | 0 | |
| | 100RB+50RB | 10.0 < Wgap ≤ 45.0 | 1611 | 5.1 | |
| | | 0.0 < Wgap ≤ 10.0 | 321 | 0 | |
| | 100RB+75RB | 5.0 < Wgap ≤ 40.0 | 1611 | 4.5 | |

| | | | | | |
|---|---|---|---|---|---|
| | | 0.0 < Wgap ≤ 5.0 | 321 | 0 | |
| | 100RB+100RB | 0.0 < Wgap ≤ 35.0 | 1611 | 4.1 | |
| CA_4A-4A | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | FDD |
| CA_5A-5A | 25RB+25RB | NOTE 7 | 121 | 5.3 | FDD |
| | 25RB+50RB | NOTE 7 | 121 | 4.4 | |
| | 50RB+25RB | NOTE 7 | 121 | 5.9 | |
| | 50RB+50RB | NOTE 7 | 121 | 4.6 | |
| CA_7A-7A | 25RB+25RB | 0< Wgap ≤ 60 | 25 | 0.0 | FDD |
| | 25RB+50RB | 0 < Wgap ≤ 55 | 25 | 0.0 | |
| | 25RB+75RB | 0 < Wgap ≤ 50 | 25 | 0.0 | |
| | 25RB+100RB | 0 < Wgap ≤ 45 | 25 | 0.0 | |
| | 50RB+25RB | 30 < Wgap ≤ 55 | 321 | 0.0 | |
| | | 0 < Wgap ≤ 30 | 50 | 0.0 | |
| | 50RB+50RB | 25.0 < Wgap ≤ 50.0 | 321 | 0.0 | |
| | | 0.0 < Wgap ≤ 25.0 | 50 | 0.0 | |
| | 50RB+75RB | 20 < Wgap ≤ 45 | 321 | 0.0 | |
| | | 0 < Wgap ≤ 20 | 50 | 0.0 | |
| | 50RB+100RB | 15 < Wgap ≤ 40 | 321 | 0.0 | |
| | | 0 < Wgap ≤ 15 | 50 | 0.0 | |
| | 75RB+25RB | 20.0 < Wgap ≤ 50.0 | 321 | 0.0 | |

| | | | | | |
|---|---|---|---|---|---|
| | | 0.0 < Wgap ≤ 20.0 | 501 | 0.0 | |
| | 75RB+50RB | 20.0 < Wgap ≤ 45.0 | 321 | 0.0 | |
| | | 0.0 < Wgap ≤ 20.0 | 501 | 0.0 | |
| | 75RB+75RB | 15.0 < Wgap ≤ 40.0 | 321 | 0.0 | |
| | | 0.0 < Wgap ≤ 15.0 | 501 | 0.0 | |
| | 75RB+100RB | 10 < Wgap ≤ 35 | 321 | 0.0 | |
| | | 0 < Wgap ≤ 10 | 501 | 0.0 | |
| | 100RB+25RB | 25 < Wgap ≤ 45 | 321 | 0.0 | |
| | | 0 < Wgap ≤ 25 | 451 | 0.0 | |
| | 100RB+50RB | 20 < Wgap ≤ 40 | 321 | 0.0 | |
| | | 0 < Wgap ≤ 20 | 451 | 0.0 | |
| | 100RB+75RB | 15.0 < Wgap ≤ 35.0 | 361 | 0.0 | |
| | | 0.0 < Wgap ≤ 15.0 | 501 | 0.0 | |
| | 100RB+100RB | 15.0 < Wgap ≤ 30.0 | 321 | 0.0 | |
| | | 0.0 < Wgap ≤ 15.0 | 451 | 0.0 | |
| CA_12A-12A | 25RB+25RB | 0.0 < Wgap ≤ 7.0 | 518 | 3 | FDD |
| CA_23A-23A | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | FDD |
| CA_25A-25A | 25RB+25RB | 30.0 < Wgap ≤ 55.0 | 101 | 5.0 | FDD |
| | | 0.0 < Wgap ≤ 30.0 | 251 | 0.0 | |
| | 25RB+50RB | 25.0 < Wgap ≤ 50.0 | 101 | 4.5 | |

| | | | | | |
|---|---|---|---|---|---|
| | | 0.0 < Wgap ≤ 25.0 | 251 | 0.0 | |
| | 25RB+75RB | 20 < Wgap ≤ 45 | 101 | 4.3 | |
| | | 0 < Wgap ≤ 20 | 251 | 0 | |
| | 25RB+100RB | 15 < Wgap ≤ 40 | 101 | 4.1 | |
| | | 0 < Wgap ≤ 15 | 251 | 0 | |
| | 50RB+25RB | 15.0 < Wgap ≤ 50.0 | 104 | 5.5 | |
| | | 0.0 < Wgap ≤ 15.0 | 321 | 0.0 | |
| | 50RB+50RB | 10.0 < Wgap ≤ 45.0 | 104 | 5.0 | |
| | | 0.0 < Wgap ≤ 10.0 | 321 | 0.0 | |
| | 50RB+75RB | 5 < Wgap ≤ 40 | 104 | 4.5 | |
| | | 0 < Wgap ≤ 5 | 321 | 0 | |
| | 50RB+100RB | 0 < Wgap ≤ 35 | 104 | 4.2 | |
| | 75RB+25RB | 10 < Wgap ≤ 45 | 1014 | 7.6 | |
| | | 0 < Wgap ≤ 10 | 321 | 0 | |
| | 75RB+50RB | 5 < Wgap ≤ 40 | 1014 | 6.7 | |
| | | 0 < Wgap ≤ 5 | 321 | 0 | |
| | 75RB+75RB | 0 < Wgap ≤ 35 | 1014 | 5.6 | |
| | 75RB+100RB | 0 < Wgap ≤ 30 | 1014 | 4.8 | |
| | 100RB+25RB | 0 < Wgap ≤ 40 | 1215 | 8 | |
| | 100RB+50RB | 0 < Wgap ≤ 35 | 1215 | 6.7 | |

| | | | | | |
|---|---|---|---|---|---|
| | 100RB+75RB | 0 < Wgap ≤ 30 | 1215 | 6.1 | |
| | 100RB+100RB | 0 < Wgap ≤ 25 | 1215 | 5.7 | |
| CA_25A-25A-25A | 25RB+25RB+25RB | Wgap_L = Wgap_H = 25 MHz | 101 | 5.0 | FDD |
| | | Wgap_L = Wgap_H = 5 MHz | 251 | 0.0 | |
| | 50RB+50RB+50RB | Wgap_L = Wgap_H = 17.5 MHz | 104 | 5.0 | |
| | 75RB+75RB+75RB | Wgap_L = Wgap_H = 10 MHz | 1014 | 5.6 | |
| | 100RB+100RB+100RB | Wgap_L = Wgap_H = 2.5 MHz | 1215 | 5.7 | |
| CA_40A-40A | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_40A-40C | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_40C-40C | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_41A-41A | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_41A-41C | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_41A-41D | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_41C-41C | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_41A-41A-41A | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_41A-41A-41C | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_42A-42A | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_42A-42C | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_42A-42D | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_42C-42C | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |

| | | | | | |
|---|---|---|---|---|---|
| CA_48A-48A | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_48A-48A-48A | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_48A-48A-48A-48A | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_48A-48C | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_48A-48D | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_48A-48E | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_48C-48C | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_48C-48D | NOTE 6 | NOTE 7 | NOTE 8 | 0.0 | TDD |
| CA_66A-66A | NOTE 6 | NOTE 7 | NOTE 8, NOTE 16 | 0.0 | FDD |
| CA_66A-66A-66A | NOTE 6 | NOTE 7 | NOTE 8, NOTE 16 | 0.0 | FDD |
| CA_66A-66B | NOTE 6 | NOTE 7 | NOTE 8, NOTE 16 | 0.0 | FDD |
| CA_66A-66C | NOTE 6 | NOTE 7 | NOTE 8, NOTE 16 | 0.0 | FDD |

NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission.
NOTE 2: $W_{gap}$ is the sub-block gap between the two sub-blocks.
NOTE 3: The carrier center frequency of PCC in the UL operating band is configured closer to the DL operating band.
NOTE 4: refers to the UL resource blocks shall be located at $RB_{start}$=33.
NOTE 5: For the TDD intra-band non-contiguous CA configurations, the minimum requirements apply only in synchronized operation between all component carriers.
NOTE 6: All combinations of channel bandwidths defined in Table 5.4.2A.1-3.
NOTE 7: All applicable sub-block gap sizes.
NOTE 8: The PCC allocation is same as Transmission bandwidth configuration $N_{RB}$ as defined in Table 5.4.2-1. In case of uplink sub-block is TDD intra-band contiguous CA then the uplink PCC and SCC allocations are the same as $N_{RB_agg}$ defined in Table 7.3A.0-1.
NOTE 9: refers to the UL resource blocks shall be located at $RB_{start}$=25.
NOTE 10: refers to the UL resource blocks shall be located at $RB_{start}$=35.
NOTE 11: refers to the UL resource blocks shall be located at $RB_{start}$=50.
NOTE 12: refers to the UL resource blocks shall be located at $RB_{start}$=39.
NOTE 13: refers to the UL resource blocks shall be located at $RB_{start}$=57.
NOTE 14: refers to the UL resource blocks shall be located at $RB_{start}$=44.
NOTE 15: refers to the UL resource blocks shall be located at $RB_{start}$=62.
NOTE 16: The carrier center frequency of PCC in the DL operating band is configured closer to the UL operating band.
NOTE 17: Void
NOTE 18: refers to the UL resource blocks shall be located at RBstart=12.
NOTE 19: For operations with 4 antenna ports, the MSD in the applicable bands shall be modified by the absolute value of $\Delta R_{IB,4R}$ in Table 7.3.3-1a when MSD > 0.

For intra-band non-contiguous carrier aggregation with two uplink and downlink carriers the reference sensitivity is defined to be met with both downlink and uplink carriers activated. The downlink PCC and SCC minimum requirements for reference sensitivity power level as specified in Table 7.3.3-1, Table 7.3.3-1a, Table 7.3.3-1A, Table 7.3.3-1B and Table 7.3.3-1C are increased by amount of $\Delta R_{2UL_PCC}$ and $\Delta R_{2UL_SCC}$ which are defined in Table 7.3A.0-4 when uplink PCC and SCC allocations are according to the Table 7.3A.0-4.

**Table 7.3A.0-4: Intra-band non-contiguous CA with two uplinks configuration for reference sensitivity**

| CA configuration | Aggregated channel bandwidth (PCC+SCC) | $W_{gap}$ / [MHz] | UL PCC allocation | UL SCC allocation | $\Delta R_{2UL_PCC}$ (dB) | $\Delta R_{2UL_SCC}$ (dB) | Duplex mode |
|---|---|---|---|---|---|---|---|
| CA_4A-4A | NOTE 2 | NOTE 3 | NOTE 4 | NOTE 5 | 0.0 | 0.0 | FDD |
| NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A. | | | | | | | |
| NOTE 2: All combinations of channel bandwidths defined in Table 5.4.2A.1-3. | | | | | | | |
| NOTE 3: All applicable sub-block gap sizes. | | | | | | | |
| NOTE 4: The PCC allocation is same as Transmission bandwidth configuration $N_{RB}$ as defined in Table 5.4.2-1. | | | | | | | |
| NOTE 5: The SCC allocation is same as Transmission bandwidth configuration $N_{RB}$ as defined in Table 5.4.2-1. | | | | | | | |

For combinations of intra-band and inter-band carrier aggregation with up to five downlink carriers (up to two non-contiguous sub-blocks per band and up to four contiguously aggregated carriers per band) and up to three uplink carriers (up to two contiguously aggregated carriers per band), the requirement is defined with an uplink configuration in accordance with Table 7.3A.0-3 when the uplink is active in a band supporting two non-contigous component carriers, Table 7.3A.0-1 when the uplink (up to two contiguously aggregated uplink carriers) is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.3-2 when an uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to four component carriers. The carrier center frequency of PCC in the UL operating band is configured closer to the DL operating band when the uplink is active in band(s) supporting non-contiguous aggregation of up to two sub-blocks. For these uplink configurations, the UE shall meet the reference sensitivity requirements for intra-band non-contiguous carrier aggregation of two downlink sub-blocks, the requirements for intra-band contiguous carrier aggregation for the contiguously aggregated downlink carriers and for any remaining component carrier(s) the requirements specified in subclause 7.3.3. For the two component carriers within the same band, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps (Table 7.3A.0-3) when the uplink is active in another band. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with all uplink carriers active in each band capable of UL operation. For component carriers configured in Band 46, the said requirements for intra-band carrier aggregation of downlink carriers are replaced by the requirements in Table 7.3A.0-0eA for the uplink in any band other than band 46 with the uplink configuration specified in Table 7.3.3-2. Unless given by Table 7.3.3-3, the reference sensitivity requirements shall be verified with the network signalling value NS_01 (Table 6.2.4.3-1) configured.

For the UE that supports any of combinations of intra-band and inter-band carrier aggregation given in Table 7.3A.0-5, exceptions to the requirements for a band(s) specified in subclause 7.3.3 are allowed when the band(s) is impacted by harmonic interference from the uplink being active in a lower-frequency band of the same CA configuration. For these exceptions, the UE shall meet the requirements specified in Table 7.3A.0-5 and Table 7.3A.0-6.

**Table 7.3A.0-5: Reference sensitivity for carrier aggregation QPSK $P_{REFSENS, CA}$ (exceptions due to harmonic issues in the combinations of intra-band and inter-band CA)**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **EUTRA band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex mode** |
| CA_1A-3A-7C-28A[5,6] | 1[21] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-3A-3A-7A-28A[5,6] | 1[21] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-3C-8A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_1A-3A-19A-42C[8,9] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-19A-42C[10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-3A-20A-28A | 1[21] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-3A-21A-42C[8,9] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-21A-42C[10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3C-28A | 1[21] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-3A-28A-42C[8,9] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-3A-28A-42C[10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-42C[8,9] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_1A-7A-8A-40C[5,6] | 7[33] | | | | -87.1 | -86.7 | -86.4 | FDD |
| CA_1A-7C-28A[5,6] | 1[21] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| CA_1A-3A-42C[10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-3A-42C[9,10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-3A-3A-42C[11] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_1A-21A-28A-42C[4, 14] | 21 | | | N/A | N/A | N/A | | FDD |
| | 42 | | | N/A | N/A | N/A | N/A | TDD |
| CA_1A-28A-42C[5,6,12,13] | 1[21] | | | -89.8 | -89.4 | -89 | -88.7 | FDD |
| | 42 | | | -85.7 | -85.4 | -85.1 | -84.9 | TDD |
| CA_2A-2A-4A-12A[5,6] | 4[21] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_2A-2A-5A-12A-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-2A-7A-12A-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-2A-12A-66A-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-13A-48A-48A[8,9] CA_2A-13A-48C[8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-13A-48A-48A[10] CA_2A-13A-48C[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-7A-12B-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-2A-12A-30A-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-2A-12A-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-2A-12B-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-12A-30A-66A-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-12B-66A[5,6] | 16[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-12B-66A-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-4A-4A-12A[5,6] | 4[21] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_2A-4A-12A-12A[5,6] | 4[21] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_2A-4A-12B[5,6] | 4[21] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_2A-48A-48C[9, 22] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-48A-48C[1] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-48A-48D[8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_2A-48A-48D[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-48C-48C[8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-48C-48C[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-48D[9, 22] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-48D[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-48E[8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-48E[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-12A-66A-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-12A-66C[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_2A-13A-48D[8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-13A-48D[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-13A-48A-48C[8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-13A-48A-48C[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-13A-48C-66A[8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-13A-48C-66A[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-13A-48A-48A-66A[8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-13A-48A-48A-66A[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-48D-66A[8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-48D-66A[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-48A-48A-66A[8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-48A-48A-66A[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_2A-48A-48C-66A[8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_2A-48A-48C-66A[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-3A-7A-7A-8A[4] | 3 | | | N/A | N/A | N/A | N/A | |
| CA_3A-3A-7A-7A-8A[5,6] | 7[21] | | | -88 | -87,4 | -87 | -86,7 | FDD |
| CA_3A-3A-7A-8A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-3A-7A-8A[5,6] | 7[21] | | | -88 | -87.4 | -87 | -86.7 | FDD |
| CA_3A-3A-8A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_3A-7A-7A-8A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| | 7 | | | N/A | N/A | N/A | N/A | |
| CA_3A-7A-7A-8A[4,5,6] | 3 | | | -97 | -94 | -92.2 | -91 | FDD |
| | 7[21] | | | -88 | -87.4 | -87 | -86.7 | |
| CA_3C-7A-8A-38A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| | 7 | | | N/A | N/A | N/A | N/A | |
| CA_3A-7A-8A-40C[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| | 7 | | | | N/A | N/A | N/A | |
| CA_3A-7A-8A-40C[5,6] | 7[33] | | | | -87.1 | -86.7 | -86.4 | FDD |
| CA_3A-19A-42C[8,9] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-19A-42C[10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | |
| CA_3A-19A-42D[8,9] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-19A-42D[10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-21A-42C[1,2] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-21A-42C[3] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-21A-42D[8,9] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-21A-42D[10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-28A-40C[8,9] | 28 | | | -60.7 | -60.7 | -60.7 | -60.7 | FDD |
| CA_3A-28A-40D[8,9] | 28 | | | -60.7 | -60.7 | -60.7 | -60.7 | FDD |
| CA_3A-28A-41A-42C[8,9,20] | 42[21] | | | | -71.7 | -71.7 | -71.7 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_3A-28A-41A-42C[10,20] | 42[21] | | | | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-28A-41A-42C[12,13,20] | 42[21] | | | | -85.4 | -85.1 | -84.9 | TDD |
| CA_3A-28A-41C-42A[8,9,20] | 42[21] | | | | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-28A-41C-42A[10,20] | 42[21] | | | | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-28A-41C-42A[12,13,20] | 42[21] | | | | -85.4 | -85.1 | -84.9 | TDD |
| CA_3A-28A-42C[8,9] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-28A-42C[10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-28A-42C[12,13] | 42[21] | | | -85.7 | -85.4 | -85.1 | -84.9 | TDD |
| CA_3A-28A-42D[8,9] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-28A-42D[10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-28A-42D[12,13] | 42[21] | | | -85.7 | -85.4 | -85.1 | -84.9 | TDD |
| CA_3A-42C[8,9] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-42C[10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-42D[8,9] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-42D[10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-3A-42C[8,9] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-3A-42C[10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-3A-42D[9,10] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-3A-42D[11] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-42A-42C[8,9] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-42A-42C[10] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-42C-42C[8, 9,10] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-42C-42C[11] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3A-42E[9,10] | 42[21] | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_3A-42E[11] | 42[21] | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_3C-8A[4] | 3 | | | N/A | N/A | N/A | N/A | FDD |
| CA_4A-4A-5A-12A[5,6] | 4[21] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_4A-4A-12A[5,6] | 4 | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_4A-4A-12A-12A[5,6] | 4[21] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_4A-4A-12A-30A[5,6] | 4[21] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_4A-4A-12B[5,6] | 4[21] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_4A-5A-12B[5,6] | 4[21] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_4A-12A-12A[5,6] | 4[21] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_4A-12B[5,6] | 4[21] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_4A-5A-12A-12A[5,6] | 4[21] | | | -90 | -89.5 | -89 | -88.5 | FDD |
| CA_7A-7A-8A[5,6] | 7[21] | | | -88 | -87.4 | -87 | -86.7 | FDD |
| CA_8A-41C[7] | 41 | | | | N/A | N/A | N/A | TDD |
| CA_8A-42C[15,16] | 42[21] | | | -84.8 | -84.7 | -84.6 | -84.5 | TDD |
| CA_12A-30A-66A-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_12A-66A-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_12A-66C[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_12B-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_12B-66A-66A[5,6] | 66[21] | | | -89.5 | -89 | -88.5 | -88 | FDD |
| CA_20A-38A-40A-40A[15,16] | 20 | | | -60.7 | -60.7 | -60.7 | | FDD |
| CA_20A-38A-40C[15,16] | 20 | | | -60.7 | -60.7 | -60.7 | | FDD |
| CA_20A-40D[7] | 20 | | | -60.7 | -60.7 | -60.7 | | FDD |
| CA_21A-28A-42C[4,14] | 21 | | | N/A | N/A | N/A | N/A | FDD |
| | 42 | | | N/A | N/A | | | TDD |
| CA_25A-25A-26A-41C[7] | 41 | | | N/A | N/A | N/A | N/A | TDD |
| CA_26A-41C[7] | 41 | | | N/A | N/A | N/A | N/A | TDD |
| CA_28A-40C[16,17] | 28[21] | | | -60.7 | -60.7 | -60.7 | -60.7 | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_28A-40D[16,17] | 28[21] | | | -60.7 | -60.7 | -60.7 | -60.7 | FDD |
| CA_28A-41A-42C[12, 13] | 42[21] | | | | -85.4 | -85.1 | -84.9 | TDD |
| CA_28A-41C-42A[12, 13] | 42[21] | | | | -85.4 | -85.1 | -84.9 | TDD |
| CA_28A-41C-42C[12,13] | 42[21] | | | | -85.4 | -85.1 | -84.9 | TDD |
| CA_28A-42C[12,13] CA_28A-42D[12,13] | 42[21] | | | -85.7 | -85.4 | -85.1 | -84.9 | TDD |
| CA_48A-48C-66A[8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48A-48C-66A[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48A-48C-66B [8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48A-48C-66B [10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48A-48C-66C [8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48A-48C-66C [10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48A-48D-66A [8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48A-48D-66A [10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48C-48C-66A [8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48C-48C-66A [10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA_48D-66A[8,9] | 48 | | | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA_48D-66A[10] | 48 | | | -97.1 | -94.7 | -93.2 | -92.5 | TDD |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.

NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1

NOTE 3: The signal power is specified per port

NOTE 4: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity for all active downlink component carriers is only verified when this is not the case (the requirements specified in clause 7.3.3 apply unless otherwise specified).

NOTE 5: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of a high band.

NOTE 6: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.3 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{HB}$ the carrier frequency of a high band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the low band.

NOTE 7: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity is only verified when this is not the case (the requirements specified in clause 7.3.3 apply).

NOTE 8: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range $\Delta F_{HD}$ above and below the edge of this downlink transmission bandwidth. The value $\Delta F_{HD}$ depends on the E-UTRA configuration: $\Delta F_{HD}$ = 10 MHz for CA_3A-42C, CA_3A-42D, CA_3A-3A-42C, CA_3A-42A-42C, CA_3A-42C-42C, CA_1A-3A-19A-42C, CA_1A-3A-21A-42C, CA_1A-3A-42C, CA_3A-28A-42C, CA_3A-28A-42D, CA_3A-19A-42C, CA_3A-19A-42D, CA_3A-21A-42D, CA_3A-28A-40C, CA_3A-28A-40D, CA_3A-28A-41A-42C, CA_3A-28A-41C-42A, CA_2A-48C-48C, CA_2A-48A-48D, CA_48A-48C-66C, CA_48A-48C-66B, CA_48A-48D-66A, CA_48C-48C-66A, CA_48D-66A, CA_48A-48C-66A, CA_2A-13A-48D, CA_2A-13A-48A-48C, CA_2A-13A-48C-66A, CA_2A-13A-48A-48A-66A, CA_2A-48D-66A, CA_2A-48A-48C-66A and CA_2A-48E.

NOTE 9: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.2 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{HB}$ carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.

NOTE 10: The requirements are only applicable to channel bandwidths with a carrier frequency at $\pm(20 + BW_{Channel}^{HB} / 2)$ MHz offset from $2 f_{UL}^{LB}$ in the victim (higher band) with $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$, where $BW_{Channel}^{LB}$ and $BW_{Channel}^{HB}$ are the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.

NOTE 11: Void

NOTE 12: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 5th transmitter harmonic is within the downlink transmission bandwidth of a high band.

NOTE 13: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that

$f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.5 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{HB}$ the carrier frequency of a high band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the low band.

NOTE 14: No requirements apply when there is at least one individual RE on band 28 uplink outside frequencies 728 – 738 MHz. The reference sensitivity is only verified when all configured RE's are confined within frequencies 728 – 738 MHz (the requirements specified in clause 7.3.1 of [6] apply).

NOTE 15: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 4th transmitter harmonic is within the downlink transmission bandwidth of a high band.

NOTE 16: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.4 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{HB}$ the carrier frequency of a high band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the low band.

NOTE 17: These requirements apply when there is at least one individual RE within the downlink transmission bandwidth of the victim (lower) band for which the 3rd harmonic is within the uplink transmission bandwidth or the uplink adjacent channel's transmission bandwidth of an aggressor (higher) band.

NOTE 18: The requirements should be verified for UL EARFCN of the aggressor (higher) band (superscript HB) such that $f_{DL}^{LB} = \lfloor f_{UL}^{HB} / 0.3 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{LB}$ the carrier frequency in the victim (lower) band and $BW_{Channel}^{HB}$ the channel bandwidth configured in the higher band.

NOTE 19: The requirement for B46 does not apply when there is at least one individual RE within the B46 downlink transmission bandwidth which falls into the reference sensitivity exclusion region as specified in Table 6.2.4.3-3.

NOTE 20: The B41 requirements are modified by -0.1dB when carrier frequency of the assigned E-UTRA channel bandwidth is within 2545-2690 MHz.

NOTE 21: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured.

NOTE 22: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range $\Delta F_{HD}$ above and below the edge of this downlink transmission bandwidth. The value $\Delta F_{HD}$ depends on the E-UTRA configuration: $\Delta F_{HD}$ = 10 MHz for CA_2A-48A-48C

**Table 7.3A.0-6: Uplink configuration for the low band (exceptions due to harmonic issues in the combinations of intra-band and inter-band CA)**

| E-UTRA Band / Channel bandwidth of the high band / $N_{RB}$ / Duplex mode | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **UL band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Duplex mode** |
| CA_1A-3A-7C-28A | 28 | | | | 16 | 25 | 25 | FDD |
| CA_1A-3A-3A-7A-28A | 28 | | | | 16 | 25 | 25 | FDD |
| CA_1A-3A-19A-42C | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-3A-3A-20A-28A | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-3A-21A-42C | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-3C-28A | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-3A-28A-42C | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-3A-42C | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-3A-3A-42C | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_1A-7A-8A-40C | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_1A-7C-28A | 28 | | | | 16 | 25 | 25 | FDD |
| CA_1A-28A-42C | 28 | | | 8 | 16 | 25 | 25 | FDD |
| CA_2A-2A-4A-12A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_2A-2A-5A-12A-66A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_2A-2A-7A-12A-66A | 12 | | | 8 | 16 | | | FDD |
| CA_2A-2A-12A-30A-66A | 12 | | | 8 | 16 | 25 | 25 | FDD |
| CA_2A-2A-12A-66A | 12 | | | 8 | 16 | | | FDD |
| CA_2A-2A-12A-66A-66A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_2A-2A-12B-66A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_2A-4A-4A-12A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_2A-4A-12A-12A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_2A-4A-12B | 12 | | | 8 | 16 | | | FDD |
| CA_2A-7A-12B-66A | 12 | | | 8 | 16 | | | FDD |
| CA_2A-12A-30A-66A-66A | 12 | | | 8 | 16 | 25 | 25 | FDD |
| CA_2A-12A-66A-66A | 12 | | | 8 | 16 | | | FDD |
| CA_2A-12A-66C | 12 | | | 8 | 16 | | | FDD |
| CA_2A-12B-66A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_2A-12B-66A-66A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_2A-13A-48A-48A<br>CA_2A-13A-48C | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_2A-13A-48D | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_2A-13A-48A-48C | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_2A-13A-48C-66A | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 66 | | | 12[1] | 25[1] | 36[1] | 50[1] | FDD |
| CA_2A-13A-48A-48A-66A | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 66 | | | 12[1] | 25[1] | 36[1] | 50[1] | FDD |
| CA_2A-48A-48D | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_2A-48C-48C | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_2A-48D | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_2A-48E | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_2A-48A-48A- | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 66A | 66 | | | 12[1] | 25[1] | 36[1] | 50[1] | FDD |
| CA_2A-48D-66A | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| | 66 | | | 12[1] | 25[1] | 36[1] | 50[1] | FDD |
| CA_2A-48A-48C-66A | 2 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| CA_3A-3A-7A-7A-8A | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_3A-3A-7A-8A | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_3A-7A-7A-8A | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_3A-7A-8A-40C | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_3A-19A-42C | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-19A-42D | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-42C | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-3A-42D | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-42C-42C | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-42E | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-21A-42C | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-21A-42D | 3 | | | 12 | 25 | 36 | 50 | FDD |
| CA_3A-28A-40C | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_3A-28A-40D | 40 | | | | 50 | 75 | 100 | TDD |
| CA_3A-28A-41A-42C | 3 | | | | 25 | 36 | 50 | FDD |
| | 28 | | | | 10 | 15 | 20 | FDD |
| CA_3A-28A-41C-42A | 3 | | | | 25 | 36 | 50 | FDD |
| | 28 | | | | 10 | 15 | 20 | FDD |
| CA_3A-28A-42C | 3 | | | 12 | 25 | 36 | 50 | FDD |
| | 28 | | | 8 | 16 | | | FDD |
| CA_4A-4A-5A-12A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_4A-4A-12A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_4A-4A-12A-12A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_4A-4A-12A-30A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_4A-4A-12B | 12 | | | 8 | 16 | | | FDD |
| CA_4A-12A-12A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_4A-12B | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_4A-5A-12A-12A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_4A-5A-12B | 12 | | | 8 | 16 | | | FDD |
| CA_7A-7A-8A | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_8A-42C | 8 | | | 8 | 16 | 25 | 25 | FDD |
| CA_12A-30A-66A-66A | 12 | | | 8 | 16 | | | FDD |
| CA_12A-66A-66A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_12A-66C | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_12B-66A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_12B-66A-66A | 12 | | | 8 | 16 | 20 | 20 | FDD |
| CA_20A-38A-40A-40A[3] | 40 | | | 25 | 50 | 75 | | TDD |
| CA_20A-38A-40C[3] | 40 | | | 25 | 50 | 75 | | TDD |
| CA_20A-40D[3] | 40 | | | 25 | 50 | 75 | | TDD |
| CA_28A-40C | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_28A-40D | 40 | | | 25 | 50 | 75 | 100 | TDD |
| CA_28A-41A-42C | 28 | | | | 10 | 15 | 20 | FDD |
| CA_28A-41C-42A | 28 | | | | 10 | 15 | 20 | FDD |
| CA_28A-41C-42C | 28 | | | | 10 | 15 | 20 | FDD |
| CA_28A-42C CA_28A-42D | 28 | | | 5 | 10 | 15 | 20 | FDD |
| CA_48A-48C-66A | 66 | | | 12 | 25 | 36 | 50 | FDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_48A-48C-66B | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_48A-48C-66C | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_48A-48D-66A | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_48C-48C-66A | 66 | | | 12 | 25 | 36 | 50 | FDD |
| CA_48D-66A | 66 | | | 12 | 25 | 36 | 50 | FDD |

NOTE 1: refers to the UL resource blocks, which shall be centred within the transmission bandwidth configuration for the channel bandwidth.
NOTE 2: the UL configuration applies regardless of the channel bandwidth of the low band unless the UL resource blocks exceed that specified in Table 7.3.3-2 for the uplink bandwidth in which case the allocation according to Table 7.3.3-2 applies.
NOTE 3: refers to the UL resource blocks shall be located between 2373-2400MHz.

The normative reference for this requirement is TS 36.101[2] clause 7.3.1 and 7.3.1A.

## 7.3A.1 Reference sensitivity level for CA (intra-band contiguous DL CA and UL CA)

### 7.3A.1.1 Test purpose

To verify the ability of UE that support CA to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area of an e-NodeB.

### 7.3A.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 7.3A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3A.0.

### 7.3A.1.4 Test description

#### 7.3A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.3A.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.3A.1.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | C: Low range, High range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ (Note 3) |

Test Parameters for CA Configurations

| CA Configuration / $N_{RB_agg}$ | | DL Allocation | | UL Allocation | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PCC $N_{RB}$ | SCC $N_{RB}$ | CC MOD | PCC & SCC RB allocation | CC MOD | $N_{RB_alloc}$ | PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$) | | | |
| 50 | 25 | QPSK | 50+25 | QPSK | 25 | P_25@25 | S_0@0 | - | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 25 | P_25@25 | S_0@0 | - | - |
| 50 | 100 | QPSK | 50+100 | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 75 | 50 | QPSK | 75+50 | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 129 | P_75@0 | S_54@0 | - | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 50 | P_50@50 | S_0@0 | - | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 125 | P_100@0 | S_25@0 | - | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 75 | P_75@25 | S_0@0 | - | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 75 | QPSK | 100+75 | QPSK | 175 | P_100@0 | S_75@0 | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 50 | P_50@50 | S_0@0 | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 75 | P_75@25 | S_0@0 | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 130 | P_100@0 | S_30@0 | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 200 | P_100@0 | S_100@0 | - | - |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.
Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3A.0-1 for UE supporting two uplink carriers is tested per Test CA configuration.
Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.32 as appropriate if the UE supports 2 Rx antennas or Figure A.80 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 7.3A.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.3A.1.4.3.

### 7.3A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.3A.1.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.3A.1.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.3A.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCC to the appropriate REFSENS value defined in Table 7.3A.1.5-1. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the Throughput measurement.

7. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.3A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

## 7.3A.1.5 Test requirement

For intra-band contiguous carrier aggregation the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.1.5-1 and table 7.3A.1.5-2.

**Table 7.3A.1.5-1: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band**

| CA Configuration | 100RB+25RB | | 100RB+50RB | | 75RB+75RB | | 75RB+50RB | | 100RB+75RB | | 100RB+100RB | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100RB | 25RB | 100RB | 50RB | 75RB | 75RB | 75RB | 50RB | 100RB | 75RB | 100RB | 100RB |
| CA_1C | - | - | - | - | -94.5 | -94.5 | - | - | - | - | -93.3 | -93.3 |
| | | | | | -97.2[4] | -97.2[4] | | | | | -96.0[4] | -96.0[4] |
| CA_3C | -90.3 | -96.3 | -90.3 | -93.3 | - | - | - | - | -90.3 | -91.5 | -90.3 | -90.3 |
| | -93.0[4] | -99.0[4] | -93.0[4] | -96.0[4] | | | | | -93.0[4] | -94.2[4] | -93.0[4] | -93.0[4] |
| CA_7C | - | - | - | - | -92.5 | -92.5 | -92.5 | -94.3 | - | - | -91.3 | -91.3 |
| | | | | | -95.2[4] | -95.2[4] | -95.2[4] | -97.0[4] | | | -94.0[4] | -94.0[4] |
| CA_38C | - | - | - | - | -94.5 | -94.5 | - | - | - | - | -93.3 | -93.3 |
| CA_39C | -93.3 | -99.3 | -93.3 | -96.3 | - | - | - | - | -93.3 | -94.5 | - | - |
| | -96.0[4] | -102.0[4] | -96.0[4] | -99.0[4] | | | | | -96.0[4] | -97.2[4] | | |
| CA_40C | - | - | -93.3 | -96.3 | -94.5 | -94.5 | - | - | -93.3 | -94.5 | -93.3 | -93.3 |
| | | | -96.0[4] | -99.0[4] | -97.2[4] | -97.2[4] | | | -96.0[4] | -97.2[4] | -96.0[4] | -96.0[4] |
| CA_41C | -91.3 | -97.3 | -91.3 | -94.3 | -92.5 | -92.5 | -92.5 | -94.3 | -91.3 | -92.5 | -91.3 | -91.3 |
| | | | -94.0[4] | -97.0[4] | -95.2[4] | -95.2[4] | -95.2[4] | -97.0[4] | -94.0[4] | -95.2[4] | -94.0[4] | -94.0[4] |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_42C | -92 | -98 | -92 | -95 | - | - | - | - | -92 | -93.2 | -92 | -92 |
| | -94.2[4] | -100.2[4] | -94.2[4] | -97.2[4] | | | | | -94.2[4] | -95.4[4] | -94.2[4] | -94.2[4] |

Note 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5 for one uplink carrier and in subclause 6.2.5A for two u carriers.
Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as desc Annex A.5.1.1/A.5.2.1
Note 3: The signal power is specified per port
Note 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.

For the UE which supports inter-band carrier aggregation configurations the $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C shall be applied for applicable bands.

In case the UE supports more than one of the inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is $\leq$ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 7.3.3-1A, truncated to one decimal place that would apply for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL (i.e. bands listed in Table 7.3A.0-0a), then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied
- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 7.3.3-1A that would apply for that operating band among the supported CA configurations

The reference receive sensitivity (REFSENS) requirement for intra-band specified in Table 7.3A.1.5-1 shall be met for each uplink CA configurations less than or equal to that specified in Table 7.3A.1.5-2.

NOTE: Table 7.3A.1.5-2 does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors.

**Table 7.3A.1.5-2: Intra-band CA uplink configuration for reference sensitivity**

| **CA configuration / CC combination / NRB_agg / Duplex mode** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CA configuration** | **100RB+25RB** | | **100RB+50RB** | | **75RB+75RB** | | **75RB+50RB** | | **100RB+75RB** | | **100RB+100RB** | | **Duplex Mode** |
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA_1C | N/A | N/A | N/A | N/A | 75 | 54 | N/A | N/A | N/A | N/A | 100 | 30 | FDD |
| CA_3C | 50 | 0 | 50 | 0 | N/A | N/A | N/A | N/A | 50 | 0 | 50 | 0 | FDD |
| CA_7C | N/A | N/A | N/A | N/A | 75 | 0 | 75 | 0 | N/A | N/A | 75 | 0 | FDD |
| CA_38C | N/A | N/A | N/A | N/A | 75 | 75 | N/A | N/A | N/A | N/A | 100 | 100 | TDD |
| CA_39C | 100 | 25 | 100 | 50 | N/A | N/A | N/A | N/A | 100 | 75 | N/A | N/A | TDD |
| CA_40C | N/A | N/A | 100 | 50 | 75 | 75 | N/A | N/A | 100 | 75 | 100 | 100 | TDD |
| CA_41C | 100 | 25 | 100 | 50 | 75 | 75 | 75 | 50 | 100 | 75 | 100 | 100 | TDD |
| CA_42C | 100 | 25 | 100 | 50 | N/A | N/A | N/A | N/A | 100 | 75 | 100 | 100 | TDD |

Note 1: The carrier centre frequency of SCC in the UL operating band is configured closer to the DL operating band.
Note 2: The transmitted power over both PCC and SCC shall be set to $P_{UMAX}$ as defined in subclause 6.2.5 for one uplink carrier and in subclause 6.2.5A for two uplink carriers.
Note 3: The UL resource blocks in both PCC and SCC shall be confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2A-1).
Note 4: The UL resource blocks in PCC shall be located as close as possible to the downlink operating band, while the UL resource blocks in SCC shall be located as far as possible from the downlink operating band.
Note 5: In case a CA configuration consists of CC channel bandwidths which are unequal in bandwidth the PCC channel bandwidth shall be the larger one for reference sensitivity test.

## 7.3A.2 Reference sensitivity level for CA (intra-band contiguous DL CA without UL CA)

### 7.3A.2.1 Test purpose

Same as in clause 7.3A.1.1.

### 7.3A.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA. This test case applies only for CA Configurations that do not support UL CA.

### 7.3A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3A.0.

### 7.3A.2.4 Test description

#### 7.3A.2.4.1 Initial conditions

Same as in clause 7.3A.1.4.1 with the following exceptions:

- Instead of Table 7.3A.1.4.1-1→ use Table 7.3A.2.4.1-1.

**Table 7.3A.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | | | B: Low range, High range<br>C: Low range, High range (Note 4) | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$<br>(Notes 3, 4) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | **UL Allocation** | | | | | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | QPSK | 6+25 | QPSK | 6 | P_6@0 | - | - | - |
| 15 | 50 | QPSK | 15+50 | QPSK | 15 | P_15@0 | - | - | - |
| 25 | 25 | QPSK | 25+25 | QPSK | 20 | P_20@0 | - | - | - |
| 25 | 25 | QPSK | 25+25 | QPSK | 25 | P_25@0 | - | - | - |
| 25 | 50 | QPSK | 25+50 | QPSK | 20 | P_20@0 | - | - | - |
| 25 | 100 | QPSK | 25+100 | QPSK | 25 | P_25@0 | - | - | - |
| 50 | 25 | QPSK | 50+25 | QPSK | 25 | P_25@25 | - | - | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 25 | P_25@25 | - | - | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 50 | P_50@0 | - | - | - |
| 50 | 75 | QPSK | 50+75 | QPSK | 50 | P_50@0 | - | - | - |
| 75 | 25 | QPSK | 75+25 | QPSK | 75 | P_75@0 | - | - | - |
| 75 | 50 | QPSK | 75+50 | QPSK | 75 | P_75@0 | - | - | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 75 | P_75@0 | - | - | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 50 | P_50@50 | - | - | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 100 | P_100@0 | - | - | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 75 | P_75@25 | - | - | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 100 | P_100@0 | - | - | - |
| 100 | 75 | QPSK | 100+75 | QPSK | 100 | P_100@0 | - | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 50 | P_50@50 | - | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 75 | P_75@25 | - | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 100 | P_100@0 | - | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |
| Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3.3-2 for UE supporting one uplink carrier is tested per Test CA configuration. | | | | | | | | | |
| Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | | |
| Note 4: For CA_70C all test frequency IDs shall be tested according to table 4.3.1.1.70A-1, in TS 36.508 [7]. | | | | | | | | | |

## 7.3A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.3A.1.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.3A.2.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.3A.2.4.1-1 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCC to the appropriate REFSENS value defined in Tables 7.3A.1.5-1 to 7.3A.1.5-7. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the Throughput measurement.

7. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.3A.2.4.3 Message contents

Same as in clause 7.3A.1.4.3.

## 7.3A.2.5 Test requirement

Same as in clause 7.3A.1.5 with the following test requirement defined in Table 7.3A.2.5-1 additions.

**Table 7.3A.2.5-1: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band contiguous DL CA without UL CA**

| CA Configuration | 25RB+6RB | | 25RB+15RB | | 25RB+25RB | | 50RB+6RB | | 50RB+15RB | | Duplex Mode |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25RB | 6RB | 25RB | 15RB | 25RB | 25RB | 50RB | 6RB | 50RB | 15RB | |
| CA_27B | -97.3 | -102.5 | -97.3 | -99.5 | -97.3 | -97.3 | -94.3 | -102.5 | -94.3 | -99.5 | FDD |

Note 1: The transmitter shall be set to $P_{UMAX}$ as defined in clause 6.2.5
Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
Note 3: The signal power is specified per port

**Table 7.3A.2.5-2: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band contiguous DL CA without UL CA (table 2)**

| CA Configuration | 50RB+50RB | | 25RB+75RB | | | | | | | | Duplex Mode |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50RB | 50RB | 25RB | 75RB | | | | | | | |
| CA_23B | -96.3 | -96.3 | -99.3 | -94.5 | | | | | | | FDD |

Note 1: The transmitter shall be set to $P_{UMAX}$ as defined in clause 6.2.5
Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
Note 3: The signal power is specified per port

**Table 7.3A.2.5-3: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band contiguous DL CA without UL CA (table 3)**

| Configuration / CC combination / $N_{RB_agg}$ / Duplex mode | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA configuration | 100RB+25RB | | 100RB+50RB | | 75RB+75RB | | 75RB+50RB | | 100RB+75RB | | 100RB+100RB | | Duplex Mode |
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | |
| CA_2C | -91.3 | -97.3 | -91.3 | -94.3 | -92.5 | -92.5 | -92.5 | -94.3 | -91.3 | -92.5 | -91.3 | -91.3 | FDD |
| | -94[4] | -100[4] | -94[4] | -97[4] | -95.2[4] | -95.2[4] | -95.2[4] | -97[4] | -94[4] | -95.2[4] | -94[4] | -94[4] | |
| CA_66C | -92.8 | -98.8 | -92.8 | -95.8 | -94 | -94 | -94 | -95.8 | -92.8 | -94 | -92.8 | -92.8 | FDD |
| | -95.5[4] | -101.5[4] | -95.5[4] | -98.5[4] | -96.7[4] | -96.7[4] | -96.7[4] | -98.5[4] | -95.5[4] | -96.7[4] | -95.5[4] | -95.5[4] | |

Note 1: The transmitter shall be set to $P_{UMAX}$ as defined in clause 6.2.5
Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
Note 3: The signal power is specified per port
Note 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.

**Table 7.3A.2.5-4: Intra-band CA without UL CA uplink configuration for reference sensitivity (table 4)**

| CA configuration / CC combination / $N_{RB_agg}$ / Duplex mode | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Uplink CA configuration | 100RB+25RB | | 100RB+50RB | | 75RB+75RB | | 75RB+50RB | | 100RB+75RB | | 100RB+100RB | | Duplex Mode |
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | |
| CA_66C (NOTE 7) | 100 | N/A | 100 | N/A | 75 | N/A | 75 | N/A | 100 | N/A | 100 | N/A | FDD |

NOTE 1: The carrier centre frequency of SCC in the UL operating band is configured closer to the DL operating band.
NOTE 2: The transmitted power over both PCC and SCC shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 3: The UL resource blocks in both PCC and SCC shall be confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).
NOTE 4: The UL resource blocks in PCC shall be located as close as possible to the downlink operating band, while the UL resource blocks in SCC shall be located as far as possible from the downlink operating band.
NOTE 5: In case a CA configuration consists of CC channel bandwidths which are unequal in bandwidth the PCC channel bandwidth shall be the larger one for reference sensitivity test.
NOTE 6: Void.
NOTE 7: The PCC is contained within 1710-1780 MHz.

**Table 7.3A.2.5-5: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band contiguous DL CA without UL CA (table 5)**

| Configuration / CC combination / $N_{RB_agg}$ / Duplex mode | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CA configuration | 75RB+25RB | | 50RB+50RB | | 50RB+25RB | | 25RB+25RB | | Duplex Mode |
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | |
| CA_66B | -94 | -98.8 | -95.8 | -95.8 | -95.8 | -98.8 | -98.8 | -98.8 | FDD |
| | -96.7[4] | -101.5[4] | -98.5[4] | -98.5[4] | -98.5[4] | -101.5[4] | -101.5[4] | -101.5[4] | |

Note 1: The transmitter shall be set to $P_{UMAX}$ as defined in clause 6.2.5A
Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
Note 3: The signal power is specified per port
Note 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.

**Table 7.3A.2.5-6: Intra-band CA without UL CA uplink configuration for reference sensitivity (table 6)**

| Configuration / CC combination / $N_{RB_agg}$ / Duplex mode | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Uplink CA configuration | 75RB+25RB | | 50RB+50RB | | 50RB+25RB | | 25RB+25RB | | Duplex Mode |
| | PCC | SCC | PCC | SCC | PCC | SCC | PCC | SCC | |
| CA_66B (NOTE 7) | 75 | N/A | 50 | N/A | 50 | N/A | 25 | N/A | FDD |

NOTE 1: The carrier centre frequency of SCC in the UL operating band is configured closer to the DL operating band.
NOTE 2: The transmitted power over both PCC and SCC shall be set to PUMAX as defined in subclause 6.2.5A.
NOTE 3: The UL resource blocks in both PCC and SCC shall be confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).
NOTE 4: The UL resource blocks in PCC shall be located as close as possible to the downlink operating band, while the UL resource blocks in SCC shall be located as far as possible from the downlink operating band.
NOTE 5: In case a CA configuration consists of CC channel bandwidths which are unequal in bandwidth the PCC channel bandwidth shall be the larger one for reference sensitivity test.
NOTE 6: Void.
NOTE 7: The PCC is contained within 1710-1780 MHz.

**Table 7.3A.2.5-7: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band contiguous DL CA without UL CA (table 7)**

| Configuration / CC combination / $N_{RB_agg}$ / Duplex mode | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA configuration | 25RB+100RB | | 50RB+75RB | | 75RB+50RB | | | | | | | | Duplex Mode |
| | PCC | SCC | PCC | SCC | PCC | SCC | | | | | | | |
| CA_70C | -99.3 | -93.3 | -96.3 | -94.5 | -94.5 | -96.3 | | | | | | | FDD |
| Note 1: The transmitter shall be set to $P_{UMAX}$ as defined in clause 6.2.5<br>Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1<br>Note 3: The signal power is specified per port | | | | | | | | | | | | | |

## 7.3A.3 Reference sensitivity level for CA (inter-band DL CA without UL CA)

Editor's note: Band 70 CA configurations are missing test point analysis

### 7.3A.3.1 Test purpose

Same as in clause 7.3A.1.1.

### 7.3A.3.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support inter-band DL CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 2DL CA with FDD-TDD inter-band CA.

This test case also applies to all types of E-UTRA UE release 13 and forward that support DL LAA.

### 7.3A.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3A.0.

### 7.3A.3.4 Test description

#### 7.3A.3.4.1 Initial conditions

Same as in clause 7.3A.1.4.1 with the following exceptions:

- Instead of Table 7.3A.1.4.1-1→ use Table 7.3A.3.4.1-1.
- Instead of clause 7.3A.1.4.3 use clause 7.3A.3.4.3.

**Table 7.3A.3.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2. | | | | | A: Mid range for PCC and SCC, unless otherwise specified in the Tables 7.3A.3.4.1-2 to 7.3A.3.4.1-33 | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Highest $N_{RB_agg}$, unless otherwise specified in the Tables 7.3A.3.4.1-2 to 7.3A.3.4.1-33 | |
| Network signalling value | | | | | NS_01<br><br>Unless given by Table 7.3.3.-3 for the band with active uplink carrier | |
| Test Parameters for CA Configurations | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | | **UL Allocation** | |
| **PCC NRB** | **SCCs $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | | **CC MOD** | **PCC $N_{RB_alloc}$** |
| 25 | 25 | QPSK | 25 | 25 | QPSK | 25 |
| 25 | 25 | QPSK | 25 | 25 | QPSK | 8 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 50 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 25 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 20 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 16 |
| 50 | 75 | QPSK | 50 | 75 | QPSK | 50 |
| 50 | 75 | QPSK | 50 | 75 | QPSK | 25 |
| 50 | 75 | QPSK | 50 | 75 | QPSK | 20 |
| 50 | 75 | QPSK | 50 | 75 | QPSK | 16 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 50 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 25 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 20 |
| 75 | 25 | QPSK | 75 | 25 | QPSK | 75 |
| 75 | 25 | QPSK | 75 | 25 | QPSK | 20 |
| 75 | 50 | QPSK | 75 | 50 | QPSK | 75 |
| 75 | 50 | QPSK | 75 | 50 | QPSK | 50 |
| 75 | 50 | QPSK | 75 | 50 | QPSK | 25 |
| 75 | 50 | QPSK | 75 | 50 | QPSK | 20 |
| 75 | 50 | QPSK | 75 | 50 | QPSK | 18 |
| 75 | 75 | QPSK | 75 | 75 | QPSK | 75 |
| 75 | 75 | QPSK | 75 | 75 | QPSK | 50 |
| 75 | 75 | QPSK | 75 | 75 | QPSK | 25 |
| 75 | 75 | QPSK | 75 | 75 | QPSK | 20 |
| 75 | 100 | QPSK | 75 | 100 | QPSK | 75 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 75 | 100 | QPSK | 75 | 100 | QPSK | 50 |
| 75 | 100 | QPSK | 75 | 100 | QPSK | 25 |
| 75 | 100 | QPSK | 75 | 100 | QPSK | 20 |
| 100 | 25 | QPSK | 100 | 25 | QPSK | 25 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 100 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 75 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 50 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 25 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 20 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 100 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 75 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 50 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 25 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 25 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 20 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 20 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 25 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 45 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 50 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 75 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 100 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3A.3.5-2 for UE supporting one uplink carrier is tested per Test CA configuration.

Note 3: The UL resource blocks shall be located as close as possible to the downlink PCC but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).

Note 4: The frequencies of PCC and SCC shall be switched and tested in each configuration, according to the UE declared capability for UL support (within CA operation) in the individual bands.

**Table 7.3A.3.4.1-1a: Void**

**Table 7.3A.3.4.1-2: Test frequencies and Test CC combinations for CA_1A-3A**

| CBW | | | Band 3 | | |
|---|---|---|---|---|---|
| | | | 5MHz | 15MHz | 20MHz |
| | | | High range | | |
| Band 1 as PCC (Note 1) | 20MHz | Low range | X[2] | X[2] | X[2] |
| | | Mid range | - | - | X[3] |
| Band 1 as SCC | 20MHz | Low range | - | - | X |

Note 1: For Band 1 as PCC, the exceptions described in Table 7.3A.0-0bA are tested.
Note 2: This is the case that the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. The appropriate Uplink RB allocation value according to Table 7.3A.0-0bB should be applied.
Note 3: This is the case that the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. The appropriate Uplink RB allocation value according to Table 7.3A.0-0bB should be applied.

**Table 7.3A.3.4.1-3: Test frequencies and Test CC combinations for CA_1A-11A**

| CBW | | | Band 11 | |
|---|---|---|---|---|
| | | | 10MHz | 10MHz |
| | | | Low range | High range |
| Band 1 | 20MHz | Low range | | X |
| | 20MHz | High range | X | |

**Table 7.3A.3.4.1-4: Test frequencies and Test CC combinations for CA_1A-18A**

| CBW | | | Band 18 | |
|---|---|---|---|---|
| | | | 10MHz | 15MHz |
| | | | Low range | Mid range |
| Band 1 | 10MHz | Low range | X | |
| | 15MHz | | X | |
| | 20MHz | | X | X |

**Table 7.3A.3.4.1-5: Test frequencies and Test CC combinations for CA_1A-19A**

| CBW | | | Band 19 | |
|---|---|---|---|---|
| | | | 10MHz | 15MHz |
| | | | High range | Mid range |
| Band 1 | 10MHz | Mid range | | X |
| | 15MHz | | X | |
| | 20MHz | | | X |

**Table 7.3A.3.4.1-6: Test frequencies and Test CC combinations for CA_1A-21A**

| CBW | | | Band 21 | |
|---|---|---|---|---|
| | | | 10MHz | 15MHz |
| | | | High range | Mid range |
| Band 1 | 15MHz | Mid range | X | X |
| | 20MHz | | - | X |

**Table 7.3A.3.4.1-7: Test frequencies and Test CC combinations for CA_1A-26A**

| CBW | | | Band 26 | |
|---|---|---|---|---|
| | | | 10MHz | 15MHz |
| | | | Low range | Low range |
| Band 1 | 10MHz | Low range | X | |
| | 15MHz | | X | |
| | 20MHz | | X | X |

**Table 7.3A.3.4.1-8: Test frequencies and Test CC combinations for CA_1A-28A**

| CBW | | | Band 28 | | |
|---|---|---|---|---|---|
| | | | 5MHz | 20MHz | |
| | | | Mid range | Low range | High range |
| Band 1 as PCC | 20MHz | Low range | - | X | - |
| | | High range | - | - | X |
| Band 1 as SCC | 5MHz | High range | X[1,2] | - | - |
| | 20MHz | Low range | - | X | - |
| | | High range | - | - | X |

Note 1: For Band 1 as SCC the exceptions described in Table 7.3A.0-0a are tested. For this purpose the test frequencies are selected to fulfil the equation in Table 7.3A.0-0a Note 6.

Note 2: Band 28:$f_{UL}$ = 722.5 MHz ($N_{UL}$ = 27405), $f_{DL}$ = 777.5 MHz ($N_{DL}$ = 9405)
Band 1:$f_{DL}$ = 2167.5 MHz ($N_{DL}$ = 575)

**Table 7.3A.3.4.1-9: Test frequencies and Test CC combinations for CA_1A-41A**

| CBW | | | Band 41 as SCC |
|---|---|---|---|
| | | | 20MHz |
| | | | Mid range |
| Band 1 as PCC | 20MHz | Low range | X |
| | 20MHz | High range | X |

**Table 7.3A.3.4.1-10: Test frequencies and Test CC combinations for CA_2A-13A**

| CBW | | | Band 13 |
|---|---|---|---|
| | | | 10MHz |
| | | | Mid range |
| Band 2 | 10MHz | Low range | X |
| | 15 MHz | Mid range | X |
| | 20 MHz | High range | X |

**Table 7.3A.3.4.1-10a: Test frequencies and Test CC combinations for CA_2A-71A**

| CBW | | | Band 71 as PCC | | | | | Band 71 as SCC | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5MHz | 10MHz | 20MHz | 20MHz | 20MHz | 20MHz | |
| | | | Low range | | | | Mid range | Mid range | High range |
| Band 2 as SCC | 5MHz | High range | X[1] | | | | | | |
| | 10MHz | | | X[1] | | | | | |
| | 15MHz | | | | X[1] | | | | |
| | 20MHz | | | | | X[1] | | | |
| | 20MHz | Mid range | | | | | X | | |
| Band 2 as PCC | 20MHz | High range | | | | | | X[2,3] | |
| | | Low range | | | | | | | X |

Note 1: For Band 2 as SCC the exceptions described in Table 7.3A.0-0a Note 36 and Note 37 are tested.
Note 2: For Band 71 as SCC the exception described in for Table 7.3A.0-0a Note 15 are tested. For this purpose the test frequencies for Band 71 are selected to fulfil the equation in Table 7.3A.0-0a Note 16.
Note 3: Band 71:$f_{UL}$ = 679.3 MHz ($N_{UL}$ = 133285), $f_{DL}$ = 633.3 MHz ($N_{DL}$ = 68749)

**Table 7.3A.3.4.1-10b: Test frequencies and Test CC combinations for CA_2A-71A BCS1**

| CBW | | | Band 71 as PCC | | | Band 71 as SCC | |
|---|---|---|---|---|---|---|---|
| | | | 5MHz | 10MHz | 10MHz | 10MHz | |
| | | | Low range | | Mid range | Mid range | High range |
| Band 2 as SCC | 5MHz | High range | X[1] | | | | |
| | 10MHz | | | X[1] | | | |
| | | Mid range | | | X | | |
| Band 2 as PCC | 10MHz | High range | | | | X[2,3] | |
| | | Low range | | | | | X |

Note 1: For Band 2 as SCC the exceptions described in Table 7.3A.0-0a Note 36 and Note 37 are tested.
Note 2: For Band 71 as SCC the exception described in for Table 7.3A.0-0a Note 15 are tested. For this purpose the test frequencies for Band 71 are selected to fulfil the equation in Table 7.3A.0-0a Note 16.
Note 3: Band 71:fUL = 681 MHz (NUL = 133302), fDL = 635 MHz (NDL = 68766)

**Table 7.3A.3.4.1-11: Test frequencies and Test CC combinations for CA_3A-8A**

| CBW | | | Band 8 | |
|---|---|---|---|---|
| | | | 5 MHz | 10 MHz |
| | | | High range | |
| Band 3 | 10MHz | Mid range | - | X |
| | 15MHz | | X | - |
| | 20MHz | | X | X |

**Table 7.3A.3.4.1-11a: Test frequencies and Test CC combinations for CA_3A-11A**

| CBW | | | Band 11 |
|---|---|---|---|
| | | | 10MHz |
| | | | Low range |
| Band 3 | 15MHz | Mid range | X[1] |
| Note 1: Band 3: $f_{UL}$ = 1757.4MHz ($N_{UL}$ = 19674), $f_{DL}$ = 1852.4MHz ($N_{DL}$ = 1674)<br>Band 11: $f_{UL}$ = 1432.9MHz ($N_{UL}$ = 22800), $f_{DL}$ = 1480.9MHz ($N_{DL}$ = 4800) | | | |

**Table 7.3A.3.4.1-12: Test frequencies and Test CC combinations for CA_3A-18A**

| CBW | | | Band 18 | |
|---|---|---|---|---|
| | | | 10MHz | 15MHz |
| | | | Low range | Mid range |
| Band 3 | 20MHz | Low range | X | X |

**Table 7.3A.3.4.1-13: Test frequencies and Test CC combinations for CA_3A-19A**

| CBW | | | Band 19 | |
|---|---|---|---|---|
| | | | 10MHz | 15MHz |
| | | | High range | Mid range |
| Band 3 | 15MHz | High range | X | X |
| | 20MHz | | X | X |

**Table 7.3A.3.4.1-14: Test frequencies and Test CC combinations for CA_3A-26A**

| CBW | | | Band 26 | |
|---|---|---|---|---|
| | | | 10MHz | 15MHz |
| | | | Low range | |
| Band 3 | 10MHz | Mid range | X | - |
| | 15MHz | | X | - |
| | 20MHz | | X | X |

**Table 7.3A.3.4.1-15: Test frequencies and Test CC combinations for CA_3A-27A**

| CBW | | | Band 27 |
|---|---|---|---|
| | | | 10MHz |
| | | | High range |
| Band 3 | 10MHz | Mid range | X |
| | 15MHz | | X |
| | 20MHz | | X |

**Table 7.3A.3.4.1-16: Test frequencies and Test CC combinations for CA_3A-28A**

| CBW | | | Band 28 | |
|---|---|---|---|---|
| | | | 20MHz | |
| | | | Low range | High range |
| Band 3 | 20MHz | Low range | X | - |
| | | High range | - | X |

**Table 7.3A.3.4.1-16a: Test frequencies and Test CC combinations for CA_3A-69A**

| CBW | | | Band 69 (SCC only) |
|---|---|---|---|
| | | | 20MHz |
| | | | Mid range |
| Band 3 (PCC) | 20MHz | Mid range | X |

**Table 7.3A.3.4.1-17: Test frequencies and Test CC combinations for CA_3A-42A**

| CBW | | | Band 42 | | |
|---|---|---|---|---|---|
| | | | 20MHz | | |
| | | | Low range | Mid range | High range |
| Band 3 as PCC (Note 1) | 20MHz | Low range | X[2] | - | - |
| | | High range | - | X[3] | - |
| Band 3 as SCC | 20MHz | Mid range | X | - | X |

Note 1: For Band 3 as PCC, the exceptions described in Table 7.3A.0-0a are tested. For this purpose the test frequencies are selected to fulfil the equation in Table 7.3A.0-0a Note 10 or Note 11.

Note 2: Test point fulfils the equation in Note 10 in Table 7.3A.0-0a.
Band 3: $f_{UL}$ = 1720MHz ($N_{UL}$ = 19300), $f_{DL}$ = 1815MHz ($N_{DL}$ = 1300)
Band 42: $f_{UL/DL}$ = 3440MHz ($N_{UL/DL}$ = 41990)

Note 3: Test point fulfils the equation in Note 11 in Table 7.3A.0-0a.
Band 3: $f_{UL}$ = 1775MHz ($N_{UL}$ = 19850), $f_{DL}$ = 1870MHz ($N_{DL}$ = 1850)
Band 42: $f_{UL/DL}$ = 3520MHz ($N_{DL}$ = 42790)

**Table 7.3A.3.4.1-18: Test frequencies and Test CC combinations for CA_4A-5A**

| CBW | | | Band 5 | | |
|---|---|---|---|---|---|
| | | | 10 MHz | | |
| | | | Low range | Mid range | High range |
| Band 4 | 10MHz | Mid range | X | X | X |

**Table 7.3A.3.4.1-19: Test frequencies and Test CC combinations for CA_4A-13A**

| CBW | | | Band 13 |
|---|---|---|---|
| | | | 10MHz |
| | | | Mid range |
| Band 4 | 10MHz | Low range | X |
| | 15 MHz | Mid range | X |
| | 20 MHz | High range | X |

**Table 7.3A.3.4.1-20: Test frequencies and Test CC combinations for CA_4A-17A**

| CBW | | | Band 17 | | |
|---|---|---|---|---|---|
| | | | 10MHz | | |
| | | | Low range | Mid range | High range |
| Band 4 as PCC | 10 MHz | Mid range | X | - | X |
| Band 4 as SCC (Note 1) | 10MHz | Low range | X[2] | - | - |
| | | Mid range | - | X[3] | - |
| | | High range | - | - | X[4] |

Note 1: For Band 4 as SCC the exceptions described in Table 7.3A.0-0a are tested. For this purpose the test frequencies are selected to fulfil the equation in Table 7.3A.0-0a Note 6.

Note 2: Band 17: $f_{UL}$ = 709.1 MHz ($N_{UL}$ = 23781), $f_{DL}$ = 739.1 MHz ($N_{DL}$ = 5781)
Band 4: $f_{DL}$ = 2127.3 MHz ($N_{DL}$ = 2123)

Note 3: Band 17: $f_{UL}$ = 710 MHz ($N_{UL}$ = 23790), $f_{DL}$ = 740 MHz ($N_{DL}$ = 5790)
Band 4: $f_{DL}$ = 2130 MHz ($N_{DL}$ = 2150)

Note 4: Band 17: $f_{UL}$ = 710.9 MHz ($N_{UL}$ = 23799), $f_{DL}$ = 740.9 MHz ($N_{DL}$ = 5799)
Band 4: $f_{DL}$ = 2132.7 MHz ($N_{DL}$ = 2177)

**Table 7.3A.3.4.1-20.0: Test frequencies and Test CC combinations for CA_4A-28A**

| CBW | | | Band 28 | |
|---|---|---|---|---|
| | | | 20MHz | |
| | | | Low range | Mid range |
| Band 4 as PCC | 20MHz | Mid range | - | X |
| Band 4 as SCC | 20MHz | Mid range | X[1,2] | X |

Note 1: For Band 4 as SCC the exceptions described in Table 7.3A.0-0a are tested. For this purpose the test frequencies are selected to fulfil the equation in Table 7.3A.0-0a Note 6.

Note 2: Band 28: $f_{UL}$ = 713 MHz ($N_{UL}$ = 27310), $f_{DL}$ = 768 MHz ($N_{DL}$ = 9310)
Band 4: $f_{DL}$ = 2139 MHz ($N_{DL}$ = 2240)

**Table 7.3A.3.4.1-20a: Test frequencies and Test CC combinations for CA_7A-8A**

| CBW | | | Band 8 | |
|---|---|---|---|---|
| | | | 10MHz | |
| | | | Low range | Mid range |
| Band 7 as PCC | 20MHz | Mid range | - | X |
| Band 7 as SCC | 20MHz | Mid range | X[1,2] | X |

Note 1: For Band 7 as SCC the exceptions described in Table 7.3A.0-0a are tested. For this purpose the test frequencies are selected to fulfil the equation in Table 7.3A.0-0a Note 6.

Note 2: Band 8: $f_{UL}$ = 885 MHz ($N_{UL}$ = 21500), $f_{DL}$ = 930 MHz ($N_{DL}$ = 3500)
Band 7: $f_{DL}$ = 2655 MHz ($N_{DL}$ = 3100)

**Table 7.3A.3.4.1-21: Test frequencies and Test CC combinations for CA_7A-28A**

| CBW | | | Band 28 | |
|---|---|---|---|---|
| | | | 10MHz | 15MHz |
| | | | High range | Mid range |
| Band 7 | 15MHz | High range | | X |
| | 20MHz | Mid range | X | X |

**Table 7.3A.3.4.1-22: Test frequencies and Test CC combinations for CA_8A-11A**

| CBW | | | Band 11 |
|---|---|---|---|
| | | | 10MHz |
| | | | Low range |
| Band 8 | 10MHz | High range | X |

**Table 7.3A.3.4.1-22a: Test frequencies and Test CC combinations for CA_8A-28A**

| CBW | | | Band 28 | |
|---|---|---|---|---|
| | | | 20MHz | |
| | | | Low range | High range |
| Band 8 as PCC | 10MHz | Low range | X | X |
| | | High range | X | X |

**Table 7.3A.3.4.1-23: Test frequencies and Test CC combinations for CA_8A-42A**

| CBW | | | Band 42 | | |
|---|---|---|---|---|---|
| | | | 20MHz | | |
| | | | Low range | Mid range | High range |
| Band 8 as PCC | 5MHz | Mid range | - | X | X[1,2] |
| | 10MHz | Low range | X | - | - |
| | | High range | - | - | X |
| Band 8 as SCC | 10MHz | Mid range | - | X | - |

Note 1: For Band 8 as PCC, the exceptions described in Table 7.3A.0-0a are tested. For this purpose the test frequencies are selected to fulfil the equation in Table 7.3A.0-0a Note 12 or Note 13.

Note 2: Test point fulfils the equation in Note 12 and 13 in Table 7.3A.0-0a.
Band 8: $f_{UL}$ = 897.5MHz ($N_{UL}$ = 21625), $f_{DL}$ = 942.5MHz ($N_{DL}$ = 3625)
Band 42: $f_{UL/DL}$ = 3590MHz ($N_{UL/DL}$ = 43490)

**Table 7.3A.3.4.1-24: Test frequencies and Test CC combinations for CA_11A-18A**

| CBW | | | Band 18 | |
|---|---|---|---|---|
| | | | 10MHz | 15MHz |
| | | | Low range | Mid range |
| Band 11 | 10MHz | High range | X | X |

**Table 7.3A.3.4.1-24a: Test frequencies and Test CC combinations for CA_11A-28A**

| CBW | | | Band 28 | |
|---|---|---|---|---|
| | | | 10MHz | |
| | | | Mid range | High range |
| Band 11 as PCC | 10MHz | Low range | | X[2] |
| | | High range | X[3] | |
| Band 11 as SCC | 10MHz | Low range | | X[1,2] |
| | | High range | X[3] | |

Note 1: For Band 11 as SCC the exceptions described in Table 7.3A.0-0a are tested. For this purpose the test frequencies are selected to fulfil the equation in Table 7.3A.0-0a Note 10.

Note 2: Band 11: $f_{UL}$ = 1432.9 MHz ($N_{UL}$ = 22800), $f_{DL}$ = 1480.9 MHz ($N_{DL}$ = 4800)
Band 28: $f_{UL}$ = 743 MHz ($N_{UL}$ = 27610), $f_{DL}$ = 798 MHz ($N_{DL}$ = 9610)

Note 3: Band 11: $f_{UL}$ = 1442.9 MHz ($N_{UL}$ = 22900), $f_{DL}$ = 1490.9 MHz ($N_{DL}$ = 4900)
Band 28: $f_{UL}$ = 723 MHz ($N_{UL}$ = 27410), $f_{DL}$ = 778 MHz ($N_{DL}$ = 9410)

**Table 7.3A.3.4.1-24b: Test frequencies and Test CC combinations for CA_12A-66A**

| CBW | | | Band 66 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 5MHz | 10MHz | | 15MHz | | 20MHz |
| | | | Low range | Low range | Mid range | Low range | Mid range | Mid range |
| Band 12 as PCC | 5MHz | Low range | X[2] | | | | | |
| | | Mid range | | X[3] | | | | |
| | 10MHz | Mid range | | | X | | X | X |
| | | High range | | | | X[4] | | |
| Band 12 as SCC | 10MHz | Mid | | | X | | X | X |

Note 1: For Band 12 as PCC, the exceptions described in Table 7.3A.0-0a are tested. For this purpose the test frequencies are selected to fulfil the equation in Table 7.3A.0-0a Note 5 or Note 6.

Note 2: Test point fulfils the equation in Note 5 and 6 in Table 7.3A.0-0a.
Band 12: $f_{UL}$ = 704MHz ($N_{UL}$ = 23060), $f_{DL}$ = 734MHz ($N_{DL}$ = 5060)
Band 66: $f_{UL}$ = 1712.5MHz ($N_{UL}$ = 131997), $f_{DL}$ = 2112.5MHz ($N_{DL}$ = 66461)

Note 3: Band 12: $f_{UL}$ = 707.5MHz ($N_{UL}$ = 23095), $f_{DL}$ = 737.5MHz ($N_{DL}$ = 5095)
Band 66: $f_{UL}$ = 1720MHz ($N_{UL}$ = 132072), $f_{DL}$ = 2120MHz ($N_{DL}$ = 66536)

Note 4: Band 12: $f_{UL}$ = 711MHz ($N_{UL}$ = 23130), $f_{DL}$ = 741MHz ($N_{DL}$ = 5130)
Band 66: $f_{UL}$ = 1717.5MHz ($N_{UL}$ = 132047), $f_{DL}$ = 2117.5MHz ($N_{DL}$ = 66511)

**Table 7.3A.3.4.1-25: Test frequencies and Test CC combinations for CA_18A-28A**

| CBW | | | Band 28 | | |
|---|---|---|---|---|---|
| | | | 5MHz | 10MHz | |
| | | | High range | Mid range | High range |
| Band 18 | 10MHz | Low range | | X | |
| | 15MHz | Middle range | X | | X |

**Table 7.3A.3.4.1-25a: Test frequencies and Test CC combinations for CA_20A-42A**

| CBW | | | Band 42 | |
|---|---|---|---|---|
| | | | 20MHz | |
| | | | Low range | Mid range |
| Band 20 as PCC | 20MHz | Mid range | X | X |
| Band 20 as SCC | 20MHz | Mid range | - | X |
| Note 1: For Band 20 as PCC the exceptions described in Table 7.3A.0-0a are tested. For this purpose the test frequencies are selected to fulfil the equation in Table 7.3A.0-0a Note 12, 13. | | | | |
| Note 2: Band 20: $f_{UL}$ = 847 MHz ($N_{UL}$ = 24300), $f_{DL}$ = 806 MHz ($N_{DL}$ = 6300). Band 42: $f_{UL/DL}$ =3410 MHz ($N_{UL/DL}$ = 41690). | | | | |

**Table 7.3A.3.4.1-26: Test frequencies and Test CC combinations for CA_19A-21A**

| CBW | | | Band 21 | |
|---|---|---|---|---|
| | | | 10MHz | 15MHz |
| | | | High range | Mid range |
| Band 19 | 10MHz | High range | | X |
| | 15MHz | Mid range | X | X |

**Table 7.3A.3.4.1-27: Test frequencies and Test CC combinations for CA_26A-41A**

| CBW | | | Band 41 |
|---|---|---|---|
| | | | 20MHz |
| | | | Mid range |
| Band 26 | 10MHz | Low range | X |
| | 15MHz | | X |

**Table 7.3A.3.4.1-28: Test frequencies and Test CC combinations for CA_28A-41A**

| CBW | | | Band 41 | | |
|---|---|---|---|---|---|
| | | | 20MHz | | |
| | | | Low range | Mid range | High range |
| Band 28 | 10MHz | Low range | X | - | - |
| | | Mid range | - | X | - |
| | | High range | - | X | X |

**Table 7.3A.3.4.1-28a: Test frequencies and Test CC combinations for CA_28A-40A**

| CBW | | | Band 40 | | |
|---|---|---|---|---|---|
| | | | 20MHz | | |
| | | | Low range | Mid range | High range |
| Band 28 as PCC | 20MHz | Mid range | - | X | - |
| Band 28 as SCC | 20MHz | Low range | - | - | X |
| | | Mid range | - | - | - |
| | | High range | X | - | - |
| Note 1: B20+B40 and B28+B40 can have high MSD levels due to harmonic mixing problem in the receiver when the UL in B40 is active and these scenarios need not be tested according to RAN4 agreement. | | | | | |

**Table 7.3A.3.4.1-29: Test frequencies and Test CC combinations for CA_28A-42A**

| CBW | | | Band 42 | | | |
|---|---|---|---|---|---|---|
| | | | 5MHz | | 20MHz | |
| | | | Mid range | High range | Low range | High range |
| Band 28 as PCC | 5MHz | Low range | X[1,3] | - | - | - |
| | | Mid range | - | X[1,2] | - | - |
| | 20MHz | Low range | - | - | X | - |
| | | High range | - | - | - | X |
| Band 28 as SCC | 20MHz | Low range | - | - | X | - |
| | | High range | - | - | - | X |
| Note 1: For Band 28 as PCC the exceptions described in Table 7.3A.0-0a are tested. For this purpose the test frequencies are selected to fulfil the equation in Table 7.3A.0-0a Note 16.<br>Note 2: Band 28:$f_{UL}$ = 719.5 MHz ($N_{UL}$ = 27375), $f_{DL}$ = 774.5 MHz ($N_{DL}$ = 9375).<br>Note 3: Band 42:$f_{UL/DL}$ =3527.5 MHz ($N_{UL/DL}$ = 42865). | | | | | | |

**Table 7.3A.3.4.1-30: Test frequencies and Test CC combinations for CA_39A-41A**

| CBW | | | Band 41 |
|---|---|---|---|
| | | | 20MHz |
| | | | Mid range |
| Band 39 | 20 MHz | Low range | X |
| | | Mid range | X |
| | | High range | X |

**Table 7.3A.3.4.1-31: Test frequencies and Test CC combinations for CA_29A-66A**

| CBW | | | Band 66 | |
|---|---|---|---|---|
| | | | 20 MHz | |
| | | | Mid range | High range |
| Band 29 | 5MHz | High range | X | X |
| | 10MHz | Middle range | X | |

**Table 7.3A.3.4.1-32: Test frequencies and Test CC combinations for CA_66A-70A**

| CBW | | | Band 70 |
|---|---|---|---|
| | | | 15MHz |
| | | | Mid range |
| Band 66 | 20 MHz | Mid range | X |
| | | High range | X |

**Table 7.3A.3.4.1-33: Test frequencies and Test CC combinations for CA_70A-71A**

| CBW | | | Band 71 | | |
|---|---|---|---|---|---|
| | | | 10MHz | | |
| | | | Low range | Mid range | High range |
| Band 70 as PCC | 15MHz | Mid range | - | X | - |
| Band 70 as SCC | 15MHz | Low range | X | - | - |
| | | Mid range | - | - | X |
| | | High range | - | - | - |

## 7.3A.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.3A3.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.3A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.3A.3.4.1-1 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCC to the appropriate REFSENS value defined in Table 7.3A.3.5-1. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the Throughput measurement.

7. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.3A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions.

#### 7.3A.3.4.3.1 Message contents exceptions (network signalled value "NS_01")

Message contents according to TS 36.508 [7] subclause 4.6 can be used without exceptions.

#### 7.3A.3.4.3.2 Message contents exceptions (network signalled value "NS_06")

1. Information element additionalSpectrumEmission is set to NS_06. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3A.3.4.3.2-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_06"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 6 (NS_06) | | |

## 7.3A.3.5 Test requirement

For inter-band carrier aggregation with uplink assigned to one E-UTRA band the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.3A.3.5-1 and Table 7.3A.3.5-2 (originated from single carrier Tables 7.3.5-1 and 7.3.5-2). The reference sensitivity is defined to be met with both downlink component carriers active and either of the uplink component carriers active.

**Table 7.3A.3.5-1: Reference sensitivity QPSK $P_{REFSENS}$ for inter-band**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CA Configuration** | **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| CA_1A-3A | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[19] | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 3 (Note 6) | | | -93.3 | -90.8 | -89.3 | -88.3 | |
| CA_1A-5A | 1 | - | - | - | -96.3 | - | - | FDD |
| | | - | - | - | -99.0[19] | - | - | |
| | 5 | - | - | - | -94.3 | - | - | |
| CA_1A-7A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 7 | - | - | - | -94.3 | -92.5 | -91.3 | |
| | | - | - | - | -97.0[19] | -95.2[19] | -94.0[19] | |
| CA_1A-8A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| | 8 | - | - | -96.3 | -93.3 | - | - | |
| CA_1A-11A | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| | 11 | | | -99.3 | -96.3 | | | |
| CA_1A-18A | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| | 18 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_1A-19A | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| | 18 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_1A-20A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| | 20 | - | - | -96.3 | -93.3 | -90.5 | -89.3 | |
| | | - | - | -99.0[19] | -96.0[19] | -93.2[19] | -92.0[19] | |
| CA_1A-21A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| | 21 | - | - | -99.3 | -96.3 | -94.5 | - | |
| | | - | - | -102.0[19] | -99.0[19] | -97.2[19] | - | |
| CA_1A-26A | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| | 26 | - | - | -96.8[5] | -93.8[5] | -92[5] | - | |
| CA_1A-28A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| | 1 (Note 4) | - | - | -89.1 | -88.7 | -88.3 | -88.0 | |
| | 28 | - | - | -97.6 | -94.6 | -92.8 | -90.1 | |
| CA_1A-40A (Note 14) | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | 1 | | | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| | 40 | - | - | [-92.7] | -91.2 | -89.7 | -88.7 | TDD |
| CA_1A-40A (Note 15) | 1 | - | - | -91.0 | [-88.8] | [-87.2] | [-86.2] | FDD |
| | 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| CA_1A-41A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| | 41 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| | | - | - | -100.0[19] | -97.0[19] | -95.2[19] | -94.0[19] | |
| CA_1A-42A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| | 42 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | - | - | -100.2[19] | -97.2[19] | -95.4[19] | -94.2[19] | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_1A-46A (Note 17) | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | 1 | - | - | -102[19] | -99[19] | -97.2[19] | -96[19] | FDD |
| | 46 | - | - | - | - | - | -88.5 | TDD |
| CA_2A-4A | 2 | -102.0 | -99.0 | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | -104.7[19] | -101.7[19] | -100.0[19] | -97.0[19] | -95.2[19] | -94.0[19] | |
| | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | - | - | -102[19] | -99[19] | -97.2[19] | -96[19] | |
| CA_2A-5A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | | | -100.0[19] | -97.0[19] | -95.2[19] | -94.0[19] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| CA_2A-7A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | | | -100[19] | 97[19] | -95.2[19] | 92[19] | |
| | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100[19] | 97[19] | -95.2[19] | 92[19] | |
| CA_2A-12A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | | | -100.0[19] | -97.0[19] | -95.2[19] | -94.0[19] | |
| | 12 | - | -98 | -96.3 | -93.3 | - | - | |
| CA_2A-13A | 2 | - | - | - | -94.3 | -92.5 | -91.3 | FDD |
| | | | | | -97.0[19] | -95.2[19] | -94.0[19] | |
| | 13 | - | - | - | -93.3 | - | - | |
| CA_2A-14A | 2 | - | - | - | -94.3 | -92.5 | -91.3 | FDD |
| | | | | | -97.0[19] | -95.2[19] | -94.0[19] | |
| | 14 | - | - | -96.3 | -93.3 | - | - | |
| CA_2A-17A | 2 | - | - | -97.3 | -94.3 | - | - | FDD |
| | | - | - | -100.0[19] | -97.0[19] | - | - | |
| | 17 | - | - | -96.3 | -93.3 | - | - | |
| CA_2A-29A | 2 | - | - | -97.3 | -94.3 | - | - | FDD |
| | | - | - | -100.0[19] | -97.0[19] | - | - | |
| | 29 | - | -98 | -96.3 | -93.3 | - | - | |
| CA_2A-30A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | | | -100[19] | 97[19] | -95.2[19] | 92[19] | |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_2A-46A (Note 17) | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | 2 | - | - | -100[19] | -97[19] | -95.2[19] | -94[19] | FDD |
| | 46 | - | - | - | - | - | -88.5 | TDD |
| CA_2A-66A | 2 | -101.7 | -98.7 | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | -104.4[19] | -101.4[19] | -100.0[19] | -97.0[19] | -95.2[19] | -94.0[19] | |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[19] | -98.5[19] | -96.7[19] | -95.5[19] | |
| CA_2A-71A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | | | -100[19] | 97[19] | -95.2[19] | 92[19] | |
| | 71 | - | - | -99.2 | -96.2 | -94.0 | -89.5 | |
| CA_2A-71A[X1] | 2 | - | - | -92.4 | -93.0 | -91.5 | -90.4 | FDD |
| | 71 | - | - | -99.2 | -96.2 | -94.0 | -89.5 | |
| CA_2A-71A[X2] | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100[19] | 97[19] | -95.2[19] | 92[19] | |
| | 71 | - | - | -69.7 | -69.7 | -69.7 | -69.7 | |
| CA_3A-5A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 5 | - | -99.5 | -97.3 | -94.3 | - | - | |
| CA_3A-7A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 7 | - | - | - | -94.3 | -92.5 | -91.3 | |
| | | - | - | - | -97.0[19] | -95.2[19] | -94.0[19] | |
| CA_3A-8A | 3 | - | - | - | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | - | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 8 | - | - | -96.3 | -93.3 | - | - | |
| CA_3A-11A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 11 | - | - | -99.3 | -96.3 | - | - | |
| CA_3A-18A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 18 | - | - | -99.3 | -96.3 | -94.5 | - | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_3A-19A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 19 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_3A-20A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 20 | - | - | -96.3 | -93.3 | - | - | |
| | | - | - | -99.0[19] | -96.0[19] | - | - | |
| CA_3A-26A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 26 | - | - | -96.8[5] | -93.8[5] | -92[5] | - | |
| CA_3A-27A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 27 | - | - | -97.3 | -94.3 | - | - | |
| CA_3A-28A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 28 | - | - | -97.8 | -94.8 | -93 | -90.3 | |
| CA_3A-38A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | 38 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| CA_3A-40A (Note 12) | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 40 | - | - | -94.7 | -92.2 | -90.6 | -89.5 | TDD |
| CA_3A-40A (Note 15) | 3 | - | - | -93.5 | -90.5 | -88.8 | -87.6 | FDD |
| | 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| CA_3A-41A (Note 11) | 3 | - | - | [-93.3] | [-90.3] | [-88.5] | [-87.2] | FDD |
| | 41 | - | - | -96.8[10] | -93.8[10] | -92[10] | -90.8[10] | TDD |
| | | - | - | -99.5[10,19] | -96.5[10,19] | -94.7[10,19] | -93.5[10,19] | |
| CA_3A-41A (Note 12) | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 41 | - | - | [-92.6][10] | [-90][10] | [-88.5][10] | [-87.4][10] | TDD |
| CA_3A-42A | 3 | - | - | -96.1 | -93.1 | -91.3 | -90.1 | FDD |
| | | - | - | -98.8[19] | -95.8[19] | -94.0[19] | -92.8[19] | |
| | 42 | - | - | -98 | -95 | -93.2 | -92 | |
| | | - | - | -100.2[19] | -97.2[19] | -95.4[19] | -94.2[19] | |
| | 42 (Note 7) | - | - | -70.7 | -70.7 | -70.7 | -70.7 | TDD |
| | 42 (Note 8) | - | - | -96.1 | -93.7 | -92.2 | -91.5 | |
| CA_3A-46A (Note 17) | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -94.2[19] | -93.0[19] | |
| | 46 | - | - | - | - | - | -88.5 | TDD |
| CA_3A-69A | 3 | | | - | - | - | -90.3 | FDD |
| | | | | - | - | - | -93.019 | |
| | 69 | | | - | - | - | -93.7 | |
| CA_4A-5A | 4 | - | - | -99.3 | -96.3 | - | - | FDD |
| | | - | - | -102[19] | -99[19] | - | - | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| CA_4A-7A | 4 | - | - | -99.3 | -96.3 | - | - | FDD |
| | | - | - | -102[19] | -99[19] | - | - | |
| | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100.0[19] | -97.0[19] | -95.2[19] | -94.0[19] | |
| CA_4A-12A | 4 | -104 | -101 | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | -106.7[19] | -103.7[19] | -102[19] | -99[19] | -97.2[19] | -96[19] | |
| | 4 (Note 4) | -88.5 | -88.5 | -89.3 | -88.8 | -88.3 | -87.8 | |
| | | -91.2[19] | -91.2[19] | -92[19] | -91.5[19] | -91[19] | -90.5[19] | |
| | 12 | - | - | -96.3 | -93.3 | - | - | |
| CA_4A-13A | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102[19] | -99[19] | -97.2[19] | -96[19] | |
| | 13 | - | - | - | -93.3 | - | - | |
| CA_4A-17A | 4 | - | - | -99.3 | -96.3 | - | - | FDD |
| | | - | - | -102[19] | -99[19] | - | - | |
| | 4 (Note 4) | - | - | [-89.3] | [-88.8] | - | - | |
| | | - | - | [-92][19] | [-91.5][19] | - | - | |

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|---|---|---|---|---|---|---|---|---|
| | 17 | - | - | -96.3 | -93.3 | - | - | |
| CA_4A-27A | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102[19] | -99[19] | -97.2[19] | -96[19] | |
| | 27 | - | -99.5 | -97.3 | -94.3 | - | - | |
| CA_4A-28A | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102[19] | -99[19] | -97.2[19] | -96[19] | |
| | 4 (Note 4) | - | - | -89.1 | -88.7 | -88.3 | -88 | |
| | | - | - | -91.8[19] | -91.4[19] | -91[19] | -90.7[19] | |
| | 28 | - | - | -97.6 | -94.6 | -92.8 | -90.1 | |
| CA_4A-29A | 4 | - | - | -99.3 | -96.3 | - | - | FDD |
| | | - | - | -102[19] | -99[19] | - | - | |
| | 29 | - | -98 | -96.3 | -93.3 | - | - | |
| CA_4A-46A (Note 17) | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102[19] | -96[19] | -97.2[19] | -96[19] | |
| | 46 | - | - | - | - | - | -88.5 | TDD |
| CA_4A-71A | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102[19] | -99[19] | -97.2[19] | -96[19] | |
| | 71 | - | - | -99.2 | -96.2 | -94.0 | -89.5 | |
| CA_5A-7A | 5 | -102.5 | -99.5 | -97.3 | -94.3 | - | - | FDD |
| | 7 | - | - | - | -94.3 | -92.5 | -91.3 | |
| | | - | - | - | -97.0[19] | -95.2[19] | -94.0[19] | |
| CA_5A-12A | 5 | | | -97.3 | -94.3 | | | FDD |
| | 12 | | | -96.3 | -93.3 | | | |
| CA_5A-13A | 5 | - | - | -97.3 | -94.3 | - | - | FDD |
| | 13 | - | - | - | -93.3 | - | - | |
| CA_5A-25A | 5 | - | - | -97.3 | -94.3 | - | - | FDD |
| | 25 | - | - | -95.8 | -92.8 | -91 | -89.8 | |
| | | - | - | -98.5[19] | -95.5[19] | -93.7[19] | -92.5[19] | |
| CA_5A-30A | 5 | - | - | -97.3 | -94.3 | - | - | FDD |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_5A-46A (Note 17) | 5 | - | - | -97.3 | -94.3 | - | - | FDD |
| | 46 | - | - | - | -91.5 | - | -88.5 | TDD |
| CA_5A-66A | 5 | - | - | -97.3 | -94.3 | - | - | FDD |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[19] | -98.5[19] | -96.7[19] | -95.5[19] | |
| CA_7A-8A | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[19] | -97.0[19] | -95.2[19] | -94.0[19] | |
| | 7 (Note 4) | - | - | -87.3 | -86.7 | -86.3 | -86.0 | |
| | 8 | - | -98.5 | -96.3 | -93.3 | - | - | |
| CA_7A-20A | 7 | - | - | - | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | - | -97.0[19] | -95.2[19] | -94.0[19] | |
| | 20 | - | - | -96.3 | -93.3 | - | - | |
| | | - | - | -99.0[19] | -96.0[19] | - | - | |
| CA_7A-28A | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[19] | -97.0[19] | -95.2[19] | -94.0[19] | |
| | 28 | - | - | -98.5 | -95.5 | -93.7 | - | |
| CA_7A-42A (Note 21) | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[19] | -97.0[19] | -95.2[19] | -94.0[19] | |
| | 42 | - | - | -94.6 | -92 | -90.5 | -89.4 | TDD |
| CA_7A-42A (Note 22) | 7 | - | - | -95.5 | -92.5 | -90.8 | -89.6 | FDD |
| | 42 | - | - | -97.5 | -94.5 | -92.7 | -91.5 | TDD |
| | | - | - | -99.7[19] | -96.7[19] | -94.9[19] | -93.7[19] | |
| CA_7A-46A (Note 17) | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | 7 | - | - | -100[19] | -97[19] | -95.2[19] | -94[19] | FDD |
| | 46 | - | - | - | - | - | -88.5 | TDD |
| CA_8A-11A | 8 | | | -96.3 | -93.3 | | | FDD |
| | 11 | | | -99.3 | -96.3 | | | |
| CA_8A-27A | 8 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 27 | - | - | -97.3 | -94.3 | - | - | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_8A-28A (Note 23) | 8 | - | -98.5 | -96.3 | -93.3 | - | - | FDD |
| | 28 | - | - | -97.8 | -94.8 | -93 | -90.3 | |
| CA_8A-40A | 8 | - | -98.5 | -96.3 | -93.3 | - | | FDD |
| | 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| | | - | - | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| CA_8A-42A | 8 | -101.3 | -98.3 | -96.1 | -93.1 | - | - | FDD |
| | 42 (Note 16) | - | - | -83.8 | -83.7 | -83.6 | -83.5 | TDD |
| | 42 | - | - | -98 | -95 | -93.2 | -92 | |
| | | - | - | -100.2[19] | -97.2[19] | -95.4[19] | -94.2[19] | |
| CA_8A-46A (Note 17) | 8 | -101.5 | 98.5 | -96.3 | -93.3 | - | - | FDD |
| | 46 | - | - | - | - | - | -88.5 | TDD |
| CA_11A-18A | 11 | - | - | -99.3 | -96.3 | - | - | FDD |
| | 18 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_11A-28A | 11 | - | - | -99.3 | -96.3 | - | - | FDD |
| | 11 (Note 7) | - | - | -74.5 | -74.5 | - | - | |
| | 28 | - | - | -97.6 | -94.6 | -92.8 | -91.6 | |
| CA_11A-46A (Note 17) | 11 | - | - | -99.3 | -96.3 | - | - | FDD |
| | 46 | - | - | - | - | - | -88.5 | TDD |
| CA_12A-25A | 12 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 25 | - | - | -95.8 | -92.8 | -91 | -89.8 | |
| | | - | - | -98.5[19] | -95.5[19] | -93.7[19] | -92.5[19] | |
| CA_12A-66A | 12 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -93.5 | |
| | | - | - | -101.5[19] | -98.5[19] | -96.7[19] | -96.2[19] | |
| CA_12A-30A | 12 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_13A-46A (Note17) | 13 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 46 | - | - | - | - | - | -88.5 | TDD |
| CA_13A-66A | 13 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[19] | -98.5[19] | -96.7[19] | -95.5[19] | |
| CA_14A-30A | 14 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_14A-66A | 14 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -93.5 | |
| | | - | - | -101.5[19] | -98.5[19] | -96.7[19] | -95.5[19] | |
| CA_18A-28A | 18 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| | 28 | - | - | -97.8 | -94.8 | - | - | |
| CA_19A-21A | 19 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| | 21 | - | - | -99.3 | -96.3 | -94.5 | - | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_19A-28A | 19 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| | 28 | - | - | -97.8 | -94.8 | - | - | |
| | 28 (Note 9) | - | - | -93.3 | -91.3 | - | - | |
| CA_19A-42A | 19 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| | 42 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | - | - | -100.2[19] | -97.2[19] | -95.4[19] | -94.2[19] | |
| CA_19A-46A (Note 17) | 19 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| | 46 | - | - | - | - | - | -88.5 | TDD |
| CA_20A-31A | 20 | - | - | -96.3 | -93.3 | -90.5 | -89.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -93.2[19] | -92.0[19] | |
| | 31 | - | -95.0 | -92.8 | - | - | - | |
| CA_20A-32A | 20 | - | - | -96.3 | -93.3 | - | - | FDD |
| | | - | - | -99.0[19] | -96.0[19] | - | - | |
| | 32 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | |
| CA_20A-42A | 20 | | | -96.3 | -93.3 | -90.5 | -89.3 | FDD |
| | | | | -99.0[19] | -96.0[19] | -93.2[19] | -92.0[19] | |
| | 42 (Note 16) | - | - | -83.8 | -83.7 | -83.6 | -83.5 | TDD |
| | 42 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | |
| | | - | - | -100.2[19] | -97.2[19] | -95.4[19] | -94.2[19] | |
| CA_20A-67A | 20 | | | -96.3 | -93.3 | -90.5 | -89.3 | FDD |
| | | - | - | -99.0[19] | -96.0[19] | -93.2[19] | -92.0[19] | |
| | 67 | | | -99.3 | -96.3 | -94.5 | -93.3 | |
| CA_21A-42A | 21 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| | | - | - | -102.0[19] | -99.0[19] | -97.2[19] | - | |
| | 42 | - | - | -98 | -95 | -93.2 | -92 | TDD |
| | | - | - | -100.2[19] | -97.2[19] | -95.4[19] | -94.2[19] | |
| CA_21A-46A (Note 17) | 21 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| | 46 | - | - | - | - | - | -88.5 | TDD |
| CA_23A-29A | 23 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | 29 | | -98 | -96.3 | -93.3 | | | |
| CA_26A-41A | 26 | - | - | -96.8[5] | -93.8[5] | -92[5] | | FDD |
| | 41 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| | | - | - | -100.0[19] | -97.0[19] | -95.2[19] | -94.0[19] | |
| CA_28A-40A (Note 20) | 28 | - | - | -97.8 | -94.8 | -93 | -90.3 | FDD |
| | 40 | - | - | -94.4 | -92.2 | -90.7 | -89.8 | TDD |
| CA_26A-46A (Note 17) | 26 | - | -99 | -96.8[5] | -93.8[5] | - | - | FDD |
| | 46 | - | - | - | - | - | -88.5 | TDD |
| CA_28A-40A (Note 15) | 28 | - | - | -96.1 | -93.4 | -91.8 | -89.1 | FDD |
| | 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| CA_28A-41A | 28 | - | - | -97.8 | -94.8 | - | - | FDD |
| | 41 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| | | - | - | -100.0[19] | -97.0[19] | -95.2[19] | -94.0[19] | |
| CA_28A-42A | 28 | - | - | -97.6 | -94.6 | -92.8 | -91.6 | FDD |
| | 42 | - | - | -98 | -95 | -93.2 | -92 | TDD |
| | 42 (Note13) | - | - | -84.7 | -84.4 | -84.1 | -83.9 | TDD |
| CA_28A-46A (Note 17) | 28 | - | - | -97.8 | -94.8 | -93 | -90.3 | FDD |
| | 46 | - | - | - | -91.5 | - | -88.5 | TDD |
| CA_29A-66A | 29 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | - | - | -101.5[19] | -98.5[19] | -96.7[19] | -95.5[19] | |
| CA_29A-70A | 29 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 70 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_30A-66A | 30 | - | - | -98.3 | -95.3 | - | - | FDD |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | - | - | -101.5[19] | -98.5[19] | -96.7[19] | -95.5[19] | |
| CA_39A-41A | 39 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| | | - | - | -102.0[19] | -99.0[19] | -97.2[19] | -96.0[19] | |
| | 41 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100.0[19] | -97.0[19] | -95.2[19] | -94.0[19] | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_39A-46A (Note 17) | 39 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| | 46 | - | - | - | - | - | -88.5 | |
| CA_40A-46A (Note 17) | 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| | 46 | - | - | - | -91.5 | - | -88.5 | |
| CA_41A-42A | 41 | - | - | - | -93.9 | -92.1 | -90.9 | TDD |
| | 42 | - | - | - | -94.8 | -93.0 | -91.8 | |
| CA_41A-46A (Note 17) | 41 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| | 41 | - | - | -100[19] | -97[19] | -95.2[19] | -94[19] | |
| | 46 | - | - | - | - | - | -88.5 | |
| CA_42A-46A (Note 17) | 42 | - | - | -98 | -95 | -93.2 | -92 | TDD |
| | 42 (Note 19) | - | - | -99.7 | -96.7 | -94.9 | -93.7 | |
| | 46 | - | - | - | - | - | -81.5 | |
| CA_46A-66A | 46 | - | - | - | - | - | -88.5 | TDD |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | FDD |
| | | - | - | -101.5[19] | -98.5[19] | -96.7[19] | -95.5[19] | |
| CA_46A-70A | 46 | - | - | - | - | - | -88.5 | TDD |
| | 70 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| CA_66A-70A | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | FDD |
| | | - | - | -101.5[19] | -98.5[19] | -96.7[19] | -95.5[19] | |
| | 70 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_66A-71A | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | FDD |
| | | - | - | -101.5[19] | -98.5[19] | -96.7[19] | -95.5[19] | |
| | 71 | - | - | -96.5 | -93.5 | -91.3 | -86.8 | |
| CA_70A-71A | 70 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| | | - | - | -89.3[4] | -88.8[4] | -88.5[4] | - | |
| | 71 | - | - | -96.5 | -93.5 | -91.3 | -86.8 | |

Note 1: The transmitter shall be set to maximum output power level (Table 7.3A.3.5-2)

Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.3.1.

Note 3: The signal power is specified per port

Note 4: Reference sensitivity for the high band for which the 3rd harmonic of the low band is within transmission bandwidth, as specified Note 5 in Table 7.3A.0-0a.

Note 5: [5] indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.

Note 6: Reference sensitivity for the case that the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz

Note 7: Reference sensitivity for the high band for which the 2nd harmonic of the low band is within transmission bandwidth, as specified Note 9 and 10 in Table 7.3A.0-0a.

Note 8: Reference sensitivity for the high band for which the 2nd harmonic of the low band is within transmission bandwidth, as specified Note 11 in Table 7.3A.0-0a.

Note 9: These requirements apply when the uplink is active in Band 19 and the downlink channels in Band 28 are allocated at the middle of the restricted frequency range specified for this CA configuration (Table 5.2A-2). For each channel bandwidth in Band 28, the requirement applies regardless of channel bandwidth in Band 19.

Note 10: The B41 requirements are modified by -0.5dB when carrier frequency of the assigned E-UTRA channel bandwidth is within 2545-2690 MHz.

Note 11: These requirements apply when the uplink is active in Band 41.

Note 12: These requirements apply when the uplink is active in Band 3.

Note 13: Reference sensitivity for the high band for which the 5th harmonic of the low band is within transmission bandwidth, as specified Note 15 and 16 in Table 7.3A.0-0a.

Note 14: These requirements apply when the uplink is active in Band 1.

Note 15: These requirements apply when the uplink is active in Band 40.

Note 16: Reference sensitivity for the high band for which the 4th harmonic of the low band is within transmission bandwidth, as specified Note 12 and 13 in Table 7.3A.0-0a.

Note 17: The requirements do not apply when there is at least one individual RE within the uplink transmission bandwidth of the lower band for which the transmitter harmonic is within the downlink transmission bandwidth of the higher band and a range $\Delta F_{HD}$ from lower and higher frequency of the uplink transmission bandwidth multiplied by the harmonic order. Negative $\Delta F_{HD}$ reduces the REFSENS exclusion range while positive $\Delta F_{HD}$ extends the range. $\Delta F_{HD}$ = [30] MHz for the E-UTRA configuration which has 2nd harmonic issue. $\Delta F_{HD}$ = 15 MHz for the E-UTRA configuration which has 3rd harmonic issue. $\Delta F_{HD}$ = [10] MHz for the E-UTRA configuration which has 4th harmonic issue. $\Delta F_{HD}$ = [-20] MHz for the E-UTRA configuration which has 6th harmonic issue. $\Delta F_{HD}$ = [-30] MHz for the E-UTRA configuration which has 7th harmonic issue. $\Delta F_{HD}$ = [-40] MHz for the E-UTRA configuration which has for 8th harmonic issue. For band combinations including more than one licensed band with band 46,

the value $\Delta F_{HD}$ depends on which licensed band is used for uplink transmission.

Note 18: The value $\Delta F_{HD}$ in Note 17 shall be scaled as $\Delta F_{HD}$ *($N_{RB}$/100) according to the uplink configuration defined in Table 7.3A.3.5-2.

Note 19: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.

Note 20: These requirements apply when the uplink is active in Band 28.

Note 21: These requirements apply when the uplink is active in Band 7.

Note 22: These requirements apply when the uplink is active in Band 42.

Note 23: These requirements apply when the uplink is active in Band 8.

Note 24: These requirements apply when the lower edge frequency of the 5 MHz uplink channel in Band 71 is located at or below 668 MHz and the downlink channel in Band 2 is located with its upper edge at 1990 MHz. These requirements also apply when the lower edge frequency of the 10 MHz, 15 MHz, or 20 MHz uplink channel in Band 71 is located at or below 668 MHz and the downlink channel in Band 2 is located with its upper edge at 1990 MHz.

Note 25: These requirements apply when there is at least one individual RE within the downlink transmission bandwidth of the victim (lower) band for which the 3rd harmonic is within the uplink transmission bandwidth or the uplink adjacent channel's transmission bandwidth of an aggressor (higher) band.

For the UE which supports inter-band carrier aggregation configurations the $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C shall be applied for applicable bands.

In case the UE supports more than one of the inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 7.3.3-1A, truncated to one decimal place that would apply for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL (i.e. bands listed in Table 7.3A.0-0a), then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 7.3.3-1A that would apply for that operating band among the supported CA configurations

The reference receive sensitivity (REFSENS) requirement for inter-band specified in Table 7.3A.3.5-1 shall be met for an uplink CA configurations than or equal to that specified in Table 7.3A.3.5-2.

NOTE: Table 7.3A.3.5-2 does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors.

**Table 7.3A.3.5-2: Inter-band CA uplink configuration for reference sensitivity, $L_{CRB}$ @ $RB_{start}$ format**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CA Configuration** | **E-UTRA Band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Duplex Mode** |
| CA_1A-3A | 1 | - | - | 25@0[5] | 25@0[5] | 25@0[5] | 25@0[5] | FDD |
| | 1 | | | 25@0[6] | 45@0[6] | 45@0[6] | 45@0[6] | |
| | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | |
| CA_1A-5A | 1 | - | - | - | 50@0 | - | - | FDD |
| | 5 | - | - | - | 25@25 | - | - | |
| CA_1A-7A | 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 7 | - | - | - | 50@0 | 75@0 | 75@25 | |
| CA_1A-8A | 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 8 | - | - | 25@0 | 25@25 | - | - | |
| CA_1A-11A | 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 11 | - | - | 25@0 | 25@25 | - | - | |
| CA_1A-18A | 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 18 | - | - | 25@0 | 25@25 | 25@50 | - | |
| CA_1A-19A | 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 19 | - | - | 25@0 | 25@25 | 25@50 | - | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_1A-20A | 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 20 | - | - | 25@0 | 20@0 | 20@11 | 20@16 | |
| CA_1A-21A | 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 21 | - | - | 25@0 | 25@25 | 25@50 | - | |
| CA_1A-26A | 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 26 | - | - | 25@0 | 25@25 | 25@50 | - | |
| CA_1A-28A | 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 28 | - | - | 25@0 | 25@25 | 25@50 | 25@75 | |
| | 28 | | | 8@9[2] | 16@17[2] | 25@24[2] | 25@38[2] | |
| CA_1A-40A | 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 40 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| CA_1A-41A | 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 41 | - | - | - | - | - | - | TDD |
| CA_1A-42A | 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 42 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| CA_1A-46A | 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 46 | - | - | - | - | - | - | TDD |
| CA_2A-4A | 2 | 6@0 | 15@0 | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 4 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | |
| CA_2A-5A | 2 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 5 | - | - | 25@0 | 25@25 | - | - | |
| CA_2A-7A | 2 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 7 | - | - | 25@0 | 50@0 | 75@0 | 75@25 | |
| CA_2A-12A | 2 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 12 | - | 15@0 | 20@5 | 20@30 | - | - | |
| CA_2A-13A | 2 | - | - | - | 50@0 | 50@25 | 50@50 | FDD |
| | 13 | - | - | - | 20@0 | - | - | |
| CA_2A-17A | 2 | - | - | 25@0 | 50@0 | - | - | FDD |
| | 17 | - | - | 20@5 | 20@30 | - | - | |
| CA_2A-28A | 2 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 28 | - | - | 25@0 | 25@25 | 25@50 | 25@75 | |
| CA_2A-29A | 2 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 29 | - | - | - | - | - | - | |
| CA_2A-30A | 2 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 30 | - | - | 25@0 | 25@25 | - | - | |
| CA_2A-46A | 2 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 46 | - | - | - | - | - | - | TDD |
| CA_2A-66A | 2 | 6@0 | 15@0 | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 66 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | |
| CA_2A-71A | 2 | - | - | 25@0 | 50@0 | 50@0 | 50@0 | FDD |
| | 71 | - | - | 25@0 | 25@12 | 20@27 | 20@40 | |
| CA_3A-5A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 5 | - | 15@0 | 25@0 | 25@25 | - | - | |
| CA_3A-7A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 7 | - | - | - | 50@0 | 75@0 | 75@25 | |
| CA_3A-8A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 8 | - | - | 25@0 | 25@25 | - | - | |
| CA_3A-11A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 11 | - | - | 25@0 | 25@25 | - | - | |
| CA_3A-18A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 18 | - | - | 25@0 | 25@25 | 25@50 | - | |
| CA_3A-19A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 19 | - | - | 25@0 | 25@25 | 25@50 | - | |
| CA_3A-20A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 20 | - | - | 25@0 | 20@0 | - | - | |
| CA_3A-26A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 26 | - | - | 25@0 | 25@25 | 25@50 | - | |
| CA_3A-27A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 27 | - | - | 25@0 | 25@25 | - | - | |
| CA_3A-28A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 28 | - | - | 25@0 | 25@25 | 25@50 | 25@75 | |
| CA_3A-38A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 38 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| CA_3A-40A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 40 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_3A-41A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 41 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| CA_3A-42A | 3 | - | - | 12@7[9] | 25@13[9] | 36@20[9] | 50@25[9] | FDD |
| | 42 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| CA_3A-46A | 3 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| | 46 | - | - | - | - | - | - | TDD |
| CA_4A-5A | 4 | - | - | 25@0 | 50@0 | - | - | FDD |
| | 5 | - | - | 25@0 | 25@25 | - | - | |
| CA_4A-7A | 4 | - | - | 25@0 | 50@0 | - | - | FDD |
| | 7 | - | - | 25@0 | 50@0 | 75@0 | 75@25 | |
| CA_4A-12A | 4 | 6@0 | 15@0 | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 12 | - | - | 20@5 | 20@30 | - | - | |
| | 12 | 2@2[2] | 5@5[2] | 8@9[2] | 16@17[2] | - | - | |
| CA_4A-13A | 4 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 13 | - | - | - | 20@0 | - | - | |
| CA_4A-17A | 4 | - | - | 25@0 | 50@0 | - | - | FDD |
| | 17 | - | - | 20@5 | 20@30 | - | - | |
| | 17 | - | - | 8@9[2] | 16@17[2] | - | - | |
| CA_4A-27A | 4 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 27 | - | 15@0 | 25@0 | 25@25 | - | - | |
| CA_4A-28A | 4 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 28 | - | - | 25@0 | 25@25 | 25@50 | 25@75 | |
| | 28 | - | - | 8@9[2] | 16@17[2] | 25@24[2] | 25@38[2] | |
| CA_4A-29A | 4 | - | - | 25@0 | 50@0 | - | - | FDD |
| | 29 | - | - | - | - | - | - | |
| CA_4A-46A | 4 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 46 | - | - | - | - | - | - | TDD |
| CA_5A-7A | 5 | 6@0 | 15@0 | 25@0 | 25@25 | - | - | FDD |
| | 7 | - | - | - | 50@0 | 75@0 | 75@25 | |
| CA_5A-12A | 5 | - | - | 25@0 | 25@25 | - | * | FDD |
| | 12 | - | - | 20@5 | 20@30 | - | - | |
| CA_5A-13A | 5 | - | - | 25@0 | 25@25 | - | - | FDD |
| | 13 | - | - | - | 20@0 | - | - | |
| CA_5A-25A | 5 | - | - | 25@0 | 25@25 | - | - | FDD |
| | 25 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | |
| CA_5A-30A | 5 | - | - | 25@0 | 25@25 | - | - | FDD |
| | 30 | - | - | 25@0 | 25@25 | - | - | |
| CA_5A-46A | 5 | - | - | 25@0 | 25@25 | - | - | FDD |
| | 46 | - | - | - | - | - | - | TDD |
| CA_5A-66A | 5 | - | - | 25@0 | 25@25 | - | - | FDD |
| | 66 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | |
| CA_7A-8A | 7 | - | - | 25@0 | 50@0 | 75@0 | 75@25 | FDD |
| | 8 | - | 15@0 | 25@0 | 25@25 | - | - | |
| | 8[2,10] | - | - | - | 8@21, 16@17, 25@12, | - | - | |
| CA_7A-20A | 7 | - | - | - | 50@0 | 75@0 | 75@25 | FDD |
| | 20 | - | - | 25@0 | 20@0 | - | - | |
| CA_7A-46A | 7 | - | - | 25@0 | 50@0 | 75@0 | 75@25 | FDD |
| | 46 | - | - | - | - | - | - | TDD |
| CA_7A-28A | 7 | - | - | 25@0 | 50@0 | 75@0 | 75@25 | FDD |
| | 28 | - | - | 25@0 | 25@25 | 25@50 | - | |
| CA_7A-42A | 7 | - | - | 25@0 | 50@0 | 75@0 | 75@25 | FDD |
| | 42 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| CA_8A-11A | 8 | - | - | 25@0 | 25@25 | - | - | FDD |
| | 11 | - | - | 25@0 | 25@25 | - | - | |
| CA_8A-27A | 8 | - | - | 25@0 | 25@25 | - | - | FDD |
| | 27 | - | - | 25@0 | 25@25 | - | - | |
| CA_8A-28A | 8 | - | 15@0 | 25@0 | 25@0 | - | - | FDD |
| | 28 | - | - | - | - | - | - | |
| CA_8A-40A | 8 | - | 15@0 | 25@0 | 25@25 | - | - | FDD |
| | 40 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_8A-42A | 8 | 6@0 | 15@0 | 25@0 | 25@25 | | | FDD |
| | 42 | | | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| CA_8A-46A | 8 | 6@0 | 15@0 | 25@0 | 25@25 | - | - | FDD |
| | 46 | - | - | - | - | - | - | TDD |
| CA_11A-18A | 11 | - | - | 25@0 | 25@25 | - | - | FDD |
| | 18 | - | - | 25@0 | 25@25 | 25@50 | - | |
| CA_11A-28A | 11 | - | - | 25@0 | 25@25 | | | FDD |
| | 28 | | | 25@0 | 25@25 | 25@50 | 25@75 | |
| | 28[9] | - | - | 12@12 | 25@0 | - | - | |
| CA_11A-46A | 11 | - | - | 25@0 | 25@25 | - | - | FDD |
| | 46 | - | - | - | - | - | - | TDD |
| CA_12A-25A | 12 | - | - | 20@5 | 20@30 | - | - | FDD |
| | 25 | - | - | 25@0 | 50@0 | 50@25 | 50@50 | |
| CA_12A-30A | 12 | - | - | 20@5 | 20@30 | - | - | FDD |
| | 30 | - | - | 25@0 | 25@25 | - | - | |
| CA_12A-66A | 12 | - | - | 20@5 | 20@30 | - | - | FDD |
| | 66 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | |
| CA_13A-46A | 13 | - | - | 20@0 | 20@0 | - | - | FDD |
| | 46 | - | - | - | - | - | - | TDD |
| CA_13A-66A | 13 | - | - | 20@0 | 20@0 | - | - | FDD |
| | 66 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | |
| CA_18A-28A | 18 | - | - | 25@0 | 25@25 | 25@50 | - | FDD |
| | 28 | - | - | 25@0 | 25@25 | - | - | |
| CA_19A-21A | 19 | - | - | 25@0 | 25@25 | 25@50 | - | FDD |
| | 21 | - | - | 25@0 | 25@25 | 25@50 | - | |
| CA_19A-28A | 19 | - | - | 18@0 | 18@0 | 18@0 | - | FDD |
| | 28 | - | - | 25@0 | 25@50 | - | - | |
| CA_19A-42A | 19 | - | - | 25@0 | 25@25 | 25@50 | - | FDD |
| | 42 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| CA_19A-46A | 19 | - | - | 25@0 | 25@25 | 25@50 | - | FDD |
| | 46 | - | - | - | - | - | - | TDD |
| CA_20A-31A | 20 | - | - | 25@0 | 20@0 | 20@11 | 20@16 | FDD |
| | 31 | - | 5@9 | 5@10 | - | - | - | |
| CA_20A-32A | 20 | - | - | 25@0 | 20@0 | | | FDD |
| | 32 | - | - | N/A | N/A | N/A | N/A | |
| CA_20A-42A | 20 | - | - | 25@0 | 20@0 | 20@11 | 20@16 | FDD |
| | 20[10,11] | | | | | | 8@46<br>16@42<br>25@37 | FDD |
| | 42 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| CA_21A-46A | 21 | - | - | 25@0 | 25@25 | 25@50 | - | FDD |
| | 46 | - | - | - | - | - | - | TDD |
| CA_20A-67A | 20 | - | - | 25@0 | 20@0 | 20@11 | 20@16 | FDD |
| | 67 | - | - | N/A | N/A | N/A | N/A | |
| CA_21A-42A | 21 | - | - | 25@0 | 25@25 | 25@50 | - | FDD |
| | 42 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| CA_23A-29A | 23 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 29 | - | - | - | - | - | - | |
| CA_26A-41A | 26 | - | - | 25@0 | 25@25 | 25@50 | - | FDD |
| | 41 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| CA_26A_46A | 26 | - | 15@0 | 25@0 | 25@25 | - | - | FDD |
| | 46 | - | - | - | - | - | - | TDD |
| CA_28A-40A | 28 | - | - | 25@0 | 25@25 | 25@50 | 25@75 | FDD |
| | 40 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| CA_28A-41A | 28 | - | - | 25@0 | 25@25 | - | - | FDD |
| | 41 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| CA_28A-42A | 28 | - | - | 25@0 | 25@25 | 25@50 | 25@75 | FDD |
| | 42 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_28A-46A | 28 | - | - | 25@0 | 25@25 | 25@50 | 25@75 | FDD |
| | 46 | - | - | - | - | - | - | TDD |
| CA_29A-66A | 29 | - | - | - | - | - | - | FDD |
| | 66 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | |
| CA_29A-70A | 29 | - | - | - | - | - | - | FDD |
| | 70 | - | - | 25@0 | 50@0 | 75@0 | - | |
| CA_30A-66A | 30 | - | - | 25@0 | 25@25 | - | - | FDD |
| | 66 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | |
| CA_39A-41A | 39 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| | 41 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | |
| CA_39A-46A | 39 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| | 46 | - | - | - | - | - | - | |
| CA_40A-46A | 40 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| | 46 | - | - | - | - | - | - | |
| CA_41A-42A | 41 | - | - | - | 50@0 | 75@0 | 100@0 | TDD |
| | 42 | - | - | - | 50@0 | 75@0 | 100@0 | |
| CA_41A-46A | 41 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| | 46 | - | - | - | - | - | - | |
| CA_42A-46A | 42 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| | 46 | - | - | - | - | - | - | |
| CA_46A-66A | 46 | - | - | - | - | - | - | TDD |
| | 66 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| CA_46A-70A | 46 | - | - | - | - | - | - | TDD |
| | 70 | - | - | 25@0 | 50@0 | 75@0 | - | FDD |
| CA_66A-70A | 66 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 70 | - | - | 25@0 | 50@0 | 75@0 | - | |
| CA_66A-71A | 66 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| | 71 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | |
| CA_70A-71A | 70 | - | - | 25@0 | 50@0 | 75@0 | - | FDD |
| | 71 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | |
| | 71 | - | - | 8@12[2] | 16@12[2] | 20@12[2] | - | |

Note 1: Void
Note 2: Configuration for the low band for which the 3rd harmonic is within transmission bandwidth of the high band, as specified in Table 7.3A.0-0a Note 5.
Note 3: Void
Note 4: Void
Note 5: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz.
Note 6: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz.
Note 7: Void
Note 8: Void
Note 9: Configuration for the low band for which the 2nd harmonic is within transmission bandwidth of the high band, as specified in Table 7.3A.0-0a Note 9 or Note 11.
Note 10: This configuration is used for testing the 3rd harmonic or 4th harmonic interfered high band only. It is for low band with multiple choices of RB number corresponding to different high band bandwidth as indicated in Table 7.3A.0-0aa: Uplink configuration for the low band (exceptions). Only one bandwidth option was used for simplicity.
Note 11: Configuration for the low band for which the 4th harmonic is within transmission bandwidth of the high band, as specified in Table 7.3A.0-0a Note 12 and 13.

## 7.3A.4 Reference sensitivity level for CA (intra-band non-contiguous DL CA without UL CA)

### 7.3A.4.1 Test purpose

Same as in clause 7.3A.1.1.

### 7.3A.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA but no UL CA.

### 7.3A.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3A.0.

### 7.3A.4.4 Test description

#### 7.3A.4.4.1 Initial conditions

Same as in clause 7.3A.1.4.1 with the following exceptions:

- Instead of Table 7.3A.1.4.1-1→ use Table 7.3A.4.4.1-1.
- Instead of clause 7.3A.1.4.3 use clause 7.3A.3.4.3.

**Table 7.3A.4.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2. | | | | A: N/A (Range is not relevant) | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration. | | | | Refer to test point | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | **$W_{gap}$ [MHz]** | **DL Allocation** | | **UL Allocation** | |
| | **PCC $N_{RB}$** | **SCCs $N_{RB}$** | | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **PCC RB allocation ($L_{CRB}$ @ $RB_{start}$)** |
| **Test Parameters for CA_2A-2A Configurations** | | | | | | | |
| 1[5] | 100 | 25 | 35 | QPSK | 100+25 | QPSK | P_16@57 |
| 2[6] | 100 | 25 | 35 | QPSK | 100+25 | QPSK | P_16@39 |
| 3 | 100 | 100 | 20 | QPSK | 100+100 | QPSK | P_16@57 |
| **Test Parameters for CA_3A-3A Configurations** | | | | | | | |
| 1[10] | 100 | 25 | 50 | QPSK | 100+25 | QPSK | P_16@50 |
| 2[10] | 100 | 25 | 15 | QPSK | 100+25 | QPSK | P_32@68 |
| 3[10] | 100 | 100 | 35 | QPSK | 100+100 | QPSK | P_16@50 |
| 4[10] | 100 | 50 | 45 | QPSK | 100+50 | QPSK | P_16@50 |
| 5[10] | 100 | 50 | 10 | QPSK | 100+50 | QPSK | P_32@68 |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | |
| 1[4] | 50 | 25 | 30 | QPSK | 50+25 | QPSK | P_50@0 |
| 2[4] | 50 | 50 | 25 | QPSK | 50+50 | QPSK | P_50@0 |
| 3[3] | 100 | 25 | 20 | QPSK | 100+25 | QPSK | P_100@0 |
| 4[3] | 100 | 100 | 5 | QPSK | 100+100 | QPSK | P_100@0 |
| **Test Parameters for CA_5A-5A Configurations** | | | | | | | |
| 1 | 50 | 25 | 10 | QPSK | 50+25 | QPSK | P_12@38 |
| 2 | 50 | 50 | 5 | QPSK | 50+50 | QPSK | P_12@38 |
| **Test Parameters for CA_7A-7A Configurations** | | | | | | | |
| 1[11] | 100 | 75 | 35 | QPSK | 100+75 | QPSK | P_36@64 |
| 2[11] | 100 | 75 | 15 | QPSK | 100+75 | QPSK | P_50@50 |
| 3[11] | 100 | 100 | 30 | QPSK | 100+100 | QPSK | P_32@68 |
| 4[11] | 100 | 100 | 15 | QPSK | 100+100 | QPSK | P_45@55 |
| 5[11] | 100 | 25 | 45 | QPSK | 100+25 | QPSK | P_32@68 |
| 6[11] | 100 | 25 | 25 | QPSK | 100+25 | QPSK | P_45@55 |
| 7[11] | 100 | 50 | 40 | QPSK | 100+50 | QPSK | P_32@68 |
| 8[11] | 100 | 50 | 20 | QPSK | 100+50 | QPSK | P_45@55 |
| 9[11] | 50 | 100 | 40 | QPSK | 50+100 | QPSK | P_32@18 |
| 10[11] | 50 | 100 | 15 | QPSK | 50+100 | QPSK | P_50@0 |
| 11[11] | 50 | 25 | 55 | QPSK | 50+25 | QPSK | P_32@18 |
| 12[11] | 50 | 25 | 30 | QPSK | 50+25 | QPSK | P_50@0 |
| **Test Parameters for CA_23A-23A Configurations** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 50 | 25 | 5 | QPSK | 50+25 | QPSK | P_50@0 |
| **Test Parameters for CA_25A-25A Configurations** | | | | | | | |
| 1[3] | 50 | 25 | 50 | QPSK | 50+25 | QPSK | P_10@33 |
| 2[3] | 50 | 25 | 15 | QPSK | 50+25 | QPSK | P_32@18 |
| 3[3] | 50 | 50 | 45 | QPSK | 50+50 | QPSK | P_10@33 |
| 4[3] | 50 | 50 | 10 | QPSK | 50+50 | QPSK | P_32@18 |
| 5[4] | 100 | 25 | 40 | QPSK | 100+25 | QPSK | P_12@62 |
| 6[4] | 100 | 100 | 25 | QPSK | 100+100 | QPSK | P_12@62 |
| **Test Parameters for CA_41A-41A Configurations** | | | | | | | |
| 1[4] | 100 | 25 | 169 | QPSK | 100+25 | QPSK | P_100@0 |
| 2[3] | 100 | 50 | 164 | QPSK | 100+50 | QPSK | P_100@0 |
| 3 | 100 | 100 | 154 | QPSK | 100+100 | QPSK | P_100@0 |
| **Test Parameters for CA_42A-42A Configurations** | | | | | | | |
| 1 | 100 | 25 | 175 | QPSK | 100+25 | QPSK | P_100@0 |
| 2 | 100 | 100 | 160 | QPSK | 100+100 | QPSK | P_100@0 |
| **Test Parameters for CA_66A-66A Configurations** | | | | | | | |
| 1 | 100 | 25 | 65 | QPSK | 100+25 | QPSK | P_100@0 |
| 2 | 100 | 100 | 50 | QPSK | 100+100 | QPSK | P_100@0 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.
Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band.
Note 3: Applicable if only Bandwidth Combination Set 0 is supported by the UE for the CA Configuration.
Note 4: Not applicable if only Bandwidth Combination Set 0 is supported by the UE for the CA Configuration.
Note 5: Not applicable if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
Note 6: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
Note 7: Applicable if only Bandwidth Combination Set 1 is supported by the UE for the CA Configuration.
Note 8: Void
Note 9: Void
Note 10: Applicable test configuratons are specified in Table 7.3A.4.4.1-1a.
Note 11: Applicable test configurations are specified in Table 7.3A.4.4.1-1b.

**Table 7.3A.4.4.1-1a: Test Configuration Applicability for CA_3A-3A**

| | Supported BCS | | |
|---|---|---|---|
| **ID** | **0** | **1** | **0,1** |
| 1 | x | x | x |
| 2 | x | x | x |
| 3 | x | - | x |
| 4 | - | x | - |
| 5 | - | x | - |

**Table 7.3A.4.4.1-1b: Test Configuration Applicability for CA_7A-7A**

| | Supported BCS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | 0 | 1 | 2 | 3 | 0,1 | 0,2 | 0,3 | 1,2 | 1,3 | 2,3 | 0,1,2 | 0,1,3 | 0,2,3 | 1,2,3 | 0,1,2,3 |
| 1 | x | - | - | - | - | x | - | - | - | - | - | - | - | - | - |
| 2 | x | - | - | - | - | x | - | - | - | - | - | - | - | - | - |
| 3 | x | x | - | x | x | x | x | x | x | x | x | x | x | x | x |
| 4 | x | x | - | x | x | x | x | x | x | x | x | x | x | x | x |
| 5 | - | x | - | - | x | - | - | x | x | - | x | x | - | x | x |
| 6 | - | x | - | - | x | - | - | x | x | - | x | x | - | x | x |
| 7 | - | - | - | x | - | - | x | - | - | x | - | - | x | - | - |
| 8 | - | - | - | x | - | - | x | - | - | x | - | - | x | - | - |
| 9 | - | - | x | - | - | - | - | - | - | - | - | - | - | - | - |
| 10 | - | - | x | - | - | - | - | - | - | - | - | - | - | - | - |
| 11 | - | - | x | - | - | - | - | - | - | - | - | - | - | - | - |
| 12 | - | - | x | - | - | - | - | - | - | - | - | - | - | - | - |

### 7.3A.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.3A4.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.3A.4.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.3A.4.4.1-1 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
6. Set the Downlink signal level for PCC and SCC to the appropriate REFSENS value defined in Table 7.3A.4.5-1. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the Throughput measurement.
7. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.3A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions.

#### 7.3A.4.4.3.1 Message contents exceptions (network signalled value "NS_01")

Message contents according to TS 36.508 [7] subclause 4.6 can be used without exceptions.

#### 7.3A.4.4.3.2 Message contents exceptions (network signalled value "NS_03")

1. Information element additionalSpectrumEmission is set to NS_03. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3A.4.4.3.2-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_03"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 3 (NS_03) | | |

## 7.3A.4.5 Test requirement

For intra-band non-contiguous carrier aggregation with one uplink carrier on the PCC, the throughput of each downlink component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.3.2 with parameters specified in Table 7.3A.4.5-1.

**Table 7.3A.4.5-1: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band Non-contiguous**

| ID/ CA configuration / $P_{REFSENS}$ | | | |
|---|---|---|---|
| **ID** | **CA configuration** | **PCC (dBm)** | **SCC (dBm)** |
| 1 | CA_2A-2A | -91.3 | -90.1 |
| 2 | | -94.0 | -90.1 |
| 3 | | -91.3 | -86.7 |
| | | -94.0[4] | |
| 1 | CA_3A-3A | -90.3 | -89.8 |
| | | -93.0[4] | |
| 2 | | -90.3 | -96.3 |
| | | -93.0[4] | -99.04 |
| 3 | | -90.3 | -86.2 |
| | | -93.0[4] | |
| 4 | | -90.3 | -88.2 |
| 5 | | -90.3 | -93.3 |
| 1 | CA_4A-4A | -96.3 | -99.3 |
| | | -99[4] | -102[4] |
| 2 | | -96.3 | -96.3 |
| | | -99[4] | -99[4] |
| 3 | | -93.3 | -99.3 |
| | | -96[4] | -102[4] |
| 4 | | -93.3 | -93.3 |
| | | -96[4] | -96[4] |
| 1 | CA_5A-5A | -94.3 | -91.4 |
| 2 | | -94.3 | -89.7 |
| 1 | CA_7A-7A | -91.3 | -92.5 |
| | | -94.0[4] | -95.2[4] |
| 2 | | -91.3 | -92.5 |
| | | -94.0[4] | -95.24 |
| 3 | | -91.3 | -91.3 |
| | | -94.0[4] | -94.0[4] |
| 4 | | -91.3 | -91.3 |
| | | -94.0[4] | -94.0[4] |
| 5 | | -91.3 | -97.3 |
| 6 | | -91.3 | -97.3 |
| 7 | | -91.3 | -94.3 |
| 8 | | -91.3 | -94.3 |
| 9 | | -94.3 | -91.3 |
| 10 | | -94.3 | -91.3 |
| 11 | | -94.3 | -97.3 |
| 12 | | -94.3 | -97.3 |
| 1 | CA_23A-23A | -96.3 | -99.3 |
| 1 | CA_25A-25A | -92.8 | -90.3 |
| | | -95.5[4] | -93.0[4] |
| 2 | | -92.8 | -95.8 |
| | | -95.5[4] | -98.5[4] |
| 3 | | -92.8 | -87.8 |
| | | -95.5[4] | -90.5[4] |
| 4 | | -92.8 | -92.8 |
| | | -95.5[4] | -95.5[4] |
| 5 | | -89.8 | -87.8 |
| | | -92.5[4] | -90.5[4] |

| | | | |
|---|---|---|---|
| 6 | | -89.8 | -84.1 |
| | | -92.5[4] | -86.8[4] |
| 1 | CA_41A-41A | -91.3 | -97.3 |
| | | -94.0[4] | -100.0[4] |
| 2 | | -91.3 | -94.3 |
| | | -94.0[4] | -97.0[4] |
| 3 | | -91.3 | -91.3 |
| | | -94.0[4] | -94.0[4] |
| 1 | CA_42A-42A | -92 | -98 |
| | | -94.2[4] | -100.2[4] |
| 2 | | -92 | -92 |
| | | -94.2[4] | -94.2[4] |
| 1 | CA_66A-66A | -92.8 | -98.8 |
| | | -95.5[4] | -101.5[4] |
| 2 | | -92.8 | -92.8 |
| | | -95.5[4] | -95.5[4] |
| Note 1: The transmitter shall be set to maximum output power level.<br>Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.<br>Note 3: The signal power is specified per port.<br>Note 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured. | | | |

For the UE which supports inter-band carrier aggregation configurations the $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C shall be applied for applicable bands.

In case the UE supports more than one of the inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 7.3.3-1A, truncated to one decimal place that would apply for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL (i.e. bands listed in Table 7.3A.0-0a), then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 7.3.3-1A that would apply for that operating band among the supported CA configurations

The reference receive sensitivity (REFSENS) requirement for intra-band non-contiguous specified in Table 7.3A.4.5-1 shall be met for an uplink CA configurations equal to that specified in Table 7.3A.4.4.1-1.

NOTE: Table 7.3A.4.4.1-1 does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors.

**Table 7.3A.4.5-2: Void**

## 7.3A.5 Reference sensitivity level for 3DL CA

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- TR 36.905 test point analysis for CA_28A-40C is missing, meaning it is not yet determined if testing of fallback configuration CA_28A_40A can be skipped.

- Band 70 CA configurations are missing test point analysis.

### 7.3A.5.1 Test purpose

Same as in clause 7.3A.1.1.

### 7.3A.5.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 3DL with CA configurations in Table 7.1-2a.

This test case also applies to all types of E-UTRA UE release 13 and forward that support 3DL CA involving Band 46.

### 7.3A.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3A.0.

### 7.3A.5.4 Test description

#### 7.3A.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.3A.5.4.1-1 through table 7.3A.5.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.3A.5.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC $N_{RB}$” and “SCCs $N_{RB}$” columns |
| Network signalling value | NS_01 by default, exceptions listed in Table 7.3.3-3, dependent on PCC Band |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3,4) | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for a CA_XD Configuration (Intra-band contiguous)** | | | | | | | | | | | | |
| **1** | X | Low/CC1 | REFSENS | All RBs | X | Low/CC2 | N/A | All RBs | X | Low/CC3 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB_agg |
| **2** | X | Low/CC1 | REFSENS | All RBs | X | Low/CC2 | N/A | All RBs | X | Low/CC3 | N/A | All RBs |
| | QPSK | QPSK | | Lowest NRB_agg | N/A | QPSK | | Lowest NRB_agg | N/A | QPSK | | Lowest NRB_agg |
| **3** | X | High/CC1 | REFSENS | All RBs | X | High/CC2 | N/A | All RBs | X | High/CC3 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB_agg |
| **4** | X | High/CC1 | REFSENS | All RBs | X | High/CC2 | N/A | All RBs | X | High/CC3 | N/A | All RBs |
| | QPSK | QPSK | | Lowest NRB_agg | N/A | QPSK | | Lowest NRB_agg | N/A | QPSK | | Lowest NRB_agg |
| **Default Test Settings for a CA_XA-YA-ZA Configuration (Inter-band)** | | | | | | | | | | | | |
| **1** | X | Mid | REFSENS | All RBs | Y | Mid | N/A | All RBs | Z | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | All RBs | Z | Mid | N/A | All RBs | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | All RBs | Y | Mid | N/A | All RBs | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |

| Test Settings for CA_1A-3A-5A Configuration | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1**[13] | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 5 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **2**[13] | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 5 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 5 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **4** | 3 | High | 50@50 | All RBs | 1 | Low | N/A | All RBs | 5 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5** | 5 | Mid | 25@25 | All RBs | 1 | Mid | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-3A-7A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **2** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **3** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 3 | High | 50@50 | All RBs | 1 | Low | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 3 | Mid | 50@50 | All RBs | 1 | Mid | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 7 | Mid | 75@25 | All RBs | 1 | Mid | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-3A-8A Configuration** | | | | | | | | | | | | |
| **1**[13] | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **2**[13] | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **4** | 3 | High | 50@50 | All RBs | 1 | Low | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5** | 3 | Mid | 50@0 | All RBs | 1 | Mid | N/A | All RBs | 8 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 8 | High | 25@25 | All RBs | 1 | Mid | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-3A-11A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 11 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **2** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **3** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 11 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **4** | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5** | 3 | High | 50@50 | All RBs | 1 | Low | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **6**[31] | 3 | Mid | 50@25 | All RBs | 1 | High | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **7**[32] | 11 | Low | 25@25 | All RBs | 1 | High | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **8** | 11 | High | 25@25 | All RBs | 1 | Low | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Test Settings for CA_1A-3A-18A Configuration** | | | | | | | | | | | | |
| 1 | 1 | Low | 50@0 | All RBs | 3 | Low | N/A | All RBs | 18 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 2 | 1 | Low | 75@0 | All RBs | 3 | Low | N/A | All RBs | 18 | Low | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 3 | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| 4 | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| 5 | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 75 |
| 6 | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| 7 | 1 | Low | 100@0 | All RBs | 3 | Low | N/A | All RBs | 18 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 8 | 3 | High | 50@50 | All RBs | 1 | Low | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| 9 | 3 | Low | 50@50 | All RBs | 1 | Low | N/A | All RBs | 18 | Low | N/A | All RBs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 10 | 3 | Low | 50@50 | All RBs | 1 | Low | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| 11 | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 3 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 12 | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 3 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 13 | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 3 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 14 | 18 | Mid | 25@50 | All RBs | 1 | Low | N/A | All RBs | 3 | Low | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-3A-18A with UL CA Configuration** | | | | | | | | | | | | |
| 1 | 1 | NOTE X | 25@0 | All RBs | 3 | NOTE X | 25@0 | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 2 | 1 | Mid | 25@0 | All RBs | 18 | Mid | 25@0 | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 3 | 1 | Mid | 100@0 | All RBs | 18 | Mid | 25@50 | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 75 | N/A | QPSK | | 100 |
| 4 | 3 | Mid | 25@0 | All RBs | 18 | Mid | 25@0 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 5 | 3 | Mid | 50@50 | All RBs | 18 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 75 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-3A-19A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 19 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **2** | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 19 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **3**[13] | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 19 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 75 |
| **4** | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 19 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5** | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 19 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **6** | 3 | High | 50@50 | All RBs | 1 | Mid | N/A | All RBs | 19 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **7** | 3 | High | 50@50 | All RBs | 1 | Mid | N/A | All RBs | 19 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **8** | 3 | High | 50@50 | All RBs | 1 | Mid | N/A | All RBs | 19 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **9** | 3 | High | 50@50 | All RBs | 1 | Mid | N/A | All RBs | 19 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **10** | 19 | High | 25@25 | All RBs | 1 | Mid | N/A | All RBs | 3 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **11** | 19 | High | 25@25 | All RBs | 1 | Mid | N/A | All RBs | 3 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **12** | 19 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs | 3 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **13** | 19 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs | 3 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-3A-20A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 20 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **2** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 20 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **3** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 20 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 20 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 1 | Mid | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 20 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 3 | High | 50@50 | All RBs | 1 | Low | N/A | All RBs | 20 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 3 | Mid | 50@0 | All RBs | 1 | Mid | N/A | All RBs | 20 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8** | 20 | Mid | 20@16 | All RBs | 1 | Mid | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-3A-26A** | | | | | | | | | | | | |
| 1 | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| 2 | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| 3 | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| 4 | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 26 | Low | N/A | All RBs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| 5 | 1 | Low | 50@0 | All RBs | 3 | Low | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 6 | 1 | Low | 75@0 | All RBs | 3 | Low | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 7 | 3 | High | 50@50 | All RBs | 1 | Low | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| 8 | 3 | Mid | 50@0 | All RBs | 1 | Low | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 9 | 3 | Mid | 50@25 | All RBs | 1 | Low | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 10 | 3 | Mid | 50@50 | All RBs | 1 | Low | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 11 | 3 | Mid | 50@50 | All RBs | 1 | Low | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| 12 | 26 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| 13 | 26 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| 14 | 26 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 15 | 26 | Low | 25@50 | All RBs | 1 | Low | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-3A-26A with UL CA Configuration** | | | | | | | | | | | | |
| 1 | 1 | NOTE X | 25@0 | All RBs | 3 | NOTE X | 25@0 | All RBs | 26 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 2 | 1 | Mid | 25@0 | All RBs | 26 | Mid | 25@0 | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 3 | 1 | Mid | 100@0 | All RBs | 26 | Mid | 25@50 | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 75 | N/A | QPSK | | 100 |
| 4 | 3 | NOTE X | 25@0 | All RBs | 26 | NOTE X | 25@0 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 5 | 3 | NOTE X | 25@25 | All RBs | 26 | NOTE X | 25@0 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| **Test Settings for CA_1A-3A-28A Configuration** | | | | | | | | | | | | |
| 1 | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 3 | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 4 | 1 | Low | 100@0 | All RBs | 3 | High | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 5 | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 6 | 1 | High | 100@0 | All RBs | 3 | High | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 7 | 3 | Low | 50@50 | All RBs | 1 | Low | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 8 | 3 | High | 50@50 | All RBs | 1 | Low | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 9 | 28 | Mid | 25@0 | All RBs | 1 | High | N/A | All RBs | 3 | High | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| 10 | 28 | Low | 25@75 | All RBs | 1 | Low | N/A | All RBs | 3 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 11 | 28 | Low | 25@38 | All RBs | 1 | Low | N/A | All RBs | 3 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 12 | 28 | High | 25@75 | All RBs | 1 | High | N/A | All RBs | 3 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-3A-28A with UL CA Configuration** | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | NOTE 38 | 25@0 | All RBs | 3 | NOTE 38 | 25@0 | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 2 | 1 | Mid | 25@0 | All RBs | 28 | Mid | 25@0 | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 3 | 1 | Mid | 100@0 | All RBs | 28 | Mid | 25@50 | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 |
| 4 | 1 | NOTE 28 | 25@0 | All RBs | 28 | NOTE 39 | 8@17 | All RBs | 3 | NOTE 39 | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 5 | 3 | Mid | 25@0 | All RBs | 28 | Mid | 8@17 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 6 | 3 | Mid | 100@0 | All RBs | 28 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 |
| 7 | 3 | NOTE 39 | 25@0 | All RBs | 28 | NOTE 39 | 8@17 | All RBs | 1 | NOTE 39 | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| **Test Settings for CA_1A-3A-40A Configuration** | | | | | | | | | | | | |
| **1**[13] | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 40 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **2**[13] | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 40 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 40 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 3 | High | 50@50 | All RBs | 1 | Low | N/A | All RBs | 40 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 40 | Mid | 100@0 | All RBs | 1 | Mid | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-3A-41A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **2** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **3** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 1 | High | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 41 | Mid | N/A | All RBs |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 3 | High | 50@50 | All RBs | 1 | Low | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8** | 3 | Mid | 50@50 | All RBs | 1 | Mid | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-3A-42A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **2** | 1 | Low | 25@0 | All RBs | 3 | High | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 1 | Mid | 45@0 | All RBs | 3 | High | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4**[14] | 1 | Mid | 100@0 | All RBs | 3 | High | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5**[15] | 3 | High | 50@50 | All RBs | 1 | Low | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 3 | Low[16] | 50@25 | All RBs | 1 | Mid | N/A | All RBs | 42 | Low[16] | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **7** | 3 | High[17] | 50@25 | All RBs | 1 | Mid | N/A | All RBs | 42 | Mid[17] | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **8** | 42 | Mid | 100@0 | All RBs | 1 | Mid | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **9** | 42 | Low | 100@0 | All RBs | 1 | Mid | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **10** | 42 | High | 100@0 | All RBs | 1 | Mid | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-3A-42A Configuration** | | | | | | | | | | | | |
| 1 | 1 | NOTE 38 | 25@0 | All RBs | 3 | NOTE 38 | 25@0 | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 2 | 1 | NOTE 39 | 25@0 | All RBs | 3 | NOTE 39 | 25@0 | All RBs | 42 | NOTE 39 | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 3 | 1 | Mid | 25@0 | All RBs | 42 | Mid | 25@0 | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 4 | 1 | Mid | 100@0 | All RBs | 42 | Mid | 50@0 | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 |
| 5 | 3 | NOTE 38 | 25@0 | All RBs | 42 | NOTE 38 | 25@0 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 3 | NOTE 38 | 25@0 | All RBs | 42 | NOTE 38 | 25@0 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| **Test Settings for CA_1A-5A-7A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 50@0 | All RBs | 5 | High | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 1 | Low | 100@0 | All RBs | 5 | High | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **3** | 5 | High | 25@25 | All RBs | 1 | Low | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **4** | 5 | High | 25@25 | All RBs | 1 | Low | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 7 | Mid | 75@25 | All RBs | 1 | Low | N/A | All RBs | 5 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **6** | 7 | Mid | 75@25 | All RBs | 1 | Low | N/A | All RBs | 5 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_1A-7A-8A Configuration** | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 1 | Mid | 25@0 | All RBs | 7 | Mid | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **2** | 7 | Mid | 75@25 | All RBs | 1 | Mid | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 8 | Mid | 25@25 | All RBs | 1 | Mid | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 8 | Low | 25@12 | All RBs | 1 | Mid | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-8A-11A Configuration** | | | | | | | | | | | | |
| **1** | 1 | High | 100@0 | All RBs | 8 | High | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 8 | High | 25@25 | All RBs | 1 | High | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 11 | Low | 25@25 | All RBs | 1 | High | N/A | All RBs | 8 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_1A-8A-28A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 100@0 | All RBs | 8 | Low | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 1 | High | 100@0 | All RBs | 8 | High | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **3** | 8 | Low | 25@0 | All RBs | 1 | Mid | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 8 | Low | 25@0 | All RBs | 1 | Mid | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 8 | High | 25@0 | All RBs | 1 | Mid | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 8 | High | 25@0 | All RBs | 1 | Mid | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-11A-18A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 100@0 | All RBs | 11 | High | N/A | All RBs | 18 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 1 | High | 100@0 | All RBs | 11 | Low | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 75 |
| **3** | 1 | Low | 50@0 | All RBs | 11 | Low | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 75 |
| **4** | 1 | Low | 75@0 | All RBs | 11 | Low | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 75 |

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| **5** | 11 | High | 25@25 | All RBs | 1 | Low | N/A | All RBs | 18 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **6** | 11 | High | 25@25 | All RBs | 1 | Low | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **7** | 11 | Low | 25@25 | All RBs | 1 | High | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **8** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 11 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **9** | 18 | Mid | 25@25 | All RBs | 1 | Low | N/A | All RBs | 11 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **10** | 18 | Mid | 25@25 | All RBs | 1 | High | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **11** | 18 | Mid | 25@25 | All RBs | 1 | Low | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **12** | 18 | Mid | 25@25 | All RBs | 1 | Low | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **Test Settings for CA_1A-11A-28A Configuration** | | | | | | | | | | | | |

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| **1** | 1 | Low | 100@0 | All RBs | 11 | High | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 1 | High | 100@0 | All RBs | 11 | Low | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **3** | 11 | Low | 25@25 | All RBs | 1 | High | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **4** | 11 | High | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5**[26] | 28 | Mid | 8@9 | All RBs | 1 | High | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **6**[27] | 28 | High | 25@0 | All RBs | 1 | High | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **7**[28] | 28 | Mid | 25@25 | All RBs | 1 | Low | N/A | All RBs | 11 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **8** | 28 | Low | 25@75 | All RBs | 1 | Low | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **9** | 28 | High | 25@75 | All RBs | 1 | High | N/A | All RBs | 11 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_1A-18A-28A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 50@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 1 | Low | 75@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 1 | Low | 100@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 1 | Low | 100@0 | All RBs | 18 | Mid | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **5** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **6** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **7** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **8** | 18 | Mid | 25@50 | All RBs | 1 | Low | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |
| **9** | 18 | Mid | 25@50 | All RBs | 1 | Low | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |

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| **10** | 28 | High | 25@0 | All RBs | 1 | Low | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **11** | 28 | Mid | 25@25 | All RBs | 1 | Low | N/A | All RBs | 18 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **12** | 28 | High | 25@25 | All RBs | 1 | High | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Test Settings for CA_1A-18A-28A 3DL CA with UL CA Configuration** | | | | | | | | | | | | |
| **1** | 1 | Mid | 25@0 | All RBs | 8 | Mid | 25@0 | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| **2** | 1 | Mid | 100@0 | All RBs | 18 | Mid | 25@50 | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 75 | N/A | QPSK | | 50 |
| **3** | 18 | Mid | 25@0 | All RBs | 28 | Mid | 25@0 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| **4** | 18 | Mid | 25@50 | All RBs | 28 | Mid | 25@25 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | QPSK | QPSK | | 50 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-19A-21A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Mid | 75@0 | All RBs | 19 | High | N/A | All RBs | 21 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 75 |
| **2** | 1 | Mid | 75@0 | All RBs | 19 | Mid | N/A | All RBs | 21 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **3** | 1 | Mid | 100@0 | All RBs | 19 | High | N/A | All RBs | 21 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 75 |
| **4** | 1 | Mid | 100@0 | All RBs | 19 | Mid | N/A | All RBs | 21 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **5** | 19 | High | 25@25 | All RBs | 1 | Mid | N/A | All RBs | 21 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **6** | 19 | High | 25@25 | All RBs | 1 | Mid | N/A | All RBs | 21 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **7** | 19 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs | 21 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **8** | 19 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs | 21 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **9** | 21 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs | 19 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **10** | 21 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs | 19 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **11** | 21 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs | 19 | High | N/A | All RBs |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **12** | 21 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs | 19 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Test Settings for CA_1A-19A-28A Configuration (Note 18)** | | | | | | | | | | | | |
| **1** | 1 | Mid | 100@0 | All RBs | 19 | Mid | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **2[19]** | 19 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 19 | Mid | 18@0 | All RBs | 1 | Mid | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **4** | 28 | Mid | 25@25 | All RBs | 1 | Mid | N/A | All RBs | 19 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Test Settings for CA_1A-19A-42A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Mid | 50@0 | All RBs | 19 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **2** | 1 | Mid | 75@0 | All RBs | 19 | High | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **3** | 1 | Mid | 100@0 | All RBs | 19 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **4** | 19 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **5** | 19 | High | 25@25 | All RBs | 1 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **6** | 19 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 42 | Mid | 100@0 | All RBs | 1 | Mid | N/A | All RBs | 19 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Test Settings for CA_1A-21A-42A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Mid | 75@0 | All RBs | 21 | High | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 1 | Mid | 75@0 | All RBs | 21 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **3** | 1 | Mid | 100@0 | All RBs | 21 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **4** | 21 | High | 25@25 | All RBs | 1 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **5** | 21 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **6** | 21 | Mid | 25@50 | All RBs | 1 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 42 | Mid | 100@0 | All RBs | 1 | Mid | N/A | All RBs | 21 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Test Settings for CA_1A-41A-42A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 100@0 | All RBs | 41 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 1 | Mid | 100@0 | All RBs | 41 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 1 | High | 100@0 | All RBs | 41 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 42 | Mid | 100@0 | All RBs | 41 | Mid | N/A | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_2A-4A-5A Configuration** | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | All RBs | 4 | Mid | N/A | All RBs | 5 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **2** | 4 | Mid | 50@0 | All RBs | 2 | Mid | N/A | All RBs | 5 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 4 | Mid | 50@0 | All RBs | 2 | Mid | N/A | All RBs | 5 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **4** | 5 | Low | 25@25 | All RBs | 2 | Mid | N/A | All RBs | 4 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5** | 5 | High | 25@25 | All RBs | 2 | Mid | N/A | All RBs | 4 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_2A-4A-7A with UL CA Configuration** | | | | | | | | | | | | |
| **1** | 2 | Low | 50@0 | All RBs | 4 | High | 25@0 | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 25 | N/A | QPSK | | 100 |
| **2** | 4 | Mid[33] | 25@0 | All RBs | 2 | Mid[33] | 25@0 | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 100 |
| **Test Settings for CA_2A-4A-12A Configuration** | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | All RBs | 4 | Mid | N/A | All RBs | 12 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **2** | 4 | Mid | 100@0 | All RBs | 2 | Mid | N/A | All RBs | 12 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 4 | Mid | 100@0 | All RBs | 2 | Mid | N/A | All RBs | 12 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |

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| **4** | 12 | Low[10] | 16@17 | All RBs | 2 | Mid | N/A | All RBs | 4 | Low[10] | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5** | 12 | High[11] | 16@17 | All RBs | 2 | Mid | N/A | All RBs | 4 | High[11] | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_2A-4A-13A Configuration** | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | All RBs | 4 | Mid | N/A | All RBs | 13 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **2** | 4 | Mid | 100@0 | All RBs | 2 | Mid | N/A | All RBs | 13 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 13 | Mid | 20@0 | All RBs | 2 | Low | N/A | All RBs | 4 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 13 | Mid | 20@0 | All RBs | 2 | Mid | N/A | All RBs | 4 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **5** | 13 | Mid | 20@0 | All RBs | 2 | High | N/A | All RBs | 4 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_2A-4A-29A Configuration** | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | All RBs | 4 | Mid | N/A | All RBs | 29 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **2** | 4 | Mid | 100@0 | All RBs | 2 | Mid | N/A | All RBs | 29 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_2A-4A-30A Configuration** | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | All RBs | 4 | Mid | N/A | All RBs | 30 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **2** | 4 | Mid | 100@0 | All RBs | 2 | Mid | N/A | All RBs | 30 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 30 | Mid | 25@25 | All RBs | 2 | Low | N/A | All RBs | 4 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_2A-4A-71A Configuration** | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | All RBs | 4 | Mid | N/A | All RBs | 71 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 4 | Mid | 100@0 | All RBs | 2 | Mid | N/A | All RBs | 71 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 71 | Low | 25@0 | All RBs | 2 | High | N/A | All RBs | 4 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **4** | 71 | Low | 25@0 | All RBs | 2 | High | N/A | All RBs | 4 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **5** | 71 | Low | 20@0 | All RBs | 2 | High | N/A | All RBs | 4 | Mid | N/A | All RBs |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **6** | 71 | Low | 20@0 | All RBs | 2 | High | N/A | All RBs | 4 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_2A-66A-71A Configuration** | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | All RBs | 66 | Mid | N/A | All RBs | 71 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 66 | Mid | 100@0 | All RBs | 2 | Mid | N/A | All RBs | 71 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 71 | Low | 25@0 | All RBs | 2 | High | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **4** | 71 | Low | 25@0 | All RBs | 2 | High | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **5** | 71 | Low | 20@0 | All RBs | 2 | High | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **6** | 71 | Low | 20@0 | All RBs | 2 | High | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_2A-5A-13A Configuration** | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | All RBs | 5 | Mid | N/A | All RBs | 13 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 5 | Mid | 25@25 | All RBs | 2 | Mid | N/A | All RBs | 13 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 13 | Mid | 20@0 | All RBs | 2 | Low | N/A | All RBs | 5 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 13 | Mid | 20@0 | All RBs | 2 | Mid | N/A | All RBs | 5 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **5** | 13 | Mid | 20@0 | All RBs | 2 | High | N/A | All RBs | 5 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_2A-12A-66A Configuration** | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | All RBs | 12 | Mid | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 12 | Low[28] | 20@5 | All RBs | 2 | Mid | N/A | All RBs | 66 | Low[28] | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |
| **3** | 12 | Mid[29] | 20@5 | All RBs | 2 | Mid | N/A | All RBs | 66 | Low[29] | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **4** | 12 | High[30] | 20@30 | All RBs | 2 | Mid | N/A | All RBs | 66 | Low[30] | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **5** | 12 | Mid | 20@30 | All RBs | 2 | Mid | N/A | All RBs | 66 | Mid | N/A | All RBs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 66 | Mid | 100@0 | All RBs | 2 | Mid | N/A | All RBs | 12 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |

**Test Settings for CA_2A-66A-71A Configuration**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 2 | High | 50@50 | All RBs | 66 | Mid | N/A | All RBs | 71 | Note X1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 66 | Mid | 100@0 | All RBs | 2 | Mid | N/A | All RBs | 71 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 71 | Low | 25@0 | All RBs | 2 | High | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **4** | 71 | Low | 25@12 | All RBs | 2 | High | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **5** | 71 | Low | 20@25 | All RBs | 2 | High | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **6** | 71 | Low | 20@40 | All RBs | 2 | High | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 2 | Low | 100@0 | All RBs | 66 | Mid | N/A | All RBs | 71 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8** | 71 | Mid | 100@0 | All RBs | 2 | Mid | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |

**Test Settings for CA_3A-7A-8A Configuration**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 3 | Mid | 50@0 | All RBs | 7 | Mid | N/A | All RBs | 8 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **2** | 3 | Mid | 50@25 | All RBs | 7 | Mid | N/A | All RBs | 8 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |
| **3** | 3 | Mid | 50@50 | All RBs | 7 | Mid | N/A | All RBs | 8 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |
| **4** | 3 | Mid | 50@50 | All RBs | 7 | Mid | N/A | All RBs | 8 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5** | 7 | Mid | 75@25 | All RBs | 3 | Mid | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **6** | 8 | Mid | 25@12 | All RBs | 3 | Mid | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 8 | Mid | 25@25 | All RBs | 3 | Mid | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8** | 8 | High | 25@25 | All RBs | 3 | Mid | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **9** | 8 | High | 25@0 | All RBs | 3 | Mid | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **10** | 8 | High | 25@0 | All RBs | 3 | Mid | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **11** | 8 | High | 25@25 | All RBs | 3 | Mid | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_3A-7A-20A with UL CA Configuration CA_3A-7A, CA_7A-20A and CA_3A-20A** | | | | | | | | | | | | |
| 1 | 3 | Mid[35] | 25@0 | All RBs | 7 | Mid[35] | 50@0 | All RBs | 20 | Mid[35] | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 50 | N/A | QPSK | | 50 |
| 2 | 3 | Mid[36] | 50@0 | All RBs | 20 | Mid[36] | 25@0 | All RBs | 20 | Mid[35] | N/A | All RBs |
| | QPSK | QPSK | | 50 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 3 | 7 | Mid[37] | 50@0 | All RBs | 20 | Mid[37] | 25@0 | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | QPSK | QPSK | | 25 | N/A | QPSK | | 100 |
| **Test Settings for CA_3A-7A-42A Configuration** | | | | | | | | | | | | |
| 1 | 3 | Low[16] | 50@25 | All RBs | 7 | Mid | N/A | All RBs | 42 | Low[16] | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 2 | 3 | High[17] | 50@25 | All RBs | 7 | Mid | N/A | All RBs | 42 | Mid[17] | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 3 | 7 | Mid | 75@25 | All RBs | 3 | High | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 4 | 42 | Low | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 5 | 42 | High | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 6 | 42 | Mid | 100@0 | All RBs | 3 | High | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_3A-8A-11A Configuration** | | | | | | | | | | | | |
| **1** | 3 | Mid | 50@0 | All RBs | 8 | High | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2[31]** | 3 | Mid | 50@25 | All RBs | 8 | High | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **3** | 3 | Mid | 50@50 | All RBs | 8 | High | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **4** | 3 | Mid | 50@50 | All RBs | 8 | High | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **5** | 8 | High | 25@25 | All RBs | 3 | Mid | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 8 | High | 25@0 | All RBs | 3 | Mid | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **7** | 8 | High | 25@0 | All RBs | 3 | Mid | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **8** | 8 | High | 25@25 | All RBs | 3 | Mid | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **9[32]** | 11 | Low | 25@25 | All RBs | 3 | Mid | N/A | All RBs | 8 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **Test Settings for CA_3A-8A-28A Configuration** | | | | | | | | | | | | |
| **1** | 3 | Mid | 50@0 | All RBs | 8 | High | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 3 | Mid | 50@25 | All RBs | 8 | High | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **3** | 3 | Mid | 50@50 | All RBs | 8 | High | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **4** | 3 | Mid | 50@50 | All RBs | 8 | High | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **5** | 8 | High | 25@25 | All RBs | 3 | Mid | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **6** | 8 | High | 25@0 | All RBs | 3 | Mid | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **7** | 8 | High | 25@0 | All RBs | 3 | Mid | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8** | 8 | High | 25@25 | All RBs | 3 | Mid | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **9** | 8 | Low | 25@0 | All RBs | 3 | Mid | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **10** | 8 | Low | 25@0 | All RBs | 3 | Mid | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_3A-8A-40A Configuration** | | | | | | | | | | | | |
| **1** | 3 | Mid | 50@50 | All RBs | 8 | High | N/A | All RBs | 40 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 8 | High | 25@25 | All RBs | 3 | Mid | N/A | All RBs | 40 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 40 | Mid | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_3A-11A-28A Configuration** | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1**[31] | 3 | Mid | 50@25 | All RBs | 11 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 3 | Low | 50@50 | All RBs | 11 | Low | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **3** | 3 | High | 50@50 | All RBs | 11 | Low | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **4**[32] | 11 | Low | 25@25 | All RBs | 3 | Mid | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **5** | 11 | High | 25@25 | All RBs | 3 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **6** | 28 | High | 25@0 | All RBs | 3 | High | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **7** | 28 | Low | 25@75 | All RBs | 3 | Low | N/A | All RBs | 11 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **8** | 28 | Mid | 25@25 | All RBs | 3 | High | N/A | All RBs | 11 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_3A-19A-42A Configuration** | | | | | | | | | | | | |
| **1** | 3 | Low[16] | 50@25 | All RBs | 19 | Mid | N/A | All RBs | 42 | Low[16] | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **2** | 3 | High[17] | 50@25 | All RBs | 19 | Mid | N/A | All RBs | 42 | Mid[17] | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **3** | 19 | Mid | 25@50 | All RBs | 3 | High | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 42 | Low | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 19 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **5** | 42 | High | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 19 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **6** | 42 | Mid | 100@0 | All RBs | 3 | High | N/A | All RBs | 19 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Test Settings for CA_3A-20A-42A Configuration** | | | | | | | | | | | | |
| 1 | 3 | Low[16] | 50@25 | All RBs | 20 | Mid | N/A | All RBs | 42 | Low[16] | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 2 | 3 | High[17] | 50@25 | All RBs | 20 | Mid | N/A | All RBs | 42 | Mid[17] | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 3 | 20 | Mid | 20@16 | All RBs | 3 | High | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 4 | 42 | Low | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 20 | Mid | N/A | All RBs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 5 | 42 | High | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 20 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 6 | 42 | Mid | 100@0 | All RBs | 3 | High | N/A | All RBs | 20 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_3A-28A-41A Configuration** | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | Low | 50@50 | All RBs | 28 | Low | N/A | All RBs | 41 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 2 | 3 | Mid | 50@50 | All RBs | 28 | High | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 3 | 3 | High | 50@50 | All RBs | 28 | High | N/A | All RBs | 41 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 4 | 28 | Low | 25@25 | All RBs | 3 | Low | N/A | All RBs | 41 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 5 | 28 | High | 25@25 | All RBs | 3 | Mid | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 6 | 28 | High | 25@25 | All RBs | 3 | High | N/A | All RBs | 41 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 7 | 41 | Low | 100@0 | All RBs | 3 | Low | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 8 | 41 | Mid | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 9 | 41 | High | 100@0 | All RBs | 3 | High | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_3A-41A-42A Configuration** | | | | | | | | | | | | |
| **1** | 3 | Mid | 50@50 | All RBs | 41 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 3 | Low[16] | 50@25 | All RBs | 41 | Mid | N/A | All RBs | 42 | Low[16] | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 3 | High[17] | 50@25 | All RBs | 41 | High | N/A | All RBs | 42 | Mid[17] | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 41 | Mid | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 42 | Low | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 42 | Mid | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 42 | High | 100@0 | All RBs | 3 | Mid | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_4A-5A-13A Configuration** | | | | | | | | | | | | |
| **1** | 4 | Mid | 50@0 | All RBs | 5 | Mid | N/A | All RBs | 13 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 5 | Low | 25@25 | All RBs | 4 | Mid | N/A | All RBs | 13 | Mid | N/A | All RBs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 5 | Mid | 25@25 | All RBs | 4 | Mid | N/A | All RBs | 13 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 5 | High | 25@25 | All RBs | 4 | Mid | N/A | All RBs | 13 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **5** | 13 | Mid | 20@0 | All RBs | 4 | Low | N/A | All RBs | 5 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **6** | 13 | Mid | 20@0 | All RBs | 4 | Mid | N/A | All RBs | 5 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **7** | 13 | Mid | 20@0 | All RBs | 4 | High | N/A | All RBs | 5 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| | **Test Settings for CA_4A-7A-12A_BCS1 Configuration** | | | | | | | | | | | |
| | 4 | Mid | 100@0 | All RBs | 7 | Mid | N/A | All RBs | 12 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| | 4 | Low | 100@0 | All RBs | 7 | Mid | N/A | All RBs | 12 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| | 7 | Mid | 75@25 | All RBs | 4 | Mid | N/A | All RBs | 12 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| | 12 | Low[10] | 16@17 | All RBs | 4 | Low[10] | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| | 12 | High[11] | 16@17 | All RBs | 4 | High[11] | N/A | All RBs | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| | **Test Settings for CA_4A-12A-30A Configuration** | | | | | | | | | | | |
| **1** | 4 | Mid | 100@0 | All RBs | 12 | Low | N/A | All RBs | 30 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 4 | Mid | 100@0 | All RBs | 12 | High | N/A | All RBs | 30 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 12 | Low[10] | 16@17 | All RBs | 4 | Low[10] | N/A | All RBs | 30 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **4** | 12 | High[11] | 16@17 | All RBs | 4 | High[11] | N/A | All RBs | 30 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5** | 30 | Mid | 25@25 | All RBs | 4 | Mid | N/A | All RBs | 12 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| | **Test Settings for CA_8A-11A-28A Configuration** | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 8 | Low | 25@0 | All RBs | 11 | Low | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 8 | Low | 25@0 | All RBs | 11 | Low | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **3** | 8 | High | 25@0 | All RBs | 11 | Low | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **4** | 8 | High | 25@0 | All RBs | 11 | Low | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **5** | 11 | Low | 25@25 | All RBs | 8 | High | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **6** | 11 | High | 25@25 | All RBs | 8 | Low | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **Test Settings for CA_12A-30A-66A Configuration** | | | | | | | | | | | | |
| **1** | 12 | Mid | 20@30 | All RBs | 30 | Mid | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 12 | Low | 20@5 | All RBs | 30 | Mid | N/A | All RBs | 66 | Low | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 50 | N/A | QPSK | | 25 |
| **3** | 12 | Mid | 20@5 | All RBs | 30 | Mid | N/A | All RBs | 66 | Low | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 12 | Mid | 20@30 | All RBs | 30 | Mid | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **5** | 30 | Mid | 25@25 | All RBs | 12 | Mid | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **6** | 66 | Mid | 50@0 | All RBs | 12 | Mid | N/A | All RBs | 30 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **7** | 66 | Mid | 100@0 | All RBs | 12 | Mid | N/A | All RBs | 30 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **Test Settings for CA_19A-21A-42A Configuration** | | | | | | | | | | | | |
| **1** | 19 | High | 25@25 | All RBs | 21 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **2** | 19 | Mid | 25@50 | All RBs | 21 | High | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **3** | 19 | Mid | 25@50 | All RBs | 21 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **4** | 21 | Mid | 25@50 | All RBs | 19 | High | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **5** | 21 | High | 25@25 | All RBs | 19 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **6** | 21 | Mid | 25@50 | All RBs | 19 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **7** | 42 | Mid | 100@0 | All RBs | 19 | Mid | N/A | All RBs | 21 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **Test Settings for CA_66A-70A-71A Configuration** | | | | | | | | | | | | |
| **1** | 66 | Mid | 100@0 | All RBs | 70 | Mid | N/A | All RBs | 71 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **2** | 70 | Mid | 75@0 | All RBs | 66 | Mid | N/A | All RBs | 71 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 71 | Mid | 16@12 | All RBs | 66 | Mid | N/A | All RBs | 70 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **4** | 71 | Mid | 50@0 | All RBs | 66 | High | N/A | All RBs | 70 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Default Test Settings for a CA_XC-YA and CA_XB-YA Configurations (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | |
| **1** | X | Low/CC1 | REFSENS | All RBs | X | Low/CC2 | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB |
| **2** | X | Low/CC1 | REFSENS | All RBs | X | Low/CC2 | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | Lowest NRB_agg | N/A | QPSK | | Lowest NRB_agg | N/A | QPSK | | Highest NRB |
| **3** | X | High/CC1 | REFSENS | All RBs | X | High/CC2 | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB |
| **4** | X | High/CC1 | REFSENS | All RBs | X | High/CC2 | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | Lowest NRB_agg | N/A | QPSK | | Lowest NRB_agg | N/A | QPSK | | Highest NRB |
| **5** | Y | Mid | REFSENS | All RBs | X | Mid/CC1 | N/A | All RBs | X | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | N/A | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB_agg |
| **Default Test Settings for CA_XA-YC and CA_XA-YB Configurations** | | | | | | | | | | | | |
| **1** | Y | Low/CC1 | REFSENS | All RBs | Y | Low/CC2 | N/A | All RBs | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB |
| **2** | Y | Low/CC1 | REFSENS | All RBs | Y | Low/CC2 | N/A | All RBs | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | Lowest NRB_agg | N/A | QPSK | | Lowest NRB_agg | N/A | QPSK | | Highest NRB |
| **3** | Y | High/CC1 | REFSENS | All RBs | Y | High/CC2 | N/A | All RBs | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4** | Y | High/CC1 | REFSENS | All RBs | Y | High/CC2 | N/A | All RBs | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | Lowest NRB_agg | N/A | QPSK | | Lowest NRB_agg | N/A | QPSK | | Highest NRB |
| **5** | X | Mid | REFSENS | All RBs | Y | Mid/CC1 | N/A | All RBs | Y | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | N/A | QPSK | | Highest NRB_agg | N/A | QPSK | | Highest NRB_agg |
| **Test Settings for a CA_1A-41C Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 100@0 | All RBs | 41 | Mid/CC1 | N/A | All RBs | 41 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 1 | High | 100@0 | All RBs | 41 | Mid/CC1 | N/A | All RBs | 41 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for a CA_1A-3C Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 25@0 | All RBs | 3 | High/CC1 | N/A | All RBs | 3 | High/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **2** | 1 | Low | 25@0 | All RBs | 3 | High/CC1 | N/A | All RBs | 3 | High/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **3** | 1 | Low | 25@0 | All RBs | 3 | High/CC1 | N/A | All RBs | 3 | High/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 1 | Mid | 45@0 | All RBs | 3 | High/CC1 | N/A | All RBs | 3 | High/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 3 | High/CC1 | 50@50 | All RBs | 3 | High/CC2 | N/A | All RBs | 1 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 3 | High/CC1 | 50@50 | All RBs | 3 | High/CC2 | N/A | All RBs | 1 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **Test Settings for a CA_1C-3A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low/CC1 | 25@0 | All RBs | 1 | Low/CC2 | N/A | All RBs | 3 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |
| **2** | 1 | Low/CC1 | 25@0 | All RBs | 1 | Low/CC2 | N/A | All RBs | 3 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **3** | 1 | Low/CC1 | 25@0 | All RBs | 1 | Low/CC2 | N/A | All RBs | 3 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 1 | Mid/CC1 | 45@0 | All RBs | 1 | Mid/CC2 | N/A | All RBs | 3 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 1 | Low/CC1 | 75@0 | All RBs | 1 | Low/CC2 | N/A | All RBs | 3 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| **6** | 1 | Low/CC1 | 100@0 | All RBs | 1 | Low/CC2 | N/A | All RBs | 3 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 3 | High | 50@50 | All RBs | 1 | Low/CC1 | N/A | All RBs | 1 | Low/CC2 | N/A | All RBs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_1A-42C with UL CA Configuration** | | | | | | | | | | | | |
| 1 | 1 | Mid | 25@0 | All RBs | 42 | Mid/CC1 | 25@0 | All RBs | 42 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 25 |
| 2 | 1 | Mid | 100@0 | All RBs | 42 | Mid/CC1 | 100@0 | All RBs | 42 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 |
| 3 | 42 | Low/CC1 | 100@0 | All RBs | 42 | Low/CC2 | 25@0 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 25 | N/A | QPSK | | 100 |
| 4 | 42 | Low/CC1 | 100@0 | All RBs | 42 | Low/CC2 | 100@0 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 |
| 5 | 42 | High/CC1 | 100@0 | All RBs | 42 | High/CC2 | 25@0 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 25 | N/A | QPSK | | 100 |
| 6 | 42 | High/CC1 | 100@0 | All RBs | 42 | High/CC2 | 100@0 | All RBs | 1 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for a CA_2C-30A Configuration** | | | | | | | | | | | | |
| **1** | 2 | High/CC2 | 50@50 | All RBs | 2 | High/CC1 | N/A | All RBs | 30 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **2** | 2 | Low/CC2 | 50@50 | All RBs | 2 | Low/CC1 | N/A | All RBs | 30 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 2 | High/CC2 | 50@50 | All RBs | 2 | High/CC1 | N/A | All RBs | 30 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **4** | 2 | Low/CC2 | 50@50 | All RBs | 2 | Low/CC1 | N/A | All RBs | 30 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **5** | 30 | Mid | 25@25 | All RBs | 2 | Mid/CC2 | N/A | All RBs | 2 | Mid/CC1 | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for a CA_2C-66A Configurations** | | | | | | | | | | | | |
| 1 | 2 | Low/CC1 | 100@0 | All RBs | 2 | Low/CC2 | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 2 | 2 | Low/CC1 | 25@0 | All RBs | 2 | Low/CC2 | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 3 | 2 | High/CC1 | 100@0 | All RBs | 2 | High/CC2 | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 4 | 2 | High/CC1 | 25@0 | All RBs | 2 | High/CC2 | N/A | All RBs | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 5 | 66 | Mid | 100@0 | All RBs | 2 | Mid/CC1 | N/A | All RBs | 2 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for a CA_3C-8A Configuration** | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 3 | High/CC1 | 50@50 | All RBs | 3 | High/CC2 | N/A | All RBs | 8 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | QPSK | QPSK | | 50 |
| **2** | 3 | Low/CC1 | 50@50 | All RBs | 3 | Low/CC2 | N/A | All RBs | 8 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | QPSK | QPSK | | 50 |
| **3** | 3 | High/CC1 | 50@50 | All RBs | 3 | High/CC2 | N/A | All RBs | 8 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | QPSK | QPSK | | 50 |
| **4** | 3 | Low/CC1 | 50@50 | All RBs | 3 | Low/CC2 | N/A | All RBs | 8 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | QPSK | QPSK | | 50 |
| **5** | 8 | High | 25@25 | All RBs | 3 | Mid/CC1 | N/A | All RBs | 3 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |
| **Test Settings for CA_3A-42C Configuration (Note 21, Note 22)** | | | | | | | | | | | | |
| **1** | 3 | Low | 50@25 | All RBs | 42 | Low[21] | N/A | All RBs | 42 | Low[21] | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 3 | High | 50@25 | All RBs | 42 | Mid[22] | N/A | All RBs | 42 | Mid[22] | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 42 | Low/CC1 | 100@0 | All RBs | 42 | Low/CC2 | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 42 | High/CC1 | 100@0 | All RBs | 42 | High/CC2 | N/A | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_3A-42C with UL CA Configuration** | | | | | | | | | | | | |
| 1 | 3 | NOTE 38 | 25@0 | All RBs | 42 | NOTE 38 | 25@0 | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 100 |
| 2 | 3 | NOTE 38 | 25@0 | All RBs | 42 | NOTE 38 | 25@0 | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | QPSK | QPSK | | 25 | N/A | QPSK | | 100 |
| 3 | 42 | Low/CC1 | 100@0 | All RBs | 42 | Low/CC2 | 25@0 | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 25 | N/A | QPSK | | 100 |
| 4 | 42 | Low/CC1 | 100@0 | All RBs | 42 | Low/CC2 | 100@0 | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 |
| 5 | 42 | High/CC1 | 100@0 | All RBs | 42 | High/CC2 | 25@0 | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 25 | N/A | QPSK | | 100 |
| 6 | 42 | High/CC1 | 100@0 | All RBs | 42 | High/CC2 | 100@0 | All RBs | 3 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_5A-12B Configuration** | | | | | | | | | | | | |
| **1** | 5 | Mid | 25@25 | All RBs | 12 | Mid/CC1 | N/A | All RBs | 12 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **2** | 12 | Mid/CC1 | 20@30 | All RBs | 12 | Mid/CC2 | N/A | All RBs | 5 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 12 | Low/CC1 | 20@5 | All RBs | 12 | Low/CC2 | N/A | All RBs | 5 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **4** | 12 | Low/CC1 | 20@5 | All RBs | 12 | Low/CC2 | N/A | All RBs | 5 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **5** | 12 | High/CC1 | 20@5 | All RBs | 12 | High/CC2 | N/A | All RBs | 5 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **6** | 12 | High/CC1 | 20@5 | All RBs | 12 | High/CC2 | N/A | All RBs | 5 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **Test Settings for CA_8A-41C Configuration** | | | | | | | | | | | | |
| **1** | 8 | Mid | 25@0 | All RBs | 41 | High/CC1 | N/A | All RBs | 41 | High/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 8 | Mid | 25@25 | All RBs | 41 | High/CC1 | N/A | All RBs | 41 | High/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 41 | Mid/CC1 | 100@0 | All RBs | 41 | Mid/CC2 | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 41 | Low/CC1 | 100@0 | All RBs | 41 | Low/CC2 | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **5** | 41 | Low/CC1 | 100@0 | All RBs | 41 | Low/CC2 | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **6** | 41 | High/CC1 | 100@0 | All RBs | 41 | High/CC2 | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **7** | 41 | High/CC1 | 100@0 | All RBs | 41 | High/CC2 | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_8A-42C Configuration** | | | | | | | | | | | | |
| **1** | 8 | Mid | 25@25 | All RBs | 42 | Mid/CC1 | N/A | All RBs | 42 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2**[25] | 8 | Mid | 25@0 | All RBs | 42 | High/CC1 | N/A | All RBs | 42 | High/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 42 | Low/CC1 | 100@0 | All RBs | 42 | Low/CC2 | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **4** | 42 | High/CC1 | 100@0 | All RBs | 42 | High/CC2 | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5** | 42 | High/CC1 | 100@0 | All RBs | 42 | High/CC2 | N/A | All RBs | 8 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **Test Settings for CA_26A-41C Configuration** | | | | | | | | | | | | |
| **1** | 26 | Low | 25@25 | All RBs | 41 | Mid/CC1 | N/A | All RBs | 41 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 41 | Low/CC1 | 100@0 | All RBs | 41 | Low/CC2 | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 75 |
| **3** | 41 | Low/CC1 | 100@0 | All RBs | 41 | Low/CC2 | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **4** | 41 | High/CC1 | 100@0 | All RBs | 41 | High/CC2 | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 75 |
| **5** | 41 | High/CC1 | 100@0 | All RBs | 41 | High/CC2 | N/A | All RBs | 26 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Test Settings for CA_28A-40C Configuration** | | | | | | | | | | | | |
| **1** | 28 | Mid | 25@75 | All RBs | 40 | Mid/CC1 | N/A | All RBs | 40 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 40 | Low/CC1 | 100@0 | All RBs | 40 | Low/CC2 | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 40 | Low/CC1 | 100@0 | All RBs | 40 | Low/CC2 | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_28A-41C Configuration** | | | | | | | | | | | | |
| **1** | 28 | Low | 25@25 | All RBs | 41 | Low/CC1 | N/A | All RBs | 41 | Low/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 28 | Mid | 25@25 | All RBs | 41 | Mid/CC1 | N/A | All RBs | 41 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 28 | High | 25@25 | All RBs | 41 | Mid/CC1 | N/A | All RBs | 41 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 28 | High | 25@25 | All RBs | 41 | High/CC1 | N/A | All RBs | 41 | High/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 41 | Low/CC1 | 100@0 | All RBs | 41 | Low/CC2 | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **6** | 41 | Low/CC1 | 100@0 | All RBs | 41 | Low/CC2 | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **7** | 41 | Mid/CC1 | 100@0 | All RBs | 41 | Mid/CC2 | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **8** | 41 | Mid/CC1 | 100@0 | All RBs | 41 | Mid/CC2 | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **9** | 41 | High/CC1 | 100@0 | All RBs | 41 | High/CC2 | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **10** | 41 | High/CC1 | 100@0 | All RBs | 41 | High/CC2 | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_28A-42C Configuration** | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1**[24] | 28 | Low | 25@0 | All RBs | 42 | Mid | N/A | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |
| **2**[23] | 28 | Mid | 25@0 | All RBs | 42 | High | N/A | All RBs | 42 | High | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |
| **3** | 28 | Low | 25@75 | All RBs | 42 | Low/CC1 | N/A | All RBs | 42 | Low/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 28 | High | 25@75 | All RBs | 42 | High/CC1 | N/A | All RBs | 42 | High/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 42 | Low/CC1 | 100@0 | All RBs | 42 | Low/CC2 | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **6** | 42 | Low/CC1 | 100@0 | All RBs | 42 | Low/CC2 | N/A | All RBs | 28 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 42 | High/CC1 | 100@0 | All RBs | 42 | High/CC2 | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **8** | 42 | High/CC1 | 100@0 | All RBs | 42 | High/CC2 | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_29A-66C Configuration** | | | | | | | | | | | | |
| **1** | 66 | Low/CC1 | 100@0 | All RBs | 66 | Low/CC2 | N/A | All RBs | 29 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **2** | 66 | High/CC1 | 100@0 | All RBs | 66 | High/CC2 | N/A | All RBs | 29 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 66 | Low/CC1 | 100@0 | All RBs | 66 | Low/CC2 | N/A | All RBs | 29 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **4** | 66 | High/CC1 | 100@0 | All RBs | 66 | High/CC2 | N/A | All RBs | 29 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **Test Settings for CA_39C-41A Configuration** | | | | | | | | | | | | |
| **1** | 39 | Low/CC1 | 100@0 | All RBs | 39 | Low/CC2 | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 39 | Low/CC1 | 25@0 | All RBs | 39 | Low/CC2 | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 39 | High/CC1 | 100@0 | All RBs | 39 | High/CC2 | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **4** | 39 | High/CC1 | 25@0 | All RBs | 39 | High/CC2 | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 39 | Mid/CC1 | 25@0 | All RBs | 39 | Mid/CC2 | N/A | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 41 | Mid | 100@0 | All RBs | 39 | Low/CC1 | N/A | All RBs | 39 | Low/CC2 | N/A | All RBs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **7** | 41 | Mid | 100@0 | All RBs | 39 | High/CC1 | N/A | All RBs | 39 | High/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_39A-41C Configuration** | | | | | | | | | | | | |
| **1** | 39 | Low | 100@0 | All RBs | 41 | Mid/CC1 | N/A | All RBs | 41 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 39 | High | 50@0 | All RBs | 41 | Mid/CC1 | N/A | All RBs | 41 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 41 | Mid/CC1 | 100@0 | All RBs | 41 | Mid/CC2 | N/A | All RBs | 39 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 41 | Mid/CC1 | 100@0 | All RBs | 41 | Mid/CC2 | N/A | All RBs | 39 | Low | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5** | 41 | Mid/CC1 | 100@0 | All RBs | 41 | Mid/CC2 | N/A | All RBs | 39 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 41 | Mid/CC1 | 100@0 | All RBs | 41 | Mid/CC2 | N/A | All RBs | 39 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_41A-42C with UL CA Configuration** | | | | | | | | | | | | |
| 1 | 41 | Mid | 50@0 | All RBs | 42 | Mid/CC1 | 50@0 | All RBs | 42 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 50 | QPSK | QPSK | | 50 | QPSK | QPSK | | 100 |
| 2 | 41 | Mid | 100@0 | All RBs | 42 | Mid/CC1 | 100@0 | All RBs | 42 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| 3 | 42 | Low/CC1 | 100@0 | All RBs | 42 | Low/CC2 | 50@0 | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 50 | QPSK | QPSK | | 100 |
| 4 | 42 | High/CC1 | 100@0 | All RBs | 42 | High/CC2 | 50@0 | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 50 | QPSK | QPSK | | 100 |
| 5 | 42 | Low/CC1 | 100@0 | All RBs | 42 | Low/CC2 | 100@0 | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| 6 | 42 | High/CC1 | 100@0 | All RBs | 42 | High/CC2 | 100@0 | All RBs | 41 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| **Test Settings for CA_41A-42C with 3UL CA Configuration** | | | | | | | | | | | | |
| 1 | 41 | Mid | 50@0 | All RBs | 42 | Mid/CC1 | 50@0 | All RBs | 42 | Mid/CC2 | 100@0 | All RBs |
| | QPSK | QPSK | | 50 | QPSK | QPSK | | 50 | QPSK | QPSK | | 100 |
| 2 | 41 | Mid | 100@0 | All RBs | 42 | Mid/CC1 | 100@0 | All | 42 | Mid/CC2 | 100@0 | All RBs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | RBs | | | | |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| 3 | 42 | Low/CC1 | 100@0 | All RBs | 42 | Low/CC2 | 50@0 | All RBs | 41 | Mid | 100@0 | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 50 | QPSK | QPSK | | 100 |
| 4 | 42 | High/CC1 | 100@0 | All RBs | 42 | High/CC2 | 50@0 | All RBs | 41 | Mid | 100@0 | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 50 | QPSK | QPSK | | 100 |
| 5 | 42 | Low/CC1 | 100@0 | All RBs | 42 | Low/CC2 | 100@0 | All RBs | 41 | Mid | 100@0 | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| 6 | 42 | High/CC1 | 100@0 | All RBs | 42 | High/CC2 | 100@0 | All RBs | 41 | Mid | 100@0 | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| **Test Settings for CA_41C-42A with UL CA Configuration** | | | | | | | | | | | | |
| 1 | 41 | Low/CC1 | 100@0 | All RBs | 41 | Low/CC1 | 50@0 | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 50 | QPSK | QPSK | | 100 |
| 2 | 41 | High/CC1 | 100@0 | All RBs | 41 | High/CC1 | 50@0 | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 50 | QPSK | QPSK | | 100 |
| 3 | 41 | Low/CC1 | 100@0 | All RBs | 41 | Low/CC2 | 100@0 | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| 4 | 41 | High/CC1 | 100@0 | All RBs | 41 | High/CC2 | 100@0 | All RBs | 42 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| 5 | 41 | Mid/CC1 | 50@0 | All RBs | 42 | Mid | 50@0 | All RBs | 41 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 50 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| 6 | 41 | Mid/CC2 | 100@0 | All RBs | 42 | Mid | 100@0 | All RBs | 41 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| **Test Settings for CA_41C-42A with 3UL CA Configuration** | | | | | | | | | | | | |
| 1 | 41 | Low/CC1 | 100@0 | All RBs | 41 | Low/CC1 | 50@0 | All RBs | 42 | Mid | 100@0 | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 50 | QPSK | QPSK | | 100 |
| 2 | 41 | High/CC1 | 100@0 | All RBs | 41 | High/CC1 | 50@0 | All RBs | 42 | Mid | 100@0 | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 50 | QPSK | QPSK | | 100 |
| 3 | 41 | Low/CC1 | 100@0 | All RBs | 41 | Low/CC2 | 100@0 | All | 42 | Mid | 100@0 | All RBs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | RBs | | | | |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| 4 | 41 | High/CC1 | 100@0 | All RBs | 41 | High/CC2 | 100@0 | All RBs | 42 | Mid | 100@0 | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| 5 | 41 | Mid/CC1 | 50@0 | All RBs | 42 | Mid | 50@0 | All RBs | 41 | Mid/CC2 | 100@0 | All RBs |
| | QPSK | QPSK | | 50 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| 6 | 41 | Mid/CC2 | 100@0 | All RBs | 42 | Mid | 100@0 | All RBs | 41 | Mid/CC2 | 100@0 | All RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| **Test Settings for CA_46C-66A Configuration** | | | | | | | | | | | | |
| **1** | 66 | Low | 100@0 | All RBs | 46 | Mid/CC1 | N/A | All RBs | 46 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 66 | High | 100@0 | All RBs | 46 | Mid/CC1 | N/A | All RBs | 46 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_46A-66C Configuration** | | | | | | | | | | | | |
| **1** | 66 | Low/CC1 | 100@0 | All RBs | 66 | Mid/CC2 | N/A | All RBs | 46 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 66 | High/CC1 | 100@0 | All RBs | 66 | High/CC2 | N/A | All RBs | 46 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_70C-71A Configuration** | | | | | | | | | | | | |
| 1 | 70 | Mid/CC1 | 75@0 | All RBs | 70 | Mid/CC2 | N/A | All RBs | 71 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| 2 | 71 | Low | 16@12 | All RBs | 70 | Mid/CC1 | N/A | All RBs | 70 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| 3 | 71 | High | 50@0 | All RBs | 70 | Mid/CC1 | N/A | All RBs | 70 | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 4: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41D, X=41
Note 6: **Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-19A,X=1,Y=3,Z=19
Note 7: **Intra-band contiguous + Inter-band:** X,Y correspond to the different bands in the CA Configuration, e.g. for CA_1C-3A, X=1,Y=3, for CA_1A_42C, X=1,Y=42.
Note 8: REFSENS refers to the PCC bands and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.

Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$

Note 10: Band 12: $f_{UL}$ = 706.7 MHz ($N_{UL}$ = 23087), $f_{DL}$ = 736.7 MHz ($N_{DL}$ = 5087)
Band 4: $f_{DL}$ = 2120.1 MHz ($N_{DL}$ = 2051)

Note 11: Band 12: $f_{UL}$ = 710.9 MHz ($N_{UL}$ = 23129), $f_{DL}$ = 740.9 MHz ($N_{DL}$ = 5129)
Band 4: $f_{DL}$ = 2132.7 MHz ($N_{DL}$ = 2177)

Note 12: N/A

Note 13: Test points that fulfil criteria of Note 4 in Table 7.3A.5.5-3

Note 14: Only Band 1 and Band 42 need to be tested and Band 3 does not need to be tested

Note 15: Only Band 1 and Band 3 need to be tested and Band 42 does not need to be tested

Note 16: Band 3: fUL = 1720MHz (NUL = 19300), fDL = 1815MHz (NDL = 1300)
Band 42: fUL/DL = 3440MHz (NUL/DL = 41990)

Note 17: Band 3: fUL = 1775MHz (NUL = 19850), fDL = 1870MHz (NDL = 1850)
Band 42: fUL/DL = 3520MHz (NDL = 42790)

Note 18: N/A

Note 19: Only Band 1 and Band 19 need to be tested and Band 28 does not need to be tested

Note 20: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC} = N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.

Note 21: Band 42: $f_{UL/DL}$ for SCC1 = 3430.2MHz ($N_{UL/DL}$ = 41892), $f_{UL/DL}$ for SCC2 = 3450MHz ($N_{UL/DL}$ = 42090)

Note 22: Band 42: $f_{UL/DL}$ for SCC1 = 3500.2MHz ($N_{UL/DL}$ = 42592), $f_{UL/DL}$ for SCC2 = 3520MHz ($N_{UL/DL}$ = 42790).

Note 23: Band 28: $f_{UL}$ = 719.3MHz ($N_{UL}$ = 27373), $f_{DL}$ = 774.3MHz ($N_{DL}$ = 9373).

Note 24: Band 42: $f_{UL/DL}$ for SCC1 = 3515.8MHz ($N_{UL}$ = 42748), $f_{UL/DL}$ for SCC2 = 3527.5MHz ($N_{DL}$ = 42865).

Note 25: Band 8: $f_{UL}$ = 897.5MHz ($N_{UL}$ = 21625), $f_{DL}$ = 942.5MHz ($N_{DL}$ = 3625), Band 42: $f_{UL/DL}$ = 3590MHz ($N_{UL/DL}$ = 43490).

Note 26: Band 28: $f_{UL}$ = 722.5 MHz ($N_{UL}$ = 27405), $f_{DL}$ = 777.5 MHz ($N_{DL}$ = 9405), Band 1: $f_{DL}$ = 2167.5 MHz ($N_{DL}$ = 575).

Note 27: Band 28: $f_{UL}$ = 743 MHz ($N_{UL}$ = 27610), $f_{DL}$ = 798 MHz ($N_{DL}$ = 9610). Band 11: $f_{DL}$ = 1480.9 MHz ($N_{DL}$ = 4800).

Note 28: Band 12: $f_{UL}$ = 704MHz ($N_{UL}$ = 23060), $f_{DL}$ = 734MHz ($N_{DL}$ = 5060)
Band 66: $f_{UL}$ = 1712.5MHz ($N_{UL}$ = 131997), $f_{DL}$ = 2112.5MHz ($N_{DL}$ = 66461)

Note 29: Band 12: $f_{UL}$ = 707.5MHz ($N_{UL}$ = 23095), $f_{DL}$ = 737.5MHz ($N_{DL}$ = 5095)
Band 66: $f_{UL}$ = 1720MHz ($N_{UL}$ = 132072), $f_{DL}$ = 2120MHz ($N_{DL}$ = 66536)

Note 30: Band 12: $f_{UL}$ = 711MHz ($N_{UL}$ = 23130), $f_{DL}$ = 741MHz ($N_{DL}$ = 5130)
Band 66: $f_{UL}$ = 1717.5MHz ($N_{UL}$ = 132047), $f_{DL}$ = 2117.5MHz ($N_{DL}$ = 66511).

Note 31: Band 3: $f_{UL}$ = 1757.4MHz ($N_{UL}$ = 19674), $f_{DL}$ = 1852.4MHz ($N_{DL}$ = 1674),
Band 11: $f_{DL}$ = 1480.9MHz ($N_{DL}$ = 4800).

Note 32: Band 3: $f_{DL}$ = 1852.4MHz ($N_{DL}$ = 1674),
Band 11: $f_{UL}$ = 1432.9MHz ($N_{UL}$ = 22800), $f_{DL}$ = 1480.9MHz ($N_{DL}$ = 4800).

Note 33: Band 2: $f_{UL}$ = 1868.3MHz ($N_{UL}$ = 18783), $f_{DL}$ = 1948.3MHz ($N_{DL}$ = 783).
Band 4: $f_{UL}$ = 1735MHz ($N_{UL}$ = 20200), $f_{DL}$ = 2135MHz ($N_{DL}$ = 2200).

Note 34: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.

Note 35: Band 3: $f_{UL}$ = 1737MHz ($N_{UL}$ = 19470), $f_{DL}$ = 1832MHz ($N_{DL}$ = 1470).
Band 7: $f_{UL}$ = 2543MHz ($N_{UL}$ = 23430), $f_{DL}$ = 2663MHz ($N_{DL}$ = 3180).
Band 20: $f_{UL}$ = 847MHz ($N_{UL}$ = 24300), $f_{DL}$ = 806MHz ($N_{DL}$ = 6300).

Note 36: Band 3: $f_{UL}$ = 1775MHz ($N_{UL}$ = 19850), $f_{DL}$ = 1870MHz ($N_{DL}$ = 1850).
Band 7: $f_{UL}$ = 2510MHz ($N_{UL}$ = 23100), $f_{DL}$ = 2630MHz ($N_{DL}$ = 2850).
Band 20: $f_{UL}$ = 855MHz ($N_{UL}$ = 24380), $f_{DL}$ = 814MHz ($N_{DL}$ = 6380).

Note 37: Band 7: $f_{UL}$ = 2512MHz ($N_{UL}$ = 23120), $f_{DL}$ = 2632MHz ($N_{DL}$ = 2512).
Band 20: $f_{UL}$ = 851MHz ($N_{UL}$ = 24340), $f_{DL}$ = 851MHz ($N_{DL}$ = 6340).
Note 38: Test frequency for each CA configuration shall follow Table 7.3A.0-0f. If test configurations of each ID in a CA configuration are same, test frequency shall follow the order of Table 7.3A.0-0f.
Note 39: Test frequency for each CA configuration shall follow Table 7.3A.0-0g. If test configurations of each ID in a CA configuration are same, test frequency shall follow the order of Table 7.3A.0-0g.
Note 40: Band 71:$f_{UL}$ = 679.3 MHz ($N_{UL}$ = 133285), $f_{DL}$ = 633.3 MHz ($N_{DL}$ = 68749)

**Table 7.3A.5.4.1-2: Test Configuration Table $W_{gap}$**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC $N_{RB}$" and “SCCs $N_{RB}$ ” columns |
| Network signalling value | NS_01 by default, exceptions listed in Table 7.3.3-3, dependent on PCC Band |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | UL alloc (Note 2,3,4) | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc |
| **Group Test Settings for CA_2A-2A-XA or CA_XA-2A-2A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| **1[10]** | 2 | CC2 | 16@57 | All RBs | 35 | 2 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| **2[11]** | 2 | CC2 | 16@39 | All RBs | 20 | 2 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| **3** | 2 | CC2 | 16@57 | All RBs | 20 | 2 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| **4** | X | Mid | REFSENS | All RBs | - | 2 | CC2 | N/A | All RBs | 20 | 2 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Group Test Settings for CA_2A-2A-71A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| **1** | 2 | CC2 | 50@50 | All RBs | 35 | 2 | CC1 | N/A | All RBs | - | 71 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 |
| **2[10]** | 2 | CC2 | 16@57 | All RBs | 35 | 2 | CC1 | N/A | All RBs | - | 71 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 |
| **3** | 2 | CC2 | 50@50 | All RBs | 20 | 2 | CC1 | N/A | All RBs | - | 71 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **4** | 2 | CC2 | 16@57 | All RBs | 20 | 2 | CC1 | N/A | All RBs | - | 71 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **5** | 71 | Low | 25@0 | All RBs | - | 2 | CC2 | N/A | All RBs | 35 | 2 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 25 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | 71 | Low | 25@0 | All RBs | - | 2 | CC2 | N/A | All RBs | 30 | 2 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 |
| **7** | 71 | Low | 20@0 | All RBs | - | 2 | CC2 | N/A | All RBs | 25 | 2 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 75 | | N/A | QPSK | | 75 | | N/A | QPSK | | 100 |
| **8** | 71 | Low | 20@0 | All RBs | - | 2 | CC2 | N/A | All RBs | 20 | 2 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Group Test Settings for CA_3A-3A-XA or CA_XA-3A-3A Configurations** | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| **1[18]** | 3 | CC2 | 16@50 | All RBs | 50 | 3 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| **2[18]** | 3 | CC2 | 32@68 | All RBs | 15 | 3 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| **3[18]** | 3 | CC2 | 16@50 | All RBs | 35 | 3 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| **4[18]** | 3 | CC2 | 16@50 | All RBs | 45 | 3 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | Highest NRB |
| **5[18]** | 3 | CC2 | 32@68 | All RBs | 10 | 3 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | Highest NRB |
| **6[18]** | X | Mid | REFSENS | All RBs | - | 3 | CC2 | N/A | All RBs | 35 | 3 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **7[18]** | X | Mid | REFSENS | All RBs | - | 3 | CC2 | N/A | All RBs | 10 | 3 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **Group Test Settings for CA_4A-4A-XA or CA_XA-4A-4A Configurations** | | | | | | | | | | | | | | |
| **1** | 4 | CC2 | 100@0 | All RBs | 20 | 4 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| **2** | 4 | CC2 | 100@0 | All RBs | 5 | 4 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| **3** | X | Mid | REFSENS | All RBs | - | 4 | CC2 | N/A | All RBs | 5 | 4 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Group Test Settings for CA_4A-4A-71AConfigurations** | | | | | | | | | | | | | | |
| **1** | 4 | CC2 | 100@0 | All RBs | 20 | 4 | CC1 | N/A | All RBs | - | 71 | Mid | N/A | All RBs |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| **2** | 4 | CC2 | 100@0 | All RBs | 5 | 4 | CC1 | N/A | All RBs | - | 71 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| **3** | 71 | Mid | REFSENS | All RBs | - | 4 | CC2 | N/A | All RBs | 5 | 4 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for CA_4A-4A-12A Configuration** | | | | | | | | | | | | | | |
| **1** | 4 | CC2 | 100@0 | All RBs | 20 | 4 | CC1 | N/A | All RBs | - | 12 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 50 |
| **2** | 4 | CC2 | 100@0 | All RBs | 20 | 4 | CC1 | N/A | All RBs | - | 12 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **3** | 12 | Mid | 20@30 | All RBs | - | 4 | CC2 | N/A | All RBs | 20 | 4 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 25 |
| **4** | 12 | Mid | 8@42[7] | All RBs | - | 4 | CC2 | N/A | All RBs | 5 | 4 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for CA_4A-4A-13A Configuration** | | | | | | | | | | | | | | |
| **1** | 4 | CC2 | 100@0 | All RBs | 20 | 4 | CC1 | N/A | All RBs | - | 13 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| **2** | 4 | CC2 | 100@0 | All RBs | 5 | 4 | CC1 | N/A | All RBs | - | 13 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| **3** | 13 | Mid | REFSENS | All RBs | - | 4 | CC2 | N/A | All RBs | 5 | 4 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **4** | 4 | CC1 | 50@0 | All RBs | 10 | 4 | CC2 | N/A | All RBs | - | 13 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| **Test Settings for CA_5A-5A-66A** | | | | | | | | | | | | | | |
| **1** | 5 | CC2 | 50@0 | All RBs | 50 | 5 | CC1 | N/A | All RBs | - | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| **2** | 5 | CC2 | 50@0 | All RBs | 50 | 5 | CC1 | N/A | All RBs | - | 66 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | Highest NRB |
| **3** | 66 | Mid | REFSENS | All RBs | - | 5 | CC2 | N/A | All RBs | 50 | 5 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **Group Test Settings for CA_7A-7A-XA or CA_XA-7A-7A Configurations** | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1[19] | 7 | CC2 | 32@68 | All RBs | 45 | 7 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| 2[19] | 7 | CC2 | 45@55 | All RBs | 25 | 7 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| 3[19] | 7 | CC2 | 32@68 | All RBs | 40 | 7 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | Highest NRB |
| 4[19] | 7 | CC2 | 45@55 | All RBs | 20 | 7 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | Highest NRB |
| 5[19] | 7 | CC2 | 36@64 | All RBs | 35 | 7 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 75 | | N/A | QPSK | | Highest NRB |
| 6[19] | 7 | CC2 | 50@50 | All RBs | 15 | 7 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 75 | | N/A | QPSK | | Highest NRB |
| 7[19] | 7 | CC2 | 32@68 | All RBs | 30 | 7 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| 8[19] | 7 | CC2 | 45@55 | All RBs | 15 | 7 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| 9[19] | 7 | CC2 | 32@18 | All RBs | 40 | 7 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| 10[19] | 7 | CC2 | 50@0 | All RBs | 15 | 7 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| 11[19] | 7 | CC2 | 32@18 | All RBs | 55 | 7 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| 12[19] | 7 | CC2 | 50@0 | All RBs | 30 | 7 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| 13[19] | X | Mid | REFSENS | All RBs | - | 7 | CC2 | N/A | All RBs | 40 | 7 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 |
| 14[19] | X | Mid | REFSENS | All RBs | - | 7 | CC2 | N/A | All RBs | 30 | 7 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Test Settings for CA_12A-66A-66A Configuration** | | | | | | | | | | | | | | |
| **1** | 66 | CC2 | 100@0 | All RBs | 65 | 66 | CC1 | N/A | All RBs | - | 12 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 50 |
| **2** | 66 | CC2 | 100@0 | All RBs | 50 | 66 | CC1 | N/A | All RBs | - | 12 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **3** | 12 | Low | 20@5 | All RBs | - | 66 | CC2 | N/A | All RBs | 65 | 66 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 25 |
| **4** | 12 | Mid | 20@5 | All RBs | - | 66 | CC2 | N/A | All RBs | 60 | 66 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **5** | 12 | High | 20@30 | All RBs | - | 66 | CC2 | N/A | All RBs | 75 | 66 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 75 |
| **6** | 12 | Mid | 20@30 | All RBs | - | 66 | CC2 | N/A | All RBs | 50 | 66 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for CA_29A-66A-66A Configurations** | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | 29 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **2** | 66 | CC1 | 100@0 | All RBs | 65 | 66 | CC2 | N/A | All RBs | - | 29 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 50 |
| **Group Test Settings for CA_66A-66A-XA or CA_XA-66A-66A Configurations** | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | 100@0 | All RBs | 65 | 66 | CC2 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| **2** | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| **3** | X | Mid | REFSENS | All RBs | - | 66 | CC1 | N/A | All RBs | 50 | 66 | CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Group Test Settings for CA_42A-42A-XA or CA_XA-42A-42A Configurations** | | | | | | | | | | | | | | |
| **1** | 42 | CC2 | 100@0 | All RBs | 175 | 42 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| **2** | 42 | CC2 | 100@0 | All RBs | 160 | 42 | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| **3** | X | Mid | REFSENS | All RBs | - | 42 | CC2 | N/A | All RBs | 160 | 42 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for CA_7A-42A-42A Configurations** | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 42 | CC2 | 100@0 | All RBs | 175 | 42 | CC1 | N/A | All RBs | - | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | Highest NRB |
| **2** | 42 | CC2 | 100@0 | All RBs | 160 | 42 | CC1 | N/A | All RBs | - | 7 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| **3** | 7 | Mid | 75@25 | All RBs | - | 42 | CC2 | N/A | All RBs | 160 | 42 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for CA_20A-42A-42A Configurations** | | | | | | | | | | | | | | |
| **1** | 20 | Mid | 25@37 | All RBs | - | 42 | CC2 | N/A | All RBs | 160 | 42 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **2** | 20 | Mid | 20@16 | All RBs | - | 42 | CC2 | N/A | All RBs | 70 | 42 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **3** | 42 | CC2 | 100@0 | All RBs | 175 | 42 | CC1 | N/A | All RBs | - | 20 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 |
| **4** | 42 | CC2 | 100@0 | All RBs | 160 | 42 | CC1 | N/A | All RBs | - | 20 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_41C-41A Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| **1** | 41 | CC3 | 100@0 | All RBs | 149 | 41 | CC2 | N/A | All RBs | - | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 25 |
| **2** | 41 | CC3 | 100@0 | All RBs | 134.2 | 41 | CC2 | N/A | All RBs | - | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_41A-41C Configuration** | | | | | | | | | | | | | | |
| **1** | 41 | CC3 | 100@0 | All RBs | - | 41 | CC2 | N/A | All RBs | 149 | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 25 |
| **2** | 41 | CC3 | 100@0 | All RBs | - | 41 | CC2 | N/A | All RBs | 134.2 | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for CA_46A-46A-66A Configuration** | | | | | | | | | | | | | | |
| **1** | 66 | Low | 100@0 | All RBs | - | 46 | CC1 | N/A | All RBs | 725 | 46 | CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **2** | 66 | High | 100@0 | All RBs | - | 46 | CC1 | N/A | All RBs | 725 | 46 | CC2 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_66A-66C Configuration** | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | 100@0 | All RBs | 45 | 66 | CC2 | N/A | All RBs | - | 66 | CC3 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 25 |
| **2** | 66 | CC1 | 100@0 | All RBs | 30.2 | 66 | CC2 | N/A | All RBs | - | 66 | CC3 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band non-contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: **Intra-band non-contiguous + Intra-band contiguous:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 4: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band non-contiguous + Inter-band:** X and Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A,X=2,Y=5 or Y=5, X =2
Note 6: **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A,X=41.
Note 7: REFSENS refers to the PCC bands and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Inter-band:** Configuration for the low band for which the 3rd harmonic is within transmission bandwidth of the high band, as specified in Table 7.3A.0-0a Note 5.
Note 9: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.
Note 10: Not applicable if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
Note 11: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
Note 12: Void
Note 13: Void
Note 14: Void
Note 15: Void
Note 16: Void
Note 17 Void
Note 18: Applicable test configuratons are specified in Table 7.3A.5.4.1-2a.
Note 19: Applicable test configurations are specified in Table 7.3A.5.4.1-2b.
Note 20: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.

**Table 7.3A.5.4.1-2a: Test Configuration Applicability for CA_3A-3A-XA or CA_XA-3A-3A**

| ID | Supported BCS | | |
|---|---|---|---|
| | 0 | 1 | 0,1 |
| | Associated CA_3A-3A BCS(Note1) | | |
| | 0 | 1 | 0,1 |
| 1 | x | x | x |
| 2 | x | x | x |
| 3 | x | - | x |
| 4 | - | x | - |
| 5 | - | x | - |
| 6 | x | - | x |
| 7 | - | x | - |
| Note 1: Associated CA_3A-3A BCS for each BCS of CA_3A-3A-XA or CA_XA-3A-3A is specified in Table 5.4.2A.1-1 to Table 5.4.2A.1-3. | | | |

**Table 7.3A.5.4.1-2b: Test Configuration Applicability for CA_7A-7A-XA or CA_XA-7A-7A**

| ID | Supported BCS | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 0,1 |
| | Associated CA_7A-7A BCS(Note1) | | | | | | |
| | 1 | 2 | 3 | 1 | 2 | 3 | 1,2 |
| 1 | x | - | - | x | - | - | x |
| 2 | x | - | - | x | - | - | x |
| 3 | - | - | x | - | - | x | - |
| 4 | - | - | x | - | - | x | - |
| 5 | - | - | - | - | - | - | - |
| 6 | - | - | - | - | - | - | - |
| 7 | x | - | x | x | - | x | x |
| 8 | x | - | x | x | - | x | x |
| 9 | - | x | - | - | x | - | - |
| 10 | - | x | - | - | x | - | - |
| 11 | - | x | - | - | x | - | - |
| 12 | - | x | - | - | x | - | - |
| 13 | - | x | - | - | x | - | - |
| 14 | x | - | x | x | - | x | x |
| Note 1: Associated CA_7A-7A BCS for each BCS of CA_7A-7A-XA or CA_XA-7A-7A is specified in Table 5.4.2A.1-1 to Table 5.4.2A.1-3. | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.55 if the UE supports 2 Rx antennas or Figure A.80 if the UE supports 4 Rx antennas in at least one band within the CA configuration.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 7.3A.5.4.1-1 through Table7.3A.5.4.1-2 as appropriate.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.3A.5.4.3.

### 7.3A.5.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.3A.5.4.3

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.3A.5.4.1-1 through Table7.3A.5.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.3A.5.4.1-1 through Table7.3A.5.4.1-2 as appropriate on PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the appropriate REFSENS value defined in Table 7.3A.5.5-1 through Table7.3A.5.5-7. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the Throughput measurement.

7. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.3A.5.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

## 7.3A.5.5 Test requirement

For intra-band contiguous carrier aggregation the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.5.5-1. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.5.5-1: Reference sensitivity QPSK $P_{REFSENS}$ for Intra-band contiguous**

| | | Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CA Configuration** | **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| CA_40D | 40 | - | - | - | -96.3 | -94.5 | -93.3 | TDD |
| | | - | - | - | -99.0[4] | -97.2[4] | -96.0[4] | |
| CA_41D | 41 | - | - | - | -94.3 | -92.5 | -91.3 | TDD |
| | | - | - | - | -97.0[4] | -95.2[4] | -94.0[4] | |
| Note 1: The transmitter shall be set to maximum output power level (Table 7.3A.5.5-2) | | | | | | | | |
| Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 | | | | | | | | |
| Note 3: The signal power is specified per port | | | | | | | | |
| Note 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured. | | | | | | | | |

**Table 7.3A.5.5-2: Void**

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as

specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.5.5-3 (originated from single carrier Tables 7.3.5-1). The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.5.5-3: Reference sensitivity QPSK $P_{REFSENS}$ for inter-band**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CA Configuration** | **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| CA_1A-3A-5A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 3 (Note 4) | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| CA_1A-3A-7A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 3 (Note 4) | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 7 | - | - | - | -94.3 | -92.5 | -91.3 | |
| | | - | - | - | -97.0[20] | -95.2[20] | -94.0[20] | |
| CA_1A-3A-8A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 3 (Note 4) | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 8 | - | -98.5 | -96.3 | -93.3 | - | - | |
| CA_1A-3A-11A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.020 | -99.020 | -97.220 | -96.020 | |
| | 3 (Note 5) | - | - | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | - | - | -99.020 | -96.020 | -94.220 | -93.020 | |
| | 3 (Note 4) | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 11 | - | - | -99.3 | -96.3 | - | - | |
| CA_1A-3A-18A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 3 (Note 5) | - | - | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | - | - | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 3 (Note 4) | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 18 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_1A-3A-18A (NOTE 27) | 1 | - | - | -76.3 | - | - | - | FDD |
| | | - | - | -76.3[20] | - | - | - | |
| | 3 | - | - | -96.3 | - | - | - | |
| | | - | - | -99.0[20] | - | - | - | |
| | 18 | - | - | -99.3 | - | - | - | |
| CA_1A-3A-19A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 3 (Note 4) | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 19 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_1A-3A-21A[12] | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 3 | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 21 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_1A-3A-21A[13] | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | - | - | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 21 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_1A-3A-41A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 3(Note 12) | - | - | -93.7 | -90.8 | -89.7 | -88.3 | |
| | 3(Note 13) | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 41(Note | - | - | -92.6 | -90 | -88.5 | -91.3 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 14) | | | | | | | |
| CA_1A-3A-42A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 3 (Note 4) | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 42 | - | - | -98 | -95 | -93.2 | -92 | TDD |
| | | | | -100.2[20] | -97.2[20] | -95.4[20] | -94.2[20] | |
| | 42 (Note 9) | - | - | -71.2 | -71.2 | -71.2 | -71.2 | |
| | 42 (Note 10) | - | - | -96.6 | -94.2 | -92.7 | -92 | |
| CA_1A-3A-42A (NOTE 27) | 1 | - | - | -76.3 | - | - | - | FDD |
| | | - | - | -76.3[20] | - | - | - | |
| | 3 | - | - | -96.3 | - | - | - | |
| | | - | - | -99.0[20] | - | - | - | |
| | 42 | - | - | -98 | - | - | - | TDD |
| | | - | - | -100.2[20] | - | - | - | |
| | 1 | - | - | -99.3 | - | - | - | FDD |
| | | - | - | -102.0[20] | - | - | - | |
| | 3 | - | - | -96.3 | - | - | - | |
| | | - | - | -99.0[20] | - | - | - | |
| | 42 | - | - | -87 | - | - | - | TDD |
| | | - | - | -89.2[20] | - | - | - | |
| CA_1A-3A-42A (NOTE 28) | 1 | - | - | -99.3 | - | - | - | FDD |
| | | | | -102.0[20] | - | - | - | |
| | 3 | - | - | -67.0 | - | - | - | |
| | | - | - | -67.0[20] | - | - | - | |
| | | - | - | -88.8 | - | - | - | |
| | | - | - | -88.2[20] | - | - | - | |
| | 42 | - | - | -98 | - | - | - | TDD |
| | | - | - | -100.2[20] | - | - | - | |
| CA_1A-3A-20A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 3 (Note 4) | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 20 | - | - | -96.3 | -93.3 | -90.5 | -89.3 | |
| | | - | - | -99.0[20] | -96.0[20] | -93.2[20] | -92.0[20] | |
| CA_1A-3A-26A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | - | - | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 3 (Note 4) | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 26 | - | - | -96.8[6] | -93.8[6] | | | |
| CA_1A-3A-26A (NOTE 27) | 1 | - | - | -76.3 | - | - | - | FDD |
| | | - | - | -76.3[20] | - | - | - | |
| | 3 | - | - | -92.3 | - | - | - | |
| | | - | - | -92.3[20] | - | - | - | |
| | 26 | - | - | -96.8 | - | - | - | |
| CA_1A-3A-26A (NOTE 28) | 1 | - | - | -99.3 | - | - | - | FDD |
| | | - | - | -102.0[20] | - | - | - | |
| | 3 | - | - | -96.3 | - | - | - | |
| | | - | - | -99.0[20] | - | - | - | |
| | 26 | - | - | -96.8 | - | - | - | |
| | 1 | - | - | -99.3 | - | - | - | FDD |
| | | - | - | -102.0[20] | - | - | - | |
| | 3 | - | - | -96.3 | - | - | - | |
| | | - | - | -99.0[20] | - | - | - | |
| | 26 | - | - | -70.8 | - | - | - | |
| CA_1A-3A-28A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 1(Note 21) | - | - | -89.1 | -88.7 | -88.3 | -88.0 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 3(Note 4) | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 3(Note 5) | - | - | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | - | - | -99[20] | -96[20] | -94.2[20] | -93[20] | |
| | 3(Note 21) | - | - | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | - | - | -99[20] | -96[20] | -94.2[20] | -93.0[20] | |
| | 28 | - | - | -97.6 | -94.6 | -92.8 | -90.1 | |
| CA_1A-3A-28A (NOTE 27) | 1 | - | - | -76.3 | - | - | - | FDD |
| | | - | - | -76.3[20] | - | - | - | |
| | 3 | - | - | -96.3 | - | - | - | |
| | | - | - | -99.0[20] | - | - | - | |
| | 28 | - | - | -97.6 | - | - | - | |
| CA_1A-3A-28A (NOTE 29) | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | - | - | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 28 | - | - | -97.6 | -94.6 | -92.8 | -90.1 | |
| | 1 | - | - | -99.3 | - | - | - | FDD |
| | | - | - | -102.0[20] | - | - | - | |
| | 3 | - | - | -92.3 | - | - | - | |
| | | - | - | -95.0[20] | - | - | - | |
| | 28 | - | - | -97.6 | - | - | - | |
| CA_1A-3A-28A (NOTE 28) | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | - | - | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 28 | - | - | -97.6 | -94.6 | -92.8 | -90.1 | |
| | 1 | - | - | -88.3 | - | - | - | FDD |
| | | - | - | -91.0[20] | - | - | - | |
| | 3 | - | - | -96.3 | - | - | - | |
| | | - | - | -99.0[20] | - | - | - | |
| | 28 | - | - | -97.6 | - | - | - | |
| CA_1A-3A-40A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 1(NOTE 25) | - | - | -91.0 | [-88.8] | [-87.2] | [-86.2] | |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 3 (Note 4) | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 3(NOTE 25) | - | - | -93.5 | -90.5 | -88.8 | -87.6 | |
| | 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 40(Note 19) | | | -99.3 | -92.2 | -90.6 | -89.5 | |
| | 40(Note 26) | - | - | [-92.6] | -90.6 | -89.3 | -88.2 | |
| | | - | - | [-95.3][20] | -93.3[20] | -92.0[20] | -90.9[20] | |
| CA_1A-5A-7A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100.0[20] | -97.0[20] | -97.2[20] | -93.0[20] | |
| CA_1A-7A-8A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100.0[20] | -97.0[20] | -97.2[20] | -93.0[20] | |
| | 7(Note 8) | - | - | -87.3 | -86.7 | -86.3 | -86.0 | |
| | | - | - | -90.0[20] | -89.4[20] | -89[20] | -88.7[20] | |
| | 8 | - | - | -96.3 | -93.3 | - | - | |
| | 8(Note 8) | | | -96.1 | -93.1 | - | - | |
| CA_1A-7A-20A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 7 | - | - | - | -94.3 | -92.5 | -91.3 | |
| | | - | - | - | -97.0[20] | -97.2[20] | -93.0[20] | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 20 | - | - | -96.3 | -93.3 | - | - | |
| | | - | - | -99[20] | -96[20] | - | - | |
| CA_1A-8A-11A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 8 | - | - | -96.3 | -93.3 | - | - | |
| | 11 | - | - | -99.3 | -96.3 | - | - | |
| CA_1A-8A-28A (Note 15) | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 8 | - | -98.5 | -96.3 | -93.3 | - | - | |
| | 28 | - | - | -97.6 | -94.6 | -92.8 | -90.1 | |
| CA_1A-8A-40A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 1(Note 25) | - | - | -91.0 | [-88.8] | [-87.2] | [-86.2] | |
| | 8 | - | -98.5 | -96.3 | -93.3 | - | - | |
| | 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 40(Note 26) | - | - | [-92.7] | -91.2 | -89.7 | -88.7 | |
| CA_1A-11A-18A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 11 | - | - | -99.3 | -96.3 | - | - | |
| | 18 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_1A-11A-28A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.7 | FDD |
| | 1(Note 8) | - | - | -89.1 | -87.7 | -88.3 | -88 | |
| | 11 | - | | -99.3 | -96.3 | - | - | |
| | 11(Note 9) | - | - | -74.5 | -74.5 | - | - | |
| | 28 | - | - | -97.6 | -94.6 | -92.8 | -90.1 | |
| CA_1A-18A-28A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 18 | - | - | -99.3 | -96.3 | -94.5 | - | |
| | 28 | - | - | -97.8 | -94.8 | - | - | |
| | 28 (Note 7) | - | - | -93.3 | -91.8 | - | - | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_1A-19A-21A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 19 | - | - | -99.3 | -96.3 | -94.5 | - | |
| | 21 | - | - | -99.3 | -96.3 | -94.5 | - | |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | - | |
| CA_1A-19A-28A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 19 | - | - | -99.3 | -96.3 | -94.5 | - | |
| | 28 | - | - | -97.8 | -94.8 | - | - | |
| | 28 (Note 11) | - | - | -93.3 | -91.3 | - | - | |
| CA_1A-19A-42A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 19 | - | - | -99.3 | -96.3 | -94.5 | - | |
| | 42 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | - | - | -100.2[20] | -97.2[20] | -95.4[20] | -94.2[20] | |
| CA_1A-21A-42A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 21 | - | - | -99.3 | -96.3 | -94.5 | - | |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | - | |
| | 42 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | - | - | -100.2[20] | -97.2[20] | -95.4[20] | -94.2[20] | |
| CA_1A-41A-42A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 41 | - | - | - | -94.3 | -92.5 | -91.3 | TDD |
| | | - | - | - | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 42 | - | - | - | -95.0 | -93.2 | -92.0 | |
| | | - | - | - | -97.2[20] | -95.4[20] | -94.2[20] | |
| CA_2A-4A-5A | 2 | - | - | -97,3 | -94,3 | -92.5 | -91,3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | - | - | -102[20] | -99[20] | -97.2[20] | -96[20] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| CA_2A-4A-7A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | - | - | -102[20] | -99[20] | -97.2[20] | -96[20] | |
| | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| CA_2A-4A-7A (Note 24) | 2 | - | - | - | - | - | -86.3 | FDD |
| | 2 | - | - | - | - | - | -83.620 | |
| | 4 | - | - | -99.3 | - | - | - | |
| | | - | - | -102[20] | - | - | - | |
| | 7 | - | - | - | - | - | -91.3 | |
| | 2 | - | - | -97.3 | - | - | - | FDD |
| | 4 | - | - | -94.3 | - | - | - | |
| | | - | - | -97[20] | - | - | - | |
| | 7 | - | - | - | - | - | -91.3 | |
| CA_2A-4A-12A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | | | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 2 (Note 8) | - | - | -97 | -94 | -92.2 | -91 | |
| | | | | -99.7[20] | -96.7[20] | -94.9[20] | -93.7[20] | |
| | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | - | - | -102[20] | -99[20] | -97.2[20] | -96[20] | |
| | 4 (Note 8) | - | - | -89.3 | -88.8 | -88.3 | -87.8 | |
| | | - | - | -92[20] | -91.5[20] | -91[20] | -90.5[20] | |
| | 12 | - | - | -96.3 | -93.3 | - | - | |
| | 12 (Note8) | - | - | -95.8 | -92.8 | - | - | |
| CA_2A-4A-13A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | - | - | -102[20] | -99[20] | -97.2[20] | -96[20] | |
| | 13 | - | - | - | -93.3 | - | - | |
| CA_2A-4A-29A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | - | - | -102[20] | -99[20] | -97.2[20] | -96[20] | |
| | 29 | - | - | -96.3 | -93.3 | - | - | |
| CA_2A-4A-30A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | - | - | -102[20] | -99[20] | -97.2[20] | -96[20] | |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_2A-4A-71A | 2 | - | - | -97,3 | -94,3 | -92.5 | -91,3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | - | - | -102[20] | -99[20] | -97.2[20] | -96[20] | |
| | 71 | - | - | -96.5 | -93.5 | -91.3 | -86.8 | |
| CA_2A-5A-12A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| | 12 | - | - | -96.3 | -93.3 | - | - | |
| CA_2A-5A-13A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| | 13 | - | - | - | -93.3 | - | - | |
| CA_2A-5A-30A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_2A-5A-66A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[20] | -98.5[20] | -96.7[20] | -95.5[20] | |
| CA_2A-7A-12A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 12 | - | - | -96.3 | -93.3 | - | - | |
| CA_2A-12A-30A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 12 | - | - | -96.3 | -93.3 | - | - | |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_2A-12A-66A | 2 | - | - | -97.0 | -94.0 | -92.2 | -91.0 | FDD |
| | | - | - | -99.7[20] | -96.7[20] | -94.9[20] | -93.7[20] | |
| | 12 | - | - | -95.8 | -92.8 | - | - | |
| | 66 | - | - | -88.8 | -88.3 | -87.8 | -87.3 | |
| | | - | - | -91.5[20] | -91.0[20] | -90.5[20] | -90.0[20] | |
| CA_2A-13A-66A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 13 | - | - | - | -93.3 | - | - | |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | - | - | -101.5[20] | -98.5[20] | -96.7[20] | -95.5[20] | |
| CA_2A-14A-30A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 14 | - | - | -96.3 | -93.3 | - | - | |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_2A-14A-66A | 2 | - | - | -97.0 | -94.0 | -92.2 | -91.0 | FDD |
| | | - | - | -99.7[20] | -96.7[20] | -94.9[20] | -93.7[20] | |
| | 14 | - | - | -96.3 | -93.3 | - | - | |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | - | - | -101.5[20] | -98.5[20] | -96.7[20] | -95.5[20] | |
| CA_2A-29A-30A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 29 | - | - | -96.3 | -93.3 | - | - | |
| | 30 | - | - | -98.3 | -95.3 | - | - | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_2A-30A-66A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | - | - | -101.5[20] | -98.5[20] | -96.7[20] | -95.5[20] | |
| CA_2A-66A-71A | 2 | - | - | -97,3 | -94,3 | -92.5 | -91,3 | FDD |
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | - | - | -101.5[20] | -98.5[20] | -96.7[20] | -95.5[20] | |
| | 71 | - | - | -96.5 | -93.5 | -91.3 | -86.8 | |
| CA_3A-7A-8A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 7 | - | - | - | -94.3 | -92.5 | -91.3 | |
| | 7 (Note8) | - | - | - | -86.7 | -86.3 | -86 | |
| | 8 | - | - | -96.3 | -93.3 | - | - | |
| | 8 (Note8) | - | - | -96.1 | -93.1 | - | - | |
| CA_3A-7A-20A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 7 | - | - | - | -94.3 | -92.5 | -91.3 | |
| | | - | - | - | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 20 | - | - | -96.3 | -93.3 | -90.5 | -89.3 | |
| | | - | - | -99.0[20] | -96.0[20] | -93.2[20] | -92.0[20] | |
| CA_3A-7A-42A | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | | | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 7 | | | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | | | -100[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | | | -102.2[20] | -97.2[20] | -95.4[20] | -95.2[20] | |
| | 42 (Note 9) | | | -71.2 | -71.2 | -71.2 | -71.2 | |
| | 42 (Note 10) | | | -96.6 | -94.2 | -92.7 | -92.0 | |
| CA_3A-8A-11A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 8 | - | - | -96.3 | -93.3 | - | - | |
| | 11 | - | - | -99.3 | -96.3 | - | - | |
| CA_3A-8A-28A (Note 16) | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 8 | - | -98.5 | -96.3 | -93.3 | - | - | |
| | 28 | - | - | -97.8 | -94.8 | -93 | -90.3 | |
| CA_3A-8A-40A | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | | | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 3(Note 25) | - | - | -93.5 | -90.5 | -88.8 | -87.6 | |
| | 8 | - | -98.5 | -96.3 | -93.3 | - | - | |
| | 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | -96.0[20] | |
| | 40(Note 19) | - | - | -94.7 | -92.2 | -90.6 | -89.5 | |
| CA_3A-11A-28A | 3 | - | - | -96.0 | -93.0 | -91.2 | -90.0 | FDD |
| | | - | - | -98.7[20] | -95.7[20] | -93.9[20] | -92.7[20] | |
| | 11 | - | - | -98.8 | -95.8 | - | - | |
| | 11 (Note 9) | - | - | -74.5 | -74.5 | - | - | |
| | 28 | - | - | -97.6 | -94.6 | -92.8 | -90.1 | |
| CA_3A-19A-42A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 19 | - | - | -99.3 | -96.3 | -94.5 | - | |
| | 42 | - | - | -98 | -95 | -93.2 | -92 | TDD |
| | | - | - | -102.2[20] | -97.2[20] | -95.4[20] | -95.2[20] | |
| | 42 (Note 9) | - | - | -71.2 | -71.2 | -71.2 | -71.2 | |
| | 42 (Note 10) | - | - | -96.6 | -94.2 | -92.7 | -92 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_3A-20A-32A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | 20 | - | - | -96.3 | -93.3 | -90.5 | -89.3 | |
| | 32 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | |
| CA_3A-20A-42A | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | | | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 20 | | | -96.3 | -93.3 | -90.5 | -89.3 | |
| | | | | -99.0[20] | -96.0[20] | -93.2[20] | -92.0[20] | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | | | -102.2[20] | -97.2[20] | -95.4[20] | -95.2[20] | |
| | 42 (Note 9) | | | -71.2 | -71.2 | -71.2 | -71.2 | |
| | 42 (Note 10) | | | -96.6 | -94.2 | -92.7 | -92.0 | |
| CA_3A-21A-42A | 3 | - | - | -96.0 | -93.0 | -91.2 | -90.0 | FDD |
| | | - | - | -98.7[20] | -95.7[20] | -93.9[20] | -92.7[20] | |
| | 21 | - | - | -98.8 | -95.8 | -94.0 | - | |
| | 42 | - | - | -70.7 | -70.7 | -70.7 | -70.7 | TDD |
| CA_3A-21A-42A | 3 | - | - | -96.0 | -93.0 | -91.2 | -90.0 | FDD |
| | | - | - | -98.7[20] | -95.7[20] | -93.9[20] | -92.7[20] | |
| | 21 | - | - | -98.8 | -95.8 | -94.0 | - | |
| | 42 | - | - | -96.1 | -93.7 | -92.2 | -91.5 | TDD |
| CA_3A-28A-41A (Note 18) | 3 | - | - | [-93.3] | [-90.3] | [-88.5] | [-87.2] | FDD |
| | 28 | - | - | -97.8 | -94.8 | - | - | |
| | 41 | - | - | -96.8[17] | -93.8[17] | -92[17] | -90.8[17] | TDD |
| | | - | - | -99.5[17,20] | -96.5[17,20] | -94.7[17,20] | -93.5[17,20] | |
| CA_3A-28A-41A (Note 19) | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[20] | -96.0[20] | -94.2[20] | -93.0[20] | |
| | 28 | - | - | -97.8 | -94.8 | - | - | |
| | 41 | - | - | [-92.6][17] | [-90][17] | [-88.5][17] | [-87.4][17] | TDD |
| CA_3A-41A-42A (Note 19) | 3 | - | - | -95.8 | -92.8 | -91 | -89.8 | FDD |
| | 41 (Note 17) | - | - | [-92.6] | [90.0] | [-88.5] | [-87.4] | TDD |
| | 42 | | | -97.5 | -94.5 | -92.7 | -91.5 | |
| | 42 (Note 9) | | | -70.7 | -70.7 | -70.7 | -70.7 | |
| | 42 (Note 10) | | | -96.1 | -93.7 | -92.2 | -91.5 | |
| CA_3A-41A-42A (Note 18, Note 23) | 3 | | | [-92.8] | [-89.8] | [-88] | [-86.7] | FDD |
| | 41 (Note 17) | | | -96.8 | -93.8 | -92.0 | -90.8 | TDD |
| | 42 | | | -97.5 | -94.5 | -92.7 | -91.5 | |
| CA_3A-41A-42A (Note 22, Note 23) | 3 | | | -95.8 | -92.8 | -91 | -89.8 | FDD |
| | 41 (Note 17) | | | -96.8 | -93.8 | -92.0 | -90.8 | TDD |
| | 42 | | | -97.5 | -94.5 | -92.7 | -91.5 | |
| CA_4A-5A-12A | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102[20] | -99[20] | -97.2[20] | -96[20] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| | 12 | - | - | -96.3 | -93.3 | - | - | |
| CA_4A-5A-13A | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102[20] | -99[20] | -97.2[20] | -96[20] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| | 13 | - | - | - | -93.3 | - | - | |
| CA_4A-5A-29A | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102[20] | -99[20] | -97.2[20] | -96[20] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| | 29 | - | - | -96.3 | -93.3 | - | - | |
| CA_4A-5A-30A | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102[20] | -99[20] | -97.2[20] | -96[20] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_4A-7A-12A | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102[20] | -99[20] | -97.2[20] | -96[20] | |
| | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | - | - | -100.0[20] | -97.0[20] | -95.2[20] | -94.0[20] | |
| | 12 | - | - | -96.3 | -93.3 | - | - | |
| CA_4A-12A-30A | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102[20] | -99[20] | -97.2[20] | -96[20] | |
| | 4 (Note 8) | - | - | -89.7 | -89.2 | -88.7 | -88.2 | |
| | | - | - | -92.4[20] | -91.9[20] | -91.4[20] | -90.9[20] | |
| | 12 | - | - | -96.3 | -93.3 | - | - | |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_4A-29A-30A | 4 | - | - | -98.9 | -95.9 | -94.1 | -92.9 | FDD |
| | | - | - | -101.6[20] | -98.6[20] | -96.8[20] | -95.6[20] | |
| | 29 | - | - | -96.3 | -93.3 | - | - | |
| | 30 | - | - | -97.8 | -94.8 | - | - | |
| CA_5A-30A-66A | 5 | - | - | -97.3 | -94.3 | - | - | FDD |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | - | - | -101.5[20] | -98.5[20] | -96.7[20] | -95.5[20] | |
| CA_7A-8A-20A | 7 | - | - | - | -94.3 | -92.5 | -91.3 | FDD |
| | 8 | - | -98.5 | -96.3 | -93.3 | - | - | |
| | 20 | - | - | [-96.3] | [-93.3] | - | - | |
| | | - | - | [-99.0][20] | [-96.0][20] | - | - | |
| CA_8A-11A-28A | 8 | - | - | -96.1 | -93.1 | - | - | FDD |
| | 11 | - | - | -99.3 | -96.3 | - | - | |
| | 28 | - | - | -97.6 | -94.6 | -92.8 | -90.1 | |
| CA_12A-30A-66A | 12 | - | - | -95.8 | -92.8 | - | - | FDD |
| | 30 | - | - | -97.8 | -94.8 | - | - | |
| | 66 | - | - | -88.8 | -88.3 | -87.8 | -87.3 | |
| | | - | - | -91.5[20] | -91.0[20] | -90.5[20] | -90.0[20] | |
| CA_14A-30A-66A | 14 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 30 | - | - | -97.8 | -94.8 | - | - | |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | - | - | -101.5[20] | -98.5[20] | -96.7[20] | -95.5[20] | |
| CA_19A-21A-42A | 19 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| | 21 | - | - | -99.3 | -96.3 | -94.5 | - | |
| | | - | - | -102.0[20] | -99.0[20] | -97.2[20] | - | |
| | 42 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | - | - | -102.2[20] | -97.2[20] | -95.4[20] | -94.2[20] | |
| CA_29A-46A-66A | 29 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 46 | - | - | - | - | - | -88.5 | TDD |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | FDD |
| | | - | - | -101.5[20] | -98.5[20] | -96.7[20] | -95.5[20] | |
| CA_29A-66A-70A | 29 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | - | - | -101.5[20] | -98.5[20] | -96.7[20] | -95.5[20] | |
| | 70 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_66A-70A-71A | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | FDD |
| | | - | - | -101.5[20] | -98.5[20] | -96.7[20] | -95.5[20] | |
| | 70 | - | - | -99.3 | -96.3 | -94.5 | - | |
| | 70(Note 8) | - | - | -89.3 | -88.8 | -88.5 | - | |
| | 71 | - | - | -96.5 | -93.5 | -91.2 | -86.8 | |

Note 1: The transmitter shall be set to maximum output power level (Table 7.3A.5.5-4)
Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
Note 3: The signal power is specified per port
Note 4: Reference sensitivity for the case that the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz.
Note 5: Reference sensitivity for the case that the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz.
Note 6: [6] indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.
Note 7: These requirements apply when the uplink is active in Band 18 and the downlink channels in Band 28 are confined within the restricted frequency range specified for this CA configuration (Table 5.2A-2).
Note 8: Reference sensitivity for the high band for which the 3rd harmonic of the low band is within transmission bandwidth, as specified Note 5 and 6 in Table 7.3A.0-0a.
Note 9: Reference sensitivity for the high band for which the 2nd harmonic of the low band is within transmission

bandwidth, as specified Note 9 and 10 in Table 7.3A.0-0a.
Note 10: Reference sensitivity for the high band for which the 2nd harmonic of the low band is within transmission bandwidth, as specified Note 11 in Table 7.3A.0-0a.
Note 11: These requirements apply when the uplink is active in Band 19 and the downlink channels in Band 28 are allocated at the middle of the restricted frequency range specified for this CA configuration (Table 5.2A-2). For each channel bandwidth in Band 28, the requirement applies regardless of channel bandwidth in Band 19.
NOTE 12: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in Band 3 and Band 41, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 13: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in Band 3 and Band 41, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 14: The B41 requirements also apply to the supported CA_1A-41A.
NOTE 15: These requirements apply when the uplink is active in Band 1 or Band 8.
NOTE 16: These requirements apply when the uplink is active in Band 3 or Band 8.
NOTE 17: The B41 requirements are modified by -0.5dB when carrier frequency of the assigned E-UTRA channel bandwidth is within 2545-2690MHz.
NOTE 18: These requirements apply when the uplink is active in Band 41.
NOTE 19: These requirements apply when the uplink is active in Band 3.
NOTE 20: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
NOTE 21: These requirements apply when the uplink is active in a lower-frequency band and is within a specified frequency range such that transmitter harmonics fall within the downlink transmission bandwidth assigned in a higher band.
NOTE 22: These requirements apply when the uplink is active in Band 42.
NOTE 23: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRA band and without simultaneous Rx/Tx.
NOTE 24: These requirements apply when UL CA is configured and the uplink is active in Band 2 and Band 4.
NOTE 25: These requirements apply when the uplink is active in Band 40.
NOTE 26: These requirements apply when the uplink is active in Band 1.
NOTE 27: These requirements apply when UL CA is configured and the uplink is active in Band X and Band Y in CA_XA-YA-ZA.
NOTE 28: These requirements apply when UL CA is configured and the uplink is active in Band Y and Band Z in CA_XA-YA-ZA.
NOTE 29: These requirements apply when UL CA is configured and the uplink is active in Band Z and Band X in CA_XA-YA-ZA.
NOTE 30: These requirements apply when the lower edge frequency of the 5 MHz uplink channel in Band 71 is located at or below 668 MHz and the downlink channel in Band 2 is located with its upper edge at 1990 MHz. These requirements also apply when the lower edge frequency of the 10 MHz, 15 MHz, or 20 MHz uplink channel in Band 71 is located at or below 668 MHz and the downlink channel in Band 2 is located with its upper edge at 1990 MHz.
NOTE 31: These requirements apply when there is at least one individual RE within the downlink transmission bandwidth of the victim (lower) band for which the 3rd harmonic is within the uplink transmission bandwidth or the uplink adjacent channel's transmission bandwidth of an aggressor (higher) band.

For the UE which supports inter-band carrier aggregation configurations the $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C shall be applied for applicable bands.

Unless otherwise specified, in case the UE supports more than one of the above 3DL inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one 3DL inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz and the tolerances are the same, the value applies to the band. If the tolerances are different, the applicable additional 3DL tolerance is FFS. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 3DL carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional 3DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 3DL CA configurations

The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.

The reference receive sensitivity (REFSENS) requirement for inter-band specified in Table 7.3A.5.5-3 shall be met for an uplink CA configurations than or equal to that specified in Table 7.3.5-2.

NOTE: Table 7.3A.5.5-4 does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors.

**Table 7.3A.5.5-4: Void**

For combinations of intra-band contiguous and inter-band carrier aggregation with three downlink carriers and one uplink carrier assigned to one E-UTRA band the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.5.5-5. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.5.5-5: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band contiguous + inter-band**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CA Configuration** | **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| CA_1A-3C (Note 9) | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[16] | -99.0[16] | -97.2[16] | -96.0[16] | |
| | 3 | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| CA_1A-3C (Note 10) | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[16] | -99.0[16] | -97.2[16] | -96.0[16] | |
| | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | - | - | -99.0[16] | -96.0[16] | -94.2[16] | -93.0[16] | |
| CA_1A-3C (Note 9) | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[16] | -99.0[16] | -97.2[16] | -96.0[16] | |
| | 3 | - | - | -93.3 | -90.8 | -89.3 | -88.3 | |
| CA_1A-3C (Note 10) | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[16] | -99.0[16] | -97.2[16] | -96.0[16] | |
| | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | - | - | -99.0[16] | -96.0[16] | -94.2[16] | -93.0[16] | |
| CA_1A-41C | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[16] | -99.0[16] | -97.2[16] | -96.0[16] | |
| | 41 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| CA_1A-42C | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[16] | -99.0[16] | -97.2[16] | -96.0[16] | |
| | 42 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | - | - | -100.2[16] | -97.2[16] | -95.4[16] | -94.2[16] | |
| CA_2A-5B | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| CA_2A-7C | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| CA_2A-66C | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[16] | -98.5[16] | -96.7[16] | -95.5[16] | |
| CA_2C-5A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| CA_2C-29A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| | 29 | - | - | -96.3 | -93.3 | - | - | |
| CA_2C-30A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_2C-66A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[16] | -98.5[16] | -96.7[16] | -95.5[16] | |
| CA_3C-5A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[16] | -96.0[16] | -94.2[16] | -93.0[16] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| CA_3C-8A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | 8 | - | -98.5 | -96.3 | -93.3 | - | - | |
| CA_3A-7C | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[16] | -96.0[16] | -94.2[16] | -93.0[16] | |
| | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| CA_3A-40C (Note 12) | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[16] | -96.0[16] | -94.2[16] | -93.0[16] | |
| | 40 | - | - | -94.7 | -92.2 | -90.6 | -89.5 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_3A-40C (Note 13) | 3 | - | - | -93.5 | -90.5 | -88.8 | -87.6 | FDD |
| | 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| CA_3A-41C (Note 12) | 3 | - | - | [-93.3] | [-90.3] | [-88.5] | [-87.2] | FDD |
| | 41 | - | - | -96.8[11] | -93.8[11] | -92[11] | -90.8[11] | TDD |
| | | - | - | -99.5[11,16] | -96.5[11,16] | -94.7[11,16] | -93.5[11,16] | |
| CA_3A-41C (Note 14) | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[16] | -96.0[16] | -94.2[16] | -93.0[16] | |
| | 41 | - | - | [-92.6][11] | [-90][11] | [-88.5][11] | [-87.4][11] | TDD |
| CA_3A-42C | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[16] | -96.0[16] | -94.2[16] | -93.0[16] | |
| | 42 | - | - | -98 | -95 | -93.2 | -92.0 | TDD |
| | | - | - | -100.2[16] | -97.2[16] | -95.4[16] | -94.2[16] | |
| | 42 (Note 4) | - | - | -71.2 | -71.2 | -71.2 | -71.2 | |
| | 42 (Note 5) | - | - | -96.6 | -94.2 | -92.7 | -92.0 | |
| CA_3A-42C (Note 17) | 3 | - | - | -67.0 | - | - | - | FDD |
| | | - | - | -67.0[6] | - | - | - | |
| | 42 | - | - | -71.7 | - | - | - | TDD |
| | | - | - | -88.8 | - | - | - | |
| | 3 | - | - | -88.2[6] | - | - | - | FDD |
| | | - | - | -97.1 | - | - | - | |
| | 42 | - | - | -67.0 | - | - | - | TDD |
| | | - | - | -67.0[6] | - | - | - | |
| | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[16] | -96.0[16] | -94.2[16] | -93.0[16] | |
| | 42 | - | - | -98 | -95 | -93.2 | -92.0 | TDD |
| | | - | - | -100.2[16] | -97.2[16] | -95.4[16] | -94.2[16] | |
| CA_3C-7A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[16] | -96.0[16] | -94.2[16] | -93.0[16] | |
| | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| CA_4A-7C | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102[16] | -99[16] | -97.2[16] | -96[16] | |
| | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| CA_5A-12B | 5 | - | - | -97.3 | -94.3 | - | - | FDD |
| | 12 | - | - | -96.3 | -93.3 | - | - | |
| CA_5B-30A | 5 | - | - | -97.3 | -94.3 | - | - | FDD |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_5B-66A | 5 | - | - | -97.3 | -94.3 | - | - | FDD |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| CA_8A-42C | 8 | -101.3 | -98.3 | -96.1 | -93.1 | - | - | FDD |
| | 42 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | - | - | -100.2[16] | -97.2[16] | -95.4[16] | -94.2[16] | |
| | 42 (Note 8) | - | - | -83.8 | -83.7 | -83.6 | -83.5 | |
| CA_19A-42C | 19 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| | 42 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | - | - | -100.2[16] | -97.2[16] | -95.4[16] | -94.2[16] | |
| CA_21A-42C | 21 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| | | - | - | -102.0[16] | -99.0[16] | -97.2[16] | - | |
| | 42 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | - | - | -100.2[16] | -97.2[16] | -95.4[16] | -94.2[16] | |
| CA_25A-41C | 25 | - | - | -95.8 | -92.8 | -91.0 | -89.8 | FDD |
| | | - | - | -98.5[16] | -95.5[16] | -93.7[16] | -92.5[16] | |
| | 41 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| CA_26A-41C | 26 | - | - | -96.8[6] | -93.8[6] | -92[6] | - | FDD |
| | 41 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| CA_28A-40C (Note 15) | 28 | - | - | -97.8 | -94.8 | -93 | -90.3 | FDD |
| | 40 | - | - | -94.4 | -92.2 | -90.7 | -89.8 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_28A-40C (Note 13) | 28 | - | - | -96.1 | -93.4 | -91.8 | -89.1 | FDD |
| | 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| CA_28A-41C | 28 | - | - | -97.8 | -94.8 | - | - | FDD |
| | 41 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| CA_28A-42C | 28 | - | - | -97.3 | -94.3 | -92.5 | -89.8 | FDD |
| | 42 | - | - | -96.5 | -93.5 | -91.7 | -90.5 | TDD |
| | 42 (Note 7) | - | - | -84.9 | -84.6 | -84.3 | -84.1 | TDD |
| CA_29A-66C | 29 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[16] | -98.5[16] | -96.7[16] | -95.5[16] | |
| CA_29A-70C | 29 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 70 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_39A-41C | 39 | - | - | - | -96.3 | -94.5 | -93.3 | TDD |
| | | - | - | - | -99.0[16] | -97.2[16] | -96.0[16] | |
| | 41 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100.0[16] | -97.0[16] | -95.2[16] | -94.0[16] | |
| CA_39C-41A | 39 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| | | - | - | -102.0[16] | -99.0[16] | -97.2[16] | -96.0[16] | |
| | 41 | - | - | - | - | - | -91.3 | |
| | | - | - | - | - | - | -94.0[16] | |
| CA_41A-42C | 41 | - | - | - | -93.9 | -92.1 | -90.9 | TDD |
| | | - | - | - | -96.6[16] | -94.8[16] | -93.6[16] | |
| | 42 | - | - | -97.5 | -94.5 | -92.7 | -91.5 | |
| | | - | - | -99.7[16] | -96.7[16] | -94.9[16] | -93.7[16] | |
| CA_41C-42A | 41 | - | - | - | -93.9 | -92.1 | -90.9 | TDD |
| | | - | - | - | -96.6[16] | -94.8[16] | -93.6[16] | |
| | 42 | - | - | -97.5 | -94.5 | -92.7 | -91.5 | |
| | | - | - | -99.7[16] | -96.7[16] | -94.9[16] | -93.7[16] | |
| CA_46C-66A | 46 | - | - | - | - | - | -88.5 | TDD |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | FDD |
| | | - | - | -101.5[16] | -98.5[16] | -96.7[16] | -95.5[16] | |
| CA_46A-66C | 46 | - | - | - | - | - | -88.5 | TDD |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | FDD |
| | | - | - | -101.5[16] | -98.5[16] | -96.7[16] | -95.5[16] | |
| CA_66A-70A | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | FDD |
| | | - | - | -101.5[16] | -98.5[16] | -96.7[16] | -95.5[16] | |
| | 70 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_66A-70C | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | FDD |
| | | - | - | -101.5[16] | -98.5[16] | -96.7[16] | -95.5[16] | |
| | 70 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | |
| CA_66C-70A | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | FDD |
| | | - | - | -101.5[16] | -98.5[16] | -96.7[16] | -95.5[16] | |
| | 70 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_66C-71A | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | FDD |
| | | - | - | -101.5[16] | -98.5[16] | -96.7[16] | -95.5[16] | |
| | 71 | - | - | -96.5 | -93.5 | -91.2 | -86.8 | |
| CA_70C-71A | 70 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | 70 | - | - | -89.3[18] | -88.8[18] | -88.5[18] | -88.3[18] | |
| | 71 | - | - | -96.5 | -93.5 | -91.2 | -86.8 | |

Note 1: The transmitter shall be set to maximum output power level (Table 7.3A.5.5-4)
Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
Note 3: The signal power is specified per port
Note 4: Reference sensitivity for the high band for which the 2nd harmonic of the low band is within transmission bandwidth, as specified Note 9 and 10 in Table 7.3A.0-0a.
Note 5: Reference sensitivity for the high band for which the 2nd harmonic of the low band is within transmission bandwidth, as specified Note 11 in Table 7.3A.0-0a.
Note 6: [6]indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.
Note 7: Reference sensitivity for the high band for which the 5th harmonic of the low band is within transmission bandwidth, as specified Note 15 and 16 in Table 7.3A.0-0a.
Note 8: Reference sensitivity for the high band for which the 4th harmonic of the low band is within transmission bandwidth, as specified Note 12 and 13 in Table 7.3A.0-0a.
Note 9: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in Band 3, the requirement applies regardless of channel bandwidth in Band 1.
Note 10: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in Band 3, the requirement applies regardless of channel bandwidth in Band 1.
Note 11: The B41 requirements are modified by -0.5dB when carrier frequency of the assigned E-UTRA channel bandwidth is within 2545-2690 MHz.
Note 12: These requirements apply when the uplink is active in Band 3.
Note 13: These requirements apply when the uplink is active in Band 40.
Note 14: These requirements apply when the uplink is active in Band 41.
Note 15: These requirements apply when the uplink is active in Band 28.
Note 16: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
NOTE 17: These requirements apply when UL CA is configured and the uplink is active in Band X and Band Y in CA_XA-

| | |
|---|---|
| | YC. |
| Note 18: | Reference sensitivity for the high band for which the 3rd harmonic of the low band is within transmission bandwidth, as specified Note 5 and 6 in Table 7.3A.0-0a. |

For combinations of intra-band non-contiguous and inter-band carrier aggregation with three downlink carriers and one uplink carrier assigned to one E-UTRA band the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.5.5-6. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.5.5-6: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band non-contiguous + inter-band**

| CA Configuration | Testpoint ID | PCC | | | SCC1 | | | SCC2 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Band | $N_{RB}$ | Requirement (dBm) | Band | $N_{RB}$ | Requirement (dBm) | Band | $N_{RB}$ | Requirer (dBm |
| CA_2A-2A-XA or CA_XA-2A-2A | 1 | 2 | 100 | -91.3 | 2 | 25 | -90.1[1] | X | Highest $N_{RB}$ | $P_{REFSE}$ |
| | 2 | 2 | 100 | -94.0 | 2 | 25 | -90.1[1] | X | Highest $N_{RB}$ | $P_{REFSE}$ |
| | 3 | 2 | 100 | -91.3<br>-94.0[8] | 2 | 100 | -86.7[1] | X | Highest $N_{RB}$ | $P_{REFSE}$ |
| | 4 | X | Highest $N_{RB}$ | $P_{REFSENS}$ | 2 | 100 | -91.3 | 2 | 100 | -91.3 |
| CA_2A-2A-71A | 1 | 2 | 100 | -91.3 | 2 | 25 | -90.1[1] | 71 | Highest $N_{RB}$ | -86.6 |
| | 2 | 2 | 100 | -94.0 | 2 | 25 | -90.1[1] | 71 | Highest $N_{RB}$ | -86.6 |
| | 3 | 2 | 100 | -91.3<br>-94.0[8] | 2 | 100 | -86.7[1] | 71 | Highest $N_{RB}$ | -86.6 |
| | 4 | 71 | Highest $N_{RB}$ | -86.8 | 2 | 100 | -91.3 | 2 | 100 | -91.3 |
| CA_3A-3A-XA or CA_XA-3A-3A | 1 | 3 | 100 | -90.3<br>-93.0[8] | 3 | 25 | -89.8[1] | X | Highest $N_{RB}$ | $P_{REFSE}$ |
| | 2 | 3 | 100 | -90.3<br>-93.0[8] | 3 | 25 | -96.3 | X | Highest $N_{RB}$ | $P_{REFSE}$ |
| | 3 | 3 | 100 | -90.3<br>-93.0[8] | 3 | 100 | -86.2[6] | X | Highest $N_{RB}$ | $P_{REFSE}$ |
| | 4 | 3 | 100 | -90.3 | 3 | 50 | -88.2[1] | X | Highest $N_{RB}$ | $P_{REFSE}$ |
| | 5 | 3 | 100 | -90.3 | 3 | 50 | -93.3 | X | Highest $N_{RB}$ | $P_{REFSE}$ |
| | 6 | X | Highest $N_{RB}$ | $P_{REFSENS}$ | 3 | 100 | -90.3<br>-93.0[8] | 3 | 100 | -90.3<br>-93.0 |
| | 7 | X | Highest $N_{RB}$ | $P_{REFSENS}$ | 3 | 100 | -90.3 | 3 | 50 | -93.3 |
| CA_4A-4A-XA or CA_XA-4A-4A | 1 | 4 | 100 | -93.3<br>-96[8] | 4 | 25 | -99.3<br>-102[8] | X | Highest NRB | PREFSE |
| | 2 | 4 | 100 | -93.3<br>-96[8] | 4 | 100 | -93.3<br>-96[8] | X | Highest NRB | PREFSE |
| | 3 | X | Highest NRB | PREFSENS | 4 | 100 | -93.3<br>-96[8] | 4 | 100 | -93.3<br>-96[8] |
| CA_4A-4A-71A | 1 | 4 | 100 | -93.3<br>-96[8] | 4 | 25 | -99.3<br>-102[8] | 71 | Highest NRB | -86.8 |
| | 2 | 4 | 100 | -93.3<br>-96[8] | 4 | 100 | -93.3<br>-96[8] | 71 | Highest NRB | -86.8 |
| | 3 | 71 | Highest NRB | -86.8 | 4 | 100 | -93.3<br>-96[8] | 4 | 100 | -93.3<br>-96[8] |
| CA_4A-4A-12A | 1 | 4 | 100 | -93.3<br>-96[8] | 4 | 25 | -99.3<br>-102[8] | 12 | 50 | -93.5 |
| | 2 | 4 | 100 | -93.3<br>-96[8] | 4 | 100 | -93.3<br>-96[8] | 12 | 50 | -93.5 |
| | 3 | 12 | 50 | -93.5 | 4 | 100 | -93.3<br>-96[8] | 4 | 25 | -99.3<br>-102 |
| | 4 | 12 | 50 | -93.5 | 4 | 100 | -87.8[7]<br>-90.5[7,8] | 4 | 100 | -87.8<br>-90.5[7] |
| CA_4A-4A-13A | 1 | 4 | 100 | -93.3<br>-96[8] | 4 | 25 | -99.3<br>-102[8] | 13 | 50 | -93.3 |
| | 2 | 4 | 100 | -93.3<br>-96[8] | 4 | 100 | -93.3<br>-96[8] | 13 | 50 | -93.3 |
| | 3 | 13 | 50 | -93.3 | 4 | 100 | -93.3<br>-96[8] | 4 | 100 | -93.3<br>-96[8] |
| | 4 | 4 | 50 | -96.3 | 4 | 100 | -93.3 | 13 | 50 | -93.3 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | -99[8] | | | -96[8] | | | |
| CA_5A-5A-66A | 1 | 5 | 50 | -94.3 | 5 | 25 | -97.3 | 66 | 100 | -92.8<br>-95.5 |
| | 2 | 5 | 50 | -94.3 | 5 | 50 | -94.3 | 66 | 100 | -92.8<br>-95.5 |
| | 3 | 66 | 100 | -92.8<br>-95.5[8] | 5 | 50 | -94.3 | 5 | 50 | -94.3 |
| CA_7A-7A-XA or CA_XA-7A-7A | 1 | 7 | 100 | -91.3 | 7 | 25 | -97.3 | X | Highest NRB | $P_{REFSE}$ |
| | 2 | 7 | 100 | -91.3 | 7 | 25 | -97.3 | X | Highest NRB | $P_{REFSE}$ |
| | 3 | 7 | 100 | -91.3 | 7 | 50 | -94.3 | X | Highest NRB | $P_{REFSE}$ |
| | 4 | 7 | 100 | -91.3 | 7 | 50 | -94.3 | X | Highest NRB | $P_{REFSE}$ |
| | 5 | 7 | 100 | -91.3 | 7 | 75 | -92.5 | X | Highest NRB | $P_{REFSE}$ |
| | 6 | 7 | 100 | -91.3 | 7 | 75 | -92.5 | X | Highest NRB | $P_{REFSE}$ |
| | 7 | 7 | 100 | -91.3 | 7 | 100 | -91.3 | X | Highest NRB | $P_{REFSE}$ |
| | 8 | 7 | 100 | -91.3 | 7 | 100 | -91.3 | X | Highest NRB | $P_{REFSE}$ |
| | 9 | 7 | 50 | -94.3 | 7 | 100 | -91.3 | X | Highest NRB | $P_{REFSE}$ |
| | 10 | 7 | 50 | -94.3 | 7 | 100 | -91.3 | X | Highest NRB | $P_{REFSE}$ |
| | 11 | 7 | 50 | -94.3 | 7 | 25 | -97.3 | X | Highest NRB | $P_{REFSE}$ |
| | 12 | 7 | 50 | -94.3 | 7 | 25 | -97.3 | X | Highest NRB | $P_{REFSE}$ |
| | 13 | X | Highest NRB | PREFSENS | 7 | 50 | -94.3 | 7 | 100 | -91.3 |
| | 14 | X | Highest NRB | PREFSENS | 7 | 100 | -91.3 | 7 | 100 | -91.3 |
| CA_7A-42A-42A | 1 | 42 | 100 | -91.5<br>-93.7[8] | 42 | 25 | -97.5<br>-99.7[8] | 7 | 100 | -89.6 |
| | 2 | 42 | 100 | -91.5<br>-93.7[8] | 42 | 100 | -91.5<br>-93.7[8] | 7 | 100 | -89.6 |
| | 3 | 7 | 100 | -91.3 | 42 | 100 | -89.4 | 42 | 100 | -89.4 |
| CA_12A-66A-66A | 1 | 66 | 100 | -92.8<br>-95.5[8] | 66 | 25 | -98.8<br>-101.5[8] | 12 | 50 | -93.5 |
| | 2 | 66 | 100 | -92.8<br>-95.5[8] | 66 | 100 | -92.8<br>-95.5[8] | 12 | 50 | -93.5 |
| | 3 | 12 | 25 | -96.5 | 66 | 100 | -92.8<br>-95.5[8] | 66 | 25 | -98.8<br>-101.5 |
| | 4 | 12 | 25 | -96.5 | 66 | 100 | -92.8<br>-95.5[8] | 66 | 50 | -95.8<br>-98.5 |
| | 5 | 12 | 50 | -93.5 | 66 | 100 | -92.8<br>-95.5[8] | 66 | 75 | -94.0<br>-96.7 |
| | 6 | 12 | 50 | -93.5 | 66 | 100 | -87.3[7]<br>-90.0[7,8] | 66 | 100 | -87.3<br>-90.0 |
| CA_20A-42A-42A | 1 | 20 | 100 | -89.3<br>-92.0[8] | 42 | 100 | -92<br>-94.2[8] | 42 | 100 | -83.5<br>-85.7 |
| | 2 | 20 | 100 | -89.3<br>-92.0[8] | 42 | 100 | -92<br>-94.2[8] | 42 | 100 | -92<br>-94.2 |
| | 3 | 42 | 100 | -92<br>-94.2[8] | 42 | 25 | -98<br>-100.2[8] | 20 | 100 | -89.3<br>-92.0 |
| | 4 | 42 | 100 | -92<br>-94.2[8] | 42 | 100 | -92<br>-94.2[8] | 20 | 100 | -89.3<br>-92.0 |
| CA_29A-66A-66A | 1 | 66 | 100 | -92.8<br>-95.5[8] | 66 | 100 | -92.8<br>-95.5[8] | 29 | 50 | -93.3 |
| | 2 | 66 | 100 | -92.8<br>-95.5[8] | 66 | 25 | -98.8<br>-101.5[8] | 29 | 50 | -93.3 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CA_42A-42A-XA or CA_XA-42A-42A | 1 | 42 | 100 | -92 -94.2[8] | 42 | 25 | -98 -100.2[8] | X | Highest NRB | PREFSE |
| | 2 | 42 | 100 | -92 -94.2[8] | 42 | 100 | -92 -94.2[8] | X | Highest NRB | PREFSE |
| | 3 | X | Highest NRB | PREFSENS | 42 | 100 | -92 -94.2[8] | 42 | 100 | -92 -94.2 |
| CA_46A-46A-66A | 1 | 66 | 100 | -92.8 -95.5[8] | 46 | 100 | -88.5 | 46 | 100 | -88.5 |
| | 2 | 66 | 100 | -92.8 -95.5[8] | 46 | 100 | -88.5 | 46 | 100 | -88.5 |
| CA_66A-66A-XA or CA_XA-66A-66A | 1 | 66 | 100 | -92.8 -95.5[8] | 66 | 25 | -98.8 -101.5[8] | X | Highest NRB | PREFSE |
| | 2 | 66 | 100 | -92.8 -95.5[8] | 66 | 100 | -92.8 -95.5[8] | X | Highest NRB | PREFSE |
| | 3 | X | Highest NRB | PREFSENS | 66 | 100 | -92.8 -95.5[8] | 66 | 100 | -92.8 -95.5 |

Note 1: Requirements with additional relaxation ($\Delta R_{IBNC}$) as per Table 7.3A.0-3.
Note 2: "Testpoint ID" refers to IDs in Table 7.3A.5.4.1-4.
Note 3: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 4: The signal power is specified per port.
Note 5: $P_{REFSENS}$ refers to the PCC band's single carrier reference sensitivity according to table 7.3.5-1.
Note 6: Void
Note 7: Reference sensitivity for the high band for which the 3rd harmonic of the low band is within transmission bandwidth, as specified Note 5 in Table 7.3A.0-0a.
Note 8: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.

For combinations of intra-band non-contiguous and intra-band contiguous carrier aggregation with three downlink carriers and one uplink carrier assigned to one E-UTRA band the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.5.5-7. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.5.5-7: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band non-contiguous + intra-band contiguous**

| CA Configuration | Testpoint ID | PCC | | SCC1 | | SCC2 | |
|---|---|---|---|---|---|---|---|
| | | $N_{RB}$ | Requirement (dBm) | $N_{RB}$ | Requirement (dBm) | $N_{RB}$ | Requirement (dBm) |
| CA_41A-41C | 1 | 100 | -91.3 | 100 | -91.3 | 25 | -97.3 |
| | | | 94.0[6] | | 94.0[6] | | 100.0[6] |
| | 2 | 100 | -91.3 | 100 | -91.3 | 100 | -91.3 |
| | | | 94.0[6] | | 94.0[6] | | 94.0[6] |
| CA_41C-41A | 1 | 100 | -91.3 | 100 | -91.3 | 25 | -97.3 |
| | | | 94.0[6] | | 94.0[6] | | 100.0[6] |
| | 2 | 100 | -91.3 | 100 | -91.3 | 100 | -91.3 |
| | | | 94.0[6] | | 94.0[6] | | 94.0[6] |
| CA_66A-66A-66A | 1 | 100 | -92.8 | 100 | -92.8 | 25 | -92.8 |
| | | | -95.5[6] | | -95.5[6] | | -95.5[6] |
| | 2 | 100 | -92.8 | 100 | -92.8 | 100 | -92.8 |
| | | | -95.5[6] | | -95.5[6] | | -95.5[6] |
| CA_66A-66C | 1 | 100 | -92.8 | 100 | -92.8 | 25 | -98.8 |
| | | | -95.5[6] | | -95.5[6] | | -101.5[6] |
| | 2 | 100 | -92.8 | 100 | -92.8 | 100 | -92.8 |
| | | | -95.5[6] | | -95.5[6] | | -95.5[6] |

Note 1: Requirements with additional relaxation ($\Delta R_{IBNC}$) as per Table 7.3A.0-3.
Note 2: "Testpoint ID" refers to IDs in Table 7.3A.5.4.1-5.
Note 3: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 4: The signal power is specified per port.
Note 5: $P_{REFSENS}$ refers to the PCC band's single carrier reference sensitivity according to table 7.3.5-1.
Note 6: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.

## 7.3A.6 Reference sensitivity level for CA (inter-band DL CA and UL CA)

### 7.3A.6.1 Test purpose

Same as in clause 7.3A.1.1.

### 7.3A.6.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support inter-band DL CA and UL CA.

### 7.3A.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3A.0.

### 7.3A.6.4 Test description

#### 7.3A.6.4.1 Initial conditions

Same as in clause 7.3A.1.4.1 with the following exceptions:

- Instead of Table 7.3A.1.4.1-1→ use Table 7.3A.6.4.1-1.
- Instead of clause 7.3A.1.4.3 use clause 7.3A.6.4.3.

**Table 7.3A.6.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | | | For test frequencies refer to “Range” columns. | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | Refer to “PCC $N_{RB}$”and “SCC $N_{RB}$ ” columns | | | | | | | |
| Network signalling value | | | | | NS_01<br>Unless given by Table 7.3.3-3 for the band with active uplink carrier | | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | | | | |
| **ID** | **CA Configuration / $N_{RB_agg}$** | | | | | | **DL Allocation** | | | **UL Allocation (Note 2,3)** | | |
| | **CA Configuration** | | | | **PCC $N_{RB}$** | **SCC $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | | **CC MOD** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| | **PCC** | | **SCC** | | | | | **PCC** | **SCC** | | | |
| | **Band** | **Range** | **Band** | **Range** | | | | | | | | |
| **Default Test Settings for a CA_XA-YA Configuration** | | | | | | | | | | | | |
| 1 | X | Mid | Y | Mid | Lowest $N_{RB}$ | Lowest $N_{RB}$ | QPSK | All RBs | | QPSK | REFSENS | REFSENS |
| 2 | X | Mid | Y | Mid | Highest $N_{RB}$ | Highest $N_{RB}$ | QPSK | All RBs | | QPSK | REFSENS | REFSENS |
| **Test Settings for CA_1A-3A Configuration** | | | | | | | | | | | | |
| 1 | 1 | Note 5 | 3 | Note 5 | 25 | 25 | QPSK | All RBs | | QPSK | 25@0 | 25@0 |
| **Test Settings for CA_1A-8A Configuration** | | | | | | | | | | | | |
| 1 | 1 | Note 5 | 8 | Note 5 | 25 | 25 | QPSK | All RBs | | QPSK | 25@0 | 25@0 |
| **Test Settings for CA_2A-4A Configuration** | | | | | | | | | | | | |
| 1 | 2 | Note 5,6 | 4 | Note 5 | 100 | 25 | QPSK | All RBs | | QPSK | 50@0 | 25@0 |
| 2 | 2 | Note 5 | 4 | Note 5 | 25 | 25 | QPSK | All RBs | | QPSK | 25@0 | 25@0 |
| **Test Settings for CA_3A-5A Configuration** | | | | | | | | | | | | |
| 1 | 3 | Note 5 | 5 | Note 5 | 50 | 25 | QPSK | All RBs | | QPSK | 50@0 | 25@0 |
| 2 | 3 | Note 5 | 5 | Note 5 | 50 | 25 | QPSK | All RBs | | QPSK | 50@0 | 25@0 |
| **Test Settings for CA_3A-7A Configuration** | | | | | | | | | | | | |
| 1 | 3 | Note 5 | 7 | Note 5 | 25 | 50 | QPSK | All RBs | | QPSK | 25@0 | 50@0 |
| **Test Settings for CA_3A-8A Configuration** | | | | | | | | | | | | |
| 1 | 3 | Note 5 | 8 | Note 5 | 50 | 25 | QPSK | All RBs | | QPSK | 50@0 | 25@0 |
| 2 | 3 | Note 5 | 8 | Note 5 | 50 | 25 | QPSK | All RBs | | QPSK | 50@0 | 25@0 |
| **Test Settings for CA_3A-19A Configuration** | | | | | | | | | | | | |
| 1 | 3 | Note 5 | 19 | Note 5 | 25 | 25 | QPSK | All RBs | | QPSK | 25@0 | 25@0 |
| 2 | 3 | Note 5 | 19 | Note 5 | 25 | 25 | QPSK | All RBs | | QPSK | 25@0 | 25@0 |
| **Test Settings for CA_3A-20A Configuration** | | | | | | | | | | | | |
| 1 | 3 | Note 5 | 20 | Note 5 | 25 | 25 | QPSK | All RBs | | QPSK | 25@0 | 25@0 |
| 2 | 3 | Note 5 | 20 | Note 5 | 25 | 25 | QPSK | All RBs | | QPSK | 25@0 | 25@0 |
| **Test Settings for CA_3A-26A Configuration** | | | | | | | | | | | | |
| 1 | 3 | Note 5 | 26 | Note 5 | 25 | 25 | QPSK | All RBs | | QPSK | 25@0 | 25@0 |
| 2 | 3 | Note 5 | 26 | Note 5 | 25 | 25 | QPSK | All RBs | | QPSK | 25@0 | 25@0 |
| **Test Settings for CA_3A-42A Configuration** | | | | | | | | | | | | |
| 1 | 3 | Note 5 | 42 | Note 5 | 25 | 25 | QPSK | All RBs | | QPSK | 25@0 | 25@0 |
| 2 | 3 | Note 5 | 42 | Note 5 | 25 | 25 | QPSK | All RBs | | QPSK | 25@0 | 25@0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Test Settings for CA_4A-5A Configuration** | | | | | | | | | | | |
| 1 | 4 | Note 5 | 5 | Note 5 | 25 | 25 | QPSK | All RBs | QPSK | 25@0 | 25@0 |
| **Test Settings for CA_4A-7A Configuration** | | | | | | | | | | | |
| 1 | 4 | Note 5 | 7 | Note 5 | 25 | 25 | QPSK | All RBs | QPSK | 25@0 | 25@0 |
| **Test Settings for CA_5A-7A Configuration** | | | | | | | | | | | |
| 1 | 5 | Note 5 | 7 | Note 5 | 25 | 50 | QPSK | All RBs | QPSK | 25@0 | 50@0 |
| **Test Settings for CA_7A-20A Configuration** | | | | | | | | | | | |
| 1 | 7 | Note 5 | 20 | Note 5 | 50 | 25 | QPSK | All RBs | QPSK | 50@0 | 25@0 |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 3: X,Y correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A,X=1,Y=3.
Note 4: REFSENS refers to the PCC bands and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 5: Test frequency for each CA configuration shall follow Table 7.3A.0-0f. If test configurations of each ID in a CA configuration are same, test frequency shall follow the order of Table 7.3A.0-0f.
Note 6: Not applicable if the UE only supports Bandwidth Combination Set 1.

### 7.3A.6.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.3A.1.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.3A.6.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.3A.6.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCC to the appropriate REFSENS value defined in Table 7.3A.6.5-1. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the Throughput measurement.

7. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.3A.6.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

## 7.3A.6.5 Test requirement

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.3A.6.5-1 (originated from single carrier Tables 7.3.5-1). The reference sensitivity is defined to be met with both downlink component carriers active and both of the uplink component carriers active.

**Table 7.3A.6.5-1: Reference sensitivity QPSK PREFSENS**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CA Configuration** | **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| CA_1A-3A | 1 | - | - | -76.3 | - | - | - | FDD |
| | 3 | - | - | -96.3 | - | - | - | |
| CA_1A-5A | 1 | - | - | - | -96.3 | - | - | FDD |
| | | - | - | - | -99.0[6] | - | - | |
| | 5 | - | - | - | -94.3 | - | - | |
| CA_1A-7A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[6] | -99.0[6] | -97.2[6] | -96.0[6] | |
| | 7 | - | - | - | -94.3 | -92.5 | -91.3 | |
| | | - | - | - | -97.0[6] | -95.2[6] | -93.0[6] | |
| CA_1A-8A | 1 | - | - | -93.3 | - | - | - | FDD |
| | 8 | - | - | -96.3 | - | - | - | |
| CA_1A-18A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[6] | -99.0[6] | -97.2[6] | -96.0[6] | |
| | 18 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_1A-19A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[6] | -99.0[6] | -97.2[6] | -96.0[6] | |
| | 19 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_1A-21A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[6] | -99.0[6] | -97.2[6] | -96.0[6] | |
| | 21 | - | - | -99.3 | -96.3 | -94.5 | - | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_1A-26A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[6] | -99.0[6] | -97.2[6] | -96.0[6] | |
| | 26 | - | - | -96.8[5] | -93.8[5] | -92[5] | - | |
| CA_1A-28A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[6] | -99.0[6] | -97.2[6] | -96.0[6] | |
| | 1 (Note 4) | - | - | -89.1 | -88.7 | -88.3 | -88.0 | |
| | 28 | - | - | -97.6 | -94.6 | -92.8 | -90.1 | |
| CA_1A-42A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[6] | -99.0[6] | -97.2[6] | -96.0[6] | |
| | 42 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | - | - | -100.2[6] | -97.2[6] | -95.4[6] | -94.2[6] | |
| CA_2A-4A | 2 | - | - | - | - | - | -86.3 | FDD |
| | 4 | - | - | -99.3 | - | - | - | |
| | | | | -102[6] | | | | |
| | 2 | - | - | -97.3 | - | - | - | FDD |
| | | - | - | -100.0[6] | - | - | - | |
| | 4 | - | - | -94.3 | - | - | - | |
| | | | | -97[6] | | | | |
| CA_2A-5A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100[6] | 97[6] | -95.2[6] | 92[6] | |
| | 5 | - | - | -97.3 | -94.3 | - | - | |
| CA_2A-7A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100[6] | 97[6] | -95.2[6] | 92[6] | |
| | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100[6] | 97[6] | -95.2[6] | 92[6] | |
| CA_2A-12A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100[6] | 97[6] | -95.2[6] | 92[6] | |
| | 12 | - | -98 | -96.3 | -93.3 | - | - | |
| CA_2A-13A | 2 | - | - | - | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | - | -97.0[6] | -95.2[6] | -94.0[6] | |
| | 13 | - | - | - | -93.3 | - | - | |
| CA_2A-30A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100[6] | 97[6] | -95.2[6] | 92[6] | |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_2A-66A | 2 | -101.7 | -98.7 | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100[6] | 97[6] | -95.2[6] | 92[6] | |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[6] | -98.5[6] | -96.7[6] | -95.5[6] | |
| CA_3A-5A | 3 | - | - | - | -89.3 | - | - | FDD |
| | | - | - | - | -92.0[6] | - | - | |
| | 5 | - | - | -97.3 | - | - | - | |
| | 3 | - | - | - | -93.3 | - | - | |
| | 5 | - | - | -73.3 | - | - | - | |
| | 5 | - | - | -73.3 | - | - | - | |
| CA_3A-7A | 3 | - | - | -96.3 | - | - | - | FDD |
| | | - | - | -99.0[6] | - | - | - | |
| | 7 | - | - | - | -81.3 | - | - | |
| CA_3A-8A | 3 | - | - | - | -93.3 | - | - | FDD |
| | | | | | -96.0[6] | | | |
| | 8 | - | - | -88.3 | - | - | - | |
| | 3 | - | - | - | -86.9 | - | - | |
| | 8 | - | - | -96.3 | - | - | - | |
| CA_3A-18A | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | - | - | -99.0[6] | -96.0[6] | -94.2[6] | -93.0[6] | |
| | 18 | - | - | -99.3 | -96.3 | -94.5 | - | |
| CA_3A-19A | 3 | - | - | -92.3 | - | - | - | FDD |
| | 19 | - | - | -99.3 | - | - | - | |
| | 3 | - | - | -96.3 | - | - | - | FDD |
| | | | | -99.0[6] | | | | |
| | 19 | - | - | -72.3 | - | - | - | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_3A-20A | 3 | - | - | -92.3 | - | - | - | FDD |
| | 20 | - | - | -96.3 | - | - | - | |
| | | - | - | -99.0[6] | - | - | - | |
| | 3 | - | - | -96.3 | - | - | - | FDD |
| | | - | - | -99.0[6] | - | - | - | |
| | 20 | - | - | -87.3 | - | - | - | |
| CA_3A-26A | 3 | - | - | -92.3 | - | - | - | FDD |
| | 26 | - | - | -96.8[5] | - | - | - | |
| | 3 | - | - | -96.3 | - | - | - | FDD |
| | | - | - | -99.0[6] | - | - | - | |
| | 26 | - | - | -70.8[5] | - | - | - | |
| CA_3A-42A | 3 | - | - | -67.0 | - | - | - | FDD |
| | | - | - | -67.0[6] | - | - | - | |
| | 42 | - | - | -71.7 | - | - | - | TDD |
| | 3 | - | - | -88.8 | - | - | - | FDD |
| | | - | - | -88.2[6] | - | - | - | |
| | 42 | - | - | -97.1 | - | - | - | TDD |
| CA_4A-5A | 4 | - | - | -99.3 | - | - | - | FDD |
| | | - | - | -102[6] | - | - | - | |
| | 5 | - | - | -71.3 | - | - | - | |
| CA_4A-7A | 4 | - | - | -99.3 | - | - | - | FDD |
| | | - | - | -102[6] | - | - | - | |
| | 7 | - | - | -82.3 | - | - | - | |
| CA_4A-12A | 4 | -104 | -101 | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | -106.7[6] | -103.7[6] | -102[6] | -99[6] | -97.2[6] | -96[6] | |
| | 4 (Note 4) | -88.5 | -88.5 | -89.3 | -88.8 | -88.3 | -87.8 | |
| | | -91.2[6] | -91.2[6] | -92[6] | -91.5[6] | -91[6] | -90.5[6] | |
| | 12 | - | - | -96.3 | -93.3 | - | - | |
| CA_4A-13A | 4 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102[6] | -99[6] | -97.2[6] | -96[6] | |
| | 13 | - | - | - | -93.3 | - | - | |
| CA_4A-17A | 4 | - | - | -99.3 | -96.3 | - | - | FDD |
| | | - | - | -102[6] | -99[6] | - | - | |
| | 4 (Note 4) | - | - | -89.3 | -88.8 | - | - | |
| | | - | - | -92[6] | -91.5[6] | - | - | |
| | 17 | - | - | -96.3 | -93.3 | - | - | |
| CA_5A-7A | 5 | - | - | -85.3 | - | - | - | FDD |
| | 7 | - | - | - | -94.3 | - | - | |
| | | - | - | - | -97.0[6] | - | - | |
| CA_5A-30A | 5 | - | - | -97.3 | -94.3 | - | - | FDD |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_5A-66A | 5 | - | - | -97.3 | -94.3 | - | - | FDD |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[6] | -98.5[6] | -96.7[6] | -95.5[6] | |
| CA_7A-20A | 7 | - | - | - | -94.3 | - | - | FDD |
| | | - | - | - | -97.0 | - | - | |
| | 20 | - | - | -85.0[6] | - | - | - | |
| CA_7A-28A | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[6] | -97.0[6] | -95.2[6] | -94.0[6] | |
| | 28 | - | - | -98.5 | -95.5 | -93.7 | - | |
| CA_12A-30A | 12 | - | - | -96.3 | -93.3 | - | - | FDD |
| | 30 | - | - | -98.3 | -95.3 | - | - | |
| CA_18A-28A | 18 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| | 28 | - | - | -97.8 | -94.8 | - | - | |
| CA_19A-21A | 19 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| | 21 | - | - | -99.3 | -96.3 | -94.5 | - | |
| | | - | - | -102.0[6] | -99.0[6] | -97.2[6] | - | |
| CA_39A-41A | 39 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| | | - | - | -102.0[6] | -99.0[6] | -97.2[6] | -96.0[6] | |
| | 41 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100.0[6] | -97.0[6] | -95.2[6] | -94.0[6] | |
| CA_41A-42A | 41 | - | - | - | -94.3 | -92.5 | -91.3 | TDD |
| | 42 | - | - | - | -94.8 | -93 | -91.8 | |

| | |
|---|---|
| Note 1: | Both of the transmitters shall be set min(+20 dBm, $P_{CMAX_L,c}$) as defined in subclause 6.2.5A |
| Note 2: | The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 |
| Note 3: | The signal power is specified per port |
| Note 4: | Reference sensitivity for the high band for which the 3rd harmonic of the low band is within transmission bandwidth, as specified Note 5 in Table 7.3A.0-0a. |
| Note 5: | [5] indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz. |
| Note 6: | Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured. |

## 7.3A.7 Reference sensitivity level for CA (intra-band non-contiguous DL CA and UL CA)

### 7.3A.7.1 Test purpose

Same as in clause 7.3A.1.1.

### 7.3A.7.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA and UL CA.

### 7.3A.7.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3A.0.

### 7.3A.7.4 Test description

#### 7.3A.7.4.1 Initial conditions

Same as in clause 7.3A.1.4.1 with the following exceptions:

- Instead of Table 7.3A.1.4.1-1→ use Table 7.3A.7.4.1-1.
- Instead of clause 7.3A.1.4.3 use clause 7.3A.7.4.3.

**Table 7.3A.7.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2. | A: N/A (Range is not relevant) |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration. | Refer to test point |

| Test Parameters for CA Configurations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ID | CA Configuration / $N_{RB_agg}$ | | $W_{gap}$ [MHz] | DL Allocation | | UL Allocation | | | |
| | PCC $N_{RB}$ | SCCs $N_{RB}$ | | CC MOD | PCC & SCC RB allocation | CC MOD | PCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) | CC MOD | SCC $N_{RB_alloc}$ ($L_{CRB}$ @ $RB_{start}$) |
| **Test Parameters for CA_4A-4A Configurations** | | | | | | | | | |
| 1 | 100 | 25 | 35 | QPSK | 100+25 | QPSK | 100@0 | QPSK | 25@0 |
| 2 | 100 | 100 | 20 | QPSK | 100+100 | QPSK | 100@0 | QPSK | 100@0 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-3.
Note 2: The carrier centre frequency of PCC in the UL operating band is configured closer to the DL operating band.

### 7.3A.7.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.3A7.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.3A.7.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.3A.7.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
6. Set the Downlink signal level for PCC and SCC to the appropriate REFSENS value defined in Table 7.3A.7.5-1. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the Throughput measurement.
7. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.3A.7.4.3 Message contents

Same as in clause 7.3A.4.4.3.

## 7.3A.7.5 Test requirement

For intra-band non-contiguous carrier aggregation with two uplink carriers, the throughput of each downlink component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.3.2 with parameters specified in Table 7.3A.7.5-1.

**Table 7.3A.7.5-1: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band Non-contiguous**

| ID/ CA configuration / $P_{REFSENS}$ | | | |
|---|---|---|---|
| **ID** | **CA configuration** | **PCC measurement (dBm)** | **SCC measurement (dBm)** |
| 1 | CA_4A-4A | -93.3 | -99.3 |
| | | -96[4] | -102[4] |
| 2 | | -93.3 | -93.3 |
| | | -96[4] | -96[4] |
| Note 1: The transmitter shall be set to maximum output power level<br>Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1<br>Note 3: The signal power is specified per port<br>Note 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured. | | | |

For the UE which supports inter-band carrier aggregation configurations the $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C shall be applied for applicable bands.

In case the UE supports more than one of the inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 7.3.3-1A, truncated to one decimal place that would apply for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL (i.e. bands listed in Table 7.3A.0-0a), then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied.

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 7.3.3-1A that would apply for that operating band among the supported CA configurations.

## 7.3A.8

## 7.3A.9 Reference sensitivity level for 4DL CA

Editor's note: Following aspects missing or not yet determined:

- Reference sensitivity QPSK $P_{REFSENS}$ has defined and made for some CA bands, some of are incomplete.

### 7.3A.9.1 Test purpose

Same as in clause 7.3A.1.1.

### 7.3A.9.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 4DL with CA configurations in Table 7.1-2b.

### 7.3A.9.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3A.0.

### 7.3A.9.4 Test description

#### 7.3A.9.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be

tested with applicable test parameters for each channel bandwidth, and are shown in table 7.3A.9.4.1-1 through table 7.3A.9.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.3A.9.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | | | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | | | | | | | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns | | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | | | | Refer to “PCC NRB” and “SCCs NRB” columns | | | | | | | | |
| Network signalling value | | | | | | | | | NS_01 by default, exceptions listed in Table 7.3.3-3, dependent on PCC Band | | | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | | | | | | | | | |
| **ID** | **PCC** | | | | **SCC1** | | | | **SCC2** | | | | **SCC3** | | | | |
| | **Band** | **Range** | **NRB** | | **Band** | **Range** | **NRB** | | **Band** | **Range** | **NRB** | | **Band** | **Range** | **NRB** | | |
| | **UL MOD** | **DL MOD** | **ULalloc (Note 2,3,4)** | **DLalloc** | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | **UL MOD** | **UL MOD** | **ULalloc** | **DLalloc** | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | |
| **Default Test Settings for a CA_XE Configuration (Intra-band contiguous)** | | | | | | | | | | | | | | | | | |
| **1** | X | Low/CC1 | REFSENS | ALL RBs | X | Low/CC2 | N/A | ALL RBs | X | Low/CC3 | N/A | ALL RBs | X | Low/CC4 | N/A | ALL RBs | |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | |
| **2** | X | Low/CC1 | REFSENS | ALL RBs | X | Low/CC2 | N/A | ALL RBs | X | Low/CC3 | N/A | ALL RBs | X | Low/CC4 | N/A | ALL RBs | |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | |
| **3** | X | High/CC1 | REFSENS | ALL RBs | X | High/CC2 | N/A | ALL RBs | X | High/CC3 | N/A | ALL RBs | X | High/CC4 | N/A | ALL RBs | |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | |
| **4** | X | High/CC1 | REFSENS | ALL RBs | X | High/CC2 | N/A | ALL RBs | X | High/CC3 | N/A | ALL RBs | X | High/CC4 | N/A | ALL RBs | |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | |
| **Default Test Settings for a CA_XA-YD, YD-XA Configuration (Inter-band)** | | | | | | | | | | | | | | | | | |
| **1** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | |
| **2** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | |

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| **3** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **4** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | R | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Test Settings for a CA_1A-3A-7A-8A Configuration** | | | | | | | | | | | | | | | | |
| 1 | 1 | Low | 25@0 | ALL RBs | 3 | High | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 8 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 2 | 1 | Low | 25@0 | ALL RBs | 3 | High | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 8 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 3 | 1 | Mid | 45@0 | ALL RBs | 3 | High | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 8 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |

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| 4 | 3 | High | 50@50 | ALL RBs | 1 | Low | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 8 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 5 | 3 | Mid | 50@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 8 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 6 | 3 | Mid | 50@0 | ALL RBs | 1 | Mid | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 8 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 7 | 7 | Mid | 75@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 8 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 8 | 8 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 9 | 8 | Mid | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 10 | 8 | Low | 25@12 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for a CA_1A-3A-8A-40A Configuration** | | | | | | | | | | | | | | | | |
| 1[11] | 1 | Low | 25@0 | ALL | 3 | High | N/A | ALL RBs | 8 | Mid | N/A | ALL RBs | 40 | Mid | N/A | ALL |

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| | | | | RBs | | | | | | | | | | | | RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 2[11] | 1 | Low | 25@0 | ALL RBs | 3 | High | N/A | ALL RBs | 8 | Mid | N/A | ALL RBs | 40 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 3 | 1 | Mid | 45@0 | ALL RBs | 3 | High | N/A | ALL RBs | 8 | Mid | N/A | ALL RBs | 40 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 4 | 3 | High | 50@50 | ALL RBs | 1 | Low | N/A | ALL RBs | 8 | High | N/A | ALL RBs | 40 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 5 | 3 | Mid | 50@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 8 | High | N/A | ALL RBs | 40 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 6 | 8 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 40 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 7 | 40 | Mid | 100@0 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 8 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for a CA_1A-3A-19A-42A Configuration** | | | | | | | | | | | | | | | | |
| 1 | 1 | Mid | 45@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 2 | 1 | Mid | 45@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 3[11] | 1 | Low | 25@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 4 | 1 | Mid | 45@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |

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| 5 | 1 | Mid | 45@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 6 | 1 | Low | 25@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 7[12] | 1 | Mid | 100@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 8 | 1 | Mid | 50@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 9 | 1 | Mid | 75@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 10 | 3 | High | 50@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 11 | 3 | High | 50@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 12 | 3 | High | 50@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 13 | 3 | High | 50@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 14[14] | 3 | High | 50@50 | ALL RBs | 1 | Low | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 15[13] | 3 | Low12 | 50@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Low12 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |

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| 16[15] | 3 | High13 | 50@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid13 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 17[13] | 3 | Low | 50@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Low | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 18[15] | 3 | High | 50@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 19 | 19 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 20 | 19 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 21 | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 22 | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 23 | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 24 | 42 | Mid | 100@0 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| 25 | 42 | Low | 100@0 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| 26 | 42 | High | 100@0 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |

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| 27 | 42 | Mid | 100@0 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Test Settings for a CA_1A-19A-21A-42A Configuration** | | | | | | | | | | | | | | | | |
| 1 | 1 | Mid | 75@0 | ALL RBs | 19 | High | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 2 | 1 | Mid | 75@0 | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 3 | 1 | Mid | 100@0 | ALL RBs | 19 | High | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 4 | 1 | Mid | 100@0 | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 5 | 1 | Mid | 50@0 | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 6 | 1 | Mid | 75@0 | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 7 | 19 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 8 | 19 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 9 | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 10 | 19 | Mid | 50@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPS | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |

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| 11 | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 12 | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 13 | 21 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 14 | 21 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 15 | 21 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 16 | 21 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 17 | 21 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 18 | 21 | Mid | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| 19 | 21 | High | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 |
| 20 | 42 | Mid | 100@0 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **Test Settings for CA_2A-4A-5A-12A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | ALL | 4 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 12 | Mid | N/A | ALL |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | RBs | | | | | | | | | | | | RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 4 | Mid | 50@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | High | N/A | ALL RBs | 12 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 4 | Mid | 50@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Low | N/A | ALL RBs | 12 | Low | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 4 | Mid | 50@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | High | N/A | ALL RBs | 12 | Low | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **5** | 4 | Mid | 50@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Low | N/A | ALL RBs | 12 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **6** | 5 | Low | 25@25 | ALL RBs | 12 | Mid | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 4 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 5 | High | 25@25 | ALL RBs | 12 | Mid | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 4 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8** | 12 | Low[18] | 20@30 | ALL RBs | 4 | Low[18] | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **9** | 12 | High[19] | 20@30 | ALL RBs | 4 | High[19] | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_2A-4A-5A-30A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | ALL RBs | 4 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 4 | Mid | 50@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Low | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 4 | Mid | 50@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | High | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 4 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **5** | 5 | Low | 25@25 | ALL RBs | 2 | Mid | N/A | ALL RBs | 4 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **6** | 5 | High | 25@25 | ALL RBs | 2 | Mid | N/A | ALL RBs | 4 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **7** | 5 | Mid | 25@25 | ALL RBs | 2 | Mid | N/A | ALL RBs | 4 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **8** | 30 | Mid | 25@25 | ALL RBs | 2 | Mid | N/A | ALL RBs | 4 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_2A-4A-7A-12A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | ALL RBs | 4 | Mid | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 12 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **2** | 4 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 12 | Low | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 4 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 12 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **4** | 7 | Mid | 75@25 | ALL RBs | 4 | Mid | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 12 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5** | 12 | Low10 | 16@17 | ALL RBs | 2 | Mid | N/A | ALL RBs | 4 | Low10 | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **6** | 12 | High11 | 16@17 | ALL RBs | 2 | Mid | N/A | ALL RBs | 4 | High11 | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **Test Settings for CA_2A-4A-12A-30A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | ALL RBs | 4 | Mid | N/A | ALL RBs | 12 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 4 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 12 | Low | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 4 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 12 | High | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 12 | Low[18] | 16@17 | ALL RBs | 2 | Mid | N/A | ALL RBs | 4 | Low[18] | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5** | 12 | High[19] | 16@17 | ALL RBs | 2 | Mid | N/A | ALL RBs | 4 | High[19] | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **6** | 30 | Mid | 25@25 | ALL RBs | 2 | Mid | N/A | ALL RBs | 4 | Mid | N/A | ALL RBs | 12 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings for CA_2A-4A-29A-30A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | ALL RBs | 4 | Mid | N/A | ALL RBs | 29 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 4 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 29 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 30 | Mid | 25@25 | ALL RBs | 2 | Mid | N/A | ALL RBs | 4 | Mid | N/A | ALL RBs | 29 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |

| Test Settings for CA_2A-12A-30A-66A Configuration | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 2 | Mid | 50@50 | ALL RBs | 12 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 12 | Mid | 20@30 | ALL RBs | 2 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **3** | 12 | Low | 20@5 | ALL RBs | 2 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Low | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 25 |
| **4** | 12 | Mid | 20@5 | ALL RBs | 2 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Low | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **5** | 12 | High | 20@30 | ALL RBs | 2 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Low | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 75 |
| **6** | 12 | Low | 20@30 | ALL RBs | 2 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Low | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **7** | 12 | Mid | 20@30 | ALL RBs | 2 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **8** | 30 | Mid | 25@25 | ALL RBs | 2 | Mid | N/A | ALL RBs | 12 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **9** | 66 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 12 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **10** | 66 | Mid | 50@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 12 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **Test Settings for CA_3A-7A-20A-32A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 3 | Mid | 50@50 | ALL RBs | 7 | Mid | N/A | ALL RBs | 20 | Mid | N/ | ALL RBs | 32 | Mid | N/ | ALL RBs |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | A | 100 | QPSK | QPSK | A | 100 |
| **2** | 7 | Mid | 75@25 | ALL RBs | 3 | Mid | N/A | ALL RBs | 20 | Mid | N/A | ALL RBs | 32 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 |
| **3** | 20 | Mid | 20@0 | ALL RBs | 3 | Mid | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 32 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | QPSK | QPSK | | 100 |
| **Default Test Settings for CA_XB-YA-ZA and CA_XC-YA-ZA Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | X | Low/CC1 | REFSENS | ALL RBs | X | Low/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Low/CC1 | REFSENS | ALL RBs | X | Low/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | X | High/CC1 | REFSENS | ALL RBs | X | High/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | X | High/CC1 | REFSENS | ALL RBs | X | High/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings CA_XA-ZA-YB and for CA_XA-ZA-YC/CA_XA-YC-ZA Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | Y | Low/CC1 | REFSENS | ALL RBs | Y | Low/CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Low/CC1 | REFSENS | ALL RBs | Y | Low/CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPS | QPSK | | Lowest | N/A | QPSK | | Lowest | N/A | QPSK | | Highest | N/A | QPSK | | Highest |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | K | | | $N_{RB_agg}$ | | | | $N_{RB_agg}$ | | | | $N_{RB}$ | | | | $N_{RB}$ |
| **3** | Y | High/CC 1 | REFSENS | ALL RBs | Y | High/CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | High/CC 1 | REFSENS | ALL RBs | Y | High/CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Test Settings CA_1A-3C-8A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 1 | Low | 25@0 | ALL RBs | 3 | High/CC 1 | N/A | ALL RBs | 3 | High/CC2 | N/A | ALL RBs | 8 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **2** | 1 | Low | 25@0 | ALL RBs | 3 | High/CC 1 | N/A | ALL RBs | 3 | High/CC2 | N/A | ALL RBs | 8 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 1 | Mid | 45@0 | ALL RBs | 3 | High/CC 1 | N/A | ALL RBs | 3 | High/CC2 | N/A | ALL RBs | 8 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **4** | 3 | High/CC 1 | 50@50 | ALL RBs | 1 | Low | N/A | ALL RBs | 3 | High/CC2 | N/A | ALL RBs | 8 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **5** | 3 | High/CC 1 | 50@50 | ALL RBs | 1 | Low | N/A | ALL RBs | 3 | High/CC2 | N/A | ALL RBs | 8 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **6** | 3 | Low/CC1 | 50@50 | ALL RBs | 1 | Low | N/A | ALL RBs | 3 | Low/CC2 | N/A | ALL RBs | 8 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **7** | 3 | Low/CC1 | 50@50 | ALL RBs | 1 | Low | N/A | ALL RBs | 3 | Low/CC2 | N/A | ALL RBs | 8 | High | N/A | ALL RBs |

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| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| **8** | 8 | High | 25@25 | ALL RBs | 1 | Low | N/A | ALL RBs | 3 | Mid/CC1 | N/A | ALL RBs | 3 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings CA_1A-3A-42C Configuration** | | | | | | | | | | | | | | | | |
| **1** | 1 | Low | 25@0 | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 1 | Low | 25@0 | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 1 | Mid | 45@0 | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4**[12] | 1 | Mid | 100@0 | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 1 | Mid | 100@0 | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6**[13] | 3 | High | 50@50 | ALL RBs | 1 | Low | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 3 | Low[16] | 50@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 42 | Low[16]/CC 1 | N/A | ALL RBs | 42 | Low[16]/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8** | 3 | High[17] | 50@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 42 | Mid[17]/CC 1 | N/A | ALL RBs | 42 | Mid[17]/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **9** | 3 | Low | 50@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 42 | Low[16]/CC 1 | N/A | ALL RBs | 42 | Low[16]/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **10** | 3 | High | 50@25 | ALL | 1 | Mid | N/A | ALL RBs | 42 | Mid[17]/CC | N/A | ALL RBs | 42 | Mid[17]/CC2 | N/A | ALL |

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| | | | | RBs | | | | | | 1 | | | | | | RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **11** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **12** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **13** | 42 | Mid/CC1 | 100@0 | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **14** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **15** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings CA_1A-19A-42C Configuration** | | | | | | | | | | | | | | | | |
| **1** | 1 | Mid | 50@0 | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 1 | Mid | 75@0 | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 1 | Mid | 100@0 | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 19 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |

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| **6** | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 42 | Mid/CC1 | 100@0 | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **8** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **9** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **10** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **11** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Test Settings CA_1A-21A-42C Configuration** | | | | | | | | | | | | | | | | |
| **1** | 1 | Mid | 75@0 | ALL RBs | 21 | High | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 1 | Mid | 75@0 | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 1 | Mid | 100@0 | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 21 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 21 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPS | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |

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| **6** | 21 | Mid | 100@0 | ALL RBs | 1 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 42 | Mid/CC1 | 100@0 | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **8** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **9** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **10** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **11** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Test Settings for a CA_1A-41A-42C Configuration** | | | | | | | | | | | | | | | | |
| 1 | 1 | Low | 100@0 | ALL RBs | 41 | Mid | N/A | ALL RBs | 42 | Low/CC1 | N/A | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 1 | Mid | 100@0 | ALL RBs | 41 | Mid | N/A | ALL RBs | 42 | Low/CC1 | N/A | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 1 | High | 100@0 | ALL RBs | 41 | Mid | N/A | ALL RBs | 42 | Low/CC1 | N/A | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 42 | Mid/CC1 | 100@0 | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 41 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 5 | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 41 | Mid | N/A | ALL RBs |

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| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 6 | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 41 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 7 | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 41 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 8 | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 41 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for a CA_1A-41C-42A Configuration** | | | | | | | | | | | | | | | | |
| 1 | 1 | Low | 100@0 | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 2 | 1 | Mid | 100@0 | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 3 | 1 | High | 100@0 | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 4 | 42 | Mid | 100@0 | ALL RBs | 1 | Mid | N/A | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings CA_2A-5A-12B Configuration** | | | | | | | | | | | | | | | | |
| 1 | 2 | Mid | 50@50 | ALL RBs | 5 | Mid | N/A | ALL RBs | 12 | Mid/CC1 | N/A | ALL RBs | 12 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| 2 | 5 | Mid | 25@25 | ALL RBs | 2 | Mid | N/A | ALL RBs | 12 | Mid/CC1 | N/A | ALL RBs | 12 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 |
| 3 | 12 | Mid/CC1 | 20@30 | ALL RBs | 12 | Mid/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |

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| 4 | 12 | Low/CC1 | 20@5 | ALL RBs | 12 | Low/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 5 | 12 | Low/CC1 | 20@5 | ALL RBs | 12 | Low/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 6 | 12 | High/CC1 | 20@5 | ALL RBs | 12 | High/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 7 | 12 | High/CC1 | 20@5 | ALL RBs | 12 | High/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **Test Settings CA_2A-66C-71A Configuration** | | | | | | | | | | | | | | | | |
| 1 | 2 | High | 50@50 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | Note X5 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 2 | 2 | Low | 100@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 3 | 66 | Low/CC1 | 100@0 | ALL RBs | 66 | Low/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 4 | 66 | Low/CC1 | 100@0 | ALL RBs | 66 | Low/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 5 | 66 | High/CC1 | 100@0 | ALL RBs | 66 | High/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| 6 | 66 | High/CC1 | 100@0 | ALL RBs | 66 | High/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 7 | 66 | Mid/CC1 | 100@0 | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPS | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |

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| | K | | | | | | | | | | | | | | | |
| 8 | 71 | Low | 25@0 | ALL RBs | 2 | High | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 25 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 |
| 9 | 71 | Low | 25@12 | ALL RBs | 2 | High | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 |
| 10 | 71 | Low | 20@0 | ALL RBs | 2 | High | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 |
| 11 | 71 | Low | 20@0 | ALL RBs | 2 | High | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 |
| 12 | 71 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings CA_3A-19A-42C Configuration** | | | | | | | | | | | | | | | | |
| **1** | 3 | Low[16] | 50@25 | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Low[16]/CC1 | N/A | ALL RBs | 42 | Low[16]/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 3 | High[17] | 50@25 | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid[17]/CC1 | N/A | ALL RBs | 42 | Mid[17]/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 19 | Mid | 25@50 | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **5** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **6** | 42 | Mid/CC1 | 100@0 | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |

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| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **7** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **8** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Test Settings CA_3A-41A-42C Configuration** | | | | | | | | | | | | | | | | |
| **1** | 3 | Mid | 50@50 | ALL RBs | 41 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2**[13] | 3 | Low | 50@25 | ALL RBs | 41 | Mid | N/A | ALL RBs | 42 | Low/CC1 | N/A | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3**[15] | 3 | High | 50@25 | ALL RBs | 41 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 41 | Mid | 100@0 | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 41 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 42 | Mid/CC1 | 100@0 | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8**[16] | 3 | Low | 50@25 | ALL RBs | 41 | Mid | N/A | ALL RBs | 42 | Low/CC1 | N/A | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **9**[17] | 3 | High | 50@25 | ALL | 41 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL |

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| | | | | RBs | | | | | | | | | | | | RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **10** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **11** | 42 | Mid/CC1 | 100@0 | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings CA_19A-21A-42C Configuration** | | | | | | | | | | | | | | | | |
| **1** | 19 | High | 25@25 | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 19 | Mid | 25@50 | ALL RBs | 21 | High | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 19 | Mid | 25@50 | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 21 | Mid | 25@25 | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 21 | High | 25@50 | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 21 | Mid | 25@50 | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 42 | Mid/CC1 | 100@0 | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **8** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |

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| **9** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **10** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **11** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **Test Settings CA_41C-42C Configuration** | | | | | | | | | | | | | | | | |
| **1** | 41 | Mid/CC1 | 100@0 | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 41 | Low/CC1 | 100@0 | ALL RBs | 41 | Low/CC2 | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 41 | Low/CC1 | 50@0 | ALL RBs | 41 | Low/CC2 | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 41 | High/CC1 | 100@0 | ALL RBs | 41 | High/CC2 | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 41 | High/CC1 | 50@0 | ALL RBs | 41 | High/CC2 | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 42 | Low/CC1 | 50@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs |
| | QPS | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |

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| **9** | 42 | High/CC 1 | 50@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **10** | 42 | Mid/CC1 | 100@0 | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings CA_41C-42C with UL Configuration** | | | | | | | | | | | | | | | | |
| 1 | 41 | **Low/CC 1** | **100@0** | **ALL RBs** | 41 | **Low/CC2** | 50@0 | **ALL RBs** | 42 | **Mid/CC1** | N/A | ALL RBs | 42 | **Mid/CC2** | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 2 | 41 | **High/CC 1** | **100@0** | **ALL RBs** | 41 | **High/CC2** | 50@0 | **ALL RBs** | 42 | **Mid/CC1** | N/A | ALL RBs | 42 | **Mid/CC2** | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 3 | 41 | **Low/CC 1** | **100@0** | **ALL RBs** | 41 | **Low/CC2** | 100@0 | **ALL RBs** | 42 | **Mid/CC1** | N/A | ALL RBs | 42 | **Mid/CC2** | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 4 | 41 | **High/CC 1** | **100@0** | **ALL RBs** | 41 | **High/CC2** | 100@0 | **ALL RBs** | 42 | **Mid/CC1** | N/A | ALL RBs | 42 | **Mid/CC2** | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 5 | 41 | **Mid/CC1** | **50@0** | **ALL RBs** | 42 | **Mid/CC1** | 50@0 | **ALL RBs** | 41 | **Mid/CC2** | N/A | ALL RBs | 42 | **Mid/CC2** | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 6 | 41 | **Mid/CC1** | **100@0** | **ALL RBs** | 42 | **Mid/CC1** | 100@0 | **ALL RBs** | 41 | **Mid/CC2** | N/A | ALL RBs | 41 | **Mid/CC2** | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 7 | 42 | **Low/CC 1** | **100@0** | **ALL RBs** | 42 | **Low/CC2** | 50@0 | **ALL RBs** | 41 | **Mid/CC1** | N/A | ALL RBs | 41 | **Mid/CC2** | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 8 | 42 | **High/CC 1** | **100@0** | **ALL RBs** | 42 | **High/CC2** | 50@0 | **ALL RBs** | 41 | **Mid/CC1** | N/A | ALL RBs | 41 | **Mid/CC2** | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 9 | 42 | **Low/CC 1** | **100@0** | **ALL RBs** | 42 | **Low/CC2** | 100@0 | **ALL RBs** | 41 | **Mid/CC1** | N/A | ALL RBs | 41 | **Mid/CC2** | N/A | ALL RBs |

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| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| 10 | 42 | **High/CC1** | **100@0** | **ALL RBs** | 42 | **High/CC2** | 100@0 | **ALL RBs** | 41 | **Mid/CC1** | N/A | ALL RBs | 41 | **Mid/CC2** | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings CA_2C-5A-30A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 2 | Low/CC1 | 50@50 | ALL RBs | 2 | Low/CC2 | N/A | ALL RBs | 5 | Low | N/A | ALL RBs | 30 | Low | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 2 | Low/CC1 | 50@50 | ALL RBs | 2 | Low/CC2 | N/A | ALL RBs | 5 | Low | N/A | ALL RBs | 30 | Low | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 2 | Mid/CC1 | 50@50 | ALL RBs | 2 | Mid/CC2 | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 2 | High/CC1 | 50@50 | ALL RBs | 2 | High/CC2 | N/A | ALL RBs | 5 | High | N/A | ALL RBs | 30 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **5** | 2 | High/CC1 | 50@50 | ALL RBs | 2 | High/CC2 | N/A | ALL RBs | 5 | High | N/A | ALL RBs | 30 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **6** | 5 | Low | 25@25 | ALL RBs | 30 | Low | N/A | ALL RBs | 2 | Low/CC1 | N/A | ALL RBs | 2 | Low/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 5 | Mid | 25@25 | ALL RBs | 30 | Mid | N/A | ALL RBs | 2 | Mid/CC1 | N/A | ALL RBs | 2 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8** | 5 | High | 25@25 | ALL RBs | 30 | Mid | N/A | ALL RBs | 2 | Mid/CC1 | N/A | ALL RBs | 2 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **9** | 5 | High | 25@25 | ALL RBs | 30 | High | N/A | ALL RBs | 2 | High/CC1 | N/A | ALL RBs | 2 | High/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **10** | 30 | Low | 25@25 | ALL | 5 | Low | N/A | ALL RBs | 2 | Low/CC1 | N/A | ALL RBs | 2 | Low/CC2 | N/A | ALL |

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| | | | | RBs | | | | | | | | | | | | RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **11** | 30 | Mid | 25@25 | ALL RBs | 5 | Mid | N/A | ALL RBs | 2 | Mid/CC1 | N/A | ALL RBs | 2 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **12** | 30 | High | 25@25 | ALL RBs | 5 | Mid | N/A | ALL RBs | 2 | Mid/CC1 | N/A | ALL RBs | 2 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **13** | 30 | High | 25@25 | ALL RBs | 5 | High | N/A | ALL RBs | 2 | High/CC1 | N/A | ALL RBs | 2 | High/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings CA_2C-12A-30A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 2 | Low/CC1 | 50@50 | ALL RBs | 2 | Low/CC2 | N/A | ALL RBs | 12 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 2 | Low/CC1 | 50@50 | ALL RBs | 2 | Low/CC2 | N/A | ALL RBs | 12 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 2 | High/CC1 | 50@50 | ALL RBs | 2 | High/CC2 | N/A | ALL RBs | 12 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 2 | High/CC1 | 50@50 | ALL RBs | 2 | High/CC2 | N/A | ALL RBs | 12 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **5** | 2 | Mid/CC1 | 50@50 | ALL RBs | 2 | Mid/CC2 | N/A | ALL RBs | 12 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **6** | 12 | Mid | 20@30 | ALL RBs | 30 | Mid | N/A | ALL RBs | 2 | Mid/CC1 | N/A | ALL RBs | 2 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 30 | Mid | 25@25 | ALL RBs | 12 | Mid | N/A | ALL RBs | 2 | Mid/CC1 | N/A | ALL RBs | 2 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |

| Test Settings CA_2C-29A-30A Configuration | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 2 | Low/CC1 | 50@50 | ALL RBs | 2 | Low/CC2 | N/A | ALL RBs | 29 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 2 | Low/CC1 | 50@50 | ALL RBs | 2 | Low/CC2 | N/A | ALL RBs | 29 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 2 | High/CC1 | 50@50 | ALL RBs | 2 | High/CC2 | N/A | ALL RBs | 29 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 2 | High/CC1 | 50@50 | ALL RBs | 2 | High/CC2 | N/A | ALL RBs | 29 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **5** | 2 | Mid/CC1 | 50@50 | ALL RBs | 2 | Mid/CC2 | N/A | ALL RBs | 29 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **6** | 30 | Mid | 25@25 | ALL RBs | 29 | Mid | N/A | ALL RBs | 2 | Mid/CC1 | N/A | ALL RBs | 2 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings CA_66A-70C-71A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 66 | Mid | 100@0 | ALL RBs | 70 | Mid/CC1 | N/A | ALL RBs | 70 | Mid/CC2 | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 70 | Mid/CC1 | 75@0 | ALL RBs | 70 | Mid/CC2 | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **3** | 71 | Low | 16@12 | ALL RBs | 66 | Mid | N/A | ALL RBs | 70 | Mid/CC1 | N/A | ALL RBs | 70 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **Test Settings CA_66C-70A-71A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 66 | Mid/CC1 | 100@0 | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 70 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **2** | 66 | High/CC | 100@0 | ALL | 66 | High/CC2 | N/A | ALL RBs | 70 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | RBs | | | | | | | | | | | | RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **3** | 70 | Mid | 75@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **4** | 71 | Low | 16@12 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 70 | Low | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **5** | 71 | High | 50@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 70 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 4: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41E, X=41.
Note 6: **Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-8A,X=1,Y=3,Z=7,R=8.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_3C-7A-28A, X=3,Y=7 and Z=28.
Note 8: REFSENS refers to the PCC bands and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose the Combination with $N_{RB_PCC}$ = $N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.
Note 11: Test points that fulfil criteria of Note 4 in Table 7.3A.5.5-3.
Note 12: Only Band 1 and Band 42 need to be tested and Band 3 does not need to be tested.
Note 13: Band 3: fUL = 1720MHz (NUL = 19300), fDL = 1815MHz (NDL = 1300)
Band 42: fUL/DL = 3440MHz (NUL/DL = 41990)
Note 14: Only Band 1 and Band 3 need to be tested and Band 42 does not need to be tested.
Note 15: Band 3: fUL = 1775MHz (NUL = 19850), fDL = 1870MHz (NDL = 1850)
Band 42: fUL/DL = 3520MHz (NDL = 42790)
Note 16: Band 42: $f_{UL/DL}$ for SCC1 = 3430.2MHz ($N_{UL/DL}$ = 41892), $f_{UL/DL}$ for SCC2 = 3450MHz ($N_{UL/DL}$ = 42090)
Note 17: Band 42: $f_{UL/DL}$ for SCC1 = 3500.2MHz ($N_{UL/DL}$ = 42592), $f_{UL/DL}$ for SCC2 = 3520MHz ($N_{UL/DL}$ = 42790)
Note 18: Band 12: $f_{UL}$ = 706.7 MHz ($N_{UL}$ = 23087), $f_{DL}$ = 736.7 MHz ($N_{DL}$ = 5087)
Band 4: $f_{DL}$ = 2120.1 MHz ($N_{DL}$ = 2051)
Note 19: Band 12: $f_{UL}$ = 710.9 MHz ($N_{UL}$ = 23129), $f_{DL}$ = 740.9 MHz ($N_{DL}$ = 5129)
Band 4: $f_{DL}$ = 2132.7 MHz ($N_{DL}$ = 2177)
Note 20: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 21: Test point that fulfils criteria of Note 16 in Table 7.3A.0-0a.

| |
|---|
| Band 71: $f_{UL}$ = 679.3 MHz ($N_{UL}$ = 133285), $f_{DL}$ = 633.3 MHz ($N_{DL}$ = 68749) |

**Table 7.3A.9.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default, exceptions listed in Table 7.3.3-3, dependent on PCC Band |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | | $W_{gap}$ [MHz] | SCC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3,4) | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | UL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for a CA_XA-XA-YA-ZA Configuration (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-ZA-YA-YA / CA_XA-YA-YA-ZA Configuration** | | | | | | | | | | | | | | | | | | | |
| **1** | Y | CC2 | REFSENS | ALL RBs | Max | Y | CC1 | N/A | ALL RBs | - | X | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | X | Mid | REFSENS | ALL RBs | - | Y | CC2 | N/A | ALL RBs | Max | Y | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | CC2 | N/A | ALL RBs | Max | Y | CC1 | N/A | ALL RBs | - | X | Mid | N/A | ALL RBs |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Test Settings for CA_2A-2A-4A-5A Configurations** | | | | | | | | | | | | | | | | | | | |
| **1** | 2 | CC2 | **16@57** | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 4 | Mid | N/A | ALL RBs | - | 5 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **2** | 2 | CC2 | 16@57 | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 4 | Mid | N/A | ALL RBs | - | 5 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **3** | 2 | CC2 | 16@57 | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 4 | Mid | N/A | ALL RBs | - | 5 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **4** | 4 | Low, High | 50@0 | ALL RBs | - | 5 | Mid | N/A | ALL RBs | - | 2 | CC2 | N/A | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **5** | 4 | Low | 100@0 | ALL RBs | - | 5 | Mid | N/A | ALL RBs | - | 2 | CC2 | N/A | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **6** | 5 | Mid | 25@25 | ALL RBs | - | 4 | Low, High | N/A | ALL RBs | - | 2 | CC2 | N/A | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **7** | 5 | Low | 25@25 | ALL RBs | - | 4 | Mid | N/A | ALL RBs | - | 2 | CC2 | N/A | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 |
| **Test Settings for CA_2A-2A-5A-12A Configurations** | | | | | | | | | | | | | | | | | | | |
| **1** | 2 | CC2 | 16@57 | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 5 | Mid | N/A | ALL RBs | - | 12 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **2** | 2 | CC2 | 16@57 | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 5 | Mid | N/A | ALL RBs | - | 12 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **3** | 5 | Mid | 25@25 | ALL RBs | - | 12 | Mid | N/A | ALL RBs | - | 2 | CC2 | Max | ALL RBs | - | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4** | 12 | Mid | 25@25 | ALL RBs | - | 5 | Mid | N/A | ALL RBs | - | 2 | CC2 | Max | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for CA_2A-2A-12A-30A Configurations** | | | | | | | | | | | | | | | | | | | |
| **1** | 2 | CC2 | 16@57 | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 12 | Mid | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **2** | 2 | CC2 | 16@57 | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 12 | Mid | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **3** | 2 | CC2 | **16@57** | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 12 | Mid | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **4** | 12 | Mid | 20@30 | ALL RBs | - | 30 | Mid | N/A | ALL RBs | - | 2 | CC2 | N/A | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 | | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 |
| **5** | 30 | Mid | 25@25 | ALL RBs | - | 12 | Mid | N/A | ALL RBs | - | 2 | CC2 | N/A | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 | | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 |

| Test Settings for CA_2A-4A-7A-7A Configurations | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 2 | Mid | 50@50 | ALL RBs | - | 4 | Mid | N/A | ALL RBs | - | 7 | CC2 | N/A | ALL RBs | 30 | 7 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **2** | 4 | Mid | 100@0 | ALL RBs | - | 2 | Mid | N/A | ALL RBs | - | 7 | CC2 | N/A | ALL RBs | 30 | 7 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **3** | 7 | CC2 | 32@68 | ALL RBs | 45 | 7 | CC1 | N/A | ALL RBs | - | 2 | Mid | N/A | ALL RBs | - | 4 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 25 |
| **4** | 7 | CC2 | 45@55 | ALL RBs | 25 | 7 | CC1 | N/A | ALL RBs | - | 2 | Mid | N/A | ALL RBs | - | 4 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 25 |
| **5** | 7 | CC2 | 32@68 | ALL RBs | 30 | 7 | CC1 | N/A | ALL RBs | - | 2 | Mid | N/A | ALL RBs | - | 4 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **6** | 7 | CC2 | 45@55 | ALL RBs | 15 | 7 | CC1 | N/A | ALL RBs | - | 2 | Mid | N/A | ALL RBs | - | 4 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for CA_2A-4A-7A-7A with UL CA Configurations** | | | | | | | | | | | | | | | | | | | |
| **1** | 2 | Low | 50@0 | ALL RBs | - | 4 | High | 25@0 | ALL RBs | - | 7 | CC2 | N/A | ALL RBs | 30 | 7 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | QPSK | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **2** | 4 | Mid[16] | 25@0 | ALL RBs | - | 2 | Mid[16] | 25@0 | ALL RBs | - | 7 | CC2 | N/A | ALL RBs | 30 | 7 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | | QPSK | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |

| Default Test Settings for a CA_4A-4A-5A-30A Configuration | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 4 | CC2 | 100@0 | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs | - | 5 | Mid | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **2** | 4 | CC2 | 100@0 | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs | - | 5 | Mid | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **3** | 4 | CC2 | 50@0 | ALL RBs | Low | 4 | CC1 | N/A | ALL RBs | - | 5 | Low | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **4** | 4 | CC2 | 50@0 | ALL RBs | Low | 4 | CC1 | N/A | ALL RBs | - | 5 | High | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **5** | 5 | Mid | 50@0 | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **6** | 5 | Low | 25@25 | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Low | 4 | CC1 | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **7** | 5 | High | 25@25 | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Low | 4 | CC1 | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **8** | 30 | Mid | 50@0 | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs | - | 5 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **9** | 30 | Mid | 25@25 | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Low | 4 | CC1 | N/A | ALL RBs | - | 5 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **Test Settings for a CA_4A-4A-12A-30A Configuration** | | | | | | | | | | | | | | | | | | | |
| **1** | 4 | CC2 | 100@0 | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs | - | 12 | Mid | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **2** | 4 | CC2 | 100@0 | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs | - | 12 | Mid | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |

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| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **3** | 4 | CC2 | 100@0 | ALL RBs | Low | 4 | CC1 | N/A | ALL RBs | - | 12 | Mid | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **4** | 12 | Mid | 50@0 | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **5** | 12 | Mid | 20@30 | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Low | 4 | CC1 | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **6** | 30 | Mid | 50@0 | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs | - | 12 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **7** | 30 | Mid | 25@25 | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Low | 4 | CC1 | N/A | ALL RBs | - | 12 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **Test Settings for a CA_4A-4A-29A-30A Configuration** | | | | | | | | | | | | | | | | | | | |
| **1** | 4 | CC2 | 100@0 | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs | - | 29 | Mid | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **2** | 4 | CC2 | 100@0 | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs | - | 29 | Mid | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **3** | 4 | CC2 | 50@0 | ALL RBs | Low | 4 | CC1 | N/A | ALL RBs | - | 29 | Mid | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **4** | 4 | CC2 | 100@0 | ALL RBs | Low | 4 | CC1 | N/A | ALL RBs | - | 29 | Mid | N/A | ALL RBs | - | 30 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 |
| **5** | 30 | Mid | 50@0 | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs | - | 29 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |

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| **6** | 30 | Mid | 25@25 | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Low | 4 | CC1 | N/A | ALL RBs | - | 29 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **Test Settings for a CA_2A-12A-66A-66A Configuration** | | | | | | | | | | | | | | | | | | | |
| **1** | 2 | Mid | 50@50 | ALL RBs | - | 12 | Mid | N/A | ALL RBs | - | 66 | CC2 | N/A | ALL RBs | 50 | 66 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **2** | 12 | Low | 20@5 | ALL RBs | - | 2 | Mid | N/A | ALL RBs | - | 66 | CC2 | N/A | ALL RBs | 65 | 66 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 25 |
| **3** | 12 | Mid | 20@5 | ALL RBs | - | 2 | Mid | N/A | ALL RBs | - | 66 | CC2 | N/A | ALL RBs | 60 | 66 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **4** | 12 | High | 20@30 | ALL RBs | - | 2 | Mid | N/A | ALL RBs | - | 66 | CC2 | N/A | ALL RBs | 55 | 66 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 75 |
| **5** | 12 | High | 20@30 | ALL RBs | - | 2 | Mid | N/A | ALL RBs | - | 66 | CC2 | N/A | ALL RBs | 50 | 66 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **6** | 12 | Low | 20@5 | ALL RBs | - | 2 | Mid | N/A | ALL RBs | - | 66 | CC2 | N/A | ALL RBs | 65 | 66 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 25 |
| **7** | 12 | Mid | 20@5 | ALL RBs | - | 2 | Mid | N/A | ALL RBs | - | 66 | CC2 | N/A | ALL RBs | 50 | 66 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_29A-66A-66A-70A Configuration** | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | REFSENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | 29 | Mid | N/A | ALL RBs | - | 70 | Mid | N/A | ALL RBs |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | **100** | | N/A | QPSK | | **100** | | N/A | QPSK | | 50 | | N/A | QPSK | | 75 |
| **2** | 66 | CC1 | REFSENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | 29 | Mid | N/A | ALL RBs | - | 70 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | **100** | | N/A | QPSK | | **25** | | N/A | QPSK | | 50 | | N/A | QPSK | | 75 |
| **3** | 70 | Mid | REFSENS | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | 29 | High | N/A | ALL RBs |
| | QPSK | QPSK | | **75** | | N/A | QPSK | | **100** | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **Test Settings for a CA_66A-66A-70A-71A Configuration** | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | CC1/Low | 100@0 | ALL RBs | - | 66 | CC2/High | N/A | ALL RBs | - | 70 | Mid | N/A | ALL RBs | - | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | **100** | | N/A | QPSK | | **100** | | QPSK | QPSK | | 75 | | N/A | QPSK | | 50 |
| **2** | 66 | CC1/Low | 100@0 | ALL RBs | - | 66 | CC2/High | N/A | ALL RBs | - | 70 | Mid | N/A | ALL RBs | - | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | **100** | | N/A | QPSK | | **25** | | QPSK | QPSK | | 75 | | | QPSK | | 50 |
| **3** | 70 | Mid | 75@0 | ALL RBs | - | 66 | CC1/Low | 100@0 | ALL RBs | - | 66 | CC2/High | N/A | ALL RBs | - | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | **75** | | QPSK | QPSK | | **100** | | N/A | QPSK | | 100 | | | QPSK | | 50 |
| **4** | 71 | Low | 16@12 | ALL RBs | - | 66 | CC1/Low | 100@0 | ALL RBs | - | 66 | CC2/High | N/A | ALL RBs | - | 70 | Low | N/A | ALL RBs |
| | QPSK | QPSK | | **50** | | QPSK | QPSK | | **100** | | N/A | QPSK | | 100 | | | QPSK | | 75 |
| **5** | 71 | High | 50@0 | ALL RBs | - | 66 | CC1/Low | 100@0 | ALL RBs | - | 66 | CC2/High | N/A | ALL RBs | - | 70 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | **50** | | QPSK | QPSK | | **100** | | N/A | QPSK | | 100 | | | QPSK | | 75 |

| Default Test Settings for a CA_XA-XD/XD-XA/XC-XC Configuration (Intra-band non-contiguous + Intra-band contiguous) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TBD | | | | | | | | | | | | | | | | | | | |
| Default Test Settings for a CA_XA-XA-YB/XA-XA-YC/XC-YC Configuration (Intra-band non-contiguous/contiguous + Inter-band Intra-band contiguous) | | | | | | | | | | | | | | | | | | | |
| TBD | | | | | | | | | | | | | | | | | | | |
| Test Settings for CA_2A-2A-12B Configurations | | | | | | | | | | | | | | | | | | | |
| **1** | 2 | CC2 | 50@50 | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 12 | Mid/ CC1 | N/A | ALL RBs | - | 12 | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 25 |
| **2** | 2 | CC2 | 50@50 | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 12 | Mid/ CC1 | N/A | ALL RBs | - | 12 | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 50 | | N/A | QPSK | | 25 |
| **3** | 2 | CC2 | 16@57 | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 12 | Mid/ CC1 | N/A | ALL RBs | - | 12 | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 25 |
| **4** | 2 | CC2 | 16@57 | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 12 | Mid/ CC1 | N/A | ALL RBs | - | 12 | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 50 | | N/A | QPSK | | 25 |
| **5** | 12 | Low/ CC1 | 20@5 | ALL RBs | - | 12 | Low/CC2 | N/A | ALL RBs | - | 2 | CC2 | Max | ALL RBs | - | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **6** | 12 | Low/ CC1 | 20@30 | ALL RBs | - | 12 | Low/CC2 | N/A | ALL RBs | - | 2 | CC2 | Max | ALL RBs | - | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **7** | 12 | Mid/ CC1 | 20@30 | ALL RBs | - | 12 | Mid/CC2 | N/A | ALL RBs | - | 2 | CC2 | Max | ALL RBs | - | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **8** | 12 | High/ CC1 | 20@5 | ALL RBs | - | 12 | High/CC2 | N/A | ALL RBs | - | 2 | CC2 | Max | ALL RBs | - | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **9** | 12 | High/ CC1 | 20@30 | ALL RBs | - | 12 | High/CC2 | N/A | ALL RBs | - | 2 | CC2 | Max | ALL RBs | - | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |

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| **1** | 2 | Low/CC1 | 100@0 | ALL RBs | - | 2 | Low/CC2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **2** | 2 | Low/CC1 | 25@0 | ALL RBs | - | 2 | Low/CC2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **3** | 2 | High/CC1 | 100@0 | ALL RBs | - | 2 | High/CC2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **4** | 2 | High/CC1 | 25@0 | ALL RBs | - | 2 | High/CC2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **5** | 66 | CC1 | 100@0 | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | 2 | Mid/CC1 | N/A | ALL RBs | - | 2 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **6** | 66 | CC1 | 100@0 | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | 2 | Mid/CC1 | N/A | ALL RBs | - | 2 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_66A-66A-70C Configuration** | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | REFSENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | 70 | CC1 | N/A | ALL RBs | - | 70 | CC2 | N/A | ALL |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 75 | | N/A | QPSK | | 50 |
| **2** | 66 | CC1 | REFSENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | 70 | CC1 | N/A | ALL RBs | - | 70 | CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 75 | | N/A | QPSK | | 50 |
| **3** | 70 | CC1 | REFSENS | ALL RBs | | 70 | CC2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for CA_66C-70C Configurations** | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | Mid/CC1 | REFSENS | ALL RBs | - | 66 | Mid/CC2 | N/A | ALL RBs | - | 70 | Mid/CC1 | N/A | ALL RBs | - | 70 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 75 | | N/A | QPSK | | 50 |
| **2** | 66 | High/CC1 | REFSENS | ALL RBs | - | 66 | High/CC2 | N/A | ALL RBs | - | 70 | Mid/CC1 | N/A | ALL RBs | - | 70 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 75 | | N/A | QPSK | | 50 |
| **3** | 70 | Mid/CC1 | REFSENS | ALL RBs | - | 70 | Mid/CC2 | N/A | ALL RBs | - | 66 | High/CC1 | REFSENS | ALL RBs | - | 66 | High/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |

| Default Test Settings for CA_XA-XA-YA-YA Configurations (Intra-band non-contiguous + Intra-band non-contiguous) | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | Max | Y | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | | QPSK | QPSK | | Highest $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **2** | Y | CC2 | REFSENS | ALL RBs | Max | Y | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | | QPSK | QPSK | | Highest $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Test Settings for CA_2A-2A-4A-4A Configurations** | | | | | | | | | | | | | | | | | | |
| **1**[14] | 2 | CC2 | 16@57 | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **2**[15] | 2 | CC4 | 16@39 | ALL RBs | Max | 2 | CC3 | N/A | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **3** | 2 | CC2 | 16@57 | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs | - | 4 | CC2 | N/A | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **4** | 4 | CC2 | 100@0 | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs | - | 2 | CC2 | N/A | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **5** | 4 | CC2 | 100@0 | ALL RBs | Max | 4 | CC1 | N/A | ALL RBs | - | 2 | CC2 | N/A | ALL RBs | Max | 2 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for CA_3A-3A-7A-7A Configurations** | | | | | | | | | | | | | | | | | | |
| **1** | 3 | CC2 | 16@50 | ALL RBs | 50 | 3 | CC1 | N/A | ALL RBs | - | 7 | CC2 | N/A | ALL RBs | 40 | 7 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **2** | 3 | CC2 | 32@68 | ALL RBs | 15 | 3 | CC1 | N/A | ALL RBs | - | 7 | CC2 | N/A | ALL RBs | 40 | 7 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **3**[13] | 3 | CC2 | 16@50 | ALL RBs | 35 | 3 | CC1 | N/A | ALL RBs | - | 7 | CC2 | N/A | ALL RBs | 40 | 7 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **4**[11] | 3 | CC2 | 16@50 | ALL RBs | 45 | 3 | CC1 | N/A | ALL RBs | - | 7 | CC2 | N/A | ALL RBs | 40 | 7 | CC1 | N/A | ALL RBs |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **5**[11] | 3 | CC2 | 32@68 | ALL RBs | 10 | 3 | CC1 | N/A | ALL RBs | - | 7 | CC2 | N/A | ALL RBs | 40 | 7 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **6** | 7 | CC2 | 32@68 | ALL RBs | 45 | 7 | CC1 | N/A | ALL RBs | - | 3 | CC2 | N/A | ALL RBs | 10 | 3 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **7** | 7 | CC2 | 45@55 | ALL RBs | 25 | 7 | CC1 | N/A | ALL RBs | - | 3 | CC2 | N/A | ALL RBs | 10 | 3 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **8**[11] | 7 | CC2 | 32@68 | ALL RBs | 40 | 7 | CC1 | N/A | ALL RBs | - | 3 | CC2 | N/A | ALL RBs | 10 | 3 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **9**[11] | 7 | CC2 | 45@55 | ALL RBs | 20 | 7 | CC1 | N/A | ALL RBs | - | 3 | CC2 | N/A | ALL RBs | 10 | 3 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **10**[13] | 7 | CC2 | 32@68 | ALL RBs | 30 | 7 | CC1 | N/A | ALL RBs | - | 3 | CC2 | N/A | ALL RBs | 35 | 3 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **11**[13] | 7 | CC2 | 45@55 | ALL RBs | 15 | 7 | CC1 | N/A | ALL RBs | - | 3 | CC2 | N/A | ALL RBs | 35 | 3 | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band non-contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: **Intra-band non-contiguous + Intra-band contiguous:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 4: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band non-contiguous + Inter-band:** X, Y, Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-12A,X=2,Y=4,Z=12.
Note 6: **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A-41A,X=41.
Note 7: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-4A,X=2,Y=4.
Note 8: REFSENS refers to the PCC bands and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.
Note 10: Applicable if only Bandwidth Combination Set 0 is supported by the UE for the CA Configuration. (This note is not applicable for any existing test point and only reserved for future use)
Note 11: Not applicable if only Bandwidth Combination Set 0 is supported by the UE for the CA Configuration.
Note 12: Applicable if only Bandwidth Combination Set 1 is supported by the UE for the CA Configuration. (This note is not applicable for any existing test point and only reserved for future use)

Note 13: Not applicable if only Bandwidth Combination Set 1 is supported by the UE for the CA Configuration.
Note 14: Not applicable if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
Note 15: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
Note 16: Band 2: $f_{UL}$ = 1868.3MHz ($N_{UL}$ = 18783), $f_{DL}$ = 1948.3MHz ($N_{DL}$ = 783).
Band 4: $f_{UL}$ = 1735MHz ($N_{UL}$ = 20200), $f_{DL}$ = 2135MHz ($N_{DL}$ = 2200).
Note 17: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.55 if the UE supports 2 Rx antennas or Figure A.80 if the UE supports 4 Rx antennas in at least one band within the CA configuration..
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 7.3A.9.4.1-1 through Table7.3A.9.4.1-6 as appropriate.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.3A.9.4.3.

### 7.3A.9.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.3A.9.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.3A.9.4.1-1 through Table7.3A.9.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.3A.9.4.1-1 through Table7.3A.9.4.1-2 as appropriate on PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
6. Set the Downlink signal level for PCC and SCCs to the appropriate REFSENS value defined in Table 7.3A.9.5-1 through Table7.3A.9.5-7. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the Throughput measurement.
7. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.3A.9.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

## 7.3A.9.5 Test requirement

For intra-band contiguous carrier aggregation the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.9.5-1. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.9.5-1: Reference sensitivity QPSK $P_{REFSENS}$ for Intra-band contiguous**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **EUTRA band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex mode** |
| CA_40E | 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| | | - | - | -102[4] | -99[4] | -97.2[4] | -96[4] | |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
NOTE 3: The signal power is specified per port.
NOTE 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.

**Table 7.3A.9.5-2: FFS**

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.9.5-3 (originated from single carrier Tables 7.3.5-1). The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.9.5-3: Reference sensitivity QPSK $P_{REFSENS}$ for inter-band**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **EUTRA band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex mode** |
| CA_1A-3A-7A-8A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[4] | -99.0[4] | -97.2[4] | -96.0[4] | |
| | 3 | - | - | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | - | - | -99.0[4] | -96.0[4] | -94.2[4] | -93.0[4] | |
| | 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | |
| | | - | - | -100.0[4] | -97.0[4] | -97.2[4] | -93.0[4] | |
| | 7[11,12] | - | - | -87.3 | -86.7 | -86.3 | -86.0 | |
| | | - | - | -90.0[4] | -89.4[4] | -89.0[4] | -88.7[4] | |
| | 8 | - | - | -96.3 | -93.3 | - | - | |
| | 8[11,12] | - | - | -96.1 | -93.1 | - | - | |
| CA_1A-3A-8A-40A | 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | - | - | -102.0[4] | -99.0[4] | -97.2[4] | -96.0[4] | |
| | 1[13] | - | - | -91.0 | [-88.8] | [-87.2] | [-86.2] | |
| | 3[8] | | | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 3[9] | - | - | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | - | - | -99.0[4] | -96.0[4] | -94.2[4] | -93.0[4] | |
| | 3[13] | - | - | -93.5 | -90.5 | -88.8 | -87.6 | |
| | 8 | - | -98.5 | -96.3 | -93.3 | - | - | |
| | 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| | | - | - | -102.0[4] | -99.0[4] | -97.2[4] | -96.0[4] | |
| | 40[14] | - | - | -94.7 | -92.2 | -90.6 | -89.5 | |
| | 40[15] | - | - | [-92.7] | -91.2 | -89.7 | -88.7 | |
| | | - | - | [-95.4][4] | -93.9[4] | -92.4[4] | -91.4[4] | |
| CA_1A-3A-19A-42A[5,6] | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[4] | -99.0[4] | -97.2[4] | -96.0[4] | |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[4] | -96.0[4] | -94.2[4] | -93.0[4] | |
| | 19 | | | -99.3 | -96.3 | -94.5 | | |
| | 42 | | | -71.2 | -71.2 | -71.2 | -71.2 | TDD |
| CA_1A-3A-19A-42A[7] | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[4] | -99.0[4] | -97.2[4] | -96.0[4] | |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[4] | -96.0[4] | -94.2[4] | -93.0[4] | |
| | 19 | | | -99.3 | -96.3 | -94.5 | | |
| | 42 | | | -96.6 | -94.2 | -92.7 | -92.0 | TDD |
| CA_1A-3A-19A-42A | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[4] | -99.0[4] | -97.2[4] | -96.0[4] | |
| | 3[8] | | | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 3[9] | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[4] | -96.0[4] | -94.2[4] | -93.0[4] | |
| | 19 | | | -99.3 | -96.3 | -94.5 | | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | | | -100.2[4] | -97.2[4] | -95.4[4] | -94.2[4] | |
| CA_1A-3A-21A-42A[6] | 1 | - | - | -99.1 | -96.1 | -94.3 | -93.1 | FDD |
| | | - | - | -101.8[4] | -98.8[4] | -97.0[4] | -95.8[4] | |
| | 3 | - | - | -96.0 | -93.0 | -91.2 | -90.0 | |
| | | - | - | -98.7[4] | -95.7[4] | -93.9[4] | -92.7[4] | |
| | 21 | - | - | -98.8 | -95.8 | -94.0 | - | |
| | 42 | - | - | -70.7 | -70.7 | -70.7 | -70.7 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_1A-3A-21A-42A[7] | 1 | - | - | -99.1 | -96.1 | -94.3 | -93.1 | FDD |
| | | - | - | -101.8[4] | -98.8[4] | -97.0[4] | -95.8[4] | |
| | 3 | - | - | -96.0 | -93.0 | -91.2 | -90.0 | |
| | | - | - | -98.7[4] | -95.7[4] | -93.9[4] | -92.7[4] | |
| | 21 | - | - | -98.8 | -95.8 | -94.0 | - | |
| | 42 | - | - | -96.1 | -93.7 | -92.2 | -91.5 | TDD |
| CA_1A-3A-21A-42A[8] | 1 | - | - | -99.1 | -96.1 | -94.3 | -93.1 | FDD |
| | | - | - | -101.8[4] | -98.8[4] | -97.0[4] | -95.8[4] | |
| | 3 | - | - | -93.0 | -90.5 | -89.0 | -88.0 | |
| | 21 | - | - | -98.8 | -95.8 | -94.0 | - | |
| | 42 | - | - | -97.5 | -94.5 | -92.7 | -91.5 | TDD |
| | | - | - | -99.7[4] | -96.7[4] | -94.9[4] | -93.7[4] | |
| CA_1A-3A-21A-42A[9] | 1 | - | - | -99.1 | -96.1 | -94.3 | -93.1 | FDD |
| | | - | - | -101.8[4] | -98.8[4] | -97.0[4] | -95.8[4] | |
| | 3 | - | - | -96.0 | -93.0 | -91.2 | -90.0 | |
| | | - | - | -98.7[4] | -95.7[4] | -93.9[4] | -92.7[4] | |
| | 21 | - | - | -98.8 | -95.8 | -94.0 | - | |
| | 42 | - | - | -97.5 | -94.5 | -92.7 | -91.5 | TDD |
| | | - | - | -99.7[4] | -96.7[4] | -94.9[4] | -93.7[4] | |
| CA_1A-19A-21A-42A | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[4] | -99.0[4] | -97.2[4] | -96.0[4] | |
| | 19 | | | -99.3 | -96.3 | -94.5 | | |
| | 21 | | | -99.3 | -96.3 | -94.5 | | |
| | | | | -102.0[4] | -99.0[4] | -97.2[4] | | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | | | -100.2[4] | -97.2[4] | -95.4[4] | -94.2[4] | |
| CA_2A-4A-5A-12A[11,12] | 2 | | | -97.0 | -94.0 | -92.2 | -91.0 | FDD |
| | | | | -99.7[4] | -96.7[4] | -94.9[4] | -93.7[4] | |
| | 4 | | | -89.3 | -88.8 | -88.3 | -87.5 | |
| | | | | -92[4] | -91.5[4] | -91[4] | -90.2[4] | |
| | 5 | | | -96.8 | -93.8 | | | |
| | 12 | | | -95.8 | -92.8 | | | |
| CA_2A-4A-5A-29A | 2 | | | -97.0 | -94.0 | -92.2 | -91.0 | FDD |
| | | | | -99.7[4] | -96.7[4] | -94.9[4] | -93.7[4] | |
| | 4 | | | -99.0 | -96.0 | -94.2 | -93.0 | |
| | | | | -101.7[4] | -98.7[4] | -96.9[4] | -95.7[4] | |
| | 5 | | | -97.3 | -94.3 | | | |
| | 29 | | | -96.3 | -93.3 | | | |
| CA_2A-4A-5A-30A | 2 | | | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | | | -100.0[4] | -97.0[4] | -95.2[4] | -94.0[4] | |
| | 4 | | | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | | | -102[4] | -99[4] | -97.2[4] | -96[4] | |
| | 5 | | | -97.3 | -94.3 | | | |
| | 30 | | | -98.3 | -95.3 | | | |
| CA_2A-4A-12A-30A[10] | 2 | | | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | | | -100.0[4] | -97.0[4] | -95.2[4] | -94.0[4] | |
| | 2[10] | | | -96.9 | -93.9 | -92.1 | -90.9 | |
| | | | | -99.6[4] | -96.6[4] | -94.8[4] | -93.6[4] | |
| | 4 | | | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | | | -102[4] | -99[4] | -97.2[4] | -96[4] | |
| | 4[10] | | | -89.3 | -88.8 | -88.3 | -87.8 | |
| | | | | -92[4,10] | -91.5[4,10] | -91[4,10] | -90.5[4] | |
| | 12 | | | -96.3 | -93.3 | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 12[10] | | | -95.8 | -92.8 | | | |
| | 30 | | | -98.3 | -95.3 | | | |
| | 30[10] | | | -97.8 | -94.8 | | | |
| CA_2A-4A-29A-30A | 2 | | | -96.9 | -93.9 | -92.1 | -90.9 | FDD |
| | | | | -99.6[4] | -96.6[4] | -94.8[4] | -93.6[4] | |
| | 4 | | | -98.9 | -95.9 | -94.1 | -92.9 | |
| | | | | -101.6[4] | -98.6[4] | -96.8[4] | -95.6[4] | |
| | 29 | | | -96.3 | -93.3 | | | |
| | 30 | | | -97.8 | -94.8 | | | |
| CA_2A-5A-30A-66A | 2 | | | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | | | -100.0[4] | -97.0[4] | -95.2[4] | -94.0[4] | |
| | 5 | | | -97.3 | -94.3 | | | |
| | 30 | | | -98.3 | -95.3 | | | |
| | 66 | | | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | - | - | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| CA_2A-12A-30A-66A | 2 | | | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | | | -100.0[4] | -97.0[4] | -95.2[4] | -94.0[4] | |
| | 12 | | | -96.3 | -93.3 | | | |
| | 30 | | | -98.3 | -95.3 | | | |
| | 66 | | | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | - | - | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| CA_2A-14A-30A-66A | 2 | | | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | | | -100.0[4] | -97.0[4] | -95.2[4] | -94.0[4] | |
| | 14 | | | -96.3 | -93.3 | | | |
| | 30 | | | -98.3 | -95.3 | | | |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | - | - | -101.5[20] | -98.5[20] | -96.7[20] | -95.5[20] | |
| CA_3A-7A-20A-32A | 3 | | | -98.3 | -95.3 | -93.5 | -92.3 | FDD |
| | | | | -101.0[4] | -98.0[4] | -96.2[4] | -95.0[4] | |
| | 7 | | | -99.3 | -96.3 | -94.2 | -93.3 | |
| | | | | -102.0[4] | -99.0[4] | -96.9[4] | -96.0[4] | |
| | 20 | | | -98.3 | -95.3 | -92.5 | -91.3 | |
| | 32 | | | -99.5 | -96.5 | -94.7 | -93.5 | |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
NOTE 3: The signal power is specified per port.
NOTE 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
NOTE 5: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range $\Delta F_{HD}$ above and below the edge of this downlink transmission bandwidth. The value $\Delta F_{HD}$ depends on the E-UTRA configuration: $\Delta F_{HD}$ = 10 MHz for CA_3A-42A, CA_3A-42C, CA_1A-3A-42A, CA_1A-3A-42C, CA_3A-19A-42A, CA_3A-19A-42C, CA_1A-3A-19A-42A and CA_1A-3A-19A-42C.
NOTE 6: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.2 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB}/2 < f_{UL}^{LB} < F_{UL_high}^{LB} - BW_{Channel}^{LB}/2$ with $f_{DL}^{HB}$ carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.
NOTE 7: The requirements are only applicable to channel bandwidths with a carrier frequency at $\pm\left(20 + BW_{Channel}^{HB}/2\right)$ MHz offset from $2 f_{UL}^{LB}$ in the victim (higher band) with $F_{UL_low}^{LB} + BW_{Channel}^{LB}/2 < f_{UL}^{LB} < F_{UL_high}^{LB} - BW_{Channel}^{LB}/2$, where $BW_{Channel}^{LB}$ and $BW_{Channel}^{HB}$ are the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.
NOTE 8: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless

of channel bandwidth in Band 1.
NOTE 9: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 10: Reference sensitivity for the high band for which the 3rd harmonic of the low band is within transmission bandwidth, as specified Note 5 and 6 in Table 7.3A.0-0a.
NOTE 11: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of a high band.
NOTE 12: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.3 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{HB}$ the carrier frequency of a high band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the low band.
NOTE 13: These requirements apply when the uplink is active in Band 40.
NOTE 14: These requirements apply when the uplink is active in Band 3.
NOTE 15: These requirements apply when the uplink is active in Band 1.

For the UE which supports inter-band carrier aggregation configurations the $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C shall be applied for applicable bands.

Unless otherwise specified, in case the UE supports more than one of the above 4DL inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one 4DL inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz and the tolerances are the same, the value applies to the band. If the tolerances are different, the applicable additional 4DL tolerance is FFS. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 4DL carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional 4DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 4DL CA configurations

The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.

The reference receive sensitivity (REFSENS) requirement for inter-band specified in Table 7.3A.9.5-3 shall be met for an uplink CA configurations than or equal to that specified in Table 7.3.5-2.

NOTE: Table 7.3A.9.5-4 does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors.

**Table 7.3A.9.5-4: Void**

For combinations of intra-band contiguous and inter-band carrier aggregation with three downlink carriers and one uplink carrier assigned to one E-UTRA band the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.9.5-5. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.9.5-5: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band contiguous + inter-band**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **EUTRA band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex mode** |
| CA_1A-3A-42C[5] | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[4] | -99.0[4] | -97.5[4] | -96.0[4] | |
| | 3 | | | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | | | -100.2[4] | -97.2[4] | -95.4[4] | -94.2[4] | |
| CA_1A-3A-42C[6] | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[4] | -99.0[4] | -97.5[4] | -96.0[4] | |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[4] | -96.0[4] | -94.2[4] | -93.0[4] | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | | | -100.2[4] | -97.2[4] | -95.4[4] | -94.2[4] | |
| CA_1A-3A-42C[7,8] | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[4] | -99.0[4] | -97.5[4] | -96.0[4] | |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[4] | -96.0[4] | -94.2[4] | -93.0[4] | |
| | 42 | | | -71.2 | -71.2 | -71.2 | -71.2 | TDD |
| CA_1A-3A-42C[9] | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[4] | -99.0[4] | -97.5[4] | -96.0[4] | |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | | | | -99.0[4] | -96.0[4] | -94.2[4] | -93.0[4] | |
| | 42 | | | -96.6 | -94.2 | -92.7 | -92.0 | TDD |
| CA_1A-3C-8A[5] | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | 3 | | | -93.3 | -90.8 | -89.3 | -88.3 | |
| | 8 | | -98.5 | -96.3 | -93.3 | | | |
| CA_1A-3C-8A[6] | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | |
| | 8 | | -98.5 | -96.3 | -93.3 | | | |
| CA_1A-19A-42C | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[4] | -99.0[4] | -97.5[4] | -96.0[4] | |
| | 19 | | | -99.3 | -96.3 | -94.5 | | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | | | -100.2[4] | -97.2[4] | -95.4[4] | -94.2[4] | |
| CA_1A-21A-42C | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[4] | -99.0[4] | -97.5[4] | -96.0[4] | |
| | 21 | | | -99.3 | -96.3 | -94.5 | | |
| | | | | -102.0[4] | -99.0[4] | -97.5[4] | | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | | | -100.2[4] | -97.2[4] | -95.4[4] | -94.2[4] | |
| CA_1A-41A-42C | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102[4] | -99[4] | -97.2[4] | -96[4] | |
| | 41 | | | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| | | | | -100[4] | -97[4] | -95.2[4] | -94[4] | |
| | 42 | | | -97.5 | -94.5 | -92.7 | -91.5 | |
| | | | | -99.7[4] | -96.7[4] | -94.9[4] | -93.7[4] | |
| CA_1A-41C-42A | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102[4] | -99[4] | -97.2[4] | -96[4] | |
| | 41 | | | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| | | | | -100[4] | -97[4] | -95.2[4] | -94[4] | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 42 | | | -97.5 | -94.5 | -92.7 | -91.5 | |
| | | | | -99.7[4] | -96.7[4] | -94.9[4] | -93.7[4] | |
| CA_1A-42D | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[4] | -99.0[4] | -97.2[4] | -96.0[4] | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | | | -100.2[4] | -97.2[4] | -95.4[4] | -94.2[4] | |
| CA_2A-5A-12B | 2 | | | | -94.3 | -92.5 | -91.3 | FDD |
| | | | | | -97.0[4] | -95.5[4] | -94.0[4] | |
| | 5 | | | -97.3 | -94.3 | | | |
| | 12 | | | -96.3 | -93.3 | | | |
| CA_2A-5B-30A | 2 | | | | -94.3 | -92.5 | -91.3 | FDD |
| | | | | | -97.0[4] | -95.5[4] | -94.0[4] | |
| | 5 | | | -97.3 | -94.3 | | | |
| | 30 | | | -97.8 | -94.8 | | | |
| CA_2A-5B-66A | 2 | | | | -94.3 | -92.5 | -91.3 | FDD |
| | | | | | -97.0[4] | -95.5[4] | -94.0[4] | |
| | 5 | | | -97.3 | -94.3 | | | |
| | 66 | | | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| CA_2C-12A-30A | 2 | | | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | | | -100.0[4] | -97.0[4] | -95.5[4] | -94.0[4] | |
| | 12 | | | -96.3 | -93.3 | | | |
| | 30 | | | -98.3 | -95.3 | | | |
| CA_2C-29A-30A | 2 | | | -96.9 | -93.9 | -92.1 | -90.9 | FDD |
| | | | | -99.6[4] | -96.6[4] | -94.8[4] | -93.6[4] | |
| | 29 | | | -96.3 | -93.3 | | | |
| | 30 | | | -97.8 | -94.8 | | | |
| CA_2A-66C-71A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[4] | -97.0[4] | -95.5[4] | -94.0[4] | |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 71 | - | - | -96.5 | -93.5 | -91.3 | -86.8 | |
| CA_2A-66C-71A[X1,X2] | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[4] | -97.0[4] | -95.5[4] | -94.0[4] | |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 71 | - | - | -69.7 | -69.7 | -69.7 | -69.7 | |
| CA_2A-66C-71A[X3] | 2 | - | - | -92.4 | -93.0 | -91.5 | -90.4 | FDD |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 71 | - | - | -96.5 | - | - | - | |
| CA_2A-66C-71A[X4] | 2 | - | - | -95.8 | -93.0 | -91.5 | -90.4 | FDD |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 71 | - | - | - | -93.5 | -91.3 | -86.8 | |
| CA_3A-19A-42C[7,8] | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | | | -99.0[4] | -96.0[4] | -94.2[4] | -93.0[4] | |
| | 19 | | | -99.3 | -96.3 | -94.5 | | |
| | 42 | | | -71.2 | -71.2 | -71.2 | -71.2 | TDD |
| CA_3A-19A-42C[9] | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | | | [-99][4] | [-96][4] | [-94.2][4] | [-93][4] | |
| | 19 | | | -99.5 | -96.5 | -94.7 | | |
| | 42 | | | -96.6 | -94.2 | -92.7 | -92.0 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA_3A-21A-42C | 3 | | | -96.0 | -93.0 | -91.2 | -90.0 | FDD |
| | | | | -98.7[4] | -95.7[4] | -93.9[4] | -92.7[4] | |
| | 21 | | | -98.8 | -95.8 | -94.0 | - | |
| | 42 | | | -70.7 | -70.7 | -70.7 | -70.7 | TDD |
| CA_3A-21A-42C | 3 | | | -96.0 | -93.0 | -91.2 | -90.0 | FDD |
| | | | | -98.7[4] | -95.7[4] | -93.9[4] | -92.7[4] | |
| | 21 | | | -98.8 | -95.8 | -94.0 | - | |
| | 42 | | | -96.1 | -93.7 | -92.2 | -91.5 | TDD |
| CA_3A-42D | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | | | -99.0[4] | -96.0[4] | -94.2[4] | -93.0[4] | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | | | -100.2[4] | -97.2[4] | -95.4[4] | -94.2[4] | |
| CA_5B-30A-66A | 5 | | | -97.3 | -94.3 | | | FDD |
| | 30 | | | -97.8 | -94.8 | | | |
| | 66 | | | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| CA_19A-21A-42C | 19 | | | -99.3 | -96.3 | -94.5 | | FDD |
| | 21 | | | -99.3 | -96.3 | -94.5 | | |
| | | | | -102.0[4] | -99.0[4] | -97.5[4] | | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | | | -100.2[4] | -97.2[4] | -95.4[4] | -94.2[4] | |
| CA_29A-66A-70C | 29 | | | -96.3 | -93.3 | | | FDD |
| | 66 | | | -98.8 | -95.8 | -94 | -92.8 | |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 70 | | | -99.3 | -96.3 | -94.5 | -93.3 | |
| CA_29A-66C-70A | 29 | | | -96.3 | -93.3 | | | FDD |
| | 66 | | | -98.8 | -95.8 | -94 | -92.8 | |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 70 | | | -99.3 | -96.3 | -94.5 | | |
| CA_39A-41D | 39 | | | | -96.3 | -94.5 | -93.3 | TDD |
| | | | | | -99.0[4] | -97.2[4] | -96.0[4] | |
| | 41 | | | | | | -91.3 | |
| | | | | | | | -94.0[4] | |
| CA_39C-41C | 39 | | | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| | | | | -102.0[4] | -99.0[4] | -97.2[4] | -96.0[4] | |
| | 41 | | | | | | -91.3 | |
| | | | | | | | -94.0[4] | |
| CA_41C-42C | 41 | | | | -94.3 | -92.5 | -91.3 | TDD |
| | | | | | -97.0[4] | -95.2[4] | -94.0[4] | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | |
| | | | | -100.2[4] | -97.2[4] | -95.4[4] | -94.2[4] | |
| CA_66A-70C-71A | 66 | | | -98.8 | -95.8 | -94 | -92.8 | FDD |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 70 | | | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | | | -89.3[8,9] | -88.8[8,9] | -88.5[8,9] | -88.3[8,9] | |
| | 71 | | | -96.5 | -93.5 | -91.2 | -86.8 | |
| CA_66C-70A-71A | 66 | | | -98.8 | -95.8 | -94 | -92.8 | FDD |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 70 | | | -99.3 | -96.3 | -94.5 | - | |
| | | | | -89.3[8,9] | -88.8[8,9] | -88.5[8,9] | - | |
| | 71 | | | -96.5 | -93.5 | -91.2 | -86.8 | |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1

NOTE 3: The signal power is specified per port.
NOTE 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in Band 3 and Band 5 or Band 8 or Band 19 or Band 20 or Band 26 or Band 28 or Band 42, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 6: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in Band 3 and Band 5 or Band 8 or Band 19 or Band 20 or Band 26 or Band 28 or Band 42, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 7: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range $\Delta F_{HD}$ above and below the edge of this downlink transmission bandwidth. The value $\Delta F_{HD}$ depends on the E-UTRA configuration: $\Delta F_{HD}$ = 10 MHz for CA_3A-42C, CA_1A-3A-42C and CA_3A-19A-42C.
NOTE 8: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.2 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB}/2 < f_{UL}^{LB} < F_{UL_high}^{LB} - BW_{Channel}^{LB}/2$ with $f_{DL}^{HB}$ carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.
NOTE 9: The requirements are only applicable to channel bandwidths with a carrier frequency at $\pm(20 + BW_{Channel}^{HB}/2)$ MHz offset from $2 f_{UL}^{LB}$ in the victim (higher band) with $F_{UL_low}^{LB} + BW_{Channel}^{LB}/2 < f_{UL}^{LB} < F_{UL_high}^{LB} - BW_{Channel}^{LB}/2$, where $BW_{Channel}^{LB}$ and $BW_{Channel}^{HB}$ are the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.
NOTE 10: These requirements apply when there is at least one individual RE within the downlink transmission bandwidth of the victim (lower) band for which the 3rd harmonic is within the uplink transmission bandwidth or the uplink adjacent channel's transmission bandwidth of an aggressor (higher) band.
NOTE 11: The requirements should be verified for UL EARFCN of the aggressor (higher) band (superscript HB) such that $f_{DL}^{LB} = \lfloor f_{UL}^{HB} / 0.3 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{LB}$ the carrier frequency in the victim (lower) band and $BW_{Channel}^{HB}$ the channel bandwidth configured in the higher band.
NOTE 12: These requirements apply when the lower edge frequency of the 5 MHz uplink channel in Band 71 is located at or below 668 MHz and the downlink channel in Band 2 is located with its upper edge at 1990 MHz.
NOTE 13: These requirements apply when the lower edge frequency of the 10 MHz, 15 MHz, or 20 MHz uplink channel in Band 71 is located at or below 668 MHz and the downlink channel in Band 2 is located with its upper edge at 1990 MHz.

For combinations of intra-band non-contiguous and inter-band carrier aggregation with three downlink carriers and one uplink carrier assigned to one E-UTRA band the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.9.5-6. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.9.5-6: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band non-contiguous + inter-band**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **EUTRA band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex mode** |
| CA_2A-2A-12B | 2 | | | -92.0 | -89.7 | -87.9 | -86.7 | FDD |
| | | | | -94.7[4] | -92.4[4] | -90.9[4] | -89.4[4] | |
| | 12 | | | -96.3 | -93.3 | | | |
| CA_2A-2A-4A-5A | 2 | | | -92.0 | -89.7 | -87.9 | -86.7 | FDD |
| | | | | -94.7[4] | -92.4[4] | -90.9[4] | -89.4[4] | |
| | 4 | | | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | | | -102[4] | -99[4] | -97.2[4] | -96[4] | |
| | 5 | | | -97.3 | -94.3 | | | |
| CA_2A-2A-5A-12A | 2 | | | -92.0 | -89.7 | -87.9 | -86.7 | FDD |
| | | | | -94.7[4] | -92.4[4] | -90.9[4] | -89.4[4] | |
| | 5 | | | -97.3 | -94.3 | | | |
| | 12 | | | -96.3 | -93.3 | | | |
| CA_2A-2A-5A-30A | 2 | | | -92.0 | -89.7 | -87.9 | -86.7 | FDD |
| | | | | -94.7[4] | -92.4[4] | -90.9[4] | -89.4[4] | |
| | 5 | | | -97.3 | -94.3 | | | |
| | 30 | | | -98.3 | -95.3 | | | |
| CA_2A-2A-12A-30A | 2 | | | -92.0 | -89.7 | -87.9 | -86.7 | FDD |
| | | | | -94.7[4] | -92.4[4] | -90.9[4] | -89.4[4] | |
| | 12 | | | -96.3 | -93.3 | | | |
| | 30 | | | -98.3 | -95.3 | | | |
| CA_2A-4A-7A-7A | 2 | | | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | 4 | | | -99.3 | -96.3 | -94.2 | -93.3 | |
| | | | | -102[4] | -99[4] | -96.9[4] | -96[4] | |
| | 7 | | | -97.3 | -94.3 | -92.5 | -91.3 | |
| CA_2A-4A-7A-7A (Note 8) | 2 | - | - | - | - | - | -86.3 | FDD |
| | 2 | - | - | - | - | - | -83.6[20] | |
| | 4 | - | - | -99.3 | - | - | - | |
| | | | | -102[4] | | | | |
| | 7 | - | - | - | - | - | -91.3 | |
| | 2 | - | - | -97.3 | - | - | - | FDD |
| | 4 | - | - | -94.3 | - | - | - | |
| | | | | -97[4] | | | | |
| | 7 | - | - | - | - | - | -91.3 | |
| CA_2A-12A-66A-66A[6,7] | 2 | | | -97.7 | -94.7 | -92.9 | -91.7 | FDD |
| | 12 | | | -96.5 | -93.5 | | | |
| | 66 | | | -89.5 | -89.0 | -88.5 | -88.0 | |
| | | | | -92.2[4] | -91.7[4] | -91.2[4] | -90.7[4] | |
| CA_4A-4A-12A-30A[6,7] | 4 | | | -90 | -89.5 | -89 | -88.5 | FDD |
| | | | | -92.7[4] | -92.2[4] | -91.7[4] | -91.2[4] | |
| | 12 | | | -96.5 | -93.5 | | | |
| | 30 | | | -98.5 | -95.5 | | | |
| CA_4A-4A-29A-30A | 4 | | | -99.6 | -96.6 | -94.8 | -93.6 | FDD |
| | | | | -102.3[4] | -99.3[4] | -97.5[4] | -96.3[4] | |
| | 29 | | | -97 | -94 | | | |
| | 30 | | | -98.5 | -95.5 | | | |
| CA_14A-30A-66A-66A | 14 | | | -96.3 | -93.3 | | | FDD |
| | 30 | | | -98.3 | -95.3 | | | |
| | 66 | - | - | -98.8 | -95.8 | -94.0 | -92.8 | |
| | | - | - | -101.5[20] | -98.5[20] | -96.7[20] | -95.5[20] | |
| CA_29A-66A-66A-70A | 29 | | | -96.3 | -93.3 | | | FDD |
| | 66 | | | -98.8 | -95.8 | -94 | -92.8 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 70 | | | -99.3 | -96.3 | -94.5 | | |
| CA_66A-66A-70A-71A | 66 | | | -98.8 | -95.8 | -94 | -92.8 | FDD |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 70 | | | -99.3 | -96.3 | -94.5 | - | |
| | | | | -89.3[6,7] | -88.8[6,7] | -88.5[6,7] | - | |
| | 71 | | | -96.5 | -93.5 | -91.2 | -86.8 | |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: The signal power is specified per port
NOTE 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
NOTE 5: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity is only verified when this is not the case (the requirements specified in clause 7.3.1 apply).
NOTE 6: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of a high band.
NOTE 7: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.3 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with $f_{DL}^{HB}$ the carrier frequency of a high band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the low band.
NOTE 8: These requirements apply when UL CA is configured and the uplink is active in Band 2 and Band 4.

For combinations of intra-band non-contiguous and intra-band contiguous carrier aggregation with three downlink carriers and one uplink carrier assigned to one E-UTRA band the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.9.5-7. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.9.5-7: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band non-contiguous/contiguous + (inter-band) intra-band contiguous**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **EUTRA band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex mode** |
| CA_2C-66A-66A | 2 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| | | - | - | -100.0[4] | -97.0[4] | -95.2[4] | -94.0[4] | |
| | 66 | - | - | -98.8 | -95.8 | -94 | -92.8 | |
| | | - | - | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| CA_66A-66A-70C | 66 | | | -98.8 | -95.8 | -94 | -92.8 | FDD |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 70 | | | -99.3 | -96.3 | -94.5 | -93.3 | |
| CA_66C-70C | 66 | | | -98.8 | -95.8 | -94 | -92.8 | FDD |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 70 | | | -99.3 | -96.3 | -94.5 | -93.3 | |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: The signal power is specified per port
NOTE 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.

For combinations of intra-band non-contiguous and intra-band non-contiguous carrier aggregation with four downlink carriers and one uplink carrier assigned to one E-UTRA band the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with

parameters specified in Table 7.3A.9.5-8. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.9.5-8: Reference sensitivity QPSK $P_{REFSENS}$ for intra-band non-contiguous + intra-band non-contiguous**

| CA Configuration | ID | PCC | | | SCC1 | | | SCC2 | | | SCC3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Band | $N_{RB}$ | Req (dBm) | Band | $N_{RB}$ | Req (dBm) | Band | $N_{RB}$ | Req (dBm) | Band | $N_{RB}$ | Req (dBm) |
| CA_2A-2A-4A-4A | 1 | 2 | 100 | -91.3 | 2 | 25 | -90.1[1] | 4 | 100 | -93.3<br>-96[5] | 4 | 100 | -93.3<br>-96[5] |
| | 2 | 2 | 100 | -94.0 | 2 | 25 | -90.1[1] | 4 | 100 | -93.3<br>-96[5] | 4 | 100 | -93.3<br>-96[5] |
| | 3 | 2 | 100 | -91.3 | 2 | 100 | -86.7[1] | 4 | 100 | -93.3<br>-96[5] | 4 | 100 | -93.3<br>-96[5] |
| | 4 | 4 | 100 | -93.3<br>-96[5] | 4 | 100 | -93.3<br>-96[5] | 2 | 100 | -91.3<br>-94.0[5] | 2 | 100 | -91.3<br>-94.0[5] |
| | 5 | 4 | 100 | -93.3<br>-96[5] | 4 | 25 | -99.3[1]<br>-102[1,5] | 2 | 100 | -91.3<br>-94.0[5] | 2 | 100 | -91.3<br>-94.0[5] |
| CA_3A-3A-7A-7A | 1 | 3 | 100 | -90.3 | 3 | 25 | -89.81 | 7 | 100 | -91.3 | 7 | 50 | -94.3 |
| | 2 | 3 | 100 | -90.3 | 3 | 25 | -96.3 | 7 | 100 | -91.3 | 7 | 50 | -94.3 |
| | 3 | 3 | 100 | -90.3 | 3 | 100 | -86.21 | 7 | 100 | -91.3 | 7 | 50 | -94.3 |
| | 4 | 3 | 100 | -90.3 | 3 | 50 | -88.21 | 7 | 100 | -91.3 | 7 | 50 | -94.3 |
| | 5 | 3 | 100 | -90.3 | 3 | 50 | -93.3 | 7 | 100 | -91.3 | 7 | 50 | -94.3 |
| | 6 | 7 | 100 | -91.3 | 7 | 25 | -97.3 | 3 | 100 | -90.3 | 3 | 50 | -93.3 |
| | 7 | 7 | 100 | -91.3 | 7 | 25 | -97.3 | 3 | 100 | -90.3 | 3 | 50 | -93.3 |
| | 8 | 7 | 100 | -91.3 | 7 | 50 | -94.3 | 3 | 100 | -90.3 | 3 | 50 | -93.3 |
| | 9 | 7 | 100 | -91.3 | 7 | 50 | -94.3 | 3 | 100 | -90.3 | 3 | 50 | -93.3 |
| | 10 | 7 | 100 | -91.3 | 7 | 100 | -91.3 | 3 | 100 | -90.3 | 3 | 100 | -90.3 |
| | 11 | 7 | 100 | -91.3 | 7 | 100 | -91.3 | 2 | 100 | -90.3 | 2 | 100 | -90.3 |

Note 1: Requirements with additional relaxation ($\Delta R_{IBNC}$) as per Table 7.3A.0-3.
Note 2: "ID" refers to IDs in Table 7.3A.9.4.1-6.
Note 3: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 4: The signal power is specified per port.
Note 5: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.

## 7.3A.10 Reference sensitivity level for 5DL CA

Editor's note: Following aspects missing or not yet determined:

- Test configuration table is under investigating
- Test requirement for some CA configuration is TBD
- Test applicability with related information in Table 7.1-2a needs to add to TS36.521-2

### 7.3A.10.1 Test purpose

Same as in clause 7.3A.1.1.

### 7.3A.10.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 5DL with CA configurations in Table 7.1-2c.

### 7.3A.10.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3A.0.

## 7.3A.10.4 Test description

### 7.3A.10.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.3A.10.4.1-1 through table 7.3A.10.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.3A.10.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| Network signalling value | NS_01 by default, exceptions listed in Table 7.3.3-3, dependent on PCC Band |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3,4) | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | UL MOD | DL MOD | UL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for a CA_XF Configuration** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Low/CC1 | REFSENS | ALL RBs | X | Low/CC2 | N/A | ALL RBs | X | Low/CC3 | N/A | ALL RBs | X | Low/CC4 | N/A | ALL RBs | X | Low/CC5 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **2** | X | Low/CC1 | REFSENS | ALL RBs | X | Low/CC2 | N/A | ALL RBs | X | Low/CC3 | N/A | ALL RBs | X | Low/CC4 | N/A | ALL RBs | X | Low/CC5 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **3** | X | High/CC1 | REFSENS | ALL RBs | X | High/CC2 | N/A | ALL RBs | X | High/CC3 | N/A | ALL RBs | X | High/CC4 | N/A | ALL RBs | X | High/CC5 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **4** | X | High/CC1 | REFSENS | ALL RBs | X | High/CC2 | N/A | ALL RBs | X | High/CC3 | N/A | ALL RBs | X | High/CC4 | N/A | ALL RBs | X | High/CC5 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XE-YA, YA-XE Configuration** | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 3 | N/A | ALL RBs | X | Mid/CC 4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 3 | N/A | ALL RBs | X | Mid/CC 4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 3 | N/A | ALL RBs | X | Mid/CC 4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **4** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 3 | N/A | ALL RBs | X | Mid/CC 4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XC-YD and CA_XB-YD Configuration** | | | | | | | | | | | | | | | | | | | |
| **1** | X | Low/CC1 | REFSENS | ALL RBs | X | Low/CC2 | N/A | ALL RBs | Y | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | Y | Mid/CC 3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Low/CC1 | REFSENS | ALL RBs | X | Low/CC2 | N/A | ALL RBs | Y | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | Y | Mid/CC 3 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **3** | X | High/CC1 | REFSENS | ALL RBs | X | High/CC2 | N/A | ALL RBs | Y | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | Y | Mid/CC 3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | X | High/CC1 | REFSENS | ALL RBs | X | High/CC2 | N/A | ALL RBs | Y | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | Y | Mid/CC 3 | N/A | ALL RBs |

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| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **5** | Y | Low/CC1 | REFSENS | ALL RBs | Y | Low/CC2 | N/A | ALL RBs | Y | Low/CC3 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Y | Low/CC1 | REFSENS | ALL RBs | Y | Low/CC2 | N/A | ALL RBs | Y | Low/CC3 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **7** | Y | High/CC1 | REFSENS | ALL RBs | Y | High/CC2 | N/A | ALL RBs | Y | High/CC3 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **8** | Y | High/CC1 | REFSENS | ALL RBs | Y | High/CC2 | N/A | ALL RBs | Y | High/CC3 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA-SA Configuration** | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | R | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPS | QPSK | | Highe | N/A | QPSK | | Highe | N/A | QPSK | | Highe | N/A | QPSK | | Highe | N/A | QPSK | | Highe |

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| | K | | | st $N_{RB}$ | | | | st $N_{RB}$ | | | | st $N_{RB}$ | | | | st $N_{RB}$ | | | st $N_{RB}$ |
| **5** | S | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings for CA_XC-YA-ZA-RA Configuration** | | | | | | | | | | | | | | | | | | | |
| **1** | X | Low/CC1 | REFSENS | ALL RBs | X | Low/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Low/CC1 | REFSENS | ALL RBs | X | Low/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | X | High/CC1 | REFSENS | ALL RBs | X | High/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | X | High/CC1 | REFSENS | ALL RBs | X | High/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **7** | R | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings for CA_XA-ZA-RA-YC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | Y | Low/ CC1 | REFSENS | ALL RBs | Y | Low/CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Low/ CC1 | REFSENS | ALL RBs | Y | Low/CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | High/ CC1 | REFSENS | ALL RBs | Y | High/CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | High/ CC1 | REFSENS | ALL RBs | Y | High/CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **7** | R | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest | N/A | QPSK | | Lowest | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |

| | | | | | | | | $N_{RB_agg}$ | | | | $N_{RB_agg}$ | | | | | | | | |
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| **Test Settings for a CA_1A-3A-19A-42C Configuration** | | | | | | | | | | | | | | | | | | | | |
| **1**[11] | 1 | Mid | 45@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 1 | Mid | 45@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 1 | Low | 25@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 1 | Mid | 45@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 1 | Mid | 45@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 1 | Low | 25@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7**[12] | 1 | Mid | 100@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8** | 1 | Mid | 50@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **9** | 1 | Mid | 75@0 | ALL RBs | 3 | High | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **10** | 1 | Mid | 100@0 | ALL RBs | 3 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **11** | 3 | High | 50@50 | ALL | 1 | Mid | N/A | ALL | 19 | High | N/A | ALL | 42 | Mid/CC | N/A | ALL | 42 | Mid/CC | N/A | ALL |

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| | | | | RBs | | | | RBs | | | | RBs | | 1 | | RBs | | 2 | | RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **12** | 3 | High | 50@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **13** | 3 | High | 50@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **14** | 3 | High | 50@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **15**[13] | 3 | High | 50@50 | ALL RBs | 1 | Low | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **16**[14] | 3 | Low | 50@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Low/CC 1 | N/A | ALL RBs | 42 | Low/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **17**[15] | 3 | High | 50@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **18**[14] | 3 | Low | 50@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Low/CC 1 | N/A | ALL RBs | 42 | Low/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **19**[15] | 3 | High | 50@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **20** | 19 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **21** | 19 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **22** | 19 | Mid | 25@50 | ALL | 1 | Mid | N/A | ALL | 3 | High | N/A | ALL | 42 | Mid/CC | N/A | ALL | 42 | Mid/CC | N/A | ALL |

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| | | | | RBs | | | | RBs | | | | RBs | | 1 | | RBs | | 2 | | RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **23** | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **24** | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | High | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **25** | 42 | Mid/CC 1 | 100@0 | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **26** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **27** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **28** | 42 | Mid/CC 1 | 100@0 | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | High | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **29** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **30** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Test Settings for a CA_1A-19A-21A-42C Configuration** | | | | | | | | | | | | | | | | | | | | |
| **1** | 1 | Mid | 75@0 | ALL RBs | 19 | High | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 1 | Mid | 75@0 | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 1 | Mid | 100@0 | ALL RBs | 19 | High | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 1 | Mid | 100@0 | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 1 | Mid | 50@0 | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 1 | Mid | 75@0 | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | High | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 19 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8** | 19 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **9** | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **10** | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **11** | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **12** | 19 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 21 | High | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **13** | 21 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **14** | 21 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **15** | 21 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **16** | 21 | Mid | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **17** | 21 | High | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **18** | 21 | Mid | 25@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | High | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **19** | 21 | High | 25@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **20** | 42 | Mid/CC 1 | 100@0 | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **21** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **22** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **23** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |
| **24** | 42 | High/CC2 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 19 | Mid | N/A | ALL RBs | 21 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 75 |

| Test Settings for CA_1A-41C-42C Configuration | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 1 | Low | 100@0 | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs | 41 | Mid/CC 2 | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 1 | Mid | 100@0 | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs | 41 | Mid/CC 2 | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 1 | High | 100@0 | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs | 41 | Mid/CC 2 | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 42 | Low/CC1 | 50@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 42 | High/CC1 | 50@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **9** | 42 | Mid/CC 1 | 100@0 | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **10** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 1 | Mid | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Default Test Settings for CA_2A-5B-30A-66A Configuration** | | | | | | | | | | | | | | | | | | | | |
| **1** | 2 | Mid | 100@0 | ALL RBs | 5 | Mid/CC 1 | N/A | ALL RBs | 5 | Mid/CC 2 | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **2** | 5 | Low/CC1 | 50@0 | ALL RBs | 5 | Low/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **3** | 5 | Low/CC1 | 25@0 | ALL RBs | 5 | Low/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **4** | 5 | High/CC1 | 50@**0** | ALL RBs | 5 | High/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **5** | 5 | High/CC1 | 25@**0** | ALL RBs | 5 | High/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **6** | 30 | Mid | 50@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid/CC1 | N/A | ALL RBs | 5 | Mid/CC2 | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 |
| **7** | 66 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid/CC1 | N/A | ALL RBs | 5 | Mid/CC2 | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **Default Test Settings for CA_2A-5B-66A-66A** | | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | Low/CC1 | 100@0 | ALL RBs | 66 | Low/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | 66 | Low/CC1 | 100@0 | ALL RBs | 66 | Low/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | 66 | High/CC1 | 100@0 | ALL RBs | 66 | High/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4** | 66 | High/ CC1 | 100@0 | ALL RBs | 66 | High/C C2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | 2 | Mid | 100@0 | ALL RBs | 66 | Mid/CC 1 | N/A | ALL RBs | 66 | Mid/CC 2 | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | 5 | Mid | 50@0 | ALL RBs | 66 | Mid/CC 1 | N/A | ALL RBs | 66 | Mid/CC 2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **7** | 66 | Mid | 100@0 | ALL RBs | 66 | Mid/CC 1 | N/A | ALL RBs | 66 | Mid/CC 2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs |
| | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Test Settings for CA_3A-41C-42C Configuration** | | | | | | | | | | | | | | | | | | | | |
| **1** | 3 | Mid | 50@50 | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs | 41 | Mid/CC 2 | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2**[16] | 3 | Low | 50@25 | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs | 41 | Mid/CC 2 | N/A | ALL RBs | 42 | Low/CC 1 | N/A | ALL RBs | 42 | Low/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3**[17] | 3 | High | 50@25 | ALL RBs | 41 | Mid/CC 1 | N/A | ALL RBs | 41 | Mid/CC 2 | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 41 | Mid/CC 1 | 100@0 | ALL RBs | 41 | Mid/CC 2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 41 | Low/C C1 | 100@0 | ALL RBs | 41 | Low/C C2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid/CC 1 | N/A | ALL RBs | 42 | Mid/CC 2 | N/A | ALL RBs |
| | QPS | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | | N/A | QPSK | | 100 |

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| **6** | 41 | Low/CC1 | 100@0 | ALL RBs | 41 | Low/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | | N/A | QPSK | | |
| **7** | 41 | High/CC1 | 100@0 | ALL RBs | 41 | High/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **8** | 41 | High/CC1 | 100@0 | ALL RBs | 41 | High/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **9** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **10** | 42 | Mid/CC1 | 100@0 | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **11** | 42 | High/CC1 | 100@0 | ALL RBs | 42 | High/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **12**[18] | 3 | Low | 50@25 | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs | 42 | Low/CC1 | N/A | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **13**[19] | 3 | High | 50@25 | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **14** | 42 | Low/CC1 | 100@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **15** | 42 | Mid/CC1 | 100@0 | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **16** | 41 | Low/CC1 | 50@0 | ALL RBs | 41 | Low/CC1 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |

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| **17** | 41 | High/CC1 | 50@0 | ALL RBs | 41 | High/CC1 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 42 | Mid/CC1 | N/A | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **18** | 42 | Low/CC1 | 50@0 | ALL RBs | 42 | Low/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **19** | 42 | Mid/CC1 | 50@0 | ALL RBs | 42 | Mid/CC2 | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 41 | Mid/CC1 | N/A | ALL RBs | 41 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Default Test Settings for CA_5B-30A-66A-66A** | | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | Low/CC1 | 100@0 | ALL RBs | 66 | Low/CC2 | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | 66 | Low/CC1 | 100@0 | ALL RBs | 66 | Low/CC2 | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | 66 | High/CC1 | 100@0 | ALL RBs | 66 | High/CC2 | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | 66 | High/CC1 | 100@0 | ALL RBs | 66 | High/CC2 | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | 5 | Mid | 50@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |

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| **6** | 30 | Mid | 50@0 | ALL RBs | 66 | Mid/CC 1 | N/A | ALL RBs | 66 | Mid/CC 2 | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 66 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **7** | 66 | Mid | 100@0 | ALL RBs | 66 | Mid/CC 1 | N/A | ALL RBs | 66 | Mid/CC 2 | N/A | ALL RBs | 5 | Mid | N/A | ALL RBs | 30 | Mid | N/A | ALL RBs |
| | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Test Settings for CA_29A-66C-70C Configuration** | | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | Mid/CC 1 | 100@0 | ALL RBs | 66 | Mid/CC 2 | N/A | ALL RBs | 29 | Mid | N/A | ALL RBs | 70 | Mid/CC 1 | N/A | ALL RBs | 70 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **2** | 66 | High/CC1 | 100@0 | ALL RBs | 66 | High/CC2 | N/A | ALL RBs | 29 | Mid | N/A | ALL RBs | 70 | Mid/CC 1 | N/A | ALL RBs | 70 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **3** | 70 | Mid/CC 1 | 100@0 | ALL RBs | 70 | Mid/CC 2 | N/A | ALL RBs | 29 | Mid | N/A | ALL RBs | 66 | High/CC1 | N/A | ALL RBs | 66 | High/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Test Settings for CA_66A-66A-70C-71A Configuration** | | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | Low/CC1 | 100@0 | ALL RBs | 66 | High/CC2 | N/A | ALL RBs | 70 | Mid/CC 1 | N/A | ALL RBs | 70 | Mid/CC 2 | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 66 | Low/CC1 | 100@0 | ALL RBs | 66 | High/CC2 | N/A | ALL RBs | 70 | Mid/CC 1 | N/A | ALL RBs | 70 | Mid/CC 2 | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 70 | Mid/CC 1 | 75@0 | ALL RBs | 70 | Mid/CC 2 | N/A | ALL RBs | 66 | Low/CC1 | N/A | ALL RBs | 66 | High/CC2 | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **4** | 71 | Low | 16@12 | ALL RBs | 66 | Low/CC1 | N/A | ALL RBs | 66 | High/CC2 | N/A | ALL RBs | 70 | Mid/CC 1 | N/A | ALL RBs | 70 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |

| Test Settings for CA_66C-70C-71A Configuration | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 66 | Mid/CC 1 | 100@0 | ALL RBs | 66 | Mid/CC 2 | N/A | ALL RBs | 70 | Mid/CC 1 | N/A | ALL RBs | 70 | Mid/CC 2 | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 66 | High/CC1 | 100@0 | ALL RBs | 66 | High/CC2 | N/A | ALL RBs | 70 | Mid/CC 1 | N/A | ALL RBs | 70 | Mid/CC 2 | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 70 | Mid/CC 1 | 75@0 | ALL RBs | 70 | Mid/CC 2 | N/A | ALL RBs | 66 | Mid/CC 1 | N/A | ALL RBs | 66 | Mid/CC 2 | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **4** | 71 | Low | 16@12 | ALL RBs | 66 | Mid/CC 1 | N/A | ALL RBs | 66 | Mid/CC 2 | N/A | ALL RBs | 70 | Mid/CC 1 | N/A | ALL RBs | 70 | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 4: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41F, X=41.
Note 6: **Inter-band:** X,Y,Z,R,S correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-20A-42A,X=1,Y=3,Z=7,R=20,S=42.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_3C-7A-28A, X=3,Y=7 and Z=28.
Note 8: REFSENS refers to the PCC bands and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose the Combination with $N_{RB_PCC}$ = $N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.
Note 11: Test points that fulfil criteria of Note 4 in Table 7.3A.5.5-3.
Note 12: Only Band 1 and Band 42 need to be tested and Band 3 does not need to be tested.
Note 13: Only Band 1 and Band 3 need to be tested and Band 42 does not need to be tested.
Note 14: Band 42: $f_{UL/DL}$ for SCC1 = 3430.2MHz ($N_{UL/DL}$ = 41892), $f_{UL/DL}$ for SCC2 = 3450MHz ($N_{UL/DL}$ = 42090)
Note 15: Band 42: $f_{UL/DL}$ for SCC1 = 3500.2MHz ($N_{UL/DL}$ = 42592), $f_{UL/DL}$ for SCC2 = 3520MHz ($N_{UL/DL}$ = 42790)
Note 16: Band 3: fUL = 1720MHz (NUL = 19300), fDL = 1815MHz (NDL = 1300)
Band 42: fUL/DL = 3440MHz (NUL/DL = 41990)
Note 17: Band 3: fUL = 1775MHz (NUL = 19850), fDL = 1870MHz (NDL = 1850)
Band 42: fUL/DL = 3520MHz (NDL = 42790)
Note 18: Band 42: $f_{UL/DL}$ for SCC1 = 3430.2MHz ($N_{UL/DL}$ = 41892), $f_{UL/DL}$ for SCC2 = 3450MHz ($N_{UL/DL}$ = 42090)
Note 19: Band 42: $f_{UL/DL}$ for SCC1 = 3500.2MHz ($N_{UL/DL}$ = 42592), $f_{UL/DL}$ for SCC2 = 3520MHz ($N_{UL/DL}$ = 42790).

**Table 7.3A.10.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default, exceptions listed in Table 7.3.3-3, dependent on PCC Band |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | | $W_{gap}$ [MHz] | SCC3 | | | | $W_{gap}$ [MHz] | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | UL alloc (Note 2,3, 4) | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | UL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for a CA_XA-XA-YA-ZA-RA Configuration** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB}$ | | N/A | QPSK | | $N_{RB}$ | | N/A | QPSK | | $N_{RB}$ | | N/A | QPSK | | $N_{RB}$ | | N/A | QPSK | | $N_{RB}$ |

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| | | | | agg | | | | | agg | | | | | agg | | | | | agg | | | | | agg |
| **4** | R | Mid | REFSENS | ALLRBs | - | X | CC2 | N/A | ALLRBs | Max | X | CC1 | N/A | ALLRBs | - | Y | Mid | N/A | ALLRBs | - | Z | Mid | N/A | ALLRBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for a CA_29A-66A-66A-70C Configuration** | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | REFSENS | ALLRBs | Max | 66 | CC2 | N/A | ALLRBs | - | 29 | Mid | N/A | ALLRBs | - | 70 | Mid/CC1 | N/A | ALLRBs | - | 70 | Mid/CC2 | N/A | ALLRBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 | | N/A | QPSK | | 75 | | N/A | QPSK | | 50 |
| **2** | 66 | CC1 | REFSENS | ALLRBs | Max | 66 | CC2 | N/A | ALLRBs | - | 29 | Mid | N/A | ALLRBs | - | 70 | Mid/CC1 | N/A | ALLRBs | - | 70 | Mid/CC2 | N/A | ALLRBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 25 | | N/A | QPSK | | 50 | | N/A | QPSK | | 75 | | N/A | QPSK | | 50 |
| **3** | 70 | Mid/CC1 | REFSENS | ALLRBs | - | 70 | Mid/CC2 | N/A | ALLRBs | - | 29 | Mid | N/A | ALLRBs | - | 66 | CC1 | N/A | ALLRBs | Max | X | CC2 | N/A | ALLRBs |
| | QPSK | QPSK | | 75 | | N/A | QPSK | | 50 | | N/A | QPSK | | 50 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.55 if the UE supports 2 Rx antennas or Figure A.80 if the UE supports 4 Rx antennas in at least one band within the CA configuration.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 7.3A.10.4.1-1 through Table 7.3A.10.4.1-2 as appropriate.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.3A.10.4.3.

### 7.3A.10.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.3A.10.4.3.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.3A.10.4.1-1 through Table7.3A.10.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.3A.10.4.1-1 through Table 7.3A.10.4.1-2 as appropriate on PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the appropriate REFSENS value defined in Table 7.3A.10.5-1 through Table7.3A.10.5-5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the Throughput measurement.

7. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.3A.10.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

## 7.3A.10.5 Test requirement

For intra-band contiguous carrier aggregation the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.10.5-1. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.10.5-1: Reference sensitivity QPSK $P_{REFSENS}$ for CA_XF Configuration**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CA Configuration | E-UTRA Band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| CA_41F | 41 | | | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| | | | | -100[4] | -97[4] | -95.2[4] | -94[4] | |
| NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.<br>NOTE 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1<br>NOTE 3: The signal power is specified per port<br>NOTE 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured. | | | | | | | | |

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.10.5-2 (originated from single carrier Tables 7.3.5-1). The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.10.5-2: Reference sensitivity QPSK $P_{REFSENS}$ for CA_XA-YA-ZA-RA-SA**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA_XA-YA-ZA-RA-SA | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.<br>NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.<br>NOTE 3: The signal power is specified per port. | | | | | | | | |

For the UE which supports inter-band carrier aggregation configurations the $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C shall be applied for applicable bands.

Unless otherwise specified, in case the UE supports more than one of the above 5DL inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one 5DL inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz and the tolerances are the same, the value applies to the band. If the tolerances are different, the applicable additional 5DL tolerance is FFS. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 5DL carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional 5DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 5DL CA configurations

The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.

The reference receive sensitivity (REFSENS) requirement for inter-band specified in Table 7.3A.10.5-2 shall be met for an uplink CA configurations than or equal to that specified in Table 7.3.5-2.

NOTE: Table 7.3A.10.5-3 does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors.

**Table 7.3A.10.5-3: Void**

For combinations of intra-band contiguous and inter-band carrier aggregation with three downlink carriers and one uplink carrier assigned to one E-UTRA band the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.10.5-4. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.10.5-4: Reference sensitivity QPSK $P_{REFSENS}$ for CA_XA-YA-ZA-RC or XA-YC-ZC**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUTRA CA Configuration** | **EUTRA band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex mode** |
| CA_1A-3A-19A-42C | 1 | | | -99.1 | -96.1 | -94.3 | -93.1 | FDD |
| | 3[5] | | | -93.1 | -90.6 | -89.1 | -88.1 | |
| | 3[6] | | | -96.1 | -93.1 | -91.3 | -90.1 | |
| | 19 | | | -99.3 | -96.3 | -94.5 | | |
| | 42 | | | -97.5 | -94.5 | -92.7 | -91.5 | TDD |
| CA_1A-3A-19A-42C[7,8] | 1 | | | -99.1 | -96.1 | -94.3 | -93.1 | FDD |
| | 3 | | | -96.1 | -93.1 | -91.3 | -90.1 | |
| | 19 | | | -99.3 | -96.3 | -94.5 | | |
| | 42 | | | -70.7 | -70.7 | -70.7 | -70.7 | TDD |
| CA_1A-3A-19A-42C[9] | 1 | | | -99.1 | -96.1 | -94.3 | -93.1 | FDD |
| | 3 | | | -96.1 | -93.1 | -91.3 | -90.1 | |
| | 19 | | | -99.3 | -96.3 | -94.5 | | |
| | 42 | | | -96.1 | -93.7 | -92.2 | -91.5 | TDD |
| CA_1A-3A-21A-42C | 1 | | | -99.1 | -96.1 | -94.3 | -93.1 | FDD |
| | | | | -101.8[4] | -98.8[4] | -97.0[4] | -95.8[4] | |
| | 3[5] | | | -93.0 | -90.5 | -89.0 | -88.0 | |
| | 3[6] | | | -96.0 | -93.0 | -91.2 | -90.0 | |
| | | | | -98.7[4] | -95.7[4] | -93.9[4] | -92.7[4] | |
| | 21 | | | -98.8 | -95.8 | -94.0 | - | |
| | 42 | | | -97.5 | -94.5 | -92.7 | -91.5 | TDD |
| | | | | -99.7 | -96.7 | -94.9 | -93.7 | |
| CA_1A-3A-21A-42C[7,8] | 1 | | | -99.1 | -96.1 | -94.3 | -93.1 | FDD |
| | | | | -101.8[4] | -98.8[4] | -97.0[4] | -95.8[4] | |
| | 3 | | | -96.0 | -93.0 | -91.2 | -90.0 | |
| | | | | -98.7[4] | -95.7[4] | -93.9[4] | -92.7[4] | |
| | 21 | | | -98.8 | -95.8 | -94.0 | - | |
| | 42 | | | -70.7 | -70.7 | -70.7 | -70.7 | TDD |
| CA_1A-3A-21A-42C[9] | 1 | | | -99.1 | -96.1 | -94.3 | -93.1 | FDD |
| | | | | -101.8[4] | -98.8[4] | -97.0[4] | -95.8[4] | |
| | 3 | | | -96.0 | -93.0 | -91.2 | -90.0 | |
| | | | | -98.7[4] | -95.7[4] | -93.9[4] | -92.7[4] | |
| | 21 | | | -98.8 | -95.8 | -94.0 | - | |
| | 42 | | | -96.1 | -93.7 | -92.2 | -91.5 | TDD |
| CA_1A-19A-21A-42C | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | 1[4] | | | -102.0 | -99.0 | -97.2 | -96.0 | |
| | 19 | | | -99.3 | -96.3 | -94.5 | | |
| | 21 | | | -99.3 | -96.3 | -94.5 | | |
| | 21[4] | | | -102.0 | -99.0 | -97.2 | | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | 42[4] | | | -100.2 | -97.2 | -95.4 | -94.2 | |
| CA_1A-41C-42C | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102[4] | -99[4] | -97.2[4] | -96[4] | |
| | 41 | | | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| | | | | -100[4] | -97[4] | -95.2[4] | -94[4] | |
| | 42 | | | -97.5 | -94.5 | -92.7 | -91.5 | |
| | | | | -99.7[4] | -96.7[4] | -94.9[4] | -93.7[4] | |
| CA_1A-42E | 1 | | | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| | | | | -102.0[4] | -99.0[4] | -97.2[4] | -96.0[4] | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | -100.2[4] | -97.2[4] | -95.4[4] | -94.2[4] | |
| CA_2A-5B-30A-66A | 2 | | | -97,3 | -94,3 | -92.5 | -91,3 | FDD |
| | | | | -100.0[4] | -97.0[4] | -95.2[4] | -94.0[4] | |
| | 5 | | | -97.3 | -94.3 | | | |
| | 30 | | | -98.3 | -95.3 | | | |
| | 66 | | | -98.8 | -95.8 | -94 | -92.8 | |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| CA_2A-5B-66A-66A | 2 | | | -97,3 | -94,3 | -92.5 | -91,3 | FDD |
| | | | | -100.0[4] | -97.0[4] | -95.2[4] | -94.0[4] | |
| | 5 | | | -97.3 | -94.3 | | | |
| | 66 | | | -98.8 | -95.8 | -94 | -92.8 | |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| CA_5B-30A-66A-66A | 5 | | | -97.3 | -94.3 | | | FDD |
| | 30 | | | -98.3 | -95.3 | | | |
| | 66 | | | -98.8 | -95.8 | -94 | -92.8 | |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| CA_3A-42E | 3 | | | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| | | | | -99.0[4] | -96.0[4] | -94.2[4] | -93.0[4] | |
| | 42 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| | | | | -100.2[4] | -97.2[4] | -95.4[4] | -94.2[4] | |
| CA_29A-66C-70C | 29 | | | -96.3 | -93.3 | | | FDD |
| | 66 | | | -98.8 | -95.8 | -94 | -92.8 | |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 70 | | | -99.3 | -96.3 | -94.5 | -93.3 | |
| CA_66A-66A-70C-71A | 66 | | | -98.8 | -95.8 | -94 | -92.8 | FDD |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 70 | | | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | | | -89.3[8,9] | -88.8[8,9] | -88.5[8,9] | -88.3[8,9] | |
| | 71 | | | -96.5 | -93.5 | -91.2 | -86.8 | |
| CA_66C-70C-71A | 66 | | | -98.8 | -95.8 | -94 | -92.8 | |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 70 | | | -99.3 | -96.3 | -94.5 | -93.3 | |
| | | | | -89.3[8,9] | -88.8[8,9] | -88.5[8,9] | -88.3[8,9] | |
| | 71 | | | -96.5 | -93.5 | -91.2 | -86.8 | |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: The signal power is specified per port.
NOTE 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in Band 3 and Band 5 or Band 8 or Band 19 or Band 20 or Band 26 or Band 28 or Band 42, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 6: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in Band 3 and Band 5 or Band 8 or Band 19 or Band 20 or Band 26 or Band 28 or Band 42, the requirement applies regardless of channel bandwidth in Band 1.
NOTE 7: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range $\Delta F_{HD}$ above and below the edge of this downlink transmission bandwidth. The value $\Delta F_{HD}$ depends on the E-UTRA configuration: $\Delta F_{HD}$ = 10 MHz for CA_3A-42C, CA_1A-3A-42C and CA_3A-19A-42C.
NOTE 8: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.2 \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB}/2 < f_{UL}^{LB} < F_{UL_high}^{LB} - BW_{Channel}^{LB}/2$ with $f_{DL}^{HB}$ carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.
NOTE 9: The requirements are only applicable to channel bandwidths with a carrier frequency at $\pm\left(20 + BW_{Channel}^{HB}/2\right)$ MHz offset from $2\,f_{UL}^{LB}$ in the victim (higher band) with $F_{UL_low}^{LB} + BW_{Channel}^{LB}/2 < f_{UL}^{LB} < F_{UL_high}^{LB} - BW_{Channel}^{LB}/2$, where $BW_{Channel}^{LB}$ and $BW_{Channel}^{HB}$ are the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.

For combinations of intra-band non-contiguous and inter-band carrier aggregation with three downlink carriers and one uplink carrier assigned to one E-UTRA band the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3A.10.5-5. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

**Table 7.3A.10.5-5: Reference sensitivity QPSK $P_{REFSENS}$ for CA_XA-XA-XD or XA-XC-XC or XA-YC-YC or XA-YA-YA-YC or XA-XA-YD or XA-XA-YA-YC or XA-XA-YA-YA-YA or XA-XA-XA-YC or XA-YA-ZA-ZA-ZA or XA-YA-YA-ZC or XA-YA-YA-ZA-ZA or XA-YA-ZA-RA-RA**

| Channel bandwidth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA_29A-66A-66A-70C | 29 | | | -96.3 | -93.3 | | | FDD |
| | 66 | | | -98.8 | -95.8 | -94 | -92.8 | |
| | | | | -101.5[4] | -98.5[4] | -96.7[4] | -95.5[4] | |
| | 70 | | | -99.3 | -96.3 | -94.5 | -93.3 | |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
NOTE 3: The signal power is specified per port.
NOTE 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.

# 7.3B Reference sensitivity level for UL-MIMO

## 7.3B.1 Test purpose

To verify the ability of UE that support UL-MIMO to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area of an e-NodeB.

## 7.3B.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

## 7.3B.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in Clause 7.3.3 shall be met with the UL-MIMO configurations specified in Table 6.2.2B.3-2. For UL-MIMO, the parameter $P_{UMAX}$ is the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 36.101 [2] clause 7.3.1B.

## 7.3B.4 Test description

### 7.3B.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.3B.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.3B.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[4] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2). | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.3B.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.3B.4.3.

## 7.3B.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.3B.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 7.3B.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3B.5-1. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the throughput measurement.

4. Measure the average throughput for duration sufficient to achieve statistical significance according to Annex G.2.

### 7.3B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

#### 7.3B.4.3.1 Message contents exceptions (network signalled value "NS_01")

Message contents according to TS 36.508 [7] clause 4.6 can be used without exceptions.

#### 7.3B.4.3.2 Message contents exceptions (network signalled value "NS_03")

1. Information element additionalSpectrumEmission is set to NS_03. This can be set in the SystemInformationblockType2 as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3B.4.3.2-1: SystemInformationBlockType2: Additional spurious emissions test requirement for "NS_03"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 3 (NS_03) | | |

#### 7.3B.4.3.3 Message contents exceptions (network signalled value "NS_06")

1. Information element additionalSpectrumEmission is set to NS_06. This can be set in the SystemInformationblockType2 as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3B.4.3.3-1: SystemInformationBlockType2: Additional spurious emissions test requirement for "NS_06"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 6 (NS_06) | | |

#### 7.3B.4.3.4 Message contents exceptions (network signalled value "NS_[09]")

1. Information element additionalSpectrumEmission is set to NS_[09]. This can be set in the SystemInformationblockType2 as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3B.4.3.4-1: SystemInformationBlockType2: Additional spurious emissions test requirement for "NS_[09]"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | TBD | | |

## 7.3B.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.3B.5-1 and Table 7.3B.5-2.

**Table 7.3B.5-1: Reference sensitivity QPSK $P_{REFSENS}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| 1 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| 2 | -102.0 | -99.0 | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| 3 | -101.0 | -98.0 | -96.3 | -93.3 | -91.5 | -90.3 | FDD |
| 4 | -104.0 | -101.0 | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| 5 | -102.5 | -99.5 | -97.3 | -94.3 | | | FDD |
| 6 | - | - | -99.3 | -96.3 | | | FDD |
| 7 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | FDD |
| 8 | -101.5 | -98.5 | -96.3 | -93.3 | | | FDD |
| 9 | - | - | -98.3 | -95.3 | -93.5 | -92.3 | FDD |
| 10 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| 11 | - | - | -99.3 | -96.3 | | | FDD |
| 12 | -101.0 | -98.0 | -96.3 | -93.3 | | | FDD |
| 13 | | | -96.3 | -93.3 | | | FDD |
| 14 | | - | -96.3 | -93.3 | | | FDD |
| ... | | | | | | | |
| 17 | - | - | -96.3 | -93.3 | | | FDD |
| 18 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| 19 | - | - | -99.3 | -96.3 | -94.5 | - | FDD |
| 20 | | | -96.3 | -93.3 | -90.5 | -89.3 | FDD |
| 21 | | | -99.3 | -96.3 | -94.5 | | FDD |
| 22 | | | -96.0 | -93.0 | -91.2 | -90.0 | FDD |
| 23 | -104.0 | -101.0 | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| 24 | | | -99.3 | -96.3 | | | FDD |
| 25 | -100.5 | -97.5 | -95.8 | -92.8 | -91.0 | -89.8 | FDD |
| 26 | -102 | -99 | -96.8[6] | -93.8[6] | -92[6] | | FDD |
| 27 | -102.5 | -99.5 | -97.3 | -94.3 | | | FDD |
| 28 | | -99.5 | -97.8 | -94.8 | -93.0 | -90.3 | FDD |
| 30 | - | - | -98.3 | -95.3 | - | - | FDD |
| 31 | -98.3 | -95.0 | -92.8 | | | | FDD |
| ... | | | | | | | |
| 33 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| 34 | - | - | -99.3 | -96.3 | -94.5 | - | TDD |
| 35 | -105.5 | -101.5 | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| 36 | -105.5 | -101.5 | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| 37 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| 38 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| 39 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| 40 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| 41 | - | - | -97.3 | -94.3 | -92.5 | -91.3 | TDD |
| 42 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| 43 | - | - | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| 45 | - | - | -99.3 | -96.3 | -94.5 | -93.3 | TDD |
| … | | | | | | | |
| 48 | | | -98.0 | -95.0 | -93.2 | -92.0 | TDD |
| … | | | | | | | |
| 65 | -103.5 | -100.5 | -99.5 | -96.5 | -94 | -92.8 | FDD |
| 66 | -103.5 | -100.5 | -98.8 | -95.8 | -94 | -92.8 | FDD |
| … | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 68 | | | -97.8 | -94.8 | -93.0 | | FDD |
| … | | | | | | | |
| 72 | -98.3 | -95.0 | -92.8 | | | | FDD |

Note 1: The transmitter shall be set to $P_{UMAX}$ as defined in clause 6.2.5
Note 2: The reference measurement channel is specified in A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
Note 3: The signal power is specified per port
Note 4: For the UE which supports both Band 3 and Band 9 the reference sensitivity level is FFS.
Note 5: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
Note 6: [6] indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.

For the UE which supports inter-band carrier aggregation configurations the $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C shall be applied for applicable bands.

In case the UE supports more than one of the inter-band carrier aggregation configurations and an E-UTRA operating band belongs to more than one inter-band carrier aggregation configurations then:

- When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the tolerances in Table 7.3.3-1A, truncated to one decimal place that would apply for that operating band among the supported CA configurations. In case there is a harmonic relation between low band UL and high band DL (i.e. bands listed in Table 7.3A.0-0a), then the maximum tolerance among the different supported carrier aggregation configurations involving such band shall be applied

- When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum tolerance in Table 7.3.3-1A that would apply for that operating band among the supported CA configurations

NOTE 1: The relation to the received PSD is $\left\langle \mathrm{REF}\,\hat{I}_{or} \right\rangle = P_{REFSENS}\left(N_{sc}^{RB} N_{RB} \Delta f\right)^{-1}$ with $N_{\mathrm{RB}}$ is the transmission bandwidth configuration according to Table 5.4.2-1.

The reference receive sensitivity (REFSENS) requirement specified in Table 7.3B.5-1 shall be met for an uplink transmission bandwidth less than or equal to that specified in Table 7.3B.5-2.

NOTE 2: Table 7.3B.5-2 does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors.

**Table 7.3B.5-2: Uplink configuration for reference sensitivity**

| E-UTRA Band / Channel bandwidth / $N_{RB}$ / Duplex mode | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA Band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Duplex Mode** |
| 1 | - | - | 25 | 50 | 75 | 100 | FDD |
| 2 | 6 | 15 | 25 | 50 | 50[1] | 50[1] | FDD |
| 3 | 6 | 15 | 25 | 50 | 50[1] | 50[1] | FDD |
| 4 | 6 | 15 | 25 | 50 | 75 | 100 | FDD |
| 5 | 6 | 15 | 25 | 25[1] | - | - | FDD |
| 6 | - | - | 25 | 25[1] | - | - | FDD |
| 7 | - | - | 25 | 50 | 75[1] | 75[1] | FDD |
| 8 | 6 | 15 | 25 | 25[1] | - | - | FDD |
| 9 | - | - | 25 | 50 | 50[1] | 50[1] | FDD |
| 10 | - | - | 25 | 50 | 75 | 100 | FDD |
| 11 | - | - | 25 | 25[1] | | | FDD |
| 12 | 6 | 15 | 20[1] | 20[1] | | | FDD |
| 13 | | | 20[1] | 20[1] | | | FDD |
| 14 | | - | 15[1] | 15[1] | | | FDD |
| ... | | | | | | | |
| 17 | - | - | 20[1] | 20[1] | | | FDD |
| 18 | - | - | 25 | 25[1] | 25[1] | - | FDD |
| 19 | - | - | 25 | 25[1] | 25[1] | - | FDD |
| 20 | | | 25 | 20[1] | 20[3] | 20[3] | FDD |
| 21 | | | 25 | 25[1] | 25[1] | | FDD |
| 22 | | | 25 | 50 | 50[1] | 50[1] | FDD |
| 23 | 6 | 15 | 25 | 50 | 75[1] | 100[1] | FDD |
| 24 | | | 25 | 50 | | | FDD |
| 25 | 6 | 15 | 25 | 50 | 50[1] | 50[1] | FDD |
| 26 | 6 | 15 | 25 | 25[1] | 25[1] | | FDD |
| 27 | 6 | 15 | 25 | 25[1] | - | - | FDD |
| 28 | | 15 | 25 | 25[1] | 25[1] | 25[1] | FDD |
| 30 | - | - | 25 | 25[1] | - | - | FDD |
| 31 | 6 | 5[4] | 5[4] | | | | FDD |
| … | | | | | | | |
| 33 | - | - | 25 | 50 | 75 | 100 | TDD |
| 34 | - | - | 25 | 50 | 75 | - | TDD |
| 35 | 6 | 15 | 25 | 50 | 75 | 100 | TDD |
| 36 | 6 | 15 | 25 | 50 | 75 | 100 | TDD |
| 37 | - | - | 25 | 50 | 75 | 100 | TDD |
| 38 | - | - | 25 | 50 | 75 | 100 | TDD |
| 39 | | | 25 | 50 | 75 | 100 | TDD |
| 40 | | | 25 | 50 | 75 | 100 | TDD |
| 41 | | | 25 | 50 | 75 | 100 | TDD |
| 42 | | | 25 | 50 | 75 | 100 | TDD |
| 43 | | | 25 | 50 | 75 | 100 | TDD |
| 45 | | | 25 | 50 | 75 | 100 | TDD |
| … | | | | | | | |
| 48 | | | 25 | 50 | 75 | 100 | TDD |
| … | | | | | | | |
| 65 | 6 | 15 | 25 | 50 | 75 | 100 | FDD |
| 66 | - | - | 25 | 50 | 75 | 100 | FDD |
| … | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 68 | | | 25 | 25[1] | 25[1] | | |
| … | | | | | | | |
| 72 | 6 | 5[4] | 5[4] | | | | FDD |

Note 1: The UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).
Note 2: For the UE which supports both Band 11 and Band 21 the uplink configuration for reference sensitivity is FFS.
Note 3: For Band 20; in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$=11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$=16.
Note 4: [4] refers to Bands 31 and 72; in the case of 3 MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 9 and in the case of 5 MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 10.

# 7.3C

# 7.3D Reference sensitivity level for ProSe

## 7.3D.0 Minimum requirements (QPSK) for ProSe

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.6.2 with parameters specified in Table 7.3D.0-1 and Table 7.3D.0-2.

**Table 7.3D.0-1: Reference sensitivity for ProSe Direct Discovery QPSK PREFSENS**

| | Channel bandwidth | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA ProSe Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| 2 | | | -104.1 | -104.1 | -104.1 | -104.1 | HD |
| 3 | | | -103.1 | -103.1 | -103.1 | -103.1 | HD |
| 4 | | | -106.1 | -106.1 | -106.1 | -106.1 | HD |
| 7 | | | -103.8 | -103.8 | -103.8 | -103.8 | HD |
| 14 | | | -103.1 | -103.1 | | | HD |
| 20 | | | -103.2 | -103.2 | -102.2 | -102.2 | HD |
| 26 | | | -103.5[5] | -103.5 [5] | -103.5 [5] | | HD |
| 28 | | | -104.4 | -104.4 | -104.4 | -102.9 | HD |
| 31 | | | -99.5 | | | | HD |
| 68 | | | -104.4 | -104.4 | -104.4 | | HD |
| 72 | | | -99.5 | | | | HD |

NOTE 1: Reference measurement channel is A.6.2.
NOTE 2: The signal power is specified per port.
NOTE 3: For the UE which supports both Band 3 and Band 9 the reference sensitivity level is FFS.
NOTE 4: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
NOTE 5: [5] indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.
NOTE 6: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.

**Table 7.3D.0-2: Reference sensitivity for ProSe Direct Communication QPSK PREFSENS**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| E-UTRA ProSe Band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| 3 | | | | -97.6 | | | HD |
| 7 | | | | -98.3 | | | HD |
| 14 | | | | -97.6 | | | HD |
| 20 | | | | -97.7 | | | HD |
| 26 | | | | -98.0 [5] | | | HD |
| 28 | | | | -98.9 | | | HD |
| 31 | | | -96.7 | | | | HD |
| 68 | | | -101.7 | -98.9 | | | HD |
| 72 | | | -96.7 | | | | HD |

NOTE 1: Reference measurement channel is A.6.2.
NOTE 2: The signal power is specified per port.
NOTE 3: For the UE which supports both Band 3 and Band 9 the reference sensitivity level is FFS.
NOTE 4: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
NOTE 5: [5] indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.
NOTE 6: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.

NOTE: Table 7.3D.0-1/ Table 7.3D.0-2 is intended for conformance tests and does not necessarily reflect the operational conditions of the network, where the number of allocated resource blocks will be practically constrained by other factors.

For the UE which supports ProSe in an operating band as specified in Clause 5.2D and is configured with (and can transmit on) only PCell, and the UE also supports a E-UTRA downlink inter-band carrier aggregation configuration in Table 7.3.3-1A or Table 7.3.3-1B, the minimum requirement for reference sensitivity in Table 7.3D.0-1 and Table 7.3D.0-2 shall be increased by the amount given in $\Delta_{RIB,c}$ in Table 7.3.3-1A or Table 7.3.3-1B for the corresponding E-UTRA ProSe band.

## 7.3D.1 Reference sensitivity level for ProSe Direct Discovery

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Use of OCNG for Downlink has not been considered and is still FFS.
- Message exceptions content needs further investigation (some values still TBD).
- Test time is FFS.

### 7.3D.1.1 Test purpose

Verify that UE receives ProSe Discovery physical channels data with a given average throughput under conditions of low signal level and ideal propagation.

### 7.3D.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Discovery, but not ProSe Direct Communication.

### 7.3D.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3D.0.

## 7.3D.1.4 Test description

### 7.3D.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA ProSe bands specified in table 5.4.2D.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.3D.1.4.1-1. The details of the downlink, uplink and sidelink reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.6.

**Table 7.3D.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range (Note 4) | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, Highest | | | | | |
| | **Downlink Configuration (Note 2)** | | **Uplink Configuration (Note 2)** | | **Sidelink Configuration (Reception) (Note 3)** | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Mod'n | RB allocation |
| 5MHz | QPSK | 8 | QPSK | 8 | QPSK | 2 |
| 10MHz | QPSK | 16 | QPSK | 16 | QPSK | 2 |
| 15MHz | QPSK | 25 | QPSK | 25 | QPSK | 2 |
| 20MHz | QPSK | 30 | QPSK | 30 | QPSK | 2 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA ProSe and Operating band, according to the applicability specified respectively in Table 5.4.2D.1-1 and Table 5.4.2.1-1.<br>Note 2: After DRX configuration, DL-RMC (PDSCH) and DCI-0 for scheduling UL-RMC (PUSCH) are applied only in the DRX On subframes.<br>Note 3: The RB start for the transmission of Sidelink RMC is RB#0.<br>Note 4: Sidelink uses the frequencies defined for Uplink. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.67.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.3D.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents exceptions are defined in clause 7.3D.1.4.3.
7. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is activated.

### 7.3D.1.4.2 Test procedure

1. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions (only those marked with "…Step 1…" ) are defined in clause 7.3D.1.4.3.
2. The UE shall transmit RRCConnectionReconfigurationComplete message.
3. Initialise the variables Ptot and Pok as 0.
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.3D.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.3D.1.4.1-1. When the UE has no payload data to send, it transmits uplink MAC padding bits on the UL RMC.

6. SS transmits PSDCH to transmit the SL RMC according to Table 7.3D.1.4.1-1. Set the Sidelink signal level to the appropriate REFSENS value defined in Table 7.3D.1.5-1.

7. SS shall send SL Discovery Packets (MAC padding bits) on the SL RMC for the test time [FFS]. SS stores the number of the transmitted Discovery Packets in the current test iteration in the variable Ptot.

8. SS shall send (on the available PDSCH) a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER REQUEST" message and wait for the UE to respond (on the available PUSCH) with a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER RESPONSE".

9. SS calculates the variable Pok as (current counter value - counter value at last test iteration).

10. SS shall compute the throughput as following:

    TP = Pok / Ptot * 100%

### 7.3D.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

- Table A.7.1.1-1 for FDD
- Table A.7.1.2-1 for TDD

**Table 7.3D.1.4.3-1: ACTIVATE TEST MODE: Reference sensitivity for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 7.3D.1.4.3-2: CLOSE UE TEST LOOP: Reference sensitivity for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 7.3D.1.4.3-3: MAC-MainConfig-RBC: Reference sensitivity for ProSe Direct Discovery (applicable only for Step 1 of Test procedure)**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | TBD | | |
| periodicBSR-Timer | TBD | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | TBD | | |
| } | | | |

### 7.3D.1.5 Test requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.6.2 with parameters specified in Table 7.3D.1.5-1.

**Table 7.3D.1.5-1: Reference sensitivity for ProSe Direct Discovery QPSK PREFSENS**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| E-UTRA ProSe Band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| 2 | | | -103.4 | -103.4 | -103.4 | -103.4 | HD |
| 3 | | | -102.4 | -102.4 | -102.4 | -102.4 | HD |
| 4 | | | -105.4 | -105.4 | -105.4 | -105.4 | HD |
| 7 | | | -103.1 | -103.1 | -103.1 | -103.1 | HD |
| 14 | | | -102.4 | -102.4 | | | HD |
| 20 | | | -102.5 | -102.5 | -101.5 | -101.5 | HD |
| 26 | | | -102.8[5] | -102.8[5] | -102.8[5] | | HD |
| 28 | | | -103.7 | -103.7 | -103.7 | -102.2 | HD |
| 31 | | | -98.8 | | | | HD |
| 68 | | | -103.7 | -103.7 | -103.7 | | HD |
| 72 | | | -98.8 | | | | HD |

NOTE 1: Reference measurement channel is A.6.2
NOTE 2: The signal power is specified per port
NOTE 3: For the UE which supports both Band 3 and Band 9 the reference sensitivity level is FFS.
NOTE 4: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
NOTE 5: [5] indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.
NOTE 6: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.

NOTE: Table 7.3D.1.5-1 is intended for conformance tests and does not necessarily reflect the operational conditions of the network, where the number of allocated resource blocks will be practically constrained by other factors.

For the UE which supports ProSe in an operating band as specified in Clause 5.2D and is configured with (and can transmit on) only PCell, and the UE also supports a E-UTRA downlink inter-band carrier aggregation configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, the test requirement for reference sensitivity in Table 7.3D.1.5-1 shall be increased by the amount given in $\Delta_{RIB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C for the corresponding E-UTRA ProSe band.

## 7.3D.2 Reference sensitivity level for ProSe Direct Communication

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Many clauses are TBD

### 7.3D.2.1 Test purpose

Verify that UE receives ProSe Communication physical channels data with a given average throughput under conditions of low signal level and ideal propagation.

### 7.3D.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Communication.

### 7.3D.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3D.0.

#### 7.3D.2.4 Test description

TBD

##### 7.3D.2.4.1 Initial conditions

TBD

##### 7.3D.2.4.2 Test procedure

TBD

##### 7.3D.2.4.3 Message contents

TBD

#### 7.3D.2.5 Test requirements

TBD

## 7.3E Reference sensitivity level for UE category 0

### 7.3E.1 Test purpose

Same test purpose as in clause 7.3.1

### 7.3E.2 Test applicability

This test applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 7.3E.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3E.3-1/Table 7.3E.3-2 and Table 7.3E.3-3.

**Table 7.3E.3-1: Reference sensitivity for FDD and TDD UE category 0 QPSK $P_{REFSENS}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| 2 | -100.2 | -97.2 | -95.5 | -92.5 | -90.7 | -89.5 | FDD |
| 3 | -99.2 | -96.2 | -94.5 | -91.5 | -89.7 | -88.5 | FDD |
| 4 | -102.2 | -99.2 | -97.5 | -94.5 | -92.7 | -91.5 | FDD |
| 5 | -100.7 | -97.7 | -95.5 | -92.5 | | | FDD |
| 8 | -99.7 | -96.7 | -94.5 | -91.5 | | | FDD |
| 13 | | | -94 | -91 | | | FDD |
| 20 | | | -94.5 | -91.5 | -88.2 | -87 | FDD |
| 39 | | | -97.5 | -94.5 | -92.7 | -91.5 | TDD |
| 41 | | | -95.5 | -92.5 | -90.7 | -89.5 | TDD |
| NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5<br>NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 | | | | | | | |

**Table 7.3E.3-2: Reference sensitivity for HD-FDD UE category 0 QPSK $P_{REFSENS}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| E-UTRA Band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| 2 | -101 | -98 | -96.3 | -93.3 | -91.5 | -90.3 | HD-FDD |
| 3 | -100 | -97 | -95.3 | -92.3 | -90.5 | -89.3 | HD-FDD |
| 4 | -103 | -100 | -98.3 | -95.3 | -93.5 | -92.3 | HD-FDD |
| 5 | -101.5 | -98.5 | -96.3 | -93.3 | | | HD-FDD |
| 8 | -100.5 | -97.5 | -95.3 | -92.3 | | | HD-FDD |
| 13 | | | -95.3 | -92.3 | | | HD-FDD |
| 20 | | | -95.3 | -92.3 | -89.5 | -88.3 | HD-FDD |
| NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5<br>NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 | | | | | | | |

The reference receive sensitivity (REFSENS) requirement specified in Table 7.3E.3-1/Table 7.3E.3-2 shall be met for an uplink transmission bandwidth less than or equal to that specified in Table 7.3E.3-3.

NOTE: Table 7.3E.3-3 is intended for conformance tests and does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors.

**Table 7.3E.3-3: FDD and TDD UE category 0 Uplink configuration for reference sensitivity**

| E-UTRA Band / Channel bandwidth / $N_{RB}$ / Duplex mode | | | | | | | |
|---|---|---|---|---|---|---|---|
| E-UTRA Band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex Mode |
| 2 | 6 | 15 | 25 | 36[1] | 36[1] | 36[1] | FDD and HD-FDD |
| 3 | 6 | 15 | 25 | 36[1] | 36[1] | 36[1] | FDD and HD-FDD |
| 4 | 6 | 15 | 25 | 36[1] | 36[1] | 36[1] | FDD and HD-FDD |
| 5 | 6 | 15 | 25 | 25[1] | | | FDD and HD-FDD |
| 8 | 6 | 15 | 25 | 25[1] | | | FDD and HD-FDD |
| 13 | | | 20[1] | 20[1] | | | FDD and HD-FDD |
| 20 | | | 25 | 20[1] | 20[2] | 20[2] | FDD and HD-FDD |
| 39 | | | 25 | 36[1] | 36[1] | 36[1] | TDD |
| 41 | | | 25 | 36[1] | 36[1] | 36[1] | TDD |
| NOTE 1: [1] refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).<br>NOTE 2: [2] refers to Band 20; in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 16. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.3.1E.

## 7.3E.4 Test description

### 7.3E.4.1 Initial conditions

Same initial conditions as in clause 7.3.4.1 with the following exceptions:

- Instead of Table 7.3.4.1-1 → use Table 7.3E.4.1-1.
- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 7.3E.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest, 5MHz, Highest | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD and HD-FDD | TDD |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 14 | 14 | QPSK | 15 | 15 |
| 5MHz | QPSK | 14 | 14 | QPSK | 25 | 25 |
| 5MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 10MHz | QPSK | 14 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 15MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 15MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 20MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2. Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3E.3-3 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Downlink RB position shall be $RB_{start}$ = 0 | | | | | | |

## 7.3E.4.2 Test procedure

Same test procedure as in clause 7.3.4.2.

## 7.3E.4.3 Message contents

Same message contents as in clause 7.3.4.3

# 7.3E.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3E.5-1 and Table 7.3E.5-2.

**Table 7.3E.5-1: Reference sensitivity for FDD and TDD UE category 0 QPSK $P_{REFSENS}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| 2 | -99.5 | -96.5 | -94.8 | -91.8 | -90 | -88.8 | FDD |
| 3 | -98.5 | -95.5 | -93.8 | -90.8 | -89 | -87.8 | FDD |
| 4 | -101.5 | -98.5 | -96.8 | -93.8 | -92 | -90.8 | FDD |
| 5 | -100 | -97 | -94.8 | -91.8 | | | FDD |
| 8 | -99 | -96 | -93.8 | -90.8 | | | FDD |
| 13 | | | -93.3 | -90.3 | | | FDD |
| 20 | | | -93.8 | -90.8 | -87.5 | -86.3 | FDD |
| 39 | | | -96.8 | -93.8 | -92 | -90.8 | TDD |
| 41 | | | -94.8 | -91.8 | -90 | -88.8 | TDD |
| NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5<br>NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 | | | | | | | |

**Table 7.3E.5-2: Reference sensitivity for HD-FDD UE category 0 QPSK $P_{REFSENS}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| 2 | -100.3 | -97.3 | -95.6 | -92.6 | -90.8 | -89.6 | HD-FDD |
| 3 | -99.3 | -96.3 | -94.6 | -91.6 | -89.8 | -88.6 | HD-FDD |
| 4 | -102.3 | -99.3 | -97.6 | -94.6 | -92.8 | -91.6 | HD-FDD |
| 5 | -100.8 | -97.8 | -95.6 | -92.6 | | | HD-FDD |
| 8 | -99.8 | -96.8 | -94.6 | -91.6 | | | HD-FDD |
| 13 | | | -94.6 | -91.6 | | | HD-FDD |
| 20 | | | -94.6 | -91.6 | -88.8 | -87.6 | HD-FDD |
| NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5<br>NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 | | | | | | | |

# 7.3EA Reference sensitivity level for UE category M1

## 7.3EA.1 Test purpose

To verify the category M1 UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area of an e-NodeB.

## 7.3EA.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category M1.

## 7.3EA.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3EA-1 and Table 7.3EA-2.

**Table 7.3EA-1: Reference sensitivity for FDD and TDD UE category M1 QPSK $P_{REFSENS}$**

| E-UTRA Band | REFSENS (dBm) | Duplex Mode |
|---|---|---|
| 1 | -102.2 | FDD |
| 2 | -100.2 | FDD |
| 3 | -99.2 | FDD |
| 4 | -102.2 | FDD |
| 5 | -100.7 | FDD |
| 7 | -100.2 | FDD |
| 8 | -99.7 | FDD |
| 11 | -102.2[3] | FDD |
| 12 | -99.2 | FDD |
| 13 | -98.7 | FDD |
| 14 | -98.7 | FDD |
| 18 | -102.2[4] | FDD |
| 19 | -102.2 | FDD |
| 20 | -99.7 | FDD |
| 21 | -102.2[3] | FDD |
| 26 | -100.2 | FDD |
| 27 | -100.7 | FDD |
| 28 | -100.7 | FDD |
| 31 | -96.5 | FDD |
| … | | |
| 39 | -103.7 | TDD |
| 41 | -101.7 | TDD |
| … | | |
| 71 | -99.4 | FDD |
| 72 | -96.5 | FDD |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5EA.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
NOTE 4: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.
NOTE 5: For cat M1 the same RF bandwidth applies for all applicable channel bandwidths as specified in Table 5.4.2.1-1.
NOTE 6: The reference receive sensitivity shall be met for an uplink transmission bandwidth less than or equal to 6 RB except for bands 31 and 72. For bands 31 and 72; in the case of 3 MHz channel bandwidth 5 RB applies and the UL resource blocks shall be located at $RB_{start}$ 9. In case of 5 MHz channel bandwidth 5 RB applies and the UL resource blocks shall be located at $RB_{start}$ 10.
NOTE 7: The UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth.

**Table 7.3EA-2: Reference sensitivity for HD-FDD UE category M1 QPSK $P_{REFSENS}$**

| E-UTRA Band | REFSENS (dBm) | Duplex Mode |
|---|---|---|
| 1 | -103 | HD-FDD |
| 2 | -101 | HD-FDD |
| 3 | -100 | HD-FDD |
| 4 | -103 | HD-FDD |
| 5 | -101.5 | HD-FDD |
| 7 | -101 | HD-FDD |
| 8 | -100.5 | HD-FDD |
| 11 | -103[3] | HD-FDD |
| 12 | -100 | HD-FDD |
| 13 | -100 | HD-FDD |
| 14 | -100 | HD-FDD |
| 18 | -103[4] | HD-FDD |
| 19 | -103 | HD-FDD |
| 20 | -100.5 | HD-FDD |
| 21 | -103[3] | HD-FDD |
| 26 | -101 | HD-FDD |
| 27 | -101.5 | HD-FDD |
| 28 | -101.5 | HD-FDD |
| 31 | -97.3 | HD-FDD |
| 71 | -100.2 | HD-FDD |
| 72 | -97.3 | HD-FDD |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5EA.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
NOTE 4: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.
NOTE 5: For cat M1 the same RF bandwidth applies for all applicable channel bandwidths as specified in Table 5.4.2-1.

The reference receive sensitivity (REFSENS) requirement specified in Table 7.3EA-1/Table 7.3EA-2 shall be met for an uplink transmission bandwidth less than or equal to that specified in Table 7.3EA-3.

NOTE: Table 7.3EA-3 is intended for conformance tests and does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors. Typical receiver sensitivity performance with HARQ retransmission enabled and using a residual BLER metric relevant for e.g. Speech Services is given in the Annex G (informative).

**Table 7.3EA-3: FDD and TDD UE category M1 Uplink configuration for reference sensitivity**

| E-UTRA Band | $N_{RB}$ | Duplex Mode |
|---|---|---|
| 1 | 6[1] | FDD and HD-FDD |
| 2 | 6[1] | FDD and HD-FDD |
| 3 | 6[1] | FDD and HD-FDD |
| 4 | 6[1] | FDD and HD-FDD |
| 5 | 6[1] | FDD and HD-FDD |
| 7 | 6[1] | FDD and HD-FDD |
| 8 | 6[1] | FDD and HD-FDD |
| 11 | 6[1] | FDD and HD-FDD |
| 12 | 6[1] | FDD and HD-FDD |
| 13 | 6[1] | FDD and HD-FDD |
| 14 | 6[1] | FDD and HD-FDD |
| 18 | 6[1] | FDD and HD-FDD |
| 19 | 6[1] | FDD and HD-FDD |
| 20 | 6[1] | FDD and HD-FDD |
| 21 | 6[1] | FDD and HD-FDD |
| 26 | 6[1] | FDD and HD-FDD |
| 27 | 6[1] | FDD and HD-FDD |
| 28 | 6[1] | FDD and HD-FDD |
| 31 | 6[1] | FDD and HD-FDD |
| … | | |
| 39 | 6[1] | TDD |
| 41 | 6[1] | TDD |
| … | | |
| 71 | 6[1] | FDD and HD-FDD |
| 72 | 6[1] | FDD and HD-FDD |
| NOTE 1: [1] refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | |

…

Unless given by Table 7.3EA-4, the minimum requirements specified in Tables 7.3EA-1 and 7.3EA-2 shall be verified with the network signalling value NS_01 (Table 6.2.4EA-1) configured.

**Table 7.3EA-4: Network signalling value for reference sensitivity**

| E-UTRA Band | Network Signalling value |
|---|---|
| 2 | NS_03 |
| 4 | NS_03 |
| 10 | NS_03 |
| 12 | NS_06 |
| 13 | NS_06 |
| 14 | NS_06 |
| 17 | NS_06 |
| 19 | NS_08 |
| 21 | NS_09 |
| 23 | NS_03 |
| 30 | NS_21 |
| 66 | NS_03 |

The normative reference for this requirement is TS 36.101 [2] clauses 7.3.1 and 7.3.1E.

# 7.3EA.4 Test description

## 7.3EA.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for CAT M1 in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.3EA.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 7.3EA.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD and HD-FDD | TDD |
| 5MHz | QPSK | 4 | 4 | QPSK | 6 | 6 |
| Note 1: Downlink RB position shall be $RB_{start}$ = 0 within the narrowband<br>Note 2: The Narrowband index (TS36.211, 5.2.4) shall be set to 0 for all testpoints. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.3EA.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 7.3EA.4.3.

## 7.3EA.4.2 Test procedure

1. SS transmits PDSCH via M-PDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 7.3EA.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

2. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 7.3EA.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3EA.5-1 for FDD and TDD and in Table 7.3EA.5-2 for HD-FDD. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the Throughput measurement.

4. Measure the average throughput for duration sufficient to achieve statistical significance according to Annex G.2.

### 7.3EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions.

**Table 7.3EA.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| mpdcch-NumRepetition-r13 | r1 | | |

#### 7.3EA.4.3.1 Message contents exceptions (network signalled value "NS_01")

Message contents according to TS 36.508 [7] subclause 4.6 can be used without exceptions.

#### 7.3EA.4.3.2 Message contents exceptions (network signalled value "NS_03")

1. Information element additionalSpectrumEmission is set to NS_03. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3EA.4.3.2-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_03"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 3 (NS_03) | | |

#### 7.3EA.4.3.3 Message contents exceptions (network signalled value "NS_06")

1. Information element additionalSpectrumEmission is set to NS_06. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3EA.4.3.3-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_06"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 6 (NS_06) | | |

#### 7.3EA.4.3.4 Message contents exceptions (network signalled value "NS_09")

1. Information element additionalSpectrumEmission is set to NS_09. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3EA.4.3.4-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_09"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 9 (NS_09) | | |

#### 7.3EA.4.3.5 Message contents exceptions (network signalled value "NS_08")

1. Information element additionalSpectrumEmission is set to NS_08. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

**Table 7.3EA.4.3.5-1: *SystemInformationBlockType2*: Additional spurious emissions test requirement for "NS_08"**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| additionalSpectrumEmission | 8 (NS_08) | | |

## 7.3EA.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 with parameters specified in Table 7.3EA.5-1 and Table 7.3EA.5-2.

**Table 7.3EA.5-1: Reference sensitivity for FDD and TDD UE category M1 QPSK $P_{REFSEN}$**

| E-UTRA Band | REFSENS (dBm/1080 kHz) | Duplex Mode |
|---|---|---|
| 1 | -101.5 | FDD |
| 2 | -99.5 | FDD |
| 3 | -98.5 | FDD |
| 4 | -101.5 | FDD |
| 5 | -100.0 | FDD |
| 7 | -99.5 | FDD |
| 8 | -99.0 | FDD |
| 11 | -101.5[3] | FDD |
| 12 | -98.5 | FDD |
| 13 | -98.0 | FDD |
| 14 | -98.0 | FDD |
| 18 | -101.5[4] | FDD |
| 19 | -101.5 | FDD |
| 20 | -99.0 | FDD |
| 21 | -101.5[3] | FDD |
| 26 | -99.5 | FDD |
| 27 | -100.0 | FDD |
| 28 | -100.0 | FDD |
| 31 | -95.8 | FDD |
| … | | |
| 39 | -103.0 | TDD |
| 41 | -101.0 | TDD |
| … | | |
| 71 | -98.3 | FDD |
| 72 | -95.8 | FDD |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5EA.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
NOTE 4: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.
NOTE 5: For cat M1 the same RF bandwidth applies for all applicable channel bandwidths as specified in Table 5.4.2.1-1.
NOTE 6: The reference receive sensitivity shall be met for an uplink transmission bandwidth less than or equal to 6 RB except for bands 31 and 72. For bands 31 and 72; in the case of 3 MHz channel bandwidth 5 RB applies and the UL resource blocks shall be located at $RB_{start}$ 9. In case of 5 MHz channel bandwidth 5 RB applies and the UL resource blocks shall be located at $RB_{start}$ 10.
NOTE 7: The UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth.
NOTE 8: These REFSENS levels are applicable only to 6 RB. OCNG shall be filled to entire channel bandwidth with the same PSD of REFSENS level in 6 RBs.

**Table 7.3EA.5-2: Reference sensitivity for HD-FDD UE category M1 QPSK $P_{REFSENS}$**

| E-UTRA Band | REFSENS (dBm/1080 kHz) | Duplex Mode |
|---|---|---|
| 1 | -102.3 | HD-FDD |
| 2 | -100.3 | HD-FDD |
| 3 | -99.3 | HD-FDD |
| 4 | -102.3 | HD-FDD |
| 5 | -100.8 | HD-FDD |
| 7 | -100.3 | HD-FDD |
| 8 | -99.8 | HD-FDD |
| 11 | -102.3[3] | HD-FDD |
| 12 | -99.3 | HD-FDD |
| 13 | -99.3 | HD-FDD |
| 14 | -99.3 | HD-FDD |
| 18 | -102.3[4] | HD-FDD |
| 19 | -102.3 | HD-FDD |
| 20 | -99.8 | HD-FDD |
| 21 | -102.3[3] | HD-FDD |
| 26 | -100.3 | HD-FDD |
| 27 | -100.8 | HD-FDD |
| 28 | -100.8 | HD-FDD |
| 31 | -96.6 | HD-FDD |
| 71 | -99.5 | |
| 72 | -96.6 | HD-FDD |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5EA.
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
NOTE 3: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
NOTE 4: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.
NOTE 5: For cat M1 the same RF bandwidth applies for all applicable channel bandwidths as specified in Table 5.4.2-1.
NOTE 6: These REFSENS levels are applicable only to 6 RB. OCNG shall be filled to entire channel bandwidth with the same PSD of REFSENS level in 6 RBs.

# 7.3EB Reference sensitivity level for UE category 1bis

## 7.3EB.1 Test purpose

To verify the category 1bis UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area of an e-NodeB.

## 7.3EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

## 7.3EB.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3EB.3-1 and Table 7.3EB.3-2.

**Table 7.3EB.3-1: Reference sensitivity for FDD and TDD UE category 1bis QPSK $P_{REFSENS}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| E-UTRA Band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| 1 | | | -97.5 | -94 | -92.2 | -91 | FDD |
| 2 | -100.2 | -97.2 | -95.5 | -92 | -90.2 | -89 | FDD |
| 3 | -99.2 | -96.2 | -94.5 | -91 | -89.2 | -88 | FDD |
| 4 | -102.2 | -99.2 | -97.5 | -94 | -92.2 | -91 | FDD |
| 5 | -100.7 | -97.7 | -95.5 | -92.5 | | | FDD |
| 7 | | | -95.5 | -92 | -90.2 | -89 | FDD |
| 8 | -99.7 | -96.7 | -94.5 | -91.5 | | | FDD |
| 12 | -98.7 | -95.7 | -94 | -91 | | | FDD |
| 13 | | | -94 | -91 | | | FDD |
| 18 | | | -97.5 | -94.5 | -92.7 | | FDD |
| 20 | | | -94.5 | -91.5 | -88.2 | -87 | FDD |
| 26 | -100.2 | -97.2 | -95.0[3] | -92.0[3] | -90.2[3] | | FDD |
| 28 | | -97.7 | -96.0 | -93.0 | -91.2 | -88.5 | FDD |
| 31 | -96.5 | -92.5 | -90.5 | | | | FDD |
| 39 | | | -97.5 | -94.5 | -92.7 | -91.5 | TDD |
| 41 | | | -95.5 | -92.5 | -90.7 | -89.5 | TDD |
| 66 | -101.7 | -98.7 | -97 | -93.5 | -91.7 | -90.5 | FDD |
| 72 | -96.5 | -92.5 | -90.5 | | | | FDD |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: [3] indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.

**Table 7.3EB.3-2: FDD and TDD UE category 1bis Uplink configuration for reference sensitivity**

| E-UTRA Band / Channel bandwidth / $N_{RB}$ / Duplex mode | | | | | | | |
|---|---|---|---|---|---|---|---|
| E-UTRA Band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex Mode |
| 1 | | | 25 | 50 | 75 | 100 | FDD |
| 2 | 6 | 15 | 25 | 50 | 50[1] | 50[1] | FDD |
| 3 | 6 | 15 | 25 | 50 | 50[1] | 50[1] | FDD |
| 4 | 6 | 15 | 25 | 50 | 75 | 100 | FDD |
| 5 | 6 | 15 | 25 | 25[1] | | | FDD |
| 7 | | | 25 | 50 | 75 | 75[1] | FDD |
| 8 | 6 | 15 | 25 | 25[1] | | | FDD |
| 12 | 6 | 15 | 20[1] | 20[1] | | | FDD |
| 13 | | | 20[1] | 20[1] | | | FDD |
| 18 | | | 25 | 25 | 25 | | FDD |
| 20 | | | 25 | 20[1] | 20[2] | 20[2] | FDD |
| 26 | 6 | 15 | 25 | 25[1] | 25[1] | | FDD |
| 28 | | 15 | 25 | 25[1] | 25[1] | 25[1] | FDD |
| 31 | 6 | 5[3] | 5[3] | | | | FDD |
| 39 | | | 25 | 50 | 75 | 100 | TDD |
| 41 | | | 25 | 50 | 75 | 100 | TDD |
| 66 | 6 | 15 | 25 | 50 | 75 | 100 | FDD |
| 72 | 6 | 5[3] | 5[3] | | | | FDD |

NOTE 1: [1] refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).
NOTE 2: [2] refers to Band 20; in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 16.
NOTE 3: [3] refers to Bands 31 and 72; in the case of 3 MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 9 and in the case of 5 MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 10.

The normative reference for this requirement is TS 36.101 [2] clause 7.3.1E.

# 7.3EB.4 Test description

## 7.3EB.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Tables 7.3EB.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.3EB.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 3MHz | QPSK | 15 | 15 | QPSK | 5[4] | N/A |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[4] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20[5] | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2. Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3EB.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).

Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used.

Note 4: Applicable only to E-UTRA FDD Bands 31 and 72; in the case of 3 MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 9 and in the case of 5 MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 10. (according to Table 7.3EB.3-2).

Note 5: Applicable only to E-UTRA FDD Band 20; in the case of 15 MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 11 and in the case of 20 MHz channel bandwidth, the UL resource blocks shall be located at $RB_{start}$ 16. (according to Table 7.3EB.3-2).

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to Tables 7.3EB.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.3EB.4.3.

### 7.3EB.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.3EB.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Tables 7.3EB.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3EB.5-1. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits $P_{UMAX}$ level for at least the duration of the Throughput measurement.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.3EB.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 7.3EB.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.3EB.5-1 and Table 7.3EB.5-2.

**Table 7.3EB.5-1: Reference sensitivity for FDD and TDD UE category 1bis QPSK $P_{REFSENS}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| 1 | | | -96.8 | -93.3 | -91.5 | -90.3 | FDD |
| 2 | -99.5 | -96.5 | -94.8 | -91.3 | -89.5 | -88.3 | FDD |
| 3 | -98.5 | -95.5 | -93.8 | -90.3 | -88.5 | -87.3 | FDD |
| 4 | -101.5 | -98.5 | -96.8 | -93.3 | -91.5 | -90.3 | FDD |
| 5 | -100 | -97 | -94.8 | -91.8 | | | FDD |
| 7 | | | -94.8 | -91.3 | -89.5 | -88.3 | FDD |
| 8 | -99 | -96 | -93.8 | -90.8 | | | FDD |
| 12 | -98 | -95 | -93.3 | -90.3 | | | FDD |
| 13 | | | -93.3 | -90.3 | | | FDD |
| 18 | | | -96.8 | -93.8 | -92 | | FDD |
| 20 | | | -93.8 | -90.8 | -87.5 | -86.3 | FDD |
| 26 | -99.5 | -96.5 | -94.3[3] | -91.3[3] | -89.5[3] | | FDD |
| 28 | | -97 | -95.3 | -92.3 | -90.5 | -87.8 | FDD |
| 31 | -95.8 | -91.8 | -89.8 | | | | FDD |
| 39 | | | -96.8 | -93.8 | -92 | -90.8 | TDD |
| 41 | | | -94.8 | -91.8 | -90 | -88.8 | TDD |
| 66 | -101 | -98 | -96.3 | -92.8 | -91 | -89.8 | FDD |
| 72 | -95.8 | -91.8 | -89.8 | | | | FDD |

NOTE 1: The transmitter shall be set to $P_{UMAX}$ as defined in subclause 6.2.5
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: [3] indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.

**Table 7.3EB.5-2: FDD and TDD UE category 1bis Uplink configuration for reference sensitivity, $L_{CRB}$ @ $RB_{start}$ format**

| E-UTRA Band / Channel bandwidth / $N_{RB}$ / Duplex mode | | | | | | | |
|---|---|---|---|---|---|---|---|
| E-UTRA Band | 1.4 MHz / 6 | 3 MHz / 15 | 5 MHz / 25 | 10 MHz / 50 | 15 MHz / 75 | 20 MHz / 100 | Duplex Mode |
| 1 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| 2 | 6@0 | 15@0 | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| 3 | 6@0 | 15@0 | 25@0 | 50@0 | 50@25 | 50@50 | FDD |
| 4 | 6@0 | 15@0 | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| 5 | 6@0 | 15@0 | 25@0 | 25@25 | - | - | FDD |
| 7 | - | - | 25@0 | 50@0 | 75@0 | 75@25 | FDD |
| 8 | 6@0 | 15@0 | 25@0 | 25@25 | - | - | FDD |
| 12 | 6@0 | 15@0 | 20@5 | 20@30 | - | - | FDD |
| 13 | - | - | 20@0 | 20@0 | - | - | FDD |
| 18 | - | - | 25@0 | 25@25 | 25@50 | - | FDD |
| 20 | - | - | 25@0 | 20@0 | 20@11 | 20@16 | FDD |
| 26 | 6@0 | 15@0 | 25@0 | 25@25 | 25@50 | - | FDD |
| 28 | | 15@0 | 25@0 | 25@25 | 25@50 | 25@75 | FDD |
| 31 | 6@0 | 5@9 | 5@10 | - | - | - | FDD |
| 39 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| 40 | - | - | 25@0 | 50@0 | 75@0 | 100@0 | TDD |
| 66 | 6@0 | 15@0 | 25@0 | 50@0 | 75@0 | 100@0 | FDD |
| 72 | 6@0 | 5@9 | 5@10 | | | | FDD |

# 7.3EC Reference sensitivity level for UE category M2

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Downlink RB allocation is TBD
- Reference measurement channel not defined for cat M2

## 7.3EC.1 Test purpose

To verify the category M2 UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area of an e-NodeB.

## 7.3EC.2 Test applicability

This test applies to all types of E-UTRA UE release 14 and forward of UE category M2.

## 7.3EC.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3EC.3-1 and Table 7.3EC.3-2.

**Table 7.3EC.3-1: Reference sensitivity for FDD /TDD UE category [M2] QPSK $P_{REFSENS}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| 1 | | | -97.7 | -97.7 | -97.7 | -97.7 | FDD |
| 2 | -100.2 | -97.2 | -95.7 | -95.7 | -95.7 | -95.7 | FDD |
| 3 | -99.2 | -96.2 | -94.7 | -94.7 | -94.7 | -94.7 | FDD |
| 4 | -102.2 | -99.2 | -97.7 | -97.7 | -97.7 | -97.7 | FDD |
| 5 | -100.7 | -97.7 | -95.7 | -95.7 | | | FDD |
| 7 | | | -95.7 | -95.7 | -95.7 | -95.7 | FDD |
| 8 | -99.7 | -96.7 | -94.7 | -94.7 | | | FDD |
| 11 | | | -97.7 | -97.7 | | | |
| 12 | -99.2 | -96.2 | -94.7 | -94.7 | | | FDD |
| 13 | | | -94.2 | -94.2 | | | FDD |
| … | | | | | | | |
| 18 | | | -97.7 | -97.7 | -97.7 | | FDD |
| 19 | | | -97.7 | -97.7 | -97.7 | | FDD |
| 20 | | | -94.7 | -94.7 | -94.7 | -94.7 | FDD |
| 21 | | | -97.7 | -97.7 | -97.7 | | FDD |
| 25 | -98.7 | -95.7 | -94.2 | -94.2 | -94.2 | -94.2 | FDD |
| 26 | -100.2 | -97.2 | -95.2 | -95.2 | -95.2 | | FDD |
| 27 | -100.7 | -97.7 | -95.7 | -95.7 | | | FDD |
| 28 | | -97.7 | -96.2 | -96.2 | -96.2 | -96.2 | FDD |
| 31 | -96.5 | -93.2 | -91.2 | | | | FDD |
| … | | | | | | | |
| 39 | | | -97.7 | -97.7 | -97.7 | -97.7 | TDD |
| 40 | | | -97.7 | -97.7 | -97.7 | -97.7 | TDD |
| 41 | | | -95.7 | -95.7 | -95.7 | -95.7 | TDD |
| 66 | -101.7 | -98.7 | -97.2 | -97.2 | -97.2 | -97.2 | FDD |
| … | | | | | | | |
| 71 | [-99.4] | [-95.4] | [-93.4] | [-93.4] | [-93.4] | [-93.4] | FDD |
| 72 | -96.5 | -93.2 | -91.2 | | | | FDD |

NOTE 1: The transmitter shall be set to PUMAX as defined in subclause 6.2.5
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
NOTE 4: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.
NOTE 5: The UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth.

**Table 7.3EC.3-2: Reference sensitivity for HD-FDD category [M2] QPSK $P_{REFSENS}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| 1 | | | -97 | -97 | -97 | -97 | HD-FDD |
| 2 | -101 | -97 | -95 | -95 | -95 | -95 | HD-FDD |
| 3 | -100 | -96 | -94 | -94 | -94 | -94 | HD-FDD |
| 4 | -103 | -99 | -97 | -97 | -97 | -97 | HD-FDD |
| 5 | -101.5 | -97.5 | -95.5 | -95.5 | | | HD-FDD |
| 7 | | | -95 | -95 | -95 | -95 | HD-FDD |
| 8 | -100.5 | -96.5 | -94.5 | -94.5 | | | HD-FDD |
| 11 | | | -97 | -97 | | | HD-FDD |
| 12 | -100 | -96 | -94 | -94 | | | HD-FDD |
| 13 | | | -94 | -94 | | | HD-FDD |
| 14 | | | -94 | -94 | | | HD-FDD |
| 18 | | | -97 | -97 | -97 | | HD-FDD |
| 19 | | | -97 | -97 | -97 | | HD-FDD |
| 20 | | | -94.5 | -94.5 | -94.5 | -94.5 | HD-FDD |
| 21 | | | -97 | -97 | -97 | | HD-FDD |
| 25 | -99.5 | -95.5 | -93.5 | -93.5 | -93.5 | -93.5 | HD-FDD |
| 26 | -101 | -97 | -95 | -95 | -95 | | HD-FDD |
| 27 | -101.5 | -97.5 | -95.5 | -95.5 | | | HD-FDD |
| 28 | | -97.5 | -95.5 | -95.5 | -95.5 | -95.5 | HD-FDD |
| 31 | -97.3 | -93.3 | -91.3 | | | | HD-FDD |
| 71 | -100.2 | -96.2 | -94.2 | -94.2 | -94.2 | -94.2 | HD-FDD |
| 72 | -97.3 | -93.3 | -91.3 | | | | HD-FDD |

NOTE 1: The transmitter shall be set to PUMAX as defined in subclause 6.2.5
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
NOTE 4: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.

The reference receive sensitivity (REFSENS) requirement specified in Table 7.3EC.3-1/Table 7.3EC.3-2 shall be met for an uplink transmission bandwidth less than or equal to that specified in Table 7.3EC.3-3.

NOTE: Table 7.3EC.3-3 is intended for conformance tests and does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors. Typical receiver sensitivity performance with HARQ retransmission enabled and using a residual BLER metric relevant for e.g. Speech Services is given in the Annex G (informative).

**Table 7.3EC.3-3: FDD/HD-FDD and TDD UE category M2 Uplink configuration for reference sensitivity**

| E-UTRA Band / Channel bandwidth / $N_{RB}$ / Duplex mode | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA Band** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **Duplex Mode** |
| 1 | | | [24] | [24] | [24] | [24] | FDD/HD-FDD |
| 2 | [6] | [15] | [24] | [24] | [24] | [24] | FDD/HD-FDD |
| 3 | [6] | [15] | [24] | [24] | [24] | [24] | FDD/HD-FDD |
| 4 | [6] | [15] | [24] | [24] | [24] | [24] | FDD/HD-FDD |
| 5 | [6] | [15] | [24] | [24] | | | FDD/HD-FDD |
| 7 | | | [24] | [24] | [24] | [24] | FDD/HD-FDD |
| 8 | [6] | [15] | [24] | [24] | | | FDD/HD-FDD |
| 11 | | | [24] | [24] | | | FDD/HD-FDD |
| 12 | [6] | [15] | [20[1]] | [20[1]] | | | FDD/HD-FDD |
| 13 | | | [20[1]] | [20[1]] | | | FDD/HD-FDD |
| 14 | | | [15[1]] | [15[1]] | | | FDD/HD-FDD |
| 18 | | | [24] | [24] | [24] | | FDD/HD-FDD |
| 19 | | | [24] | [24] | [24] | | FDD/HD-FDD |
| 20 | | | [24] | [20[1]] | [20[3]] | [20[3]] | FDD/HD-FDD |
| 21 | | | [24] | [24[1]] | [24[1]] | | FDD/HD-FDD |
| 25 | [6] | [15] | [24] | [24] | [24] | [24] | FDD/HD-FDD |
| 26 | [6] | [15] | [24] | [24] | [24] | | FDD/HD-FDD |
| 27 | [6] | [15] | [24] | [24] | | | FDD/HD-FDD |
| 28 | | [15] | [24] | [24] | [24] | [24] | FDD/HD-FDD |
| 31 | [6] | [5[4]] | [5[4]] | | | | FDD/HD-FDD |
| … | | | | | | | |
| 39 | | | | [24] | [24] | [24] | TDD |
| 40 | | | | [24] | [24] | [24] | TDD |
| 41 | | | | [24] | [24] | [24] | TDD |
| … | | | | | | | |
| 71 | [6] | [15] | [24] | [24] | [24] | [24] | FDD/HD-FDD |
| 72 | [6] | [5[4]] | [5[4]] | | | | FDD/HD-FDD |

NOTE 1: [1] refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).

NOTE 2: For the UE which supports both Band 11 and Band 21 the uplink configuration for reference sensitivity is FFS.

NOTE 3: [3] refers to Band 20; in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RBstart 11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RBstart 16

NOTE 4: [4] refers to Bands 31 and 72; in the case of 3 MHz channel bandwidth, the UL resource blocks shall be located at RBstart 9 and in the case of 5 MHz channel bandwidth, the UL resource blocks shall be located at RBstart 10.

Unless given by Table 7.3EC.3-4, the minimum requirements specified in Tables 7.3EC.3-1 and 7.3EC.3-2 shall be verified with the network signalling value NS_01 (Table 6.2.4EA-1) configured.

**Table 7.3EC.3-4: Network signalling value for reference sensitivity**

| E-UTRA Band | Network Signalling value |
|---|---|
| 2 | NS_03 |
| 4 | NS_03 |
| 10 | NS_03 |
| 12 | NS_06 |
| 13 | NS_06 |
| 14 | NS_06 |
| 17 | NS_06 |
| 19 | NS_08 |
| 21 | NS_09 |
| 23 | NS_03 |
| 30 | NS_21 |
| 66 | NS_03 |
| 71 | NS_35 |

The normative reference for this requirement is TS 36.101 [2] clauses 7.3.1 and 7.3.1E.

# 7.3EC.4 Test description

## 7.3EC.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for CAT M2 in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.3EC.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 7.3EC.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD and HD-FDD | TDD |
| 1.4MHz | QPSK | TBD | N/A | QPSK | [6] | N/A |
| 3MHz | QPSK | TBD | N/A | QPSK | [15] | N/A |
| 5MHz | QPSK | TBD | N/A | QPSK | [24] | N/A |
| 5MHz | QPSK | TBD | N/A | QPSK | [20[3]] | N/A |
| 5MHz | QPSK | TBD | N/A | QPSK | [5[4]] | N/A |
| 10MHz | QPSK | N/A | TBD | QPSK | N/A | [24] |
| Note 1: Downlink RB position shall be $RB_{start}$ = 0 within the narrowband<br>Note 2: The Wideband index (TS36.211, 5.2.4) shall be set to 0 for all testpoints.<br>Note 3: Applicable only to E-UTRA FDD band 12 and 13. The UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).<br>Note 4: Applicable only to E-UTRA FDD bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3EC.3-3). | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.3EC.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 7.3EC.4.3.

## 7.3EC.4.2 Test procedure

Same as in clause 7.3EA.4.2

## 7.3EC.4.3 Message contents

Same as in clause 7.3EA.4.3

## 7.3EC.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 with parameters specified in Table 7.3EC.5-1 and Table 7.3EC.5-2.

**Table 7.3EC.5-1: Reference sensitivity for FDD and TDD UE category M2 QPSK $P_{REFSEN}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| 1 | | | -97 | -97 | -97 | -97 | FDD |
| 2 | -99.5 | -96.5 | -95 | -95 | -95 | -95 | FDD |
| 3 | -98.5 | -95.5 | -94 | -94 | -94 | -94 | FDD |
| 4 | -101.5 | -98.5 | -97 | -97 | -97 | -97 | FDD |
| 5 | -100 | -97 | -95 | -95 | | | FDD |
| 7 | | | -95 | -95 | -95 | -95 | FDD |
| 8 | -99 | -96 | -94 | -94 | | | FDD |
| 11 | 0.7 | 0.7 | -97 | -97 | | | |
| 12 | -98.5 | -95.5 | -94 | -94 | | | FDD |
| 13 | | | -93.5 | -93.5 | | | FDD |
| … | | | | | | | |
| 18 | | | -97 | -97 | -97 | | FDD |
| 19 | | | -97 | -97 | -97 | | FDD |
| 20 | | | -94 | -94 | -94 | -94 | FDD |
| 21 | | | -97 | -97 | -97 | | FDD |
| 25 | -98 | -95 | -93.5 | -93.5 | -93.5 | -93.5 | FDD |
| 26 | -99.5 | -96.5 | -94.5 | -94.5 | -94.5 | | FDD |
| 27 | -100 | -97 | -95 | -95 | 0.7 | | FDD |
| 28 | 0.7 | -97 | -95.5 | -95.5 | -95.5 | -95.5 | FDD |
| 31 | -95.8 | -92.5 | -90.5 | | | | FDD |
| … | | | | | | | |
| 39 | | | -97 | -97 | -97 | -97 | TDD |
| 40 | | | -97 | -97 | -97 | -97 | TDD |
| 41 | | | -95 | -95 | -95 | -95 | TDD |
| 66 | -101 | -98 | -96.5 | -96.5 | -96.5 | -96.5 | FDD |
| … | | | | | | | |
| 71 | [-98.7] | [-94.7] | [-92.7] | [-92.7] | [-92.7] | [-92.7] | FDD |
| 72 | -95.8 | -92.5 | -90.5 | | | | FDD |

NOTE 1: The transmitter shall be set to PUMAX as defined in subclause 6.2.5
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
NOTE 4: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.
NOTE 5: The UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth.

**Table 7.3EC.5-2: Reference sensitivity for HD-FDD UE category M2 QPSK $P_{REFSENS}$**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| E-UTRA Band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| 1 | | | -96.3 | -96.3 | -96.3 | -96.3 | HD-FDD |
| 2 | -100.3 | -96.3 | -94.3 | -94.3 | -94.3 | -94.3 | HD-FDD |
| 3 | -99.3 | -95.3 | -93.3 | -93.3 | -93.3 | -93.3 | HD-FDD |
| 4 | -102.3 | -98.3 | -96.3 | -96.3 | -96.3 | -96.3 | HD-FDD |
| 5 | -100.8 | -96.8 | -94.8 | -94.8 | | | HD-FDD |
| 7 | | | -94.3 | -94.3 | -94.3 | -94.3 | HD-FDD |
| 8 | -99.8 | -95.8 | -93.8 | -93.8 | | | HD-FDD |
| 11 | | | -96.3 | -96.3 | | | HD-FDD |
| 12 | -99.3 | -95.3 | -93.3 | -93.3 | | | HD-FDD |
| 13 | | | -93.3 | -93.3 | | | HD-FDD |
| 14 | | | -93.3 | -93.3 | | | HD-FDD |
| 18 | | | -96.3 | -96.3 | -96.3 | | HD-FDD |
| 19 | | | -96.3 | -96.3 | -96.3 | | HD-FDD |
| 20 | | | -93.8 | -93.8 | -93.8 | -93.8 | HD-FDD |
| 21 | | | -96.3 | -96.3 | -96.3 | | HD-FDD |
| 25 | -98.8 | -94.8 | -92.8 | -92.8 | -92.8 | -92.8 | HD-FDD |
| 26 | -100.3 | -96.3 | -94.3 | -94.3 | -94.3 | | HD-FDD |
| 27 | -100.8 | -96.8 | -94.8 | -94.8 | 0.7 | | HD-FDD |
| 28 | | -96.8 | -94.8 | -94.8 | -94.8 | -94.8 | HD-FDD |
| 31 | -96.6 | -92.6 | -90.6 | | | | HD-FDD |
| 71 | -99.5 | -95.5 | -93.5 | -93.5 | -93.5 | -93.5 | HD-FDD |
| 72 | -96.6 | -92.6 | -90.6 | | | | HD-FDD |

NOTE 1: The transmitter shall be set to PUMAX as defined in subclause 6.2.5
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
NOTE 4: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.

# 7.3F Reference sensitivity level for category NB1 and NB2

## 7.3F.1 Reference sensitivity level without repetitions for category NB1 and NB2

### 7.3F.1.1 Test purpose

To verify the UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area of an e-NodeB.

### 7.3F.1.2 Test applicability

This test applies to all types of UE release 13 and forward of category NB1.

This test applies to all types of UE release 14 and forward of category NB2.

### 7.3F.1.3 Minimum conformance requirements

The category NB1 and NB2 UE throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with received signal level as specified in Table 7.3F.1.3-1. Requirement in Table 7.3F.1.3-1 applies for any uplink configuration.

**Table 7.3F.1.3-1: Reference sensitivity for category NB1 and NB2**

| Operating band | REFSENS [dBm] |
|---|---|
| 1, 2, 3, [4], 5, 8, 11, 12, 13, 14, 17, 18, 19, 20, 21, 25, 26, 28, 31, 66, 70, 71, 72 | - 108.2 |

The normative reference for this requirement is TS 36.101 clause 7.3.1F.1.

## 7.3F.1.4 Test description

### 7.3F.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters, and are shown in table 7.3F.1.4.1-1. The details of the downlink reference measurement channel (RMC) are specified in Annex A.3. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 7.3F.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 8.1.1 | | | NC, TL/VL, TL/VH, TH/VL, TH/VH | | |
| Test Frequencies as specified in TS36.508 [7] clause 8.1.3.1 | | | Frequency ranges defined in Annex K.1.2 | | |
| **Configuration ID** | **Downlink Configuration** | | **Uplink Configuration** | | |
| | Modulation | Subcarriers | Modulation | $N_{tones}$ | Subcarrier spacing |
| 1 | QPSK | 12 | BPSK | 1@0 | 15kHz |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only the main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C0, C1 and C.3.0, and NPUSCH Format 2 is used to carry ACK/NACK on the uplink.
4. The DL Reference Measurement channels are set according to Table 7.3F.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 7.3F.1.4.3.

### 7.3F.1.4.2 Test Procedure

1. SS transmits NPDSCH via NPDCCH DCI format N1 for C_RNTI to transmit the DL RMC according to Table 7.3F.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The UE will send the HARQ feedback based on information contain in DCI format N1.
2. Set the Downlink signal level to the REFSENS value defined in Table 7.3F.1.5-1.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.3F.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.6.

### 7.3F.1.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.3F.1.5-1.

**Table 7.3F.1.5-1: Reference sensitivity for category NB1 and NB2**

| Operating band | REFSENS [dBm] |
|---|---|
| 1, 2, 3, [4], 5, 8, 11, 12, 13, 14, 17, 18, 19, 20, 21, 25, 26, 28, 31, 66, 70, 71, 72 | - 107.5 |

## 7.3F.2 Void

# 7.3G Reference sensitivity level for V2X Communication

## 7.3G.0 Minimum conformance requirements

When UE is configured for E-UTRA V2X reception non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.2G-1, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.8.2 with parameters specified in Table 7.3G.0-1.

**Table 7.3G.0-1: Reference sensitivity of E-UTRA V2X Bands (PC5)**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| E-UTRA V2X Band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| 47 | | | | -90.4 | | -87.5 | HD |
| NOTE 1: Reference measurement channel is defined in A.8.2.<br>NOTE 2: The signal power is specified per port. | | | | | | | |

**Table 7.3G.0-1a: Sidelink TX configuration for reference sensitivity of E-UTRA V2X Bands (PC5)**

| E-UTRA Band / Channel bandwidth / $N_{RB}$ / Duplex mode | | | | | | | |
|---|---|---|---|---|---|---|---|
| E-UTRA V2X Band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex Mode |
| 47 | | | | 50 | | 98 | HD |

When UE is configured for E-UTRA V2X reception on V2X carrier con-current with E-UTRA uplink and downlink for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-2 with one or multiple contiguous carriers in V2X sidelink, E-UTRA V2X sidelink throughput for each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.8.2 with parameters specified in Table 7.3G.0-2. Also the E-UTRA downlink throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.3.3.2.

For the UE which supports V2X in an operating band as specified in Table 5.2G-2, and the UE also supports a E-UTRA downlink inter-band con-current configuration in Table 7.3.1-1A, the minimum requirement for reference sensitivity in Table 7.3G.0-1 and Table 7.3G.0-2 shall be increased by the amount given in $\Delta R_{IB,c}$ in Table 7.3G.0-2a for the corresponding E-UTRA V2X band.

**Table 7.3G.0-2: Reference sensitivity for V2X Communication QPSK $P_{REFSENS}$**

| Inter-band V2X reception | | Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| E-UTRA V2X Band | E-UTRA or V2X band | E-UTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| Band 47 | Band 3 | 3 | -101.7 | -98.7 | -97 | -94 | -92.2 | -91 | FDD |
| | | 47 | | | | -90.4 | | -87.5 | HD |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Band 47 | Band 5 | 5 | | | -98 | -95 | | | FDD |
| | | 47 | | | | -90.4 | | -87.5 | HD |
| Band 47 | Band 7 | 7 | | | -98 | -95 | -93.2 | -92 | FDD |
| | | 47 | | | | -90.4 | | -87.5 | HD |
| Band 47 | Band 8 | 8 | -102.2 | -99.2 | -97 | -94 | | | FDD |
| | | 47 | | | | -90.4 | | -87.5 | HD |
| Band 47 | Band 20 | 20 | | | -97 | -94 | -91.2 | -90 | FDD |
| | | 47 | | | | -90.4 | | -87.5 | HD |
| Band 47 | Band 28 | 28 | | -100.2 | -98.5 | -95.5 | -93.7 | -91 | FDD |
| | | 47 | | | | -90.4 | | -87.5 | HD |
| Band 47 | Band 34 | 34 | | | -100 | -97 | -95.2 | | TDD |
| | | 47 | | | | -90.4 | | -87.5 | HD |
| Band 47 | Band 39 | 39 | | | -100 | -97 | -95.2 | -94 | TDD |
| | | 47 | | | | -90.4 | | -87.5 | HD |
| Band 47 | Band 41 | 41 | | | -98 | -95 | -93.2 | -92 | TDD |
| | | 47 | | | | -90.4 | | -87.5 | HD |
| Band 47 | Band 71 | 71 | | | -97.2 | -94.2 | -92 | -87.5 | FDD |
| | | 47 | | | | -90.4 | | -87.5 | HD |

**Table 7.3G.0-2A: $\Delta R_{IB,c}$ (two bands)**

| V2X inter-band con-current band Configuration | E-UTRA Band | $\Delta R_{IB,c}$ [dB] |
|---|---|---|
| V2X_3A-47A | 3 | 0 |
| V2X_5-47 | 5 | 0.2 |
| V2X_7A-47A | 7 | 0 |
| V2X_8A-47A | 8 | 0 |
| V2X_20-47 | 20 | 0.2 |
| V2X_28A-47A | 28 | 0.2 |
| V2X_34-47 | 34 | 0 |
| V2X_39A-47A | 39 | 0 |
| V2X_41A-47A | 41 | 0 |
| V2X_71A-47A | 71 | 0 |

The reference sensitivity is defined to be met with E-UTRA uplink assigned to one band (that differs from the V2X operating band) and all E-UTRA downlink carriers active. The E-UTRA uplink resource blocks shall be located as close as possible to E-UTRA V2X operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). The uplink configuration for the E-UTRA operating band is specified in Table 7.3G.0-3 and 7.3G.0-4.

**Table 7.3G.0-3: Uplink configuration for REFSENS of E-UTRA V2X Bands(PC5)**

| Inter-band E-UTRA V2X /E-UTRA configuration | | E-UTRA UL band / Channel BW / $N_{RB}$ / Duplex mode | | | |
|---|---|---|---|---|---|
| E-UTRA V2X band (PC5) | E-UTRA V2X band (Uu) | E-UTRA V2X UL band (Uu) | Channel Bandwidth (MHz) | $N_{RB}$ | Duplex Mode |
| 47 | 3 | 3 | 10 | 50 | FDD |
| 47 | 5 | 5 | 10 | 50 | FDD |
| 47 | 7 | 7 | 10 | 50 | FDD |
| 47 | 8 | 8 | 10 | 50 | FDD |
| 47 | 20 | 20 | 10 | 50 | FDD |
| 47 | 28 | 28 | 10 | 50 | FDD |
| 47 | 34 | 34 | 10 | 50 | TDD |
| 47 | 39 | 39 | 10 | 50 | TDD |
| 47 | 41 | 41 | 10 | 50 | TDD |
| 47 | 71 | 71 | 10 | 50 | FDD |

**Table 7.3G.0-4: Sidelink TX configuration for REFSENS of E-UTRA V2X Bands**

| Inter-band E-UTRA V2X /E-UTRA configuration | | E-UTRA UL band / Channel BW / $N_{RB}$ / Duplex mode | | | |
|---|---|---|---|---|---|
| E-UTRA V2X band (PC5) | E-UTRA V2X band (Uu) | E-UTRA or V2X band (PC5) | Channel Bandwidth (MHz) | $N_{RB}$ | Duplex Mode |
| 47 | 3 | 47 | 10 | 50 | HD |
| 47 | 5 | 47 | 10 | 50 | HD |
| 47 | 7 | 47 | 10 | 50 | HD |
| 47 | 8 | 47 | 10 | 50 | HD |
| 47 | 20 | 47 | 10 | 50 | HD |
| 47 | 28 | 47 | 10 | 50 | HD |
| 47 | 34 | 47 | 10 | 50 | HD |
| 47 | 39 | 47 | 10 | 50 | HD |
| 47 | 41 | 47 | 10 | 50 | HD |
| 47 | 71 | 47 | 10 | 50 | HD |

For intra-band contiguous multi-carrier operation the reference sensitivity requirement specified in Table 7.3G.0-1 shall apply for each component carrier with all carriers active. The requirement is applied for multi-carrier intra-band concurrent receptions when 2 carrier transmissions are activated at the same time.

**Table 7.3G.0-5: Sidelink TX configuration for REFSENS of E-UTRA V2X Bands for intra-band multi-carrier operation**

| V2X configuration | 50RB+50RB | | 100RB+50RB | | Duplex Mode |
|---|---|---|---|---|---|
| | PCC | SCC | PCC | SCC | |
| V2X_47B | 50 | 50 | N/A | N/A | HD |
| V2X_47C | N/A | N/A | 100 | 50 | HD |

The normative reference for this requirement is TS 36.101 [2] clause 7.3.1G.

## 7.3G.1 Reference sensitivity level for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 7.3G.1.1 Test purpose

Verify that UE receives V2X Communication physical channels data with a given average throughput under conditions of low signal level and ideal propagation.

## 7.3G.1.2 Test applicability

This test case applies to all types of UE that support V2X Sidelink Communication and Band 47.

## 7.3G.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3G.0.

## 7.3G.1.4 Test description

### 7.3G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.3G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 7.3G.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 96 |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.92.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 7.3G.1.4.3.

3. The V2X reference measurement channel is set according to Table 7.3G.1.4.1-1.

3a. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 5A-V2X in Receive Mode according to TS 36.508 [7] clause 4.5.9. Message content exceptions are defined in clause 7.3G.1.4.3.

6. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 7.3G.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration and to schedule the V2X RMC according to Table 7.3G.1.4.1-1.

2. Set the signal level of V2X to the appropriate REFSENS value defined in Table 7.3 G.1.3-1.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

#### 7.3G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.10.

### 7.3G.1.5 Test requirements

When UE is configured for E-UTRA V2X reception non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.2G-1, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.8.2 with parameters specified in Table 7.3G.1.5-1.

**Table 7.3G.1.5-1: Reference sensitivity**

| Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **E-UTRA V2X Band** | **1.4 MHz (dBm)** | **3 MHz (dBm)** | **5 MHz (dBm)** | **10 MHz (dBm)** | **15 MHz (dBm)** | **20 MHz (dBm)** | **Duplex Mode** |
| 47 | | | | -89 | | -86.1 | TDD |
| NOTE 1: Reference measurement channel is defined in A.8.2.<br>NOTE 2: The signal power is specified per port. | | | | | | | |

## 7.3G.2 Reference sensitivity level for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

### 7.3G.2.1 Test purpose

Same as in clause 7.3G.1.1.

### 7.3G.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support V2X Communication.

### 7.3G.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3G.0.

### 7.3G.2.4 Test description

#### 7.3G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.3G.2.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3.

**Table 7.3G.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Low range, Mid range, High range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink** | | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | QPSK | 1 | QPSK | 1 | 10 MHz | QPSK | 48 |
| 1.4 MHz | QPSK | 5 | QPSK | 5 | 20 MHz | QPSK | 96 |
| 3 MHz | QPSK | 1 | QPSK | 1 | | | |
| 3 MHz | QPSK | 4 | QPSK | 4 | | | |
| 5 MHz | QPSK | 1 | QPSK | 1 | | | |
| 5 MHz | QPSK | 8 | QPSK | 8 | | | |
| 10 MHz | QPSK | 1 | QPSK | 1 | | | |
| 10 MHz | QPSK | 12 | QPSK | 12 | | | |
| 15 MHz | QPSK | 1 | QPSK | 1 | | | |
| 15 MHz | QPSK | 16 | QPSK | 16 | | | |
| 20 MHz | QPSK | 1 | QPSK | 1 | | | |
| 20 MHz | QPSK | 18 | QPSK | 18 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3G.0-4 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2G.1-2). | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 7.3G.2.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to Table 7.3G.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 7.3G.2.4.3.

### 7.3G.2.4.2 Test procedure

1. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.3G.2.4.1-1 on E-UTRA band. The SS sends downlink MAC padding bits on the DL RMC.
2. SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 7.3G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.
3. Set the signal level of V2X for V2X band and E-UTRA band to the appropriate REFSENS value defined in Table 7.3G.2.5-1.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.3G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 7.3G.2.5 Test requirements

When UE is configured for E-UTRA V2X reception on V2X carrier con-current with E-UTRA uplink for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-2, E-UTRA V2X sidelink throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.8.2 with parameters specified in Table 7.3G.2.5-1. Also the E-UTRA downlink throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.3.3.2.

For the UE which supports V2X in an operating band as specified in Table 5.2G-2, and the UE also supports a E-UTRA downlink inter-band con-current configuration in Table 7.3.1G-2A, the minimum requirement for reference sensitivity in Table 7.3G.0-1 and Table 7.3G.0-2 shall be increased by the amount given in $\Delta R_{IB,c}$ in Table 7.3.1G-2A for the corresponding E-UTRA V2X band.

**Table 7.3G.2.5-1: Reference sensitivity for V2X Communication QPSK $P_{REFSENS}$**

| Inter-band V2V reception | | Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| E-UTRA V2X Band | E-UTRA band | E-UTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| Band 47 | Band 3 | 3 | -101 | -98 | -96.3 | -93.3 | -91.5 | -90.3 | TDD-FDD |
| | | 47 | | | | -88.9 | | -86 | |
| Band 47 | Band 5 | 5 | | | -97.3 | -94.3 | | | TDD-FDD |
| | | 47 | | | | -88.9 | | -86 | |
| Band 47 | Band 7 | 7 | | | -97.3 | -94.3 | -92.5 | -91.3 | TDD-FDD |
| | | 47 | | | | -88.9 | | -86 | |
| Band 47 | Band 8 | 8 | -101.5 | -98.5 | -96.3 | -93.3 | | | TDD-FDD |
| | | 47 | | | | -88.9 | | -86 | |
| Band 47 | Band 20 | 20 | | | -96.3 | -93.3 | -90.5 | -89.3 | TDD-FDD |
| | | 47 | | | | -88.9 | | -86 | |
| Band 47 | Band 28 | 28 | | -99.5 | -97.8 | -94.8 | -93 | -90.3 | TDD-FDD |
| | | 47 | | | | -88.9 | | -86 | |
| Band 47 | Band 34 | 34 | | | -99.3 | -96.3 | -94.5 | | TDD-TDD |
| | | 47 | | | | -88.9 | | -86 | |
| Band 47 | Band 39 | 39 | | | -99.3 | -96.3 | -94.5 | -93.3 | TDD-TDD |
| | | 47 | | | | -88.9 | | -86 | |
| Band 47 | Band 41 | 41 | | | -97.3 | -94.3 | -92.5 | -91.3 | TDD-TDD |
| | | 47 | | | | -88.9 | | -86 | |
| Band 47 | Band 71 | 71 | | | -96.5 | -93.5 | -91.3 | -86.8 | TDD-FDD |
| | | 47 | | | | -88.9 | | -86 | |

## 7.3G.3 Reference sensitivity level for V2X Communication / Intra-band contiguous multi-carrier operation

### 7.3G.3.1 Test purpose

Same as in clause 7.3G.1.1.

### 7.3G.3.2 Test applicability

This test case applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 7.3G.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.3G.0.

#### 7.3G.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.3G.3.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 7.3G.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for Channel Bandwidths** | | | |
| **V2X multi-carrier Configuration** | | **V2X PSSCH Allocation** | |
| **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **CC1 and CC2 RB Allocation** |
| 10MHz | 10MHz | QPSK | 48+48 |

1. Connect the SS and GNSS simulator to the UE antenna connector as shown in TS 36.508 [7] Annex A, Figure A.89a.
2. The parameter settings for the V2X sidelink communication over PC5 are pre-configured according to TS 36.508 [7] subclause 101.4. Message content exceptions are defined in clause 7.3G.3.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to Table 7.3G.3.4.1-1.

4a. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X according to TS 36.508 [7] clause 4.5.9.
7. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)
8. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 7.3G.3.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration and to schedule the V2X RMC according to Table 7.3G.3.4.1-1 for 2 carrier intra-concurrent receptions. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
2. Set the signal level of V2X for each component carrier to the appropriate REFSENS value defined in Table 7.3G.3.5-3.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2 .

### 7.3G.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 7.3G.3.5 Test requirements

When UE is configured for E-UTRA V2X reception non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in Table 5.2G-1, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.8.2 with parameters specified in Table 7.3G.3.5-3.

**Table 7.3G.3.5-3: Reference sensitivity for V2X Communication QPSK $P_{REFSENS}$**

| Intra-band multi-carrier | | Channel bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| E-UTRA V2X Band | E-UTRA V2X Band | E-UTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| Band 47 | Band 47 | 47 | | | | -88.9 | | -86 | TDD-TDD |
| | | 47 | | | | -88.9 | | -86 | |

For intra-band contiguous multi-carrier operation, the above reference sensitivity requirement shall apply for each component carrier with both carriers active. The requirement is applied for 2 carrier intra-concurrent receptions when 2 carrier transmissions are activated at the same time.

## 7.4 Maximum input level

### 7.4.1 Test purpose

Maximum input level tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to an e-NodeB.

### 7.4.2 Test applicability

This test applies to all types of E-UTRA UE release 8 and forward.

### 7.4.3 Minimum conformance requirements

Maximum input level is defined as the maximum mean power received at the UE antenna port, at which the specified relative throughput shall meet or exceed the minimum requirements for the specified reference measurement channel.

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.4.3-1. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.4.3-1: Maximum input level**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -25[2] | | | | | |
| | | -27[3] | | | | | |
| NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5. | | | | | | | |
| NOTE 2: Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| NOTE 3: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.4.1.

## 7.4.4 Test description

### 7.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.4.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.4.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 | Mid range | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3.1 | Lowest, 5MHz, Highest | | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | | **UE** |
| | | **FDD** | **TDD** | | **FDD** | **TDD** | **Category** |
| 1.4MHz | 64-QAM | 6 | 6 | QPSK | 6 | 6 | 1-5 |
| 3MHz | 64-QAM | 15 | 15 | QPSK | 15 | 15 | 1-5 |
| 5MHz | 64-QAM | 25 | 25 | QPSK | 25 | 25 | 2-5 |
| 5MHz | 64-QAM | 25 | N/A | QPSK | 20 | N/A | 2-5 |
| 5MHz | 64-QAM | 25 | N/A | QPSK | 15 | N/A | 2-5 |
| 5MHz | 64-QAM | 25 | N/A | QPSK | 5[4] | N/A | 2-5 |
| 5MHz | 64-QAM | 18 | 18 | QPSK | 25 | 25 | 1 |
| 5MHz | 64-QAM | 18 | 18 | QPSK | 20 | 20 | 1 |
| 5MHz | 64-QAM | 18 | 18 | QPSK | 15 | 15 | 1 |
| 5MHz | 64-QAM | 18 | N/A | QPSK | 5[4] | N/A | 1 |
| 10MHz | 64-QAM | 50 | 50 | QPSK | 50 | 50 | 2-5 |
| 10MHz | 64-QAM | 50 | N/A | QPSK | 25 | N/A | 2-5 |
| 10MHz | 64-QAM | 50 | N/A | QPSK | 20 | N/A | 2-5 |
| 10MHz | 64-QAM | 50 | N/A | QPSK | 15 | N/A | 2-5 |
| 10MHz | 64-QAM | 17 | 17 | QPSK | 50 | 50 | 1 |
| 10MHz | 64-QAM | 17 | N/A | QPSK | 25 | N/A | 1 |
| 10MHz | 64-QAM | 17 | N/A | QPSK | 20 | N/A | 1 |
| 10MHz | 64-QAM | 17 | N/A | QPSK | 15 | N/A | 1 |
| 15MHz | 64-QAM | 75 | 75 | QPSK | 75 | 75 | 2-5 |
| 15MHz | 64-QAM | 75 | N/A | QPSK | 50 | N/A | 2-5 |
| 15MHz | 64-QAM | 75 | N/A | QPSK | 25 | N/A | 2-5 |
| 15MHz | 64-QAM | 75 | N/A | QPSK | 20 | N/A | 2-5 |
| 15MHz | 64-QAM | 17 | 17 | QPSK | 75 | 75 | 1 |
| 15MHz | 64-QAM | 17 | N/A | QPSK | 50 | N/A | 1 |
| 15MHz | 64-QAM | 17 | N/A | QPSK | 25 | N/A | 1 |
| 15MHz | 64-QAM | 17 | N/A | QPSK | 20 | N/A | 1 |
| 20MHz | 64-QAM | 100 | 100 | QPSK | 100 | 100 | 3-5 |
| 20MHz | 64-QAM | 100 | N/A | QPSK | 75 | N/A | 3-5 |
| 20MHz | 64-QAM | 100 | N/A | QPSK | 50 | N/A | 3-5 |
| 20MHz | 64-QAM | 100 | N/A | QPSK | 25 | N/A | 3-5 |
| 20MHz | 64-QAM | 100 | N/A | QPSK | 20 | N/A | 3-5 |
| 20MHz | 64-QAM | 83 | 83 | QPSK | 100 | 100 | 2 |
| 20MHz | 64-QAM | 83 | N/A | QPSK | 75 | N/A | 2 |
| 20MHz | 64-QAM | 83 | N/A | QPSK | 50 | N/A | 2 |
| 20MHz | 64-QAM | 83 | N/A | QPSK | 25 | N/A | 2 |
| 20MHz | 64-QAM | 83 | N/A | QPSK | 20 | N/A | 2 |
| 20MHz | 64-QAM | 17 | 17 | QPSK | 100 | 100 | 1 |
| 20MHz | 64-QAM | 17 | N/A | QPSK | 75 | N/A | 1 |
| 20MHz | 64-QAM | 17 | N/A | QPSK | 50 | N/A | 1 |
| 20MHz | 64-QAM | 17 | N/A | QPSK | 25 | N/A | 1 |
| 20MHz | 64-QAM | 17 | N/A | QPSK | 20 | N/A | 1 |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band. The applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).
Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used.
Note 4: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2).

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Figure A.3.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.4.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.4.4.3.

### 7.4.4.2 Test procedure

SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.4.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.4.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

Set the Downlink signal level to the value defined in Table 7.4.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.4.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the Throughput measurement.

Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

**Table 7.4.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.4.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4.5-1.

**Table 7.4.5-1: Maximum input level**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |

| | | |
|---|---|---|
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2 64QAM R=3/4variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | |

# 7.4_1 Maximum input level with 4 Rx antenna ports

## 7.4_1.1 Test purpose

Same test purpose as in clause 7.4.1.

## 7.4_1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that supports 4 Rx antenna ports but not 256QAM in DL.

## 7.4_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 7.4.3.

## 7.4_1.4 Test description

### 7.4_1.4.1 Initial conditions

Same as in clause 7.4.4.1 with following exceptions:

- Instead of Table 7.4.4.1-1→ use Table 7.4_1.4.1-1.
- Instead of Figure A.3→ use Figure A.69.

**Table 7.4_1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | 64QAM | 6 | N/A | QPSK | 6 | N/A |
| 3MHz | 64QAM | 15 | N/A | QPSK | 15 | N/A |
| 5MHz | 64QAM | 25 | N/A | QPSK | 25 | N/A |
| 10MHz | 64QAM | 50 | N/A | QPSK | 50 | N/A |
| 10MHz | 64QAM | 50 | N/A | QPSK | 20 | N/A |
| 15MHz | 64QAM | 75 | N/A | QPSK | 75 | N/A |
| 15MHz | 64QAM | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | 64QAM | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | 64QAM | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | 64QAM | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | 64QAM | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | 64QAM | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2. Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).<br>Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |

### 7.4_1.4.2 Test procedure

Same as in clause 7.4.4.2 with following exceptions:

- Instead of Table 7.4.4.1-1→ use Table 7.4_1.4.1-1.

### 7.4_1.4.3 Message contents

Same as in clause 7.4.4.3.

## 7.4_1.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4_1.5-1.

**Table 7.4_1.5-1: Maximum input level**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2 64QAM R=3/4variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

# 7.4_H Maximum input level for 256QAM in DL

## 7.4_H.1 Test purpose

Same test purpose as in clause 7.4.1.

## 7.4_H.2 Test applicability

This test applies to all types of E-UTRA UEs release 12 and forward that support 256QAM in DL.

## 7.4_H.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4.3.

## 7.4_H.4 Test description

### 7.4_H.4.1 Initial conditions

Same initial conditions as in clause 7.4.4.1 with the following exceptions:

- Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Figure A.3 if the UE supports 2 Rx antennas or Figure A.69 if the UE supports 4 Rx antennas in the band.
- Instead of Table 7.4.4.1-1, use Table 7.4_H.4.1-1.

**Table 7.4_H.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | 256-QAM | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | 256-QAM | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | 256-QAM | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | 256-QAM | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | 256-QAM | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | 256-QAM | 25 | N/A | QPSK | 5[4] | N/A |
| 10MHz | 256-QAM | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | 256-QAM | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | 256-QAM | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | 256-QAM | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | 256-QAM | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | 256-QAM | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | 256-QAM | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | 256-QAM | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | 256-QAM | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | 256-QAM | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | 256-QAM | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | 256-QAM | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | 256-QAM | 100 | N/A | QPSK | 20 | N/A |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band. The applicable channel bandwidths are specified in Table 5.4.2.1-1.

Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).

Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used.

Note 4: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2).

### 7.4_H.4.2 Test procedure

Same test procedure as in clause 7.4.4.2 with the following exceptions:

- Instead of Table 7.4.4.1-1, use Table 7.4_H.4.1-1.
- Instead of Table 7.4.5-1, use Table 7.4_H.5-1.
- Instead of DCI format 1A use DCI format 1.

### 7.4_H.4.3 Message contents

Same message contents as defined in clause 7.4.4.3.

## 7.4_H.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4_H.5-1.

**Table 7.4_H.5-1: Maximum input level**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 | 3 MHz | 5 MHz | 10 | 15 | 20 |

| | | MHz | | | MHz | MHz | MHz |
|---|---|---|---|---|---|---|---|
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -27.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

# 7.4A Maximum input level for CA

## 7.4A.0 Minimum conformance requirements

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the maximum input level is defined with the uplink active on the band(s) other than the band whose downlink is being tested. For E-UTRA CA configurations including an operating band without uplink band or an operating band with an unpaired DL part, the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. The UE shall meet the requirements specified in subclause 7.4.3 for each component carrier while all downlink carriers are active.

For intra-band contiguous carrier aggregation maximum input level is defined as the powers received at the UE antenna port over the Transmission bandwidth configuration of each CC, at which the specified relative throughput shall meet or exceed the minimum requirements for the specified reference measurement channel over each component carrier.

The downlink SCC shall be configured at nominal channel spacing to the PCC. For FDD the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.4A.0-1 with the uplink configuration set according to Table 7.3A.0-1 for the applicable carrier aggregation configuration. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.3-2.

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels over each component carrier as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.4A.0-1. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Table 7.4A.0-1.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, each larger than or equal to 5 MHz, the maximum input level requirements are defined with the uplink configuration in accordance with Table 7.3A.0-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in Table 7.4.3-1 and Table 7.4A.0-1 for one component carrier and two component carriers per sub-block, respectively. The throughput of each downlink component carrier shall be ≥ 95% of the maximum throughput of the specified reference measurement channel as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1). The requirements apply with all downlink carriers active.

**Table 7.4A.0-1: Maximum input level for intra-band contiguous CA**

| Rx Parameter | Units | CA Bandwidth Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power in largestTransmission Bandwidth Configuration CC | dBm | | -28[2] | -25[2] | -25[2] | -26[2] | -27[2] |
| | | | -30[3] | -27[3] | -27[3] | [-28][3] | [-29][3] |
| Power in each other CC | dBm | | -28 + 10log(N RB,c /N RB,largest BW) [2] | -25 + 10log(N RB,c /N RB,largest BW) [2] | -25 + 10log (N RB,c /N RB,largest BW) [2] | -26 + 10log (N RB,c /N RB,largest BW) [2] | -27 + 10log (N RB,c /N RB,largest BW) [2] |
| | | | -30+ 10log(N RB,c /N RB,largest BW) [3] | -27 + 10log(N RB,c /N RB,largest BW) [3] | -27 + 10log (N RB,c /N RB,largest BW) [3] | [-28] + 10log (N RB,c /N RB,largest BW) [3] | [-29] + 10log (N RB,c /N RB,largest BW) [3] |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in clause 6.2.5A. | | | | | | | |
| Note 2: Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| Note 3: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

For combinations of intra-band and inter-band carrier aggregation with up to five downlink carriers (up to two non-contiguous sub-blocks per band and up to four contiguously aggregated carriers per band) and one uplink assigned to one E-UTRA band, the requirement is defined with the uplink active in a band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3A.0-3 when the uplink is active in the band supporting two non-contiguous component carriers, Table 7.3A.0-1 when the uplink is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.3-2 when the uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to four component carriers. For these uplink configurations, the UE shall meet the maximum input-level requirements for intra-band non-contiguous carrier aggregation of two downlink sub-blocks, the requirements for intra-band contiguous carrier aggregation for the contiguously aggregated downlink carriers and for any remaining component carrier(s) the requirements specified in subclause 7.4.3. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with the single uplink carrier active in each band capable of UL operation.

The normative references for this requirement are TS 36.101 [2] clauses 7.4.1A and 7.4.1.

## 7.4A.1 Maximum input level for CA (intra-band contiguous DL CA and UL CA)

Editor's note:

- Any restriction of the applicability of test points due to the supported UE category is under investigation

### 7.4A.1.1 Test purpose

Maximum input level for CA test verifies the UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to an e-NodeB.

### 7.4A.1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 7.4A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.0.

## 7.4A.1.4 Test description

### 7.4A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.4A.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.4A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | | | | NC | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | | | | Mid range | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in clause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 3) | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | **UL Allocation** | | | |
| **PCC $N_{RB}$** | **SCC $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 50 | 25 | 64-QAM | 50+25 | QPSK | 25 | P_25@25 | S_0@0 |
| 50 | 50 | 64-QAM | 50+50 | QPSK | 25 | P_25@25 | S_0@0 |
| 50 | 100 | 64-QAM | 50+100 | QPSK | 150 | P_50@0 | S_100@0 |
| 75 | 50 | 64-QAM | 75+50 | QPSK | 75 | P_75@0 | S_0@0 |
| 75 | 75 | 64-QAM | 75+75 | QPSK | 75 | P_75@0 | S_0@0 |
| 75 | 75 | 64-QAM | 75+75 | QPSK | 129 | P_75@0 | S_54@0 |
| 75 | 75 | 64-QAM | 75+75 | QPSK | 150 | P_75@0 | S_75@0 |
| 100 | 25 | 64QAM | 100+25 | QPSK | 50 | P_50@0 | S_0@0 |
| 100 | 25 | 64-QAM | 100+25 | QPSK | 125 | P_100@0 | S_25@0 |
| 100 | 50 | 64-QAM | 100+50 | QPSK | 75 | P_75@25 | S_0@0 |
| 100 | 50 | 64-QAM | 100+50 | QPSK | 150 | P_100@0 | S_50@0 |
| 100 | 75 | 64-QAM | 100+75 | QPSK | 175 | P_100@0 | S_75@0 |
| 100 | 100 | 64-QAM | 100+100 | QPSK | 50 | P_50@50 | S_0@0 |
| 100 | 100 | 64-QAM | 100+100 | QPSK | 75 | P_75@25 | S_0@0 |
| 100 | 100 | 64-QAM | 100+100 | QPSK | 130 | P_100@0 | S_30@0 |
| 100 | 100 | 64-QAM | 100+100 | QPSK | 200 | P_100@0 | S_100@0 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

Note 2: Depending on CA Configuration only the appropriate Uplink RB allocation value according to table 7.3A.0-1 is tested per CA Configuration Test CC combination.

Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.32 as appropriate if the UE supports 2 Rx antennas or Figure A.80 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1

4. The UL and DL Reference Measurement channels are set according to Table 7.4A.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.4A.1.4.3.

### 7.4A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.4A.1.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.4A.1.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.4A.1.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCC to the value defined in Table 7.4A.1.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that for at least the duration of the Throughput measurement:
The PCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.4A.1.5-1 + $10\log(P_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
or within (+0dB, -4 dB) of (target level in Table 7.4A.1.5-1 + $10\log(P_L_{CRB}/N_{RB_alloc})$) for carrier frequency $3.0\text{GHz} < f \leq 4.2\text{GHz}$.
The SCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.4A.1.5-1 + $10\log(S_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
or within (+0dB, -4 dB) of (target level in Table 7.4A.1.5-1 + $10\log(S_L_{CRB}/N_{RB_alloc})$) for carrier frequency $3.0\text{GHz} < f \leq 4.2\text{GHz}$.

7. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.4A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

**Table 7.4A.1.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

**Table 7.4A.1.4.3-2: UplinkPowerControlDedicatedSCell-r10**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH-r10 | 0 | | |
| deltaMCS-Enabled-r10 | en0 | | |
| accumulationEnabled-r10 | TRUE | | |
| pSRS-Offset-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| pSRS-OffsetAp-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| filterCoefficient-r10 | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| pathlossReferenceLinking-r10 | sCell | | |
| } | | | |

## 7.4A.1.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4A.1.5-1.

**Table 7.4A.1.5-1: Maximum input level for intra-band contiguous CA**

| **Rx Parameter** | **Units** | **CA Bandwidth Class** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **A** | **B** | **C** | **D** | **E** | **F** |
| Power in largest Transmission Bandwidth Configuration CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | | | |
| Power in each other CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -25.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier and in subclause 6.2.5A for two uplink carriers.<br>Note 2: Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

# 7.4A.1_H Maximum input level for CA (intra-band contiguous DL CA and UL CA) for 256QAM in DL

## 7.4A.1_H.1 Test purpose

Same test purpose as in clause 7.4A.1.

## 7.4A.1_H.2 Test applicability

This test applies to all types of E-UTRA UE release 12 and forward that support intra-band contiguous DL CA and UL CA and 256QAM in DL.

## 7.4A.1_H.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.0 with the following exceptions:

- Instead of Table 7.4A.0-1, use Table 7.4A.1_H.3-1.

**Table 7.4A.1_H.3-1: Maximum input level for intra-band contiguous CA**

| Rx Parameter | Units | CA Bandwidth Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |
| Power in largest Transmission Bandwidth Configuration CC | dBm | | -28[2] | -25[2] | -25[2] | | |
| | | | -30[3] | -27[3] | -27[3] | | |
| Power in each other CC | dBm | | -28+ 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) [2] | -25 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) [2] | -25 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) [2] | | |
| | | | -30+ 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) [3] | -27 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) [3] | -27 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) [3] | | |
| NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A. | | | | | | | |
| NOTE 2: Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| NOTE 3: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

## 7.4A.1_H.4 Test description

### 7.4A.1_H.4.1 Initial conditions

Same initial conditions as in clause 7.4A.1.4.1 with the following exceptions:

- Instead of Table 7.4A.1.4.1-1, use Table 7.4A.1_H.4.1-1.

**Table 7.4A.1_H.4.1-1: Test Configuration Table**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | Mid range |
| Test CC Combination setting ($N_{RB_agg}$) as specified in clause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$ |
| **Test Parameters for CA Configurations** | |
| use the content of Table 7.4A.1.4.1-1 replacing CC MOD of DL Allocation by 256QAM | |

### 7.4A.1_H.4.2 Test procedure

Same test procedure as in clause 7.4A.1.4.2 with the following exceptions:

- Instead of Table 7.4A.1.4.1-1, use Table 7.4A.1_H.4.1-1.
- Instead of Table 7.4A.1.5-1, use 7.4A.1_H.5-1.
- Instead of DCI format 1A use DCI format 1.

### 7.4A.1_H.4.3 Message contents

Same message contents as defined in clause 7.4A.1.4.3.

### 7.4A.1_H.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4A.1_H.5-1.

**Table 7.4A.1_H.5-1: Maximum input level for intra-band contiguous CA**

| Rx Parameter | Units | CA Bandwidth Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |
| Power in largest Transmission Bandwidth Configuration CC | dBm | | For carrier frequency f ≤ 3.0GHz: -30.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -31.0 | For carrier frequency f ≤ 3.0GHz: -27.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 | | | |
| Power in each other CC | dBm | | For carrier frequency f ≤ 3.0GHz: -30.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -31.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -27.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier and in subclause 6.2.5A for two uplink carriers. | | | | | | | |
| Note 2: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

## 7.4A.2 Maximum input level for CA (intra-band contiguous DL CA without UL CA)

Editor's note:

- Any restriction of the applicability of test points due to the supported UE category is under investigation

### 7.4A.2.1 Test purpose

Same test purpose as in clause 7.4A.1.1.

### 7.4A.2.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA. This test case applies only for CA Configurations that do not support UL CA.

### 7.4A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.0.

### 7.4A.2.4 Test description

#### 7.4A.2.4.1 Initial conditions

Same initial conditions as in clause 7.4A.1.4.1 with the following exceptions:

- Instead of Table 7.4A.1.4.1-1 → use Table 7.4A.2.4.1-1.
- Instead of clause 7.4A.1.4.3 → use clause 7.4A.2.4.3.

**Table 7.4A.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | B: Mid range<br>C: Mid range (Note 4) |
| Test CC Combination setting ($N_{RB_agg}$) as specified in clause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Notes 3, 4) |

**Test Parameters for CA Configurations**

| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | **UL Allocation** | | | |
|---|---|---|---|---|---|---|---|
| **PCC $N_{RB}$** | **SCC $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 6 | 25 | 64-QAM | 6+25 | QPSK | 6 | P_6@0 | NA |
| 15 | 50 | 64-QAM | 15+50 | QPSK | 15 | P_15@0 | NA |
| 25 | 25 | 64-QAM | 25+25 | QPSK | 20 | P_20@0 | NA |
| 25 | 25 | 64-QAM | 25+25 | QPSK | 25 | P_25@0 | NA |
| 25 | 50 | 64-QAM | 25+50 | QPSK | 20 | P_20@0 | NA |
| 25 | 100 | 64-QAM | 25+100 | QPSK | 25 | P_25@0 | NA |
| 50 | 25 | 64-QAM | 50+25 | QPSK | 25 | P_25@25 | NA |
| 50 | 50 | 64-QAM | 50+50 | QPSK | 25 | P_25@25 | NA |
| 50 | 50 | 64-QAM | 50+50 | QPSK | 50 | P_50@0 | NA |
| 50 | 75 | 64-QAM | 50+75 | QPSK | 50 | P_50@0 | NA |
| 75 | 25 | 64-QAM | 75+25 | QPSK | 75 | P_75@0 | NA |
| 75 | 50 | 64-QAM | 75+50 | QPSK | 75 | P_75@0 | NA |
| 75 | 75 | 64-QAM | 75+75 | QPSK | 75 | P_75@0 | NA |
| 100 | 25 | 64-QAM | 100+25 | QPSK | 50 | P_50@50 | NA |
| 100 | 25 | 64-QAM | 100+25 | QPSK | 100 | P_100@0 | NA |
| 100 | 50 | 64-QAM | 100+50 | QPSK | 75 | P_75@25 | NA |
| 100 | 50 | 64-QAM | 100+50 | QPSK | 100 | P_100@0 | NA |
| 100 | 75 | 64-QAM | 100+75 | QPSK | 100 | P_100@0 | NA |
| 100 | 100 | 64-QAM | 100+100 | QPSK | 50 | P_50@50 | NA |
| 100 | 100 | 64-QAM | 100+100 | QPSK | 75 | P_75@25 | NA |
| 100 | 100 | 64-QAM | 100+100 | QPSK | 100 | P_100@0 | NA |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

Note 2: Depending on CA Configuration only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per CA Configuration Test CC combination.

Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.

Note 4: For CA_70C all test frequency IDs shall be tested according to table 4.3.1.1.70A-1, in TS 36.508 [7].

### 7.4A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.4A.2.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.4A.2.4.1-1 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.
6. Set the Downlink signal level for PCC and SCC to the value defined in Table 7.4A.1.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.4A.1.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq 4.2$GHz, for at least the duration of the Throughput measurement.
7. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.4A.2.4.3 Message contents

Same message contents as in clause 7.4.4.3.

## 7.4A.2.5 Test requirement

Same test requirements as in clause 7.4A.1.5 with the following exceptions:

- Instead of Table 7.4A.1.5-1 → use Table 7.4A.2.5-1.

**Table 7.4A.2.5-1: Maximum input level for intra-band contiguous CA**

| Rx Parameter | Units | CA Bandwidth Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |
| Power in largest Transmission Bandwidth Configuration CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | | | |
| Power in each other CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7 + $10\log(N_{RB,c}/N_{RB,largest\ BW})$<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 + $10\log(N_{RB,c}/N_{RB,largest\ BW})$ | For carrier frequency f ≤ 3.0GHz: -25.7 + $10\log(N_{RB,c}/N_{RB,largest\ BW})$<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 + $10\log(N_{RB,c}/N_{RB,largest\ BW})$ | | | |
| Note 1: The transmitter shall be set to 4dB below $PC_{MAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

# 7.4A.2_H Maximum input level for CA (intra-band contiguous DL CA without UL CA) for 256QAM in DL

## 7.4A.2_H.1 Test purpose

Same test purpose as in clause 7.4A.2.1.

## 7.4A.2_H.2 Test applicability

This test applies to all types of E-UTRA UE release 12 and forward that support intra-band contiguous DL CA and 256QAM in DL. This test case applies only for CA Configurations that do not support UL CA.

## 7.4A.2_H.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.1_H.3.

## 7.4A.2_H.4 Test description

### 7.4A.2_H.4.1 Initial conditions

Same initial conditions as in clause 7.4A.2.4.1 with the following exceptions:

- Instead of Table 7.4A.2.4.1-1, use Table 7.4A.2_H.4.1-1.
- Instead of clause 7.4A.2.4.3, use clause 7.4A.2_H.4.3.

**Table 7.4A.2_H.4.1-1: Test Configuration Table**

| Initial Conditions |
|---|
| use the content of Table 7.4A.2.4.1-1 raplacing CC MOD of DL Allocation by 256QAM |

### 7.4A.2_H.4.2 Test procedure

Same test procedure as defined in clause 7.4A.2.4.2 with the following exceptions:

- Instead of Table 7.4A.2.4.1-1, use Table 7.4A.2_H.4.1-1.
- Instead of Table 7.4A.1.5-1, use Table 7.4A.2_H.5-1.
- Instead of DCI format 1A use DCI format 1.

### 7.4A.2_H.4.3 Message contents

Same message contents as defined in clause 7.4A.2.4.3.

## 7.4A.2_H.5 Test requirement

Same test requirements as in clause 7.4A.1.5 with the following exceptions:

- Instead of Table 7.4A.1.5-1, use Table 7.4A.2_H.5-1.

**Table 7.4A.2_H.5-1: Maximum input level for intra-band contiguous CA**

| Rx Parameter | Units | CA Bandwidth Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power in largest Transmission Bandwidth Configuration CC | dBm | | For carrier frequency f ≤ 3.0GHz: -30.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -31.0 | For carrier frequency f ≤ 3.0GHz: -27.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 | | | |
| Power in each other CC | dBm | | For carrier frequency f ≤ 3.0GHz: -30.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -31.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -27.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | | | |
| Note 1: The transmitter shall be set to 4dB below $PC_{MAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

## 7.4A.3 Maximum input level for CA (inter-band DL CA without UL CA)

Editor's note:

- Any restriction of the applicability of test points due to the supported UE category is under investigation

### 7.4A.3.1 Test purpose

Same test purpose as in clause 7.4A.1.1

### 7.4A.3.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support inter-band DL CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 2DL CA with FDD-TDD inter-band CA.

This test case also applies to all types of E-UTRA UE release 13 and forward that support DL LAA.

### 7.4A.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.0.

### 7.4A.3.4 Test description

#### 7.4A.3.4.1 Initial conditions

Same initial conditions as in clause 7.4A.1.4.1 with the following exceptions:

- Instead of Table 7.4A.1.4.1-1 → use Table 7.4A.3.4.1-1.
- Instead of clause 7.4A.1.4.3 → use clause 7.4A.3.4.3.

**Table 7.4A.3.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | A: Mid range for PCC and SCC | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE | Highest $N_{RB_agg}$ for PCC and SCC | | | | | |
| Test Parameters for CA Configurations | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | | **UL Allocation** | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | | **CC MOD** | **PCC $N_{RB_alloc}$** |
| 50 | 50 | 64-QAM | 50 | 50 | QPSK | 50 |
| 50 | 50 | 64-QAM | 50 | 50 | QPSK | 25 |
| 50 | 50 | 64-QAM | 50 | 50 | QPSK | 20 |
| 50 | 50 | 64-QAM | 50 | 50 | QPSK | 16 |
| 50 | 75 | 64-QAM | 50 | 75 | QPSK | 25 |
| 50 | 100 | 64-QAM | 50 | 100 | QPSK | 50 |
| 50 | 100 | 64-QAM | 50 | 100 | QPSK | 25 |
| 50 | 100 | 64-QAM | 50 | 100 | QPSK | 20 |
| 50 | 100 | 64-QAM | 50 | 100 | QPSK | 16 |
| 75 | 25 | 64-QAM | 75 | 25 | QPSK | 75 |
| 75 | 25 | 64-QAM | 75 | 25 | QPSK | 20 |
| 75 | 50 | 64-QAM | 75 | 50 | QPSK | 25 |
| 75 | 75 | 64-QAM | 75 | 75 | QPSK | 25 |
| 75 | 100 | 64-QAM | 75 | 100 | QPSK | 25 |
| 100 | 50 | 64-QAM | 100 | 50 | QPSK | 100 |
| 100 | 50 | 64-QAM | 100 | 50 | QPSK | 75 |
| 100 | 50 | 64-QAM | 100 | 50 | QPSK | 50 |
| 100 | 75 | 64-QAM | 100 | 75 | QPSK | 100 |
| 100 | 75 | 64-QAM | 100 | 75 | QPSK | 50 |
| 100 | 100 | 64-QAM | 100 | 100 | QPSK | 100 |
| 100 | 100 | 64-QAM | 100 | 100 | QPSK | 75 |
| 100 | 100 | 64-QAM | 100 | 100 | QPSK | 50 |
| 100 | 100 | 64-QAM | 100 | 100 | QPSK | 45 |
| 100 | 100 | 64-QAM | 100 | 100 | QPSK | 25 |
| 100 | 100 | 64-QAM | 100 | 100 | QPSK | 20 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3A.3.5-2 for UE supporting one uplink carrier is tested per Test CA configuration.
Note 3: The UL resource blocks shall be located as close as possible to the downlink PCC but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).
Note 4: The frequencies of PCC and SCC shall be switched and tested in each configuration, according to the UE declared capability for UL support (within CA operation) in the individual bands.

### 7.4A.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.4A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.4A.3.4.1-1 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
6. Set the Downlink signal level to the value as defined in Table 7.4A.3.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.4A.3.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the Throughput measurement.
7. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.4A.3.4.3 Message contents

Same message contents as in clause 7.4.4.3.

### 7.4A.3.5 Test requirement

For inter-band carrier aggregation with uplink assigned to one E-UTRA band the maximum input level is defined with the uplink active on the band other than the band whose downlink is being tested, i.e. the requirements are tested only for the SCell downlink. The UE shall meet the requirement for each component carrier, when operated as SCell, while both downlink carriers are active.

The throughput measured during the test procedure for each component carrier, when operated as SCell, shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4A.3.5-1 (originated from the single carrier Table 7.4.5-1).

**Table 7.4A.3.5-1: Maximum input level for inter-band DL CA without UL CA**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0<br>For carrier frequency 4.2GHz < f ≤ 6.0GHz: -26.5 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2 64QAM R=3/4variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

## 7.4A.3_H Maximum input level for CA (inter-band DL CA without UL CA) for 256QAM in DL

### 7.4A.3_H.1 Test purpose

Same test purpose as in clause 7.4A.3.

### 7.4A.3_H.2 Test applicability

This test applies to all types of E-UTRA UE release 12 and forward that support inter-band DL CA without UL CA and 256QAM in DL.

### 7.4A.3_H.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.1_H.3.

### 7.4A.3_H.4 Test description

#### 7.4A.3_H.4.1 Initial conditions

Same initial conditions as in clause 7.4A.1.4.1 with the following exceptions:

- Instead of Table 7.4A.1.4.1-1 → use Table 7.4A.3_H.4.1-1.
- Instead of clause 7.4A.1.4.3 → use clause 7.4A.3_H.4.3.

**Table 7.4A.3_H.4.1-1: Test Configuration Table**

| **Initial Conditions** |
|---|
| use the content of Table 7.4A.3.4.1-1 raplacing CC MOD of DL Allocation by 256QAM |

#### 7.4A.3_H.4.2 Test procedure

Same test procedure as in clause 7.4A.3.4.2 with the following exceptions:

- Instead of Table 7.4A.3.4.1-1 → use Table 7.4A.3_H.4.1-1.
- Instead of Table 7.4A.3.5-1 → use 7.4A.3_H.5-1.
- Instead of DCI format 1A use DCI format 1.

#### 7.4A.3_H.4.3 Message contents

Same message contents as defined in clause 7.4A.3.4.3.

### 7.4A.3_H.5 Test requirement

Same test requirement as defined in clause 7.4A.3.5 with the following exceptions:

- Instead of Table 7.4A.3.5-1 → use 7.4A.3_H.5-1.

**Table 7.4A.3_H.5-1: Maximum input level for inter-band CA**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -27.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

## 7.4A.4 Maximum input level for CA (intra band non-contiguous DL CA without UL CA)

### 7.4A.4.1 Test purpose

Same as in clause 7.4A.1.1.

### 7.4A.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA but no UL CA.

### 7.4A.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.0.

### 7.4A.4.4 Test description

#### 7.4A.4.4.1 Initial conditions

Same initial conditions as in clause 7.4A.1.4.1 with the following exceptions:

- Instead of Table 7.4A.1.4.1-1 → use Tables 7.4A.4.4.1-1.
- Instead of clause 7.4A.1.4.3 → use clause 7.4A.3.4.3.

**Table 7.4A.4.4.1-1: Test Configuration Table**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | A: N/A (Range is not relevant) |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration. | Refer to test point |
| **Test Parameters for CA Configurations** | |
| use the content of Table 7.3A.4.4.1-1 | |

#### 7.4A.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.4A.4.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.4A.4.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.4A.4.4.1-1 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.
6. Set the Downlink signal level for PCC and SCC to the value defined in Table 7.4A.4.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.4A.4.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the Throughput measurement.
7. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

#### 7.4A.4.4.3 Message contents

Same message contents as in clause 7.4.4.3.

### 7.4A.4.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4A.4.5-1 (originated from the single carrier Table 7.4.5-1).

**Table 7.4A.4.5-1: Maximum input level for intra band non-contiguous DL CA without UL CA**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2 64QAM R=3/4variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

## 7.4A.4_H Maximum input level for CA (intra band non-contiguous DL CA without UL CA) for 256QAM in DL

### 7.4A.4_H.1 Test purpose

Same as in clause 7.4A.1.1.

### 7.4A.4_H.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward that support intra-band non-contiguous DL CA but no UL CA and 256QAM in DL.

### 7.4A.4_H.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.1_H.3

### 7.4A.4_H.4 Test description

#### 7.4A.4_H.4.1 Initial conditions

Same initial conditions as defined in clause 7.4A.1.4.1 with the following exceptions:

- Instead of Table 7.4A.1.4.1-1 → use Tables 7.4A.4_H.4.1-1.
- Instead of clause 7.4A.1.4.3 → use clause 7.4A.3.4.3.

**Table 7.4A.4_H.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | A: N/A (Range is not relevant) |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration. | Refer to test point |
| **Test Parameters for CA Configurations** | |
| use the content of Table 7.3A.4.4.1-1 raplacing CC MOD of DL Allocation by 256QAM | |

#### 7.4A.4_H.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.4A.4_H.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer 3GPP TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer 3GPP TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC according to Table 7.4A.4_H.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.4A.4_H.4.1-1 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCC to the value defined in Table 7.4A.4_H.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that for at least the duration of the Throughput measurement:
   The PCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.4A.4_H.5-1), for carrier frequency f ≤ 3.0GHz,
   or within (+0dB, -4 dB) of (target level in Table 7.4A.4_H.5-1) for carrier frequency 3.0GHz < f ≤ 4.2GHz.

7. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.4A.4_H.4.3 Message contents

Same message contents as defined in clause 7.4.4.3.

## 7.4A.4_H.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4A.4_H.5-1 (originated from the single carrier Table 7.4.5-1).

**Table 7.4A.4_H.5-1: Maximum input level for intra band non-contiguous DL CA without UL CA**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | For carrier frequency f ≤ 3.0GHz: -27.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

# 7.4A.5 Maximum input level for 3DL CA

## 7.4A.5.1 Test purpose

Maximum input level for CA test verifies the UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to an e-NodeB.

## 7.4A.5.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 3DL with CA configurations in Table 7.1-2a.

This test case also applies to all types of E-UTRA UE release 13 and forward that support 3DL CA involving Band 46.

### 7.4A.5.3 Minimum conformance requirements

The Minimum conformance requirements are defined in clause 7.4A.0.

### 7.4A.5.4 Test description

#### 7.4A.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in tables of 5.4.2A.1 as applicable. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.4A.5.4.1-1 to 7.4A.5.4.1-2. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.4A.5.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| est Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| est Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA andwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| est CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA onfiguration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| etwork signalling value | NS_01 by default |

**Test Parameters for CA Configurations**

| | PCC | | | | SCC1 | | | | SCC2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLallo |
| **Default Test Settings for a CA_XD Configuration (Intra-band contiguous)** | | | | | | | | | | | | |
| | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | X | Mid/CC3 | N/A | All RBs |
| | QPSK | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowes $N_{RB_agg}$ |
| | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | X | Mid/CC3 | N/A | All RBs |
| | QPSK | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highes $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA Configuration (Inter-band)** | | | | | | | | | | | | |
| | X | Mid | REFSENS | All RBs | Y | Mid | N/A | All RBs | Z | Mid | N/A | All RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highes $N_{RB}$ |
| | Y | Mid | REFSENS | All RBs | X | Mid | N/A | All RBs | Z | Mid | N/A | All RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highes $N_{RB}$ |
| | Z | Mid | REFSENS | All RBs | X | Mid | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highes $N_{RB}$ |
| **Default Test Settings for CA_XB-YA and CA_XC-YA Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | |
| | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Highes $N_{RB}$ |
| | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highes $N_{RB}$ |
| | Y | Mid | REFSENS | All RBs | X | Mid/CC1 | N/A | All RBs | X | Mid/CC2 | N/A | All RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowes $N_{RB_agg}$ |
| | Y | Mid | REFSENS | All RBs | X | Mid/CC1 | N/A | All RBs | X | Mid/CC2 | N/A | All RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highes $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-YB and CA_XA-YC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | |
| | Y | Mid/CC1 | REFSENS | All RBs | Y | Mid/CC2 | N/A | All RBs | X | Mid | N/A | All RBs |
| | QPSK | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highes $N_{RB}$ |
| | Y | Mid/CC1 | REFSENS | All RBs | Y | Mid/CC2 | N/A | All RBs | X | Mid | N/A | All RBs |
| | QPSK | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Highes $N_{RB}$ |
| | X | Mid | REFSENS | All RBs | Y | Mid/CC1 | N/A | All RBs | Y | Mid/CC2 | N/A | All RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highes $N_{RB_agg}$ |
| | X | Mid | REFSENS | All RBs | Y | Mid/CC1 | N/A | All RBs | Y | Mid/CC2 | N/A | All RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowes $N_{RB_agg}$ |

ote 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration, The applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.
ote 2: Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
ote 3: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individu band within the CA Configuration, test points with that individual band as PCC are not applicable.
ote 4: **Intra-band contiguous:** X corresponds to the band in the CA Configuration. E.g. for CA_41D, X=41
ote 5: **Inter-band:** X,Y,Z correspond to the 1st, 2nd and 3rd band in the CA Configuration. E.g. for CA_1A-3A-19A, X=1, Y=3, Z=19
ote 6: **Intra-band contiguous + Inter-band:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_1C-3A, X=1 and Y=
ote 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3. 2.
ote 8: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
ote 9: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choos the Combination with $N_{RB_PCC} = N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.
ote 10: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.

**Table 7.4A.5.4.1-2: Test Configuration Table with $W_{gap}$**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3,4) | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for CA_XA-XA-YA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | X | CC2 | REFSENS | All RBs | Max | X | CC1 | N/A | All RBs | - | Y | Mid | N/A | All RBs |
| | QPSK | 64-QAM | | | | N/A | 64-QAM | | | | N/A | 64-QAM | | |
| 2 | Y | Mid | REFSENS | All RBs | - | X | CC2 | N/A | All RBs | Max | X | CC1 | N/A | All RBs |
| | QPSK | 64-QAM | | | | N/A | 64-QAM | | | | N/A | 64-QAM | | |
| **Default Test Settings for CA_XA-YA-YA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | Y | CC2 | REFSENS | All RBs | Max | Y | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | 64-QAM | | | | N/A | 64-QAM | | | | N/A | 64-QAM | | |
| 2 | X | Mid | REFSENS | All RBs | - | Y | CC2 | N/A | All RBs | Max | Y | CC1 | N/A | All RBs |
| | QPSK | 64-QAM | | | | N/A | 64-QAM | | | | N/A | 64-QAM | | |
| **Group Test Settings for CA_66A-66A-XA or CA_XA-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | 64-QAM | | 100 | | N/A | 64-QAM | | 100 | | N/A | 64-QAM | | Highest NRB |
| 2 | X | Mid | REFSENS | All RBs | - | 66 | CC1 | N/A | All RBs | 50 | 66 | CC2 | N/A | All RBs |
| | QPSK | 64-QAM | | Highest NRB | | N/A | 64-QAM | | 100 | | N/A | 64-QAM | | 100 |
| **Test Settings for CA_29A-66A-66A Configuration (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | 29 | Mid | N/A | All RBs |
| | QPSK | 64-QAM | | 100 | | N/A | 64-QAM | | 100 | | N/A | 64-QAM | | 50 |
| **Test Settings for a CA_41C-41A Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 1 | 41 | CC3 | 100@0 | All RBs | 134.2 | 41 | CC2 | N/A | All RBs | - | 41 | CC1 | N/A | All RBs |
| | QPSK | 64-QAM | | 100 | | N/A | 64-QAM | | 100 | | N/A | 64-QAM | | 100 |
| **Test Settings for a CA_41A-41C Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 2 | 41 | CC3 | 100@0 | All RBs | - | 41 | CC2 | N/A | All RBs | 134.2 | 41 | CC1 | N/A | All RBs |
| | QPSK | 64-QAM | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_66A-66C Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 30.2 | 66 | CC2 | N/A | All RBs | - | 66 | CC3 | N/A | All RBs |
| | QPSK | 64-QAM | | 100 | | N/A | 64-QAM | | 100 | | N/A | 64-QAM | | 100 |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band non-contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: **Intra-band non-contiguous + Intra-band contiguous:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 4: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band non-contiguous + Inter-band:** X and Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A,X=2,Y=5
Note 6: **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A,X=41.
Note 7: **Intra-band non-contiguous + Inter-band:** REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RE allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.
Note 10: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.55 if the UE supports 2 Rx antennas or Figure A.80 if the UE supports 4 Rx antennas in at least one band within the CA configuration.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1

4. The UL and DL Reference Measurement channels are set according to Tables 7.4A.5.4.1-1 to 7.4A.5.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.4A.5.4.3.

### 7.4A.5.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.4A.5.4.3

3. SS activates SCCs by sending the activation MAC-CE (Refer to TS 36.321 [13] clauses 5.13 and 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clause 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.4A.5.4.1-1 to 7.4A.5.4.1-5 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Tables 7.4A.5.4.1-1 to 7.4A.5.4.1-2 as appropriate on PCC. Since the UE has no payload and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the value defined in Table 7.4A.5.5-2 or 7.4A.5.5-3 according to the type of CA. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the PCC output power is within +0dB, -3.4 dB of the target level for carrier frequency $f \leq 3.0$GHz
or within +0dB, -4 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the Throughput measurement.

7. Measure the average throughput for the carrier(s) indicated in table 7.4A.5.4.2-1 for duration sufficient to achieve statistical significance according to Annex G.2A.

8. Repeat steps 6 to 7 for all component carriers indicated in Table 7.4A.5.4.2-1.

**Table 7.4A.5.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2 | 7.4A.5.5-1 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.4A.5.5-2 |
| | | SCC2 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| Intra-band contiguous + Inter-band | 1 | SCC2 | 7.4A.5.5-2 |
| | 2 | | |
| | 3 | SCC1, SCC2 | 7.4A.5.5-1 |
| | 4 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC2 | 7.4A.5.5-2 |
| | 2 | SCC1 | |
| | | SCC2 | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.4A.5.5-2 |
| | | SCC1, SCC2 | 7.4A.5.5-1 |
| | 2 | PCC, SCC1 | 7.4A.5.5-1 |
| | | SCC2 | 7.4A.5.5-2 |

Note 1: Test point ID for the particular CA configuration as defined in section 7.4A.5.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.

### 7.4A.5.4.3 Message contents

Same message contents as in clause 7.4.4.3 for without UL CA.

Same message contents as in clause 7.4A.1.4.3 for UL CA.

## 7.4A.5.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.4A.5.5-1 and 7.4A.5.5-2, as applicable.

**Table 7.4A.5.5-1: Maximum input level for 3DL CA (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power in largest Transmission Bandwidth Configuration CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7 For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 | For carrier frequency f ≤ 3.0GHz: -25.7 For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | For carrier frequency f ≤ 3.0GHz: -25.7 For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | | |
| Power in each other CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -25.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -25.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier.<br>Note 2: Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.4A.5.5-2: Maximum input level for 3DL CA (Inter-band), per CC**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2 64QAM R=3/4variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

# 7.4A.5_H Maximum input level for 3DL CA for 256QAM in DL

## 7.4A.5_H.1 Test purpose

Same test purpose as in clause 7.4A.5.1.

## 7.4A.5_H.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward that support 256QAM in DL and 3DL CA.

This test case also applies to all types of E-UTRA UE release 13 and forward that support 256QAM in DL and 3DL CA involving Band 46.

## 7.4A.5_H.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.1_H.3.

## 7.4A.5_H.4 Test description

### 7.4A.5_H.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in tables of 5.4.2A.1 as applicable. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.4A.5_H.4.1-1 and 7.4A.5_H.4.1-2. The details of the uplink and downlink reference measurement channels (RMCs) are specified in clauses A.2 and A.3 respectively. The details of the OCNG patterns used are specified in clause A.5. Configurations of PDSCH and PDCCH before measurement are specified in clause C.2.

**Table 7.4A.5_H.4.1-1: Test Configuration Table**

| Initial Conditions |
|---|
| use the content of Table 7.4A.5.4.1-1 raplacing DL MOD by 256QAM |

**Table 7.4A.5_H.4.1-2: Test Configuration Table with $W_{gap}$**

| Initial Conditions |
|---|
| use the content of Table 7.4A.5.4.1-2 raplacing DL MOD by 256QAM |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.55 if the UE supports 2 Rx antennas or Figure A.80 if the UE supports 4 Rx antennas in the band.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals for PCC are initially set up according to clauses C.0, C.1 and C.3.1, and uplink signals according to clauses H.1 and H.3.1
4. The UL and DL Reference Measurement channels are set according to Tables 7.4A.5_H.4.1-1 and 7.4A.5_H.4.1-2.
5. Propagation conditions are set according to clause B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.4A.5_H.4.3.

## 7.4A.5_H.4.2 Test procedure

1. Configure SCCs according to clauses C.0, C.1 and clause C.3.1 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.4A.5_H.4.3
3. SS activates SCCs by sending the activation MAC-CE (Refer to TS 36.321 [13] clauses 5.13 and 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clause 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC according to Table 7.4A.5_H.4.1-1 and 7.4A.5_H.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Tables 7.4A.5_H.4.1-1 and 7.4A.5_H.4.1-2 as appropriate on PCC. Since the UE has no payload and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.
6. Set the Downlink signal level for PCC and SCCs to the value defined in Table 7.4A.5_H.5-1 or 7.4A.5_H.5-2 according to the type of CA. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the PCC output power is within (+0dB, -3.4dB) of the target level for carrier frequency $f \leq 3.0$GHz or within (+0dB, -4dB) of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.
7. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to clause G.2A.
8. Repeat steps 6 to 7 for all component carriers indicated in Table 7.4A.5_H.4.2-1.

**Table 7.4A.5_H.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2 | 7.4A.5_H.5-1 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.4A.5_H.5-2 |
| | | SCC2 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| Intra-band contiguous + Inter-band | 1 | SCC2 | 7.4A.5_H.5-2 |
| | 2 | | |
| | 3 | SCC1, SCC2 | 7.4A.5_H.5-1 |
| | 4 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC2 | 7.4A.5_H.5-2 |
| | 2 | SCC1 | |
| | | SCC2 | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.4A.5_H.5-2 |
| | | SCC1, SCC2 | 7.4A.5_H.5-1 |
| | 2 | PCC, SCC1 | 7.4A.5_H.5-1 |
| | | SCC2 | 7.4A.5_H.5-2 |

Note 1: Test point ID for the particular CA configuration as defined in section 7.4A.5_H.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.

### 7.4A.5_H.4.3 Message contents

Same message contents as defined in clause 7.4A.5.4.3.

## 7.4A.5_H.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in clause A.3.2 with parameters specified in Table 7.4A.5_H.5-1 and Table 7.4A.5_H.5-2.

**Table 7.4A.5_H.5-1: Maximum input level for 3DL CA (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power in largest Transmission Bandwidth Configuration CC | dBm | | For carrier frequency f ≤ 3.0GHz: -30.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -31.0 | For carrier frequency f ≤ 3.0GHz: -27.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 | For carrier frequency f ≤ 3.0GHz: -27.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 | | |
| Power in each other CC | dBm | | For carrier frequency f ≤ 3.0GHz: -30.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -31.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -27.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -27.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in clause 6.2.5 for one uplink carrier.<br>Note 2: Reference measurement channel is clause A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in clauses A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.4A.5_H.5-2: Maximum input level for 3DL CA (Inter-band), per CC**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -27.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

# 7.4A.6

# 7.4A.7 Maximum input level for 4DL CA

## 7.4A.7.1 Test purpose

Maximum input level for CA test verifies the UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to an e-NodeB.

## 7.4A.7.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 4DL with CA configurations in Table 7.1-2b.

## 7.4A.7.3 Minimum conformance requirements

The Minimum conformance requirements are defined in clause 7.4A.0.

## 7.4A.7.4 Test description

### 7.4A.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in tables of 5.4.2A.1 as applicable. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.4A.7.4.1-1 to 7.4A.7.4.1-2. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.4A.7.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for a CA_XE Configuration (Intra-band contiguous)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YD, YD-XA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **2** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **3** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ |
| **4** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ |

| Default Test Settings for a CA_XA-YA-ZA-RA Configuration (Inter-band) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | X | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **4** | R | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **Test Settings for a CA_1A-3A-7A-20A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 1 | Low | 25@0 | ALL RBs | 3 | High | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 20 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 1 | Low | 25@0 | ALL RBs | 3 | High | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 20 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 1 | Low | 25@0 | ALL RBs | 3 | High | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 20 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 1 | Mid | 45@0 | ALL RBs | 3 | High | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 20 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **5** | 3 | Low | 50@50 | ALL RBs | 1 | High | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 20 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 3 | Low | 50@50 | ALL RBs | 1 | Mid | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 20 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **7** | 1 | Mid | 100@0 | ALL RBs | 3 | Mid | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs | 20 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **8** | 7 | Mid | 75@25 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 20 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **9** | 20 | Mid | 60@16 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **10** | 7 | Mid | 100@0 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 20 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **11** | 20 | Mid | 100@0 | ALL RBs | 1 | Mid | N/A | ALL RBs | 3 | Mid | N/A | ALL RBs | 7 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Default Test Settings for CA_XB-YA-ZA and CA_XC-YA-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-XB-ZA and CA_YA-XC-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XB and CA_YA-ZA-XC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **3** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **4** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **5** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ |
| **Test Settings for CA_2A-66C-71A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 66 | Mid/CC1 | 100@0 | ALL | 66 | Mid/CC2 | N/A | ALL | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | RBs | | | | RBs | | | | | | | | RBs |
| | QPSK | 64-QAM | | 100 | N/A | 64-QAM | | 100 | N/A | 64-QAM | | 100 | N/A | 64-QAM | | 100 |
| **2** | 66 | Mid/CC1 | 100@0 | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | 100 | N/A | 64-QAM | | 25 | N/A | 64-QAM | | 100 | N/A | 64-QAM | | 100 |
| **3** | 2 | Low | 100@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | High | N/A | ALL RBs |
| | QPSK | 64-QAM | | 100 | N/A | 64-QAM | | 100 | N/A | 64-QAM | | 100 | N/A | 64-QAM | | 100 |
| **4** | 2 | Low | 100@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | High | N/A | ALL RBs |
| | QPSK | 64-QAM | | 100 | N/A | 64-QAM | | 100 | N/A | 64-QAM | | 25 | N/A | 64-QAM | | 100 |
| **5** | 71 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | 100 | N/A | 64-QAM | | 100 | N/A | 64-QAM | | 100 | N/A | 64-QAM | | 100 |
| **6** | 71 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | 100 | N/A | 64-QAM | | 100 | N/A | 64-QAM | | 100 | N/A | 64-QAM | | 25 |
| **Default Test Settings for CA_XC-YC Configuration (Intra-band contiguous + Inter-band(2))** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ |
| **3** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **4** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 4: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA

Configuration, test points with that individual band as PCC are not applicable.

Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41E, X=41.

Note 6: **Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-8A,X=1,Y=3,Z=7,R=8.

Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_3C-7A-28A, X=3,Y=7 and Z=28.

Note 8: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.

Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.

Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC}$ = $N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.

Note 11: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.

**Table 7.4A.7.4.1-2: Test Configuration Table with Wgap**

| **Initial Conditions** | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | | NC | | | | | | | | | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | | | | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns | | | | | | | | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Highest $N_{RB}$ | | | | | | | | | | | | | | |
| Network signalling value | | | | | | NS_01 by default | | | | | | | | | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | | | | | | | | | | | | |
| **ID** | **PCC** | | | | **$W_{gap}$ [MHz]** | **SCC1** | | | | **$W_{gap}$ [MHz]** | **SCC2** | | | | **$W_{gap}$ [MHz]** | **SCC3** | | | | |
| | **Band** | **Range** | **NRB** | | | **Band** | **Range** | **NRB** | | | **Band** | **Range** | **NRB** | | | **Band** | **Range** | **NRB** | | |
| | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | |
| **Default Test Settings for CA_XA-XA-YA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-XA-XA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XA-XA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | |
| **Default Test Settings for CA_66A-66A-YA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-66A-66A-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC1 | REFSENS | ALL RBs | Max | X | CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC1 | N/A | ALL RBs | Max | X | CC2 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC1 | N/A | ALL RBs | Max | X | CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YC Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YC-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | REFSENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Y | Mid/ CC1 | N/A | ALL RBs | - | Y | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ |
| **2** | Y | Mid/ CC1 | REFSENS | ALL RBs | - | Y | Mid/ CC2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XD/XD-XA/XC-XC Configurations (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | |
| **TBD** | | | | | | | | | | | | | | | | | | | |
| **Default Test Settings for CA_XA-XA-YA-YA Configurations (Intra-band non-contiguous + Intra-band non-contiguous)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC4 | REFSENS | ALL RBs | Max | X | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | Max | Y | CC1 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **2** | Y | CC4 | REFSENS | ALL RBs | Max | Y | CC3 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band non-contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-12A,X=2,Y=4,Z=12.
Note 5: **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A-41A,X=41.
Note 6: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-4A,X=2,Y=4.

| | |
|---|---|
| Note 7: | REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2. |
| Note 8: | **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing. |
| Note 9: | The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs. |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.55 if the UE supports 2 Rx antennas or Figure A.80 if the UE supports 4 Rx antennas in at least one band within the CA configuration.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1

4. The UL and DL Reference Measurement channels are set according to Tables 7.4A.7.4.1-1 to 7.4A.7.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.4A.7.4.3.

### 7.4A.7.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.4A.7.4.3

3. SS activates SCCs by sending the activation MAC-CE (Refer to TS 36.321 [13] clauses 5.13 and 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clause 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.4A.7.4.1-1 to 7.4A.7.4.1-6 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Tables 7.4A.7.4.1-1 to 7.4A.7.4.1-2 as appropriate on PCC. Since the UE has no payload and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the value defined in Table 7.4A.7.5-2 or 7.4A.7.5-3 according to the type of CA. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the PCC output power is within +0dB, -3.4 dB of the target level for carrier frequency $f \leq 3.0$GHz
or within +0dB, -4 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

7. Measure the average throughput for the carrier(s) indicated in table 7.4A.7.4.2-1 for duration sufficient to achieve statistical significance according to Annex G.2A.

8. Repeat steps 6 to 7 for all component carriers indicated in Table 7.4A.7.4.2-1.

**Table 7.4A.7.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2,SCC3 | 7.4A.7.5-1 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.4A.7.5-2 |
| | | SCC2 | |
| | | SCC3 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | 4 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| Intra-band contiguous + Inter-band | 1 | SCC2 SCC3 | 7.4A.7.5-2 |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3 | 7.4A.7.5-1 7.4A.7.5-2 |
| | 4 | | |
| | 5 | SCC1, SCC2, SCC3 | 7.4A.7.5-2 7.4A.7.5-1 |
| | 6 | | |
| Intra-band contiguous + Inter-band(2) | 1 | SCC2 SCC3 | 7.4A.7.5-1 7.4A.7.5-2 |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC2, SCC3 | 7.4A.7.5-2 |
| | 2 | SCC1, | 7.4A.7.5-2 |
| | | SCC2 | |
| | | SCC3 | |
| | 3 | SCC1, | 7.4A.7.5-2 |
| | | SCC2 | |
| | | SCC3 | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.4A.7.5-2 |
| | | SCC1, SCC2, SCC3 | 7.4A.7.5-1 |
| | 2 | SCC2 | 7.4A.7.5-1 |
| | | PCC, SCC1, SCC3 | 7.4A.7.5-2 7.4A.7.5-1 |
| Intra-band non-contiguous + Intra-band non-contiguous | 1 | SCC2 SCC3 | 7.4A.7.5-2 |
| | 2 | | |

Note 1: Test point ID for the particular CA configuration as defined in section 7.4A.7.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.

### 7.4A.7.4.3 Message contents

Same message contents as in clause 7.4.4.3 for without UL CA.

Same message contents as in clause 7.4A.1.4.3 for UL CA.

## 7.4A.7.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.4A.7.5-1 to 7.4A.7.5-2, as applicable.

**Table 7.4A.7.5-1: Maximum input level for 4DL CA (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |
| Power in largest Transmission Bandwidth Configuration CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | For carrier frequency f ≤ 3.0GHz: -26.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -27.0 | |
| Power in each other CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -25.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -25.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -26.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -27.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier.<br>Note 2: Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.4A.7.5-2: Maximum input level for 4DL CA (Inter-band), per CC**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2 64QAM R=3/4variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

# 7.4A.7_H Maximum input level for 4DL CA for 256QAM in DL

## 7.4A.7_H.1 Test purpose

Same test purpose as in clause 7.4A.7_H.1.

## 7.4A.7_H.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 4DL with CA configurations in Table 7.1-2b and 256QAM in DL.

## 7.4A.7_H.3 Minimum conformance requirements

The Minimum conformance requirements are defined in clause 7.4A.1_H.3.

## 7.4A.7_H.4 Test description

### 7.4A.7_H.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in tables of 5.4.2A.1 as applicable. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.4A.7_H.4.1-1 to 7.4A.7_H.4.1-2. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.4A.7_H.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for a CA_XE Configuration (Intra-band contiguous)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Lowest $N_{RB_agg}$ | N/A | 256-QAM | | Lowest $N_{RB_agg}$ | N/A | 256-QAM | | Lowest $N_{RB_agg}$ | N/A | 256-QAM | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB_agg}$ | N/A | 256-QAM | | Highest $N_{RB_agg}$ | N/A | 256-QAM | | Highest $N_{RB_agg}$ | N/A | 256-QAM | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YD, YD-XA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB_agg}$ | N/A | 256-QAM | | Highest $N_{RB_agg}$ | N/A | 256-QAM | | Highest $N_{RB_agg}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **2** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Lowest $N_{RB_agg}$ | N/A | 256-QAM | | Lowest $N_{RB_agg}$ | N/A | 256-QAM | | Lowest $N_{RB_agg}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **3** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB_agg}$ | N/A | 256-QAM | | Highest $N_{RB_agg}$ | N/A | 256-QAM | | Highest $N_{RB_agg}$ |
| **4** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB_agg}$ | N/A | 256-QAM | | Lowest $N_{RB_agg}$ | N/A | 256-QAM | | Lowest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | X | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **4** | R | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **Default Test Settings for CA_XB-YA-ZA and CA_XC-YA-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-XB-ZA and CA_YA-XC-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XB and CA_YA-ZA-XC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **3** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **4** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **5** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ |
| **Default Test Settings for CA_XC-YC Configuration (Intra-band contiguous + Inter-band(2))** | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ |
| **3** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **4** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 4: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41E, X=41.
Note 6: **Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-8A,X=1,Y=3,Z=7,R=8.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_3C-7A-28A, X=3,Y=7 and Z=28.
Note 8: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC}$ = $N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.
Note 11: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.

**Table 7.4A.7_H.4.1-2: Test Configuration Table with Wgap**

| **Initial Conditions** | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | | NC | | | | | | | | | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | | | | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns | | | | | | | | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Highest $N_{RB}$ | | | | | | | | | | | | | | |
| Network signalling value | | | | | | NS_01 by default | | | | | | | | | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | | | | | | | | | | | | |
| **ID** | **PCC** | | | | **$W_{gap}$ [MHz]** | **SCC1** | | | | **$W_{gap}$ [MHz]** | **SCC2** | | | | **$W_{gap}$ [MHz]** | **SCC3** | | | | |
| | **Band** | **Range** | **NRB** | | | **Band** | **Range** | **NRB** | | | **Band** | **Range** | **NRB** | | | **Band** | **Range** | **NRB** | | |
| | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | |
| **Default Test Settings for CA_XA-XA-YA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-XA-XA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XA-XA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | |
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | |
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | |
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | |
| **Default Test Settings for CA_XA-XD/XD-XA/XC-XC Configurations (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | | |
| **TBD** | | | | | | | | | | | | | | | | | | | | |
| **Default Test Settings for CA_XA-XA-YA-YA Configurations (Intra-band non-contiguous + Intra-band non-contiguous)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC4 | REFSENS | ALL RBs | Max | X | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | Max | Y | CC1 | N/A | ALL RBs | |
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | Y | CC4 | REFSENS | ALL RBs | Max | Y | CC3 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band non-contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-12A,X=2,Y=4,Z=12.
Note 5: **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A-41A,X=41.
Note 6: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-4A,X=2,Y=4.
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.
Note 9: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.55 if the UE supports 2 Rx antennas or Figure A.80 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1

4. The UL and DL Reference Measurement channels are set according to Tables 7.4A.7_H.4.1-1 to 7.4A.7_H.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.4A.7_H.4.3.

### 7.4A.7_H.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.4A.7_H.4.3

3. SS activates SCCs by sending the activation MAC-CE (Refer to TS 36.321 [13] clauses 5.13 and 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clause 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.4A.7_H.4.1-1 to 7.4A.7_H.4.1-6 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Tables 7.4A.7_H.4.1-1 to 7.4A.7_H.4.1-2 as appropriate on PCC. Since the UE has no payload and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the value defined in Table 7.4A.7_H.5-2 or 7.4A.7_H.5-3 according to the type of CA. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the PCC output power is within +0dB, -3.4 dB of the target level for carrier frequency $f \leq 3.0$GHz
or within +0dB, -4 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

7. Measure the average throughput for the carrier(s) indicated in table 7.4A.7_H.4.2-1 for duration sufficient to achieve statistical significance according to Annex G.2A.

8. Repeat steps 6 to 7 for all component carriers indicated in Table 7.4A.7_H.4.2-1.

**Table 7.4A.7_H.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2,SCC3 | 7.4A.7_H.5-1 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.4A.7_H.5-2 |
| | | SCC2 | |
| | | SCC3 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | 4 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| Intra-band contiguous + Inter-band | 1 | SCC2 SCC3 | 7.4A.7_H.5-2 |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3 | 7.4A.7_H.5-1 7.4A.7_H.5-2 |
| | 4 | | |
| | 5 | SCC1, SCC2, SCC3 | 7.4A.7_H.5-2 7.4A.7_H.5-1 |
| | 6 | | |
| Intra-band contiguous + Inter-band(2) | 1 | SCC2 SCC3 | 7.4A.7_H.5-1 7.4A.7_H.5-2 |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC2, SCC3 | 7.4A.7_H.5-2 |
| | 2 | SCC1, | 7.4A.7_H.5-2 |
| | | SCC2 | |
| | | SCC3 | |
| | 3 | SCC1, | 7.4A.7_H.5-2 |
| | | SCC2 | |
| | | SCC3 | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.4A.7_H.5-2 |
| | | SCC1, SCC2, SCC3 | 7.4A.7_H.5-1 |
| | 2 | SCC2 | 7.4A.7_H.5-1 |
| | | PCC, SCC1, SCC3 | 7.4A.7_H.5-2 7.4A.7_H.5-1 |
| Intra-band non-contiguous + Intra-band non-contiguous | 1 | SCC2 SCC3 | 7.4A.7_H.5-2 |
| | 2 | | |

Note 1: Test point ID for the particular CA configuration as defined in section 7.4A.7_H.4.1.

Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.

Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.

### 7.4A.7_H.4.3 Message contents

Same message contents as in clause 7.4.4.3 for without UL CA.

Same message contents as in clause 7.4A.1.4.3 for UL CA.

### 7.4A.7_H.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.4A.7_H.5-1 to 7.4A.7_H.5-5, as applicable.

**Table 7.4A.7_H.5-1: Maximum input level for 4DL CA (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |
| Power in largest Transmission Bandwidth Configuration CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | For carrier frequency f ≤ 3.0GHz: -26.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -27.0 | |
| Power in each other CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -25.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -25.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -26.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -27.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier.<br>Note 2: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.4A.7_H.5-2: Maximum input level for 4DL CA (Inter-band), per CC**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

## 7.4A.8 Maximum input level for 5DL CA

### 7.4A.8.1 Test purpose

Maximum input level for CA test verifies the UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to an e-NodeB.

### 7.4A.8.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 5DL with CA configurations in Table 7.1-2c.

### 7.4A.8.3 Minimum conformance requirements

The Minimum conformance requirements are defined in clause 7.4A.0.

### 7.4A.8.4 Test description

#### 7.4A.8.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in tables of 5.4.2A.1 as applicable. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.4A.8.4.1-1 to 7.4A.8.4.1-2. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.4A.8.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Range | NRB | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | UL MOD | DL MOD | ULalloc | DLalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for a CA_XF Configuration (Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 3 | N/A | ALL RBs | X | Mid/CC 4 | N/A | ALL RBs | X | Mid/CC 5 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ | N/A | 64-QAM | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 3 | N/A | ALL RBs | X | Mid/CC 4 | N/A | ALL RBs | X | Mid/CC 5 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ | N/A | 64-QAM | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA-SA Configuration (Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **4** | R | Mid | REFSEN | ALL | X | Mid | N/A | ALL | Y | Mid | N/A | ALL | Z | Mid | N/A | ALL | S | Mid | N/A | ALL |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | S | RBs | | | | RBs | | | | RBs | | | | RBs | | | | RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| 5 | S | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **Default Test Settings for CA_XE-YA, YA-XE Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| 1 | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| 2 | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| 3 | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| 4 | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ |
| **Default Test Settings for CA_YA-ZA-XB-RA and CA_YA-ZA-XC-RA Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **Default Test Settings for CA_YA-ZA-RA-XB and CA_YA-ZA-RA-XC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| 1 | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| 2 | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| 3 | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| 4 | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| 5 | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | R | Mid | N/A | ALL RBs |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **7** | R | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **8** | R | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **Default Test Settings CA_XB-YB-ZA, CA_XB-YC-ZA, CA_XC-YB-ZA, and CA_XC-YC-ZA Configuration (Intra-band contiguous + Intra-band contiguous + Inter-band)**<br>**Default Test Settings CA_ZA-XB-YB, CA_ZA-XB-YC, CA_ZA-XC-YB, and CA_ZA-XC-YC Configuration (Intra-band contiguous + Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Y | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **2** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Y | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **3** | Y | Mid/CC 1 | REFSENS | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **4** | Y | Mid/CC 1 | REFSENS | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **5** | Z | Mid | REFSENS | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Y | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Y | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ | N/A | 64-QAM | | Lowest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 4: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_42F, X=42.

Note 6: **Inter-band:** X,Y,Z,R,S correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-20A-28A,X=1,Y=3,Z=7,R=20,S=28.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_1A-5A-7A-46C, X=1,Y=5,Z=7 and R=46.
Note 8: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC} = N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.

**Table 7.4A.8.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | | $W_{gap}$ [MHz] | SCC3 | | | | $W_{gap}$ [MHz] | SCC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | UL MOD | DL MOD | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for CA_XA-XA-YA-ZA-RA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XA-XA-RA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-RA-XA-XA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **4** | R | Mid | REFSENS | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YD Configurations (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Y | CC3 | REFSENS | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | QPSK | 64-QAM | | $N_{RB_agg}$ | | QPSK | 64-QAM | | $N_{RB_agg}$ | | QPSK | 64-QAM | | $N_{RB_agg}$ |
| **2** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs |

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | QPSK | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YA-ZA-ZA Configurations Intra-band non-contiguous + Intra-band non-contiguous** | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Z | CC2 | REFSENS | ALL RBs | Max | Z | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **2** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | CC2 | N/A | ALL RBs | Max | Z | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **3** | Y | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | CC2 | N/A | ALL RBs | Max | Z | CC1 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YA-ZC Configurations Intra-band non-contiguous + Intra-band non-contiguous** | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | REFSENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Z | Mid/CC1 | N/A | ALL RBs | - | Z | Mid/CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ |
| **2** | Z | CC1/Mid | REFSENS | ALL RBs | - | Z | CC2/Mid | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | | QPSK | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | Highest $N_{RB}$ |
| **3** | Y | Mid | REFSENS | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Z | CC1/Mid | N/A | ALL RBs | - | Z | CC2/Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band non-contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-12A-66A,X=2,Y=5,Z=12,R=66.
Note 5: **Intra-band non-contiguous + Intra-band contiguous:** X,Y corresponds to the band of the CA Configuration. E.g. for CA_5A-5A-66D,X=5,Y=66.
Note 6: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-66A-66A,X=2,Y=5,Z=66.
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.55 if the UE supports 2 Rx antennas or Figure A.80 if the UE supports 4 Rx antennas in at least one band within the CA configuration.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1

4. The UL and DL Reference Measurement channels are set according to Tables 7.4A.8.4.1-1 to 7.4A.8.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.4A.8.4.3.

### 7.4A.8.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.4A.8.4.3

3. SS activates SCCs by sending the activation MAC-CE (Refer to TS 36.321 [13] clauses 5.13 and 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clause 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.4A.8.4.1-1 to 7.4A.8.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Tables 7.4A.8.4.1-1 to 7.4A.8.4.1-2 as appropriate on PCC. Since the UE has no payload and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the value defined in Table 7.4A.8.5-1 or 7.4A.8.5-2 according to the type of CA. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the PCC output power is within +0dB, -3.4 dB of the target level for carrier frequency $f \leq 3.0$GHz
or within +0dB, -4 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

7. Measure the average throughput for the carrier(s) indicated in table 7.4A.8.4.2-1 for duration sufficient to achieve statistical significance according to Annex G.2A.

8. Repeat steps 6 to 7 for all component carriers indicated in Table 7.4A.8.4.2-1.

**Table 7.4A.8.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2,SCC3,SCC4 | 7.4A.8.5-1 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.4A.8.5-2 |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 4 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 5 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| Intra-band contiguous + Inter-band | 1 | SCC4 | 7.4A.8.5-2 |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8.5-1 7.4A.8.5-2 |
| | 4 | | |
| Intra-band contiguous + Inter-band | 1 | SCC2 SCC3 SCC4 | 7.4A.8.5-2 |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3,SCC4 | 7.4A.8.5-1 7.4A.8.5-2 |
| | 4 | | |
| | 5 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8.5-2 7.4A.8.5-1 |
| | 6 | | |
| | 7 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8.5-2 7.4A.8.5-1 |
| | 8 | | |
| Intra-band contiguous + Intra-band contiguous + Inter-band | 1 | SCC2, SCC3, SCC4 | 7.4A.8.5-2 7.4A.8.5-1 |
| | 2 | SCC2, SCC3, SCC4 | 7.4A.8.5-2 7.4A.8.5-1 |
| | 3 | SCC2, SCC3, SCC4 | 7.4A.8.5-2 7.4A.8.5-1 |
| | 4 | SCC2, SCC3, SCC4 | 7.4A.8.5-2 7.4A.8.5-1 |
| | 5 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8.5-2 7.4A.8.5-1 |
| | 6 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8.5-2 7.4A.8.5-1 |
| Intra-band non-contiguous + Inter-band | 1 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8.5-2 |
| | 2 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8.5-2 |
| | 3 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8.5-2 |
| | 4 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8.5-2 |

| | | | |
|---|---|---|---|
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC, SCC1, SCC2 | 7.4A.8.5-1 |
| | | SCC3, SCC4 | 7.4A.8.5-2 |
| | 2 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8.5-2 |
| Intra-band non-contiguous + Intra-band non-contiguous | 1 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8.5-2 |
| | 2 | | |
| | 3 | | |
| Note 1: Test point ID for the particular CA configuration as defined in section 7.4A.8.4.1.<br>Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.<br>Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row. | | | |

### 7.4A.8.4.3 Message contents

Same message contents as in clause 7.4.4.3 for without UL CA.

Same message contents as in clause 7.4A.1.4.3 for UL CA.

## 7.4A.8.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.4A.8.5-1 to 7.4A.8.5-2, as applicable.

**Table 7.4A.8.5-1: Maximum input level for 5DL CA (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power in largest Transmission Bandwidth Configuration CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | For carrier frequency f ≤ 3.0GHz: -26.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -27.0 | For carrier frequency f ≤ 3.0GHz: -27.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 |
| Power in each other CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -25.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -25.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -26.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -27.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -27.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$)<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier.<br>NOTE 2: Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.4A.8.5-2: Maximum input level for 5DL CA (Inter-band), per CC**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2 64QAM R=3/4variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

# 7.4A.8_H Maximum input level for 5DL CA for 256QAM in DL

## 7.4A.8_H.1 Test purpose

Same test purpose as in clause 7.4A.8.1.

## 7.4A.8_H.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 5DL with CA configurations in Table 7.1-2c and 256QAM in DL.

## 7.4A.8_H.3 Minimum conformance requirements

The Minimum conformance requirements are defined in clause 7.4A.1_H.3.

## 7.4A.8_H.4 Test description

### 7.4A.8_H.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in tables of 5.4.2A.1 as applicable. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.4A.8_H.4.1-1 to 7.4A.8_H.4.1-2. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.4A.8_H.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Range | NRB | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | UL MOD | DL MOD | ULalloc | DLalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for a CA_XF Configuration (Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 3 | N/A | ALL RBs | X | Mid/CC 4 | N/A | ALL RBs | X | Mid/CC 5 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Lowest $N_{RB_agg}$ | N/A | 256-QAM | | Lowest $N_{RB_agg}$ | N/A | 256-QAM | | Lowest $N_{RB_agg}$ | N/A | 256-QAM | | Lowest $N_{RB_agg}$ | N/A | 256-QAM | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 3 | N/A | ALL RBs | X | Mid/CC 4 | N/A | ALL RBs | X | Mid/CC 5 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB_agg}$ | N/A | 256-QAM | | Highest $N_{RB_agg}$ | N/A | 256-QAM | | Highest $N_{RB_agg}$ | N/A | 256-QAM | | Highest $N_{RB_agg}$ | N/A | 256-QAM | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA-SA Configuration (Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **4** | R | Mid | REFSEN | ALL | X | Mid | N/A | ALL | Y | Mid | N/A | ALL | Z | Mid | N/A | ALL | S | Mid | N/A | ALL |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | S | RBs | | | | RBs | | | | RBs | | | | RBs | | | | RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **5** | S | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **Default Test Settings for CA_XE-YA, YA-XE Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 3 | N/A | ALL RBs | X | Mid/CC 4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **2** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 3 | N/A | ALL RBs | X | Mid/CC 4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **3** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 3 | N/A | ALL RBs | X | Mid/CC 4 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **4** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 3 | N/A | ALL RBs | X | Mid/CC 4 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ |
| **Default Test Settings for CA_YA-ZA-XB-RA and CA_YA-ZA-XC-RA Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **Default Test Settings for CA_YA-ZA-RA-XB and CA_YA-ZA-RA-XC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **2** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **3** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **4** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **5** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | R | Mid | N/A | ALL RBs |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **7** | R | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **8** | R | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **Default Test Settings CA_XB-YB-ZA, CA_XB-YC-ZA, CA_XC-YB-ZA, and CA_XC-YC-ZA Configuration (Intra-band contiguous + Intra-band contiguous + Inter-band)**<br>**Default Test Settings CA_ZA-XB-YB, CA_ZA-XB-YC, CA_ZA-XC-YB, and CA_ZA-XC-YC Configuration (Intra-band contiguous + Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Y | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **2** | X | Mid/CC 1 | REFSENS | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Y | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **3** | Y | Mid/CC 1 | REFSENS | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **4** | Y | Mid/CC 1 | REFSENS | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **5** | Z | Mid | REFSENS | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Y | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | X | Mid/CC 1 | N/A | ALL RBs | X | Mid/CC 2 | N/A | ALL RBs | Y | Mid/CC 1 | N/A | ALL RBs | Y | Mid/CC 2 | N/A | ALL RBs |
| | QPSK | 256-QAM | | Highest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ | N/A | 256-QAM | | Lowest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 4: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_42F, X=42.

Note 6: **Inter-band:** X,Y,Z,R,S correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-20A-28A,X=1,Y=3,Z=7,R=20,S=28.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_1A-5A-7A-46C, X=1,Y=5,Z=7 and R=46.
Note 8: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC} = N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.

**Table 7.4A.8_H.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | | $W_{gap}$ [MHz] | SCC3 | | | | $W_{gap}$ [MHz] | SCC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | UL MOD | DL MOD | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for CA_XA-XA-YA-ZA-RA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XA-XA-RA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-RA-XA-XA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ |
| **4** | R | Mid | REFSENS | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YD Configurations (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Y | CC3 | REFSENS | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | QPSK | 256-QAM | | $N_{RB_agg}$ | | QPSK | 256-QAM | | $N_{RB_agg}$ | | QPSK | 256-QAM | | $N_{RB_agg}$ |
| **2** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | QPSK | 256-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YA-ZA-ZA Configurations Intra-band non-contiguous + Intra-band non-contiguous** | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Z | CC2 | REFSENS | ALL RBs | Max | Z | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ |
| **2** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | CC2 | N/A | ALL RBs | Max | Z | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ |
| **3** | Y | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | CC2 | N/A | ALL RBs | Max | Z | CC1 | N/A | ALL RBs |
| | QPSK | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ | | N/A | 256-QAM | | $N_{RB_agg}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band non-contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-12A-66A,X=2,Y=5,Z=12,R=66.
Note 5: **Intra-band non-contiguous + Intra-band contiguous:** X,Y corresponds to the band of the CA Configuration. E.g. for CA_5A-5A-66D,X=5,Y=66.
Note 6: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-66A-66A,X=2,Y=5,Z=66.
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.55 if the UE supports 2 Rx antennas or Figure A.80 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1

4. The UL and DL Reference Measurement channels are set according to Tables 7.4A.8_H.4.1-1 to 7.4A.8_H.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.4A.8_H.4.3.

### 7.4A.8_H.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.4A.8_H.4.3

3. SS activates SCCs by sending the activation MAC-CE (Refer to TS 36.321 [13] clauses 5.13 and 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clause 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.4A.8_H.4.1-1 to 7.4A.8_H.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Tables 7.4A.8_H.4.1-1 to 7.4A.8_H.4.1-2 as appropriate on PCC. Since the UE has no payload and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the value defined in Table 7.4A.8_H.5-1 or 7.4A.8_H.5-2 according to the type of CA. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the PCC output power is within +0dB, -3.4 dB of the target level for carrier frequency $f \leq 3.0$GHz
or within +0dB, -4 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

7. Measure the average throughput for the carrier(s) indicated in table 7.4A.8_H.4.2-1 for duration sufficient to achieve statistical significance according to Annex G.2A.

8. Repeat steps 6 to 7 for all component carriers indicated in Table 7.4A.8_H.4.2-1.

**Table 7.4A.8_H.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2,SCC3,SCC4 | 7.4A.8_H.5-1 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.4A.8_H.5-2 |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 4 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 5 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| Intra-band contiguous + Inter-band | 1 | SCC4 | 7.4A.8_H.5-2 |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8_H.5-1 7.4A.8_H.5-2 |
| | 4 | | |
| Intra-band contiguous + Inter-band | 1 | SCC2 SCC3 SCC4 | 7.4A.8_H.5-2 |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3,SCC4 | 7.4A.8_H.5-1 7.4A.8_H.5-2 |
| | 4 | | |
| | 5 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 7.4A.8_H.5-1 |
| | 6 | | |
| | 7 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 7.4A.8_H.5-1 |
| | 8 | | |
| Intra-band contiguous + Intra-band contiguous + Inter-band | 1 | SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 7.4A.8_H.5-1 |
| | 2 | SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 7.4A.8_H.5-1 |
| | 3 | SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 7.4A.8_H.5-1 |
| | 4 | SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 7.4A.8_H.5-1 |
| | 5 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 7.4A.8_H.5-1 |
| | 6 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 7.4A.8_H.5-1 |
| Intra-band non-contiguous + Inter-band | 1 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 |
| | 2 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 |
| | 3 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 |
| | 4 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 |

| | | | |
|---|---|---|---|
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC, SCC1, SCC2 | 7.4A.8_H.5-1 |
| | | SCC3, SCC4 | 7.4A.8_H.5-2 |
| | 2 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 |
| Intra-band non-contiguous + Intra-band non-contiguous | 1 | SCC1, SCC2, SCC3, SCC4 | 7.4A.8_H.5-2 |
| | 2 | | |
| | 3 | | |
| Note 1: Test point ID for the particular CA configuration as defined in section 7.4A.8_H.4.1.<br>Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.<br>Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row. | | | |

### 7.4A.8_H.4.3 Message contents

Same message contents as in clause 7.4.4.3 for without UL CA.

Same message contents as in clause 7.4A.1.4.3 for UL CA.

## 7.4A.8_H.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.4A.8_H.5-1 to 7.4A.8_H.5-2, as applicable.

**Table 7.4A.8_H.5-1: Maximum input level for 5DL CA (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power in largest Transmission Bandwidth Configuration CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7 For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 | For carrier frequency f ≤ 3.0GHz: -25.7 For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | For carrier frequency f ≤ 3.0GHz: -25.7 For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | For carrier frequency f ≤ 3.0GHz: -26.7 For carrier frequency 3.0GHz < f ≤ 4.2GHz: -27.0 | For carrier frequency f ≤ 3.0GHz: -27.7 For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 |
| Power in each other CC | dBm | | For carrier frequency f ≤ 3.0GHz: -28.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) For carrier frequency 3.0GHz < f ≤ 4.2GHz: -29.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -25.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -25.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -26.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) For carrier frequency 3.0GHz < f ≤ 4.2GHz: -27.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) | For carrier frequency f ≤ 3.0GHz: -27.7 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) For carrier frequency 3.0GHz < f ≤ 4.2GHz: -28.0 + 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier. Note 2: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.4A.8_H.5-2: Maximum input level for 5DL CA (Inter-band), per CC**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -25.7 For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5. Note 2: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

# 7.4B Maximum input level for UL-MIMO

## 7.4B.1 Test purpose

Maximum input level tests the ability of UE that support UL- MIMO to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to an e-NodeB.

## 7.4B.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL- MIMO.

## 7.4B.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing, the minimum requirements in Clause 7.4.3 shall be met with the UL-MIMO configurations specified in Table 6.2.2B.3-2. For UL-MIMO, the parameter $P_{CMAX_L}$ is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 36.101 [2] clause 7.4.1B.

# 7.4B.4 Test description

## 7.4B.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.4B.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.4B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | | UE Category |
| | | FDD | TDD | | FDD | TDD | |
| 1.4MHz | 64-QAM | 6 | 6 | QPSK | 5 | 5 | 1-5 |
| 3MHz | 64-QAM | 15 | 15 | QPSK | 4 | 4 | 1-5 |
| 5MHz | 64-QAM | 25 | 25 | QPSK | 8 | 8 | 2-5 |
| 5MHz | 64-QAM | 25 | N/A | QPSK | 5[3] | N/A | 2-5 |
| 5MHz | 64-QAM | 18 | 18 | QPSK | 8 | 8 | 1 |
| 5MHz | 64-QAM | 18 | N/A | QPSK | 5[3] | N/A | 1 |
| 10MHz | 64-QAM | 50 | 50 | QPSK | 12 | 12 | 2-5 |
| 10MHz | 64-QAM | 17 | 17 | QPSK | 12 | 12 | 1 |
| 15MHz | 64-QAM | 75 | 75 | QPSK | 16 | 16 | 2-5 |
| 15MHz | 64-QAM | 17 | 17 | QPSK | 16 | 16 | 1 |
| 20MHz | 64-QAM | 100 | 100 | QPSK | 18 | 18 | 3-5 |
| 20MHz | 64-QAM | 83 | 83 | QPSK | 18 | 18 | 2 |
| 20MHz | 64-QAM | 17 | 17 | QPSK | 18 | 18 | 1 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band. The applicable channel bandwidths are specified in Table 7.3.3-2. | | | | | | | |
| Note 2: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | | |
| Note 3: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2). | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Figure A.28.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.4B.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.4B.4.3.

## 7.4B.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.4B.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 7.4B.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value defined in Table 7.4B.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB- of the target level in Table 7.4B.5-1 for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the throughput measurement.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.4B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception.

**Table 7.4B.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.4B.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4B.5-1.

**Table 7.4B.5-1: Maximum input level**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3MHz** | **5MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz:- 25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

# 7.4C

# 7.4D Maximum input level for ProSe

## 7.4D.0 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Table 7.4D.0-1.

**Table 7.4D.0-1: Maximum input level**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -22 | | | | | |

The normative reference for this requirement is TS 36.101 clause 7.4.1D.

## 7.4D.1 Maximum input level for ProSe Direct Discovery

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Use of OCNG for Downlink has not been considered and is still FFS.
- Message exceptions content needs further investigation (some values still TBD).
- Test time is FFS.

### 7.4D.1.1 Test purpose

Verify the UE's ability to receive ProSe Discovery data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

### 7.4D.1.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Discovery, but not ProSe Direct Communication.

### 7.4D.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause TS 36.101 [2] 7.4D.0.

### 7.4D.1.4 Test description

#### 7.4D.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA ProSe bands specified in table 5.4.2D.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.4D.1.4.1-1. The details of the downlink, uplink and sidelink reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.6.

**Table 7.4D.1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, Highest | | | | | |
| | | | | | | |
| | **Downlink Configuration (Note 2)** | | **Uplink Configuration (Note 2)** | | **Sidelink Configuration (Reception) (Note 3)** | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Mod'n | RB allocation |
| 5MHz | QPSK | 0 | QPSK | 0 | QPSK | 2 |
| 10MHz | QPSK | 0 | QPSK | 0 | QPSK | 2 |
| 15MHz | QPSK | 0 | QPSK | 0 | QPSK | 2 |
| 20MHz | QPSK | 0 | QPSK | 0 | QPSK | 2 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA ProSe and Operating band, according to the applicability specified respectively in Table 5.4.2D.1-1 and Table 5.4.2.1-1.<br>Note 2: The RB start for the transmission of Sidelink RMC is RB#0. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.67.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.4D.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents exceptions are defined in clause 7.4D.1.4.3.
7. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is activated.

## 7.4D.1.4.2 Test procedure

1. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions (only those marked with "…Step 1…" ) are defined in clause 7.4D.1.4.3.
2. The UE shall transmit RRCConnectionReconfigurationComplete message.
3. Initialise the variables $P_{tot}$ and $P_{ok}$ as 0.
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.4D.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.4D.1.4.1-1. When the UE has no payload data to send, it transmits uplink MAC padding bits on the UL RMC.
6. SS transmits PSDCH to transmit the SL RMC according to Table 7.4D.1.4.1-1. Set the Sidelink signal level to the value defined in Table 7.4D.1.5-1.
7. SS shall send SL Discovery Packets (MAC padding bits) on the SL RMC for the test time [FFS]. SS stores the number of the transmitted Discovery Packets in the current test iteration in the variable $P_{tot}$.
8. SS shall send (on the available PDSCH) a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER REQUEST" message and wait for the UE to respond (on the available

PUSCH) with a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER RESPONSE".

9. SS calculates the variable $P_{ok}$ as (current counter value - counter value at last test iteration).

10. SS shall compute the throughput as following:

$$TP = P_{ok} / P_{tot} * 100\%$$

### 7.4D.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

- Table A.7.1.1-1 for FDD
- Table A.7.1.2-1 for TDD

**Table 7.4D.1.4.3-1: ACTIVATE TEST MODE: Maximum input level for ProSe Direct Discovery**

| Derivation Path: 36.508 [7], Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 7.4D.1.4.3-2: CLOSE UE TEST LOOP: Maximum input level for ProSe Direct Discovery**

| Derivation Path: 36.508 [7], Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 7.4D.1.4.3-3: *MAC-MainConfig-RBC*: Maximum input level for ProSe Direct Discovery (applicable only for Step 1 of Test procedure)**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | TBD | | |
| periodicBSR-Timer | TBD | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | TBD | | |
| } | | | |

## 7.4D.1.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.6.2 with parameters specified in Table 7.4D.1.5-1.

**Table 7.4D.1.5-1: Maximum input level for ProSe Direct Discovery**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -22 – TT | | | | | |

## 7.4D.2 Maximum input level for ProSe Direct Communication

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Many clauses are TBD

### 7.4D.2.1 Test purpose

Verify the UE's ability to receive ProSe Communication data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

### 7.4D.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Communication.

### 7.4D.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in TS 36.101 [2] clause 7.4D.0.

### 7.4D.2.4 Test description

TBD

#### 7.4D.2.4.1 Initial conditions

TBD

#### 7.4D.2.4.2 Test procedure

TBD

#### 7.4D.2.4.3 Message contents

TBD

### 7.4D.2.5 Test requirements

TBD

# 7.4E Maximum input level for UE category 0

## 7.4E.1 Test purpose

Same test purpose as in clause 7.4.1.

## 7.4E.2 Test applicability

This test applies to all types of E-UTRA UE release 12 and forward of UE category 0.

## 7.4E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 7.4.3.

## 7.4E.4 Test description

### 7.4E.4.1 Initial conditions

Same initial conditions as in clause 7.4.4.1 with the following exceptions:

- Instead of Table 7.4.4.1-1 → use Table 7.4E.4.1-1.
- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

**Table 7.4E.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 4.1 | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] clause 4.3.1 | Mid range | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3.1 | Lowest, 5MHz, Highest | | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | | **UE Category** |
| | | **FDD and HD-FDD** | **TDD** | | **FDD and HD-FDD** | **TDD** | |
| 1.4MHz | 64QAM | 2 | 2 | QPSK | 6 | 6 | 0 |
| 3MHz | 64QAM | 2 | 2 | QPSK | 15 | 15 | 0 |
| 5MHz | 64QAM | 2 | 2 | QPSK | 25 | 25 | 0 |
| 5MHz | 64QAM | 2 | N/A | QPSK | 20 | N/A | 0 |
| 10MHz | 64QAM | 2 | 2 | QPSK | 36 | 36 | 0 |
| 10MHz | 64QAM | 2 | N/A | QPSK | 25 | N/A | 0 |
| 10MHz | 64QAM | 2 | N/A | QPSK | 20 | N/A | 0 |
| 15MHz | 64QAM | 2 | 2 | QPSK | 36 | 36 | 0 |
| 20MHz | 64QAM | 2 | 2 | QPSK | 36 | 36 | 0 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band. The applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3E.3-3 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).<br>Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used.<br>Note 4: Downlink RB position shall be $RB_{start}$ = 0 | | | | | | | |

### 7.4E.4.2 Test procedure

Same test procedure as in clause 7.4.4.2.

### 7.4E.4.3 Message contents

Same message contents as in clause 7.4.4.3.

## 7.4E.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4E.5-1.

**Table 7.4E.5-1: Maximum input level**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2 64QAM R=3/4variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

# 7.4EA Maximum input level for UE category M1

## 7.4EA.1 Test purpose

Maximum input level tests the ability of category M1 UE to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to an e-NodeB.

## 7.4EA.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category M1.

## 7.4EA.3 Minimum conformance requirements

Maximum input level is defined as the maximum mean power received at the UE antenna port, at which the specified relative throughput shall meet or exceed the minimum requirements for the specified reference measurement channel.

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.4EA.3-1. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.4EA.3-1: Maximum input level**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -25[2] | | | | | |
| | | -27[3] | | | | | |
| NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in subclause 6.2.5EA. | | | | | | | |
| NOTE 2: Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| NOTE 3: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.4.1.

## 7.4EA.4 Test description

### 7.4EA.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands defined for CAT M1 in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.4EA.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 7.4EA.4.1-1: Test Configuration Table RX test cases UE Cat-M1**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 | Mid range | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3.1 | 5MHz | | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | | **UE Category** |
| | | **FDD and HD-FDD** | **TDD** | | **FDD and HD-FDD** | **TDD** | |
| 5MHz | 16QAM | 2 | 2 | QPSK | 6 | 6 | M1 |
| Note 1: Downlink RB position shall be $RB_{start}$ = 0 within the narrowband<br>Note 2: The Narrowband index (TS36.211, 5.2.4) shall be set to 0 for all testpoints. | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.4EA.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 7.4EA.4.3.

## 7.4EA.4.2 Test procedure

1. SS transmits PDSCH via M-PDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 7.4EA.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via M-PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.4EA.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value defined in Table 7.4EA.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.4EA.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the Throughput measurement.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

## 7.4EA.4.3 Message contents

- Same message contents as in clause 7.4.4.3 with the following exception.

**Table 7.4EA.4.2-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| mpdcch-NumRepetition-r13 | r1 | | |

# 7.4EA.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2.2, A.2.3 and A.3.2 with parameters specified in Table 7.4EA.5-1.

**Table 7.4EA.5-1: Maximum input level**

| Rx Parameter | Units | Channel bandwidth |
|---|---|---|
| | | 5 MHz |
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5EA.<br>Note 2: Reference measurement channel is Annex A.3.2 64QAM R=3/4variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | |

# 7.4EB Maximum input level for UE Category 1bis

Editor's note

- Test case incomplete with Annex F.3.3 needing update. TT shall be same as legacy test case.

## 7.4EB.1 Test purpose

Same test purpose as in clause 7.4.1.

## 7.4EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

## 7.4EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 7.4.3.

## 7.4EB.4 Test description

### 7.4EB.4.1 Initial conditions

Same initial conditions as in clause 7.4.4.1 with the following exceptions:

- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only main UE Tx/Rx antenna.

### 7.4EB.4.2 Test procedure

Same test procedure as in clause 7.4.4.2.

### 7.4EB.4.3 Message contents

Same message contents as in clause 7.4.4.3.

## 7.4EB.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4EB.5-1.

**Table 7.4EB.5-1: Maximum input level**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -25.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -26.0 | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: Reference measurement channel is Annex A.3.2 64QAM R=3/4variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

# 7.4EC Maximum input level for UE category M2

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- 38-521-2 is not updated

## 7.4EC.1 Test purpose

Maximum input level tests the ability of category M2 UE to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to an e-NodeB.

## 7.4EC.2 Test applicability

This test applies to all types of E-UTRA UE release 14 and forward of UE category M2.

## 7.4EC.3 Minimum conformance requirements

Same as in clause 7.4EA.3.

## 7.4EC.4 Test description

### 7.4EC.4.1 Initial conditions

Same as in clause 7.4EA.4.1 with following exceptions:

- Instead of Table 7.4EA.4.1-1 → use Table 7.4EC.4.1-1

**Table 7.4EC.4.1-1: Test Configuration Table RX test cases UE Cat-M2**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 | Mid range | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3.1 | Lowest, 5MHz | | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | | **UE Category** |
| | | **FDD and HD-FDD** | **TDD** | | **FDD and HD-FDD** | **TDD** | |
| 1.4MHz | 16QAM | 2 | 2 | QPSK | 6 | 6 | M2 |
| 3MHz | 16QAM | 8 | 8 | QPSK | 15 | 15 | M2 |
| 5MHz | 16QAM | 15 | 15 | QPSK | 24 | 24 | M2 |
| Note 1: Downlink RB position shall be $RB_{start}$ = 0 within the wideband<br>Note 2: The Wideband index (TS36.211, 5.2.4) shall be set to 0 for all testpoints. | | | | | | | |

### 7.4EC.4.2 Test procedure

Same as in clause 7.4EA.4.2.

### 7.4EC.4.3 Message contents

Same as in clause 7.4EA.4.3.

## 7.4EC.5 Test requirement

Same as in clause 7.4EA.5.

# 7.4F Maximum input level for category NB1 and NB2

## 7.4F.1 Test Purpose

Maximum input level tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to an e-NodeB.

## 7.4F.2 Test Applicability

This test applies to all types of UE release 13 and forward of category NB1.

This test applies to all types of UE release 14 and forward of category NB2.

## 7.4F.3 Minimum Conformance Requirements

Maximum input level is defined as the maximum mean power received at the UE antenna port, at which the specified relative throughput shall meet or exceed the minimum requirements for the specified reference measurement channel.

Category NB1 and NB2 UE maximum input level requirement is – 25 dBm. For this input level the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in Annex A.3.2.

The normative reference for this requirement is TS 36.101 clause 7.4F.

## 7.4F.4 Test Description

### 7.4F.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the set of E-UTRA operating bands defined for NB-IoT in clause 5.2.F. All of these configurations shall be tested with applicable test parameters, and are shown in table 7.4F.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 7.4F.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 8.1.1 | | | NC | | |
| Test Frequencies as specified in TS36.508 [7] clause 8.1.3.1 | | | Frequency ranges defined in Annex K.1.1 | | |
| **Configuration ID** | **Downlink Configuration** | | **Uplink Configuration** | | |
| | Modulation | Subcarriers | Modulation | $N_{tones}$ | Subcarrier spacing |
| 1 | QPSK | 12 | BPSK | 1@0 | 15kHz |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.3 using only the main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C0, C1 and C.3.0, and NPUSCH Format 2 is used to carry ACK/NACK on the uplink.
4. The DL Reference Measurement channels are set according to Table 7.4F.4.1-1.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 7.4F.4.3.

### 7.4F.4.2 Test Procedure

4. SS transmits NPDSCH via NPDCCH DCI format N1 for C_RNTI to transmit the DL RMC according to Table 7.4F.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The UE will send the HARQ feedback based on information contain in DCI format N1.

5. Set the Downlink signal level to the value defined in Table 7.4F.5-1.

6. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.4F.4.3 Message Contents

Message contents are according to TS 36.508 [7] clause 8.1.6.

## 7.4F.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4F.5-1.

**Table 7.4F.5-1: Maximum input level for category NB1 and NB2**

| Rx Parameter | Units | Maximum input level test requirement |
|---|---|---|
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency f ≤ 3.0GHz: -25.7 |

# 7.4G Maximum input level for V2X Communication

## 7.4G.1 Maximum input level for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 7.4G.1.1 Test purpose

Verify the UE's ability to receive V2X Communication data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

### 7.4G.1.2 Test applicability

This test case applies to all types of UE that support V2X Sidelink Communication and Band 47.

### 7.4G.1.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.8.2 with parameters specified in Table 7.4G.1.3-1.

**Table 7.4G.1.3-1: Maximum input level**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | - | - | - | -22 | - | -22 |
| NOTE 1: Reference measurement channel is defined in Annex A.8.2. | | | | | | | |

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA downlink reception for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.5G-2, the requirements in subclause 7.4G.1.3 apply for the E-UTRA V2X sidelink reception and the requirements in subclause 7.4.3 apply for the E-UTRA downlink reception while all downlink carriers are active.

The normative reference for this requirement is TS 36.101 [2] clause 7.4.1G.

## 7.4G.1.4 Test description

### 7.4G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.4G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 7.4G.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 96 |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.92.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 7.4G.1.4.3.

3. The V2X reference measurement channel is set according to Table 7.4G.1.4.1-1.

3a. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 5A-V2X in Receive Mode according to TS 36.508 [7] clause 4.5.9. Message content exceptions are defined in clause 7.4G.1.4.3.

6. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 7.4G.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration and to schedule the V2X RMC according to Table 7.4G.1.4.1-1.

2. Set the signal level of V2X to the value defined in Table 7.4G.1.5-1.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.4G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.10.

### 7.4G.1.5 Test requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.8.2 with parameters specified in Table 7.4G.1.5-1.

**Table 7.4G.1.5-1: Maximum input level**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | For carrier frequency 4.2GHz < f ≤ 6GHz: -23.5 | | | | | |
| NOTE 1: Reference measurement channel is defined in Annex A.8.2. | | | | | | | |

## 7.4G.2 Maximum input level for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

### 7.4G.2.1 Test purpose

Same test purpose as in clause 7.4G.1.

### 7.4G.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support V2X Communication.

### 7.4G.2.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.8.2 with parameters specified in Table 7.4G.2.3-1.

**Table 7.4G2.3-1: Maximum input level**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | - | - | - | -22 | - | -22 |
| NOTE 1: Reference measurement channel is defined in Annex A.8.2. | | | | | | | |

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA downlink reception for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.5G-2, the requirements in subclause 7.4G.2.3 apply for the E-UTRA V2X sidelink reception and the requirements in subclause 7.4.3 apply for the E-UTRA downlink reception while all downlink carriers are active.

The normative reference for this requirement is TS 36.101 [2] clause 7.4.1G.

### 7.4G.2.4 Test description

#### 7.4G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.4G.2.4.1-1. The details of the uplink, downlink and V2X reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.8.3 respectively.

**Table 7.4G.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Mid range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink** | | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | QPSK | 1 | QPSK | 1 | 10 MHz | QPSK | 48 |
| 1.4 MHz | QPSK | 5 | QPSK | 5 | 20 MHz | QPSK | 96 |
| 3 MHz | QPSK | 1 | QPSK | 1 | | | |
| 3 MHz | QPSK | 4 | QPSK | 4 | | | |
| 5 MHz | QPSK | 1 | QPSK | 1 | | | |
| 5 MHz | QPSK | 8 | QPSK | 8 | | | |
| 10 MHz | QPSK | 1 | QPSK | 1 | | | |
| 10 MHz | QPSK | 12 | QPSK | 12 | | | |
| 15 MHz | QPSK | 1 | QPSK | 1 | | | |
| 15 MHz | QPSK | 16 | QPSK | 16 | | | |
| 20 MHz | QPSK | 1 | QPSK | 1 | | | |
| 20 MHz | QPSK | 18 | QPSK | 18 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3G.0-4 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2G.1-2). | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93a.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.7. Message content exceptions are defined in clause 7.4G.2.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to Table 7.4G.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 7.4G.2.4.3.

### 7.4G.2.4.2 Test procedure

1. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.4G.2.4.1-1 on E-UTRA band. The SS sends downlink MAC padding bits on the DL RMC.
2. SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 7.4G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.
3. Set the signal level of V2X for V2X band and E-UTRA band to the value defined in Table 7.4G.2.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.4G.2.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz or within +0, -4.3 dB of the target level for carrier frequency $f \leq 6.0$GHz for at least the duration of the Throughput measurement.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

#### 7.4G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 7.4G.2.5 Test requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.8.2 with parameters specified in Table 7.4G.2.5-1.

**Table 7.4G.2.5-1: Maximum input level**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for V2X sidelink | dBm | - | - | - | -23.5 | - | -23.5 |
| Power in Transmission Bandwidth Configuration for E-UTRA | dBm | For carrier frequency f ≤ 3.0GHz: -22.7<br>For carrier frequency 3.0GHz < f ≤ 4.2GHz: -23 | | | | | |
| NOTE 1: Reference measurement channel is defined in Annex A.8.2. | | | | | | | |

## 7.4G.3 Maximum input level for V2X Communication / Intra-band contiguous multi-carrier operation

### 7.4G.3.1 Test purpose

Same test purpose as in clause 7.4G.1.

### 7.4G.3.2 Test applicability

This test case applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 7.4G.3.3 Minimum conformance requirements

For intra-band contiguous multi-carrier operation maximum input level is defined as the powers received at the UE antenna port over the Transmission bandwidth configuration of each CC, at which the specified relative throughput shall meet or exceed the minimum requirements for the specified reference measurement channel over each component carrier.

**Table 7.4G.3.3-2: Maximum input level for intra-band contiguous multi-carrier for V2X**

| Rx Parameter | Units | V2X Bandwidth Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |
| Power in largest Transmission Bandwidth Configuration CC | dBm | | -22[2] | | | | |
| Power in each other CC | dBm | | $-22+10\log(N_{RB,c}/N_{RB,largest\ BW})$ [2] | | | | |
| NOTE 2: The requirement is applied for 2 carrier intra-concurrent receptions when 2 carrier transmission are activated at the same time | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.4.1G.

## 7.4G.3.4 Test description

### 7.4G.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.4G.3.4.1-1. The details of the uplink, downlink and V2X reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.8.3 respectively and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 7.4G.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for Channel Bandwidths** | | | |
| **V2X multi-carrier Configuration** | | **V2X PSSCH Allocation** | |
| **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **CC1 and CC2 RB Allocation** |
| 10MHz | 10MHz | QPSK | 48+48 |

1. Connect the SS and GNSS simulator to the UE antenna connector as shown in TS 36.508 [7] Annex A, Figure A.89a.

2. The parameter settings for the V2X sidelink communication over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 7.4G.3.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and V2X Reference Measurement Channels are set according to Table 7.4G.3.4.1-1.

4a. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 5A-V2X according to TS 36.508 [7] clause 4.5.9.

7. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)

8. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 7.4G.3.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration and to schedule the V2X RMC according to Table 7.4G.3.4.1-1 for 2carrier intr-band-concurrent receptions. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Set the signal level of V2X for each component carrier to the value defined in Table 7.4G.3.5-2.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2 .

### 7.4G.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 7.4G.3.5 Test requirements

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Table 7.4G.3.5-2.

**Table 7.4G.3.5-2: Maximum input level for intra-band contiguous multi-carrier for V2X**

| Rx Parameter | Units | V2X Bandwidth Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |
| Power in largest Transmission Bandwidth Configuration CC | dBm | | -23.5[2] | | | | |
| Power in each other CC | dBm | | -23.5+ 10log($N_{RB,c}$ /$N_{RB,largest\ BW}$) [2] | | | | |
| NOTE 2: The requirement is applied for 2 carrier intra-concurrent receptions when 2 carrier transmission are activated at the same time | | | | | | | |

# 7.5 Adjacent Channel Selectivity (ACS)

## 7.5.1 Test purpose

Adjacent channel selectivity tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when other e-NodeB transmitters exist in the adjacent channel.

## 7.5.2 Test applicability

This test applies to all types of E-UTRA UE release 8 and forward.

## 7.5.3 Minimum conformance requirements

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive an E-UTRA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

The UE shall fulfil the minimum requirement specified in Table 7.5.3-1 for all values of an adjacent channel interferer up to –25 dBm. However it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 7.5.3-2 and Table 7.5.3-3 where the throughput $R_{av}$ shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1). For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.5.3-1: Adjacent channel selectivity**

| | | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | 33.0 | 33.0 | 33.0 | 33.0 | 30 | 27 |

**Table 7.5.3-2: Test parameters for Adjacent channel selectivity, Case 1**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +42.5dB | REFSENS +39.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | **1.4+0.0025 /** -1.4-0.0025 | **3+0.0075 /** -3-0.0075 | **5+0.0025 /** -5-0.0025 | **7.5+0.0075 /** -7.5-0.0075 | **10+0.0125 /** -10-0.0125 | **12.5+0.0025 /** -12.5-0.0025 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |
| Note 3: The REFSENS power level is specified in Table 7.3.3-1 and Table 7.3.3-1a for two and four antenna ports, respectively. | | | | | | | |

**Table 7.5.3-3: Test parameters for Adjacent channel selectivity, Case 2**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -56.5 | -56.5 | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | **1.4+0.0025 /** -1.4-0.0025 | **3+0.0075 /** -3-0.0075 | **5+0.0025 /** -5-0.0025 | **7.5+0.0075 /** -7.5-0.0075 | **10+0.0125 /** -10-0.0125 | **12.5+0.0025 /** -12.5-0.0025 |
| Note 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.5.1.

## 7.5.4 Test description

### 7.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.5.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.5.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3. | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[4] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2). | | | | | | |

1. Connect the SS and interfering source to the UE antenna connectors as shown in TS 36.508 [7] Figure A.4.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.5.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.5.4.3.

## 7.5.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.5.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.5.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.5.5-2 (Case 1). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5.5-2 (Case 1) for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the Throughput measurement.

4. Set the Interferer signal level to the value as defined in Table 7.5.5-2 (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal in Case 1 at step 4.

7. Set the Downlink signal level to the value as defined in Table 7.5.5-3 (Case 2). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5.5-3 (Case 2) for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the Throughput measurement.

8. Set the Interferer signal level to the value as defined in Table 7.5.5-3 (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

9. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

10. Repeat steps from 7 to 9, using an interfering signal above the wanted signal in Case 2 at step 8.

11. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

### 7.5.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception

**Table 7.5.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.5.5 Test requirement

The throughput $R_{av}$ shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 under the conditions specified in table 7.5.5-2, and also under the conditions specified in table 7.5.5-3.

**Table 7.5.5-1: Adjacent channel selectivity**

| | | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | 33.0 | 33.0 | 33.0 | 33.0 | 30 | 27 |

**Table 7.5.5-2: Test parameters for Adjacent channel selectivity, Case 1**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +42.5dB | REFSENS +39.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025/ -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |
| Note 3: The REFSENS power level is specified in Table 7.3.3-1 for two antenna ports. | | | | | | | |

**Table 7.5.5-3: Test parameters for Adjacent channel selectivity, Case 2**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -56.5 | -56.5 | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025 / -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| Note 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

# 7.5_1 Adjacent Channel Selectivity (ACS) with 4 Rx antenna ports

## 7.5_1.1 Test purpose

Same test purpose as in clause 7.5.1.

## 7.5_1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that supports 4 Rx antenna ports.

## 7.5_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 7.5.3.

## 7.5_1.4 Test description

### 7.5.4_1.1 Initial conditions

Same as in clause 7.5.4.1 with following exceptions:

- Instead of Table 7.5.4.1-1→ use Table 7.5_1.4.1-1.

- Instead of Figure A.4→ use Figure A.81.

**Table 7.5_1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | QPSK | 6 | N/A | QPSK | 6 | N/A |
| 3MHz | QPSK | 15 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 50 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 75 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2. Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |

### 7.5_1.4.2 Test procedure

Same as in clause 7.5.4.2 with following exceptions:

- Instead of Table 7.5.4.1-1→ use Table 7.5_1.4.1-1.
- Instead of Table 7.5.5-2→ use Table 7.5_1.5-2.
- Instead of Table 7.5.5-3→ use Table 7.5_1.5-3.

### 7.5_1.4.3 Message contents

Same as in clause 7.5.4.3.

## 7.5_1.5 Test requirement

The throughput $R_{av}$ shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 under the conditions specified in table 7.5_1.5-2, and also under the conditions specified in table 7.5_1.5-3.

**Table 7.5_1.5-1: Adjacent channel selectivity**

| | | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | 33.0 | 33.0 | 33.0 | 33.0 | 30 | 27 |

**Table 7.5_1.5-2: Test parameters for Adjacent channel selectivity, Case 1**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +42.5dB | REFSENS +39.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025/ -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |
| Note 3: The REFSENS power level is specified in Table 7.3_1.5-1 for four antenna ports. | | | | | | | |

**Table 7.5_1.5-3: Test parameters for Adjacent channel selectivity, Case 2**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -56.5 | -56.5 | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025 / -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| Note 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

# 7.5A Adjacent Channel Selectivity (ACS) for CA

## 7.5A.0 Minimum conformance requirements

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band, the adjacent channel requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.5.3 for each component carrier while all downlink carriers are active. For E-UTRA CA configurations including an operating band without uplink operation or an operating band with an unpaired DL part (as noted in Table 5.2-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. For a component carrier configured in Band 46, the requirements specified in subclause 7.5.3 are replaced by the requirements in Table 7.5A.0-1a with test parameters in Table 7.5A.0-2a and Table 7.5A.0-3a.

**Table 7.5A.0-1a: Adjacent channel selectivity**

| E-UTRA band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | ACS | dB | | | | 33 | | 27 |

**Table 7.5A.0-2a: Test parameters for Adjacent channel selectivity, Case 1**

| E-UTRA Band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | | | | |
| | $P_{Interferer}$ | dBm | | | | REFSENS+45.5dB | | REFSENS +39.5dB |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{Interferer}$ (offset) | MHz | | | | 15+0.0075/-15-0.0075 | | 20+0.0025 / -20-0.0025 |
| NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.<br>NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | | |

**Table 7.5A.0-3a: Test parameters for Adjacent channel selectivity, Case 2**

| E-UTRA band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | Power in Transmission Bandwidth Configuration | dBm | | | | -56.5 | | -50.5 |
| | $P_{Interferer}$ | dBm | -25 | | | | | |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{Interferer}$ (offset) | MHz | | | | 15+0.0075/-15-0.0075 | | 20+0.0025 / -20-0.0025 |
| NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 24dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.<br>NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | | |

For E-UTRA CA configurations listed in Table 7.3A.0-0a under conditions for which reference sensitivity for the operating band being tested is N/A, the adjacent channel requirements of subclause 7.5A.0 do not apply.

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.5A.0-2 or Table 7.5A.0-3 with the uplink configuration set according to Table 7.3A.0-1 for the applicable carrier aggregation configuration. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.3-2. The UE shall fulfil the minimum requirement specified in Table 7.5A.0-1 for an adjacent channel interferer on either side of the aggregated downlink signal at a specified frequency offset and for an interferer power up to -25 dBm. The throughput of each carrier shall be $\geq$ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5A.0-2 and 7.5A.0-3. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Tables 7.5A.0-2 and 7.5A.0-3.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, each larger than or equal to 5 MHz, the adjacent channel selectivity requirements are defined with the uplink configuration in accordance with Table 7.3A.0-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.5.3 and 7.5A.0 for one component carrier and two component carriers per sub-block, respectively. The UE shall fulfil the minimum requirements all values of a single adjacent channel interferer in-gap and out-of-gap up to a –25 dBm interferer power while all downlink carriers are active. For the lower range of test parameters (Case 1), the interferer power $P_{interferer}$ shall be set to the maximum of the levels given by the carriers of the respective sub-blocks as specified in Table 7.5.3-2 and Table 7.5A.0-2 for one component carrier and two component

carriers per sub-block, respectively. The wanted signal power levels for the carriers of each sub-block shall then be adjusted relative to $P_{interferer}$ in accordance with the ACS requirement for each sub-block (Table 7.5.3-1 and Table 7.5A.0-1). For the upper range of test parameters (Case 2) for which the interferer power $P_{interferer}$ is -25 dBm (Table 7.5.3-3 and Table 7.5A.0-3) the wanted signal power levels for the carriers of each sub-block shall be adjusted relative to $P_{interferer}$ like for Case 1.

**Table 7.5A.0-1: Adjacent channel selectivity**

| | | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **B** | **C** | **D** | **E** | **F** |
| ACS | dB | 27 | 24 | 22.2 | 21 | 20 |

**Table 7.5A.0-2: Test parameters for Adjacent channel selectivity, Case 1**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | **B** | **C** | **D** | **E** | **F** |
| Pw in Transmission Bandwidth Configuration, per CC | | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB |
| $P_{Interferer}$ | dBm | Aggregated power + 25.5 dB | Aggregated power + 22.5 dB | Aggregated power + 20.7 dB | Aggregated power + 19.5 dB | Aggregated power + 18.5 dB |
| $BW_{Interferer}$ | MHz | 5 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.
NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.0-3: Test parameters for Adjacent channel selectivity, Case 2**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | **B** | **C** | **D** | **E** | **F** |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -50.5 +10log$_{10}$($N_{RB,c}$/ $N_{RB\ agg}$) | -47.5 +10log$_{10}$($N_{RB,c}$/$N_{RB\ agg}$) | -45.743.9 +10log$_{10}$($N_{RB,c}$/$N_{RB\ agg}$) | -44.5 +10log$_{10}$($N_{RB,c}$/$N_{RB\ agg}$) 5 | -43.5 +10log$_{10}$($N_{RB,c}$/$N_{RB\ agg}$) |
| $P_{Interferer}$ | dBm | -25 | | | | |
| $BW_{Interferer}$ | MHz | 5 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ |

NOTE 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1
NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

For combinations of intra-band and inter-band carrier aggregation with up to five downlink carriers (up to four non-contiguously aggregated carriers per band and up to four contiguously aggregated carriers per band) and one uplink carrier assigned to one E-UTRA band, the requirement is defined with the uplink active in each band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3A.0-3 when the uplink is active in the band supporting two non-contiguous component carriers, Table 7.3A.0-1 when the uplink is

active in a band supporting two contiguous component carriers and in accordance with Table 7.3.3-2 when the uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to four component carriers. For these uplink configurations, the UE shall meet the adjacent channel selectivity requirements for intra-band non-contiguous carrier aggregation of two downlink sub-blocks with $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps (Table 7.3A.0-3) for the two non-contiguous downlink sub-blocks, the requirements for intra-band contiguous carrier aggregation for the contiguously aggregated downlink carriers and for any remaining component carrier(s) the requirements specified in subclause 7.5.3. For contiguously aggregated component carriers configured in Band 46, the said requirements for intra-band contiguous carrier aggregation of downlink carriers are replaced by requirements in Table 7.5A.0-4 with test parameters in Table 7.5A.0-5 and Table 7.5A.0-6. For non-contiguously aggregated component carriers configured in Band 46, the said requirements are applied to each sub-block for in-gap and out-of-gap interferers. For the sub-block with a single component carrier, the requirement is replaced by Table 7.5A.0-1a with test parameters in Table 7.5A.0-1b and Table 7.5A.0-1c. For the sub-block with two or more contiguous component carriers, the requirement is replaced by Table 7.5A.0-4 with test parameters in Table 7.5A.0-5 and Table 7.5A.0-6. All downlink carriers shall be active throughout the tests and the requirements for downlinks shall be met with the single uplink carrier active in each band capable of UL operation.

**Table 7.5A.0-4: Adjacent channel selectivity**

| E-UTRA band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | ACS | dB | | 24 | 22.2 | 21 | |

**Table 7.5A.0-5: Test parameters for Adjacent channel selectivity, Case 1**

| E-UTRA Band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Pw in Transmission Bandwidth Configuration, per CC | | | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB | |
| | PInterferer | dBm | | Aggregated power + 22.5 dB | Aggregated power + 20.7 dB | Aggregated power + 19.5 dB | |
| | $BW_{Interferer}$ | MHz | | 20 | 20 | 20 | |
| | $F_{Interferer\ (offset)}$ | MHz | | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | |

NOTE 1*: In a band capable of uplink operation, the transmitter shall be set to 4dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.3.1 and set-up according to Annex C.3.1.
NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.0-6: Test parameters for Adjacent channel selectivity, Case 2**

| E-UTRA band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Pw in Transmission Bandwidth Configuration, per CC | dBm | | -47.5 +10log10($N_{RB,c}/N_{RB\ agg}$) | -45.7 +10log10($N_{RB,c}/N_{RB\ agg}$) | -44.5 +10log10($N_{RB,c}/N_{RB\ agg}$) | |
| | $P_{Interferer}$ | dBm | -25 | | | | |
| | $BW_{Interferer}$ | MHz | | 20 | 20 | 20 | |
| | $F_{Interferer}$ (offset) | MHz | | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | |

NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 24dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.3.1 and set-up according to Annex C.3.1.
NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

The normative references for this requirement are TS 36.101 [2] clauses 7.5.1A and 7.5.1.

## 7.5A.1 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA and UL CA)

### 7.5A.1.1 Test purpose

Adjacent channel selectivity for CA test verifies the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when other e-NodeB transmitters exist in the adjacent channel.

### 7.5A.1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 7.5A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.5A.0.

### 7.5A.1.4 Test description

#### 7.5A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.5A.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.5A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | | NC | | | | | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | | Mid range | | | | | | | |
| Test CC Combination setting (NRB_agg) as specified in clause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 3) | | | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | **UL Allocation** | | | | | |
| **PCC $N_{RB}$** | **SCC $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 50 | 25 | QPSK | 50+25 | QPSK | 25 | P_25@25 | S_0@0 | - | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 25 | P_25@25 | S_0@0 | - | - |
| 50 | 100 | QPSK | 50+100 | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 75 | 50 | QPSK | 75+50 | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 129 | P_75@0 | S_54@0 | - | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 50 | P_50@50 | S_0@0 | - | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 125 | P_100@0 | S_25@0 | - | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 75 | P_75@25 | S_0@0 | - | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 75 | QPSK | 100+75 | QPSK | 175 | P_100@0 | S_75@0 | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 50 | P_50@50 | S_0@0 | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 75 | P_75@25 | S_0@0 | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 130 | P_100@0 | S_30@0 | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 200 | P_100@0 | S_100@0 | - | - |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3.3-2 for UE supporting one uplink carrier and to table 7.3A.0-1 for UE supporting two uplink carriers are tested per Test CA configuration.

Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.

1. Connect the SS and interfering source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.34 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 7.5A.1.4.1-1.

5, Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.5A.1.4.3.

### 7.5A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.5A.1.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.5A.1.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.5A.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-2 (Case 1). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that for at least the duration of the Throughput measurement:
   The PCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.5A.1.5-2 (Case 1) + $10\log(P_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
   or within (+0dB, -4 dB) of (target level in Table 7.5A.1.5-2 (Case 1) + $10\log(P_L_{CRB}/N_{RB_alloc})$) for carrier frequency 3.0GHz < $f \leq 4.2$GHz.
   The SCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.5A.1.5-2 (Case 1) + $10\log(S_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
   or within (+0dB, -4 dB) of (target level in Table 7.5A.1.5-2 (Case 1) + $10\log(S_L_{CRB}/N_{RB_alloc})$) for carrier frequency 3.0GHz < $f \leq 4.2$GHz.

7. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-2 (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document. The interferer frequencies are adjusted in analogy with table 7.5A.1.4.2-1.

8. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal in Case 1 at step 7.

10. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-3 (Case 2). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that for at least the duration of the Throughput measurement:
    The PCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.5A.1.5-3 (Case 2) + $10\log(P_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
    or within (+0dB, -4 dB) of (target level in Table 7.5A.1.5-3 (Case 2) + $10\log(P_L_{CRB}/N_{RB_alloc})$) for carrier frequency 3.0GHz < $f \leq 4.2$GHz.
    The SCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.5A.1.5-3 (Case 2) + $10\log(S_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
    or within (+0dB, -4 dB) of (target level in Table 7.5A.1.5-3 (Case 2) + $10\log(S_L_{CRB}/N_{RB_alloc})$) for carrier frequency 3.0GHz < $f \leq 4.2$GHz.

11. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-3 (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document. The interferer frequencies are adjusted in analogy with table 7.5A.1.4.2-1.

12. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex G.2A.

13. Repeat steps from 10 to 12, using an interfering signal above the wanted signal in Case 2 at step 11.

**Table 7.5A.1.4.2-1: Example for interferer frequencies**

| | Lower frequency | Upper frequency |
|---|---|---|
| $F_{DL}$ = CA_1C Mid range (BW 20MHz + 20MHz) | 2130.1 MHz | 2149.9 MHz |
| $F_{offset}$ | 10 MHz | 10 MHz |
| $F_{Interferer}$ (offset) | -12.5 MHz | +12.5 MHz |
| $\lfloor \lvert F_{interferer\ (offset)} \rvert / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ | 12.5025 MHz | 12.5025 MHz |
| Adjusted $F_{Interferer}$ (offset) | -12.5025 MHz | +12.5025 MHz |
| $F_{Interferer} = F_{DL}$ + Adjusted $F_{Interferer}$ (offset) | 2117.5975 MHz | 2162.4025 MHz |

### 7.5A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

**Table 7.5A.1.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

**Table 7.5A.1.4.3-2: UplinkPowerControlDedicatedSCell-r10**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH-r10 | 0 | | |
| deltaMCS-Enabled-r10 | en0 | | |
| accumulationEnabled-r10 | TRUE | | |
| pSRS-Offset-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| pSRS-OffsetAp-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| filterCoefficient-r10 | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| pathlossReferenceLinking-r10 | sCell | | |
| } | | | |

## 7.5A.1.5 Test Requirements

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 under the conditions specified in table 7.5A.1.5-2, and also under the conditions specified in table 7.5A.1.5-3.

**Table 7.5A.1.5-1: Adjacent channel selectivity**

| | | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **B** | **C** | **D** | **E** | **F** |
| ACS | dB | 27 | 24 | | | |

**Table 7.5A.1.5-2: Test parameters for Adjacent channel selectivity, Case 1**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | **B** | **C** | **D** | **E** | **F** |
| Pw in Transmission Bandwidth Configuration, per CC | | REFSENS + 14 dB | REFSENS + 14 dB | | | |
| $P_{Interferer}$ | dBm | Aggregated power + 25.5 dB | Aggregated power + 22.5 dB | | | |
| $BW_{Interferer}$ | MHz | 5 | 5 | | | |
| $F_{Interferer}$ (offset) | MHz | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier and in subclause 6.2.5A for two uplink carriers.

Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1

Note 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor \lvert F_{interferer\ (offset)} \rvert / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.1.5-3: Test parameters for Adjacent channel selectivity, Case 2**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | **B** | **C** | **D** | **E** | **F** |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -50.5 +10log$_{10}$($N_{RB,c}$/ $N_{RB\ agg}$) | -47.5 +10log($N_{RB,c}$/ $N_{RB\ agg}$) | | | |
| $P_{Interferer}$ | dBm | -25 | | | | |
| $BW_{Interferer}$ | MHz | 5 | 5 | | | |
| $F_{Interferer}$ (offset) | MHz | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | | | |

Note 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier and in subclause 6.2.5A for two uplink carriers.

Note 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1

Note 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor \lvert F_{interferer\ (offset)} \rvert / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

## 7.5A.2 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA without UL CA)

### 7.5A.2.1 Test purpose

The test purpose is the same as in clause 7.5A.1.1.

### 7.5A.2.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA. This test case applies only for CA Configurations that do not support UL CA.

### 7.5A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.5A.0.

### 7.5A.2.4 Test description

#### 7.5A.2.4.1 Initial conditions

Same as in clause 7.5A.1.4.1 with the following exceptions:

- Instead of Table 7.5A.1.4.1-1→ use Table 7.5A.2.4.1-1.
- Instead of clause 7.5A.1.4.3 → use clause 7.5A.2.4.3.

**Table 7.5A.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | B: Mid range<br>C: Mid range (Note 4) |
| Test CC Combination setting (NRB_agg) as specified in clause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Notes 3, 4) |

**Test Parameters for CA Configurations**

| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | **UL Allocation** | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **PCC $N_{RB}$** | **SCC $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | QPSK | 6+25 | QPSK | 6 | P_6@0 | - | - | - |
| 15 | 50 | QPSK | 15+50 | QPSK | 15 | P_15@0 | - | - | - |
| 25 | 25 | QPSK | 25+25 | QPSK | 20 | P_20@0 | - | - | - |
| 25 | 25 | QPSK | 25+25 | QPSK | 25 | P_25@0 | - | - | - |
| 25 | 50 | QPSK | 25+50 | QPSK | 20 | P_20@0 | - | - | - |
| 25 | 100 | QPSK | 25+100 | QPSK | 25 | P_25@0 | - | - | - |
| 50 | 25 | QPSK | 50+25 | QPSK | 25 | P_25@25 | - | - | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 25 | P_25@25 | - | - | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 50 | P_50@0 | - | - | - |
| 50 | 75 | QPSK | 50+75 | QPSK | 50 | P_50@0 | - | - | - |
| 75 | 25 | QPSK | 75+25 | QPSK | 75 | P_75@0 | - | - | - |
| 75 | 50 | QPSK | 75+50 | QPSK | 75 | P_75@0 | - | - | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 75 | P_75@0 | - | - | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 50 | P_50@50 | - | - | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 100 | P_100@0 | - | - | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 75 | P_75@25 | - | - | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 100 | P_100@0 | - | - | - |
| 100 | 75 | QPSK | 100+75 | QPSK | 100 | P_100@0 | - | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 50 | P_50@50 | - | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 75 | P_75@25 | - | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 100 | P_100@0 | - | - | - |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.
Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3.3-2 for UE supporting one uplink carrier.
Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.
Note 4: For CA_70C all test frequency IDs shall be tested according to table 4.3.1.1.70A-1, in TS 36.508 [7].

## 7.5A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.5A.2.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.5A.2.4.1-1 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-2 (Case 1). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5A.1.5-2 (Case 1) for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the Throughput measurement.

7. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-2 (Case 1) and frequency below the aggregated component carriers, using a modulated interferer bandwidth as defined in Annex D of the present document. The interferer frequencies are adjusted in analogy with table 7.5A.1.4.2-1.

8. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the aggregated component carriers in Case 1 at step 7.

10. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-3 (Case 2). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5A.1.5-3 (Case 2) for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the Throughput measurement.

11. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-3 (Case 2) and frequency below the aggregated component carriers, using a modulated interferer bandwidth as defined in Annex D of the present document. The interferer frequencies are adjusted in analogy with table 7.5A.1.4.2-1.

12. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex G.2A.

13. Repeat steps from 10 to 12, using an interfering signal above the aggregated component carriers in Case 2 at step 11.

### 7.5A.2.4.3 Message contents

The message contents are the same as in clause 7.5.4.3.

## 7.5A.2.5 Test Requirements

The test requirements are the same as in clause 7.5A.1.5 with the following exceptions:

- Instead of Table 7.5A.1.5-1 → use Table 7.5A.2.5-1.
- Instead of Table 7.5A.1.5-2 → use Table 7.5A.2.5-2.
- Instead of Table 7.5A.1.5-3 → use Table 7.5A.2.5-3.

**Table 7.5A.2.5-1: Adjacent channel selectivity**

| | | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **B** | **C** | **D** | **E** | **F** |
| ACS | dB | 27 | 24 | | | |

**Table 7.5A.2.5-2: Test parameters for Adjacent channel selectivity, Case 1**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | | REFSENS + 14 dB | REFSENS + 14 dB | | | |
| $P_{Interferer}$ | dBm | Aggregated power + 25.5 dB | Aggregated power + 22.5 dB | | | |
| $BW_{Interferer}$ | MHz | 5 | 5 | | | |
| $F_{Interferer}$ (offset) | MHz | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ as defined in subclause 6.2.5. | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | | | | |
| Note 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor \lvert F_{interferer\ (offset)} \rvert / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster. | | | | | | |

**Table 7.5A.2.5-3: Test parameters for Adjacent channel selectivity, Case 2**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -50.5 +10log($N_{RB,c}$/$N_{RB\ agg}$) | -47.5 +10log($N_{RB,c}$/ $N_{RB\ agg}$) | | | |
| $P_{Interferer}$ | dBm | -25 | | | | |
| $BW_{Interferer}$ | MHz | 5 | 5 | | | |
| $F_{Interferer}$ (offset) | MHz | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | | | |
| Note 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ as defined in subclause 6.2.5. | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | | | | |
| Note 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor \lvert F_{interferer\ (offset)} \rvert / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster. | | | | | | |

## 7.5A.3 Adjacent Channel Selectivity (ACS) for CA (inter-band DL CA without UL CA)

### 7.5A.3.1 Test purpose

The test purpose is the same as in clause 7.5A.1.1.

### 7.5A.3.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support inter-band DL CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 2DL CA with FDD-TDD inter-band CA.

This test case also applies to all types of E-UTRA UE release 13 and forward that support DL LAA.

### 7.5A.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.5A.0.

## 7.5A.3.4 Test description

### 7.5A.3.4.1 Initial conditions

Same as in clause 7.5A.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2.- Instead of Table 7.5A.1.4.1-1→ use Table 7.5A.3.4.1-1.
- Instead of clause 7.5A.1.4.3 → use clause 7.5A.3.4.3.

**Table 7.5A.3.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | A: Mid range for PCC and SCC | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE | Highest $N_{RB_agg}$ for PCC and SCC | | | | | |
| **Test Parameters for CA Configurations** | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | | **UL Allocation** | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | | **CC MOD** | **PCC $N_{RB_alloc}$** |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 50 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 25 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 20 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 16 |
| 50 | 75 | QPSK | 50 | 75 | QPSK | 25 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 50 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 25 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 20 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 16 |
| 75 | 25 | QPSK | 75 | 25 | QPSK | 75 |
| 75 | 25 | QPSK | 75 | 25 | QPSK | 20 |
| 75 | 50 | QPSK | 75 | 50 | QPSK | 25 |
| 75 | 75 | QPSK | 75 | 75 | QPSK | 25 |
| 75 | 100 | QPSK | 75 | 100 | QPSK | 25 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 100 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 75 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 50 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 100 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 50 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 100 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 75 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 50 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 45 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 25 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 20 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | |
| Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3A.3.5-2 for UE supporting one uplink carrier is tested per Test CA configuration. | | | | | | |
| Note 3: The UL resource blocks shall be located as close as possible to the downlink PCC but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 4: The frequencies of PCC and SCC shall be switched and tested in each configuration, according to the UE declared capability for UL support (within CA operation) in the individual bands. | | | | | | |

## 7.5A.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.5A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.5A.3.4.1-1 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.3.5-2 (Case 1), or 7.5A.3.5-2a for operating band 46. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5A.3.5-2 (Case 1) for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

7. Set the Interferer signal level to the value as defined in Table 7.5A.3.5-2 (Case 1), or 7.5A.3.5-2a for operating band 46, and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

8. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex G.2.

9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal in Case 1 at step 7.

10. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.3.5-3 (Case 2), or 7.5A.3.5-3a for operating band 46. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5A.3.5-3 (Case 2) for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

11. Set the Interferer signal level to the value as defined in Table 7.5A.3.5-3 (Case 2), or 7.5A.3.5-3a for operating band 46, and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

12. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex G.2.

13. Repeat steps from 10 to 12, using an interfering signal above the wanted signal in Case 2 at step 11.

### 7.5A.3.4.3 Message contents

The message contents are the same as in clause 7.5.4.3.

## 7.5A.3.5 Test Requirements

For inter-band carrier aggregation with uplink assigned to one E-UTRA band, the adjacent channel requirements are defined with the uplink active on the band other than the band whose downlink is being tested i.e. the requirements are tested only for the SCell downlink. The UE shall meet the requirement specified in Table 7.5A.3.5-1 (originated from the single carrier Table 7.5.3.5-1), or the requirement specified in Table 7.5A.3.5-1a for operating band 46, with the test parameters specified in Tables 7.5A.3.5-2 and 7.5A.3.5-3 (originated from the single carrier Tables 7.5.5-2 and 7.5.5-3), or with the test parameters specified in Tables 7.5A.3.5-2a and 7.5A.3.5-3a for operating band 46, for each component carrier, when operated as SCell, while both downlink carriers are active.

The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of any downlink CC.

**Table 7.5A.3.5-1: Adjacent channel selectivity**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| ACS | dB | 33.0 | 33.0 | 33.0 | 33.0 | 30 | 27 |

**Table 7.5A.3.5-1a: Adjacent channel selectivity**

| E-UTRA band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | ACS | dB | | | | 33 | | 27 |

**Table 7.5A.3.5-2: Test parameters for Adjacent channel selectivity, Case 1**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | REFSENS for SCC +45.5dB | REFSENS for SCC+45.5 dB | REFSENS +45.5dB | REFSENS for SCC+45.5 dB | REFSENS for SCC+42.5 dB | REFSENSf or SCC +39.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset from SCC) | MHz | 1.4+0.0025 / -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in clause 6.2.5.

Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.

**Table 7.5A.3.5-2a: Test parameters for Adjacent channel selectivity, Case 1**

| E-UTRA Band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | | | | |
| | $P_{Interferer}$ | dBm | | | | REFSENS+45.5dB | | REFSENS +39.5dB |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{Interferer}$ (offset) | MHz | | | | 15+0.0075/-15-0.0075 | | 20+0.0025 / -20-0.0025 |

NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.

NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.4.1 and set-up according to Annex C.3.1.

**Table 7.5A.3.5-3: Test parameters for Adjacent channel selectivity, Case 2**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -56.5 | -56.5 | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset from SCC) | MHz | **1.4+0.0025 /** -1.4-0.0025 | **3+0.0075 /** -3-0.0075 | **5+0.0025 /** -5-0.0025 | **7.5+0.0075 /** -7.5-0.0075 | **10+0.0125 /** -10-0.0125 | **12.5+0.0025 /** -12.5-0.0025 |
| Note 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.4.1 and set-up according to Annex C.3.1. | | | | | | | |

**Table 7.5A.3.5-3a: Test parameters for Adjacent channel selectivity, Case 2**

| E-UTRA band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | Power in Transmission Bandwidth Configuration | dBm | | | | -56.5 | | -50.5 |
| | $P_{Interferer}$ | dBm | -25 | | | | | |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{Interferer}$ (offset) | MHz | | | | 15+0.0075/-15-0.0075 | | 20+0.0025 / -20-0.0025 |
| NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 24dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.<br>NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.4.1 and set-up according to Annex C.3.1. | | | | | | | | |

## 7.5A.4 Adjacent Channel Selectivity (ACS) for CA (intra-band non-contiguous DL CA without UL CA)

### 7.5A.4.1 Test purpose

Same as in clause 7.5A.1.1.

### 7.5A.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA but no UL CA.

### 7.5A.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.5A.0.

### 7.5A.4.4 Test description

#### 7.5A.4.4.1 Initial conditions

Same as in clause 7.5A.1.4.1 with the following exceptions:

- Instead of Table 7.5A.1.4.1-1→ use Tables 7.5A.4.4.1-1.

- Instead of clause 7.5A.1.4.3 → use clause 7.5A.4.4.3.

**Table 7.5A.4.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes , and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | A: N/A (Range is not relevant) |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration. | Refer to test point |
| **Test Parameters for CA Configurations** | |
| use the content of Table 7.3A.4.4.1-1 | |

### 7.5A.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.5A.4.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.5A.4.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Tables 7.5A.4.4.1-1 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.4.5-2 (Case 1). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5A.1.5-2 (Case 1) for carrier frequency $f \leq$ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

7. Set the Interferer signal level to the value as defined in Table 7.5A.4.5-2 (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

8. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal in Case 1 at step 7.

10. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.4.5-3 (Case 2). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5A.4.5-3 (Case 2) for carrier frequency $f \leq$ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

11. Set the Interferer signal level to the value as defined in Table 7.5A.4.5-3 (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

12. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex G.2A.

13. Repeat steps from 10 to 12, using an interfering signal above the wanted signal in Case 2 at step 11.

### 7.5A.4.4.3 Message contents

The message contents are the same as in clause 7.5.4.3.

### 7.5A.4.5 Test requirement

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 under the conditions specified in table 7.5A.4.5-2, and also under the conditions specified in table 7.5A.4.5-3.

**Table 7.5A.4.5-1: Adjacent channel selectivity**

| | | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | 33.0 | 33.0 | 33.0 | 33.0 | 30 | 27 |

**Table 7.5A.4.5-2: Test parameters for Adjacent channel selectivity, Case 1**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +42.5dB | REFSENS +39.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025/ -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

**Table 7.5A.4.5-3: Test parameters for Adjacent channel selectivity, Case 2**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -56.5 | -56.5 | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025 / -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| Note 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | | | | | |

## 7.5A.5 Adjacent Channel Selectivity (ACS) for 3DL CA

### 7.5A.5.1 Test purpose

Adjacent channel selectivity for CA test verifies the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when other e-NodeB transmitters exist in the adjacent channel.

### 7.5A.5.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 3DL with CA configurations in Table 7.1-2a.

This test case also applies to all types of E-UTRA UE release 13 and forward that support 3DL CA involving Band 46.

### 7.5A.5.3 Minimum conformance requirements

The Minimum conformance requirements are defined in clause 7.5A.0.

### 7.5A.5.4 Test description

#### 7.5A.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in tables of 5.4.2A.1 as applicable. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in tables 7.5A.5.4.1-1 to 7.5A.5.4.1-2. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.5A.5.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| Network signalling value | NS_01 by default |

**Test Parameters for CA Configurations**

| ID | PCC | | | | SCC1 | | | | SCC2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3) | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for a CA_XD Configuration (Intra-band contiguous)** | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | X | Mid/CC3 | N/A | All RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | X | Mid/CC3 | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA Configuration (Inter-band)** | | | | | | | | | | | | |
| **1** | X | Mid | REFSENS | All RBs | Y | Mid | N/A | All RBs | Z | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | All RBs | X | Mid | N/A | All RBs | Z | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | All RBs | X | Mid | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| Test Settings for CA_1A-18A-28A Configuration | | | | | | | | | | | | |
| **1** | 1 | Low | 50@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 1 | Low | 75@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 1 | Low | 100@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 1 | Low | 100@0 | All RBs | 18 | Mid | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **5** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **6** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **7** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **8** | 18 | Mid | 25@50 | All RBs | 1 | Low | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |
| **9** | 18 | Mid | 25@50 | All RBs | 1 | Low | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **10** | 28 | High | 25@0 | All RBs | 1 | Low | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **11** | 28 | Mid | 25@25 | All RBs | 1 | Low | N/A | All RBs | 18 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **12** | 28 | High | 25@25 | All RBs | 1 | High | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Default Test Settings for CA_XB-YA and CA_XC-YA Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | Y | Mid | N/A | All RBs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REFSENS | All RBs | X | Mid/CC1 | N/A | All RBs | X | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **4** | Y | Mid | REFSENS | All RBs | X | Mid/CC1 | N/A | All RBs | X | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-YB and CA_XA-YC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | |
| **1** | Y | Mid/CC1 | REFSENS | All RBs | Y | Mid/CC2 | N/A | All RBs | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid/CC1 | REFSENS | All RBs | Y | Mid/CC2 | N/A | All RBs | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | X | Mid | REFSENS | All RBs | Y | Mid/CC1 | N/A | All RBs | Y | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **4** | X | Mid | REFSENS | All RBs | Y | Mid/CC1 | N/A | All RBs | Y | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration, The applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

Note 2: Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.

Note 3: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.

Note 4: **Intra-band contiguous:** X corresponds to the band in the CA Configuration. E.g. for CA_41D, X=41

Note 5: **Inter-band:** X,Y,Z correspond to the 1st, 2nd and 3rd band in the CA Configuration. E.g. for CA_1A-3A-19A, X=1, Y=3, Z=19

Note 6: **Intra-band contiguous + Inter-band:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_1C-3A, X=1 and Y=3

Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.

Note 8: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.

Note 9: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC} = N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.

Note 10: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.

Note 11: ID/test points that result in no refsens requirement shall be skipped.

**Table 7.5A.5.4.1-2: Test Configuration Table $W_{gap}$**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

| Test Parameters for CA Configurations | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ID** | **PCC** | | | | **$W_{gap}$ [MHz]** | **SCC1** | | | | **$W_{gap}$ [MHz]** | **SCC2** | | | |
| | **Band** | **Range** | **NRB** | | | **Band** | **Range** | **NRB** | | | **Band** | **Range** | **NRB** | |
| | **UL MOD** | **DL MOD** | **ULalloc (Note 2,3,4)** | **DL alloc** | | **UL MOD** | **DL MOD** | **UL alloc** | **DL alloc** | | **UL MOD** | **DL MOD** | **UL alloc** | **DL alloc** |
| **Default Test Settings for CA_XA-XA-YA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| **1** | X | CC2 | REFSENS | All RBs | Max | X | CC1 | N/A | All RBs | - | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| **2** | Y | Mid | REFSENS | All RBs | - | X | CC2 | N/A | All RBs | Max | X | CC1 | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| **Default Test Settings for CA_XA-YA-YA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| **1** | Y | CC2 | REFSENS | All RBs | Max | Y | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| **2** | X | Mid | REFSENS | All RBs | - | Y | CC2 | N/A | All RBs | Max | Y | CC1 | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| **Test Settings for CA_29A-66A-66A Configuration (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | 29 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **Test Settings for a CA_41C-41A Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| **1** | 41 | CC3 | 100@0 | All RBs | 134.2 | 41 | CC2 | N/A | All RBs | - | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_41A-41C Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| **2** | 41 | CC3 | 100@0 | All RBs | - | 41 | CC2 | N/A | All RBs | 134.2 | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Group Test Settings for CA_66A-66A-XA or CA_XA-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| **2** | X | Mid | REFSENS | All RBs | - | 66 | CC1 | N/A | All RBs | 50 | 66 | CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_66A-66C Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | 100@0 | All RBs | 30.2 | 66 | CC2 | N/A | All RBs | - | 66 | CC3 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band non-contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: **Intra-band non-contiguous + Intra-band contiguous:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 4: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.

| | |
|---|---|
| Note 5: | **Intra-band non-contiguous + Inter-band:** X and Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A,X=2,Y=5 |
| Note 6: | **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A,X=41. |
| Note 7: | **Intra-band non-contiguous + Inter-band:** REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2. |
| Note 8: | **Intra-band non-contiguous + Intra-band contiguous:** REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2. |
| Note 9: | **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing. |
| Note 10: | The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs. |
| Note 11: | ID/test points that result in no refsens requirement shall be skipped. |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.58 if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1

4. The UL and DL Reference Measurement channels are set according to Tables 7.5A.5.4.1-1 to 7.5A.5.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.5A.5.4.3.

### 7.5A.5.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.5A.5.4.3

3. SS activates SCCs by sending the activation MAC-CE (Refer to TS 36.321 [13] clauses 5.13 and 6.1.3.8). Wait for at least 2 seconds (Refer to TS 36.133 [4], clause 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.5A.5.4.1-1 to 7.5A.5.4.1-5 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Tables 7.5A.5.4.1-1 to 7.5A.5.4.1-2 as appropriate on PCC. Since the UE has no payload and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the value defined for Case 1 in Table 7.5A.5.4.2-1according to the type of CA. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the PCC output power is within +0dB, -3.4 dB of the target level for carrier frequency $f \leq$ 3.0GHzor within +0dB, -4 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

7. Set the Interferer signal level to the value defined for Case 1 in Table 7.5A.5.4.2-1, according to the type of CA, with frequency below the measured carrier(s) according to table 7.5A.5.4.2-1, using a modulated interferer bandwidth as defined in Annex D of the present document. The interferer frequencies are adjusted in analogy with table 7.5A.1.4.2-1.

8. Measure the average throughput for the carrier(s) indicated in table 7.5A.5.4.2-1 for a duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to table 7.5A.5.4.2-1.

10. Set the Downlink signal level for PCC and SCCs to the value defined for Case 2 in Table 7.5A.5.4.2-1, according to the type of CA. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the PCC output power is within +0dB, -3.4 dB of the target level for carrier frequency $f \leq 3.0$GHz,
    or within +0dB, -4 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

11. Set the Interferer signal level to the value defined for Case 2 in Table 7.5A.5.4.2-1, according to the type of CA, with frequency below the measured carrier(s) according to table 7.5A.5.4.2-1, using a modulated interferer bandwidth as defined in Annex D of the present document. The interferer frequencies are adjusted in analogy with table 7.5A.1.4.2-1.

12. Measure the average throughput for the carrier(s) indicated in table 7.5A.5.4.2-1 for a duration sufficient to achieve statistical significance according to Annex G.2A.

13. Repeat steps from 10 to 12, using an interfering signal above the measured carrier(s) according to table 7.5A.5.4.2-1.

14. Repeat steps 6 to 13 for component carriers listed in Table 7.5A.5.4.2-1.

**Table 7.5A.5.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2 | 7.5A.5.5-2<br>7.5A.5.5-3 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.5A.5.5-0e<br>7.5A.5.5-0f<br>7.5A.5.5-5<br>7.5A.5.5-6 |
| | | SCC2 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| Intra-band contiguous + Inter-band | 1 | SCC2 | 7.5A.5.5-0e<br>7.5A.5.5-0f<br>7.5A.5.5-5<br>7.5A.5.5-6 |
| | 2 | | |
| | 3 | SCC1, SCC2 | 7.5A.5.5-0b<br>7.5A.5.5-0c<br>7.5A.5.5-2<br>7.5A.5.5-3 |
| | 4 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC2 | 7.5A.5.5-0e<br>7.5A.5.5-0f<br>7.5A.5.5-5<br>7.5A.5.5-6 |
| | 2 | SCC1 | |
| | | SCC2 | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.5A.5.5-5<br>7.5A.5.5-6 |
| | | SCC1, SCC2 | 7.5A.5.5-0b<br>7.5A.5.5-0c<br>7.5A.5.5-2<br>7.5A.5.5-3 |
| | 2 | PCC, SCC1 | 7.5A.5.5-0b<br>7.5A.5.5-0c<br>7.5A.5.5-2<br>7.5A.5.5-3 |
| | | SCC2 | 7.5A.5.5-5<br>7.5A.5.5-6 |

Note 1: Test point ID for the particular CA configuration as defined in section 7.5A.5.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.

### 7.5A.5.4.3 Message contents

The message contents are the same as in clause 7.5.4.3 for without UL CA.

The message contents are the same as in clause 7.5A.1.4.3 for UL CA.

## 7.5A.5.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables below, according to the type of CA.

The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of any downlink CC.

**Table 7.5A.5.5-0a: Adjacent channel selectivity for 3DL CA (band 46)**

| E-UTRA band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | ACS | dB | | 24 | 22.2 | | |

**Table 7.5A.5.5-0b: Test parameters for Adjacent channel selectivity for 3DL CA (band 46), Case 1**

| E-UTRA Band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Pw in Transmission Bandwidth Configuration, per CC | | | REFSENS + 14 dB | REFSENS + 14 dB | | |
| | PInterferer | dBm | | Aggregated power + 22.5 dB | Aggregated power + 20.7 dB | | |
| | $BW_{Interferer}$ | MHz | | 20 | 20 | | |
| | $F_{Interferer\ (offset)}$ | MHz | | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | | |

NOTE 1*: In a band capable of uplink operation, the transmitter shall be set to 4dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.3.1 and set-up according to Annex C.3.1.
NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.5.5-0c: Test parameters for Adjacent channel selectivity for 3DL CA (band46), Case 2**

| E-UTRA band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Pw in Transmission Bandwidth Configuration, per CC | dBm | | -47.5 +10log10($N_{RB,c}/N_{RB\ agg}$) | -45.7 +10log10($N_{RB,c}/N_{RB\ agg}$) | | |
| | $P_{Interferer}$ | dBm | -25 | | | | |
| | $BW_{Interferer}$ | MHz | | 20 | 20 | | |
| | $F_{Interferer}$ (offset) | MHz | | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | | |

NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 24dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.3.1 and set-up according to Annex C.3.1.
NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.5.5-0d: Adjacent channel selectivity for 3DL CA (band 46)**

| E-UTRA band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | ACS | dB | | | | 33 | | 27 |

**Table 7.5A.5.5-0e: Test parameters for Adjacent channel selectivity for 3DL CA (band 46), Case 1**

| E-UTRA Band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 46 | Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | | | | |
| | $P_{Interferer}$ | dBm | | | | REFSENS +45.5dB | | REFSENS +39.5dB |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{Interferer}$ (offset) | MHz | | | | 15+0.0075 /-15-0.0075 | | 20+0.0025 /-20-0.0025 |
| NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.<br>NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.3.1 and set-up according to Annex C.3.1. | | | | | | | | |

**Table 7.5A.5.5-0f: Test parameters for Adjacent channel selectivity for 3DL CA (band 46), Case 2**

| E-UTRA band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | Power in Transmission Bandwidth Configuration | dBm | | | | -56.5 | | -50.5 |
| | $P_{Interferer}$ | dBm | -25 | | | | | |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{Interferer}$ (offset) | MHz | | | | 15+0.0075 /-15-0.0075 | | 20+0.0025 /-20-0.0025 |
| NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 24dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.<br>NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.3.1 and set-up according to Annex C.3.1. | | | | | | | | |

**Table 7.5A.5.5-1: Adjacent channel selectivity for 3DL CA (Intra-band contiguous)**

| | | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| Rx Parameter | Units | B | C | D | E | F |
| ACS | dB | 27 | 24 | 22.2 | | |

**Table 7.5A.5.5-2: Test parameters for Adjacent channel selectivity, Case 1, 3DL CA (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB | | |
| $P_{Interferer}$ | dBm | Aggregated power + 22.5 dB | Aggregated power + 22.5 dB | Aggregated power + 20.7 dB | | |
| $BW_{Interferer}$ | MHz | 5 | 5 | 5 | | |
| $F_{Interferer}$ (offset) | MHz | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | | |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1
NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\left\lfloor \left| F_{interferer\ (offset)} \right| / 0.015 + 0.5 \right\rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.5.5-3: Test parameters for Adjacent channel selectivity, Case 2, 3DL CA (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -50.5 +10log$_{10}$($N_{RB,c}$/ $N_{RB\ agg}$) | -47.5 +10log$_{10}$($N_{RB,c}$/$N_{RB\ agg}$) | -43.9 +10log10($N_{RB,c}$/$N_{RB\ agg}$) | | |
| $P_{Interferer}$ | dBm | -25 | | | | |
| $BW_{Interferer}$ | MHz | 5 | 5 | 5 | | |
| $F_{Interferer}$ (offset) | MHz | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | | |

NOTE 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1
NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\left\lfloor \left| F_{interferer\ (offset)} \right| / 0.015 + 0.5 \right\rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.5.5-4: Adjacent channel selectivity for 3DL CA (Inter-band), per CC**

| | | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| Rx Parameter | Units | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| ACS | dB | 33.0 | 33.0 | 33.0 | 33.0 | 30 | 27 |

**Table 7.5A.5.5-5: Test parameters for Adjacent channel selectivity for 3DL CA (Inter-band), Case 1**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | REFSENS + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | REFSENS for SCC +45.5dB | REFSENS for SCC +45.5dB | REFSENS for SCC +45.5dB | REFSENS for SCC +45.5dB | REFSENS for SCC +42.5dB | REFSENS for SCC +39.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025 / -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$.at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5. | | | | | | | |
| NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | | | | | |

**Table 7.5A.5.5-6: Test parameters for Adjacent channel selectivity for 3DL CA (Inter-band), Case 2**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | -56.5 | -56.5 | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025 / -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| NOTE 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5. | | | | | | | |
| NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

# 7.5A.6

# 7.5A.7 Adjacent Channel Selectivity (ACS) for 4DL CA

## 7.5A.7.1 Test purpose

Adjacent channel selectivity for CA test verifies the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when other e-NodeB transmitters exist in the adjacent channel.

## 7.5A.7.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 4DL with CA configurations in Table 7.1-2b.

## 7.5A.7.3 Minimum conformance requirements

The Minimum conformance requirements are defined in clause 7.5A.0.

## 7.5A.7.4 Test description

### 7.5A.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in tables of 5.4.2A.1 as applicable. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in tables 7.5A.7.4.1-1 to 7.5A.7.4.1-2. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.5A.7.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC | | | | | | | | | | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns | | | | | | | | | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns | | | | | | | | | | | | | | | |
| Network signalling value | NS_01 by default | | | | | | | | | | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | | | | | | | | |
| **ID** | **PCC** | | | | **SCC1** | | | | **SCC2** | | | | **SCC3** | | | |
| | **Band** | **Range** | **NRB** | | **Band** | **Range** | **NRB** | | **Band** | **Range** | **NRB** | | **Band** | **Range** | **NRB** | |
| | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** |
| **Default Test Settings for a CA_XE Configuration (Intra-band contiguous)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YD, YD-XA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **4** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | X | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | R | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings for CA_XB-YA-ZA and CA_XC-YA-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-XB-ZA and CA_YA-XC-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XB and CA_YA-ZA-XC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |
| **Test Settings for CA_2A-66C-71A Configuration** | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 66 | Mid/CC1 | 100@0 | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 66 | Mid/CC1 | 100@0 | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 2 | Low | 100@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 2 | Low | 100@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **5** | 71 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 71 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |

**Default Test Settings for CA_XC-YC Configuration (Intra-band contiguous + Inter-band(2))**

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest NRB | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest NRB | N/A | QPSK | | Lowest $N_{RB}$ |
| **3** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest NRB | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest NRB | N/A | QPSK | | Lowest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.

Note 4: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41E, X=41.
Note 6: **Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-8A,X=1,Y=3,Z=7,R=8.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_3C-7A-28A, X=3,Y=7 and Z=28.
Note 8: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC}$ = $N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.
Note 11: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 12: ID/test points that result in no refsens requirement shall be skipped.

**Table 7.5A.7.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | | | | | | NC | | | | | | | | | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | | | | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns | | | | | | | | | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | Highest $N_{RB}$ | | | | | | | | | | | | | | |
| Network signalling value | | | | | | NS_01 by default | | | | | | | | | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | | | | | | | | | | | | |
| **ID** | **PCC** | | | | **$W_{gap}$ [MHz]** | **SCC1** | | | | **$W_{gap}$ [MHz]** | **SCC2** | | | | **$W_{gap}$ [MHz]** | **SCC3** | | | | |
| | **Band** | **Range** | **NRB** | | | **Band** | **Range** | **NRB** | | | **Band** | **Range** | **NRB** | | | **Band** | **Range** | **NRB** | | |
| | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | |
| **Default Test Settings for CA_XA-XA-YA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-XA-XA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XA-XA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | |
| **Default Test Settings for CA_66A-66A-YA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-66A-66A-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC1 | REFSENS | ALL RBs | Max | X | CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC1 | N/A | ALL RBs | Max | X | CC2 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | |
| | QPS | 64- | | $N_{RB_agg}$ | | N/A | 64- | | $N_{RB_a}$ | | N/A | 64- | | $N_{RB_a}$ | | N/A | 64- | | $N_{RB_agg}$ | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | K | QAM | | | | | QAM | | gg | | | QAM | | gg | | | QAM | | |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC1 | N/A | ALL RBs | Max | X | CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YC Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YC-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | REFSENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Y | Mid/ CC1 | N/A | ALL RBs | - | Y | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ |
| **2** | Y | Mid/ CC1 | REFSENS | ALL RBs | - | Y | Mid/ CC2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XD/XD-XA/XC-XC Configurations (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | |
| **TBD** | | | | | | | | | | | | | | | | | | | |
| **Default Test Settings for CA_XA-XA-YA-YA Configurations (Intra-band non-contiguous + Intra-band non-contiguous)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC4 | REFSENS | ALL RBs | Max | X | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | Max | Y | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | CC4 | REFSENS | ALL RBs | Max | Y | CC3 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band non-contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-12A,X=2,Y=4,Z=12.
Note 5: **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A-41A,X=41.
Note 6: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-4A,X=2,Y=4.
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.
Note 9: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 10: ID/test points that result in no refsens requirement shall be skipped.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.58 if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in at least one band within the CA configuration.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1

4. The UL and DL Reference Measurement channels are set according to Tables 7.5A.7.4.1-1 to 7.5A.7.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.5A.7.4.3.

### 7.5A.7.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.5A.7.4.3.

3. SS activates SCCs by sending the activation MAC-CE (Refer to TS 36.321 [13] clauses 5.13 and 6.1.3.8). Wait for at least 2 seconds (Refer to TS 36.133 [4], clause 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.5A.7.4.1-1 to 7.5A.7.4.1-6 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Tables 7.5A.7.4.1-1 to 7.5A.7.4.1-2 as appropriate on PCC. Since the UE has no payload and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the value defined for Case 1 in Table 7.5A.7.5-2 or 7.5A.7.5-5, 7.5A.7.5-2a or 7.5A.7.5-a for operating band 46 according to the type of CA. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the PCC output power is within +0dB, -3.4 dB of the target level for carrier frequency $f \leq 3.0$GHzor within +0dB, -4 dB of the target level for carrier frequency 3.0GHz $< f \leq 4.2$GHz, for at least the duration of the Throughput measurement.

7. Set the Interferer signal level to the value defined for Case 1 in Table 7.5A.7.5-2 or 7.5A.7.5-5, 7.5A.7.5-2a or 7.5A.7.5-a for operating band 46, according to the type of CA, with frequency below the measured carrier(s) according to table 7.5A.7.4.2-1, using a modulated interferer bandwidth as defined in Annex D of the present document.

8. Measure the average throughput for the carrier(s) indicated in table 7.5A.7.4.2-1 for a duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to table 7.5A.7.4.2-1.

10. Set the Downlink signal level for PCC and SCCs to the value defined for Case 2 in Table 7.5A.7.5-3 or 7.5A.7.5-6, and 7.5A.7.5-2a or 7.5A.7.5-a for operating band 46 according to the type of CA. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the PCC output power is within +0dB, -3.4 dB of the target level for carrier frequency $f \leq 3.0$GHz,
or within +0dB, -4 dB of the target level for carrier frequency 3.0GHz $< f \leq 4.2$GHz, for at least the duration of the Throughput measurement.

11. Set the Interferer signal level to the value defined for Case 2 in Table 7.5A.7.5-3 or 7.5A.7.5-6 and 7.5A.7.5-2a or 7.5A.7.5-a for operating band 46, according to the type of CA, with frequency below the measured carrier(s) according to table 7.5A.7.4.2-1, using a modulated interferer bandwidth as defined in Annex D of the present document.

12. Measure the average throughput for the carrier(s) indicated in table 7.5A.7.4.2-1 for a duration sufficient to achieve statistical significance according to Annex G.2A.

13. Repeat steps from 10 to 12, using an interfering signal above the measured carrier(s) according to table 7.5A.7.4.2-1.

14. Repeat steps 6 to 13 for component carriers listed in Table 7.5A.7.4.2-1.

**Table 7.5A.7.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2,SCC3 | 7.5A.7.5-2 7.5A.7.5-3 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.5A.7.5-5 7.5A.7.5-5a 7.5A.7.5-6 7.5A.7.5-6a |
| | | SCC2 | |
| | | SCC3 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | 4 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| Intra-band contiguous + Inter-band | 1 | SCC2 SCC3 | 7.5A.7.5-5 7.5A.7.5-5a 7.5A.7.5-6 7.5A.7.5-6a |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3 | 7.5A.7.5-2 7.5A.7.5-2a 7.5A.7.5-3 7.5A.7.5-3a 7.5A.7.5-5 7.5A.7.5-5a 7.5A.7.5-6 7.5A.7.5-6a |
| | 4 | | |
| | 5 | SCC1, SCC2, SCC3 | 7.5A.7.5-5 7.5A.7.5-5a 7.5A.7.5-6 7.5A.7.5-6a 7.5A.7.5-2 7.5A.7.5-2a 7.5A.7.5-3 7.5A.7.5-3a |
| | 6 | | |
| Intra-band contiguous + Inter-band(2) | 1 | SCC2 SCC3 | 7.5A.7.5-2 7.5A.7.5-2a 7.5A.7.5-3 7.5A.7.5-3a 7.5A.7.5-5 7.5A.7.5-5a 7.5A.7.5-6 7.5A.7.5-6a |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC2, SCC3 | 7.5A.7.5-5 7.5A.7.5-5a 7.5A.7.5-6 7.5A.7.5-6a |
| | 2 | SCC1, | 7.5A.7.5-5 7.5A.7.5-5a 7.5A.7.5-6 7.5A.7.5-6a |
| | | SCC2 | |
| | | SCC3 | |
| | 3 | SCC1, | 7.5A.7.5-5 7.5A.7.5-5a 7.5A.7.5-6 7.5A.7.5-6a |
| | | SCC2 | |
| | | SCC3 | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.5A.7.5-5 7.5A.7.5-6 |
| | | SCC1, SCC2, | 7.5A.7.5-5 7.5A.7.5-5a 7.5A.7.5-6 |

| | | | |
|---|---|---|---|
| | | SCC3 | 7.5A.7.5-6a<br>7.5A.7.5-2<br>7.5A.7.5-2a<br>7.5A.7.5-3<br>7.5A.7.5-3a |
| | 2 | SCC2 | 7.5A.7.5-2<br>7.5A.7.5-2a 7.5A.7.5-3<br>7.5A.7.5-3a |
| | | PCC, SCC1, SCC3 | 7.5A.7.5-5<br>7.5A.7.5-5a 7.5A.7.5-6<br>7.5A.7.5-6a<br>7.5A.7.5-2<br>7.5A.7.5-2a<br>7.5A.7.5-3<br>7.5A.7.5-3a |
| Intra-band non-contiguous + Intra-band non-contiguous | 1 | SCC2 | 7.5A.7.5-5<br>7.5A.7.5-5a 7.5A.7.5-6<br>7.5A.7.5-6a |
| | | SCC3 | |
| | 2 | SCC2 | |
| | | SCC3 | |
| Note 1: Test point ID for the particular CA configuration as defined in section 7.5A.7.4.1.<br>Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.<br>Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row. | | | |

### 7.5A.7.4.3 Message contents

Same message contents as in clause 7.5.4.3 for without UL CA.

Same message contents as in clause 7.5A.1.4.3 for UL CA.

## 7.5A.7.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables below, according to the type of CA.

The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of any downlink CC.

**Table 7.5A.7.5-1: Adjacent channel selectivity for 4DL CA (Intra-band contiguous)**

| | | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **B** | **C** | **D** | **E** | **F** |
| ACS | dB | 27 | 24 | 22.2 | 21 | 20 |

**Table 7.5A.7.5-1a: Adjacent channel selectivity 4DL CA (Intra-band contiguous) ( Band 46)**

| E-UTRA band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | **B** | **C** | **D** | **E** | **F** |
| 46 | ACS | dB | | 24 | 22.2 | 21 | |

**Table 7.5A.7.5-2: Test parameters for Adjacent channel selectivity, Case 1, 4DL CA (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | **B** | **C** | **D** | **E** | **F** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Pw in Transmission Bandwidth Configuration, per CC | | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB | |
| $P_{Interferer}$ | dBm | Aggregated power + 25.5 dB | Aggregated power + 22.5 dB | Aggregated power + 20.7 dB | Aggregated power + 19.5 dB | |
| $BW_{Interferer}$ | MHz | 5 | 5 | 5 | 5 | |
| $F_{Interferer}$ (offset) | MHz | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier.

NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.

NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.7.5-2a: Test parameters for Adjacent channel selectivity, Case 1 4DL CA (Intra-band contiguous) (Band 46)**

| E-UTRA Band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Pw in Transmission Bandwidth Configuration, per CC | | | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB | |
| | PInterferer | dBm | | Aggregated power + 22.5 dB | Aggregated power + 20.7 dB | Aggregated power + 19.5 dB | |
| | $BW_{Interferer}$ | MHz | | 20 | 20 | 20 | |
| | $F_{Interferer\ (offset)}$ | MHz | | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | |

NOTE 1*: In a band capable of uplink operation, the transmitter shall be set to 4dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A.

NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.4.1 and set-up according to Annex C.3.1.

NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.7.5-3: Test parameters for Adjacent channel selectivity, Case 2, 4DL CA (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |

| | | | | | | |
|---|---|---|---|---|---|---|
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -50.5 +10log10(N RB,c/ N RB agg) | -47.5 +10log10(N RB,c/N RB agg) | -45.7 +10log10 (N RB,c/N RB agg) | -44.5 +10log10(N RB,c/N RB agg) | |
| $P_{Interferer}$ | dBm | -25 | | | | |
| $BW_{Interferer}$ | MHz | 5 | 5 | 5 | 5 | |
| $F_{Interferer}$ (offset) | MHz | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | |

NOTE 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.
NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.7.5-3a: Test parameters for Adjacent channel selectivity, Case 2, 4DL CA (Intra-band contiguous), (Band 46)**

| E-UTRA band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Pw in Transmission Bandwidth Configuration, per CC | dBm | | -47.5 +10log10(NRB ,c/N RB agg) | -45.7 +10log10(N RB,c/N RB agg) | -44.5 +10log10(N RB,c/N RB agg) | |
| | $P_{Interferer}$ | dBm | -25 | | | | |
| | $BW_{Interferer}$ | MHz | | 20 | 20 | 20 | |
| | $F_{Interferer}$ (offset) | MHz | | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | |

NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 24dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.4.1 and set-up according to Annex C.3.1.
NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.7.5-4: Adjacent channel selectivity for 4DL CA (Inter-band), per CC**

| | | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | 33.0 | 33.0 | 33.0 | 33.0 | 30 | 27 |

**Table 7.5A.7.5-a: Adjacent channel selectivity 4DL CA (Inter-band), Band 46**

| E-UTRA band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| 46 | ACS | dB | | | | 33 | | 27 |

**Table 7.5A.7.5-5: Test parameters for Adjacent channel selectivity for 4DL CA (Inter-band), Case 1**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power in Transmission Bandwidth Configuration for each CC | dBm | REFSENS + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | REFSENS for SCC +45.5dB | REFSENS for SCC +45.5dB | REFSENS for SCC +45.5dB | REFSENS for SCC +45.5dB | REFSENS for SCC +42.5dB | REFSENS for SCC +39.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025 / -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$.at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5. | | | | | | | |
| NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |
| NOTE 3: The REFSENS power level is specified in Table 7.3.1-1 and Table 7.3.1-1a for two and four antenna ports, respectively. | | | | | | | |

**Table 7.5A.7.5-5a: Test parameters for Adjacent channel selectivity, Case 1**

| E-UTRA Band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | | | | |
| | $P_{Interferer}$ | dBm | | | | REFSENS+45.5dB | | REFSENS +39.5dB |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{Interferer}$ (offset) | MHz | | | | 15+0.0075/-15-0.0075 | | 20+0.0025 / -20-0.0025 |

**Table 7.5A.7.5-6: Test parameters for Adjacent channel selectivity for 4DL CA (Inter-band), Case 2**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | -56.5 | -56.5 | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025 / -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| NOTE 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5. | | | | | | | |
| NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

**Table 7.5A.7.5-6a: Test parameters for Adjacent channel selectivity for 4DL CA (Inter-band), Case 2, band 46**

| E-UTRA band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | Power in Transmission Bandwidth Configuration | dBm | | | | -56.5 | | -50.5 |
| | $P_{Interferer}$ | dBm | -25 | | | | | |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{Interferer}$ (offset) | MHz | | | | 15+0.0075/-15-0.0075 | | 20+0.0025 / -20-0.0025 |

## 7.5A.8 Adjacent Channel Selectivity (ACS) for 5DL CA

### 7.5A.8.1 Test purpose

Adjacent channel selectivity for CA test verifies the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when other e-NodeB transmitters exist in the adjacent channel.

### 7.5A.8.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 5DL with CA configurations in Table 7.1-2c.

### 7.5A.8.3 Minimum conformance requirements

The Minimum conformance requirements are defined in clause 7.5A.0.

### 7.5A.8.4 Test description

#### 7.5A.8.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in tables of 5.4.2A.1 as applicable. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in tables 7.5A.8.4.1-1 to 7.5A.8.4.1-2. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.5A.8.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3,4) | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | UL MOD | DL MOD | UL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for a CA_XF Configuration (Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | X | Mid/ CC5 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | X | Mid/ CC5 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA-SA Configuration (Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| 4 | R | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | S | Mid | REF | ALL | X | Mid | N/A | ALL | Y | Mid | N/A | ALL | Z | Mid | N/A | ALL | R | Mid | N/A | ALL |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SENS | RBs | | | | RBs | | | | RBs | | | | RBs | | | RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | Highest $N_{RB}$ |
| **Default Test Settings for a CA_XE-YA, YA-XE Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENSE | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/ CC1 | REF SENSE | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENSE | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid | REF SENSE | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |
| **Default Test Settings for CA_YA-ZA-XB-RA and CA_YA-ZA-XC-RA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-RA-XB and CA_YA-ZA-RA-XC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Z | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | R | Mid | N/A | ALL RBs |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **7** | R | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **8** | R | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings CA_XB-YB-ZA, CA_XB-YC-ZA, CA_XC-YB-ZA, and CA_XC-YC-ZA Configuration (Intra-band contiguous + Intra-band contiguous + Inter-band)**<br>**Default Test Settings CA_ZA-XB-YB, CA_ZA-XB-YC, CA_ZA-XC-YB, and CA_ZA-XC-YC Configuration (Intra-band contiguous + Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid/ CC1 | REF SENS | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| 4 | Y | Mid/ CC1 | REF SENS | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| 6 | Z | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 4: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41F, X=41.
Note 6: **Inter-band:** X,Y,Z,R,S correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-20A-42A,X=1,Y=3,Z=7,R=20,S=42.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_3C-7A-28A, X=3,Y=7 and Z=28.
Note 8: REFSENS refers to the PCC bands and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.

Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.

Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose the Combination with $N_{RB_PCC} = N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.

**Table 7.5A.8.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to "Range" columns. For mapping within Band refer to "CC" columns |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | | $W_{gap}$ [MHz] | SCC3 | | | | $W_{gap}$ [MHz] | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for CA_XA-XA-YA-ZA-RA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XA-XA-RA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-RA-XA-XA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REF SENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | Mid | REF SENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Z | Mid | REF SENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **4** | R | Mid | REF SENS | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YD Configurations (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Y | CC3 | REF SENS | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ |
| **2** | X | CC2 | REF SENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YA-ZA-ZA Configurations Intra-band non-contiguous + Intra-band non-contiguous** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Z | CC2 | REF SENS | ALL RBs | Max | Z | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_ag}$ | | N/A | QPSK | | $N_{RB_}$ | | N/A | QPSK | | $N_{RB_}$ | | N/A | QPSK | | $N_{RB_}$ | | N/A | QPSK | | $N_{RB_}$ |

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | g | | | | | agg | | | | | agg | | | | | agg | | | | | agg |
| **2** | X | CC2 | REF SENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | CC2 | N/A | ALL RBs | Max | Z | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | CC2 | N/A | ALL RBs | Max | Z | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YA-ZC Configurations Intra-band non-contiguous + Intra-band non-contiguous** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Z | Mid/C C1 | REF SENS | ALL RBs | - | Z | Mid/C C2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | 66 | CC1 | REF SENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Z | Mid/C C1 | N/A | ALL RBs | - | Z | Mid/C C2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Z | Mid/C C1 | N/A | ALL RBs | - | Z | Mid/C C2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band non-contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-12A-66A,X=2,Y=5,Z=12,R=66.
Note 5: **Intra-band non-contiguous + Intra-band contiguous:** X,Y corresponds to the band of the CA Configuration. E.g. for CA_5A-5A-66D,X=5,Y=66.
Note 6: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-66A-66A,X=2,Y=5,Z=66.
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1}$ = $N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.58 if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1

4. The UL and DL Reference Measurement channels are set according to Tables 7.5A.8.4.1-1 to 7.5A.8.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.5A.8.4.3.

### 7.5A.8.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.5A.8.4.3.

3. SS activates SCCs by sending the activation MAC-CE (Refer to TS 36.321 [13] clauses 5.13 and 6.1.3.8). Wait for at least 2 seconds (Refer to TS 36.133 [4], clause 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.5A.8.4.1-1 to 7.5A.8.4.1-6 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Tables 7.5A.8.4.1-1 to 7.5A.8.4.1-2 as appropriate on PCC. Since the UE has no payload and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the value defined for Case 1 in Table 7.5A.8.5-2 or 7.5A.8.5-5, and7.5A.8.5-2a or 7.5A.8.5-5a for operating band 46 according to the type of CA. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the PCC output power is within +0dB, -3.4 dB of the target level for carrier frequency $f \leq 3.0$GHzor within +0dB, -4 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the Throughput measurement.

7. Set the Interferer signal level to the value defined for Case 1 in Table 7.5A.8.5-2 or 7.5A.8.5-5, and7.5A.8.5-2a or 7.5A.8.5-5a for operating band 46 according to the type of CA, with frequency below the measured carrier(s) according to table 7.5A.8.4.2-1, using a modulated interferer bandwidth as defined in Annex D of the present document.

8. Measure the average throughput for the carrier(s) indicated in table 7.5A.8.4.2-1 for a duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to table 7.5A.8.4.2-1.

10. Set the Downlink signal level for PCC and SCCs to the value defined for Case 2 in Table 7.5A.8.5-3 or 7.5A.8.5-6 and 7.5A.8.5-2a or 7.5A.8.5-5a for operating band 46, according to the type of CA. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the PCC output power is within +0dB, -3.4 dB of the target level for carrier frequency $f \leq 3.0$GHz,
or within +0dB, -4 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the Throughput measurement.

11. Set the Interferer signal level to the value defined for Case 2 in Table 7.5A.8.5-3 or 7.5A.8.5-6 and 7.5A.8.5-2a or 7.5A.8.5-5a for operating band 46, according to the type of CA, with frequency below the measured carrier(s) according to table 7.5A.8.4.2-1, using a modulated interferer bandwidth as defined in Annex D of the present document.

12. Measure the average throughput for the carrier(s) indicated in table 7.5A.8.4.2-1 for a duration sufficient to achieve statistical significance according to Annex G.2A.

13. Repeat steps from 10 to 12, using an interfering signal above the measured carrier(s) according to table 7.5A.8.4.2-1.

14. Repeat steps 6 to 13 for component carriers listed in Table 7.5A.8.4.2-1.

**Table 7.5A.8.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2,SCC3,SCC4 | 7.5A.8.5-2 7.5A.8.5-3 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.5A.8.5-5 7.5A.8.5-5a 7.5A.8.5-6 7.5A.8.5-6a |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 4 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 5 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| Intra-band contiguous + Inter-band | 1 | SCC4 | 7.5A.8.5-5 7.5A.8.5-5a 7.5A.8.5-6 7.5A.8.5-6a |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3, SCC4 | 7.5A.8.5-2 7.5A.8.5-2a 7.5A.8.5-3 7.5A.8.5-3a 7.5A.8.5-5 7.5A.8.5-5a 7.5A.8.5-6 7.5A.8.5-6a |
| | 4 | | |
| Intra-band contiguous + Inter-band | 1 | SCC2 SCC3 SCC4 | 7.5A.8.5-5 7.5A.8.5-5a 7.5A.8.5-6 7.5A.8.5-6a |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3,SCC4 | 7.5A.8.5-2 7.5A.8.5-2a 7.5A.8.5-3 7.5A.8.5-3a 7.5A.8.5-5 7.5A.8.5-5a 7.5A.8.5-6 7.5A.8.5-6a |
| | 4 | | |
| | 5 | SCC1, SCC2, SCC3,SCC4 | 7.5A.8.5-2 7.5A.8.5-2a 7.5A.8.5-3 7.5A.8.5-3 7.5A.8.5-5 7.5A.8.5-5a 7.5A.8.5-6 7.5A.8.5-6a |
| | 6 | | |
| | 7 | SCC1, SCC2, SCC3,SCC4 | 7.5A.8.5-2 7.5A.8.5-2a 7.5A.8.5-3 7.5A.8.5-3a 7.5A.8.5-5 7.5A.8.5-5a |
| | 8 | | |

| | | | |
|---|---|---|---|
| | | | 7.5A.8.5-6<br>7.5A.8.5-6a |
| Intra-band contiguous + Intra-band contiguous + Inter-band | 1 | SCC2, SCC3, SCC4 | 7.5A.8.5-2<br>7.5A.8.5-2a<br>7.5A.8.5-3<br>7.5A.8.5-3a<br>7.5A.8.5-5<br>7.5A.8.5-5a<br>7.5A.8.5-6<br>7.5A.8.5-6a |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| | 5 | SCC1, SCC2, SCC3, SCC4 | 7.5A.8.5-2<br>7.5A.8.5-2a<br>7.5A.8.5-3<br>7.5A.8.5-2a<br>7.5A.8.5-5<br>7.5A.8.5-5a<br>7.5A.8.5-6<br>7.5A.8.5-6a |
| | 6 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC1, SCC2, SCC3, SCC4 | 7.5A.8.5-5<br>7.5A.8.5-5a<br>7.5A.8.5-6<br>7.5A.8.5-6a |
| | 2 | SCC1, SCC2, SCC3, SCC4 | 7.5A.8.5-5<br>7.5A.8.5-5a<br>7.5A.8.5-6<br>7.5A.8.5-6a |
| | 3 | SCC1, SCC2, SCC3, SCC4 | 7.5A.8.5-5<br>7.5A.8.5-5a<br>7.5A.8.5-6<br>7.5A.8.5-6a |
| | 4 | SCC1, SCC2, SCC3, SCC4 | 7.5A.8.5-5<br>7.5A.8.5-5a<br>7.5A.8.5-6<br>7.5A.8.5-6a |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC, SCC1, SCC2 | 7.5A.8.5-2<br>7.5A.8.5-2a<br>7.5A.8.5-3<br>7.5A.8.5-3a |
| | | SCC3, SCC4 | 7.5A.8.5-5<br>7.5A.8.5-5a<br>7.5A.8.5-6<br>7.5A.8.5-6a |
| | 2 | SCC1, SCC2, SCC3, SCC4 | 7.5A.8.5-5<br>7.5A.8.5-5a<br>7.5A.8.5-6<br>7.5A.8.5-6a |
| Intra-band non-contiguous + Intra-band non-contiguous | 1 | SCC1, SCC2, SCC3, SCC4 | 7.5A.8.5-5<br>7.5A.8.5-5a<br>7.5A.8.5-6<br>7.5A.8.5-6a |
| | 2 | | |
| | 3 | | |

Note 1: Test point ID for the particular CA configuration as defined in section 7.5A.8.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.

### 7.5A.8.4.3 Message contents

Same message contents as in clause 7.5.4.3 for without UL CA.

Same message contents as in clause 7.5A.1.4.3 for UL CA.

## 7.5A.8.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables below, according to the type of CA.

**Table 7.5A.8.5-1: Adjacent channel selectivity for 5DL CA (Intra-band contiguous)**

| | | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **B** | **C** | **D** | **E** | **F** |
| ACS | dB | 27 | 24 | 22.2 | 21 | 20 |

**Table 7.5A.8.5-1a: Adjacent channel selectivity 5DL CA, Band 46**

| **E-UTRA band** | **Rx Parameter** | **Units** | **CA Bandwidth Class** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **B** | **C** | **D** | **E** | **F** |
| 46 | ACS | dB | | 24 | 22.2 | 21 | |

**Table 7.5A.8.5-2: Test parameters for Adjacent channel selectivity, Case 1, 5DL CA (Intra-band contiguous)**

| **Rx Parameter** | **Units** | **CA Bandwidth Class** | | | | |
|---|---|---|---|---|---|---|
| | | **B** | **C** | **D** | **E** | **F** |
| Pw in Transmission Bandwidth Configuration, per CC | | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB |
| $P_{Interferer}$ | dBm | Aggregated power + 25.5 dB | Aggregated power + 22.5 dB | Aggregated power + 20.7 dB | Aggregated power + 19.5 dB | Aggregated power + 18.5 dB |
| $BW_{Interferer}$ | MHz | 5 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ | 2.5 + $F_{offset}$ / -2.5 - $F_{offset}$ |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier.

NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.

NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer} / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.8.5-2a: Test parameters for Adjacent channel selectivity, Case 1, 5DL CA, (Intra-band contiguous)**

**Band 46**

| E-UTRA Band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Pw in Transmission Bandwidth Configuration, per CC | | | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB | |
| | PInterferer | dBm | | Aggregated power + 22.5 dB | Aggregated power + 20.7 dB | Aggregated power + 19.5 dB | |
| | $BW_{Interferer}$ | MHz | | 20 | 20 | 20 | |
| | $F_{Interferer\ (offset)}$ | MHz | | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | |

NOTE 1*: In a band capable of uplink operation, the transmitter shall be set to 4dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.4.1 and set-up according to Annex C.3.1.
NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.8.5-3: Test parameters for Adjacent channel selectivity, Case 2, 5DL CA (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -50.5 +10log$_{10}$($N_{RB,c}$/ $N_{RB\ agg}$) | -47.5 +10log$_{10}$($N_{RB,c}$/$N_{RB\ agg}$) | -45.7 +10log$_{10}$ ($N_{RB,c}$/$N_{RB\ agg}$) | -44.5 +10log$_{10}$($N_{RB,c}$/$N_{RB\ agg}$) | -43.5 +10log$_{10}$($N_{RB,c}$/$N_{RB\ agg}$) |
| $P_{Interferer}$ | dBm | -25 | | | | |
| $BW_{Interferer}$ | MHz | 5 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ | 2.5+ $F_{offset}$ / -2.5- $F_{offset}$ |

NOTE 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.
NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.8.5-3a: Test parameters for Adjacent channel selectivity, Case 2, 5DL CA(Intra-band contiguous) , Band 46**

| E-UTRA band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Pw in Transmission Bandwidth Configuration, per CC | dBm | | -47.5 +10log10($N_{RB,c}$/$N_{RB\ agg}$) | -45.7 +10log10($N_{RB,c}$/$N_{RB\ agg}$) | -44.5 +10log10($N_{RB,c}$/$N_{RB\ agg}$) | |
| | $P_{Interferer}$ | dBm | | -25 | | | |
| | $BW_{Interferer}$ | MHz | | 20 | 20 | 20 | |
| | $F_{Interferer}$ (offset) | MHz | | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | 10 + $F_{offset}$ / -10 - $F_{offset}$ | |

NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 24dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.4.1 and set-up according to Annex C.3.1.
NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.5A.8.5-4: Adjacent channel selectivity for 5DL CA (Inter-band), per CC**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| ACS | dB | 33.0 | 33.0 | 33.0 | 33.0 | 30 | 27 |

**Table 7.5A.8.5-4a: Adjacent channel selectivity for 5DL CA (Inter-band) , Band 46**

| E-UTRA band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | ACS | dB | | | | 33 | | 27 |

**Table 7.5A.8.5-5: Test parameters for Adjacent channel selectivity for 5DL CA (Inter-band), Case 1**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | REFSENS + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | REFSENS for SCC +45.5dB | REFSENS for SCC +45.5dB | REFSENS for SCC +45.5dB | REFSENS for SCC +45.5dB | REFSENS for SCC +42.5dB | REFSENS for SCC +39.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025 / -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$.at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.
NOTE 3: The REFSENS power level is specified in Table 7.3.1-1 and Table 7.3.1-1a for two and four antenna ports, respectively.

**Table 7.5A.8.5-5a: Test parameters for Adjacent channel selectivity for 5DL CA (Inter-band) , Case 1, Band 46**

| E-UTRA Band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | | | | |
| | $P_{Interferer}$ | dBm | | | | REFSENS+45.5dB | | REFSENS +39.5dB |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{Interferer}$ (offset) | MHz | | | | 15+0.0075/-15-0.0075 | | 20+0.0025 / -20-0.0025 |

**Table 7.5A.8.5-6: Test parameters for Adjacent channel selectivity for 5DL CA (Inter-band), Case 2**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | -56.5 | -56.5 | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025 / -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| NOTE 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5. | | | | | | | |
| NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

**Table 7.5A.8.5-6a: Test parameters for Adjacent channel selectivity for 5DL CA (Inter-band) , Case 2,Band 46**

| E-UTRA band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | Power in Transmission Bandwidth Configuration | dBm | | | | -56.5 | | -50.5 |
| | $P_{Interferer}$ | dBm | -25 | | | | | |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{Interferer}$ (offset) | MHz | | | | 15+0.0075/-15-0.0075 | | 20+0.0025 / -20-0.0025 |

# 7.5B Adjacent Channel Selectivity (ACS) for UL-MIMO

## 7.5B.1 Test purpose

Adjacent channel selectivity tests the ability of UE that support UL-MIMO to receive data with a given average throughput for a specified reference measurement channel, in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when other e-NodeB transmitters exist in the adjacent channel.

## 7.5B.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

## 7.5B.3 Minimum conformance requirements

For UE(s) with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in Clause 7.5.3 shall be met with the UL-MIMO configurations specified in Table 6.2.2B.3-2. For UL-MIMO, the parameter $P_{CMAX_L}$ is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 36.101 [2] clause 7.5.1B.

## 7.5B.4 Test description

### 7.5B.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.5B.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.5B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | QPSK | Full | Full | QPSK | 5 | 5 |
| 3MHz | QPSK | Full | Full | QPSK | 4 | 4 |
| 5MHz | QPSK | Full | Full | QPSK | 8 | 8 |
| 5MHz | QPSK | Full | N/A | QPSK | 5[3] | N/A |
| 10MHz | QPSK | Full | Full | QPSK | 12 | 12 |
| 15MHz | QPSK | Full | Full | QPSK | 16 | 16 |
| 20MHz | QPSK | Full | Full | QPSK | 18 | 18 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band. The applicable channel bandwidths are specified in Table 7.3.3-2.<br>Note 2: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used.<br>Note 3: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2). | | | | | | |

1. Connect the SS and interfering source to the UE antenna connectors as shown in TS 36.508 [7] Figure A.29.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.5B.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.5B.4.3.

### 7.5B.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.5B.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 7.5B.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.5B.5-2 (Case 1). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5B.5-2 (Case 1) for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the Throughput measurement.

4. Set the Interferer signal level to the value as defined in Table 7.5B.5-2 (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal in Case 1 at step 4.

7. Set the Downlink signal level to the value as defined in Table 7.5B.5-3 (Case 2). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5B.5-3 (Case 2) for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the throughput measurement.

8. Set the Interferer signal level to the value as defined in Table 7.5B.5-3 (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

9. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

10. Repeat steps from 7 to 9, using an interfering signal above the wanted signal in Case 2 at step 8.

11. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

### 7.5B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception

**Table 7.5B.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.5B.5 Test requirement

The throughput $R_{av}$ shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 under the conditions specified in table 7.5B.5-2, and also under the conditions specified in table 7.5B.5-3.

**Table 7.5B.5-1: Adjacent channel selectivity**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| ACS | dB | 33.0 | 33.0 | 33.0 | 33.0 | 30 | 27 |

**Table 7.5B.5-2: Test parameters for Adjacent channel selectivity, Case 1**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB* | REFSENS +45.5dB | REFSENS +42.5dB | REFSENS +39.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025 | 3+0.0075 | 5+0.0025 | 7.5+0.0075 | 10+0.0125 | 12.5+0.0025 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

**Table 7.5B.5-3: Test parameters for Adjacent channel selectivity, Case 2**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -56.5 | -56.5 | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025 | 3+0.0075 | 5+0.0025 | 7.5+0.0075 | 10+0.0125 | 12.5+0.0025 |
| Note 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

# 7.5D Adjacent Channel Selectivity (ACS) for ProSe

## 7.5D.0 Minimum conformance requirements

The UE shall fulfil the minimum requirement specified in Table 7.5D.0-1 for all values of an adjacent channel interferer up to –25 dBm. However it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 7.5D.0-2 and Table 7.5D.0-3 where the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2.

**Table 7.5D.0-1: Adjacent channel selectivity for ProSe**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| ACS | dB | | | 33.0 | 33.0 | 30 | 27 |

**Table 7.5D.0-2: Test parameters for Adjacent channel selectivity for ProSe, Case 1**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | | | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +42.5dB | REFSENS +39.5dB |
| $BW_{Interferer}$ | MHz | | | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | | | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS 36.211. | | | | | | | |

**Table 7.5D.0-3: Test parameters for Adjacent channel selectivity for ProSe, Case 2**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | | | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | | | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | | | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS 36.211. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.5.1D.

## 7.5D.1 Adjacent Channel Selectivity (ACS) for ProSe Direct Discovery

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Use of OCNG for Downlink has not been considered and is still FFS.
- Message exceptions content needs further investigation (some values still TBD).
- Test time is FFS.

### 7.5D.1.1 Test Purpose

Adjacent channel selectivity tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when other e-NodeB transmitters exist in the adjacent channel.

### 7.5D.1.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Discovery, but not ProSe Direct Communication.

## 7.5D.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.5D.0.

## 7.5D.1.4 Test Description

### 7.5D.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA ProSe bands specified in table 5.4.2D.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.5D.1.4.1-1. The details of the downlink, uplink and sidelink reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.6.

**Table 7.5D.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | | | Mid range(Note 4) | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | 5MHz, Highest | | | |
| | **Downlink Configuration (Note 2)** | | **Uplink Configuration (Note 2)** | | **Sidelink Configuration (Reception) (Note 3)** | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Mod'n | RB allocation |
| 5MHz | QPSK | 8 | QPSK | 8 | QPSK | 2 |
| 10MHz | QPSK | 16 | QPSK | 16 | QPSK | 2 |
| 15MHz | QPSK | 25 | QPSK | 25 | QPSK | 2 |
| 20MHz | QPSK | 30 | QPSK | 30 | QPSK | 2 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA ProSe and Operating band, according to the applicability specified respectively in Table 5.4.2D.1-1 and Table 5.4.2.1-1.<br>Note 2: After DRX configuration, DL-RMC (PDSCH) and DCI-0 for scheduling UL-RMC (PUSCH) are applied only in the DRX On subframes.<br>Note 3: The RB start for the transmission of Sidelink RMC is RB#0.<br>Note 4: Sidelink uses the frequencies defined for Uplink. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.70.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.5D.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents exceptions are defined in clause 7.5D.1.4.3.
7. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is activated.

### 7.5D.1.4.2 Test Procedure

1. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions (only those marked with "…Step 1…") are defined in clause 7.5D.1.4.3.
2. The UE shall transmit RRCConnectionReconfigurationComplete message.

3. Initialise the variables Ptot and Pok as 0.
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.5D.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.5D.1.4.1-1. When the UE has no payload data to send, it transmits uplink MAC padding bits on the UL RMC.
6. SS transmits PSDCH to transmit the SL RMC according to Table 7.5D.1.4.1-1. Set the Sidelink signal level to the appropriate value defined in Table 7.5D.1.4.1-1 to the value as defined in Table 7.5D.1.5-2 (Case 1)
7. Set the Interferer signal level to the value as defined in Table 7.5D.1.5-2 (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.
8. SS shall send SL Discovery Packets (MAC padding bits) on the SL RMC for the test time [FFS]. SS stores the number of the transmitted Discovery Packets in the current test iteration in the variable Ptot.
9. SS shall send (on the available PDSCH) a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER REQUEST" message and wait for the UE to respond (on the available PUSCH) with a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER RESPONSE".
10. SS calculates the variable Pok as (current counter value - counter value at last test iteration).
11. SS shall compute the throughput as following:

    TP = Pok / Ptot * 100%

12. Repeat steps from 6 to 12, using an interfering signal above the wanted signal in Case 1 at step 7.
13. SS transmits PSDCH to transmit the SL RMC according to Table 7.5D.1.4.1-1. Set the Sidelink signal level to the appropriate value defined in Table 7.5D.1.4.1-1 to the value as defined in Table 7.5D.1.5-3 (Case 2)
14. Set the Interferer signal level to the value as defined in Table 7.5D.1.5-3 (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.
15. SS shall send SL Discovery Packets (MAC padding bits) on the SL RMC for the test time [FFS]. SS stores the number of the transmitted Discovery Packets in the current test iteration in the variable Ptot.
16. SS shall send (on the available PDSCH) a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER REQUEST" message and wait for the UE to respond (on the available PUSCH) with a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER RESPONSE".
17. SS calculates the variable Pok as (current counter value - counter value at last test iteration).
18. SS shall compute the throughput as following:

    TP = Pok / Ptot * 100%

19. Repeat steps from 13 to 18, using an interfering signal above the wanted signal in Case 2 at step 14.

### 7.5D.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

- Table A.7.1.1-1 for FDD
- Table A.7.1.2-1 for TDD

**Table 7.5D.1.4.3-1: ACTIVATE TEST MODE: ACS for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 7.5D.1.4.3-2: CLOSE UE TEST LOOP: ACS for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 7.5D.1.4.3-3: MAC-MainConfig-RBC: ACS for ProSe Direct Discovery (applicable only for Step 1 of Test procedure)**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | TBD | | |
| periodicBSR-Timer | TBD | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | TBD | | |
| } | | | |

## 7.5D.1.5 Test Requirement

The throughput TP shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Tables 7.5D.1.5-1, 7.5D.1.5-2 and 7.5D.1.5-3.

**Table 7.5D.1.5-1: Adjacent channel selectivity for ProSe**

| | | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | | | 33.0 | 33.0 | 30 | 27 |

**Table 7.5D.1.5-2: Test parameters for Adjacent channel selectivity for ProSe, Case 1**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | | | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +42.5dB | REFSENS +39.5dB |
| $BW_{Interferer}$ | MHz | | | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | | | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

**Table 7.5D.1.5-3: Test parameters for Adjacent channel selectivity for ProSe, Case 2**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | | | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | | | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | | | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

## 7.5D.2 Adjacent Channel Selectivity (ACS) for ProSe Direct Communication

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Test procedure is TBD
- Message contents are TBD

### 7.5D.2.1 Test Purpose

Same test purpose as in clause 7.5D.1.

### 7.5D.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Communication.

### 7.5D.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.5D.0.

### 7.5D.2.4 Test Description

#### 7.5D.2.4.1 Initial Conditions

TBD

#### 7.5D.2.4.2 Test Procedure

TBD

#### 7.5D.2.4.3 Message Contents

TBD

### 7.5D.2.5 Test Requirement

Same test requirement as in clause 7.5D.1.5.

# 7.5E Adjacent Channel Selectivity (ACS) for category 0

## 7.5E.1 Test purpose

Same test purpose as in clause 7.5.1.

## 7.5E.2 Test applicability

This test applies to all types of E-UTRA UE release 12 and forward of category 0.

## 7.5E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 7.5.3

## 7.5E.4 Test description

### 7.5E.4.1 Initial conditions

Same initial conditions as in clause 7.5.4.1 with the following exceptions:

- Instead of Table 7.5.4.1-1 → use Table 7.5E.4.1-1.
- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.4 using only main UE Tx/Rx antenna.

**Table 7.5E.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS 36.508 [7] clause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3. | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD and HD-FDD | TDD | | FDD and HD-FDD | TDD |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 14 | 14 | QPSK | 15 | 15 |
| 5MHz | QPSK | 14 | 14 | QPSK | 25 | 25 |
| 5MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 10MHz | QPSK | 14 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 15MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 15MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 20MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3E.3-3 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Downlink RB position shall be $RB_{start}$ = 0. | | | | | | |

### 7.5E.4.2 Test procedure

Same test procedure as in clause 7.5.4.2

### 7.5E.4.3 Message contents

Same message contents as in clause 7.5.4.3.

## 7.5E.5 Test requirement

The throughput $R_{av}$ shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 under the conditions specified in table 7.5E.5-2, and also under the conditions specified in table 7.5E.5-3.

**Table 7.5E.5-1: Adjacent channel selectivity**

| | | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | 33.0 | 33.0 | 33.0 | 33.0 | 30 | 27 |

**Table 7.5E.5-2: Test parameters for Adjacent channel selectivity, Case 1**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +42.5dB | REFSENS +39.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025/ -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

**Table 7.5E.5-3: Test parameters for Adjacent channel selectivity, Case 2**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | -56.5 | -56.5 | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025 / -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| Note 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

# 7.5EA Adjacent Channel Selectivity (ACS) for UE category M1

## 7.5EA.1 Test purpose

Adjacent channel selectivity tests the ability of category M1 UE to receive data with a given average throughput for a specified reference measurement channel, in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when other e-NodeB transmitters exist in the adjacent channel.

## 7.5EA.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of category M1.

## 7.5EA.3 Minimum conformance requirements

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive an E-UTRA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

The UE shall fulfil the minimum requirement specified in Table 7.5EA.3-1 for all values of an adjacent channel interferer up to –25 dBm. However it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 7.5EA.3-2 and Table 7.5EA.3-3 where the throughput $R_{av}$ shall be $\geq$ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1). For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.5EA.3-1: Adjacent channel selectivity**

| | | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | 33.0 | 33.0 | 33.0 | 33.0 | 30 | 27 |

**Table 7.5EA.3-2: Test parameters for Adjacent channel selectivity, Case 1**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +42.5dB | REFSENS +39.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | **1.4+0.0025 /** -1.4-0.0025 | **3+0.0075 /** -3-0.0075 | **5+0.0025 /** -5-0.0025 | **7.5+0.0075 /** -7.5-0.0075 | **10+0.0125 /** -10-0.0125 | **12.5+0.0025 /** -12.5-0.0025 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in clause 6.2.5EA. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |
| Note 3: For DL category M1 UE, the reference sensitivity for category M1 in table 7.3EA-1 and 7.3EA-2 should be used as REFSENS for the power in Transmission Bandwidth Configuration and $P_{Interferer}$. | | | | | | | |
| Note 4: For DL category M1 UE, the parameters for the applicable channel bandwidth apply. | | | | | | | |

**Table 7.5EA.3-3: Test parameters for Adjacent channel selectivity, Case 2**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power in Transmission Bandwidth Configuration | dBm | -56.5 | -56.5 | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | **1.4+0.0025 /** -1.4-0.0025 | **3+0.0075 /** -3-0.0075 | **5+0.0025 /** -5-0.0025 | **7.5+0.0075 /** -7.5-0.0075 | **10+0.0125 /** -10-0.0125 | **12.5+0.0025 /** -12.5-0.0025 |
| Note 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in clause 6.2.5EA. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.5.1.

# 7.5EA.4 Test description

## 7.5EA.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands defined for CAT M1 in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.5EA.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 7.5EA.4.1-1: Test Configuration Table RX test cases UE Cat-M1**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3. | 1.4, 3MHz, 5MHz | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD and HD-FDD | TDD | | FDD and HD-FDD | TDD |
| 1.4MHz | QPSK | 4 | 4 | QPSK | 6 | 6 |
| 3MHz | QPSK | 4 | 4 | QPSK | 6 | 6 |
| 5MHz | QPSK | 4 | 4 | QPSK | 6 | 6 |
| Note 1: Downlink RB position shall be $RB_{start}$ = 0 within the narrowband. | | | | | | |
| Note 2: Use narrowband index (TS36.211, 5.2.4) 0 when interferer is below carrier, and max narrowband index when interferer is above carrier. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.4 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.5EA.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 7.5EA.4.3.

## 7.5EA.4.2 Test procedure

1. SS transmits PDSCH via M-PDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 7.5EA.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via M-PDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 7.5EA.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.5EA.5-2 (Case 1). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5EA.5-2 (Case 1) for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

4. Set the Interferer signal level to the value as defined in Table 7.5EA.5-2 (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal in Case 1 at step 4.

7. Set the Downlink signal level to the value as defined in Table 7.5EA.5-3 (Case 2). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5EA.5-3 (Case 2) for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

8. Set the Interferer signal level to the value as defined in Table 7.5EA.5-3 (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

9. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

10. Repeat steps from 7 to 9, using an interfering signal above the wanted signal in Case 2 at step 8.

11. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

## 7.5EA.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception:

**Table 7.5EA.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.5EA.5 Test requirement

The throughput $R_{av}$ shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2.2, A.2.3 and A.3.2 with parameters specified in table 7.5EA.5-2, and also under the conditions specified in table 7.5EA.5-3.

**Table 7.5EA.5-1: Adjacent channel selectivity**

| | | Channel bandwidth | | |
|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** |
| ACS | dB | 33.0 | 33.0 | 33.0 |

**Table 7.5EA.5-2: Test parameters for Adjacent channel selectivity, Case 1**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | |
|---|---|---|---|---|
| | | **1.4MHz** | **3 MHz** | **5 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | |
| $P_{Interferer}$ | dBm | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025/ -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in clause 6.2.5EA. | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | |
| Note 3: For DL category M1 UE, the reference sensitivity for category M1 in table 7.3EA-1 and 7.3EA-2 should be used as REFSENS for the power in Transmission Bandwidth Configuration and $P_{Interferer}$. | | | | |
| Note 4: For DL category M1 UE, the parameters for the applicable channel bandwidth apply. | | | | |

**Table 7.5EA.5-3: Test parameters for Adjacent channel selectivity, Case 2**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | |
|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** |

| | | | | |
|---|---|---|---|---|
| Power in Transmission Bandwidth Configuration | dBm | -56.5 | -56.5 | -56.5 |
| $P_{Interferer}$ | dBm | -25 | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025/ -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 |
| Note 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5EA.<br>Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | |

# 7.5EB Adjacent Channel Selectivity (ACS) for UE Category 1bis

Editor's note

- Test case incomplete with Annex F.3.3 needing update. TT shall be same as legacy test case.

## 7.5EB.1 Test purpose

Same test purpose as in clause 7.5.1.

## 7.5EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of category 1bis.

## 7.5EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 7.5.3

## 7.5EB.4 Test description

### 7.5EB.4.1 Initial conditions

Same initial conditions as in clause 7.5.4.1 with the following exceptions:

Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.4 using only main UE Tx/Rx antenna.

### 7.5EB.4.2 Test procedure

Same test procedure as in clause 7.5.4.2

### 7.5EB.4.3 Message contents

Same message contents as in clause 7.5.4.3.

### 7.5EB.5 Test requirement

The throughput $R_{av}$ shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 under the conditions specified in table 7.5EB.5-2, and also under the conditions specified in table 7.5EB.5-3.

**Table 7.5EB.5-1: Adjacent channel selectivity**

| | | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | 33.0 | 33.0 | 33.0 | 33.0 | 30 | 27 |

**Table 7.5EB.5-2: Test parameters for Adjacent channel selectivity, Case 1**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +42.5dB | REFSENS +39.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025/ -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.<br>Note 3: The REFSENS power level is specified in Table 7.3EB.3-1 for main antenna port. | | | | | | | |

**Table 7.5EB.5-3: Test parameters for Adjacent channel selectivity, Case 2**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -56.5 | -56.5 | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | 1.4+0.0025 / -1.4-0.0025 | 3+0.0075 / -3-0.0075 | 5+0.0025 / -5-0.0025 | 7.5+0.0075 / -7.5-0.0075 | 10+0.0125 / -10-0.0125 | 12.5+0.0025 / -12.5-0.0025 |
| Note 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

# 7.5EC Adjacent Channel Selectivity (ACS) for UE category M2

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Downlink RB allocation is TBD
- The test applicability needs to be added to TS36.521-2

## 7.5EC.1 Test purpose

Adjacent channel selectivity tests the ability of category M2 UE to receive data with a given average throughput for a specified reference measurement channel, in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when other e-NodeB transmitters exist in the adjacent channel.

## 7.5EC.2 Test applicability

This test applies to all types of E-UTRA UE release 14 and forward of category M2.

# 7.5EC.3 Minimum conformance requirements

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive a E-UTRA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

The UE shall fulfil the minimum requirement specified in Table 7.5EC.3-1 for all values of an adjacent channel interferer up to –25 dBm. However it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 7.5EC.3-2 and Table 7.5EC.3-3 where the throughput $R_{av}$ shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1). For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.5EC.3-1: Adjacent channel selectivity**

| | | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | 33.0 | 33.0 | 33.0 | 33.0 | 30 | 27 |

**Table 7.5EC.3-2: Test parameters for Adjacent channel selectivity, Case 1**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +45.5dB | REFSENS +42.5dB | REFSENS +39.5dB |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | **1.4+0.0025 /** -1.4-0.0025 | **3+0.0075 /** -3-0.0075 | **5+0.0025 /** -5-0.0025 | **7.5+0.0075 /** -7.5-0.0075 | **10+0.0125 /** -10-0.0125 | **12.5+0.0025 /** -12.5-0.0025 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in clause 6.2.5EA. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |
| Note 3: For DL category M1 and M2 UE, the reference sensitivity for category M1 in table 7.3EA-1 and 7.3EA-2 and category M2 in Table 7.3EC-1 should be used as REFSENS for the power in Transmission Bandwidth Configuration and $P_{Interferer}$. | | | | | | | |
| Note 4: For DL category M1 and M2 UE, the parameters for the applicable channel bandwidth apply. | | | | | | | |

**Table 7.5EC.3-3: Test parameters for Adjacent channel selectivity, Case 2**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power in Transmission Bandwidth Configuration | dBm | -56.5 | -56.5 | -56.5 | -56.5 | -53.5 | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Interferer}$ (offset) | MHz | **1.4+0.0025 /** -1.4-0.0025 | **3+0.0075 /** -3-0.0075 | **5+0.0025 /** -5-0.0025 | **7.5+0.0075 /** -7.5-0.0075 | **10+0.0125 /** -10-0.0125 | **12.5+0.0025 /** -12.5-0.0025 |
| Note 1: The transmitter shall be set to 24dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in clause 6.2.5EA.<br>Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.5.1.

# 7.5EC.4 Test description

## 7.5EC.4.1 Initial conditions

Same as in clause 7.5EA.4.1 with the following exceptions:

- Instead of Table 7.5EA.4.1-1 → use Table 7.5EC.4.1-1
- Instead of CAT M1 → use CAT M2

**Table 7.5EC.4.1-1: Test Configuration Table RX test cases UE Cat-M2**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3. | 1.4, 3MHz, 5MHz | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD and HD-FDD | TDD | | FDD and HD-FDD | TDD |
| 1.4MHz | QPSK | TBD | TBD | QPSK | 6 | 6 |
| 3MHz | QPSK | TBD | TBD | QPSK | 15 | 15 |
| 5MHz | QPSK | TBD | TBD | QPSK | 24 | 24 |
| Note 1: Downlink RB position shall be $RB_{start}$ = 0 within the narrowband.<br>Note 2: Use narrowband index (TS36.211, 5.2.4) 0 when interferer is below carrier, and max narrowband index when interferer is above carrier. | | | | | | |

## 7.5EC.4.2 Test procedure

Same as in clause 7.5EA.4.2 with the following exceptions:

Instead of Table 7.5EA.4.1-1 → use Table 7.5EC.4.1-1

## 7.5EC.4.3 Message contents

Same as in clause 7.5EA.4.3.

# 7.5EC.5 Test requirement

Same as in clause 7.5EA.5.

# 7.5F Adjacent Channel Selectivity (ACS) for category NB1 and NB2

## 7.5F.1 Test purpose

Adjacent channel selectivity tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when other e-NodeB transmitters exist in the adjacent channel.

## 7.5F.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1 UE.

This test case applies to all types of UE release 14 and forward of category NB2 UE.

## 7.5F.3 Minimum conformance requirements

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive a signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

Category NB1 and NB2 UE shall fulfil the minimum requirement specified in Table 7.5F.3-1 for all values of an adjacent channel interferer up to –25 dBm. However it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 7.5F.3-1 where the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in Annex A.3.2.

**Table 7.5F.3-1: Adjacent channel selectivity parameters for category NB1 and NB2 UE**

| **ACS1 test Parameters** | | |
|---|---|---|
| Interferer | **GSM (GMSK)** | **E-UTRA** |
| Category NB1 or NB2 signal power ($P_{wanted}$) / dBm | REFSENS + 14 dB | |
| interferer signal power ($P_{Interferer}$) / dBm | REFSENS + 42 dB | REFSENS + 47 dB |
| Interferer bandwidth | 200 kHz | 5 MHz |
| Interferer offset from category NB1 or NB2 channel edge | ±200 kHz | ±2.5 MHz |
| **ACS2 test Parameters** | | |
| Interferer | **GSM (GMSK)** | **E-UTRA** |
| Category NB1 or NB2 signal power ($P_{wanted}$) / dBm | -25 dBm -28 dB | -25 dBm -33 dB |
| interferer signal power ($P_{Interferer}$) / dBm | -25 dBm | |
| Interferer bandwidth | 200 kHz | 5 MHz |
| Interferer offset from category NB1 or NB2 channel edge | ±200 kHz | ±2.5 MHz |

The normative reference for this requirement is TS 36.101 [2] clause 7.5.1F.

## 7.5F.4 Test description

### 7.5F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test

parameters, and are shown in table 7.5F.4.1-1. The details of the downlink reference measurement channel (RMC) are specified in Annex A.3. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 7.5F.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 8.1.1 | | | NC | | |
| Test Frequencies as specified in TS36.508 [7] clause 8.1.3.1 | | | Frequency ranges defined in Annex K.1.1 | | |
| **Configuration ID** | **Downlink Configuration** | | **Uplink Configuration** | | |
| | Modulation | Subcarriers | Modulation | $N_{tones}$ | Subcarrier spacing |
| 1 | QPSK | 12 | BPSK | 1@0 | 15kHz |

1. Connect the SS to the UE antenna connector as shown in TS 36.508 [7] Annex A, Figure A.4 using only the main UE Tx/Rx antenna, and noting that the interference can be either GSM or E-UTRA.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.2, and NPUSCH Format 2 is used to carry ACK/NACK on the uplink.
4. The DL Reference Measurement channel is set according to Table 7.5F.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 7.5F.4.3.

## 7.5F.4.2 Test procedure

1. SS transmits NPDSCH via NPDCCH DCI format N1 for C_RNTI to transmit the DL RMC according to Table 7.5F.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The UE will send HARQ feedback based on information contained in DCI format N1.
2. Set the Downlink signal level to the value defined for ACS1, GSM in Table 7.5F.5-1. For steps 2 to 5 and 6 to 9, use the default message contents.
3. Set the Interferer signal level to the value defined for ACS1, GSM in Table 7.5F.5-1, with frequency below the wanted signal according to table 7.5F.5-1, using a modulated interferer bandwidth as defined in Annex D.2 of the present document.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.
5. Repeat steps 2 to 4, using an interfering signal above the wanted signal at step 3.
6. Set the Downlink signal level to the value defined for ACS1, E-UTRA in Table 7.5F.5-1.
7. Set the Interferer signal level to the value defined for ACS1, E-UTRA in Table 7.5F.5-1, with frequency below the wanted signal according to table 7.5F.5-1, using a modulated interferer bandwidth as defined in Annex D.2 of the present document.
8. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.
9. Repeat steps 6 to 8, using an interfering signal above the wanted signal at step 7.
10. Release the connection through State 3A-NB.
11. Modify system information elements according to Table 7.5F.4.3-1 and notify the UE via paging message with SystemInformationModification included.

12. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5 using the new UL power control setting.

13. SS transmits NPDSCH via NPDCCH DCI format N1 for C_RNTI to transmit the DL RMC according to Table 7.5F.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The UE will send HARQ feedback based on information contained in DCI format N1.

14. Set the Downlink signal level to the value defined for ACS2, GSM in Table 7.5F.5-1. For steps 14 to 17 and 18 to 21, use message contents with the exceptions defined in Table 7.5F.4.3-1.

15. Set the Interferer signal level to the value defined for ACS2, GSM in Table 7.5F.5-1, with frequency below the wanted signal according to table 7.5F.5-1, using a modulated interferer of 5MHz bandwidth defined in Annex D.2 of the present document.

16. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

17. Repeat steps 14 to 16, using an interfering signal above the wanted signal at step 15.

18. Set the Downlink signal level to the value defined for ACS2, E-UTRA in Table 7.5F.5-1.

19. Set the Interferer signal level to the value defined for ACS2, E-UTRA in Table 7.5F.5-1, with frequency below the wanted signal according to table 7.5F.5-1, using a modulated interferer of 5MHz bandwidth defined in Annex D.2 of the present document.

20. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

21. Repeat steps 18 to 20, using an interfering signal above the wanted signal at step 19.

### 7.5F.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.6 with the following exceptions:

**Table 7.5F.4.3-1: UplinkPowerControlCommon-NB-DEFAULT: ACS2**

| Derivation Path: TS 36.508 [7] clause 8.1.6.3, Table 8.1.6.3-14 UplinkPowerControlCommon-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlCommon-NB-DEFAULT ::= SEQUENCE { p0-NominalNPUSCH-r13 | -70 | | |

## 7.5F.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.5F.5-1.

**Table 7.5F.5-1: Test parameters for Adjacent channel selectivity, category NB1 and NB2**

| ACS1 test Parameters | | |
|---|---|---|
| Interferer | **GSM (GMSK)** | **E-UTRA** |
| Category NB1 or NB2 signal power ($P_{wanted}$) / dBm | REFSENS + 14 dB | |
| interferer signal power ($P_{Interferer}$) / dBm | REFSENS + 42 dB | REFSENS + 47 dB |
| Interferer bandwidth | 200 kHz | 5 MHz |
| Interferer offset from category NB1 or NB2 channel edge | ±200 kHz | ±2.5 MHz |
| **ACS2 test Parameters** | | |
| Interferer | **GSM (GMSK)** | **E-UTRA** |
| Category NB1 or NB2 signal power ($P_{wanted}$) / dBm | -53 dBm | -58 dBm |
| interferer signal power ($P_{Interferer}$) / dBm | -25 dBm | |
| Interferer bandwidth | 200 kHz | 5 MHz |
| Interferer offset from category NB1 or NB2 channel edge | ±200 kHz | ±2.5 MHz |

# 7.5G Adjacent Channel Selectivity (ACS) for V2X Communication

## 7.5G.1 Adjacent channel selectivity (ACS) for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 7.5G.1.1 Test Purpose

Adjacent channel selectivity tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when other e-NodeB transmitters exist in the adjacent channel.

### 7.5G.1.2 Test Applicability

This test applies to all types of UE that support V2X Sidelink Communication and Band 47.

### 7.5G.1.3 Minimum Conformance Requirements

The V2X UE shall fulfil the minimum requirement specified in Table 7.5G.1.3-1 for all values of an adjacent channel interferer up to -25 dBm. However it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 7.5G.1.3-2 and Table 7.5G.1.3-3 where the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2.

**Table 7.5G.1.3-1: Adjacent channel selectivity for V2X**

| | | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | | | | 33.0 | | 27 |

**Table 7.5G.1.3-2: Test parameters for Adjacent channel selectivity for V2X, Case 1**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | | | | $P_{REFSENS_V2X}$ +45.5dB | | $P_{REFSENS_V2X}$ +39.5dB |
| $BW_{Interferer}$ | MHz | | | | 10 | | 10 |
| $F_{Interferer}$ (offset) | MHz | | | | 10+0.0125 / -10-0.0125 | | 15+0.0075 / -15-0.0075 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

**Table 7.5G.1.3-3: Test parameters for Adjacent channel selectivity for V2X, Case 2**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | | | | -56.5 | | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | | | | 10 | | 10 |
| $F_{Interferer}$ (offset) | MHz | | | | 10+0.0125 / -10-0.0125 | | 15+0.0075 / -15-0.0075 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.5.1G.

## 7.5G.1.4 Test Description

### 7.5G.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.5G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 7.5G.1.4.1-1: Test Configuration Table**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | 48 |
| 20MHz | QPSK | 96 |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.92a.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 7.5G.1.4.3.

3. The V2X reference measurement channel is set according to Table 7.5G.1.4.1-1.

3a. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 5A-V2X in Receive Mode according to TS 36.508 [7] clause 4.5.9. Message content exceptions are defined in clause 7.5G.1.4.3.

6. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 7.5G.1.4.2 Test Procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration and to schedule the V2X RMC according to Table 7.5G.1.4.1-1.

2. Set the Interferer signal level to the value as defined in Table 7.5G.1.5-2 (Case 1) and frequency below and above the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

3. Set the Interferer signal level to the value as defined in Table 7.5G.1.5-3 (Case 2) and frequency below and above the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.5G.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.10.

## 7.5G.1.5 Test Requirement

The throughput $R_{av}$ shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 under the conditions specified in table 7.5G.1.5-2, and also under the conditions specified in table 7.5G.1.5-3.

**Table 7.5G.1.5-1: Adjacent channel selectivity for V2X**

| | | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | | | | 33.0 | | 27 |

**Table 7.5G.1.5-2: Test parameters for Adjacent channel selectivity for V2X, Case 1**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + 14 dB | | | | | |
| $P_{Interferer}$ | dBm | | | | $P_{REFSENS_V2X}$ +45.5dB | | $P_{REFSENS_V2X}$ +39.5dB |
| $BW_{Interferer}$ | MHz | | | | 10 | | 10 |
| $F_{Interferer}$ (offset) | MHz | | | | 10+0.0125 / -10-0.0125 | | 15+0.0075 / -15-0.0075 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

**Table 7.5G.1.5-3: Test parameters for Adjacent channel selectivity for V2X, Case 2**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | | | | -56.5 | | -50.5 |
| $P_{Interferer}$ | dBm | -25 | | | | | |
| $BW_{Interferer}$ | MHz | | | | 10 | | 10 |
| $F_{Interferer}$ (offset) | MHz | | | | 10+0.0125 / -10-0.0125 | | 15+0.0075 / -15-0.0075 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

## 7.5G.2 Adjacent channel selectivity (ACS) for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

### 7.5G.2.1 Test Purpose

The test purpose is the same as in clause 7.5G.1.1.

### 7.5G.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 14 and forward that support V2X Communication.

### 7.5G.2.3 Minimum Conformance Requirements

The V2X UE shall fulfil the minimum requirement specified in Table 7.5G.2.3-1 for all values of an adjacent channel interferer up to -22 dBm. However it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 7.5G.2.3-2 and Table 7.5G.2.3-3 where the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2

**Table 7.5G.2.3-1: Adjacent channel selectivity for V2X**

| | | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | | | | 33.0 | | 27 |

**Table 7.5G.2.3-2: Test parameters for Adjacent channel selectivity for V2X, Case 1**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | DBm | $P_{REFSENS_V2X}$ + 14 dB | | | | | |
| $P_{Interferer}$ | DBm | | | | $P_{REFSENS_V2X}$ +45.5dB | | $P_{REFSENS_V2X}$ +39.5dB |
| $BW_{Interferer}$ | MHz | | | | 10 | | 10 |
| $F_{Interferer}$ (offset) | MHz | | | | 10+0.0125 / -10-0.0125 | | 15+0.0075 / -15-0.0075 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

**Table 7.5G.2.3-3: Test parameters for Adjacent channel selectivity for V2X, Case 2**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | DBm | | | | -53.5 | | -47.5 |
| $P_{Interferer}$ | DBm | -22 | | | | | |
| $BW_{Interferer}$ | MHz | | | | 10 | | 10 |
| $F_{Interferer}$ (offset) | MHz | | | | 10+0.0125 / -10-0.0125 | | 15+0.0075 / -15-0.0075 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA downlink reception for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.5G-2, the requirements in subclause 7.5G.2 apply for the E-UTRA V2X sidelink reception and the requirements in subclause 7.5.3 apply for the E-UTRA downlink reception while all downlink carriers are active.

The normative reference for this requirement is TS 36.101 [2] clause 7.5.1G.

## 7.5G.2.4 Test Description

### 7.5G.2.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.5G.2.4.1-1. The details of the uplink, downlink and V2X reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.8.3 respectively.

**Table 7.5G.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Mid range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink** | | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | QPSK | 1 | QPSK | 1 | 10 MHz | QPSK | 48 |
| 1.4 MHz | QPSK | 5 | QPSK | 5 | 20 MHz | QPSK | 96 |
| 3 MHz | QPSK | 1 | QPSK | 1 | | | |
| 3 MHz | QPSK | 4 | QPSK | 4 | | | |
| 5 MHz | QPSK | 1 | QPSK | 1 | | | |
| 5 MHz | QPSK | 8 | QPSK | 8 | | | |
| 10 MHz | QPSK | 1 | QPSK | 1 | | | |
| 10 MHz | QPSK | 12 | QPSK | 12 | | | |
| 15 MHz | QPSK | 1 | QPSK | 1 | | | |
| 15 MHz | QPSK | 16 | QPSK | 16 | | | |
| 20 MHz | QPSK | 1 | QPSK | 1 | | | |
| 20 MHz | QPSK | 18 | QPSK | 18 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3G.0-4 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2G.1-2). | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93c.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 7.5G.2.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and V2X Reference Measurement Channels are set according to Table 7.5G.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 7.5G.2.4.3.

### 7.5G.2.4.2 Test Procedure

1. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.5G.2.4.1-1 on E-UTRA Band. The SS sends downlink MAC padding bits on the DL RMC.

2. SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 7.5G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.

3. Set the Downlink signal level for V2X band and E-UTRA band to the value as defined in Table 7.5G.2.5-2 (Case 1). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5G.2.5-2 (Case 1) for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq 4.2$GHz or within +0, -4.3 dB of the target level for carrier frequency $f \leq 6.0$GHz, for at least the duration of the Throughput measurement.

4. Set the Interferer signal level to the value as defined in Table 7.5G.2.5-2 (Case 1) and frequency below and above the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

5. Measure the mean power of the UE in the channel bandwidth for each test point in table 7.5G.1.5-2 according to the test configuration from Table 7.5G.2.4.1-1. The period of measurement shall be at least continuous duration of one sub-frame (1ms).

6. Set the Downlink signal level for V2X band and E-UTRA band to the value as defined in Table 7.5G.2.5-3 (Case 2). Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.5G.2.5-2 (Case 1) for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz or within +0, -4.3 dB of the target level for carrier frequency $f \leq 6.0$GHz, for at least the duration of the Throughput measurement.

7. Set the Interferer signal level to the value as defined in Table 7.5G.2.5-3 (Case 2) and frequency below and above the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

8. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.5G.2.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 7.5G.2.5 Test Requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Table 7.5G.2.5-2, and also under the conditions specified in table 7.5G.2.5-3.

**Table 7.5G.2.5-1: Adjacent channel selectivity for V2X**

| | | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| ACS | dB | | | | 33.0 | | 27 |

**Table 7.5G.2.5-2: Test parameters for Adjacent channel selectivity for V2X, Case 1**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | DBm | $P_{REFSENS_V2X}$ + 14 dB | | | | | |
| $P_{Interferer}$ | DBm | | | | $P_{REFSENS_V2X}$ +45.5dB | | $P_{REFSENS_V2X}$ +39.5dB |
| $BW_{Interferer}$ | MHz | | | | 10 | | 10 |
| $F_{Interferer}$ (offset) | MHz | | | | 10+0.0125 / -10-0.0125 | | 15+0.0075 / -15-0.0075 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

**Table 7.5G.2.5-3: Test parameters for Adjacent channel selectivity for V2X, Case 2**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | DBm | | | | -53.5 | | -47.5 |
| $P_{Interferer}$ | DBm | -22 | | | | | |
| $BW_{Interferer}$ | MHz | | | | 10 | | 10 |
| $F_{Interferer}$ (offset) | MHz | | | | 10+0.0125 / -10-0.0125 | | 15+0.0075 / -15-0.0075 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

## 7.5G.3 Adjacent channel selectivity (ACS) for V2X Communication / Intra-band contiguous multi-carrier operation

### 7.5G.3.1 Test Purpose

The test purpose is the same as in clause 7.5G.1.1.

### 7.5G.3.2 Test Applicability

This test applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 7.5G.3.3 Minimum Conformance Requirements

For intra-band contiguous multi-carrier operation the V2X UE shall fulfil the minimum requirement specified in Table 7.5G.3.3-1 to Table 7.5G.3.3-3 where the throughput shall be $\geq$ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2.

**Table 7.5G.3.3-1: Adjacent channel selectivity for intra-band contiguous multi-carrier for V2X**

| | | V2X Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| Rx Parameter | Units | B | C | D | E | F |
| ACS | dB | 30 | | | | |

**Table 7.5G.3.3-2: Test parameters for Adjacent channel selectivity, Case 1**

| Rx Parameter | Units | V2X Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | | REFSENS + 14 dB | | | | |
| $P_{Interferer}$ | dBm | Aggregated power + 28.5 dB | | | | |
| $BW_{Interferer}$ | MHz | 10 | | | | |
| $F_{Interferer}$ (offset) | MHz | 5 + $F_{offset}$ / -5 - $F_{offset}$ | | | | |
| NOTE 1: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer} / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.<br>NOTE 2: The requirement is applied for 2 carrier intra-concurrent receptions when 2 carrier transmissions are activated at the same time. | | | | | | |

**Table 7.5G.3.3-3: Test parameters for Adjacent channel selectivity, Case 2**

| Rx Parameter | Units | V2X Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -50.5 +10log10(N RB,c/ N RB agg) | | | | |
| $P_{Interferer}$ | dBm | -22 | | | | |
| $BW_{Interferer}$ | MHz | 10 | | | | |
| $F_{Interferer}$ (offset) | MHz | 5+ $F_{offset}$ / -5- $F_{offset}$ | | | | |
| NOTE 1: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015+0.5 \rfloor 0.015+0.0075$ MHz to be offset from the sub-carrier raster.<br>NOTE 2: The requirement is applied for 2 carrier intra-concurrent receptions when 2 carrier transmissions are activated at the same time. | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.5.1G.

## 7.5G.3.4 Test Description

### 7.5G.3.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.5G.3.4.1-1. The details of the uplink, downlink and V2X reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.8.3 respectively and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 7.5G.3.4.1-1: Test Configuration Table**

| Initial Conditions | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for Channel Bandwidths** | | | |
| **V2X multi-carrier Configuration** | | **V2X PSSCH Allocation** | |
| **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **CC1 and CC2 RB Allocation** |
| 10MHz | 10MHz | QPSK | 48+48 |

1. Connect the SS and GNSS simulator to the UE antenna connector as shown in TS 36.508 [7] Annex A, Figure A.92d.

2. The parameter settings for the V2X sidelink communication over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 7.5G.3.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and V2X Reference Measurement Channels are set according to Table 7.5G.3.4.1-1.

4a. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 5A-V2X according to TS 36.508 [7] clause 4.5.9.

7. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)

8. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 7.5G.3.4.2 Test Procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration and to schedule the V2X RMC according to Table 7.5G.3.4.1-1.

2. Set the Interferer signal level to the value as defined in Table 7.5G.3.5-2 (Case 1) and frequency below and above the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

3. Set the Interferer signal level to the value as defined in Table 7.5G.3.5-3 (Case 2) and frequency below and above the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2 .

### 7.5G.3.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 7.5G.3.5 Test Requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Table 7.5G.3.5-2, and also under the conditions specified in table 7.5G.3.5-3.

**Table 7.5G.3.5-1: Adjacent channel selectivity for intra-band contiguous multi-carrier for V2X**

| | | V2X Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| **Rx Parameter** | **Units** | **B** | **C** | **D** | **E** | **F** |
| ACS | dB | 30 | | | | |

**Table 7.5G.3.5-2 Test parameters for Adjacent channel selectivity, Case 1**

| **Rx Parameter** | **Units** | **V2X Bandwidth Class** | | | | |
|---|---|---|---|---|---|---|
| | | **B** | **C** | **D** | **E** | **F** |
| Pw in Transmission Bandwidth Configuration, per CC | | REFSENS + 14 dB | | | | |
| $P_{Interferer}$ | dBm | Aggregated power + 28.5 dB | | | | |
| $BW_{Interferer}$ | MHz | 10 | | | | |
| $F_{Interferer}$ (offset) | MHz | 5 + $F_{offset}$ / -5 - $F_{offset}$ | | | | |
| NOTE 1: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer} / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster. | | | | | | |
| NOTE 2: The requirement is applied for 2 carrier intra-concurrent receptions when 2 carrier transmission are activated at the same time | | | | | | |

**Table 7.5G.3.5-3: Test parameters for Adjacent channel selectivity, Case 2**

| Rx Parameter | Units | V2X Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -50.5 +10log$_{10}$($N_{RB,c}$/ $N_{RB\ agg}$) | | | | |
| $P_{Interferer}$ | dBm | -22 | | | | |
| $BW_{Interferer}$ | MHz | 10 | | | | |
| $F_{Interferer}$ (offset) | MHz | 5+ $F_{offset}$ / -5- $F_{offset}$ | | | | |
| NOTE 1: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the adjacent channel interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015+0.5 \rfloor 0.015+0.0075$ MHz to be offset from the sub-carrier raster. | | | | | | |
| NOTE 2: The requirement is applied for 2 carrier intra-concurrent receptions when 2 carrier transmissions are activated at the same time. | | | | | | |

# 7.6 Blocking characteristics

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occur.

## 7.6.1 In-band blocking

### 7.6.1.1 Test Purpose

In-band blocking is defined for an unwanted interfering signal falling into the range from 15MHz below to 15MHz above the UE receive band, at which the relative throughput shall meet or exceed the requirement for the specified measurement channels.

The lack of in-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

### 7.6.1.2 Test Applicability

This test applies to all types of E-UTRA UE release 8 and forward.

### 7.6.1.3 Minimum Conformance Requirements

The throughput shall be $\geq$ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.1.3-1 and 7.6.1.3-2. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.6.1.3-1: In band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{loffset, case\ 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{loffset, case\ 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in clause 6.2.5.
Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.
Note 3: The REFSENS power level is specified in Table 7.3.3-1 and Table 7.3.3-1a for two and four antenna ports, respectively.

**Table 7.6.1.3-2: In-band blocking**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 |
|---|---|---|---|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 | Void | Void | -38 | -15 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{loffset,case\ 1}$ & =+BW/2 + $F_{loffset,case\ 1}$ | ≤-BW/2 – $F_{loffset,case\ 2}$ & ≥+BW/2 + $F_{loffset,case\ 2}$ | | | -BW/2 - 11 | |
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 48, 50, 51, 65, 66, 68, 70, 72, 74 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | | |
| 30 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | $F_{DL_low}$ – 11 | |
| 71 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low}$ – 12 to $F_{DL_high}$ + 15 | | | | $F_{DL-low}$ - 12 |

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band
NOTE 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -BW/2 - $F_{loffset, case\ 1}$ and
b. the carrier frequency +BW/2 + $F_{loffset, case\ 1}$
NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies

For the UE which supports inter band CA configuration in Table 7.3.3-1A, $P_{Interferer}$ power defined in Table 7.6.1.3-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A.

The normative reference for this requirement is TS 36.101 [2] clause 7.6.1.

## 7.6.1.4 Test Description

### 7.6.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[4] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |

Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.
Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).
Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used.
Note 4: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2).

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.4.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to in Table 7.6.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.1.4.3.

### 7.6.1.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the signal generator for an interfering signal below the wanted signal in Case 1 according to Tables 7.6.1.5-1 and 7.6.1.5-2.

4. Set the downlink signal level according to the table 7.6.1.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.1.5-1 for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the throughput measurement.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal in Case 1 at step 3.

7. Repeat steps from 3 to 6, using interfering signals in Case 2 at step 3and 6. The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to table 7.6.1.4.2-1.

**Table 7.6.1.4.2-1: Example for interferer frequencies**

| | Lower frequency | Upper frequency |
|---|---|---|
| Band 1 DL | 2110 MHz | 2170 MHz |
| Band 1 Midrange | 2140 MHz | |
| Receive band wanted signal (BW 5MHz) | 2137.5 MHz | 2142.5 MHz |
| Interferer case 1 | 2129.9875 MHz | 2150.0125 MHz |
| Interferer case 2 (inner frequency) | 2124.9925 MHz | 2155.0075 MHz |
| Interferer case 2 (outer frequency) | 2099.9925 MHz | 2180.0075 MHz |
| Outer limit for in band blocking | 2095MHz | 2185MHz |
| Number of test frequencies case 2 | 6 | 6 |
| Number of test frequencies for Band 17(asymmetric!), BW 5MHz, case 2 | 0 | 2 |

### 7.6.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception

**Table 7.6.1.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.6.1.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.1.5-1 and 7.6.1.5-2.

**Table 7.6.1.5-1: In band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |

| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
|---|---|---|---|---|---|---|---|
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Ioffset, case 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{Ioffset, case 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

**Table 7.6.1.5-2: In-band blocking**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 |
|---|---|---|---|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 | Void | Void | -38 | -15 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{Ioffset,case 1}$ & =+BW/2 + $F_{Ioffset,case 1}$ | ≤-BW/2 – $F_{Ioffset,case 2}$ & ≥+BW/2 + $F_{Ioffset,case 2}$ | | | -BW/2 - 11 | |
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 48, 50, 51, 65, 66, 68, 70, 72, 74 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | | |
| 30 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | $F_{DL_low}$ – 11 | |
| 71 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low}$ – 12 to $F_{DL_high}$ + 15 | | | | $F_{DL-low}$ - 12 |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency -BW/2 - $F_{Ioffset, case 1}$ and<br>b. the carrier frequency +BW/2 + $F_{Ioffset, case 1}$<br>NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies | | | | | | | | |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, $P_{Interferer}$ power defined in Table 7.6.1.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A.

# 7.6.1_1 In-band blocking with 4 Rx antenna ports

## 7.6.1_1.1 Test Purpose

In-band blocking with 4 Rx antenna ports is defined for an unwanted interfering signal falling into the range from 15MHz below to 15MHz above the UE 4 Rx receive band, at which the relative throughput shall meet or exceed the requirement for the specified measurement channels.

The lack of in-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

## 7.6.1_1.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that supports 4 Rx antenna ports.

## 7.6.1_1.3 Minimum Conformance Requirements

Same as in clause 7.6.1.3.

## 7.6.1_1.4 Test Description

### 7.6.1_1.4.1 Initial Conditions

Same as in clause 7.6.1.4.1 with following exceptions:

- Instead of Table 7.6.1.4.1-1→ use table 7.6.1_1.4-1
- Instead of Figure A.4→ use Figure A.81
- Instead of clause 7.6.1.4.3→ use clause 7.6.1_1.4.3

**Table 7.6.1_1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |

### 7.6.1_1.4.2 Test Procedure

Same as in clause 7.6.1.4.2 with following exceptions:

- Instead of Table 7.6.1.4.1-1→ use Table 7.6.1_1.4.1-1
- Instead of Table 7.6.1.5-1→ use Table 7.6.1_1.5-1

### 7.6.1_1.4.3 Message Contents

Same as in clause 7.6.1.4.3.

## 7.6.1_1.5 Test Requirement

Same as in clause 7.6.1.5 with following exceptions:

- Instead of Table 7.6.1.5-1→ use Table 7.6.1_1.5-1

**Table 7.6.1_1.5-1: In band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Ioffset,\ case\ 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{Ioffset,\ case\ 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |
| Note 3: The REFSENS power level is specified in Table 7.3_1.5-1. | | | | | | | |

# 7.6.1A In-band blocking for CA

## 7.6.1A.0 Minimum conformance requirements

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the in-band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.6.1 for each component carrier while all downlink carriers are active. For the UE which supports inter band CA configuration in Table 7.3.3-1A, $P_{Interferer}$ power defined in Table 7.6.1.3-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A. For E-UTRA CA configurations including an operating band without uplink operation or an operating band with an unpaired DL part (as noted in Table 5.2-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. The requirements for the component carrier configured in the operating band without uplink operation are specified in Table 7.6.1A.0-0, Table 7.6.1A.0-0a and Table 7.6.1A.0-0b.

**Table 7.6.1A.0-0: In-band blocking for additional operating bands for carrier aggregation**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ (offset) | MHz | $=-BW/2 - F_{Ioffset,case\ 1}$ & $=+BW/2 + F_{Ioffset,case\ 1}$ | $\leq -BW/2 - F_{Ioffset,case\ 2}$ & $\geq +BW/2 + F_{Ioffset,case\ 2}$ |
| 29, 32, 67, 69 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low} - 15$ to $F_{DL_high} + 15$ |
| Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band. | | | | |
| Note 2: For each carrier frequency the requirement is valid for two frequencies: a. the carrier frequency -BW/2 - $F_{Ioffset,\ case\ 1}$ and b. the carrier frequency +BW/2 + $F_{Ioffset,\ case\ 1}$ | | | | |
| Note 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies. | | | | |

**Table 7.6.1A.0-0a: In band blocking parameters for additional operating bands for carrier aggregation**

| E-UTRA band | Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 (NOTE 3) | Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | | | | | | | 9 |
| | $BW_{Interferer}$ | MHz | | | | | | 20 |
| | $F_{loffset, case\ 1}$ | MHz | | | | | | 30+0.0125 |
| | $F_{loffset, case\ 2}$ | MHz | | | | | | 50+0.0075 |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.
NOTE 3: The interferer consists of the Reference measurement channel specified in Annex A.3.2 (TBD)

**Table 7.6.1A.0-0b: In-band blocking for additional operating bands for carrier aggregation**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -50 | -44 |
| | $F_{Interferer}$ (offset) | MHz | $=-BW/2 - F_{loffset,case\ 1}$ & $=+BW/2 + F_{loffset,case\ 1}$ | $\leq -BW/2 - F_{loffset,case\ 2}$ & $\geq +BW/2 + F_{loffset,case\ 2}$ |
| 46 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low} - 60$ to $F_{DL_high} + 60$ |

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz or 60 MHz below or above the UE receive band.
NOTE 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency $-BW/2 - F_{loffset, case\ 1}$ and
b. the carrier frequency $+BW/2 + F_{loffset, case\ 1}$
NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies.

For E-UTRA CA configurations listed in Table 7.3A.0-0a under conditions for which reference sensitivity for the operating band being tested is N/A, the in-band blocking requirements of subclause 7.6.1A.0 do not apply.

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.6.1A.0-1 with the uplink configuration set according to Table 7.3A.0-1 for the applicable carrier aggregation configuration. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.3-2. The UE shall fulfil the minimum requirement in presence of an interfering signal specified in Tables 7.6.1A.0-1 and Tables 7.6.1A.0-2 being on either side of the aggregated signal. The throughput of each carrier shall be $\geq$ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.1A.0-1 and 7.6.1A.0-2. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Tables 7.6.1A.0-1 and 7.6.1A.0-2.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, each larger than or equal to 5 MHz, the in-band blocking requirements are defined with the uplink configuration in accordance with Table 7.3A.0-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclause 7.6.1.3 and in this subclause for single component carrier and two component carriers per sub-block, respectively. The requirements apply for in-gap and out-of-gap interferers while all downlink carriers are active.

**Table 7.6.1A.0-1: In band blocking parameters**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |

| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
|---|---|---|---|---|---|---|
| | | 9 | 12 | 13.8 | 15 | 16 |
| $BW_{Interferer}$ | MHz | 5 | 5 | 5 | 5 | 5 |
| $F_{loffset, case\ 1}$ | MHz | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 |
| $F_{loffset, case\ 2}$ | MHz | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A<br>Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | | | | |

**Table 7.6.1A.0-2: In-band blocking**

| CA configuration | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ | MHz | $=-F_{offset}- F_{loffset,case\ 1}$ & $=+F_{offset} + F_{loffset,case\ 1}$ | $\leq-F_{offset}- F_{loffset,case\ 2}$ & $\geq+F_{offset} + F_{loffset,case\ 2}$ |
| CA_1C, CA_2C, CA_3B, CA_3C, CA_5B, CA_7C, CA_8B, CA_12B, CA_23B, CA_27B, CA_38C, CA_39C, CA_40C, CA_40D, CA_40E, CA_41C, CA_41D, CA_41E, CA_41F, CA_42C, CA_42D, CA_42E, CA_42F, CA_43C, CA_48C, CA_48D, CA_48E, CA_48F, CA_66B, CA_66C, CA_70C | $F_{Interferer}$ (Range) | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 |

Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band

Note 2: For each carrier frequency the requirement is valid for two frequencies:
a) the carrier frequency $-F_{offset} - F_{loffset, case\ 1}$ and
b) the carrier frequency $+F_{offset} + F_{loffset, case\ 1}$

Note 3: $F_{offset}$ is the frequency offset from the centre frequency of the adjacent CC being tested to the edge of aggregated channel bandwidth.

Note 4: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer} / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

For combinations of intra-band and inter-band carrier aggregation with up to five downlink carriers (up to two non-contiguously sub-blocks per band and up to four contiguously aggregated carriers per band) and one uplink carrier assigned to one E-UTRA band, the requirement is defined with the uplink active in the band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3A.0-3 when the uplink is active in the band supporting two non-contiguous component carriers, Table 7.3A.0-1 when the uplink is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.3-2 when the uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to four component carriers. For these uplink configurations, the UE shall meet the in-band blocking requirements for intra-band non-contiguous carrier aggregation of two downlink sub-blocks with $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps (Table 7.3A.0-3) for the two non-contiguous downlink sub-blocks, the requirements for intra-band contiguous carrier aggregation for the contiguously aggregated downlink carriers and for any remaining component carrier(s) the requirements specified in subclause 7.6.1.3. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with the single uplink carrier active in each band capable of uplink operation.

For contiguously aggregated component carriers configured in Band 46, the said requirements for intra-band contiguous carrier aggregation of downlink carriers are replaced by requirements in Table 7.6.1A.0-3 and 7.6.1A.0-4.

**Table 7.6.1A.0-3: In band blocking parameters**

| E-UTRA Band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | | | 12 | 13.8 | 15 | |
| | $BW_{Interferer}$ | MHz | | 20 | 20 | 20 | |
| | $F_{Ioffset,\ case\ 1}$ | MHz | | 30 | 30 | 30 | |
| | $F_{Ioffset,\ case\ 2}$ | MHz | | 50 | 50 | 50 | |
| NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 4dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A.<br>NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

**Table 7.6.1A.0-4: In-band blocking**

| E-UTRA Band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -50 | -44 |
| | $F_{Interferer}$ (offset) | MHz | $=-F_{offset}-F_{Ioffset,case\ 1}$ & $=+F_{offset}+F_{Ioffset,case\ 1}$ | $\leq -F_{offset}-F_{Ioffset,case\ 2}$ & $\geq +F_{offset}+F_{Ioffset,case\ 2}$ |
| 46 | $F_{Interferer}$ (Range) | MHz | (Note 2) | $F_{DL_low}-60$ to $F_{DL_high}+60$ |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency $-F_{offset} - F_{Ioffset,\ case\ 1}$ and<br>b. the carrier frequency $+F_{offset} + F_{Ioffset,\ case\ 1}$<br>NOTE 3: $F_{offset}$ is the frequency offset from the centre frequency of the CC being tested to the edge of aggregated channel bandwidth.<br>NOTE 4: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015+0.5\rfloor 0.015+0.0075$ MHz to be offset from the sub-carrier raster. | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.6.1.1A.

## 7.6.1A.1 In-band blocking for CA (intra-band contiguous DL CA and UL CA)

### 7.6.1A.1.1 Test Purpose

In-band blocking is defined for an unwanted interfering signal falling into the range from 15MHz below to 15MHz above the UE receive band, at which the relative throughput shall meet or exceed the requirement for the specified measurement channels. The lack of in-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

### 7.6.1A.1.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 7.6.1A.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.1A.0.

### 7.6.1A.1.4 Test Description

#### 7.6.1A.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.6.1A.1.4.1-1. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.1A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | | | Mid range | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 3) | | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | **UL Allocation** | | | |
| **PCC $N_{RB}$** | **SCC $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 50 | 25 | QPSK | 50+25 | QPSK | 25 | P_25@25 | S_0@0 |
| 50 | 50 | QPSK | 50+50 | QPSK | 25 | P_25@25 | S_0@0 |
| 50 | 100 | QPSK | 50+100 | QPSK | 150 | P_50@0 | S_100@0 |
| 75 | 50 | QPSK | 75+50 | QPSK | 75 | P_75@0 | S_0@0 |
| 75 | 75 | QPSK | 75+75 | QPSK | 75 | P_75@0 | S_0@0 |
| 75 | 75 | QPSK | 75+75 | QPSK | 129 | P_75@0 | S_54@0 |
| 75 | 75 | QPSK | 75+75 | QPSK | 150 | P_75@0 | S_75@0 |
| 100 | 25 | QPSK | 100+25 | QPSK | 50 | P_50@50 | S_0@0 |
| 100 | 25 | QPSK | 100+25 | QPSK | 125 | P_100@0 | S_25@0 |
| 100 | 50 | QPSK | 100+50 | QPSK | 75 | P_75@25 | S_0@0 |
| 100 | 50 | QPSK | 100+50 | QPSK | 150 | P_100@0 | S_50@0 |
| 100 | 75 | QPSK | 100+75 | QPSK | 175 | P_100@0 | S_75@0 |
| 100 | 100 | QPSK | 100+100 | QPSK | 50 | P_50@50 | S_0@0 |
| 100 | 100 | QPSK | 100+100 | QPSK | 75 | P_75@25 | S_0@0 |
| 100 | 100 | QPSK | 100+100 | QPSK | 130 | P_100@0 | S_30@0 |
| 100 | 100 | QPSK | 100+100 | QPSK | 200 | P_100@0 | S_100@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: Depending on CA Configuration only the appropriate Uplink RB allocation value according to table 7.3A.0-1 is tested per CA Configuration Test CC combination.<br>Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.34 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are for PCC initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.6.1A.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.1A.1.4.3.

#### 7.6.1A.1.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.1A.1.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.1A.1.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.1A.1.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Tables 7.6.1A.1.5-1 and 7.6.1A.1.5-2.

7. Set the downlink signal level according to the table 7.6.1A.1.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that for at least the duration of the throughput measurement:
   The PCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.6.1A.1.5-1 + $10\log(P_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
   or within (+0dB, -4 dB) of (target level in Table 7.6.1A.1.5-1 + $10\log(P_L_{CRB}/N_{RB_alloc})$) for carrier frequency $3.0\text{GHz} < f \leq 4.2\text{GHz}$.
   The SCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.6.1A.1.5-1 + $10\log(S_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
   or within (+0dB, -4 dB) of (target level in Table 7.6.1A.1.5-1 + $10\log(S_L_{CRB}/N_{RB_alloc})$) for carrier frequency $3.0\text{GHz} < f \leq 4.2\text{GHz}$.

8. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the aggregated component carriers in Case 1 at step 6.

10. Repeat steps from 6 to 9, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to table 7.6.1A.1.4.2-1.

**Table 7.6.1A.1.4.2-1: Example for interferer frequencies**

| | Lower frequency | Upper frequency |
|---|---|---|
| Band 1 DL | 2110 MHz | 2170 MHz |
| Band 1 Midrange | PCC: 2132.5 MHz<br>SCC: 2147.5 MHz | |
| Receive band wanted signal<br>(CC Configuration / $N_{RB_agg}$ 75 + 75) | PCC: 2125 MHz<br>SCC: 2140 MHz | 2140 MHz<br>2155 MHz |
| $F_{Interferer, case\ 1}$ | 2117.5000 MHz | 2162.5000 MHz |
| $F_{Interferer, case\ 1}$(Offset) | 15.0000 MHz | |
| $\lfloor F_{Interferer, case1}(\text{Offset})/0.015+0.5 \rfloor 0.015+0.0075$ | 15.0075 MHz | |
| Adjusted $F_{Interferer, case\ 1}$ | 2117.4925 MHz | 2162.5075 MHz |
| **Case 2, 1st ( inner )** | | |
| $F_{Interferer, case\ 2}$ | 2112.5000 MHz | 2167.5000 MHz |
| $F_{Interferer, case\ 2}$ (Offset) | 20.0000 MHz | |
| $\lfloor F_{Interferer, case2}(\text{Offset})/0.015+0.5 \rfloor 0.015+0.0075$ | 20.0025 MHz | |
| Adjusted $F_{Interferer, case\ 2}$ | 2112.4975 MHz | 2167.5025 MHz |
| **Case 2, 2nd** | | |
| $F_{Interferer, case\ 2}$ | 2107.5000 MHz | 2172.5000 MHz |
| $F_{Interferer, case\ 2}$ (Offset) | 25.0000 MHz | |
| $\lfloor F_{Interferer, case2}(\text{Offset})/0.015+0.5 \rfloor 0.015+0.0075$ | 25.0125 MHz | |
| Adjusted $F_{Interferer, case\ 2}$ | 2107.4875 MHz | 2172.5125 MHz |
| **Case 2, 3rd** | | |
| $F_{Interferer, case\ 2}$ | 2102.5000 MHz | 2177.5000 MHz |
| $F_{Interferer, case\ 2}$ (Offset) | 30.0000 MHz | |
| $\lfloor F_{Interferer, case2}(\text{Offset})/0.015+0.5 \rfloor 0.015+0.0075$ | 30.0075 MHz | |
| Adjusted $F_{Interferer, case\ 2}$ | 2102.4925 MHz | 2177.5075 MHz |
| **Case 2, 4th ( outer )** | | |
| $F_{Interferer, case\ 2}$ | 2097.5000 MHz | 2182.5000 MHz |
| $F_{Interferer, case\ 2}$ (Offset) | 35.0000 MHz | |
| $\lfloor F_{Interferer, case2}(\text{Offset})/0.015+0.5 \rfloor 0.015+0.0075$ | 35.0025 MHz | |
| Adjusted $F_{Interferer, case\ 2}$ | 2097.4975 MHz | 2182.5025 MHz |
| Outer limit for in band blocking | 2095MHz | 2185MHz |
| Number of test frequencies case 2 | 4 | 4 |

### 7.6.1A.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

**Table 7.6.1A.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::=<br>SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

**Table 7.6.1A.1.4.3-2: UplinkPowerControlDedicatedSCell-r10**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT::= SEQUENCE { | | | |
| p0-UE-PUSCH-r10 | 0 | | |
| deltaMCS-Enabled-r10 | en0 | | |
| accumulationEnabled-r10 | TRUE | | |
| pSRS-Offset-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| pSRS-OffsetAp-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| filterCoefficient-r10 | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| pathlossReferenceLinking-r10 | sCell | | |
| } | | | |

## 7.6.1A.1.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.6.1A.1.5-1 and 7.6.1A.1.5-2.

**Table 7.6.1A.1.5-1: In band blocking parameters**

| **Rx Parameter** | **Units** | **CA Bandwidth Class** | | | | |
|---|---|---|---|---|---|---|
| | | **B** | **C** | **D** | **E** | **F** |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 12 | | | |
| $BW_{Interferer}$ | MHz | 5 | 5 | | | |
| $F_{Ioffset,\ case\ 1}$ | MHz | 7.5 | 7.5 | | | |
| $F_{Ioffset,\ case\ 2}$ | MHz | 12.5 | 12.5 | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier and in subclause 6.2.5A for two uplink carriers. | | | | | | |
| Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | | | | |

**Table 7.6.1A.1.5-2: In-band blocking**

| **CA configuration** | **Parameter** | **Unit** | **Case 1** | **Case 2** |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ | MHz | $=-F_{offset}-F_{Ioffset,case\ 1}$ & $=+F_{offset}+F_{Ioffset,case\ 1}$ | $\leq-F_{offset}-F_{Ioffset,case\ 2}$ & $\geq+F_{offset}+F_{Ioffset,case\ 2}$ |

| | | | | |
|---|---|---|---|---|
| CA_1C, CA_2C, CA_3B, CA_3C, CA_5B, CA_7C, CA_8B, CA_12B, CA_23B, CA_27B, CA_28C, CA_38C, CA_39C, CA_40C, CA_41C, CA_42C, CA_43C, CA_48C, CA_66B, CA_66C, CA_70C, | $F_{Interferer}$ (Range) | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 |

Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band

Note 2: For each carrier frequency the requirement is valid for two frequencies:
a) the carrier frequency $-F_{offset} - F_{loffset,\ case\ 1}$ and
b) the carrier frequency $+F_{offset} + F_{loffset,\ case\ 1}$

Note 3: $F_{offset}$ is the frequency offset from the centre frequency of the adjacent CC being tested to the edge of aggregated channel bandwidth.

Note 4: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer} / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Table 7.6.1A.1.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.1A.2 In-band blocking for CA (intra-band contiguous DL CA without UL CA)

### 7.6.1A.2.1 Test Purpose

Same test purpose as in clause 7.6.1A.1.

### 7.6.1A.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA. This test case applies only for CA Configurations that do not support UL CA.

### 7.6.1A.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.1A.0.

### 7.6.1A.2.4 Test Description

#### 7.6.1A.2.4.1 Initial Conditions

Same initial conditions as in clause 7.6.1A.1.4.1 with the following exceptions:

- Instead of Table 7.6.1A.1.4.1-1 → use Table 7.6.1A.2.4.1-1.
- Instead of clause 7.6.1A.1.4.3 → use clause 7.6.1A.2.4.3.

**Table 7.6.1A.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | | | B: Mid range<br>C: Mid range (Note 4) | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Notes 3, 4) | | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | **UL Allocation** | | | |
| **PCC $N_{RB}$** | **SCC $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 6 | 25 | QPSK | 6+25 | QPSK | 6 | P_6@0 | - |
| 15 | 50 | QPSK | 15+50 | QPSK | 15 | P_15@0 | - |
| 25 | 25 | QPSK | 25+25 | QPSK | 20 | P_20@0 | - |
| 25 | 25 | QPSK | 25+25 | QPSK | 25 | P_25@0 | - |
| 25 | 50 | QPSK | 25+50 | QPSK | 20 | P_20@0 | - |
| 25 | 100 | QPSK | 25+100 | QPSK | 25 | P_25@0 | - |
| 50 | 25 | QPSK | 50+25 | QPSK | 25 | P_25@25 | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 25 | P_25@25 | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 50 | P_50@0 | - |
| 50 | 75 | QPSK | 50+75 | QPSK | 50 | P_50@0 | - |
| 75 | 25 | QPSK | 75+25 | QPSK | 75 | P_75@0 | - |
| 75 | 50 | QPSK | 75+50 | QPSK | 75 | P_75@0 | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 75 | P_75@0 | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 50 | P_50@50 | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 100 | P_100@0 | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 75 | P_75@25 | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 100 | P 100@0 | - |
| 100 | 75 | QPSK | 100+75 | QPSK | 100 | P_100@0 | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 50 | P_50@50 | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 75 | P_75@25 | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 100 | P_100@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: Depending on CA Configuration only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per CA Configuration Test CC combination.<br>Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.<br>Note 4: For CA_70C all test frequency IDs shall be tested according to table 4.3.1.1.70A-1, in TS 36.508 [7]. | | | | | | | |

7.6.1A.2.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.1A.2.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.1A.2.4.1-1 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Tables 7.6.1A.1.5-1 and 7.6.1A.1.5-2.

7. Set the downlink signal level according to the table 7.6.1A.1.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.1A.1.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.

8. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the aggregated component carriers in Case 1 at step 6.

10. Repeat steps from 6 to 9, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to table 7.6.1A.1.4.2-1.

### 7.6.1A.2.4.3 Message Contents

Same message contents as in clause 7.6.1.4.3.

## 7.6.1A.2.5 Test Requirement

Same test requirement as in clause 7.6.1A.1.5 with the following exceptions:

- Instead of Table 7.6.1A.1.5-1 → use Table 7.6.1A.2.5-1.
- Instead of Table 7.6.1A.1.5-2 → use Table 7.6.1A.2.5-2.

**Table 7.6.1A.2.5-1: In band blocking parameter**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 12 | | | |
| $BW_{Interferer}$ | MHz | 5 | 5 | | | |
| $F_{Ioffset,\ case\ 1}$ | MHz | 7.5 | 7.5 | | | |
| $F_{Ioffset,\ case\ 2}$ | MHz | 12.5 | 12.5 | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5<br>Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | | | | |

**Table 7.6.1A.2.5-2: In-band blocking**

| CA configuration | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ | MHz | $=-F_{offset}-F_{Ioffset,case\ 1}$ & $=+F_{offset}+F_{Ioffset,case\ 1}$ | $\leq-F_{offset}-F_{Ioffset,case\ 2}$ & $\geq+F_{offset}+F_{Ioffset,case\ 2}$ |

| | | | | |
|---|---|---|---|---|
| CA_1C, CA_2C, CA_3B, CA_3C, CA_5B, CA_7C, CA_8B, CA_12B, CA_23B, CA_27B, CA_28C, CA_38C, CA_39C, CA_40C, CA_41C, CA_42C, CA_43C, CA_48C, CA_66B, CA_66C, CA_70C | $F_{Interferer}$ (Range) | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 |

Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band

Note 2: For each carrier frequency the requirement is valid for two frequencies:
a) the carrier frequency $-F_{offset} - F_{loffset,\ case\ 1}$ and
b) the carrier frequency $+F_{offset} + F_{loffset,\ case\ 1}$

Note 3: $F_{offset}$ is the frequency offset from the centre frequency of the adjacent CC being tested to the edge of aggregated channel bandwidth.

Note 4: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer} / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Table 7.6.1A.2.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.1A.3 In-band blocking for CA (inter-band DL CA without UL CA)

### 7.6.1A.3.1 Test Purpose

In-band blocking is defined for an unwanted interfering signal falling into the range from 15MHz below (60 MHz for band 46) to 15MHz above (60 MHz for band 46) the UE receive band, at which the relative throughput shall meet or exceed the requirement for the specified measurement channels.

### 7.6.1A.3.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support inter-band DL CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 2DL CA with FDD-TDD inter-band CA.

This test case also applies to all types of E-UTRA UE release 13 and forward that support DL LAA.

### 7.6.1A.3.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.1A.0.

### 7.6.1A.3.4 Test Description

#### 7.6.1A.3.4.1 Initial Conditions

Same initial conditions as in clause 7.6.1A.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2.
- Instead of Table 7.6.1A.1.4.1-1 → use Table 7.6.1A.3.4.1-1.
- Instead of clause 7.6.1A.1.4.3 → use clause 7.6.1A.3.4.3.

**Table 7.6.1A.3.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | A: Mid range for PCC and SCC |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE | Highest $N_{RB_agg}$ for PCC and SCC |

| Test Parameters for CA Configurations | | | | | | |
|---|---|---|---|---|---|---|
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | | **UL Allocation** | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | | **CC MOD** | **PCC $N_{RB_alloc}$** |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 50 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 25 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 20 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 16 |
| 50 | 75 | QPSK | 50 | 75 | QPSK | 25 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 50 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 25 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 20 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 16 |
| 75 | 50 | QPSK | 75 | 50 | QPSK | 25 |
| 75 | 75 | QPSK | 75 | 75 | QPSK | 25 |
| 75 | 100 | QPSK | 75 | 100 | QPSK | 25 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 100 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 75 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 50 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 100 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 50 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 100 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 75 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 50 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 45 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 25 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 20 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.
Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3A.3.5-2 for UE supporting one uplink carrier is tested per Test CA configuration.
Note 3: The UL resource blocks shall be located as close as possible to the downlink PCC but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).
Note 4: The frequencies of PCC and SCC shall be switched and tested in each configuration, according to the UE declared capability for UL support (within CA operation) in the individual bands.

7.6.1A.3.4.2 Test Procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.1A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.1A.3.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the parameters of the signal generator for an interfering signal below the SCC in Case 1 according to Tables 7.6.1.5-1 and 7.6.1.5-2, or 7.6.1.5-1 and 7.6.1A.3.5-0 for operating bands without uplink band (as noted in Table 5.2-1) , or 7.6.1A.3.5-0a and 7.6.1A.3.5-0b for operating band 46 without uplink band.

7. Set the downlink signal level according to the table 7.6.1A.3.5-1 or table 7.6.1A.3.5-0a for operating band 46. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.1A.3.5-1 or table 7.6.1A.3.5-0a for operating band 46 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the throughput measurement.

8. Measure the average throughput of SCC for duration sufficient to achieve statistical significance according to Annex G.2.

9. Repeat steps from 6 to 8, using an interfering signal above the SCC in Case 1 at step 6.

10. Repeat steps from 6 to 9, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to table 7.6.1.4.2-1.

#### 7.6.1A.3.4.3 Message Contents

Same message contents as in clause 7.6.1.4.3.

### 7.6.1A.3.5 Test Requirement

For inter-band carrier aggregation with uplink assigned to one E-UTRA band the in-band blocking requirements are defined with the uplink active on the band other than the band whose downlink is being tested i.e. the requirements are tested only for the SCell downlink. The UE shall meet the requirement for each component carrier, when operated as SCell, while both downlink carriers are active.

For band combinations including an operating band without uplink band (as noted in Table 5.2-1), the requirements for both downlinks shall be met with the uplink in the band capable of UL operation.

The throughput measured during the test procedure for each component carrier, when operated as SCell, shall be $\geq$ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.1A.3.5-1 and 7.6.1A.3.5-2 (originated from the single carrier Tables 7.6.1.5-1 and 7.6.1.5-2) and also Table 7.6.1A.3.5-0 for band combinations including an operating band without uplink operation or Table 7.6.1A.3.5-0a and Table 7.6.1A.3.5-0b for band combinations including operating band 46 without uplink operation.

**Table 7.6.1A.3.5-0: In-band blocking for additional operating bands for carrier aggregation**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ (offset from SCC) | MHz | =-BW/2 – $F_{Ioffset,case\ 1}$ & =+BW/2 + $F_{Ioffset,case\ 1}$ | ≤-BW/2 – $F_{Ioffset,case\ 2}$ & ≥+BW/2 + $F_{Ioffset,case\ 2}$ |
| 29, 32, 69 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 |

Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.
Note 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -BW/2 - $F_{Ioffset,\ case\ 1}$ and
b. the carrier frequency +BW/2 + $F_{Ioffset,\ case\ 1}$
Note 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies.

**Table 7.6.1A.3.5-0a: In band blocking parameters for additional operating bands for carrier aggregation**

| E-UTRA band | Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 (NOTE 3) | Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | | | | | 6 | | 9 |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{Ioffset,\ case\ 1}$ | MHz | | | | 30+0.0025 | | 30+0.0125 |
| | $F_{Ioffset,\ case\ 2}$ | MHz | | | | 50+0.0125 | | 50+0.0075 |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.3.1 and set-up according to Annex C.3.1.
NOTE 3: The interferer consists of the Reference measurement channel specified in Annex A.3.2 (TBD).

**Table 7.6.1A.3.5-0b: In-band blocking for additional operating bands for carrier aggregation**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -50 | -44 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{Ioffset,case\ 1}$ & =+BW/2 + $F_{Ioffset,case\ 1}$ | ≤-BW/2 – $F_{Ioffset,case\ 2}$ & ≥+BW/2 + $F_{Ioffset,case\ 2}$ |
| 46 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 60 to $F_{DL_high}$ + 60 |

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz or 60 MHz below or above the UE receive band.
NOTE 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -BW/2 - $F_{Ioffset,\ case\ 1}$ and
b. the carrier frequency +BW/2 + $F_{Ioffset,\ case\ 1}$
NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies.

**Table 7.6.1A.3.5-1: In band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |

| Configuration, per CC | | | | | | | |
|---|---|---|---|---|---|---|---|
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{loffset, case\ 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{loffset, case\ 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.
Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.
Note 3: The REFSENS power level is specified in Table 7.3.1-1 and Table 7.3.1-1a for two and four antenna ports, respectively.

**Table 7.6.1A.3.5-2: In-band blocking**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 |
|---|---|---|---|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 | Void | Void | -38 | -15 |
| | $F_{Interferer}$ (offset from SCC) | MHz | $=-BW/2 - F_{loffset,case\ 1}$ & $=+BW/2 + F_{loffset,case\ 1}$ | $\leq -BW/2 - F_{loffset,case\ 2}$ & $\geq +BW/2 + F_{loffset,case\ 2}$ | | | -BW/2 - 11 | |
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 66, 70 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low} - 15$ to $F_{DL_high} + 15$ | | | | |
| 30 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low} - 15$ to $F_{DL_high} + 15$ | | | $F_{DL_low} - 11$ | |
| 71 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low} - 12$ to $F_{DL_high} + 15$ | | | | $F_{DL\text{-}low} - 12$ |

Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band
Note 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -BW/2 - $F_{loffset, case\ 1}$ and
b. the carrier frequency +BW/2 + $F_{loffset, case\ 1}$
Note 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Table 7.6.1A.3.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.1A.4 In-band blocking for CA (intra-band non-contiguous DL CA without UL CA)

### 7.6.1A.4.1 Test Purpose

Same as in clause 7.6.1A.1.1.

### 7.6.1A.4.2 Test Applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA but no UL CA.

### 7.6.1A.4.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.1A.0.

### 7.6.1A.4.4 Test description

#### 7.6.1A.4.4.1 Initial Conditions

Same as in clause 7.6.1A.1.4.1 with the following exceptions:

- Instead of Table 7.6.1A.1.4.1-1→ use Table 7.6.1A.4.4.1-1.

**Table 7.6.1A.4.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes , and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | A: N/A (Range is not relevant) |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration. | Refer to test point |
| **Test Parameters for CA Configurations** | |
| use the content of Table 7.3A.4.4.1-1 | |

#### 7.6.1A.4.4.2 Test Procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.1A.4.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.1A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.1A.4.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
6. Set the parameters of the signal generator for an interfering signal below the PCC in Case 1 according to Tables 7.6.1.5-1 and 7.6.1.5-2, excluding frequencies where the interferer centre frequency falls within SCC carrier $\pm(BW/2 + F_{Ioffset,case\ 1})$, where BW & offset refer to SCC.
7. Set the downlink signal level for PCC and SCC according to the table 7.6.1.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.1.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.
8. Measure the average throughput of the PCC for duration sufficient to achieve statistical significance according to Annex G.2A.
9. Repeat steps from 6 to 8, using an interfering signal above the PCC in Case 1 at step 6.
10. Repeat steps from 6 to 9, using an interfering signal below and above the SCC in Case 1 and measuring SCC instead of PCC in step 8, excluding the frequencies where the interferer centre frequency falls within PCC carrier $\pm(BW/2 + F_{Ioffset,case\ 1})$, where BW & offset refer to PCC.
11. Repeat steps from 6 to 10**,** replacing references to Case 1 with references to Case 2. The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to table 7.6.1.4.2-1.

#### 7.6.1A.4.4.3 Message Contents

Same message contents as in clause 7.6.1.4.3.

### 7.6.1A.4.5 Test Requirement

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink carriers, each larger than or equal to 5 MHz, the in-band blocking requirements are defined with the uplink configuration of the PCC being in accordance with Table 7.3A.0-3. The UE shall meet the requirements specified in tables 7.6.1A.4.5-1 and 7.6.1A.4.5-2 for each component carrier while both downlink carriers are active. The requirements for each component carrier are the same as single carrier requirements in Tables 7.6.1.5-1 and 7.6.1.5-2.

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.1A.4.5-1 and 7.6.1A.4.5-2.

**Table 7.6.1A.4.5-1: In band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{loffset,\ case\ 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{loffset,\ case\ 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

**Table 7.6.1A.4.5-2: In-band blocking**

| CA Configuration | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ (offset) | MHz | $=-BW/2 - F_{loffset,case\ 1}$ & $=+BW/2 + F_{loffset,case\ 1}$ | $\leq -BW/2 - F_{loffset,case\ 2}$ & $\geq +BW/2 + F_{loffset,case\ 2}$ |
| CA_1A-1A, CA_2A-2A, CA_3A-3A, CA_4A-4A, CA_5A-5A, CA_7A-7A, CA_12A-12A CA_23A-23A, CA_25A-25A, CA_41A-41A, CA_42A-42A, CA_48A-48A, CA_66A-66A | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low} - 15$ to $F_{DL_high} + 15$ |
| Note1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band<br>Note 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency $-BW/2 - F_{loffset,\ case\ 1}$ and<br>b. the carrier frequency $+BW/2 + F_{loffset,\ case\ 1}$<br>Note 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies | | | | |

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Table 7.6.1A.4.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.1A.5 In-band blocking for 3DL CA

### 7.6.1A.5.1 Test Purpose

Same test purpose as in clause 7.6.1A.1.

### 7.6.1A.5.2 Test Applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support 3DL with Intra-band contiguous CA or 3DL with Inter-band CA or 3DL with Intra-band contiguous and Inter-band CA.

This test case also applies to all types of E-UTRA UE release 11 and forward that support 3DL with Intra-band non-contiguous and Inter-band CA or 3DL with Intra-band non-contiguous and Intra-band contiguous CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 3DL with FDD-TDD CA.

This test case also applies to all types of E-UTRA UE release 13 and forward that support 3DL CA involving Band

46.7.6.1A.5.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.1A.0.

### 7.6.1A.5.4 Test Description

#### 7.6.1A.5.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.1A.5.4.1-1 through table 7.6.1A.5.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.1A.5.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| Network signalling value | NS_01 by default |

**Test Parameters for CA Configurations**

| ID | PCC | | | | SCC1 | | | | SCC2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3) | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for a CA_XD Configuration (Intra-band contiguous)** | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | X | Mid/CC3 | N/A | All RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | X | Mid/CC3 | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA Configuration (Inter-band)** | | | | | | | | | | | | |
| **1** | X | Mid | REFSENS | All RBs | Y | Mid | N/A | All RBs | Z | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | All RBs | X | Mid | N/A | All RBs | Z | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | All RBs | X | Mid | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Test Settings for CA_1A-18A-28A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 50@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 1 | Low | 75@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 1 | Low | 100@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 1 | Low | 100@0 | All RBs | 18 | Mid | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **5** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **6** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **7** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **8** | 18 | Mid | 25@50 | All RBs | 1 | Low | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |
| **9** | 18 | Mid | 25@50 | All RBs | 1 | Low | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **10** | 28 | High | 25@0 | All RBs | 1 | Low | N/A | All RBs | 18 | Mid | N/A | All RBs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **11** | 28 | Mid | 25@25 | All RBs | 1 | Low | N/A | All RBs | 18 | Low | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **12** | 28 | High | 25@25 | All RBs | 1 | High | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |

**Default Test Settings for CA_XB-YA and CA_XC-YA Configuration (Intra-band contiguous + Inter-band)**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REFSENS | All RBs | X | Mid/CC1 | N/A | All RBs | X | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **4** | Y | Mid | REFSENS | All RBs | X | Mid/CC1 | N/A | All RBs | X | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |

**Default Test Settings for CA_XA-YB and CA_XA-YC Configuration (Intra-band contiguous + Inter-band)**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | Y | Mid/CC1 | REFSENS | All RBs | Y | Mid/CC2 | N/A | All RBs | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid/CC1 | REFSENS | All RBs | Y | Mid/CC2 | N/A | All RBs | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | X | Mid | REFSENS | All RBs | Y | Mid/CC1 | N/A | All RBs | Y | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **4** | X | Mid | REFSENS | All RBs | Y | Mid/CC1 | N/A | All RBs | Y | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration, The applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

Note 2: Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.

Note 3: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.

Note 4: **Intra-band contiguous:** X corresponds to the band in the CA Configuration. E.g. for CA_41D, X=41

Note 5: **Inter-band:** X,Y,Z correspond to the 1st, 2nd and 3rd band in the CA Configuration. E.g. for CA_1A-3A-19A, X=1, Y=3, Z=19

Note 6: **Intra-band contiguous + Inter-band:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_1C-3A, X=1 and Y=3

Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.

Note 8: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.

Note 9: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC} = N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.

Note 10: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.

Note 11: ID/test points that result in no refsens requirement shall be skipped.

**Table 7.6.1A.5.4.1-2: Test Configuration Table $W_{gap}$**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3,4) | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for CA_XA-XA-YA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | X | CC2 | REFSENS | All RBs | Max | X | CC1 | N/A | All RBs | - | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| 2 | Y | Mid | REFSENS | All RBs | - | X | CC2 | N/A | All RBs | Max | X | CC1 | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| **Default Test Settings for CA_XA-YA-YA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | Y | CC2 | REFSENS | All RBs | Max | Y | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| 2 | X | Mid | REFSENS | All RBs | - | Y | CC2 | N/A | All RBs | Max | Y | CC1 | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| **Test Settings for CA_29A-66A-66A Configuration (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | 29 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **Test Settings for a CA_41C-41A Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 1 | 41 | CC3 | 100@0 | All RBs | 134.2 | 41 | CC2 | N/A | All RBs | - | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_41A-41C Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 2 | 41 | CC3 | 100@0 | All RBs | - | 41 | CC2 | **N/A** | All RBs | 134.2 | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | **100** | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Group Test Settings for CA_66A-66A-XA or CA_XA-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| 2 | X | Mid | REFSENS | All RBs | - | 66 | CC1 | N/A | All RBs | 50 | 66 | CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_66A-66C Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 30.2 | 66 | CC2 | N/A | All RBs | - | 66 | CC3 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.

Note 2: **Intra-band non-contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.

Note 3: **Intra-band non-contiguous + Intra-band contiguous:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.

Note 4: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.

Note 5: **Intra-band non-contiguous + Inter-band:** X and Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A,X=2,Y=5

Note 6: **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A,X=41.
Note 7: **Intra-band non-contiguous + Inter-band:** REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RE allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.
Note 10: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 11: ID/test points that result in no refsens requirement shall be skipped.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.58 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 7.6.1A.5.4.1-1 through Table 7.6.1A.5.4.1-2 as appropriate.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.1A.5.4.3.

### 7.6.1A.5.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.1A.5.4.3

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.1A.5.4.1-1 through Table 7.6.1A.5.4.1-5 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.1A.5.4.1-1 through Table 7.6.1A.5.4.1-2 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6 Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Table 7.6.1A.5.4.2-1.

7 Set the downlink signal level according to the Table 7.6.1A.5.4.2-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.1A.5.4.2-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.

8 Measure the average throughput for the carrier(s) indicated in Table 7.6.1A.5.4.2-1for duration sufficient to achieve statistical significance according to Annex G.2A.

9 Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to Table 7.6.1A.5.4.2-1 in Case 1 at step 6.

10 Repeat steps from 6 to 9, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to table 7.6.1A.1.4.2-1.

11. Repeat steps 1 to 10 for all component carriers listed in Table 7.6.1A.5.4.2-1.

**Table 7.6.1A.5.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2 | 7.6.1A.5.5-2<br>7.6.1A.5.5-3 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.6.1A.5.5-1<br>7.6.1A.5.5-1a<br>7.6.1A.5.5-1b<br>7.6.1A.5.5-4<br>7.6.1A.5.5-5 |
| | | SCC2 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| Intra-band contiguous + Inter-band | 1 | SCC2 | 7.6.1A.5.5-1<br>7.6.1A.5.5-1a<br>7.6.1A.5.5-1b<br>7.6.1A.5.5-4<br>7.6.1A.5.5-5 |
| | 2 | | |
| | 3 | SCC1, SCC2 | 7.6.1A.5.5-2<br>7.6.1A.5.5-3<br>7.6.1A.5.5-3a<br>7.6.1A.5.5-3b |
| | 4 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC2 | 7.6.1A.5.5-1<br>7.6.1A.5.5-1a<br>7.6.1A.5.5-1b<br>7.6.1A.5.5-4<br>7.6.1A.5.5-5 |
| | 2 | SCC1, | 7.6.1A.5.5-1a<br>7.6.1A.5.5-1b<br>7.6.1A.5.5-4<br>7.6.1A.5.5-5 |
| | | SCC2 | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.6.1A.5.5-4<br>7.6.1A.5.5-5 |
| | | SCC1, SCC2 | 7.6.1A.5.5-2<br>7.6.1A.5.5-3<br>7.6.1A.5.5-3a<br>7.6.1A.5.5-3b |
| | 2 | SCC2 | 7.6.1A.5.5-1a<br>7.6.1A.5.5-1b<br>7.6.1A.5.5-4<br>7.6.1A.5.5-5 |
| | | PCC, SCC1 | 7.6.1A.5.5-2<br>7.6.1A.5.5-3 |

Note 1: Test point ID for the particular CA configuration as defined in section 7.6.1A.5.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.

### 7.6.1A.5.4.3 Message Contents

Same message contents as in clause 7.6.1.4.3 for without UL CA.

Same message contents as in clause 7.6.1A.1.4.3 for UL CA.

## 7.6.1A.5.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table s below, according to the type of CA.

**Table 7.6.1A.5.5-1: In-band blocking for additional operating bands for carrier aggregation (inter-band)**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ (offset from SCC) | MHz | =-BW/2 – $F_{loffset,case\ 1}$ & =+BW/2 + $F_{loffset,case\ 1}$ | ≤-BW/2 – $F_{loffset,case\ 2}$ & ≥+BW/2 + $F_{loffset,case\ 2}$ |
| 29 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 |

Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.
Note 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -BW/2 - $F_{loffset,\ case\ 1}$ and
b. the carrier frequency +BW/2 + $F_{loffset,\ case\ 1}$
Note 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies.

**Table 7.6.1A.5.5-1a: In band blocking parameters for additional operating bands for carrier aggregation**

| E-UTRA band | Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 (NOTE 3) | Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | | | | | 6 | | 9 |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{loffset,\ case\ 1}$ | MHz | | | | 30+0.0025 | | 30+0.0125 |
| | $F_{loffset,\ case\ 2}$ | MHz | | | | 50+0.0125 | | 50+0.0075 |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.
NOTE 3: The interferer consists of the Reference measurement channel specified in Annex A.3.2 (TBD)

**Table 7.6.1A.5.5-1b: In-band blocking for additional operating bands for carrier aggregation**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -50 | -44 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{loffset,case\ 1}$ & =+BW/2 + $F_{loffset,case\ 1}$ | ≤-BW/2 – $F_{loffset,case\ 2}$ & ≥+BW/2 + $F_{loffset,case\ 2}$ |
| 46 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 60 to $F_{DL_high}$ + 60 |

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz or 60 MHz below or above the UE receive band.
NOTE 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -BW/2 - $F_{loffset,\ case\ 1}$ and
b. the carrier frequency +BW/2 + $F_{loffset,\ case\ 1}$
NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies.

**Table 7.6.1A.5.5-2: In band blocking parameter (intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |

| Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
|---|---|---|---|---|---|---|
| | | 9 | 12 | 13.8 | | |
| $BW_{Interferer}$ | MHz | 5 | 5 | 5 | | |
| $F_{Ioffset, case\ 1}$ | MHz | 7.5 | 7.5 | 7.5 | | |
| $F_{Ioffset, case\ 2}$ | MHz | 12.5 | 12.5 | 12.5 | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5<br>Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | | | | |

**Table 7.6.1A.5.5-3: In-band blocking (intra-band contiguous)**

| CA configuration | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ | MHz | $=-F_{offset}-F_{Ioffset,case\ 1}$ & $=+F_{offset}+F_{Ioffset,case\ 1}$ | $\leq-F_{offset}-F_{Ioffset,case\ 2}$ & $\geq+F_{offset}+F_{Ioffset,case\ 2}$ |
| CA_1C, CA_2C, CA_3B, CA_3C, CA_5B, CA_7C, CA_8B, CA_12B, CA_23B, CA_27B, CA_28C, CA_38C, CA_39C, CA_40C, CA_40D, CA_41C, CA_41D, CA_42C, CA_42D, CA_43C, CA_48C, CA_48D, CA_66B, CA_66C, CA_70C, CA_66D | $F_{Interferer}$ (Range) | MHz | (Note 2) | $F_{DL_low}-15$ to $F_{DL_high}+15$ |
| Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band<br>Note 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency $-F_{offset}-F_{Ioffset,case\ 1}$ and<br>b. the carrier frequency $+F_{offset}+F_{Ioffset,case\ 1}$<br>Note 3: $F_{offset}$ is the frequency offset from the centre frequency of the adjacent CC being tested to the edge of aggregated channel bandwidth.<br>Note 4: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015+0.5\rfloor 0.015+0.0075$ MHz to be offset from the sub-carrier raster. | | | | |

**Table 7.6.1A.5.5-3a: In band blocking parameters (band 46, intra-band contiguous)**

| E-UTRA Band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | | | 12 | 13.8 | | |
| | $BW_{Interferer}$ | MHz | | 20 | 20 | | |
| | $F_{Ioffset, case\ 1}$ | MHz | | 30 | 30 | | |
| | $F_{Ioffset, case\ 2}$ | MHz | | 50 | 50 | | |
| NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 4dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A.<br>NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

**Table 7.6.1A.5.5-3b: In-band blocking (band 46, intra-band contiguous)**

| E-UTRA Band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -50 | -44 |
| | $F_{Interferer}$ (offset) | MHz | $=-F_{offset}-F_{Ioffset,case\ 1}$ & $=+F_{offset}+F_{Ioffset,case\ 1}$ | $\leq-F_{offset}-F_{Ioffset,case\ 2}$ & $\geq+F_{offset}+F_{Ioffset,case\ 2}$ |

| | | | | |
|---|---|---|---|---|
| 46 | $F_{Interferer}$ (Range) | MHz | (Note 2) | $F_{DL_low}$ – 60 to $F_{DL_high}$ + 60 |

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.
NOTE 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -$F_{offset}$ - $F_{Ioffset,\ case\ 1}$ and
b. the carrier frequency +$F_{offset}$ + $F_{Ioffset,\ case\ 1}$
NOTE 3: $F_{offset}$ is the frequency offset from the centre frequency of the CC being tested to the edge of aggregated channel bandwidth.
NOTE 4: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.6.1A.5.5-4: In-band blocking parameters (inter-band, intra-band non-contiguous)**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Ioffset,\ case\ 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{Ioffset,\ case\ 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.
Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.

**Table 7.6.1A.5.5-5: In-band blocking (inter-band, intra-band non-contiguous)**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 |
|---|---|---|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 | Void | Void | -38 |
| | $F_{Interferer}$ (offset from SCC) | MHz | =-BW/2 – $F_{Ioffset,case\ 1}$ & =+BW/2 + $F_{Ioffset,case\ 1}$ | ≤-BW/2 – $F_{Ioffset,case\ 2}$ & ≥+BW/2 + $F_{Ioffset,case\ 2}$ | | | -BW/2 - 11 |
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 66 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | |
| 30 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | $F_{DL_low}$ – 11 |

Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band
Note 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -BW/2 - $F_{Ioffset,\ case\ 1}$ and
b. the carrier frequency +BW/2 + $F_{Ioffset,\ case\ 1}$
Note 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies
Note 4: For intra-band non-contiguous + inter-band CA, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps.

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Tables 7.6.1A.5.5-1, 7.6.1A.5.5-3 and 7.6.1A.5.5-5 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C accordingly.

# 7.6.1A.6

# 7.6.1A.7 In-band blocking for 4DL CA

## 7.6.1A.7.1 Test Purpose

Same test purpose as in clause 7.6.1A.1.

## 7.6.1A.7.2 Test Applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support 4DL with TDD Intra-band contiguous CA, or 4DL with Inter-band CA, or 4DL with Intra-band contiguous and Inter-band CA.

This test case also applies to all types of E-UTRA UE release 11 and forward that support 4DL Intra-band non-contiguous CA + Inter-band CA or 4DL Intra-band non-contiguous + Intra-band contiguous CA, or 4DL with Intra-band non-contiguous and Intra-band non-contiguous CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 4DL CA with FDD-TDD CA.

## 7.6.1A.7.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.1A.0.

## 7.6.1A.7.4 Test Description

### 7.6.1A.7.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.1A.7.4.1-1 through table 7.6.1A.7.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.1A.7.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for a CA_XE Configuration (Intra-band contiguous)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YD, YD-XA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **4** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | X | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | R | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings for CA_XB-YA-ZA and CA_XC-YA-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-XB-ZA and CA_YA-XC-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XB and CA_YA-ZA-XC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |
| **Test Settings for CA_2A-66C-71A Configuration** | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 66 | Mid/CC1 | 100@0 | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 66 | Mid/CC1 | 100@0 | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 2 | Low | 100@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 2 | Low | 100@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **5** | 71 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 71 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |

**Default Test Settings for CA_XC-YC Configuration (Intra-band contiguous + Inter-band(2))**

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |
| **3** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.

Note 4: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41E, X=41.
Note 6: **Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-8A,X=1,Y=3,Z=7,R=8.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_3C-7A-28A, X=3,Y=7 and Z=28.
Note 8: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC}$ = $N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.
Note 11: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 12: ID/test points that result in no refsens requirement shall be skipped.

**Table 7.6.1A.7.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | | $W_{gap}$ [MHz] | SCC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for CA_XA-XA-YA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-XA-XA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XA-XA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-66A-66A-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC1 | REFSENS | ALL RBs | Max | X | CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC1 | N/A | ALL RBs | Max | X | CC2 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPS | 64- | | $N_{RB_agg}$ | | N/A | 64- | | $N_{RB_a}$ | | N/A | 64- | | $N_{RB_a}$ | | N/A | 64- | | $N_{RB_agg}$ |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | K | QAM | | | | | QAM | | gg | | | QAM | | gg | | | QAM | | |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC1 | N/A | ALL RBs | Max | X | CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YC Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YC-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | REFSENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Y | Mid/CC1 | N/A | ALL RBs | - | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ |
| **2** | Y | Mid/CC1 | REFSENS | ALL RBs | - | Y | Mid/CC2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XD/XD-XA/XC-XC Configurations (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | |
| **TBD** | | | | | | | | | | | | | | | | | | | |
| **Default Test Settings for CA_XA-XA-YA-YA Configurations (Intra-band non-contiguous + Intra-band non-contiguous)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC4 | REFSENS | ALL RBs | Max | X | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | Max | Y | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | CC4 | REFSENS | ALL RBs | Max | Y | CC3 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band non-contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-12A,X=2,Y=4,Z=12.
Note 5: **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A-41A,X=41.
Note 6: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-4A,X=2,Y=4.
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.
Note 9: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 10: ID/test points that result in no refsens requirement shall be skipped.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.58 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 7.6.1A.7.4.1-1 through Table 7.6.1A.7.4.1-2 as appropriate.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.1A.7.4.3.

#### 7.6.1A.7.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.1A.7.4.3

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.1A.7.4.1-1 through Table 7.6.1A.7.4.1-6 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.1A.7.4.1-1 through Table 7.6.1A.7.4.1-2 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6 Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Table 7.6.1A.7.4.2-1.

7 Set the downlink signal level according to the Table 7.6.1A.7.4.2-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.1A.7.5-1 or 7.6.1A.7.5-3, but 7.6.1A.7.5-1b and 7.6.1A.7.5-3b for operating band 46 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the throughput measurement.

8 Measure the average throughput for the carrier(s) indicated in Table 7.6.1A.7.4.2-1for duration sufficient to achieve statistical significance according to Annex G.2A.

9 Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to Table 7.6.1A.7.5-1 or 7.6.1A.7.5-3, but Table 7.6.1A.7.5-1b and 7.6.1A.7.5-3b for operating band 46 in Case 1 at step 6.

10 Repeat steps from 6 to 9, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to table 7.6.1A.1.4.2-1.

11. Repeat steps 1 to 10 for all component carriers listed in Table 7.6.1A.7.4.2-1.

**Table 7.6.1A.7.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2,SCC3 | 7.6.1A.7.5-2 7.6.1A.7.5-3 7.6.1A.7.5-3b |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.6.1A.7.5-1 7.6.1A.7.5-1b |
| | | SCC2 | |
| | | SCC3 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | 4 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| Intra-band contiguous + Inter-band | 1 | SCC2 SCC3 | 7.6.1A.7.5-1 7.6.1A.7.5-1b |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3 | 7.6.1A.7.5-1 7.6.1A.7.5-1b 7.6.1A.7.5-2 7.6.1A.7.5-3 7.6.1A.7.5-3b |
| | 4 | | |
| | 5 | SCC1, SCC2, SCC3 | 7.6.1A.7.5-1 7.6.1A.7.5-1b 7.6.1A.7.5-2 7.6.1A.7.5-3 7.6.1A.7.5-3b |
| | 6 | | |
| Intra-band contiguous + Inter-band(2) | 1 | SCC2 SCC3 | 7.6.1A.7.5-1 7.6.1A.7.5-1b 7.6.1A.7.5-2 7.6.1A.7.5-3 7.6.1A.7.5-3b |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC2, SCC3 | 7.6.1A.7.5-1 7.6.1A.7.5-1b |
| | 2 | SCC1, | 7.6.1A.7.5-4 7.6.1A.7.5-5 |
| | | SCC2 | |
| | | SCC3 | |
| | 3 | SCC1 | 7.6.1A.7.5-4 7.6.1A.7.5-5 |
| | | SCC2 | |
| | | SCC3 | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.6.1A.7.5-4 7.6.1A.7.5-5 |
| | | SCC1, SCC2, SCC3 | 7.6.1A.7.5-4 7.6.1A.7.5-5 7.6.1A.7.5-2 7.6.1A.7.5-3 7.6.1A.7.5-3b |
| | 2 | SCC2 | 7.6.1A.7.5-2 7.6.1A.7.5-3 7.6.1A.7.5-3b |
| | | PCC, SCC1, SCC3 | 7.6.1A.7.5-4 7.6.1A.7.5-5 7.6.1A.7.5-2 7.6.1A.7.5-3 7.6.1A.7.5-3b |
| Intra-band non-contiguous + Intra-band non-contiguous | 1 | SCC2 | 7.6.1A.7.5-4 7.6.1A.7.5-5 |
| | | SCC3 | |
| | 2 | SCC2 | |
| | | SCC3 | |

| | |
|---|---|
| Note 1: | Test point ID for the particular CA configuration as defined in section 7.6.1A.7.4.1. |
| Note 2: | The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on. |
| Note 3: | Where there are multiple rows for a single Test point ID, the test is repeated for each row. |

#### 7.6.1A.7.4.3 Message Contents

Same message contents as in clause 7.6.1.4.3 for without UL CA.

Same message contents as in clause 7.6.1A.1.4.3 for UL CA.

### 7.6.1A.7.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table s below, according to the type of CA.

**Table 7.6.1A.7.5-1: In-band blocking for additional operating bands for carrier aggregation (inter-band)**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ (offset from SCC) | MHz | =-BW/2 – $F_{loffset,case\ 1}$ & =+BW/2 + $F_{loffset,case\ 1}$ | ≤-BW/2 – $F_{loffset,case\ 2}$ & ≥+BW/2 + $F_{loffset,case\ 2}$ |
| 29, 32, 67, 69 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 |

Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.

Note 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -BW/2 - $F_{loffset,\ case\ 1}$ and
b. the carrier frequency +BW/2 + $F_{loffset,\ case\ 1}$

Note 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies.

**Table 7.6.1A.7.5-1a: In band blocking parameters for additional operating bands for carrier aggregation (inter-band)**

| E-UTRA band | Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 (NOTE 3) | Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | 6 | | 9 |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{loffset,\ case\ 1}$ | MHz | | | | 30+0.0025 | | 30+0.0125 |
| | $F_{loffset,\ case\ 2}$ | MHz | | | | 50+0.0125 | | 50+0.0075 |

**Table 7.6.1A.7.5-1b: In-band blocking for additional operating bands for carrier aggregation (inter-band)**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -50 | -44 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{Ioffset,case\ 1}$ & =+BW/2 + $F_{Ioffset,case\ 1}$ | ≤-BW/2 – $F_{Ioffset,case\ 2}$ & ≥+BW/2 + $F_{Ioffset,case\ 2}$ |
| 46 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 60 to $F_{DL_high}$ + 60 |

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz or 60 MHz below or above the UE receive band

NOTE 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -BW/2 - $F_{Ioffset,\ case\ 1}$ and
b. the carrier frequency +BW/2 + $F_{Ioffset,\ case\ 1}$

NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer center frequencies

**Table 7.6.1A.7.5-2: In band blocking parameter (intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 12 | 13.8 | 15 | |
| $BW_{Interferer}$ | MHz | 5 | 5 | 5 | 5 | |
| $F_{Ioffset,\ case\ 1}$ | MHz | 7.5 | 7.5 | 7.5 | 7.5 | |
| $F_{Ioffset,\ case\ 2}$ | MHz | 12.5 | 12.5 | 12.5 | 12.5 | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5

Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1

**Table 7.6.1A.7.5-3: In-band blocking (intra-band contiguous)**

| CA configuration | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ | MHz | =-$F_{offset}$– $F_{Ioffset,case\ 1}$ & =+$F_{offset}$ + $F_{Ioffset,case\ 1}$ | ≤-$F_{offset}$– $F_{Ioffset,case\ 2}$ & ≥+$F_{offset}$ + $F_{Ioffset,case\ 2}$ |
| CA_1C, CA_2C, CA_3B, CA_3C, CA_5B, CA_7C, CA_8B, CA_12B, CA_23B, CA_27B, CA_28C, CA_38C, CA_39C, CA_40C, CA_40D, CA_40E, CA_41C, CA_41D, CA_41E, CA_42C, CA_42D, CA_42E, CA_43C, CA_48C, CA_48D, CA_48E, CA_66B, CA_66C, CA_70C, CA_66D | $F_{Interferer}$ (Range) | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 |

Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.

Note 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -$F_{offset}$ - $F_{Ioffset,\ case\ 1}$ and
b. the carrier frequency +$F_{offset}$ + $F_{Ioffset,\ case\ 1}$

Note 3: $F_{offset}$ is the frequency offset from the centre frequency of the adjacent CC being tested to the edge of aggregated channel bandwidth.

Note 4: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer} / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.6.1A.7.5-3a: In band blocking parameters (intra-band contiguous)**

| E-UTRA Band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | | | 12 | 13.8 | 15 | |
| | $BW_{Interferer}$ | MHz | | 20 | 20 | 20 | |
| | $F_{Ioffset,\ case\ 1}$ | MHz | | 30 | 30 | 30 | |
| | $F_{Ioffset,\ case\ 2}$ | MHz | | 50 | 50 | 50 | |
| NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 4dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A<br>NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.4.1 and set-up according to Annex C.3.1 | | | | | | | |

**Table 7.6.1A.7.5-3b: In-band blocking intra-band contiguous)**

| E-UTRA Band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -50 | -44 |
| | $F_{Interferer}$ (offset) | MHz | $=-F_{offset} - F_{Ioffset,case\ 1}$ & $=+F_{offset} + F_{Ioffset,case\ 1}$ | $\leq -F_{offset} - F_{Ioffset,case\ 2}$ & $\geq +F_{offset} + F_{Ioffset,case\ 2}$ |
| 46 | $F_{Interferer}$ (Range) | MHz | (Note 2) | $F_{DL_low} - 60$ to $F_{DL_high} + 60$ |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency $-F_{offset} - F_{Ioffset,\ case\ 1}$ and<br>b. the carrier frequency $+F_{offset} + F_{Ioffset,\ case\ 1}$<br>NOTE 3: $F_{offset}$ is the frequency offset from the center frequency of the CC being tested to the edge of aggregated channel bandwidth.<br>NOTE 4: The $F_{interferer}$ (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer} / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster. | | | | |

**Table 7.6.1A.7.5-4: In-band blocking parameters (inter-band, intra-band non-contiguous)**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Ioffset,\ case\ 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{Ioffset,\ case\ 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

**Table 7.6.1A.7.5-5: In-band blocking (inter-band, intra-band non-contiguous)**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 |
|---|---|---|---|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 | Void | Void | -38 | -15 |
| | $F_{Interferer}$ (offset from SCC) | MHz | $=-BW/2 - F_{Ioffset,case\ 1}$ & $=+BW/2 + F_{Ioffset,case\ 1}$ | $\leq -BW/2 - F_{Ioffset,case\ 2}$ & $\geq +BW/2 + F_{Ioffset,case\ 2}$ | | | -BW/2 - 11 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 48, 50, 51, 52,65, 66, 68, 70, 72, 73, 74, 85 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | | |
| 30 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | $F_{DL_low}$ – 11 | |
| 71 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low}$ – 12 to $F_{DL_high}$ + 15 | | | | $F_{DL\text{-}low}$ - 12 |
| Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band. | | | | | | | | |
| Note 2: For each carrier frequency the requirement is valid for two frequencies: a. the carrier frequency -BW/2 - $F_{Ioffset,\ case\ 1}$ and b. the carrier frequency +BW/2 + $F_{Ioffset,\ case\ 1}$ | | | | | | | | |
| Note 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies. | | | | | | | | |
| Note 4: For intra-band non-contiguous + inter-band CA, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps. | | | | | | | | |

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Tables 7.6.1A.7.5-1, 7.6.1A.7.5-3 and 7.6.1A.7.5-5 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C accordingly.

## 7.6.1A.8 In-band blocking for 5DL CA

### 7.6.1A.8.1 Test Purpose

Same test purpose as in clause 7.6.1A.1.

### 7.6.1A.8.2 Test Applicability

This test case applies to all types of E-UTRA UE and forward that support 5DL with CA configurations in Table 7.1-2c.

### 7.6.1A.8.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.1A.0.

### 7.6.1A.8.4 Test Description

#### 7.6.1A.8.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.1A.8.4.1-1 through table 7.6.1A.8.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.1A.8.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| D | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3,4) | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | UL MOD | DL MOD | UL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for a CA_XF Configuration (Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | | |
| 1 | X | Mid/ CC1 | REF SENS | X | Mid/ CC1 | X | N/A | X | Mid/ CC1 | X | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | QPSK | QPSK | QPSK | | QPSK | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| 2 | X | Mid/ CC1 | REF SENS | X | Mid/ CC1 | X | N/A | X | Mid/ CC1 | X | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | QPSK | QPSK | QPSK | | QPSK | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA-SA Configuration (Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| 1 | X | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| 2 | Y | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| 3 | Z | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| 4 | R | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| 5 | S | Mid | REF | ALL | X | Mid | N/A | ALL | Y | Mid | N/A | ALL | Z | Mid | N/A | ALL | R | Mid | N/A | ALL |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SENS | RBs | | | | RBs | | | | RBs | | | | RBs | | | | RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings for a CA_XE-YA, YA-XE Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | X | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | X | X | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Y | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| 4 | Y | Y | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |
| **Default Test Settings for CA_XA-ZA-RA-YB and CA_XA-ZA-RA-YC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Z | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **7** | R | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **8** | R | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | N/A | QPSK | | Highest | N/A | QPSK | | Highest | N/A | QPSK | | Lowest | N/A | QPSK | | Lowest | N/A | QPSK | | Highest |

| | | | | $N_{RB}$ | | | | $N_{RB}$ | | | | $N_{RB_agg}$ | | | | $N_{RB_agg}$ | | | | $N_{RB}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Default Test Settings CA_XB-YB-ZA, CA_XB-YC-ZA, CA_XC-YB-ZA, and CA_XC-YC-ZA Configuration (Intra-band contiguous + Intra-band contiguous + Inter-band)**<br>**Default Test Settings CA_ZA-XB-YB, CA_ZA-XB-YC, CA_ZA-XC-YB, and CA_ZA-XC-YC Configuration (Intra-band contiguous + Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid/ CC1 | REF SENS | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid/ CC1 | REF SENS | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Z | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 4: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41F, X=41.
Note 6: **Inter-band:** X,Y,Z,R,S correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-20A-42A,X=1,Y=3,Z=7,R=20,S=42.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_3C-7A-28A, X=3,Y=7 and Z=28.
Note 8: REFSENS refers to the PCC bands and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose the Combination with $N_{RB_PCC} = N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.

**Table 7.6.1A.8.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to "Range" columns. For mapping within Band refer to "CC" columns |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | | $W_{gap}$ [MHz] | SCC3 | | | | $W_{gap}$ [MHz] | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for CA_XA-XA-YA-ZA-RA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XA-XA-RA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-RA-XA-XA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REF SENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | Mid | REF SENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Z | Mid | REF SENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **4** | R | Mid | REF SENS | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YD Configurations (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Y | CC3 | REF SENS | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ |
| **2** | X | CC2 | REF SENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YA-ZA-ZA Configurations Intra-band non-contiguous + Intra-band non-contiguous** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Z | CC2 | REF SENS | ALL RBs | Max | Z | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_ag}$ | | N/A | QPSK | | $N_{RB_}$ | | N/A | QPSK | | $N_{RB_}$ | | N/A | QPSK | | $N_{RB_}$ | | N/A | QPSK | | $N_{RB_}$ |

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | g | | | | | agg | | | | | agg | | | | | agg | | | | | agg |
| **2** | X | CC2 | REF SENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | CC2 | N/A | ALL RBs | Max | Z | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | CC2 | N/A | ALL RBs | Max | Z | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YA-ZC Configurations Intra-band non-contiguous + Intra-band non-contiguous** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Z | Mid/C C1 | REF SENS | ALL RBs | - | Z | Mid/C C2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | 66 | CC1 | REF SENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Z | Mid/C C1 | N/A | ALL RBs | - | Z | Mid/C C2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Z | Mid/C C1 | N/A | ALL RBs | - | Z | Mid/C C2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band non-contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-12A-66A,X=2,Y=5,Z=12,R=66.
Note 5: **Intra-band non-contiguous + Intra-band contiguous:** X,Y corresponds to the band of the CA Configuration. E.g. for CA_5A-5A-66D,X=5,Y=66.
Note 6: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-66A-66A,X=2,Y=5,Z=66.
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1}$ = $N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.58 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 7.6.1A.8.4.1-1 through Table 7.6.1A.8.4.1-2 as appropriate.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.1A.8.4.3.

### 7.6.1A.8.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.1A.8.4.3

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.1A.8.4.1-1 through Table 7.6.1A.8.4.1-6 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.1A.8.4.1-1 through Table 7.6.1A.8.4.1-2 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6 Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Table 7.6.1A.8.4.2-1.

7 Set the downlink signal level according to the Table 7.6.1A.8.4.2-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.1A.8.5-1 or 7.6.1A.8.5-3 or 7.6.1A.8.5-5 and Table 7.6.1A.8.5-1b and 7.6.1A.8.5-3b for operating band 46 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the throughput measurement.

8 Measure the average throughput for the carrier(s) indicated in Table 7.6.1A.8.4.2-1for duration sufficient to achieve statistical significance according to Annex G.2A.

9 Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to Table 7.6.1A.8.5-1 or 7.6.1A.8.5-3 or 7.6.1A.8.5-5, and Table 7.6.1A.8.5-1b and 7.6.1A.8.5-3b for for operating band 46 in Case 1 at step 6.

10 Repeat steps from 6 to 9, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to table 7.6.1A.1.4.2-1.

11. Repeat steps 1 to 10 for all component carriers listed in Table 7.6.1A.8.4.2-1.

**Table 7.6.1A.8.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2,SCC3,SCC4 | 7.6.1A.8.5-2 |
| | 2 | | 7.6.1A.8.5-3 |
| Inter-band | 1 | SCC1 | 7.6.1A.8.5-1<br>7.6.1A.8.5-1b<br>7.6.1A.8.5-4<br>7.6.1A.8.5-5 |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 4 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 5 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| Intra-band contiguous + Inter-band | 1 | SCC4 | 7.6.1A.8.5-1<br>7.6.1A.8.5-1b<br>7.6.1A.8.5-4<br>7.6.1A.8.5-5 |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3, SCC4 | 7.6.1A.8.5-1<br>7.6.1A.8.5-1b<br>7.6.1A.8.5-2<br>7.6.1A.8.5-3<br>7.6.1A.8.5-3b<br>7.6.1A.8.5-4<br>7.6.1A.8.5-5 |
| | 4 | | |
| Intra-band contiguous + Inter-band | 1 | SCC2<br>SCC3<br>SCC4 | 7.6.1A.8.5-1<br>7.6.1A.8.5-1b<br>7.6.1A.8.5-4<br>7.6.1A.8.5-5 |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3,SCC4 | 7.6.1A.8.5-1<br>7.6.1A.8.5-1b<br>7.6.1A.8.5-2<br>7.6.1A.8.5-3<br>7.6.1A.8.5-3b<br>7.6.1A.8.5-4<br>7.6.1A.8.5-5 |
| | 4 | | |
| | 5 | SCC1, SCC2, SCC3,SCC4 | 7.6.1A.8.5-1<br>7.6.1A.8.5-1b<br>7.6.1A.8.5-2<br>7.6.1A.8.5-3<br>7.6.1A.8.5-3b<br>7.6.1A.8.5-4<br>7.6.1A.8.5-5 |
| | 6 | | |
| | 7 | SCC1, SCC2, SCC3,SCC4 | 7.6.1A.8.5-1<br>7.6.1A.8.5-1b<br>7.6.1A.8.5-2<br>7.6.1A.8.5-3<br>7.6.1A.8.5-3b<br>7.6.1A.8.5-4<br>7.6.1A.8.5-5 |
| | 8 | | |
| Intra-band contiguous + Intra-band contiguous + | 1 | SCC2, SCC3, SCC4 | 7.6.1A.8.5-1 |
| | 2 | | 7.6.1A.8.5-1b |

| | | | |
|---|---|---|---|
| Inter-band | 3 | | 7.6.1A.8.5-2<br>7.6.1A.8.5-3<br>7.6.1A.8.5-3b<br>7.6.1A.8.5-4<br>7.6.1A.8.5-5 |
| | 4 | | |
| | 5 | SCC1, SCC2, SCC3, SCC4 | 7.6.1A.8.5-1<br>7.6.1A.8.5-1b<br>7.6.1A.8.5-2<br>7.6.1A.8.5-3<br>7.6.1A.8.5-3b<br>7.6.1A.8.5-4<br>7.6.1A.8.5-5 |
| | 6 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC1, SCC2, SCC3, SCC4 | 7.6.1A.8.5-1<br>7.6.1A.8.5-1a<br>7.6.1A.8.5-1b<br>7.6.1A.8.5-4<br>7.6.1A.8.5-5 |
| | 2 | SCC1, SCC2, SCC3, SCC4 | |
| | 3 | SCC1, SCC2, SCC3, SCC4 | |
| | 4 | SCC1, SCC2, SCC3, SCC4 | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC, SCC1, SCC2 | 7.6.1A.8.5-2<br>7.6.1A.8.5-3<br>7.6.1A.8.5-3b |
| | | SCC3, SCC4 | 7.6.1A.8.5-1<br>7.6.1A.8.5-1b<br>7.6.1A.8.5-4<br>7.6.1A.8.5-5 |
| | 2 | SCC1, SCC2, SCC3, SCC4 | 7.6.1A.8.5-1<br>7.6.1A.8.5-1b<br>7.6.1A.8.5-4<br>7.6.1A.8.5-5 |
| Intra-band non-contiguous + Intra-band non-contiguous | 1 | SCC1, SCC2, SCC3, SCC4 | 7.6.1A.8.5-1<br>7.6.1A.8.5-1b<br>7.6.1A.8.5-4<br>7.6.1A.8.5-5 |
| | 2 | | |
| | 3 | | |

Note 1: Test point ID for the particular CA configuration as defined in section 7.6.1A.8.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.

#### 7.6.1A.8.4.3 Message Contents

Same message contents as in clause 7.6.1.4.3 for without UL CA.

Same message contents as in clause 7.6.1A.1.4.3 for UL CA.

### 7.6.1A.8.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table s below, according to the type of CA.

**Table 7.6.1A.8.5-1: In-band blocking for additional operating bands for carrier aggregation (inter-band)**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ (offset from SCC) | MHz | =-BW/2 – $F_{loffset,case\ 1}$ & =+BW/2 + $F_{loffset,case\ 1}$ | ≤-BW/2 – $F_{loffset,case\ 2}$ & ≥+BW/2 + $F_{loffset,case\ 2}$ |
| 29, 32, 67, 69 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 |

Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.
Note 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -BW/2 - $F_{loffset,\ case\ 1}$ and
b. the carrier frequency +BW/2 + $F_{loffset,\ case\ 1}$
Note 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies.

**Table 7.6.1A.8.5-1a: In band blocking parameters for additional operating bands for carrier aggregation (inter-band)**

| E-UTRA bandf | Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 (NOTE 3) | Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | | | | | 6 | | 9 |
| | $BW_{Interferer}$ | MHz | | | | 20 | | 20 |
| | $F_{loffset,\ case\ 1}$ | MHz | | | | 30+0.0025 | | 30+0.0125 |
| | $F_{loffset,\ case\ 2}$ | MHz | | | | 50+0.0125 | | 50+0.0075 |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.4.1 and set-up according to Annex C.3.1
NOTE 3: The interferer consists of the Reference measurement channel specified in Annex A.3.2 (TBD)

**Table 7.6.1A.8.5-1b: In-band blocking for additional operating bands for carrier aggregation (inter-band)**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -50 | -44 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{loffset,case\ 1}$ & =+BW/2 + $F_{loffset,case\ 1}$ | ≤-BW/2 – $F_{loffset,case\ 2}$ & ≥+BW/2 + $F_{loffset,case\ 2}$ |
| 46 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 60 to $F_{DL_high}$ + 60 |

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz or 60 MHz below or above the UE receive band
NOTE 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -BW/2 - $F_{loffset,\ case\ 1}$ and
b. the carrier frequency +BW/2 + $F_{loffset,\ case\ 1}$
NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer center frequencies

**Table 7.6.1A.8.5-2: In band blocking parameter (intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |

| Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
|---|---|---|---|---|---|---|
| | | 9 | 12 | 13.8 | 15 | 16 |
| $BW_{Interferer}$ | MHz | 5 | 5 | 5 | 5 | 5 |
| $F_{Ioffset, case\ 1}$ | MHz | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 |
| $F_{Ioffset, case\ 2}$ | MHz | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5<br>Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | | | | |

**Table 7.6.1A.8.5-3: In-band blocking (intra-band contiguous)**

| CA configuration | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ | MHz | $=-F_{offset}-F_{Ioffset,case\ 1}$ & $=+F_{offset}+F_{Ioffset,case\ 1}$ | $\leq-F_{offset}-F_{Ioffset,case\ 2}$ & $\geq+F_{offset}+F_{Ioffset,case\ 2}$ |
| CA_1C, CA_2C, CA_3B, CA_3C, CA_5B, CA_7C, CA_8B, CA_12B, CA_23B, CA_27B, CA_38C, CA_39C, CA_40C, CA_40D, CA_40E, CA_41C, CA_41D, CA_41E, CA_41F, CA_42C, CA_42D, CA_42E, CA_42F, CA_43C, CA_48C, CA_48D, CA_48E, CA_48F, CA_66B, CA_66C, CA_70C, CA_66D | $F_{Interferer}$ (Range) | MHz | (Note 2) | $F_{DL_low}-15$ to $F_{DL_high}+15$ |
| Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.<br>Note 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency $-F_{offset} - F_{Ioffset, case\ 1}$ and<br>b. the carrier frequency $+F_{offset} + F_{Ioffset, case\ 1}$<br>Note 3: $F_{offset}$ is the frequency offset from the centre frequency of the adjacent CC being tested to the edge of aggregated channel bandwidth.<br>Note 4: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015+0.5 \rfloor 0.015+0.0075$ MHz to be offset from the sub-carrier raster. | | | | |

**Table 7.6.1A.8.5-3a: In band blocking parameters (intra-band contiguous)**

| E-UTRA Band | Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | | | 12 | 13.8 | 15 | |
| | $BW_{Interferer}$ | MHz | | 20 | 20 | 20 | |
| | $F_{Ioffset, case\ 1}$ | MHz | | 30 | 30 | 30 | |
| | $F_{Ioffset, case\ 2}$ | MHz | | 50 | 50 | 50 | |
| NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 4dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A<br>NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.4.1 and set-up according to Annex C.3.1 | | | | | | | |

**Table 7.6.1A.8.5-3b: In-band blocking (intra-band contiguous)**

| E-UTRA Band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -50 | -44 |
| | $F_{Interferer}$ (offset) | MHz | $=-F_{offset}-F_{loffset,case\ 1}$ & $=+F_{offset}+F_{loffset,case\ 1}$ | $\leq-F_{offset}-F_{loffset,case\ 2}$ & $\geq+F_{offset}+F_{loffset,case\ 2}$ |
| 46 | $F_{Interferer}$ (Range) | MHz | (Note 2) | $F_{DL_low}-60$ to $F_{DL_high}+60$ |

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band

NOTE 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency $-F_{offset} - F_{loffset,\ case\ 1}$ and
b. the carrier frequency $+F_{offset} + F_{loffset,\ case\ 1}$

NOTE 3: $F_{offset}$ is the frequency offset from the center frequency of the CC being tested to the edge of aggregated channel bandwidth.

NOTE 4: The $F_{interferer}$ (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015+0.5\rfloor 0.015+0.0075$ MHz to be offset from the sub-carrier raster.

**Table 7.6.1A.8.5-4: In-band blocking parameters (inter-band, intra-band non-contiguous)**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{loffset,\ case\ 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{loffset,\ case\ 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.

Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.

**Table 7.6.1A.8.5-5: In-band blocking (inter-band, intra-band non-contiguous)**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 |
|---|---|---|---|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 | Void | Void | -38 | -15 |
| | $F_{Interferer}$ (offset from SCC) | MHz | $=-BW/2-F_{loffset,case\ 1}$ & $=+BW/2+F_{loffset,case\ 1}$ | $\leq-BW/2-F_{loffset,case\ 2}$ & $\geq+BW/2+F_{loffset,case\ 2}$ | | | -BW/2 - 11 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 65, 66, 68, 70 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | | |
| 30 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | $F_{DL_low}$ – 11 | |
| 71 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low}$ – 12 to $F_{DL_high}$ + 15 | | | | $F_{DL\text{-}low}$ - 12 |
| Note 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.<br>Note 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency -BW/2 - $F_{Ioffset,\ case\ 1}$ and<br>b. the carrier frequency +BW/2 + $F_{Ioffset,\ case\ 1}$<br>Note 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies.<br>Note 4: For intra-band non-contiguous + inter-band CA, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps. | | | | | | | | |

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, PInterferer power defined in Tables 7.6.1A.8.5-1, 7.6.1A.8.5-3 and 7.6.1A.8.5-5 is increased by the amount given by ΔRIB,c in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C accordingly.

## 7.6.1B In-band blocking for UL-MIMO

### 7.6.1B.1 Test Purpose

In-band blocking for UL- MIMO is defined for an unwanted interfering signal falling into the range from 15MHz below to 15MHz above the UE that support UL-MIMO receive band, at which the relative throughput shall meet or exceed the requirement for the specified measurement channels.

The lack of in-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

### 7.6.1B.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

### 7.6.1B.3 Minimum Conformance Requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in subclause 7.6 shall be met with the UL-MIMO configurations specified in Table 6.2.2B.3-2. For UL-MIMO, the parameter $P_{CMAX_L}$ is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 36.101 [2] clause 7.6B.

### 7.6.1B.4 Test Description

#### 7.6.1B.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.1B.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns

used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.1B.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[4] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2). | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.29.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to in Table 7.6.1B.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.1B.4.3.

### 7.6.1B.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.1B.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 7.6.1B.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the signal generator for an interfering signal below the wanted signal in Case 1 according to Tables 7.6.1B.5-1 and 7.6.1B.5-2.

4. Set the downlink signal level according to the table 7.6.1B.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.1B.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal in Case 1 at step 3.

7. Repeat steps from 3 to 6, using interfering signals in Case 2 at step 3and 6. The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to table 7.6.1B.4.2-1.

8. Repeat steps from 3 to 5, using successively all interfering signals in Case 3 and Case 4 at step 3.

**Table 7.6.1B.4.2-1: Example for interferer frequencies**

| | Lower frequency | Upper frequency |
|---|---|---|
| Band 1 DL | 2110 MHz | 2170 MHz |
| Band 1 Midrange | 2140 MHz | |
| Receive band wanted signal (BW 5MHz) | 2137.5 MHz | 2142.5 MHz |
| Interferer case 1 | 2129.9875 MHz | 2150.0125 MHz |
| Interferer case 2 (inner frequency) | 2124.9925 MHz | 2155.0075 MHz |
| Interferer case 2 (outer frequency) | 2099.9925 MHz | 2180.0075 MHz |
| Outer limit for in band blocking | 2095MHz | 2185MHz |
| Number of test frequencies case 2 | 6 | 6 |
| Number of test frequencies for Band 17(asymmetric!), BW 5MHz, case 2 | 0 | 2 |

### 7.6.1B.4.3 Message Contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 7.6.1B.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.6.1B.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.1B.5-1 and 7.6.1B.5-2.

**Table 7.6.1B.5-1: In band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |

| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
|---|---|---|---|---|---|---|---|
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{loffset, case\ 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{loffset, case\ 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1. | | | | | | | |

**Table 7.6.1B.5-2: In-band blocking**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 |
|---|---|---|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 | Void | Void | -38 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{loffset,case\ 1}$ & =+BW/2 + $F_{loffset,case\ 1}$ | ≤-BW/2 – $F_{loffset,case\ 2}$ & ≥+BW/2 + $F_{loffset,case\ 2}$ | | | -BW/2 - 11 |
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 65, 66, 68, 70, 72 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | |
| 30 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | $F_{DL_low}$ – 11 |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency -BW/2 - $F_{loffset, case\ 1}$ and<br>b. the carrier frequency +BW/2 + $F_{loffset, case\ 1}$<br>NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies | | | | | | | |

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Table 7.6.1B.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

# 7.6.1D In-band blocking for ProSe

## 7.6.1D.0 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2.

**Table 7.6.1D.0-1: In band blocking parameters for ProSe Direct Discovery**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below + $P_{offset}$ | | | | | |
| | | | | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | | | 5 | 5 | 5 | 5 |
| $F_{Ioffset,\ case\ 1}$ | MHz | | | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{Ioffset,\ case\ 2}$ | MHz | | | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |
| $P_{offset}$ | dB | | | 10.9 | 13.9 | 15.7 | 16.9 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

**Table 7.6.1D.0-2: In band blocking parameters for ProSe Direct Communication**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below | | | | | |
| | | | | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | | | 5 | 5 | 5 | 5 |
| $F_{Ioffset,\ case\ 1}$ | MHz | | | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{Ioffset,\ case\ 2}$ | MHz | | | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

**Table 7.6.1D.0-3: In-band blocking for ProSe**

| E-UTRA ProSe band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{Ioffset,case\ 1}$ & =+BW/2 + $F_{Ioffset,case\ 1}$ | ≤-BW/2 – $F_{Ioffset,case\ 2}$ & ≥+BW/2 + $F_{Ioffset,case\ 2}$ |
| 2,3,4,7,14, 20,26,28,31 , 68, 72 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency -BW/2 - $F_{Ioffset,\ case\ 1}$ and<br>b. the carrier frequency +BW/2 + $F_{Ioffset,\ case\ 1}$<br>NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies. | | | | |

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Tables 7.6.1D.0-3 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

The normative reference for this requirement is TS 36.101 [2] clause 7.6.1.1D.

## 7.6.1D.1 In-band blocking for ProSe Direct Discovery

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Use of OCNG for Downlink has not been considered and is still FFS.

- Message exceptions content needs further investigation (some values still TBD).
- Test time is FFS.

### 7.6.1D.1.1 Test Purpose

In-band blocking is defined for an unwanted interfering signal falling into the range from 15MHz below to 15MHz above the ProSe band, at which the relative throughput shall meet or exceed the requirement for the specified measurement channels.

The lack of in-band blocking ability will decrease the coverage area when other Sidelink transmitters exist (except in the adjacent channels and spurious response).

### 7.6.1D.1.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Discovery, but not ProSe Direct Communication.

### 7.6.1D.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.1D.0.

### 7.6.1D.1.4 Test Description

#### 7.6.1D.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA ProSe bands specified in table 5.4.2D.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.1D.1.4.1-1. The details of the downlink, uplink and sidelink reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.6.

**Table 7.6.1D.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range(Note 4) | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, Highest | | | | | |
| | **Downlink Configuration (Note 2)** | | **Uplink Configuration (Note 2)** | | **Sidelink Configuration (Reception) (Note 3)** | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Mod'n | RB allocation |
| 5MHz | QPSK | 8 | QPSK | 8 | QPSK | 2 |
| 10MHz | QPSK | 16 | QPSK | 16 | QPSK | 2 |
| 15MHz | QPSK | 25 | QPSK | 25 | QPSK | 2 |
| 20MHz | QPSK | 30 | QPSK | 30 | QPSK | 2 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA ProSe and Operating band, according to the applicability specified respectively in Table 5.4.2D.1-1 and Table 5.4.2.1-1.<br>Note 2: After DRX configuration, DL-RMC (PDSCH) and DCI-0 for scheduling UL-RMC (PUSCH) are applied only in the DRX On subframes.<br>Note 3: The RB start for the transmission of Sidelink RMC is RB#0.<br>Note 4: Sidelink uses the frequencies defined for Uplink. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.70.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.6.1D.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents exceptions are defined in clause 7.6.1D.1.4.3.
7. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is activated.

### 7.6.1D.1.4.2 Test Procedure

1. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions (only those marked with "…Step 1…" ) are defined in clause 7.6.1D.1.4.3.
2. The UE shall transmit RRCConnectionReconfigurationComplete message.
3. Initialise the variables Ptot and Pok as 0.
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.3D.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.3D.1.4.1-1. When the UE has no payload data to send, it transmits uplink MAC padding bits on the UL RMC.
6. SS transmits PSDCH to transmit the SL RMC according to Table 7.6.1D.1.4.1-1. Set the Sidelink signal level to the appropriate value defined in Table 7.6.1D.1.5-1.
7. Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Tables 7.6.1D.1.5-1 and 7.6.1D.1.5-2.
8. SS shall send SL Discovery Packets (MAC padding bits) on the SL RMC for the test time [FFS]. SS stores the number of the transmitted Discovery Packets in the current test iteration in the variable Ptot.
10. SS shall send (on the available PDSCH) a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER REQUEST" message and wait for the UE to respond (on the available PUSCH) with a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER RESPONSE".
11. SS calculates the variable Pok as (current counter value - counter value at last test iteration).
12. SS shall compute the throughput as following:

    TP = Pok / Ptot * 100%

13. Repeat steps from 6 to 12, using an interfering signal above the wanted signal in Case 1 at step 7.
14. Repeat steps from 6 to 13, using interfering signals in Case 2 at step 7 and 13. The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to table 7.6.1D.1.4.2-1.

**Table 7.6.1D.1.4.2-1: Example for interferer frequencies**

| | Lower frequency | Upper frequency |
|---|---|---|
| Band 2 SL | 1850 MHz | 1910 MHz |
| Band 2 Midrange | 1880 MHz | |
| Sidlink wanted signal (BW 5MHz) | 1877.5 MHz | 1882.5 MHz |
| Interferer case 1 | 1869.9875 MHz | 1890.0125 MHz |
| Interferer case 2 (inner frequency) | 1864.9925 MHz | 1895.0075 MHz |
| Interferer case 2 (outer frequency) | 1839.9925 MHz | 1920.0075 MHz |
| Outer limit for in band blocking | 1835 MHz | 1925 MHz |
| Number of test frequencies case 2 | 6 | 6 |

#### 7.6.1D.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

- Table A.7.1.1-1 for FDD
- Table A.7.1.2-1 for TDD

**Table 7.6.1D.1.4.3-1: ACTIVATE TEST MODE: Reference sensitivity for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 7.6.1D.1.4.3-2: CLOSE UE TEST LOOP: Reference sensitivity for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 7.6.1D.1.4.3-3: MAC-MainConfig-RBC: Reference sensitivity for ProSe Direct Discovery (applicable only for Step 1 of Test procedure)**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | TBD | | |
| periodicBSR-Timer | TBD | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | TBD | | |
| } | | | |

### 7.6.1D.1.5 Test Requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Tables 7.6.1D.1.5-1 and 7.6.1D.1.5-2.

**Table 7.6.1D.1.5-1: In band blocking parameters for ProSe Direct Discovery**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below + $P_{offset}$ | | | | | |
| | | | | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | | | 5 | 5 | 5 | 5 |
| $F_{Ioffset,\ case\ 1}$ | MHz | | | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{Ioffset,\ case\ 2}$ | MHz | | | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |
| $P_{offset}$ | dB | | | 10.9 | 13.9 | 15.7 | 16.9 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

**Table 7.6.1D.1.5-2: In-band blocking for ProSe**

| E-UTRA ProSe band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{loffset,case\ 1}$ & =+BW/2 + $F_{loffset,case\ 1}$ | ≤-BW/2 – $F_{loffset,case\ 2}$ & ≥+BW/2 + $F_{loffset,case\ 2}$ |
| 2,3,4,7,14, 20,26,28,31 , 68, 72 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency -BW/2 - $F_{loffset,\ case\ 1}$ and<br>b. the carrier frequency +BW/2 + $F_{loffset,\ case\ 1}$<br>NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies. | | | | |

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Table 7.6.1D.1.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.1D.2 In-band blocking for ProSe Direct Communication

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Test description is TBD
- Test system uncertainties and test tolerances are TBD

### 7.6.1D.2.1 Test Purpose

Same test purpose as in clause 7.6.1D.1.1.

### 7.6.1D.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Communication.

### 7.6.1D.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.1D.0.

### 7.6.1D.2.4 Test Description

TBD

### 7.6.1D.2.5 Test Requirement

Same test requirement as in clause 7.6.1D.1.5 with the following exceptions:

- Instead of Table 7.6.1D.1.5-1 → use Table 7.6.1D.2.5-1.

**Table 7.6.1D.2.5-1: In band blocking parameters for ProSe Direct Communication**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below | | | | | |
| | | | | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | | | 5 | 5 | 5 | 5 |
| $F_{Ioffset,\ case\ 1}$ | MHz | | | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{Ioffset,\ case\ 2}$ | MHz | | | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

# 7.6.1E In-band blocking for UE category 0

## 7.6.1E.1 Test Purpose

The same test purpose as in clause 7.6.1.

## 7.6.1E.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward of UE category 0.

## 7.6.1E.3 Minimum Conformance Requirements

Same minimum conformance requirements as in clause 7.6.1.3.

## 7.6.1E.4 Test Description

### 7.6.1E.4.1 Initial Conditions

Same initial conditions as in clause 7.6.1.4.1 with the following exceptions:

- Instead of Table 7.6.1.4.1-1 → use Table 7.6.1E.4.1-1.
- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.4 using only main UE Tx/Rx antenna.

**Table 7.6.1E.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD and HD-FDD** | **TDD** | | **FDD and HD-FDD** | **TDD** |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 14 | 14 | QPSK | 15 | 15 |
| 5MHz | QPSK | 14 | 14 | QPSK | 25 | 25 |
| 5MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 10MHz | QPSK | 14 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 15MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 15MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 20MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3E.3-3 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).<br>Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used.<br>Note 4: Downlink RB position shall be RBstart = 0. | | | | | | |

## 7.6.1E.4.2 Test Procedure

Same test procedure as in clause 7.6.1.4.2

## 7.6.1E.4.3 Message Contents

Same message contents as in clause 7.6.1.4.3

## 7.6.1E.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in clause A.3.2 with parameters specified in Tables 7.6.1E.5-1 and 7.6.1E.5-2.

**Table 7.6.1E.5-1: In band blocking parameters**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{loffset, case\ 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{loffset, case\ 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5E.<br>Note 2: The interferer consists of the Reference measurement channel specified in clause A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in clauses A.5.1.1/A.5.2.1 and set-up according to clause C.3.1. | | | | | | | |

**Table 7.6.1E.5-2: In-band blocking**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 |
|---|---|---|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 | Void | Void | -38 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{loffset,case\ 1}$ & =+BW/2 + $F_{loffset,case\ 1}$ | ≤-BW/2 – $F_{loffset,case\ 2}$ & ≥+BW/2 + $F_{loffset,case\ 2}$ | | | -BW/2 - 11 |
| 2, 3, 4, 5, 8, 13, 20, 39, 41 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency -BW/2 - $F_{loffset,\ case\ 1}$ and<br>b. the carrier frequency +BW/2 + $F_{loffset,\ case\ 1}$.<br>NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies. | | | | | | | |

# 7.6.1EB In-band blocking for UE Category 1bis

Editor's note

- Test case incomplete with Annex F.3.3 needing update. TT shall be same as legacy test case.

## 7.6.1EB.1 Test Purpose

The same test purpose as in clause 7.6.1.

## 7.6.1EB.2 Test Applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

## 7.6.1EB.3 Minimum Conformance Requirements

Same minimum conformance requirements as in clause 7.6.1.3.

## 7.6.1EB.4 Test Description

### 7.6.1EB.4.1 Initial Conditions

Same initial conditions as in clause 7.6.1.4.1 with the following exceptions:

Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.4 using only main UE Tx/Rx antenna.

### 7.6.1EB.4.2 Test Procedure

Same test procedure as in clause 7.6.1.4.2

### 7.6.1EB.4.3 Message Contents

Same message contents as in clause 7.6.1.4.3

## 7.6.1EB.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in clause A.3.2 with parameters specified in Tables 7.6.1EB.5-1 and 7.6.1EB.5-2.

**Table 7.6.1EB.5-1: In band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{loffset, case\ 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{loffset, case\ 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5E.<br>Note 2: The interferer consists of the Reference measurement channel specified in clause A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in clauses A.5.1.1/A.5.2.1 and set-up according to clause C.3.1.<br>Note 3: The REFSENS power level is specified in Table 7.3EB.3-1 for main antenna port. | | | | | | | |

**Table 7.6.1EB.5-2: In-band blocking**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 |
|---|---|---|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 | Void | Void | -38 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{loffset,case\ 1}$ & =+BW/2 + $F_{loffset,case\ 1}$ | ≤-BW/2 – $F_{loffset,case\ 2}$ & ≥+BW/2 + $F_{loffset,case\ 2}$ | | | -BW/2 - 11 |
| 1, 2, 3, 4, 5, 6, 7, 8, 12, 13, 18, 26, 28, 31, 39, 41, 66, 72 | $F_{Interferer}$ | MHz | (Note 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency -BW/2 - $F_{loffset, case\ 1}$ and<br>b. the carrier frequency +BW/2 + $F_{loffset, case\ 1}$.<br>NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies. | | | | | | | |

# 7.6.1EC In-band blocking for UE category M2

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Downlink RB allocation is TBD
- The test applicability needs to be added to TS36.521-2

## 7.6.1EC.1 Test purpose

In-band blocking is defined for an unwanted interfering signal falling into the range from 15MHz below to 15MHz above the category M2 UE receive band, at which the relative throughput shall meet or exceed the requirement for the specified measurement channels.

The lack of in-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

## 7.6.1EC.2 Test applicability

This test applies to all types of E-UTRA UE release 14 and forward of category M2.

## 7.6.1EC.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.1EC.3-1 and 7.6.1EC.3-2. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.6.1EC.3-1: In band blocking parameters**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |

| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
|---|---|---|---|---|---|---|---|
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Ioffset, case\ 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{Ioffset, case\ 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |
| NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in subclause 6.2.5EA.<br>NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.<br>NOTE 3: For DL category M1 and M2 UE, the reference sensitivity for category M1 in table 7.3EA-1 and 7.3EA-2 and category M2 in Table 7.3EC-1 should be used as REFSENS for the power in Transmission Bandwidth Configuration.<br>NOTE 4: For DL category M1 and M2 UE, the parameters for the applicable channel bandwidth apply. | | | | | | | |

**Table 7.6.1EC.3-2: In-band blocking**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 |
|---|---|---|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 | Void | Void | -38 |
| | $F_{Interferer}$ (offset) | MHz | $=-BW/2 - F_{Ioffset,case\ 1}$ & $=+BW/2 + F_{Ioffset,case\ 1}$ | $\leq-BW/2 - F_{Ioffset,case\ 2}$ & $\geq+BW/2 + F_{Ioffset,case\ 2}$ | | | -BW/2 - 11 |
| 1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 18, 19, 20, 21, 26, 27, 28, 31, 39, 41 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low} - 15$ to $F_{DL_high} + 15$ | | | |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency -BW/2 - $F_{Ioffset, case\ 1}$ and<br>b. the carrier frequency +BW/2 + $F_{Ioffset, case\ 1}$<br>NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.6.1.

## 7.6.1EC.4 Test description

### 7.6.1EC.4.1 Initial conditions

Same as in clause 7.6.1EA.4.1 with the following exceptions:

- Instead of Table 7.6.1EA.4.1-1 → use Table 7.6.1EC.4.1-1
- Instead of CAT M1 → use CAT M2

**Table 7.6.1EC.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3. | 1.4, 3MHz, 5MHz | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD and HD-FDD | TDD | | FDD and HD-FDD | TDD |
| 1.4MHz | QPSK | TBD | TBD | QPSK | 6 | 6 |
| 3MHz | QPSK | TBD | TBD | QPSK | 15 | 15 |
| 5MHz | QPSK | TBD | TBD | QPSK | 24 | 24 |
| Note 1: Downlink RB position shall be $RB_{start}$ = 0 within the narrowband.<br>Note 2: Use narrowband index (TS36.211, 5.2.4) 0 when interferer is below carrier, and max narrowband index when interferer is above carrier. | | | | | | |

### 7.6.1EC.4.2 Test procedure

Same as in clause 7.6.1EA.4.2 with the following exceptions:

- Instead of Table 7.6.1EA.4.1-1 → use Table 7.6.1EC.4.1-1

### 7.6.1EC.4.3 Message contents

Same as in clause 7.6.1EA.4.3.

### 7.6.1EC.5 Test requirement

Same as in clause 7.6.1EA.5.

## 7.6.1F In-band blocking for category NB1 and NB2

### 7.6.1F.1 Test Purpose

In-band blocking is defined for an unwanted interfering signal falling into the range from 15MHz below to 15MHz above the UE receive band, at which the relative throughput shall meet or exceed the requirement for the specified measurement channels.

The lack of in-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

### 7.6.1F.2 Test Applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category NB1.

This test applies to all types of E-UTRA UE release 14 and forward of UE category NB2.

### 7.6.1F.3 Minimum Conformance Requirements

Category NB1 and NB2 UE throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in Annex A.3.2 with parameters specified in Table 7.6.1F.3-1.

**Table 7.6.1F.3-1: In-band blocking parameters for category NB1 and NB2**

| **IBB1 test Parameters** | |
|---|---|
| Category NB1 or NB2 signal power ($P_{wanted}$) / dBm | REFSENS + 6 dB |
| Interferer | E-UTRA |
| Interferer signal power ($P_{Interferer}$) / dBm | - 56 dBm |
| Interferer bandwidth | 5 MHz |
| Interferer offset from category NB1 or NB2 channel edge | +7.5 MHz + 0.005 MHz and -7.5 MHz - 0.005 MHz |
| **IBB2 test Parameters** | |
| Category NB1 or NB2 signal power ($P_{wanted}$) / dBm | REFSENS + 6 dB |
| Interferer | E-UTRA |
| Interferer signal power ($P_{Interferer}$) / dBm | - 44 dBm |
| Interferer bandwidth | 5 MHz |
| Interferer offset range from category NB1 or NB2 channel edge | From +12.5 MHz to $F_{DL_high}$ + 15 MHz and From -12.5 MHz to $F_{DL_low}$ - 15 MHz |

The normative reference for this requirement is TS 36.101 [2] clause 7.6.1.1F.

## 7.6.1F.4 Test Description

### 7.6.1F.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters, and are shown in table 7.6.1F.4.1-1. The details of the downlink reference measurement channels (RMCs) are specified in Annex A.3. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 7.6.1F.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 8.1.1 | | | NC | | |
| Test Frequencies as specified in TS36.508 [7] clause 8.1.3.1 | | | Frequency ranges defined in Annex K.1.1 | | |
| **Configuration ID** | **Downlink Configuration** | | **Uplink Configuration** | | |
| | Modulation | Subcarriers | Modulation | $N_{tones}$ | Subcarrier spacing |
| 1 | QPSK | 12 | BPSK | 1@0 | 15 kHz |

1. Connect the SS to the UE antenna connector as shown in TS 36.508 [7] Annex A, Figure A.4 using only the main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.2, and NPUSCH Format 2 is used to carry ACK/NACK on the uplink.
4. The DL Reference Measurement channel is set according to Table 7.6.1F.4.1-1.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 7.6.1F.4.3.

### 7.6.1F.4.2 Test Procedure

1. SS transmits NPDSCH via NPDCCH DCI format N1 for C_RNTI to transmit the DL RMC according to Table 7.6.1F.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The UE will send HARQ feedback based on information contained in DCI format N1.

2. Set the downlink signal level according to the table 7.6.1F.5-1.

3. Set the parameters of the signal generator for an interfering signal below the wanted signal in IBB1 according to Table 7.6.1F.5-1.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

5. Repeat steps from 3 to 4, using an interfering signal above the wanted signal in IBB1 at step 3.

6. Repeat steps from 3 to 5, using interfering signals in IBB2 at step 3 and 5. The ranges of IBB2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to table 7.6.1F.4.2-1.

**Table 7.6.1F.4.2-1: Example for interferer frequencies**

| | Lower frequency | Upper frequency |
|---|---|---|
| Band 1 DL | 2110 MHz | 2170 MHz |
| Band 1 Midrange | 2140 MHz | |
| Receive band wanted signal (BW 200KHz) | 2139.9 MHz | 2140.1 MHz |
| Interferer IBB1 | 2132.395 MHz | 2147.605 MHz |
| Interferer IBB2 | 2127.4 MHz | 2152.6 MHz |
| Outer limit for in band blocking | 2095MHz | 2185MHz |

### 7.6.1F.4.3 Message Contents

Message contents are according to TS 36.508 [7] clause 8.1.6.

## 7.6.1F.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in clause A.3.2 with parameters specified in Tables 7.6.1F.5-1.

**Table 7.6.1F.5-1: In-band blocking parameters for category NB1 and NB2**

| **IBB1 test Parameters** | |
|---|---|
| Category NB1 or NB2 signal power ($P_{wanted}$) / dBm | REFSENS + 6 dB |
| Interferer | E-UTRA |
| Interferer signal power ($P_{Interferer}$) / dBm | - 56 dBm |
| Interferer bandwidth | 5 MHz |
| Interferer offset from category NB1 or NB2 channel edge | +7.5 MHz + 0.005 MHz<br>and<br>-7.5 MHz - 0.005 MHz |
| **IBB2 test Parameters** | |
| Category NB1 or NB2 signal power ($P_{wanted}$) / dBm | REFSENS + 6 dB |
| Interferer | E-UTRA |
| Interferer signal power ($P_{Interferer}$) / dBm | - 44 dBm |
| Interferer bandwidth | 5 MHz |
| Interferer offset range from category NB1 or NB2 channel edge | From +12.5 MHz to $F_{DL_high}$ + 15 MHz<br>and<br>From -12.5 MHz to $F_{DL_low}$ - 15 MHz |

# 7.6.1G In-band blocking for V2X Communication

## 7.6.1G.1 In-band blocking for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 7.6.1G.1.1 Test Purpose

In-band blocking is defined for an unwanted interfering signal falling into the range from 15MHz below to 15MHz above the V2X band, at which the relative throughput shall meet or exceed the requirement for the specified measurement channels.

The lack of in-band blocking ability will decrease the coverage area when other Sidelink transmitters exist (except in the adjacent channels and spurious response).

### 7.6.1G.1.2 Test Applicability

This test applies to all types of UE that support V2X Sidelink Communication and Band 47.

### 7.6.1G.1.3 Minimum Conformance Requirements

The V2X UE throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters defined in Table 7.6.1G.1.3-1 and Table 7.6.1G.1.3-2.

**Table 7.6.1G.1.3-1: In band blocking parameters**

| **Rx parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| $BW_{Interferer}$ | MHz | | | | 10 | | 10 |
| $F_{Ioffset,\ case\ 1}$ | MHz | | | | 15+0.0025 | | 15+0.005 |
| $F_{Ioffset,\ case\ 2}$ | MHz | | | | 25+0.0075 | | 25+0.0025 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211 | | | | | | | |

**Table 7.6.1G.1.3-2: In-band blocking**

| E-UTRA V2X band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{loffset,case\ 1}$ & =+BW/2 + $F_{loffset,case\ 1}$ | ≤-BW/2 – $F_{loffset,case\ 2}$ & ≥+BW/2 + $F_{loffset,case\ 2}$ |
| 47 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low}$ –30 to $F_{DL_high}$ + 30 |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency -BW/2 - $F_{loffset,\ case\ 1}$ and<br>b. the carrier frequency +BW/2 + $F_{loffset,\ case\ 1}$<br>NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies | | | | |

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA downlink reception for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.5G-2, the requirements in subclause 7.6.1G apply for the E-UTRA V2X sidelink reception and the requirements in subclause 7.6.1.1 apply for the E-UTRA downlink reception while all downlink carriers are active.

The normative reference for this requirement is TS 36.101 [2] clause 7.6.1.1G.

## 7.6.1G.1.4 Test Description

### 7.6.1G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.1G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 7.6.1 G.1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Mid range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Lowest, 5MHz, Highest for uplink<br>Lowest, Highest for V2X | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink** | | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | QPSK | 1 | QPSK | 1 | 10 MHz | QPSK | 48 |
| 1.4 MHz | QPSK | 5 | QPSK | 5 | 20 MHz | QPSK | 96 |
| 3 MHz | QPSK | 1 | QPSK | 1 | | | |
| 3 MHz | QPSK | 4 | QPSK | 4 | | | |
| 5 MHz | QPSK | 1 | QPSK | 1 | | | |
| 5 MHz | QPSK | 8 | QPSK | 8 | | | |
| 10 MHz | QPSK | 1 | QPSK | 1 | | | |
| 10 MHz | QPSK | 12 | QPSK | 12 | | | |
| 15 MHz | QPSK | 1 | QPSK | 1 | | | |
| 15 MHz | QPSK | 16 | QPSK | 16 | | | |
| 20 MHz | QPSK | 1 | QPSK | 1 | | | |
| 20 MHz | QPSK | 18 | QPSK | 18 | | | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | | |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.92a.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 7.6.1 G.1.4.3.

3. The V2X reference measurement channel is set according to Table 7.6.1 G.1.4.1-1.

3a. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 5A-V2X in Receive Mode according to TS 36.508 [7] clause 4.5.9. Message content exceptions are defined in clause 7.6.1G.1.4.3.

6. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 7.6.1G.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration and to schedule the V2X RMC according to Table 7.6.1G.1.4.1-1.

2. Set the parameters of the signal generator for an interfering signal below the wanted signal in Case 1 according to Tables 7.6.1G.1.5-1 and 7.6.1G.1.5-2.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

4. Repeat step 3, using an interfering signal above the wanted signal in Case 1 at step 2.

5. Repeat step 3, using interfering signals in Case 2 at step2 and 4. The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to table 7.6.1G.1.5-2.

#### 7.6.1G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.10.

### 7.6.1G.1.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Tables 7.6.1G.1.5-1 and 7.6.1G.1.5-2.

**Table 7.6.1G.1.5-1: In band blocking parameters**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| $BW_{Interferer}$ | MHz | | | | 10 | | 10 |
| $F_{Ioffset, case\ 1}$ | MHz | | | | 15+0.0025 | | 15+0.005 |
| $F_{Ioffset, case\ 2}$ | MHz | | | | 25+0.0075 | | 25+0.0025 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

**Table 7.6.1G.1.5-2: In-band blocking**

| E-UTRA V2X band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 |
| | $F_{Interferer}$ (offset) | MHz | $=-BW/2 - F_{Ioffset,case\ 1}$ & $=+BW/2 + F_{Ioffset,case\ 1}$ | $\leq -BW/2 - F_{Ioffset,case\ 2}$ & $\geq +BW/2 + F_{Ioffset,case\ 2}$ |
| 47 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low} - 30$ to $F_{DL_high} + 30$ |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency $-BW/2 - F_{Ioffset, case\ 1}$ and<br>b. the carrier frequency $+BW/2 + F_{Ioffset, case\ 1}$<br>NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies | | | | |

## 7.6.1G.2 In-band blocking for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

### 7.6.1G.2.1 Test Purpose

Same as in clause 7.6.1G.1.1.

### 7.6.1G.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 14 and forward that support V2X Communication.

### 7.6.1G.2.3 Minimum Conformance Requirements

The V2X UE throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters defined in Table 7.6.1G.2.3-1 and Table 7.6.1G.2.3-2.

**Table 7.6.1G.2.3-1: In band blocking parameters**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| $BW_{Interferer}$ | MHz | | | | 10 | | 10 |
| $F_{Ioffset,\ case\ 1}$ | MHz | | | | 15+0.0025 | | 15+0.005 |
| $F_{Ioffset,\ case\ 2}$ | MHz | | | | 25+0.0075 | | 25+0.0025 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211 | | | | | | | |

**Table 7.6.1G.2.3-2: In-band blocking**

| E-UTRA V2X band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -44 | -44 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{Ioffset,case\ 1}$ & =+BW/2 + $F_{Ioffset,case\ 1}$ | ≤-BW/2 – $F_{Ioffset,case\ 2}$ & ≥+BW/2 + $F_{Ioffset,case\ 2}$ |
| 47 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low}$ –30 to $F_{DL_high}$ + 30 |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency -BW/2 - $F_{Ioffset,\ case\ 1}$ and<br>b. the carrier frequency +BW/2 + $F_{Ioffset,\ case\ 1}$<br>NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies. | | | | |

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA downlink reception for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.5G-2, the requirements in subclause 7.6.1G.2.3 apply for the E-UTRA V2X sidelink reception and the requirements in subclause 7.6.1.3 apply for the E-UTRA downlink reception while all downlink carriers are active.

The normative reference for this requirement is TS 36.101 [2] clause 7.6.1.1G.

## 7.6.1G.2.4 Test Description

### 7.6.1G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.1G.2.4.1-1. The details of the uplink, downlink and V2X reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.8.3 respectively.

**Table 7.6.1G.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | | Mid range | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink** | | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | QPSK | 1 | QPSK | 1 | 10 MHz | QPSK | 48 |
| 1.4 MHz | QPSK | 5 | QPSK | 5 | 20 MHz | QPSK | 96 |
| 3 MHz | QPSK | 1 | QPSK | 1 | | | |
| 3 MHz | QPSK | 4 | QPSK | 4 | | | |
| 5 MHz | QPSK | 1 | QPSK | 1 | | | |
| 5 MHz | QPSK | 8 | QPSK | 8 | | | |
| 10 MHz | QPSK | 1 | QPSK | 1 | | | |
| 10 MHz | QPSK | 12 | QPSK | 12 | | | |
| 15 MHz | QPSK | 1 | QPSK | 1 | | | |
| 15 MHz | QPSK | 16 | QPSK | 16 | | | |
| 20 MHz | QPSK | 1 | QPSK | 1 | | | |
| 20 MHz | QPSK | 18 | QPSK | 18 | | | |
| Note 1: V2X con-current band configurations are checked separately for each band configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2G.1-2. | | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3G.0-4 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2G.1-2). | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.93c.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to Table 7.6.1G.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 7.6.1G.2.4.3.

### 7.6.1G.2.4.2 Test procedure

1. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.6.1G.2.4.1-1 on E-UTRA Band. The SS sends downlink MAC padding bits on the DL RMC.
2. SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 7.6.1G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.
3. Set the parameters of the signal generator for an interfering signal below the V2X band in Case 1 according to Tables 7.6.1G.2.5-1 and 7.6.1G.2.5-2.
4. Set the downlink signal level according to the table 7.6.1G.2.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.1G.2.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq 4.2$GHz or within +0, -4.3 dB of the target level for carrier frequency $f \leq 6.0$GHz, for at least the duration of the throughput measurement.

5. Measure the average throughput for duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the V2X band in Case 1 at step 6.

7. Repeat steps from 3 to 6, using interfering signals in Case 2 at step 3 and 6. The ranges of case 2 are covered in steps equal to the interferer bandwidth.

#### 7.6.1G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 7.6.1G.2.5 Test Requirement

Same test requirement as in clause 7.6.1G.2.3 with the following exceptions:

- Instead of Table 7.6.1G.2.3-1 → use Table 7.6.1G.2.5-1.

- Instead of Table 7.6.1G.2.3-2 → use Table 7.6.1G.2.5-2.

**Table 7.6.1G.2.5-1: In band blocking parameters**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| $BW_{Interferer}$ | MHz | | | | 10 | | 10 |
| $F_{Ioffset,\ case\ 1}$ | MHz | | | | 15+0.0025 | | 15+0.005 |
| $F_{Ioffset,\ case\ 2}$ | MHz | | | | 25+0.0075 | | 25+0.0025 |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211 | | | | | | | |

**Table 7.6.1G.2.5-2: In-band blocking**

| E-UTRA V2X band | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -44 | -44 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{Ioffset,case\ 1}$ & =+BW/2 + $F_{Ioffset,case\ 1}$ | ≤-BW/2 – $F_{Ioffset,case\ 2}$ & ≥+BW/2 + $F_{Ioffset,case\ 2}$ |
| 47 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low}$ –30 to $F_{DL_high}$ + 30 |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency -BW/2 - $F_{Ioffset,\ case\ 1}$ and<br>b. the carrier frequency +BW/2 + $F_{Ioffset,\ case\ 1}$<br>NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies | | | | |

## 7.6.1G.3 In-band blocking for V2X Communication / Intra-band contiguous multi-carrier operation

### 7.6.1G.3.1 Test Purpose

Same as in clause 7.6.1G.1.1.

### 7.6.1G.3.2 Test Applicability

This test applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 7.6.1G.3.3 Minimum Conformance Requirements

For intra-band contiguous multi-carrier operation the V2X UE throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters defined in Table 7.6.1G.3.3-1 and Table 7.6.1G.3.3-2.

**Table 7.6.1G.3.3-1: In band blocking parameters for intra-band contiguous multi-carrier for V2X**

| Rx Parameter | Units | V2X Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + V2X Bandwidth Class specific value below | | | | |
| | | 9 | 12 | | | |
| $BW_{Interferer}$ | MHz | 10 | 10 | | | |
| $F_{Ioffset,\ case\ 1}$ | MHz | 15 | 15 | | | |
| $F_{Ioffset,\ case\ 2}$ | MHz | 25 | 25 | | | |

**Table 7.6.1G.3.3-2: In-band blocking for intra-band contiguous multi-carrier for V2X**

| V2X multi-carrier configuration | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -44 | -44 |
| | $F_{Interferer}$ (offset) | MHz | $=-F_{offset} - F_{Ioffset,case\ 1}$ & $=+F_{offset} + F_{Ioffset,case\ 1}$ | $\leq -F_{offset} - F_{Ioffset,case\ 2}$ & $\geq +F_{offset} + F_{Ioffset,case\ 2}$ |
| V2X_47B, V2X_47C, V2X_47C1 | $F_{Interferer}$ (Range) | MHz | (NOTE 2) | $F_{DL_low} - 30$ to $F_{DL_high} + 30$ |

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 30 MHz below or above the UE receive band

NOTE 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -Foffset - FIoffset, case 1 and
b. the carrier frequency +Foffset + FIoffset, case 1

NOTE 3: Foffset is the frequency offset from the centre frequency of the CC being tested to the edge of aggregated channel bandwidth.

NOTE 4: The Finterferer (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

NOTE 5: The requirement is applied for multi-carrier intra-band con-current receptions when 2 carrier transmissions are activated at the same time.

The normative reference for this requirement is TS 36.101 [2] clause 7.6.1.1G.

### 7.6.1G.3.4 Test Description

#### 7.6.1G.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in Table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.1G.3.4.1-1. The details of the uplink, downlink and V2X reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.8.3 respectively and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 7.6.1G.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for Channel Bandwidths** | | | |
| **V2X multi-carrier Configuration** | | **V2X PSSCH Allocation** | |
| **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **CC1 and CC2 RB Allocation** |
| 10MHz | 10MHz | QPSK | 48+48 |

1. Connect the SS and GNSS simulator to the UE antenna connector as shown in TS 36.508 [7] Annex A, Figure A.92d.
2. The parameter settings for V2X sidelink communication over PC5 are pre-configured according to TS 36.508 [7] subclause 4.10.1. Message content exceptions are defined in clause 7.6.1G.3.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to Table 7.6.1G.3.4.1-1.

4a. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 5A-V2X according to TS 36.508 [7] clause 4.5.9..
7. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)
8. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 7.6.1G.3.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration and to schedule the V2X RMC according to Table 7.6.1G.3.4.1-1.
2. Set the parameters of the signal generator for an interfering signal below the V2X band in Case 1 according to Tables 7.6.1G.3.5-1 and 7.6.1G.3.5-2.
3. Measure the average throughput for duration sufficient to achieve statistical significance according to Annex G.2 .
4. Repeat steps from 3, using an interfering signal above the V2X band in Case 1 at step 2.
5. Repeat steps from 3 to 6, using interfering signals in Case 2 at step 3 and4 . The ranges of case 2 are covered in steps equal to the interferer bandwidth.

### 7.6.1G.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.10.

## 7.6.1G.3.5 Test Requirement

Same test requirement as in clause 7.6.1G.3.3 with the following exceptions:

- Instead of Table 7.6.1G.3.3 -1 → use Table 7.6.1G.3.5 -1.
- Instead of Table 7.6.1G.3.3 -2 → use Table 7.6.1G.3.5-2.

**Table 7.6.1G.3.5-1: In band blocking parameters for intra-band contiguous multi-carrier for V2X**

| Rx Parameter | Units | V2X Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + V2X Bandwidth Class specific value below | | | | |
| | | 9 | 12 | | | |
| $BW_{Interferer}$ | MHz | 10 | 10 | | | |
| $F_{Ioffset,\ case\ 1}$ | MHz | 15 | 15 | | | |
| $F_{Ioffset,\ case\ 2}$ | MHz | 25 | 25 | | | |

**Table 7.6.1G.3.5-2: In-band blocking for intra-band contiguous multi-carrier for V2X**

| V2X multi-carrier configuration | Parameter | Unit | Case 1 | Case 2 |
|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -44 | -44 |
| | $F_{Interferer}$ (offset) | MHz | $=-F_{offset}-F_{Ioffset,case\ 1}$ & $=+F_{offset}+F_{Ioffset,case\ 1}$ | $\leq -F_{offset}-F_{Ioffset,case\ 2}$ & $\geq +F_{offset}+F_{Ioffset,case\ 2}$ |
| V2X_47B, V2X_47C, $V2X_47C_1$ | $F_{Interferer}$ (Range) | MHz | (NOTE 2) | $F_{DL_low}-30$ to $F_{DL_high}+30$ |

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 30 MHz below or above the UE receive band

NOTE 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -Foffset - FIoffset, case 1 and
b. the carrier frequency +Foffset + FIoffset, case 1

NOTE 3: Foffset is the frequency offset from the centre frequency of the CC being tested to the edge of aggregated channel bandwidth.

NOTE 4: The Finterferer (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015+0.5\rfloor 0.015+0.0075$ MHz to be offset from the sub-carrier raster.

NOTE 5: The requirement is applied for multi-carrier intra-band con-current receptions when 2 carrier transmissions are activated at the same time.

# 7.6.1EA In-band blocking for UE category M1

## 7.6.1EA.1 Test Purpose

In-band blocking is defined for an unwanted interfering signal falling into the range from 15MHz below to 15MHz above the category M1 UE receive band, at which the relative throughput shall meet or exceed the requirement for the specified measurement channels.

The lack of in-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

## 7.6.1EA.2 Test Applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category M1.

## 7.6.1EA.3 Minimum Conformance Requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.1EA.3-1 and 7.6.1EA.3-2. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.6.1EA.3-1: In band blocking parameters**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Ioffset, case\ 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{Ioffset, case\ 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |
| NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in subclause 6.2.5EA.<br>NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.<br>NOTE 3: For DL category M1 UE, the reference sensitivity for category M1 in table 7.3EA-1 and 7.3EA-2 should be used as REFSENS for the power in Transmission Bandwidth Configuration.<br>NOTE 4: For DL category M1 UE, the parameters for the applicable channel bandwidth apply. | | | | | | | |

**Table 7.6.1EA.3-2: In-band blocking**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 |
|---|---|---|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 | Void | Void | -38 |
| | $F_{Interferer}$ (offset) | MHz | $=-BW/2 - F_{Ioffset,case\ 1}$ & $=+BW/2 + F_{Ioffset,case\ 1}$ | $\leq -BW/2 - F_{Ioffset,case\ 2}$ & $\geq +BW/2 + F_{Ioffset,case\ 2}$ | | | -BW/2 - 11 |
| 1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 18, 19, 20, 21, 26, 27, 28, 31, 39, 41, 72 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low} - 15$ to $F_{DL_high} + 15$ | | | |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band<br>NOTE 2: For each carrier frequency the requirement is valid for two frequencies:<br>a. the carrier frequency -BW/2 - $F_{Ioffset, case\ 1}$ and<br>b. the carrier frequency +BW/2 + $F_{Ioffset, case\ 1}$<br>NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.6.1.

## 7.6.1EA.4 Test Description

### 7.6.1EA.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for CAT M1 in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.1EA.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 7.6.1EA.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | | |
| | | FDD | TDD | | FDD and HD-FDD | TDD | Narrowband index (Note 1) |
| 5MHz | QPSK | 4 | 4 | QPSK | 6 | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4. | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.4 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.6.1EA.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 7.6.1EA.4.3.

### 7.6.1EA.4.2 Test Procedure

1. SS transmits PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 7.6.1EA.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

2. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 7.6.1EA.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the signal generator for an interfering signal below the wanted signal in Case 1 according to Tables 7.6.1EA.5-1 and 7.6.1EA.5-2.

4. Set the downlink signal level according to the table 7.6.1EA.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.1EA.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the throughput measurement.

5. Measure the average throughput for duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal in Case 1 at step 3.

7. Repeat steps from 3 to 6, using interfering signals in Case 2 at step 3 and 6. The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to table 7.6.1EA.4.2-1.

**Table 7.6.1EA.4.2-1: Example for interferer frequencies**

| | Lower frequency | Upper frequency |
|---|---|---|
| Band 1 DL | 2110 MHz | 2170 MHz |
| Band 1 Midrange | 2140 MHz | |
| Receive band wanted signal (BW 5MHz) | 2137.5 MHz | 2142.5 MHz |
| Interferer case 1 | 2129.9875 MHz | 2150.0125 MHz |
| Interferer case 2 (inner frequency) | 2124.9925 MHz | 2155.0075 MHz |
| Interferer case 2 (outer frequency) | 2099.9925 MHz | 2180.0075 MHz |
| Outer limit for in band blocking | 2095MHz | 2185MHz |
| Number of test frequencies case 2 | 6 | 6 |

### 7.6.1EA.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA and the following exception

**Table 7.6.1EA.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-UE-PUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.6.1EA.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.1EA.5-1 and 7.6.1EA.5-2.

**Table 7.6.1EA.5-1: In band blocking parameters**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| $BW_{Interferer}$ | MHz | 1.4 | 3 | 5 | 5 | 5 | 5 |
| $F_{Ioffset,\ case\ 1}$ | MHz | 2.1+0.0125 | 4.5+0.0075 | 7.5+0.0125 | 7.5+0.0025 | 7.5+0.0075 | 7.5+0.0125 |
| $F_{Ioffset,\ case\ 2}$ | MHz | 3.5+0.0075 | 7.5+0.0075 | 12.5+0.0075 | 12.5+0.0125 | 12.5+0.0025 | 12.5+0.0075 |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in subclause 6.2.5EA.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.
NOTE 3: For DL category M1 UE, the reference sensitivity for category M1 in table 7.3EA-1 and 7.3EA-2 should be used as REFSENS for the power in Transmission Bandwidth Configuration.
NOTE 4: For DL category M1 UE, the parameters for the applicable channel bandwidth apply.

**Table 7.6.1EA.5-2: In-band blocking**

| E-UTRA band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 |
|---|---|---|---|---|---|---|---|
| | $P_{Interferer}$ | dBm | -56 | -44 | Void | Void | -38 |
| | $F_{Interferer}$ (offset) | MHz | =-BW/2 – $F_{loffset,case\ 1}$ & =+BW/2 + $F_{loffset,case\ 1}$ | ≤-BW/2 – $F_{loffset,case\ 2}$ & ≥+BW/2 + $F_{loffset,case\ 2}$ | | | -BW/2 - 11 |
| 1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 18, 19, 20, 21, 26, 27, 28, 31, 39, 41, 72 | $F_{Interferer}$ | MHz | (NOTE 2) | $F_{DL_low}$ – 15 to $F_{DL_high}$ + 15 | | | |

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band
NOTE 2: For each carrier frequency the requirement is valid for two frequencies:
a. the carrier frequency -BW/2 - $F_{loffset,\ case\ 1}$ and
b. the carrier frequency +BW/2 + $F_{loffset,\ case\ 1}$
NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies

## 7.6.2 Out-of-band blocking

### 7.6.2.1 Test Purpose

Out-of-band band blocking is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the UE receive band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

For the first 15 MHz below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5.1 and sub-clause 7.6.1 shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

### 7.6.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 8 and forward.

### 7.6.2.3 Minimum Conformance Requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.2.3-1 and 7.6.2.3-2. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

For Table 7.6.2.3-2 in frequency range 1, 2 and 3, up to $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where $N_{RB}$ is the number of resource blocks in the downlink transmission bandwidth configuration (see Figure 5.4.2-1). For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

For Table 7.6.2.3-2 in frequency range 4, up to $\max(8,\ \lceil(N_{RB}+2\cdot L_{CRBs})/8\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where $N_{RB}$ is the number of resource blocks in the downlink transmission bandwidth configurations (see Figure 5.4.2-1) and $L_{CRBs}$ is the number of resource blocks allocated in the uplink. For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

**Table 7.6.2.3-1: Out-of-band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |

| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
|---|---|---|---|---|---|---|---|
| | | 6 | 6 | 6 | 6 | 7 | 9 |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in clause 6.2.5.
Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The REFSENS power level is specified in Table 7.3.3-1 and Table 7.3.3-1a for two and four antenna ports, respectively.

**Table 7.6.2.3-2: Out of band blocking**

| E-UTRA band | Parameter | Units | Frequency | | | |
|---|---|---|---|---|---|---|
| | | | range 1 | range 2 | range 3 | range 4 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 | -15 |
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 (Note 2), 43 (Note 2), 44, 45, 48 (NOTE 2), 65, 66, 68, 70, 71, 72, 74 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -15 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz | - |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz | - |
| 2, 5, 12, 17 | $F_{Interferer}$ | MHz | - | - | - | $F_{UL_low}$ - $F_{UL_high}$ |

Note 1: For the UE which supports both Band 11 and Band 21 the out of blocking is FFS.
Note 2: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz.
Note 3: For the UE that supports both Band 4 and Band 66, the out-of-blocking frequency range for Band 4 is defined relative to $F_{DL_low}$ and $F_{DL_high}$ of Band 66.

The normative reference for this requirement is TS 36.101 [2] clause 7.6.2.

## 7.6.2.4 Test Description

### 7.6.2.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | One frequency chosen arbitrarily from low or high range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[4] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2). | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.5.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.6.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.2.4.3.

### 7.6.2.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.2.5-2. The frequency step size is 1MHz.

4. Set the downlink signal level according to the table 7.6.2.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.2.5-1 for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the throughput measurement.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Record the frequencies for which the throughput doesn't meet the requirements.

7. Repeat steps from 3 to 6, using an interfering signal above the wanted signal at step 3.

#### 7.6.2.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

**Table 7.6.2.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

### 7.6.2.5 Test Requirement

Except for the spurious response frequencies recorded at the final step of test procedure, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.2.5-1 and 7.6.2.5-2.

For frequency range 1, 2, and 3, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

For frequency range 4, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\max(8,\ \lceil(N_{RB}+2\cdot L_{CRBs})/8\rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

**Table 7.6.2.5-1: Out-of-band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.6.2.5-2: Out of band blocking**

| E-UTRA band | Parameter | Units | Frequency | | | |
|---|---|---|---|---|---|---|
| | | | range 1 | range 2 | range 3 | range 4 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 | -15 |
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 (Note 3), 43 (Note 3), 44, 45, 65, 66, 68, 70, 71, 72, 74 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -15 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz | - |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz | - |
| 2, 5, 12, 17 | $F_{Interferer}$ | MHz | - | - | - | $F_{UL_low}$ - $F_{UL_high}$ |
| Note 1: Range 3 shall be tested only with the highest channel bandwidth. | | | | | | |
| Note 2: For the UE which supports both Band 11 and Band 21 the out of blocking is FFS. | | | | | | |
| Note 3: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz. | | | | | | |
| Note 4: For the UE that supports both Band 4 and Band 66, the out-of-blocking frequency range for Band 4 is defined relative to $F_{DL_low}$ and $F_{DL_high}$ of Band 66. | | | | | | |

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Table 7.6.2.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

# 7.6.2_1 Out-of-band blocking with 4 Rx antenna ports

## 7.6.2_1.1 Test Purpose

Out-of-band band blocking with 4 Rx antenna ports is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the UE 4 Rx receive band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

For the first 15 MHz below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5_1.1 and sub-clause 7.6.1_1.1 shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

## 7.6.2_1.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that supports 4 Rx antenna ports.

## 7.6.2_1.3 Minimum Conformance Requirements

Same as in clause 7.6.2.3.

## 7.6.2_1.4 Test Description

### 7.6.2_1.4.1 Initial Conditions

Same as in clause 7.6.2.4.1 with following exceptions:

- Instead of Table 7.6.2.4.1-1→ use table 7.6.2_1.4.1-1
- Instead of Figure A.4→ use Figure A.81
- Instead of clause 7.6.2.4.3→ use clause 7.6.2_1.4.3

**Table 7.6.2_1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | One frequency chosen arbitrarily from low or high range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.<br>Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).<br>Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |

### 7.6.2_1.4.2 Test Procedure

Same as in clause 7.6.2.4.2 with following exceptions:

- Instead of Table 7.6.2.4.1-1→ use Table 7.6.2_1.4.1-1
- Instead of Table 7.6.2.5-1→ use Table 7.6.2_1.5-1

### 7.6.2_1.4.3 Message Contents

Same as in clause 7.6.2.4.3.

## 7.6.2_1.5 Test Requirement

Same as in clause 7.6.2.5 with following exceptions:

- Instead of Table 7.6.2.5-1→ use Table 7.6.2_1.5-1

**Table 7.6.2_1.5-1: Out-of-band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| Note 3: The REFSENS power level is specified in Table 7.3_1.5-1. | | | | | | | |

# 7.6.2A Out-of-band blocking for CA

## 7.6.2A.0 Minimum conformance requirements

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band, the out-of-band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The throughput in the downlink measured shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.2.3-1 and 7.6.2A.0-0. For E-UTRA CA configurations including an operating band without uplink operation (as noted in Table 5.2-1), the requirements for all downlinks shall be met with the uplink active in the band(s) capable of UL operation. The UE shall meet these requirements for each component carrier while all downlink carriers are active.

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the out-of-band blocking requirements specified above shall be met with the transmitter power for the uplink set to 7 dB below $P_{CMAX_L,c}$ for each serving cell *c*.

For E-UTRA CA configurations including an operating band without uplink band or an operating band with an unpaired DL part (as noted in Table 5.2-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. For E-UTRA CA configurations listed in Table 7.3A.0-0a under conditions for which reference sensitivity for the operating band being tested is N/A, the out-of-band blocking requirements of subclause 7.6.2A.0 do not apply.

**Table 7.6.2A.0-0: Out-of-band blocking for inter-band carrier aggregation**

| Parameter | Unit | Range 1 | Range 2 | Range 3 |
|---|---|---|---|---|
| $P_W$ | dBm | Table 7.6.2.3-1 for all component carriers | | |
| $P_{interferer}$ | dBm | $-44 + \Delta R_{IB,c}$ | $-30 + \Delta R_{IB,c}$ | $-15 + \Delta R_{IB,c}$ |
| $F_{interferer}$ (CW) | MHz | $-60 < f - F_{DL_Low(j)} < -15$ or $15 < f - F_{DL_High(j)} < 60$ | $-85 < f - F_{DL_Low(j)} \le -60$ or $60 \le f - F_{DL_High(j)} < 85$ | $1 \le f \le F_{DL_Low(1)} - 85$ or $F_{DL_High(j)} + 85 \le f \le F_{DL_Low(j+1)} - 85$ with $j < X$ or $F_{DL_High(X)} + 85 \le f \le 12750$ |

Note 1: $F_{DL_Low(j)}$ and $F_{DL_High(j)}$ denote the respective lower and upper frequency limits of the operating band containing carrier $j$, $j$ = 1,…,X, with carriers numbered in increasing order of carrier frequency and X the number of component carriers in the band combination (X ≤ 5 for the present version of this specification).

Note 2: For $F_{DL_Low(j+1)} - F_{DL_High(j)} < 145$ MHz and $F_{Interferer}$ in $F_{DL_High(j)} < f < F_{DL_Low(j+1)}$, $F_{Interferer}$ can be in both Range 1 and Range 2. Then the lower of the $P_{Interferer}$ applies.

Note 3: For $F_{DL_Low(j)} - 15$ MHz ≤ f ≤ $F_{DL_High(j)} + 15$ MHz the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5.1A and 7.6.1.1A shall be applied for carrier $j$.

Note 4: $\Delta R_{IB,c}$ according to Table 7.3.3-1A applies when serving cell c is measured.

Note 5 For inter-band CA combinations containing Bands 42 or 43, the interferer with respect to Band 42 or Band 43 shall have power level ($P_{Interferer}$) for Range 3 modified to $-20 + \Delta R_{IB,c}$ dBm for $F_{Interferer} > 2800$ MHz and $F_{Interferer} < 4400$ MHz.

NOTE 6: For inter-band CA combinations containing Bands 7 and 38 simultaneously, for $F_{Interferer}$ Bands 7 and 38 are considered as one single band as follows: $F_{DL_Low} = 2570$ MHz and $F_{DL_High} = 2690$ MHz. For Range 2, the following applies for $F_{DL_Low}$: $-95 < f - F_{DL_Low} \le -60$ or $60 \le f - F_{DL_High} < 85$. For Range 3 the following applies $1 \le f \le F_{DL_Low} - 95$ or $F_{DL_High} + 85 \le f \le 12750$.

NOTE 7: For CA_20A-28A the $F_{DL_low(1)}$ is given by the lower limit of the restricted operating frequency range in Band 28 and $F_{DL_high(2)}$ by Band 20 (Table 5.2A-2).

**Table 7.6.2A.0-0a: out-of-band blocking for inter-band carrier aggregation with band 46 and with one active uplink**

| Parameter | Unit | Range 1 | Range 2 | Range 3 |
|---|---|---|---|---|
| $P_{wanted}$ | dBm | Table 7.6.2.1-1 for all component carriers | | |
| $P_{interferer}$ | dBm | $-44 + \Delta R_{IB,c}$ | $-30 + \Delta R_{IB,c}$ | $-15 + \Delta R_{IB,c}$ (NOTE 5) |
| $F_{interferer}$ (CW) | MHz | $-60 < f - F_{DL_Low(j)} < -15$ with $j \le K$ or $15 < f - F_{DL_High(j)} < 60$ with $j \le K$ | $-85 < f - F_{DL_Low(j)} \le -60$ or $60 \le f - F_{DL_High(j)} < 85$ | $1 \le f \le F_{DL_Low(j)} - 85$ or $F_{DL_High(j)} + 85 \le f \le 12750$ |

NOTE 1: $F_{DL_Low(j)}$ and $F_{DL_High(j)}$, j = 1,…,K,…N, denote the respective lower and upper frequency limits of the (non-overlapping) operating bands of the CA configuration numbered in increasing order of frequency, with N the number of bands in the band combination and K the number of bands with $F_{DL_High} \le 3800$ MHz.

NOTE 2: For $F_{DL_Low(j)} - 15$ MHz ≤ f ≤ $F_{DL_High(j)} + 15$ MHz the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5.1A and 7.6.1.1A shall be applied for carrier j ≤ K.

NOTE 3: For $F_{DL_Low(j)} - 60$ MHz ≤ f ≤ $F_{DL_High(j)} + 60$ MHz the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5.1A and 7.6.1.1A shall be applied for carrier K < j ≤ N.

NOTE 4: RIB,c according to Table 7.3.1-1A applies when serving cell c is measured.

NOTE 5: The power level ($P_{Interferer}$) for Range 3 is modified to -20 dBm for $F_{Interferer} > 4400$ MHz except for band combinations with Band 42 or Band 43 for which $P_{Interferer}$ for Range 3 is modified to -20 dBm for $F_{Interferer} > 2800$ MHz.

For Table 7.6.2A.0-0 in frequency ranges 1, 2 and 3, up to $\max(24, 6 \cdot \lceil N_{RB} \cdot / 6 \rceil)$ exceptions per downlink are allowed for spurious response frequencies for one active uplink when measured using a step size of 1 MHz.

For Table 7.6.2A.0-0 in frequency ranges 1, 2 and 3, up to $2 \cdot \max(24,6 \cdot \lceil N_{RB} \cdot / 6 \rceil)$ exceptions per downlink are allowed for spurious response frequencies for two active uplinks when measured using a step size of 1 MHz. For these exceptions the requirements in clause 7.7A.0 apply.

For intra-band contiguous carrier aggregations the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.6.2A.0-1 with the uplink configuration set according to Table 7.3A.0-1 for the applicable carrier aggregation configuration. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.3-2.

The UE shall fulfil the minimum requirement in presence of an interfering signal specified in Tables 7.6.2A.0-1 and Tables 7.6.2A.0-2 being on either side of the aggregated signal. The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.2A.0-1 and 7.6.2A.0-2. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Tables 7.6.2A.0-1 and 7.6.2A.0-2.

For Table 7.6.2A.0-2 in frequency range 1, 2 and 3, up to $\max(24,6 \cdot \lceil N_{RB} \cdot / 6 \rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7 Spurious response are applicable.

**Table 7.6.2A.0-1: Out-of-band blocking parameters**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 9 | 9 | 9 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A.<br>Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2. | | | | | | |

**Table 7.6.2A.0-2: Out of band blocking**

| CA configuration | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | Range 1 | Range 2 | Range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| CA_1C, CA_2C, CA_3B, CA_3C, CA_5B, CA_7C, CA_8B, CA_12B, CA_23B, CA_27B, CA_38C, CA_40C, CA_40D, CA_40E, CA_41C, CA_41D, CA_41E, CA_41F, CA_42C[1], CA_42D[1], CA_42E[1], CA_42F[1], CA_43C[1], CA_48C[1], CA_48D[1], CA_48E[1], CA_48F[1], CA_66B, CA_66C, CA_66D, CA_70C | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ - 15 to $F_{DL_low}$ - 60 | $F_{DL_low}$ - 60 to $F_{DL_low}$ - 85 | $F_{DL_low}$ - 85 to 1 MHz |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| Note 1: For CA_42C, the power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz. | | | | | |

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, the out-of-band blocking requirements are defined with the uplink configuration in accordance with table 7.3A.0-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.6.2.3 and 7.6.2A.0 for one component carrier and two component carriers per sub-block, respectively. The requirements apply with all downlink carriers active.

For Table 7.6.2.3-2 in frequency range 1, 2 and 3, up to $\max(24,6 \cdot \lceil N_{RB} \cdot / 6 \rceil)$ exceptions per assigned E-UTRA channel per sub-block of the E-UTRA CA configuration are allowed for spurious response frequencies when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7A.4.3 spurious response are applicable.

For Table 7.6.2.3-2 in frequency range 4, up to $\max(8, \lceil (N_{RB} + 2 \cdot L_{CRBs})/8 \rceil)$ exceptions per assigned E-UTRA channel per sub-block of the E-UTRA CA configuration are allowed for spurious response frequencies when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7A.4.3 spurious response are applicable.

For intra-band non-contiguous carrier aggregation with two uplink carriers and two downlink carriers, the out-of-band blocking requirements are defined with the uplink configuration of the PCC and SCC being in accordance with Table 7.3A.0-4 and powers of both carriers set to $P_{CMAX_L,c} - 7$ dBm. The UE shall meet the requirements specified in subclause 7.6.2A.0 for each component carrier while both downlink carriers are active.

For Table 7.6.2.3-2 in frequency range 1, 2 and 3, up to $2 \cdot \max(24, 6 \cdot \lceil N_{RB} \cdot /6 \rceil)$ exceptions per assigned E-UTRA channel per sub-block of the E-UTRA CA configuration are allowed for spurious response frequencies for two active uplinks in the same operating band when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7 spurious response are applicable.

For Table 7.6.2.3-2 in frequency range 4, up to $2 \cdot \max(8, \lceil (N_{RB} + 2 \cdot L_{CRBs})/8 \rceil)$ exceptions per assigned E-UTRA channel per sub-block of the E-UTRA CA configuration are allowed for spurious response frequencies for two active uplinks in the same operating band when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 spurious response are applicable.

For combinations of intra-band and inter-band carrier aggregation with up to five downlink carriers (up to two non-contiguously sub-blocks per band and up to four contiguously aggregated carriers per band) and the uplink assigned to one E-UTRA band, the requirement is defined with the uplink active a band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3A.0-3 when the uplink is active in the band supporting two non-contiguous component carriers, Table 7.3A.0-1 when the uplink is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.3-2 when the uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to four component carriers. For the two non-contiguous component carriers within the same band, $P_{wanted}$ in Table 7.6.2A.0-0 is set using $\Delta R_{IBNC} = 0$ dB for all sub-block gaps (Table 7.3A.0-3) while a band supporting contiguously aggregated carriers the out-of-band blocking parameters in Table 7.6.2.3-1 are replaced by those specified in Table 7.6.2A.0-1. For each downlink the UE shall meet the out-of-band blocking requirements applicable for inter-band carrier aggregation with one component carrier per operating band but with up to four component carriers assigned to the same band with the following exception. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with the single uplink carrier active in each band capable of UL operation.

The normative reference for this requirement is TS 36.101 [2] clause 7.6.2.1A.

## 7.6.2A.1 Out-of-band blocking for CA (intra-band contiguous DL CA and UL CA)

### 7.6.2A.1.1 Test Purpose

Out-of-band blocking for CA is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the UE receive band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels in aggregated signals.

For the first 15 MHz below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5A and sub-clause 7.6.1A shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

### 7.6.2A.1.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 7.6.2A.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.2A.0.

### 7.6.2A.1.4 Test Description

#### 7.6.2A.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.6.2A.1.4.1-1. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.2A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | | | Mid range | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE | | | Highest $N_{RB_agg}$ (Note 3) | | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | **UL Allocation** | | | |
| **PCC $N_{RB}$** | **SCC $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 50 | 50 | QPSK | 50+50 | QPSK | 25 | P_25@25 | S_0@0 |
| 100 | 75 | QPSK | 100+75 | QPSK | 175 | P_100@0 | S_75@0 |
| 100 | 100 | QPSK | 100+100 | QPSK | 50 | P_50@50 | S_0@0 |
| 100 | 100 | QPSK | 100+100 | QPSK | 75 | P_75@25 | S_0@0 |
| 100 | 100 | QPSK | 100+100 | QPSK | 130 | P_100@0 | S_30@0 |
| 100 | 100 | QPSK | 100+100 | QPSK | 200 | P_100@0 | S_100@0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | |
| Note 2: Depending on CA Configuration only the appropriate Uplink RB allocation value according to table 7.3A.0-1 is tested per CA Configuration Test CC combination. | | | | | | | |
| Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.34 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1
4. The UL and DL Reference Measurement channels are set according to Table 7.6.2A.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.2A.1.4.3.

#### 7.6.2A.1.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.2A.1.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.1.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.1.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal below the CA Band according to Table 7.6.2A.1.5-2. The frequency step size is 1MHz.

7. Set the downlink signal level according to the table 7.6.2A.1.5-1 for both carriers. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that for at least the duration of the throughput measurement:
The PCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.6.2A.1.5-1 + $10\log(P_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
or within (+0dB, -4 dB) of (target level in Table 7.6.2A.1.5-1 + $10\log(P_L_{CRB}/N_{RB_alloc})$) for carrier frequency 3.0GHz < $f \leq 4.2$GHz.
The SCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.6.2A.1.5-1 + $10\log(S_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
or within (+0dB, -4 dB) of (target level in Table 7.6.2A.1.5-1 + $10\log(S_L_{CRB}/N_{RB_alloc})$) for carrier frequency 3.0GHz < $f \leq 4.2$GHz.

8. Measure the average throughput for all the carrier(s) indicated in the Table 7.6.2A.7.4.2-1 simultaneously for duration sufficient to achieve statistical significance according to Annex G.2. Note that the statistical decision for each component carrier should be postponed until the statistical decisions for all component carriers are obtained simultaneously according to table G.2.4-1.

9. Record the frequencies for which the throughput doesn't meet the requirements.

10. Repeat steps from 6 to 9, using an interfering signal above the CA Band at step 5.

### 7.6.2A.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

**Table 7.6.2A.1.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

**Table 7.6.2A.1.4.3-2: UplinkPowerControlDedicatedSCell-r10**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH-r10 | 0 | | |
| deltaMCS-Enabled-r10 | en0 | | |
| accumulationEnabled-r10 | TRUE | | |
| pSRS-Offset-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| pSRS-OffsetAp-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| filterCoefficient-r10 | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| pathlossReferenceLinking-r10 | sCell | | |
| } | | | |

## 7.6.2A.1.5 Test Requirement

Except for the spurious response frequencies recorded at the final step of test procedure, the throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.6.2A.1.5-1 and 7.6.2A.1.5-2.

For Table 7.6.2A.1.5-2 in frequency range 1, 2 and 3, up to $\max(24,6\cdot\lceil N_{RB}\cdot/6\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where $N_{RB}$ is the allocated number of resource blocks in the frequency channel. For these exceptions the requirements of subclause 7.7A Spurious response for CA are applicable.

**Table 7.6.2A.1.5-1: Out-of-band blocking parameters**

| **Rx Parameter** | **Units** | **CA Bandwidth Class** | | | | |
|---|---|---|---|---|---|---|
| | | **B** | **C** | **D** | **E** | **F** |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 9 | | | |
| NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A.<br>NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2. | | | | | | |

**Table 7.6.2A.1.5-2: Out of band blocking**

| **CA configuration** | **Parameter** | **Units** | **Frequency** | | |
|---|---|---|---|---|---|
| | | | **range 1** | **range 2** | **range 3** |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| CA_1C, CA_2C, CA_3C, CA_7C, CA_8B, CA_12B, CA_23B, CA_27B, CA_38C, CA_39C, CA_40C,CA_41C, CA_42C (note) | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ - 15 to $F_{DL_low}$ - 60 | $F_{DL_low}$ - 60 to $F_{DL_low}$ - 85 | $F_{DL_low}$ - 85 to 1 MHz |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + | $F_{DL_high}$ +60 to $F_{DL_high}$ | $F_{DL_high}$ +85 to +12750 |

| | | | | | |
|---|---|---|---|---|---|
| | | | 60 | +85 | MHz |
| Note: For CA_42C, the power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz. | | | | | |

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Table 7.6.2A.1.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.2A.2 Out-of-band blocking for CA (intra-band contiguous DL CA without UL CA)

### 7.6.2A.2.1 Test Purpose

Same test purpose as 7.6.2A.1.

### 7.6.2A.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA. This test case applies only for CA Configurations that do not support UL CA.

### 7.6.2A.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.2A.0.

### 7.6.2A.2.4 Test Description

#### 7.6.2A.2.4.1 Initial Conditions

Same initial conditions as in clause 7.6.2A.1.4.1 with the following exceptions:

- Instead of Table 7.6.2A.1.4.1-1 → use Table 7.6.2A.2.4.1-1.
- Instead of clause 7.6.2A.1.4.3 → use clause 7.6.2A.2.4.3.

**Table 7.6.2A.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | | B: Mid range<br>C: Mid range | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE | | Highest $N_{RB_agg}$<br>(Note 3) | | | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | **UL Allocation** | | | |
| **PCC $N_{RB}$** | **SCC $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 15 | 50 | QPSK | 15+50 | QPSK | 15 | P_15@0 | - |
| 25 | 50 | QPSK | 25+50 | QPSK | 20 | P_20@0 | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 25 | P_25@25 | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 50 | P_50@0 | - |
| 75 | 25 | QPSK | 75+25 | QPSK | 75 | P_75@0 | |
| 75 | 50 | QPSK | 75+50 | QPSK | 75 | P_75@0 | |
| 100 | 75 | QPSK | 100+75 | QPSK | 100 | P_100@0 | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 50 | P_50@0 | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 75 | P_75@0 | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 100 | P 100@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | |
| Note 2: Depending on CA Configuration only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per CA Configuration Test CC combination. | | | | | | | |
| Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | |
| Note 4: For CA_70C 75+50 shall be tested. | | | | | | | |

7.6.2A.2.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.2.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.2.4.1-1 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal below the CA Band according to Table 7.6.2A.1.5-2. The frequency step size is 1MHz.
7. Set the downlink signal level according to the table 7.6.2A.1.5-1 for both carriers. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.2A.1.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.

8. Measure the average throughput for all the carrier(s) indicated in the Table 7.6.2A.7.4.2-1 simultaneously for duration sufficient to achieve statistical significance according to Annex G.2. Note that the statistical decision for each component carrier should be postponed until the statistical decisions for all component carriers are obtained simultaneously according to table G.2.4-1.

9. Record the frequencies for which the throughput doesn't meet the requirements.

10. Repeat steps from 6 to 9, using an interfering signal above the CA Band at step 5.

#### 7.6.2A.2.4.3 Message Contents

Same message contents as in clause 7.6.2.4.3.

### 7.6.2A.2.5 Test Requirement

Same test requirement as in clause 7.6.2A.1.5 with the following exceptions:

- Instead of Table 7.6.2A.1.5-1 → use Table 7.6.2A.2.5-1.
- Instead of Table 7.6.2A.1.5-2 → use Table 7.6.2A.2.5-2.

**Table 7.6.2A.2.5-1: Out-of-band blocking parameters**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 9 | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5.<br>Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2. | | | | | | |

**Table 7.6.2A.2.5-2: Out of band blocking**

| CA configuration | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | range 1 | range 2 | range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| CA_1C, CA_2C, CA_3C, CA_5B, CA_7C, CA_12B, CA_23B, CA_27B, CA_38C, CA_39C, CA_40C, CA_41C, CA_42C (note) , CA_66B, CA_66C, CA_70C | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ - 15 to $F_{DL_low}$ - 60 | $F_{DL_low}$ - 60 to $F_{DL_low}$ - 85 | $F_{DL_low}$ - 85 to 1 MHz |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| Note: For CA_42C, the power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz. | | | | | |

For the UE which supports inter band CA configuration in Tables 7.3.3-1A**,** 7.3.3-1B and 7.3.3-1C $P_{Interferer}$ power defined in Table 7.6.2A.2.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.2A.3 Out-of-band blocking for CA (inter-band DL CA without UL CA)

Editor's notes: This clause is incomplete for Band 46. The following aspects are either missing or not yet determined.

- Test system uncertainties are missing in annex F.

### 7.6.2A.3.1 Test Purpose

Out-of-band band blocking is defined for an unwanted CW interfering signal falling more than 15 MHz below or above (60 MHz for band 46) the UE receive band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

For the first 15 MHz below or above (60 MHz for band 46) the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5.1 and sub-clause 7.6.1 shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

### 7.6.2A.3.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support inter-band DL CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 2DL CA with FDD-TDD inter-band CA.

This test case also applies to all types of E-UTRA UE release 13 and forward that support DL LAA.

### 7.6.2A.3.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.2A.0.

### 7.6.2A.3.4 Test Description

#### 7.6.2A.3.4.1 Initial Conditions

Same initial conditions as in clause 7.6.2A.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2.
- Instead of Table 7.6.2A.1.4.1-1 → use Table 7.6.2A.3.4.1-1.
- Instead of clause 7.6.2A.1.4.3 → use clause 7.6.2A.3.4.3.

**Table 7.6.2A.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | | A: Mid range for PCC and SCC | | | | |
| Test CC Combination setting b($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE | | Highest $N_{RB_agg}$ for PCC and SCC | | | | |
| **Test Parameters for CA Configurations** | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | | **UL Allocation** | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | | **CC MOD** | **PCC $N_{RB_alloc}$** |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 50 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 25 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 20 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 16 |
| 50 | 75 | QPSK | 50 | 75 | QPSK | 25 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 50 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 25 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 20 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 16 |
| 75 | 25 | QPSK | 75 | 25 | QPSK | 75 |
| 75 | 25 | QPSK | 75 | 25 | QPSK | 20 |
| 75 | 50 | QPSK | 75 | 50 | QPSK | 25 |
| 75 | 100 | QPSK | 75 | 100 | QPSK | 25 |
| 75 | 75 | QPSK | 75 | 75 | QPSK | 25 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 100 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 75 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 50 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 100 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 50 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 100 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 75 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 50 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 45 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 25 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 20 |

| | |
|---|---|
| Note 1: | CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. |
| Note 2: | Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3A.3.5-2 for UE supporting one uplink carrier is tested per Test CA configuration. |
| Note 3: | The UL resource blocks shall be located as close as possible to the downlink PCC but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). |
| Note 4: | The frequencies of PCC and SCC shall be switched and tested in each configuration (given UL is supported in PCC band as per Table 5.2-1). |

#### 7.6.2A.3.4.2 Test Procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.3.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
6. Set the parameters of the signal generator for an interfering signal below the SCC's operating band according to Table 7.6.2 A.3.5-2, or Table 7.6.2A.3.5-2a for operating band 46 without uplink band. The frequency step size is 1 MHz.
7. Set the downlink signal level according to the table 7.6.2A.3.5-1 for both carriers. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.2A.3.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.
8. Measure the average throughput of SCC for duration sufficient to achieve statistical significance according to Annex G.2.
9. Record the frequencies for which the throughput doesn't meet the requirements.
10. Repeat steps from 6 to 9, using an interfering signal above the SCC's operating band at step 6.
11. Switch the SCell into PCell and repeat steps 1 to 10, except for operating bands without uplink band (as noted in Table 5.2-1).

#### 7.6.2A.3.4.3 Message Contents

Same message contents as in clause 7.6.2.4.3.

### 7.6.2A.3.5 Test Requirement

For inter-band carrier aggregation with uplink assigned to one E-UTRA band the out-of-band blocking requirements are defined with the uplink active on the band other than the band whose downlink is being tested i.e. the requirements are tested only for the SCell downlink. The UE shall meet the requirement for each component carrier, when operated as SCell, while both downlink carriers are active.

Except for the spurious response frequencies recorded at step 9, the throughput measured during the test procedure for each component carrier, when operated as SCell, shall be $\geq$ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.2A.3.5-1 (originated from the single carrier Table 7.6.2.5-1) and 7.6.2.3.5-2.

For frequency range 1, 2, and 3, the number of spurious response frequencies recorded in the step 9 of the test procedure shall not exceed $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ exceptions per downlink in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7A.3 Spurious Response are applicable.

**Table 7.6.2A.3.5-1: Out-of-band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.6.2A.3.5-2: Out-of-band blocking for inter-band carrier aggregation with one uplink carrier**

| Parameter | Unit | Range 1 | Range 2 | Range 3 |
|---|---|---|---|---|
| $P_w$ | dBm | Table 7.6.2A.3.5-1 for both component carriers | | |
| $P_{interferer}$ | dBm | $-44 + \Delta R_{IB,c}$ | $-30 + \Delta R_{IB,c}$ | $-15 + \Delta R_{IB,c}$ |
| $F_{interferer}$ (CW) | MHz | $-60 < f - F_{DL_Low(1)} < -15$ or $-60 < f - F_{DL_Low(2)} < -15$ or $15 < f - F_{DL_High(1)} < 60$ or $15 < f - F_{DL_High(2)} < 60$ | $-85 < f - F_{DL_Low(1)} \le -60$ or $-85 < f - F_{DL_Low(2)} \le -60$ or $60 \le f - F_{DL_High(1)} < 85$ or $60 \le f - F_{DL_High(2)} < 85$ | $1 \le f \le F_{DL_Low(1)} - 85$ or $F_{DL_High(1)} + 85 \le f \le F_{DL_Low(2)} - 85$ or $F_{DL_High(2)} + 85 \le f \le 12750$ |
| Note 1: $F_{DL_Low(1)}$ and $F_{DL_High(1)}$ denote the respective lower and upper frequency limits of the lower operating band, $F_{DL_Low(2)}$ and $F_{DL_High(2)}$ the respective lower and upper frequency limits of the upper operating band. | | | | |
| Note 2: For $F_{DL_Low(2)} - F_{DL_High(1)} < 145$ MHz and FInterferer in $F_{DL_High(1)} < f < F_{DL_Low(2)}$, $F_{Interferer}$ can be in both Range 1 and Range 2. Then the lower of the $P_{Interferer}$ applies. | | | | |
| Note 3: For $F_{DL_Low(1)} - 15$ MHz $\le f \le F_{DL_High(1)} + 15$ MHz and $F_{DL_Low(2)} - 15$ MHz $\le f \le F_{DL_High(2)} + 15$ MHz the appropriate adjacent channel selectivity and in-band blocking in the respective subclauses 7.5A.1.5 and 7.6.1A.5 shall be applied. | | | | |
| Note 4: $\Delta R_{IB,c}$ according to Table 7.3.3-1A applies when serving cell c is measured. | | | | |
| Note 5 For inter-band CA combinations containing Bands 42 or 43, the interferer with respect to Band 42 or Band 43 shall have power level ($P_{Interferer}$) for Range 3 modified to $-20 + \Delta R_{IB,c}$ dBm for $F_{Interferer} > 2800$ MHz and $F_{Interferer} < 4400$ MHz. | | | | |
| Note 6: For inter-band CA combinations containing Bands 7 and 38 simultaneously, for $F_{Interferer}$ Bands 7 and 38 are considered as one single band as follows: $F_{DL_Low} = 2570$ MHz and $F_{DL_High} = 2690$ MHz. For Range 2, the following applies for $F_{DL_Low}$: $-95 < f - F_{DL_Low} \le -60$ or $60 \le f - F_{DL_High} < 85$. For Range 3 the following applies $1 \le f \le F_{DL_Low} - 95$ or $F_{DL_High} + 85 \le f \le 12750$. | | | | |
| Note 7: For CA_20A-28A the $F_{DL_low(1)}$ is given by the lower limit of the restricted operating frequency range in Band 28 and $F_{DL_high(2)}$ by Band 20 (Table 5.2A-2). | | | | |

**Table 7.6.2A.3.5-2a: Out-of-band blocking for inter-band carrier aggregation with band 46 and with one active uplink**

| Parameter | Unit | Range 1 | Range 2 | Range 3 |
|---|---|---|---|---|
| $P_{wanted}$ | dBm | Table 7.6.2A.3.5-1 for both component carriers | | |
| $P_{interferer}$ | dBm | $-44 + \Delta R_{IB,c}$ | $-30 + \Delta R_{IB,c}$ | $-15 + \Delta R_{IB,c}$ (NOTE 5) |
| $F_{interferer}$ (CW) | MHz | $-60 < f - F_{DL_Low(1)} < -15$ or $15 < f - F_{DL_High(1)} < 60$ | $-85 < f - F_{DL_Low(1)} \le -60$ or $-85 < f - F_{DL_Low(2)} \le -60$ or $60 \le f - F_{DL_High(1)} < 85$ or $60 \le f - F_{DL_High(2)} < 85$ | $1 \le f \le F_{DL_Low(1)} - 85$ or $1 \le f \le F_{DL_Low(2)} - 85$ or $F_{DL_High(1)} + 85 \le f \le 12750$ or $F_{DL_High(2)} + 85 \le f \le 12750$ |

NOTE 1: $F_{DL_Low(1)}$ and $F_{DL_High(1)}$ denote the respective lower and upper frequency limits of the lower operating band, $F_{DL_Low(2)}$ and $F_{DL_High(2)}$ the respective lower and upper frequency limits of the upper operating band.
NOTE 2: For $F_{DL_Low(1)} - 15$ MHz ≤ f ≤ $F_{DL_High(1)} + 15$ MHz the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5.1A and 7.6.1.1A shall be applied.
NOTE 3: For $F_{DL_Low(2)} - 60$ MHz ≤ f ≤ $F_{DL_High(2)} + 60$ MHz the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5.1A and 7.6.1.1A shall be applied.
NOTE 4: RIB,c according to Table 7.3.1-1A applies when serving cell c is measured.
NOTE 5: The power level ($P_{Interferer}$) for Range 3 is modified to -20 dBm for $F_{Interferer}$ > 4400 MHz except for band combinations with Band 42 or Band 43 for which $P_{Interferer}$ for Range 3 is modified to -20 dBm for $F_{Interferer}$ > 2800 MHz.

## 7.6.2A.4 Out-of-band blocking for CA (intra-band non-contiguous DL CA without UL CA)

### 7.6.2A.4.1 Test Purpose

Same as in clause 7.6.2A.1.1.

### 7.6.2A.4.2 Test Applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA but no UL CA.

### 7.6.2A.4.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.2A.0.

### 7.6.2A.4.4 Test description

#### 7.6.2A.4.4.1 Initial Conditions

Same as in clause 7.6.2A.1.4.1 with the following exceptions:

- Instead of Table 7.6.2A.1.4.1-1→ use Table 7.6.2A.4.4.1-1.

**Table 7.6.2A.4.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes , and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | A: N/A (Range is not relevant) |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration. | highest $N_{RB_agg}$ |
| **Test Parameters for CA Configurations** | |
| use the content of Table 7.3A.4.4.1-1 and test only for each CA configuration highest $N_{RB_agg}$, | |

### 7.6.2A.4.4.2 Test Procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.2A.4.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.4.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
6. Set the parameters of the signal generator for an interfering signal below the CA band according to Table 7.6.2.5-2. The frequency step size is 1 MHz.
7. Set the downlink signal level according to the table 7.6.2.5-1 for both carriers. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.2.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.
8. Measure the average throughput for all the carrier(s) indicated in the Table 7.6.2A.7.4.2-1 simultaneously for duration sufficient to achieve statistical significance according to Annex G.2. Note that the statistical decision for each component carrier should be postponed until the statistical decisions for all component carriers are obtained simultaneously according to table G.2.4-1.
9. Record the frequencies for which the throughput doesn't meet the requirements.
10. Repeat steps from 6 to 9, using an interfering signal above the CA band at step 6.

### 7.6.2A.4.4.3 Message Contents

Same message contents as in clause 7.6.2.4.3.

## 7.6.2A.4.5 Test Requirement

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink carriers, the out-of-band blocking requirements are defined with the uplink configuration of the PCC being in accordance with table 7.3.1A-3.The UE shall meet the requirements specified in tables 7.6.2A.4.5-1 and 7.6.2A.4.5-2 for each component carrier while both downlink carriers are active.

The out-of-band blocking parameters in tables 7.6.2A.4.5-1 and 7.6.2A.4.5-2 for each component carrier are the same as single carrier requirements in Tables 7.6.2.5-1 and 7.6.2.5-2.

For Table 7.6.2A.4.5-2 in frequency range 1, 2 and 3, the number of spurious response frequencies recorded in the step 9 of the test procedure shall not exceed $\max(24,6\cdot\lceil N_{RB}\cdot/6\rceil)$ exceptions per assigned E-UTRA channel per sub-block

gap of the E-UTRA CA configuration are allowed for spurious response frequencies when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7A.4 spurious response are applicable.

For Table 7.6.2A.4.5-2 in frequency range 4 the number of spurious response frequencies recorded in the step 9 of the test procedure shall not exceed $\max(8, \lceil (N_{RB} + 2 \cdot L_{CRBs})/8 \rceil)$ exceptions per assigned E-UTRA channel per sub-block gap of the E-UTRA CA configuration are allowed for spurious response frequencies when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7A.4 spurious response are applicable.

**Table 7.6.2A.4.5-1: Out-of-band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.6.2A.4.5-2: Out of band blocking**

| E-UTRA band | Parameter | Units | Frequency | | | |
|---|---|---|---|---|---|---|
| | | | range 1 | range 2 | range 3 | range 4 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 | -15 |
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 (Note 4), 43 (Note 4),44, 66 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -15 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz | - |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz | - |
| 2, 5, 12, 17 | $F_{Interferer}$ | MHz | - | - | - | $F_{UL_low}$ - $F_{UL_high}$ |
| Note 1: Range 3 shall be tested only with the highest channel bandwidth. | | | | | | |
| Note 2: For the UE which supports both Band 11 and Band 21 the out of band blocking is FFS. | | | | | | |
| Note 3: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz. | | | | | | |
| Note 4: For the UE that supports both Band 4 and Band 66, the out-of-blocking frequency range for Band 4 is defined relative to $F_{DL_low}$ and $F_{DL_high}$ of Band 66. | | | | | | |

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Table 7.6.2A.4.5-2 is increased by the amount given by $\Delta_{RIB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.2A.5 Out-of-band blocking for 3DL CA

### 7.6.2A.5.1 Test Purpose

Same test purpose as in clause 7.6.2A.3.1.

### 7.6.2A.5.2 Test Applicability

This test case applies to all types of E-UTRA UE and forward that support 3DL with CA configurations in Table 7.1-2a.

This test case also applies to all types of E-UTRA UE release 13 and forward that support 3DL CA involving Band 46.

### 7.6.2A.5.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.2A.0.

### 7.6.2A.5.4 Test Description

#### 7.6.2A.5.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.2A.5.4.1-1 through table 7.6.2A.5.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.2A.5.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to "Range" columns. For mapping within Band refer to "CC" columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to "PCC $N_{RB}$" and "SCCs $N_{RB}$" columns |
| Network signalling value | NS_01 by default |

**Test Parameters for CA Configurations**

| ID | PCC | | | | SCC1 | | | | SCC2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3) | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for a CA_XD Configuration (Intra-band contiguous)** | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | X | Mid/CC3 | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA Configuration (Inter-band)** | | | | | | | | | | | | |
| **1** | X | Mid | REFSENS | All RBs | Y | Mid | N/A | All RBs | Z | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | All RBs | X | Mid | N/A | All RBs | Z | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | All RBs | X | Mid | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Test Settings for CA_1A-18A-28A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 50@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **2** | 1 | Low | 75@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **3** | 1 | Low | 100@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **4** | 1 | Low | 100@0 | All RBs | 18 | Mid | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **5** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 50 |
| **6** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 50 |
| **7** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **8** | 18 | Mid | 25@50 | All RBs | 1 | Low | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |
| **9** | 18 | Mid | 25@50 | All RBs | 1 | Low | N/A | All RBs | 28 | High | N/A | All RBs |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **10** | 28 | High | 25@0 | All RBs | 1 | Low | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **11** | 28 | Mid | 25@25 | All RBs | 1 | Low | N/A | All RBs | 18 | Low | N/A | All RBs |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 50 |
| **12** | 28 | High | 25@25 | All RBs | 1 | High | N/A | All RBs | 18 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 75 |
| **Default Test Settings for CA_XB-YA and CA_XC-YA Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | All RBs | X | Mid/CC1 | N/A | All RBs | X | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-YB and CA_XA-YC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | |
| **1** | Y | Mid/CC1 | REFSENS | All RBs | Y | Mid/CC2 | N/A | All RBs | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid | REFSENS | All RBs | Y | Mid/CC1 | N/A | All RBs | Y | Mid/CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band contiguous:** X corresponds to the band in the CA Configuration. E.g. for CA_41D, X=41
Note 5: **Inter-band:** X,Y,Z correspond to the 1st, 2nd and 3rd band in the CA Configuration. E.g. for CA_1A-3A-19A, X=1, Y=3, Z=19
Note 6: **Intra-band contiguous + Inter-band:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_1C-3A, X=1 and Y=3
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 9: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC} = N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.
Note 10: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 11: ID/test points that result in no refsens requirement shall be skipped.

**Table 7.6.2A.5.4.1-2: Test Configuration Table with $W_{gap}$**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to "Range" columns. For mapping within Band refer to "CC" columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3,4) | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for CA_XA-XA-YA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | X | CC2 | REFSENS | All RBs | Max | X | CC1 | N/A | All RBs | - | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| 2 | Y | Mid | REFSENS | All RBs | - | X | CC2 | N/A | All RBs | Max | X | CC1 | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| **Default Test Settings for CA_XA-YA-YA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | Y | CC2 | REFSENS | All RBs | Max | Y | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| 2 | X | Mid | REFSENS | All RBs | - | Y | CC2 | N/A | All RBs | Max | Y | CC1 | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| **Test Settings for CA_29A-66A-66A Configuration (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | 29 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **Test Settings for a CA_41C-41A Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 1 | 41 | CC3 | 100@0 | All RBs | 134.2 | 41 | CC2 | N/A | All RBs | - | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_41A-41C Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 2 | 41 | CC3 | 100@0 | All RBs | - | 41 | CC2 | N/A | All RBs | 134.2 | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Group Test Settings for CA_66A-66A-XA or CA_XA-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| 2 | X | Mid | REFSENS | All RBs | - | 66 | CC1 | N/A | All RBs | 50 | 66 | CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_66A-66C Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 30.2 | 66 | CC2 | N/A | All RBs | - | 66 | CC3 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.

Note 2: **Intra-band non-contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.

Note 3: **Intra-band non-contiguous + Intra-band contiguous:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.

Note 4: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.

Note 5: **Intra-band non-contiguous + Inter-band:** X and Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A,X=2,Y=5

Note 6: **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A,X=41.
Note 7: **Intra-band non-contiguous + Inter-band:** REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RE allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.
Note 10: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 11: ID/test points that result in no refsens requirement shall be skipped.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.58 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 7.6.2A.5.4.1-1 through Table 7.6.2A.5.4.1-2 as appropriate.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.2A.5.4.3.

### 7.6.2A.5.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.2A.5.4.3
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.5.4.1-1 through Table 7.6.2A.5.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.5.4.1-1 through Table 7.6.2A.5.4.1-2 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal below the lowest CA Band according to the table indicated in the column "Table with interferer parameters to select" of Table 7.6.2A.5.4.2-1. The frequency step size is 1MHz. Use the highest $\Delta R_{IB,c}$ among CA bands for $P_{interferer}$ calculation.
7. Set the downlink signal level according to the table indicated in the column "Table with transmission parameters to select" of Table 7.6.2A.5.4.2-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.2A.5.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the throughput measurement.
8. Measure the average throughput for all the carrier(s) indicated in the Table 7.6.2A.7.4.2-1 simultaneously for duration sufficient to achieve statistical significance according to Annex G.2. Note that the statistical decision for each component carrier should be postponed until the statistical decisions for all component carriers are obtained simultaneously according to table G.2.4-1.
9. Record the frequencies for which the throughput doesn't meet the requirements and for each frequency, the carriers for which the throughput was not met.

10. Repeat steps 6 to 8 for each recorded frequency-carrier pair, with exception of pairs for which $\Delta R_{IB,c}$ is the same as $\Delta R_{IB}$ used in Step 6. In Step 6 use only recorded frequencies for interferer placement and use $\Delta R_{IB,c}$ relevant to recorded carrier for $P_{interferer}$ calculation. Remove the frequency-carrier pairs that meet the throughput requirements from the record.

11. If the CA Configuration includes multiple bands, repeat steps from 6 to 10 using an interfering signal in each gap between the CA bands, according to the table indicated in the column "Table with interferer parameters to select" of Table 7.6.2A.5.4.2-1.

12. Repeat steps from 6 to 10, using an interfering signal above the highest CA Band according to the table indicated in the column "Table with interferer parameters to select" of Table 7.6.2A.5.4.2-1.

13. Repeat steps 1 to 12 for each row of "Throughput measured on" column listed in the Table 7.6.2A.5.4.2-1.

**Table 7.6.2A.5.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with transmission parameters to select | Table with interferer parameters to select (Note 2) |
|---|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2 | 7.6.2A.5.5-1 | 7.6.2A.5.5-2 |
| | 2 | | | |
| Inter-band | 1 | SCC1, SCC2 | 7.6.2A.5.5-3 | 7.6.2A.5.5-4 |
| | 2 | SCC1, SCC2 | | |
| | 3 | SCC1, SCC2 | | |
| Intra-band contiguous + Inter-band | 1 | SCC2 | 7.6.2A.5.5-3 | 7.6.2A.5.5-4 (Note 4) |
| | 2 | SCC1, SCC2 | 7.6.2A.5.5-1 | 7.6.2A.5.5-2 (Note 5) |
| Intra-band non-contiguous + Inter-band | 1 | SCC2 | 7.6.2A.5.5-3 | 7.6.2A.5.5-4 (Note 6) |
| | 2 | SCC1, | 7.6.2A.5.5-3 | 7.6.2A.5.5-5 (Note 5) |
| | | SCC2 | | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.6.2A.5.5-3 | 7.6.2A.5.5-5 (Note 4) |
| | | SCC1, SCC2 | 7.6.2A.5.5-1 | 7.6.2A.5.5-2 (Note 6) |
| | 2 | SCC2 | 7.6.2A.5.5-3 | 7.6.2A.5.5-5 (Note 4) |
| | | PCC, SCC1 | 7.6.2A.5.5-1 | 7.6.2A.5.5-2 (Note 6) |

Note 1: Test point ID for the particular CA configuration as defined in section 7.6.2A.5.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.
Note 4: When interferer position is within range 1 or 2 frequency of other CC block, Pinterfer is selected from table 7.6.2A.5.5-2. When interferer position is closer than 15 MHz from other CC block interferer is OFF.
Note 5: When interferer position is within range 1 or 2 frequency of other CC block, Pinterfer is selected from table 7.6.2A.5.5-4. When interferer position is closer than 15 MHz from other CC block interferer is OFF.
Note 6: When interferer position is within range 1 or 2 frequency of other CC block, Pinterfer is selected from table 7.6.2A.5.5-5. When interferer position is closer than 15 MHz from other CC block interferer is OFF.

### 7.6.2A.5.4.3 Message Contents

Same message contents as in clause 7.6.2.4.3 for without UL CA.

Same message contents as in clause 7.6.2A.1.4.3 for UL CA.

## 7.6.2A.5.5 Test Requirement

Except for the spurious response frequencies recorded at the final step of test procedure, the throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table s below, according to the type of CA.

For Table 7.6.2A.5.5-2 in frequency range 1, 2 and 3, up to $\max(24,6\cdot\lceil N_{RB}\cdot/6\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where $N_{RB}$ is the

allocated number of resource blocks in the frequency channel. For these exceptions the requirements of subclause 7.7A.5 Spurious Response for CA are applicable.

**Table 7.6.2A.5.5-1: Out-of-band blocking parameters (intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 9 | 9 | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5.<br>Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2. | | | | | | |

**Table 7.6.2A.5.5-2: Out of band blocking (intra-band contiguous)**

| CA configuration | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | range 1 | range 2 | range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| CA_1C, CA_2C, CA_3C, CA_7C , CA_12B, CA_23B, CA_27B, CA_38C, CA_40C, CA_41C, CA_40D, CA_42C (Note) , CA_66C | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ - 15 to $F_{DL_low}$ - 60 | $F_{DL_low}$ - 60 to $F_{DL_low}$ - 85 | $F_{DL_low}$ - 85 to 1 MHz |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| Note: For CA_42C, the power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz. | | | | | |

For Table 7.6.2A.5.5-4 frequency range 1, 2, and 3, the number of spurious response frequencies recorded in the step 9 of the test procedure shall not exceed $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ exceptions per downlink in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7A.5 Spurious Response for CA are applicable.

**Table 7.6.2A.5.5-3: Out-of-band blocking parameters (inter-band, intra-band non-contiguous)**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.6.2A.5.5-4: Out-of-band blocking for inter-band carrier aggregation with one uplink carrier**

| Parameter | Unit | Range 1 | Range 2 | Range 3 |
|---|---|---|---|---|
| $P_{wanted}$ | dBm | Table 7.6.2A.5.5-3 for all component carriers | | |
| $P_{interferer}$ | dBm | $-44 + \Delta R_{IB,c}$ | $-30 + \Delta R_{IB,c}$ | $-15 + \Delta R_{IB,c}$ |
| $F_{interferer}$ (CW) | MHz | $-60 < f - F_{DL_Low(j)} < -15$ or $15 < f - F_{DL_High(j)} < 60$ | $-85 < f - F_{DL_Low(j)} \le -60$ or $60 \le f - F_{DL_High(j)} < 85$ | $1 \le f \le F_{DL_Low(j)} - 85$ or $F_{DL_High(j)} + 85 \le f \le F_{DL_Low(j+1)} - 85$ or $F_{DL_High(X)} + 85 \le f \le 12750$ |

Note 1: $F_{DL_Low(j)}$ and $F_{DL_High(j)}$ denote the respective lower and upper frequency limits of the operating band containing carrier *j*, *j* = 1,…,X, with carriers numbered in increasing order of carrier frequency and X the number of component carriers in the band combination (X = 2 or X = 3 for the present version of this specification).

Note 2: For $F_{DL_Low(j+1)} - F_{DL_High(j)} < 145$ MHz and $F_{Interferer}$ in $F_{DL_High(j)} < f < F_{DL_Low(j+1)}$, $F_{Interferer}$ can be in both Range 1 and Range 2. Then the lower of the $P_{Interferer}$ applies.

Note 3: For $F_{DL_Low(j)} - 15$ MHz ≤ f ≤ $F_{DL_High(j)} + 15$ MHz the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5A.5.5 and 7.6.1A.5.5 shall be applied for carrier *j*.

Note 4: $\Delta R_{IB,c}$ according to Table 7.3.3-1A applies when serving cell c is measured.

Note 5: For inter-band CA combinations containing Bands 42 or 43, the interferer with respect to Band 42 or Band 43 shall have power level ($P_{Interferer}$) for Range 3 modified to $-20 + \Delta R_{IB,c}$ dBm for $F_{Interferer} > 2800$ MHz and $F_{Interferer} < 4400$ MHz.

**Table 7.6.2A.5.5-4a: Out-of-band blocking for inter-band carrier aggregation with band 46 and with one active uplink**

| Parameter | Unit | Range 1 | Range 2 | Range 3 |
|---|---|---|---|---|
| $P_{wanted}$ | dBm | Table 7.6.2A.5.5-3 for all component carriers | | |
| $P_{interferer}$ | dBm | $-44 + \Delta R_{IB,c}$ | $-30 + \Delta R_{IB,c}$ | $-15 + \Delta R_{IB,c}$ (NOTE 5) |
| $F_{interferer}$ (CW) | MHz | $-60 < f - F_{DL_Low(j)} < -15$ with $j \le K$ or $15 < f - F_{DL_High(j)} < 60$ with $j \le K$ | $-85 < f - F_{DL_Low(j)} \le -60$ or $60 \le f - F_{DL_High(j)} < 85$ | $1 \le f \le F_{DL_Low(j)} - 85$ or $F_{DL_High(j)} + 85 \le f \le 12750$ |

NOTE 1: $F_{DL_Low(j)}$ and $F_{DL_High(j)}$, *j* = 1,…,K,…N, denote the respective lower and upper frequency limits of the (non-overlapping) operating bands of the CA configuration numbered in increasing order of frequency, with N the number of bands in the band combination and K the number of bands with $F_{DL_High} \le 3800$ MHz.

NOTE 2: For $F_{DL_Low(j)} - 15$ MHz ≤ f ≤ $F_{DL_High(j)} + 15$ MHz the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5A.5.5 and 7.6.1A.5.5 shall be applied for carrier $j \le K$.

NOTE 3: For $F_{DL_Low(j)} - 60$ MHz ≤ f ≤ $F_{DL_High(j)} + 60$ MHz the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5A.5.5 and 7.6.1A.5.5 shall be applied for carrier $K < j \le N$.

NOTE 4: $\Delta R_{IB,c}$ according to Table 7.3.3-1A applies when serving cell *c* is measured.

NOTE 5: The power level ($P_{Interferer}$) for Range 3 is modified to -20 dBm for $F_{Interferer} > 4400$ MHz except for band combinations with Band 42 or Band 43 for which $P_{Interferer}$ for Range 3 is modified to -20 dBm for $F_{Interferer} > 2800$ MHz.

For Table 7.6.2A.5.5-5 in frequency range 1, 2 and 3, the number of spurious response frequencies recorded in the step 9 of the test procedure shall not exceed $\max(24, 6 \cdot \lceil N_{RB} \cdot / 6 \rceil)$ exceptions per assigned E-UTRA channel per sub-block gap of the E-UTRA CA configuration are allowed for spurious response frequencies when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7A.5 spurious response for CA are applicable.

For Table 7.6.2A.5.5-5 in frequency range 4 the number of spurious response frequencies recorded in the step 9 of the test procedure shall not exceed $\max(8, \lceil (N_{RB} + 2 \cdot L_{CRBs}) / 8 \rceil)$ exceptions per assigned E-UTRA channel per sub-block gap of the E-UTRA CA configuration are allowed for spurious response frequencies when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7A.5 spurious response for CA are applicable.

**Table 7.6.2A.5.5-5: Out of band blocking (intra-band non-contiguous)**

| E-UTRA band | Parameter | Units | Frequency | | | |
|---|---|---|---|---|---|---|
| | | | range 1 | range 2 | range 3 | range 4 |

| | $P_{Interferer}$ | dBm | -44 | -30 | -15 | -15 |
|---|---|---|---|---|---|---|
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 (Note 4), 43 (Note 4), 44, 66 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -15 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz | - |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz | - |
| 2, 5, 12, 17 | $F_{Interferer}$ | MHz | - | - | - | $F_{UL_low}$ - $F_{UL_high}$ |
| Note 1: Range 3 shall be tested only with the highest channel bandwidth.<br>Note 2: For the UE which supports both Band 11 and Band 21 the out of band blocking is FFS.<br>Note 3: For intra-band non-contiguous + inter-band CA, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps.<br>Note 4: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz. | | | | | | |

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Tables 7.6.2A.5.5 2, 7.6.2A.5.5-4 and 7.6.2A.5.5-5 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C accordingly.

## 7.6.2A.6

## 7.6.2A.7 Out-of-band blocking for 4DL CA

### 7.6.2A.7.1 Test Purpose

Same test purpose as in clause 7.6.2A.1.

### 7.6.2A.7.2 Test Applicability

This test case applies to all types of E-UTRA UE and forward that support 4DL with CA configurations in Table 7.1-2b.

### 7.6.2A.7.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.2A.0.

### 7.6.2A.7.4 Test Description

#### 7.6.2A.7.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.2A.7.4.1-1 through table 7.6.2A.7.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.2A.7.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC $N_{RB}$" and “SCCs $N_{RB}$ ” columns |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for a CA_XE Configuration (Intra-band contiguous)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REFSENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/ CC1 | REFSENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YD, YD-XA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | R | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings for CA_XB-YA-ZA and CA_XC-YA-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-XB-ZA and CA_YA-XC-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XB and CA_YA-ZA-XC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REFSENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Test Settings for CA_2A-66C-71A Configuration** | | | | | | | | | | | | | | | | |
| **1** | 66 | Mid/CC1 | 100@0 | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 2 | Low | 100@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 71 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **Default Test Settings for CA_XC-YC Configuration (Intra-band contiguous + Inter-band(2))** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL |

| | | | | | | | | | | | | | | | | RBs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 4: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41E, X=41.
Note 6: **Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-8A,X=1,Y=3,Z=7,R=8.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_3C-7A-28A, X=3,Y=7 and Z=28.
Note 8: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC}$ = $N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.
Note 11: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 12: ID/test points that result in no refsens requirement shall be skipped.

**Table 7.6.2A.7.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | | $W_{gap}$ [MHz] | SCC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for CA_XA-XA-YA-ZA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-ZA-YA-YA Configurations Intra-band non-contiguous + Inter-band** | | | | | | | | | | | | | | | | | | | |
| **1** | Y | CC2 | REFSENS | ALL RBs | Max | Y | CC1 | N/A | ALL RBs | - | X | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | X | Mid | REFSENS | ALL RBs | - | Y | CC2 | N/A | ALL RBs | Max | Y | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | - | X | Mid | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | Max | Y | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Default Test Settings for CA_66A-66A-YA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-66A-66A-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | |
| **1** | X | CC1 | REFSENS | ALL RBs | Max | X | CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC1 | N/A | ALL RBs | Max | X | CC2 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC1 | N/A | ALL RBs | Max | X | CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YC Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YC-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | REFSENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Y | Mid/ CC1 | N/A | ALL RBs | - | Y | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ |
| **2** | Y | Mid/ CC1 | REFSENS | ALL RBs | - | Y | Mid/ CC2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XD/XD-XA/XC-XC Configurations (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | | | | | |
| **TBD** | | | | | | | | | | | | | | | | | | |
| **Default Test Settings for CA_XA-XA-YA-YA Configurations (Intra-band non-contiguous + Intra-band non-contiguous)** | | | | | | | | | | | | | | | | | | |
| **1** | X | CC4 | REFSENS | ALL RBs | Max | X | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | Max | Y | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | CC4 | REFSENS | ALL RBs | Max | Y | CC3 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.

| | |
|---|---|
| Note 3: | If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable. |
| Note 4: | **Intra-band non-contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-12A,X=2,Y=4,Z=12. |
| Note 5: | **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A-41A,X=41. |
| Note 6: | **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-4A,X=2,Y=4. |
| Note 7: | REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2. |
| Note 8: | **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing. |
| Note 9: | The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs. |
| Note 10: | ID/test points that result in no refsens requirement shall be skipped. |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.58 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 7.6.2A.7.4.1-1 through Table 7.6.2A.7.4.1-2 as appropriate.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.2A.7.4.3.

### 7.6.2A.7.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.2A.7.4.3
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.7.4.1-1 through Table 7.6.2A.7.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.7.4.1-1 through Table 7.6.2A.7.4.1-2 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal below the lowest CA Band according to the table indicated in the column "Table with interferer parameters to select" of Table 7.6.2A.7.4.2-1. The frequency step size is 1MHz. Use the highest $\Delta R_{IB,c}$ among CA bands for $P_{interferer}$ calculation.
7. Set the downlink signal level according to the table indicated in the column "Table with transmission parameters to select" of Table 7.6.2A.7.4.2-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.2A.7.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.
8. Measure the average throughput for all the carrier(s) indicated in the Table 7.6.2A.7.4.2-1 simultaneously for duration sufficient to achieve statistical significance according to Annex G.2. Note that the statistical decision for each component carrier should be postponed until the statistical decisions for all component carriers are obtained simultaneously according to table G.2.4-1.
9. Record the frequencies for which the throughput doesn't meet the requirements and for each frequency, the carriers for which the throughput was not met.
10. Repeat steps 6 to 8 for each recorded frequency-carrier pair, with exception of pairs for which $\Delta R_{IB,c}$ is the same as $\Delta R_{IB}$ used in Step 6. In Step 6 use only recorded frequencies for interferer placement and use $\Delta R_{IB,c}$ relevant to recorded carrier for $P_{interferer}$ calculation. Remove the frequency-carrier pairs that meet the throughput requirements from the record.
11. If the CA Configuration includes multiple bands, repeat steps from 6 to 10 using an interfering signal in each gap between the CA bands, according to the table indicated in the column "Table with interferer parameters to select" of Table 7.6.2A.7.4.2-1.
12. Repeat steps from 6 to 10, using an interfering signal above the highest CA Band according to the table indicated in the column "Table with interferer parameters to select" of Table 7.6.2A.7.4.2-1.
13. Repeat steps 1 to 12 for each row of "Throughput measured on" column listed in the Table 7.6.2A.7.4.2-1.

**Table 7.6.2A.7.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with transmission parameters to select | Table with interferer parameters to select (Note 2) |
|---|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2, SCC3 | 7.6.2A.7.5-1 | 7.6.2A.7.5-2 |
| Inter-band | 1 | SCC1, SCC2, SCC3 | 7.6.2A.7.5-3 | 7.6.2A.7.5-4 |
| | 2 | SCC1, SCC2, SCC3 | | |
| | 3 | SCC1, SCC2, SCC3 | | |
| | 4 | SCC1, SCC2, SCC3 | | |
| Intra-band contiguous + Inter-band | 1 | SCC2, SCC3 | 7.6.2A.7.5-3 | 7.6.2A.7.5-4 (Note 4) |
| | 2 | SCC1, SCC2 | 7.6.2A.7.5-1 | 7.6.2A.7.5-2 (Note 5) |
| | | SCC3 | 7.6.2A.7.5-3 | 7.6.2A.7.5-4 (Note 4) |
| | 3 | SCC1 | 7.6.2A.7.5-3 | 7.6.2A.7.5-4 (Note 4) |
| | | SCC2, SCC3 | 7.6.2A.7.5-1 | 7.6.2A.7.5-2 (Note 5) |
| Intra-band contiguous + Inter-band(2) | 1 | SCC2, SCC3 | 7.6.2A.7.5-1 | 7.6.2A.7.5-2 (Note 5) |
| | 2 | SCC2, SCC3 | 7.6.2A.7.5-1 | 7.6.2A.7.5-2 (Note 5) |
| Intra-band non-contiguous + Inter-band | 1 | SCC2, SCC3 | 7.6.2A.7.5-3 | 7.6.2A.7.5-4 (Note 6) |
| | 2 | SCC1, SCC2 | 7.6.2A.7.5-3 | 7.6.2A.7.5-5 (Note 5) |
| | | SCC3 | 7.6.2A.7.5-3 | 7.6.2A.7.5-4 (Note 6) |
| | 3 | SCC1 | 7.6.2A.7.5-3 | 7.6.2A.7.5-4 (Note 6) |
| | | SCC2, SCC3 | 7.6.2A.7.5-3 | 7.6.2A.7.5-5 (Note 5) |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.6.2A.7.5-3 | 7.6.2A.7.5-5 (Note 4) |
| | | SCC1, SCC2, SCC3 | 7.6.2A.7.5-1 | 7.6.2A.7.5-2 (Note 6) |
| | 2 | SCC2 | 7.6.2A.7.5-3 | 7.6.2A.7.5-5 (Note 4) |
| | | PCC, SCC1, SCC3 | 7.6.2A.7.5-1 | 7.6.2A.7.5-2 (Note 6) |
| Intra-band non-contiguous + Intra-band non-contiguous | 1 | SCC2, SCC3 | 7.6.2A.7.5-3 | 7.6.2A.7.5-5 |
| | 2 | | | |

Note 1: Test point ID for the particular CA configuration as defined in section 7.6.2A.7.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.
Note 4: When interferer position is within range 1 or 2 frequency of other CC block, Pinterfer is selected from table 7.6.2A.7.5-2. When interferer position is closer than 15 MHz from other CC block interferer is OFF.
Note 5: When interferer position is within range 1 or 2 frequency of other CC block, Pinterfer is selected from table 7.6.2A.7.5-4. When interferer position is closer than 15 MHz from other CC block interferer is OFF.
Note 6: When interferer position is within range 1 or 2 frequency of other CC block, Pinterfer is selected from table 7.6.2A.7.5-5. When interferer position is closer than 15 MHz from other CC block interferer is OFF.

### 7.6.2A.7.4.3 Message Contents

Same message contents as in clause 7.6.2.4.3 for without UL CA.

Same message contents as in clause 7.6.2A.1.4.3 for UL CA.

## 7.6.2A.7.5 Test Requirement

Except for the spurious response frequencies recorded at the final step of test procedure, the throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table s below, according to the type of CA.

For Table 7.6.2A.7.5-2 in frequency range 1, 2 and 3, up to $\max(24,6\cdot\lceil N_{RB}\cdot/6\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where $N_{RB}$ is the allocated number of resource blocks in the frequency channel. For these exceptions the requirements of subclause 7.7A.5 Spurious Response for CA are applicable.

**Table 7.6.2A.7.5-1: Out-of-band blocking parameters (intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 9 | 9 | 9 | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A.<br>Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2. | | | | | | |

**Table 7.6.2A.7.5-2: Out of band blocking (intra-band contiguous)**

| CA configuration | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | range 1 | range 2 | range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| CA_1C, CA_2C, CA_3C, CA_5B, CA_7C, CA_8B, CA_12B, CA_23B, CA_27B, CA_38C, CA_40C, CA_41C, CA_40D, CA_40E, CA_42C[1], CA_42D[1], CA_42E[1], CA_66B, CA_66C, CA_66D, CA_70C | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ - 15 to $F_{DL_low}$ - 60 | $F_{DL_low}$ - 60 to $F_{DL_low}$ - 85 | $F_{DL_low}$ - 85 to 1 MHz |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| Note 1: The power level of the interferer ($P_{Interferer}$) for this CA configuration for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz. | | | | | |

For Table 7.6.2A.7.5-4 frequency range 1, 2, and 3, the number of spurious response frequencies recorded in the step 9 of the test procedure shall not exceed $\max(24, \ 6 \cdot \lceil N_{RB} / 6 \rceil)$ exceptions per downlink in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7A.5 Spurious Response for CA are applicable.

**Table 7.6.2A.7.5-3: Out-of-band blocking parameters (inter-band, intra-band non-contiguous)**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.<br>NOTE 3: The REFSENS power level is specified in Table 7.3.1-1 and Table 7.3.1-1a for two and four antenna ports, respectively. | | | | | | | |

**Table 7.6.2A.7.5-4: Out-of-band blocking for inter-band carrier aggregation with one uplink carrier**

| Parameter | Unit | Range 1 | Range 2 | Range 3 |
|---|---|---|---|---|
| $P_{wanted}$ | dBm | Table 7.6.2A.7.5-3 for all component carriers | | |
| $P_{interferer}$ | dBm | $-44 + \Delta R_{IB,c}$ | $-30 + \Delta R_{IB,c}$ | $-15 + \Delta R_{IB,c}$ |
| $F_{interferer}$ (CW) | MHz | $-60 < f - F_{DL_Low(j)} < -15$ or $15 < f - F_{DL_High(j)} < 60$ | $-85 < f - F_{DL_Low(j)} \le -60$ or $60 \le f - F_{DL_High(j)} < 85$ | $1 \le f \le F_{DL_Low(j)} - 85$ or $F_{DL_High(j)} + 85 \le f \le F_{DL_Low(j+1)} - 85$ with $j < X$ or $F_{DL_High(X)} + 85 \le f \le 12750$ |

Note 1: $F_{DL_Low(j)}$ and $F_{DL_High(j)}$ denote the respective lower and upper frequency limits of the operating band containing carrier $j$, $j$ = 1,…,X, with carriers numbered in increasing order of carrier frequency and X the number of component carriers in the band combination (X ≤ 5 for the present version of this specification).

Note 2: For $F_{DL_Low(j+1)} - F_{DL_High(j)} < 145$ MHz and $F_{Interferer}$ in $F_{DL_High(j)} < f < F_{DL_Low(j+1)}$, $F_{Interferer}$ can be in both Range 1 and Range 2. Then the lower of the $P_{Interferer}$ applies.

Note 3: For $F_{DL_Low(j)} - 15$ MHz ≤ f ≤ $F_{DL_High(j)} + 15$ MHz the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5A.5.5 and 7.6.1A.5.5 shall be applied for carrier $j$.

Note 4: $\Delta R_{IB,c}$ according to Table 7.3.3-1A applies when serving cell c is measured.

Note 5: For inter-band CA combinations containing Bands 42 or 43, the interferer with respect to Band 42 or Band 43 shall have power level ($P_{Interferer}$) for Range 3 modified to $-20 + \Delta R_{IB,c}$ dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz.

Note 6: For inter-band CA combinations containing Bands 7 and 38 simultaneously, for $F_{Interferer}$ Bands 7 and 38 are considered as one single band as follows: $F_{DL_Low}$ = 2570 MHz and $F_{DL_High}$ = 2690 MHz. For Range 2, the following applies for $F_{DL_Low}$: $-95 < f - F_{DL_Low} \le -60$ or $60 \le f - F_{DL_High} < 85$. For Range 3 the following applies $1 \le f \le F_{DL_Low} - 95$ or $F_{DL_High} + 85 \le f \le 12750$.

For Table 7.6.2A.7.5-5 in frequency range 1, 2 and 3, the number of spurious response frequencies recorded in the step 9 of the test procedure shall not exceed $\max(24, 6 \cdot \lceil N_{RB} \cdot / 6 \rceil)$ exceptions per assigned E-UTRA channel per sub-block gap of the E-UTRA CA configuration are allowed for spurious response frequencies when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7A.5 spurious response for CA are applicable.

For Table 7.6.2A.7.5-5 in frequency range 4 the number of spurious response frequencies recorded in the step 9 of the test procedure shall not exceed $\max(8, \lceil (N_{RB} + 2 \cdot L_{CRBs}) / 8 \rceil)$ exceptions per assigned E-UTRA channel per sub-block gap of the E-UTRA CA configuration are allowed for spurious response frequencies when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7A.5 spurious response for CA are applicable.

**Table 7.6.2A.7.5-5: Out of band blocking (intra-band non-contiguous)**

| E-UTRA band | Parameter | Units | Frequency | | | |
|---|---|---|---|---|---|---|
| | | | range 1 | range 2 | range 3 | range 4 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 | -15 |
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 (NOTE 2), 43 (NOTE 2), 44, 45, 65, 66, 68, 70 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -15 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz | - |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz | - |
| 2, 5, 12, 17 | $F_{Interferer}$ | MHz | - | - | - | $F_{UL_low}$ - $F_{UL_high}$ |

NOTE 1: For the UE which supports both Band 11 and Band 21 the out of blocking is FFS.
NOTE 2: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz.
NOTE 3: For the UE that supports both Band 4 and Band 66, the out-of-blocking frequency range for Band 4 is defined relative to $F_{DL_low}$ and $F_{DL_high}$ of Band 66.
NOTE 4: For a UE supporting CA_20A-28A the requirements for Band 20 and Band 28 apply with $F_{DL_low}$ given by the lower limit of the restricted operating frequency range in Band 28 and $F_{DL_high}$ by Band 20 (Table 5.5A-2).

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Tables 7.6.2A.7.5 2, 7.6.2A.7.5-4 and 7.6.2A.7.5-5 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C accordingly.

## 7.6.2A.8 Out-of-band blocking for 5DL CA

### 7.6.2A.8.1 Test Purpose

Same test purpose as in clause 7.6.2A.1.

### 7.6.2A.8.2 Test Applicability

This test case applies to all types of E-UTRA UE and forward that support 5DL with CA configurations in Table 7.1-2c.

### 7.6.2A.8.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.2A.0.

### 7.6.2A.8.4 Test Description

#### 7.6.2A.8.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.2A.8.4.1-1 through table 7.6.2A.8.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.2A.8.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3,4) | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | UL MOD | DL MOD | UL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for a CA_XF Configuration (Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | X | Mid/ CC5 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | X | Mid/ CC5 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA-SA Configuration (Inter-band)** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| 4 | R | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | S | Mid | REF | ALL | X | Mid | N/A | ALL | Y | Mid | N/A | ALL | Z | Mid | N/A | ALL | R | Mid | N/A | ALL |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SENS | RBs | | | | RBs | | | | RBs | | | | RBs | | | | RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings for a CA_XE-YA, YA-XE Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENSE | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REF SENSE | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings for CA_XA-ZA-RA-YB and CA_XA-ZA-RA-YC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | Y | Mid/ CC1 | REF SENS | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid | REF SENS | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | R | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings CA_XB-YB-ZA, CA_XB-YC-ZA, CA_XC-YB-ZA, and CA_XC-YC-ZA Configuration (Intra-band contiguous + Intra-band contiguous + Inter-band)**<br>**Default Test Settings CA_ZA-XB-YB, CA_ZA-XB-YC, CA_ZA-XC-YB, and CA_ZA-XC-YC Configuration (Intra-band contiguous + Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| 1 | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| 2 | Y | Mid/ CC1 | REF SENS | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| 3 | Z | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration. | | | | | | | | | | | | | | | | | | | |

Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 4: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41F, X=41.
Note 6: **Inter-band:** X,Y,Z,R,S correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-20A-42A,X=1,Y=3,Z=7,R=20,S=42.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_3C-7A-28A, X=3,Y=7 and Z=28.
Note 8: REFSENS refers to the PCC bands and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose the Combination with $N_{RB_PCC} = N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.

**Table 7.6.2A.8.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to "Range" columns. For mapping within Band refer to "CC" columns |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | | $W_{gap}$ [MHz] | SCC3 | | | | $W_{gap}$ [MHz] | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for CA_XA-XA-YA-ZA-RA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XA-XA-RA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-RA-XA-XA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REF SENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | Mid | REF SENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Z | Mid | REF SENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **4** | R | Mid | REF SENS | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YD Configurations (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Y | CC3 | REF SENS | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ |
| **2** | X | CC2 | REF SENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YA-ZA-ZA Configurations Intra-band non-contiguous + Intra-band non-contiguous** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Z | CC2 | REF SENS | ALL RBs | Max | Z | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_ag}$ | | N/A | QPSK | | $N_{RB_}$ | | N/A | QPSK | | $N_{RB_}$ | | N/A | QPSK | | $N_{RB_}$ | | N/A | QPSK | | $N_{RB_}$ |

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | g | | | | | agg | | | | | agg | | | | | agg | | | | | agg |
| **2** | X | CC2 | REF SENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | CC2 | N/A | ALL RBs | Max | Z | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | CC2 | N/A | ALL RBs | Max | Z | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YA-ZC Configurations Intra-band non-contiguous + Intra-band non-contiguous** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Z | Mid/C C1 | REF SENS | ALL RBs | - | Z | Mid/C C2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | 66 | CC1 | REF SENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Z | Mid/C C1 | N/A | ALL RBs | - | Z | Mid/C C2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Z | Mid/C C1 | N/A | ALL RBs | - | Z | Mid/C C2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band non-contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-12A-66A,X=2,Y=5,Z=12,R=66.
Note 5: **Intra-band non-contiguous + Intra-band contiguous:** X,Y corresponds to the band of the CA Configuration. E.g. for CA_5A-5A-66D,X=5,Y=66.
Note 6: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-66A-66A,X=2,Y=5,Z=66.
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1}$ = $N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.58 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 7.6.2A.8.4.1-1 through Table 7.6.2A.8.4.1-2 as appropriate.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.2A.8.4.3.

### 7.6.2A.8.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.2A.8.4.3

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.8.4.1-1 through Table 7.6.2A.8.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.8.4.1-1 through Table 7.6.2A.8.4.1-2 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal below the lowest CA Band according to the table indicated in the column "Table with interferer parameters to select" of Table 7.6.2A.8.4.2-1. The frequency step size is 1MHz. Use the highest $\Delta R_{IB,c}$ among CA bands for $P_{interferer}$ calculation.

7. Set the downlink signal level according to the table indicated in the column "Table with transmission parameters to select" of Table 7.6.2A.8.4.2-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.2A.8.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the throughput measurement.

8. Measure the average throughput for all the carrier(s) indicated in the Table 7.6.2A.7.4.2-1 simultaneously for duration sufficient to achieve statistical significance according to Annex G.2. Note that the statistical decision for each component carrier should be postponed until the statistical decisions for all component carriers are obtained simultaneously according to table G.2.4-1.

9. Record the frequencies for which the throughput doesn't meet the requirements and for each frequency, the carriers for which the throughput was not met.

10. Repeat steps 6 to 8 for each recorded frequency-carrier pair, with exception of pairs for which $\Delta R_{IB,c}$ is the same as $\Delta R_{IB}$ used in Step 6. In Step 6 use only recorded frequencies for interferer placement and use $\Delta R_{IB,c}$ relevant to recorded carrier for $P_{interferer}$ calculation. Remove the frequency-carrier pairs that meet the throughput requirements from the record.

11. If the CA Configuration includes multiple bands, repeat steps from 6 to 10 using an interfering signal in each gap between the CA bands, according to the table indicated in the column "Table with interferer parameters to select" of Table 7.6.2A.8.4.2-1.

12. Repeat steps from 6 to 10, using an interfering signal above the highest CA Band according to the table indicated in the column "Table with interferer parameters to select" of Table 7.6.2A.8.4.2-1.

13. Repeat steps 1 to 12 for each row of "Throughput measured on" column listed in the Table 7.6.2A.8.4.2-1.

**Table 7.6.2A.8.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with transmission parameters to select | Table with interferer parameters to select (Note 2) |
|---|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2, SCC3, SCC4 | 7.6.2A.8.5-1 | 7.6.2A.8.5-2 |
| Inter-band | 1 | SCC1, SCC2, SCC3, SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 |
| | 2 | SCC1, SCC2, SCC3, SCC4 | | |
| | 3 | SCC1, SCC2, SCC3, SCC4 | | |
| | 4 | SCC1, SCC2, SCC3, SCC4 | | |
| Intra-band contiguous + Inter-band | 1 | SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 (Note 4) |
| | 2 | SCC1, SCC2, SCC3, SCC4 | 7.6.2A.8.5-1 | 7.6.2A.8.5-2 (Note 5) |
| Intra-band contiguous + Inter-band | 1 | SCC2, SCC3, SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 (Note 4) |
| | 2 | SCC1, SCC2 | 7.6.2A.8.5-1 | 7.6.2A.8.5-2 (Note 5) |
| | | SCC3, SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 (Note 4) |
| | 3 | SCC2, SCC3 | 7.6.2A.8.5-1 | 7.6.2A.8.5-2 (Note 5) |
| | | SCC1, SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 (Note 4) |
| | 4 | SCC2, SCC3 | 7.6.2A.8.5-1 | 7.6.2A.8.5-2 (Note 5) |
| | | SCC1, SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 (Note 4) |
| Intra-band contiguous + Intra-band contiguous | 1 | SCC2, SCC3 | 7.6.2A.8.5-1 | 7.6.2A.8.5-2 (Note 5) |
| | | SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 (Note 4) |
| | 2 | SCC2, SCC3 | 7.6.2A.8.5-1 | 7.6.2A.8.5-2 (Note 5) |
| | | SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 (Note 4) |
| | 3 | SCC1, SCC2, SCC3, SCC4 | 7.6.2A.8.5-1 | 7.6.2A.8.5-2 (Note 5) |
| Intra-band non-contiguous + Inter-band | 1 | SCC1 | 7.6.2A.8.5-3 | 7.6.2A.8.5-5 (Note 5) |
| | | SCC2, SCC3, SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 (Note 6) |
| | 2 | SCC1, SCC2 | 7.6.2A.8.5-3 | 7.6.2A.8.5-5 (Note 5) |
| | | SCC3, SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 (Note 6) |
| | 3 | SCC2, SCC3 | 7.6.2A.8.5-3 | 7.6.2A.8.5-5 (Note 5) |
| | | SCC1, SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 (Note 6) |
| | 4 | SCC3, SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-5 (Note 5) |
| | | SCC1, SCC2 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 (Note 6) |
| Intra-band non-contiguous + Intra-band contiguous | 1 | SCC3, SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-5 (Note 4) |
| | | PCC, SCC1, SCC2 | 7.6.2A.8.5-1 | 7.6.2A.8.5-2 (Note 6) |
| | 2 | PCC, SCC1 | 7.6.2A.8.5-3 | 7.6.2A.8.5-5 (Note 4) |
| | | SCC2, SCC3, SCC4 | 7.6.2A.8.5-1 | 7.6.2A.8.5-2 (Note 6) |
| Intra-band non-contiguous + Intra-band non-contiguous | 1 | SCC1, SCC2, SCC3 | 7.6.2A.8.5-3 | 7.6.2A.8.5-5 (Note 5) |
| | | SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 (Note 6) |
| | 2 | SCC1, SCC2, SCC3 | 7.6.2A.8.5-3 | 7.6.2A.8.5-5 (Note 5) |
| | | SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-4 (Note 6) |
| | 3 | SCC1, SCC2, SCC3, SCC4 | 7.6.2A.8.5-3 | 7.6.2A.8.5-5 (Note 5) |

Note 1: Test point ID for the particular CA configuration as defined in section 7.6.2A.8.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.
Note 4: When interferer position is within range 1 or 2 frequency of other CC block, Pinterfer is selected from table 7.6.2A.8.5-2. When interferer position is closer than 15 MHz from other CC block interferer is OFF.
Note 5: When interferer position is within range 1 or 2 frequency of other CC block, Pinterfer is selected from table 7.6.2A.8.5-4. When interferer position is closer than 15 MHz from other CC block interferer is OFF.
Note 6: When interferer position is within range 1 or 2 frequency of other CC block, Pinterfer is selected from table 7.6.2A.8.5-5. When interferer position is closer than 15 MHz from other CC block interferer is OFF.

#### 7.6.2A.8.4.3 Message Contents

Same message contents as in clause 7.6.2.4.3 for without UL CA.

Same message contents as in clause 7.6.2A.1.4.3 for UL CA.

### 7.6.2A.8.5 Test Requirement

Except for the spurious response frequencies recorded at the final step of test procedure, the throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table s below, according to the type of CA.

For Table 7.6.2A.8.5-2 in frequency range 1, 2 and 3, up to $\max(24,6\cdot\lceil N_{RB}\cdot/6\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where $N_{RB}$ is the allocated number of resource blocks in the frequency channel. For these exceptions the requirements of subclause 7.7A.8 Spurious Response for CA are applicable.

**Table 7.6.2A.8.5-1: Out-of-band blocking parameters (intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 9 | 9 | 9 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A.<br>Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2. | | | | | | |

**Table 7.6.2A.8.5-2: Out of band blocking (intra-band contiguous)**

| CA configuration | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | range 1 | range 2 | range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| CA_1C, CA_2C, CA_3B, CA_3C, CA_5B, CA_7C , CA_8B, CA_12B, CA_23B, CA_27B, CA_38C, CA_40C, CA_40D, CA_40E, CA_41C, CA_41D, CA_41E, CA_41F, CA_42C[1], CA_42D[1], CA_42E[1], CA_42F[1], CA_43C[1], CA_48C[1], CA_48D[1], CA_48E[1], CA_48F[1], CA_66B, CA_66C, CA_66D, CA_70C | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ - 15 to $F_{DL_low}$ - 60 | $F_{DL_low}$ - 60 to $F_{DL_low}$ - 85 | $F_{DL_low}$ - 85 to 1 MHz |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| Note 1: The power level of the interferer ($P_{Interferer}$) for this CA configuration for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz. | | | | | |

For Table 7.6.2A.8.5-4 frequency range 1, 2, and 3, the number of spurious response frequencies recorded in the step 9 of the test procedure shall not exceed $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ exceptions per downlink in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7A.5 Spurious Response for CA are applicable.

**Table 7.6.2A.8.5-3: Out-of-band blocking parameters (inter-band, intra-band non-contiguous)**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.<br>Note 3: The REFSENS power level is specified in Table 7.3.1-1 and Table 7.3.1-1a for two and four antenna ports, respectively. | | | | | | | |

**Table 7.6.2A.8.5-4: Out-of-band blocking for inter-band carrier aggregation with one uplink carrier**

| Parameter | Unit | Range 1 | Range 2 | Range 3 |
|---|---|---|---|---|
| $P_{wanted}$ | dBm | Table 7.6.2A.8.5-3 for all component carriers | | |
| $P_{interferer}$ | dBm | $-44 + \Delta R_{IB,c}$ | $-30 + \Delta R_{IB,c}$ | $-15 + \Delta R_{IB,c}$ |
| $F_{interferer}$ (CW) | MHz | $-60 < f - F_{DL_Low(j)} < -15$ or $15 < f - F_{DL_High(j)} < 60$ | $-85 < f - F_{DL_Low(j)} \le -60$ or $60 \le f - F_{DL_High(j)} < 85$ | $1 \le f \le F_{DL_Low(j)} - 85$ or $F_{DL_High(j)} + 85 \le f \le F_{DL_Low(j+1)} - 85$ with $j < X$ or $F_{DL_High(X)} + 85 \le f \le 12750$ |

Note 1: $F_{DL_Low(j)}$ and $F_{DL_High(j)}$ denote the respective lower and upper frequency limits of the operating band containing carrier $j$, $j$ = 1,…,X, with carriers numbered in increasing order of carrier frequency and X the number of component carriers in the band combination (X ≤ 5 for the present version of this specification).

Note 2: For $F_{DL_Low(j+1)} - F_{DL_High(j)} < 145$ MHz and $F_{Interferer}$ in $F_{DL_High(j)} < f < F_{DL_Low(j+1)}$, $F_{Interferer}$ can be in both Range 1 and Range 2. Then the lower of the $P_{Interferer}$ applies.

Note 3: For $F_{DL_Low(j)} - 15$ MHz ≤ f ≤ $F_{DL_High(j)} + 15$ MHz the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5A.5.5 and 7.6.1A.5.5 shall be applied for carrier $j$.

Note 4: $\Delta R_{IB,c}$ according to Table 7.3.3-1A applies when serving cell c is measured.

Note 5: For inter-band CA combinations containing Bands 42 or 43, the interferer with respect to Band 42 or Band 43 shall have power level ($P_{Interferer}$) for Range 3 modified to $-20 + \Delta R_{IB,c}$ dBm for $F_{Interferer} > 2800$ MHz and $F_{Interferer} < 4400$ MHz.

Note 6: For inter-band CA combinations containing Bands 7 and 38 simultaneously, for $F_{Interferer}$ Bands 7 and 38 are considered as one single band as follows: $F_{DL_Low} = 2570$ MHz and $F_{DL_High} = 2690$ MHz. For Range 2, the following applies for $F_{DL_Low}$: $-95 < f - F_{DL_Low} \le -60$ or $60 \le f - F_{DL_High} < 85$. For Range 3 the following applies $1 \le f \le F_{DL_Low} - 95$ or $F_{DL_High} + 85 \le f \le 12750$.

For Table 7.6.2A.8.5-5 in frequency range 1, 2 and 3, the number of spurious response frequencies recorded in the step 9 of the test procedure shall not exceed $\max(24, 6 \cdot \lceil N_{RB} \cdot / 6 \rceil)$ exceptions per assigned E-UTRA channel per sub-block gap of the E-UTRA CA configuration are allowed for spurious response frequencies when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7A.8 spurious response for CA are applicable.

For Table 7.6.2A.8.5-5 in frequency range 4 the number of spurious response frequencies recorded in the step 9 of the test procedure shall not exceed $\max(8, \lceil (N_{RB} + 2 \cdot L_{CRBs}) / 8 \rceil)$ exceptions per assigned E-UTRA channel per sub-block gap of the E-UTRA CA configuration are allowed for spurious response frequencies when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7A.8 spurious response for CA are applicable.

**Table 7.6.2A.8.5-5: Out of band blocking (intra-band non-contiguous)**

| E-UTRA band | Parameter | Units | Frequency | | | |
|---|---|---|---|---|---|---|
| | | | range 1 | range 2 | range 3 | range 4 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 | -15 |
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 (NOTE 2), 43 (NOTE 2), 44, 45, 65, 66, 68, 70 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -15 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz | - |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz | - |
| 2, 5, 12, 17 | $F_{Interferer}$ | MHz | - | - | - | $F_{UL_low}$ - $F_{UL_high}$ |

| | |
|---|---|
| Note 1: | For the UE which supports both Band 11 and Band 21 the out of blocking is FFS. |
| Note 2: | The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz. |
| Note 3: | For the UE that supports both Band 4 and Band 66, the out-of-blocking frequency range for Band 4 is defined relative to $F_{DL_low}$ and $F_{DL_high}$ of Band 66. |
| Note 4: | For a UE supporting CA_20A-28A the requirements for Band 20 and Band 28 apply with $F_{DL_low}$ given by the lower limit of the restricted operating frequency range in Band 28 and $F_{DL_high}$ by Band 20 (Table 5.5A-2). |

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Tables 7.6.2A.8.5 2, 7.6.2A.8.5-4 and 7.6.2A.8.5-5 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C accordingly.

# 7.6.2B Out-of-band blocking for UL-MIMO

## 7.6.2B.1 Test Purpose

Out-of-band band blocking for UL-MIMO is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the UE that support UL- MIMO receive band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

For the first 15 MHz below or above the UE that support UL-MIMO receive band the appropriate in-band blocking for UL-MIMO or adjacent channel selectivity for UL-MIMO in sub-clause 7.5.3 and sub-clause 7.6.1.3 shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

## 7.6.2B.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

## 7.6.2B.3 Minimum Conformance Requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in subclause 7.6 shall be met with the UL-MIMO configurations specified in Table 6.2.2B.3-2. For UL-MIMO, the parameter $P_{CMAX_L}$ is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 36.101 [2] clause 7.6B.

## 7.6.2B.4 Test Description

### 7.6.2B.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.2B.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.2B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | One frequency chosen arbitrarily from low or high range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[4] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2). | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.30.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.6.2B.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.2B.4.3.

### 7.6.2B.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2B.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 7.6.2B.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.2B.5-2. The frequency step size is 1MHz.

4. Set the downlink signal level according to the table 7.6.2B.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.2B.5-1 for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the throughput measurement.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Record the frequencies for which the throughput doesn't meet the requirements.

7. Repeat steps from 3 to 6, using an interfering signal above the wanted signal at step 3.

### 7.6.2B.4.3 Message Contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception.

**Table 7.6.2B.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.6.2B.5 Test Requirement

Except for the spurious response frequencies recorded at the final step of test procedure, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.2B.5-1 and 7.6.2B.5-2.

For frequency range 1, 2, and 3, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

For frequency range 4, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\max(8,\ \lceil(N_{RB}+2\cdot L_{CRBs})/8\rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

**Table 7.6.2B.5-1: Out-of-band blocking parameters**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.6.2B.5-2: Out of band blocking**

| E-UTRA band | Parameter | Units | Frequency | | | |
|---|---|---|---|---|---|---|
| | | | range 1 | range 2 | range 3 | range 4 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 | -15 |
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 65, 66, 68, 70, 72 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -15 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz | - |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz | - |
| 2, 5, 12, 17 | $F_{Interferer}$ | MHz | - | - | - | $F_{UL_low}$ - $F_{UL_high}$ |

Note 1: Range 3 shall be tested only with the highest channel bandwidth.
Note 2: For the UE which supports both Band 11 and Band 21 the out of blocking is FFS.
Note 3: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz.
Note 4: For the UE that supports both Band 4 and Band 66, the out-of-blocking frequency range for Band 4 is defined relative to $F_{DL_low}$ and $F_{DL_high}$ of Band 66.

# 7.6.2D Out-of-band blocking for ProSe

## 7.6.2D.0 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Tables 7.6.2.1D.0-1, 7.6.2.1D.0-2 and 7.6.2.1D.0-3.

For Table 7.6.2D.0-3 in frequency range 1, 2 and 3, up to $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where $N_{RB}$ is the number of resource blocks in the downlink transmission bandwidth configuration (see Figure 5.4.2-1). For these exceptions the requirements of subclause 7.7D Spurious response are applicable.

For Table 7.6.2D.0-3 in frequency range 4, up to $\max(8,\ \lceil(N_{RB}+2\cdot L_{CRBs})/8\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where $N_{RB}$ is the number of resource blocks in the downlink transmission bandwidth configurations (see Figure 5.6-1) and $L_{CRBs}$ is the number of resource blocks allocated in the uplink. For these exceptions the requirements of clause 7.7D spurious response are applicable.

**Table 7.6.2D.0-1: Out-of-band blocking parameters for ProSe Direct Discovery**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below + $P_{offset}$ | | | | | |
| | | | | 6 | 6 | 7 | 9 |
| $P_{offset}$ | dB | | | 10.9 | 13.9 | 15.7 | 16.9 |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2. | | | | | | | |

**Table 7.6.2D.0-2: Out-of-band blocking parameters for ProSe Direct Communication**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below | | | | | |
| | | | | 6 | 6 | 7 | 9 |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2. | | | | | | | |

**Table 7.6.2D.0-3: Out of band blocking for ProSe**

| E-UTRA ProSe band | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | Range 1 | Range 2 | Range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| 2,3,4,7,14, 20,26,28,31, 68, 72 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -15 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| NOTE 1: For the UE which supports both Band 11 and Band 21 the out of blocking is FFS. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.6.2.1D.

## 7.6.2D.1 Out-of-band blocking for ProSe Direct Discovery

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Use of OCNG for Downlink has not been considered and is still FFS.
- Message exceptions content needs further investigation (some values still TBD).
- Test time is FFS.

### 7.6.2D.1.1 Test Purpose

Out-of-band blocking for ProSe is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the ProSe band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels in aggregated signals.

For the first 15 MHz below or above the ProSe band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5D and sub-clause 7.6.1D shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

### 7.6.2D.1.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Discovery, but not ProSe Direct Communication.

### 7.6.2D.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.2D.0.

### 7.6.2D.1.4 Test Description

#### 7.6.2D.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA ProSe bands specified in table 5.4.2D.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.2D.1.4.1-1. The details of the downlink, uplink and sidelink reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.6.

**Table 7.6.2D.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range (Note 4) | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Highest | | | | | |
| | **Downlink Configuration (Note 2)** | | **Uplink Configuration (Note 2)** | | **Sidelink Configuration (Reception) (Note 3)** | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Mod'n | RB allocation |
| 5MHz | QPSK | 8 | QPSK | 8 | QPSK | 2 |
| 10MHz | QPSK | 16 | QPSK | 16 | QPSK | 2 |
| 15MHz | QPSK | 25 | QPSK | 25 | QPSK | 2 |
| 20MHz | QPSK | 30 | QPSK | 30 | QPSK | 2 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA ProSe and Operating band, according to the applicability specified respectively in Table 5.4.2D.1-1 and Table 5.4.2.1-1. | | | | | | |
| Note 2: After DRX configuration, DL-RMC (PDSCH) and DCI-0 for scheduling UL-RMC (PUSCH) are applied only in the DRX On subframes. | | | | | | |
| Note 3: The RB start for the transmission of Sidelink RMC is RB#0. | | | | | | |
| Note 4: Sidelink uses the frequencies defined for Uplink. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.71
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.6.2D.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents exceptions are defined in clause 7.6.2D.1.4.3.
7. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is activated.

### 7.6.2D.1.4.2 Test Procedure

1. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions (only those marked with "…Step 1…" ) are defined in clause 7.6.2D.1.4.3.
2. The UE shall transmit RRCConnectionReconfigurationComplete message.
3. Initialise the variables Ptot and Pok as 0.
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.3D.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2D.1.4.1-1. When the UE has no payload data to send, it transmits uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal below the Sidelink Band according to Table 7.6.2D.1.5-2. The frequency step size is 1MHz.

7. SS transmits PSDCH to transmit the SL RMC according to Table 7.6.2D.1.4.1-1. Set the Sidelink signal level to the appropriate value defined in Table 7.6.2D.1.5-1.

8. SS shall send SL Discovery Packets (MAC padding bits) on the SL RMC for the test time [FFS]. SS stores the number of the transmitted Discovery Packets in the current test iteration in the variable Ptot.

9. SS shall send (on the available PDSCH) a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER REQUEST" message and wait for the UE to respond (on the available PUSCH) with a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER RESPONSE".

10. SS calculates the variable Pok as (current counter value - counter value at last test iteration).

11. SS shall compute the throughput as following:

    TP = Pok / Ptot * 100%

12. Record the frequencies for which the throughput doesn't meet the requirements.

13. Repeat steps from 6 to 12, using an interfering signal above the Sidelink Band at step 6.

### 7.6.2D.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

- Table A.7.1.1-1 for FDD
- Table A.7.1.2-1 for TDD

**Table 7.6.2D.1.4.3-1: ACTIVATE TEST MODE: Reference sensitivity for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 7.6.2D.1.4.3-2: CLOSE UE TEST LOOP: Reference sensitivity for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 7.6.2D.1.4.3-3: MAC-MainConfig-RBC: Reference sensitivity for ProSe Direct Discovery (applicable only for Step 1 of Test procedure)**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | TBD | | |
| periodicBSR-Timer | TBD | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | TBD | | |
| } | | | |

### 7.6.2D.1.5 Test Requirement

Except for the spurious response frequencies recorded in step 12 of the test procedure, the throughput measurement of the sidelink derived in the test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Table 7.6.2D.1.5-1 and 7.6.2D.1.5-2.

For Table 7.6.2D.1.5-2 in frequency range 1, 2 and 3, up to $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where $N_{RB}$ is the number of resource blocks in the downlink transmission bandwidth configuration (see Figure 5.6-1). For these exceptions the requirements of subclause 7.7D Spurious response are applicable.

**Table 7.6.2D.1.5-1: Out-of-band blocking parameters for ProSe Direct Discovery**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below + $P_{offset}$ | | | | | |
| | | | | 6 | 6 | 7 | 9 |
| $P_{offset}$ | dB | | | 10.9 | 13.9 | 15.7 | 16.9 |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2. | | | | | | | |

**Table 7.6.2D.1.5-2: Out of band blocking for ProSe**

| E-UTRA ProSe band | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | Range 1 | Range 2 | Range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| 2,3,4,7,14, 20,26,28,31, 68 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -15 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| NOTE 1: For the UE which supports both Band 11 and Band 21 the out of blocking is FFS. | | | | | |

## 7.6.2D.2 Out-of-band blocking for Prose Direct Communication

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Test description is TBD

### 7.6.2D.2.1 Test Purpose

Same test purpose as 7.6.2D.1.1.

### 7.6.2D.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Communication.

### 7.6.2D.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.2D.0.

### 7.6.2D.2.4 Test Description

TBD

### 7.6.2D.2.5 Test Requirement

Same test requirement as in clause 7.6.2D.1.5 with the following exceptions:

- Instead of Table 7.6.2D.1.5-1 → use Table 7.6.2D.2.5-1.
- Instead of Table 7.6.2D.1.5-2 → use Table 7.6.2D.2.5-2.

**Table 7.6.2D.2.5-1: Out-of-band blocking parameters for ProSe Direct Communication**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below | | | | | |
| | | | | 6 | 6 | 7 | 9 |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2. | | | | | | | |

**Table 7.6.2D.2.5-2: Out of band blocking for ProSe**

| E-UTRA ProSe band | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | Range 1 | Range 2 | Range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| 2,3,4,7,14, 20,26,28,31, 68 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -15 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| NOTE 1: For the UE which supports both Band 11 and Band 21 the out of blocking is FFS. | | | | | |

## 7.6.2E Out-of-band blocking for UE category 0

### 7.6.2E.1 Test Purpose

Same test purpose as in clause 7.6.2.1.

### 7.6.2E.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 7.6.2E.3 Minimum Conformance Requirements

Same minimum conformance requirements as in clause 7.6.2.3.

### 7.6.2E.4 Test Description

#### 7.6.2E.4.1 Initial Conditions

Same initial conditions as in clause 7.6.2.4.1 with the following exceptions:

- Instead of Table 7.6.2.4.1-1 → use Table 7.6.2E.4.1-1.
- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.5 using only main UE Tx/Rx antenna.

**Table 7.6.2E.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | One frequency chosen arbitrarily from low or high range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD and HD-FDD** | **TDD** | | **FDD and HD-FDD** | **TDD** |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 14 | 14 | QPSK | 15 | 15 |
| 5MHz | QPSK | 14 | 14 | QPSK | 25 | 25 |
| 5MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 10MHz | QPSK | 14 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 15MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 15MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 20MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3E.3-3 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Downlink RB position shall be $RB_{start}$ = 0. | | | | | | |

### 7.6.2E.4.2 Test Procedure

Same test procedure as in clause 7.6.2.4.2

### 7.6.2E.4.3 Message Contents

Same message contents as in clause 7.6.2.4.3

## 7.6.2E.5 Test Requirement

Except for the spurious response frequencies recorded at the final step of test procedure, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in clause A.3.2 with parameters specified in Tables 7.6.2E.5-1 and 7.6.2E.5-2.

For frequency range 1, 2, and 3, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7E Spurious Response are applicable.

For frequency range 4, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\max(8,\ \lceil(N_{RB}+2\cdot L_{CRBs})/8\rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7E Spurious Response are applicable.

**Table 7.6.2E.5-1: Out-of-band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |

| Bandwidth Configuration | | | | | | | |
|---|---|---|---|---|---|---|---|
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5E. | | | | | | | |
| Note 2: The reference measurement channel is specified in clause A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in clauses A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.6.2E.5-2: Out of band blocking**

| E-UTRA band | Parameter | Units | Frequency | | | |
|---|---|---|---|---|---|---|
| | | | range 1 | range 2 | range 3 | range 4 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 | -15 |
| 2, 3, 4, 5, 8, 13, 20, 39, 41 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -15 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz | - |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz | - |
| 2, 5, | $F_{Interferer}$ | MHz | - | - | - | $F_{UL_low}$ - $F_{UL_high}$ |
| Note 1: Range 3 shall be tested only with the highest channel bandwidth. | | | | | | |

# 7.6.2EB Out-of-band blocking for UE category 1bis

Editor's note

- Test case incomplete with Annex F.3.3 needing update. TT shall be same as legacy test case.

## 7.6.2EB.1 Test Purpose

Same test purpose as in clause 7.6.2.1.

## 7.6.2EB.2 Test Applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

## 7.6.2EB.3 Minimum Conformance Requirements

Same minimum conformance requirements as in clause 7.6.2.3.

## 7.6.2EB.4 Test Description

### 7.6.2EB.4.1 Initial Conditions

Same initial conditions as in clause 7.6.2.4.1 with the following exceptions:

Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.5 using only main UE Tx/Rx antenna.

### 7.6.2EB.4.2 Test Procedure

Same test procedure as in clause 7.6.2.4.2

### 7.6.2EB.4.3 Message Contents

Same message contents as in clause 7.6.2.4.3

## 7.6.2EB.5 Test Requirement

Except for the spurious response frequencies recorded at the final step of test procedure, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in clause A.3.2 with parameters specified in Tables 7.6.2EB.5-1 and 7.6.2EB.5-2.

For frequency range 1, 2, and 3, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7E Spurious Response are applicable.

For frequency range 4, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\max(8, \lceil (N_{RB} + 2 \cdot L_{CRBs})/8 \rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7E Spurious Response are applicable.

**Table 7.6.2EB.5-1: Out-of-band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5E. | | | | | | | |
| Note 2: The reference measurement channel is specified in clause A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in clauses A.5.1.1/A.5.2.1. | | | | | | | |
| Note 3: The REFSENS power level is specified in Table 7.3EB.3-1 for main antenna port. | | | | | | | |

**Table 7.6.2EB.5-2: Out of band blocking**

| E-UTRA band | Parameter | Units | Frequency | | | |
|---|---|---|---|---|---|---|
| | | | range 1 | range 2 | range 3 | range 4 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 | -15 |
| 1, 2, 3, 4, 5, 6, 7, 8, 12, 13, 18, 26, 28, 31, 39, 41, 66, 72 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -15 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz | - |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz | - |
| 2, 5, 12 | $F_{Interferer}$ | MHz | - | - | - | $F_{UL_low}$ - $F_{UL_high}$ |
| Note 1: Range 3 shall be tested only with the highest channel bandwidth. | | | | | | |
| Note 2: For the UE that supports both Band 4 and Band 66, the out-of-blocking frequency range for Band 4 is defined relative to FDL_low and FDL_high of Band 66. | | | | | | |

## 7.6.2G Out-of-band blocking for V2X Communication

### 7.6.2G.1 Out-of-band blocking for V2X Communication/ Non-concurrent with E-UTRA uplink transmissions

#### 7.6.2G.1.1 Test Purpose

Out-of-band blocking for V2X is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the V2X band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels in aggregated signals.

For the first 15 MHz below or above the V2X band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5G and sub-clause 7.6.1G shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

#### 7.6.2G.1.2 Test Applicability

This test applies to all types of UE that support V2X Sidelink Communication and Band 47.

#### 7.6.2G.1.3 Minimum Conformance Requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Tables 7.6.2G.3-1, 7.6.2G.3-2.

For Table 7.6.2G.3-2 in frequency range 1, 2 and 3, up to $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where $N_{RB}$ is the number of resource blocks in the downlink transmission bandwidth configuration (see Figure 5.4.2-1). For these exceptions the requirements of subclause 7.7G Spurious response are applicable.

**Table 7.6.2G.1.3-1: Out-of-band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| NOTE 1: Reference measurement channel is specified in TS 36.101 [2] Annex A.8.2. | | | | | | | |

**Table 7.6.2G.1.3-2: Out of band blocking**

| E-UTRA V2X band | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | Range 1 | Range 2 | Range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| 47 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -30 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz |
| | | | $F_{DL_high}$ +30 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| NOTE: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 4400 MHz. | | | | | |

NOTE: it is FFS how to accommodate the blocking level of -30dBm in Region 1.

The normative reference for this requirement is TS 36.101 [2] clause 7.6.2.1G.

## 7.6.2G.1.4 Test Description

### 7.6.2G.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.2G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 7.6.2G.1.4.1-1: Test Configuration Table**

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | [48] |
| 20MHz | QPSK | [96] |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.89.
2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 6.8.2. Message content exceptions are defined in clause 7.6.2G.1.4.3.
3. The V2X reference measurement channel is set according to Table 7.6.2G.1.4.1-1.

3a. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. Propagation conditions are set according to Annex B.0.
5. UE test mode – State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C.
6. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)
7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 7.6.2G.1.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Set the downlink signal level according to the table 7.6.2G.1.5-1.
3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.2G.1.5-2. The frequency step size is 1MHz.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.
5. Record the frequencies for which the throughput doesn't meet the requirements.
6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 3.

#### 7.6.2G.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 7.6.2G.1.5 Test Requirement

Except for the spurious response frequencies recorded at the final step of test procedure, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in clause A.3.2 with parameters specified in Tables 7.6.2G.1.5-1 and 7.6.2G.1.5-2

For Table 7.6.2G.1.5-2 in frequency range 1, 2 and 3, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7G spurious response are applicable.

**Table 7.6.2G.1.5-1: Out-of-band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| NOTE 1: Reference measurement channel is specified in TS 36.101 [2] Annex A.8.2. | | | | | | | |

**Table 7.6.2G.1.5-2: Out of band blocking**

| E-UTRA V2X band | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | Range 1 | Range 2 | Range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| 47 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -30 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz |
| | | | $F_{DL_high}$ +30 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| NOTE: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 4400 MHz. | | | | | |

## 7.6.2G.2 Out-of-band blocking for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Test tolerance is TBD.
- Connection diagram is TBD.

### 7.6.2G.2.1 Test Purpose

Same as in clause 7.6.2G.1.1.

### 7.6.2G.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 14 and forward that support V2X Communication.

### 7.6.2G.2.3 Minimum Conformance Requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Tables 7.6.2G.2.3-1, 7.6.2G.2.3-2.

For Table 7.6.2G.2.3-2 in frequency range 1, 2 and 3, up to $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where $N_{RB}$ is the number of resource blocks in the downlink transmission bandwidth configuration (see Figure 5.4.2-1). For these exceptions the requirements of subclause 7.7G Spurious response are applicable.

**Table 7.6.2G.2.3-1: Out-of-band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| NOTE 1: Reference measurement channel is specified in TS 36.101 [2] Annex A.8.2. | | | | | | | |

**Table 7.6.2G.2.3-2: Out of band blocking**

| E-UTRA V2X band | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | Range 1 | Range 2 | Range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| 47 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -30 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz |
| | | | $F_{DL_high}$ +30 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| NOTE: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 4400 MHz. | | | | | |

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA downlink reception for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-2, the requirements in subclause 7.6.2G.2.3 apply for the E-UTRA V2X sidelink reception and the requirements in subclause 7.6.2.3 apply for the E-UTRA downlink reception while all downlink carriers are active.

The normative reference for this requirement is TS 36.101 [2] clause 7.6.2.1G.

## 7.6.2G.2.4 Test Description

### 7.6.2G.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.2G.2.4.1-1. The details of the uplink, downlink and V2X reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.8.3 respectively.

**Table 7.6.2G.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest for uplink<br>Lowest, Highest for V2X | | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink** | | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | QPSK | 1 | QPSK | 1 | 10 MHz | QPSK | [48] |
| 1.4 MHz | QPSK | 5 | QPSK | 5 | 20 MHz | QPSK | [96] |
| 3 MHz | QPSK | 1 | QPSK | 1 | | | |
| 3 MHz | QPSK | 4 | QPSK | 4 | | | |
| 5 MHz | QPSK | 1 | QPSK | 1 | | | |
| 5 MHz | QPSK | 8 | QPSK | 8 | | | |
| 10 MHz | QPSK | 1 | QPSK | 1 | | | |
| 10 MHz | QPSK | 12 | QPSK | 12 | | | |
| 15 MHz | QPSK | 1 | QPSK | 1 | | | |
| 15 MHz | QPSK | 16 | QPSK | 16 | | | |
| 20 MHz | QPSK | 1 | QPSK | 1 | | | |
| 20 MHz | QPSK | 18 | QPSK | 18 | | | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure [TBD].
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 7.6.2G.2.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to Table 7.6.2G.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 7.6.2G.2.4.3.

### 7.6.2G.2.4.2 Test procedure

1. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.6.2G.2.4.1-1 on E-UTRA Band. The SS sends downlink MAC padding bits on the DL RMC.

2. SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 7.6.2G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.

3. Set the downlink signal level according to the table 7.6.2G.2.5-1.

4. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.2G.2.5-2. The frequency step size is 1MHz.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Record the frequencies for which the throughput doesn't meet the requirements.

7. Repeat steps from 4 to 6, using an interfering signal above the wanted signal at step 4.

#### 7.6.2G.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 7.6.2G.2.5 Test Requirement

Except for the spurious response frequencies recorded at the final step of test procedure, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in clause A.3.2 with parameters specified in Tables 7.6.2G.2.5-1 and 7.6.2G.2.5-2

For Table 7.6.2G.2.5-2 in frequency range 1, 2 and 3, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\max(24, \quad 6\cdot\lceil N_{RB} / 6\rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7G spurious response are applicable.

**Table 7.6.2G.2.5-1: Out-of-band blocking parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| NOTE 1: Reference measurement channel is specified in TS 36.101 [2] Annex A.8.2. | | | | | | | |

**Table 7.6.2G.2.5-2: Out of band blocking**

| E-UTRA V2X band | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | Range 1 | Range 2 | Range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| 47 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -30 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz |
| | | | $F_{DL_high}$ +30 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| NOTE: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 4400 MHz. | | | | | |

## 7.6.2G.3 Out-of-band blocking for V2X Communication / Intra-band contiguous multi-carrier operation

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Test tolerance is FFS.

### 7.6.2G.3.1 Test Purpose

Same as in clause 7.6.2G.1.1.

### 7.6.2G.3.2 Test Applicability

This test applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 7.6.2G.3.3 Minimum Conformance Requirements

For intra-band contiguous multi-carrier operation, the V2X UE throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Tables 7.6.2G.3.3-1 and 7.6.2G.3.3-2.

For Table 7.6.2G.3.3-2 in frequency range 1, 2 and 3, up to $\max(24,6\cdot\lceil N_{RB}\cdot/6\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7 spurious response are applicable.

**Table 7.6.2G.3.3-1: Out-of-band blocking parameters for intra-band contiguous multi-carrier for V2X UE**

| Rx Parameter | Units | V2X Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + V2X Bandwidth Class specific value below | | | | |
| | | 9 | | | | |

**Table 7.6.2G.3.3-2: Out of band blocking for intra-band contiguous multi-carrier for V2X UE**

| V2X multi-carrier configuration | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | Range 1 | Range 2 | Range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| V2X_47B | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -30 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz |
| | | | $F_{DL_high}$ +30 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 4400 MHz.<br>NOTE 2: The requirement is applied for 2 carrier intra-concurrent receptions when 2 carrier transmission are activated at the same time | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.6.2.1G.

### 7.6.2G.3.4 Test Description

#### 7.6.2G.3.4.1 Initial conditions

Same initial conditions as in clause 7.6.2G.1.4.1 with the following exceptions- Instead of Table 7.6.2G.1.4.1-1 → use Table 7.6.2G.3.4.1-1.

The details of the GNSS configuration are specified in TS 36.508 [7] subclause 4.11.

**Table 7.6.2G.3.4.1-1: Test Configuration Table**

| Initial Conditions | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | Normal, TL/VL, TL/VH, TH/VL, TH/VH | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for Channel Bandwidths** | | | |
| **V2X MCC Configuration** | | **V2X PSSCH Allocation** | |
| **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **CC1 and CC2 RB Allocation** |
| 10MHz | 10MHz | QPSK | [48+48] |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.92d.
2. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
3. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)
4. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 7.6.2G.3.4.2 Test procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.
2. Set the downlink signal level according to the table 7.6.2G.3.5-1.
3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.2G.3.5-2. The frequency step size is 1MHz.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.
5. Record the frequencies for which the throughput doesn't meet the requirements.

### 7.6.2G.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6

## 7.6.2G.3.5 Test Requirement

For intra-band contiguous multi-carrier operation, except for the spurious response frequencies recorded at the final step of test procedure, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in clause A.3.2 with parameters specified in Tables 7.6.2G.3.5-1 and 7.6.2G.3.5-2

For Table 7.6.2G.3.5-2 in frequency range 1, 2 and 3, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7G spurious response are applicable.

**Table 7.6.2G.3.5-1: Out-of-band blocking parameters for intra-band contiguous multi-carrier for V2X UE**

| Rx Parameter | Units | V2X Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + V2X Bandwidth Class specific value below | | | | |
| | | 9 | | | | |

**Table 7.6.2G.3.5-2: Out of band blocking for intra-band contiguous multi-carrier for V2X UE**

| V2X multi-carrier configuration | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | Range 1 | Range 2 | Range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| V2X_47B | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -30 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz |
| | | | $F_{DL_high}$ +30 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |
| NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 4400 MHz. | | | | | |
| NOTE 2: The requirement is applied for 2 carrier intra-concurrent receptions when 2 carrier transmission are activated at the same time | | | | | |

# 7.6.2F Out-of-band blocking for category NB1 and NB2

## 7.6.2F.1 Test Purpose

Out-of-band band blocking is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the UE receive band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

For the first 15 MHz below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5F.1 and sub-clause 7.6.1F.1 shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

## 7.6.2F.2 Test Applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category NB1.

This test applies to all types of E-UTRA UE release 14 and forward of UE category NB2.

## 7.6.2F.3 Minimum Conformance Requirements

The category NB1 and NB2 UE throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.3.2 with parameters specified in Table 7.6.2F.3-1.

For Table 7.6.2F.3-1 in frequency range 1, 2 and 3, up to 24 exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7F spurious response are applicable.

**Table 7.6.2F.3-1: Out-of-band blocking parameters for category NB1 and NB2 UE**

| Parameter | Units | Frequency | | |
|---|---|---|---|---|
| | | Range 1 | Range 2 | Range 3 |
| $P_{wanted}$ | dBm | REFSENS + 6 dB | | |
| $P_{interferer}$ (CW) | dBm | -44 | -30 | -15 |
| $F_{interferer}$ range | MHz | $F_{DL_low}$ - 15 to $F_{DL_low}$ - 60 | $F_{DL_low}$ - 60 to $F_{DL_low}$ - 85 | $F_{DL_low}$ - 85 to 1 MHz |
| | MHz | $F_{DL_high}$ + 15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ + 60 to $F_{DL_high}$ + 85 | $F_{DL_high}$ + 85 to 12750 MHz |
| NOTE 1: For operating bands which downlink band frequency range is between 729 MHz < 1 GHz the power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to: [-18] dBm for the frequency range which is bounded by $F_{DL_low}$ - [150] MHz of the lowest band that UE supports in frequency range 729 MHz < 1 GHz and $F_{DL_high}$ + [150] MHz of the highest band that UE supports in frequency range 729 MHz < 1 GHz. | | | | |
| NOTE 2: For operating bands which downlink band frequency range is between 1805 MHz < f < 2200 MHz the power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to: [-20] dBm for the frequency range which is bounded by $F_{DL_low}$ - [200] MHz of the lowest band that UE supports in frequency range 1805 MHz < f < 2200 MHz and $F_{DL_high}$ + [200] MHz of the highest band that UE supports in frequency range 1805 MHz < f < 2200 MHz. | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.6.2.1F.

## 7.6.2F.4 Test Description

### 7.6.2F.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters, and are shown in table 7.6.2F.4.1-1. The details of the downlink reference measurement channels (RMCs) are specified in Annex A.3. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 7.6.2F.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 8.1.1 | | | NC | | |
| Test Frequencies as specified in TS36.508 [7] clause 8.1.3.1 | | | Frequency ranges defined in Annex K.1.1 (Note) | | |
| **Configuration ID** | **Downlink Configuration** | | **Uplink Configuration** | | |
| | Modulation | Subcarriers | Modulation | $N_{tones}$ | Subcarrier spacing |
| 1 | QPSK | 12 | BPSK | 1@0 | 15 kHz |
| Note: If UE only supports one operating band below 1GHz, one test frequency chosen arbitrarily from low or high range of supported band is tested; If UE only supports one operating band above 1GHz, one test frequency chosen arbitrarily from low or high range of supported band is tested. | | | | | |

1. Connect the SS to the UE antenna connector as shown in TS 36.508 [7] Annex A, Figure A.5 using only the main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.2, and NPUSCH Format 2 is used to carry ACK/NACK on the uplink.
4. The DL Reference Measurement channel is set according to Table 7.6.2F.4.1-1.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 7.6.2F.4.3.

### 7.6.2F.4.2 Test Procedure

1. SS transmits NPDSCH via NPDCCH DCI format N1 for C_RNTI to transmit the DL RMC according to Table 7.6.2F.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The UE will send HARQ feedback based on information contained in DCI format N1.

2. Set the downlink signal level according to the table 7.6.2F.5-1.

3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.2F.5-1. The frequency step size is 1MHz.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

5. Record the frequencies for which the throughput doesn't meet the requirements.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 3.

### 7.6.2F.4.3 Message Contents

Message contents are according to TS 36.508 [7] clause 8.1.6.

## 7.6.2F.5 Test Requirement

Except for the spurious response frequencies recorded at the final step of test procedure, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in clause A.3.2 with parameters specified in Tables 7.6.2F.5-1.

For Table 7.6.2F.5-1 in frequency range 1, 2 and 3, up to 24 exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7F spurious response are applicable.

**Table 7.6.2F.5-1: Out-of-band blocking parameters for category NB1 and NB2 UE**

| Parameter | Units | Frequency | | |
|---|---|---|---|---|
| | | Range 1 | Range 2 | Range 3 |
| $P_{wanted}$ | dBm | REFSENS + 6 dB | | |
| $P_{interferer}$ (CW) | dBm | -44 | -30 | -15 |
| $F_{interferer}$ range | MHz | $F_{DL_low}$ - 15 to $F_{DL_low}$ - 60 | $F_{DL_low}$ - 60 to $F_{DL_low}$ - 85 | $F_{DL_low}$ - 85 to 1 MHz |
| | MHz | $F_{DL_high}$ + 15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ + 60 to $F_{DL_high}$ + 85 | $F_{DL_high}$ + 85 to 12750 MHz |
| NOTE 1: For operating bands which downlink band frequency range is between 729 MHz < 1 GHz the power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to: [-18] dBm for the frequency range which is bounded by $F_{DL_low}$ - [150] MHz of the lowest band that UE supports in frequency range 729 MHz < 1 GHz and $F_{DL_high}$ + [150] MHz of the highest band that UE supports in frequency range 729 MHz < 1 GHz. | | | | |
| NOTE 2: For operating bands which downlink band frequency range is between 1805 MHz < f < 2200 MHz the power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to: [-20] dBm for the frequency range which is bounded by $F_{DL_low}$ - [200] MHz of the lowest band that UE supports in frequency range 1805 MHz < f < 2200 MHz and $F_{DL_high}$ + [200] MHz of the highest band that UE supports in frequency range 1805 MHz < f < 2200 MHz. | | | | |

# 7.6.2EA Out-of-band blocking for UE category M1

## 7.6.2EA.1 Test Purpose

Out-of-band band blocking is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the category M1 UE receive band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

For the first 15 MHz below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5EA.1 and sub-clause 7.6.1EA shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

## 7.6.2EA.2 Test Applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category M1.

## 7.6.2EA.3 Minimum Conformance Requirements

Same as in clause 7.6.2.3.

## 7.6.2EA.4 Test Description

### 7.6.2EA.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for CAT M1 in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.2EA.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 7.6.2EA.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | One frequency chosen arbitrarily from low or high range | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | | |
| | | FDD | TDD | | FDD and HD-FDD | TDD | Narrowband index (Note 1) |
| 5MHz | QPSK | 4 | 4 | QPSK | 6 | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4. | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.5 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.6.2EA.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 7.6.2EA.4.3.

### 7.6.2EA.4.2 Test Procedure

1. SS transmits PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 7.6.2EA.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

2. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 7.6.2EA.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.2EA.5-2. The frequency step size is 1MHz.

4. Set the downlink signal level according to the table 7.6.2EA.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.2EA.5-1 for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the throughput measurement.

5. Measure the average throughput for duration sufficient to achieve statistical significance according to Annex G.2.

6. Record the frequencies for which the throughput doesn't meet the requirements.

7. Repeat steps from 3 to 6, using an interfering signal above the wanted signal at step 3.

### 7.6.2EA.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA and the following exception.

**Table 7.6.2EA.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-UE-PUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.6.2EA.5 Test Requirement

Except for the spurious response frequencies recorded at the final step of test procedure, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.2EA.5-1 and 7.6.2EA.5-2.

For frequency range 1, 2, and 3, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7EA Spurious Response are applicable.

**Table 7.6.2EA.5-1: Out-of-band blocking parameters**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in subclause 6.2.5EA.
NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.
NOTE 3: For DL category M1 UE, the reference sensitivity for category M1 in table 7.3EA-1 and 7.3EA-2 should be used as REFSENS for the power in Transmission Bandwidth Configuration.
NOTE 4: For DL category M1 UE, the parameters for the applicable channel bandwidth apply.

**Table 7.6.2EA.5-2: Out of band blocking**

| E-UTRA band | Parameter | Units | Frequency | | |
|---|---|---|---|---|---|
| | | | Range 1 | Range 2 | Range 3 |
| | $P_{Interferer}$ | dBm | -44 | -30 | -15 |
| 1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 18, 19, 20, 21, 26, 27, 28, 31, 39, 41, 72 | $F_{Interferer}$ (CW) | MHz | $F_{DL_low}$ -15 to $F_{DL_low}$ -60 | $F_{DL_low}$ -60 to $F_{DL_low}$ -85 | $F_{DL_low}$ -85 to 1 MHz |
| | | | $F_{DL_high}$ +15 to $F_{DL_high}$ + 60 | $F_{DL_high}$ +60 to $F_{DL_high}$ +85 | $F_{DL_high}$ +85 to +12750 MHz |

NOTE 1: For the UE which supports both Band 11 and Band 21 the out of blocking is FFS.
NOTE 2: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz.
NOTE 3: For the UE that supports both Band 4 and Band 66, the out-of-blocking frequency range for Band 4 is defined relative to $F_{DL_low}$ and $F_{DL_high}$ of Band 66.

## 7.6.3 Narrow band blocking

### 7.6.3.1 Test Purpose

Verifies a receiver's ability to receive an E-UTRA signal at its assigned channel frequency in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

The lack of narrow-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

### 7.6.3.2 Test Applicability

This test applies to all types of E-UTRA UE release 8 and forward.

### 7.6.3.3 Minimum Conformance Requirements

The relative throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.3.3-1. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.6.3.3-1: Narrow-band blocking**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_w$ | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | | |
| Note 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| Note 3: The REFSENS power level is specified in Table 7.3.3-1 and Table 7.3.3-1a for two and four antenna ports, respectively. | | | | | | | |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, $P_{uw}$ power defined in Table 7.6.3.3-1 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A.

The normative reference for this requirement is TS 36.101 [2] clause 7.6.3.

## 7.6.3.4 Test Description

### 7.6.3.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.3.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[4] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2). | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.5.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1

4. The UL and DL Reference Measurement channels are set according to Table 7.6.3.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.3.4.3.

### 7.6.3.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.3.5-1.

4. Set the downlink signal level according to the table 7.6.3.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.3.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 3.

#### 7.6.3.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

**Table 7.6.3.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

### 7.6.3.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.6.3.5-1.

**Table 7.6.3.5-1: Narrow-band blocking**

| **Parameter** | **Unit** | **Channel Bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| $P_w$ | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | | |
| Note 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.6.3.5-1 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.3_1 Narrow band blocking with 4 Rx antenna ports

### 7.6.3_1.1 Test Purpose

Same test purpose as in clause 7.6.3.

## 7.6.3_1.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that supports 4 Rx antenna ports.

## 7.6.3_1.3 Minimum Conformance Requirements

Same as in clause 7.6.3.3.

## 7.6.3_1.4 Test Description

### 7.6.3_1.4.1 Initial Conditions

Same as in clause 7.6.3.4.1 with following exceptions:

- Instead of Table 7.6.3.3.1-1→ use table 7.6.3_1.4.1-1
- Instead of Figure A.4→ use Figure A.81
- Instead of clause 7.6.3.4.3→ use clause 7.6.3_1.4.3

**Table 7.6.3_1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |

### 7.6.3_1.4.2 Test Procedure

Same as in clause 7.6.3.4.2 with following exceptions:

- Instead of Table 7.6.3.4.1-1→ use Table 7.6.3_1.4.1-1
- Instead of Table 7.6.3.5-1→ use Table 7.6.3_1.5-1

### 7.6.3_1.4.3 Message Contents

Same as in clause 7.6.3.4.3.

### 7.6.3_1.5 Test Requirement

Same as in clause 7.6.3.5 with following exceptions:

- Instead of Table 7.6.3.5-1→ use Table 7.6.3_1.5-1

**Table 7.6.3_1.5_1-1: Narrow-band blocking**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_w$ | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta$f = 7.5 kHz) | MHz | | | | | | |
| Note 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.<br>Note 3: The REFSENS power level is specified in Table 7.3_1.5-1. | | | | | | | |

## 7.6.3A Narrow band blocking for CA

### 7.6.3A.0 Minimum conformance requirements

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the narrow-band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.6.3 for each component carrier while all downlink carriers are active. For E-UTRA CA configurations including an operating band without uplink band or an operating band with an unpaired DL part (as noted in Table 5.2-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. For E-UTRA CA configurations listed in Table 7.3A.0-0a under conditions for which reference sensitivity for the operating band being tested is N/A, the narrow-band blocking requirements of subclause 7.6.3A.0 do not apply. For E-UTRA CA configurations with a component carrier assigned in Band 46, narrow-band blocking requirements do not apply in the presence of a narrow-band interferer in Band 46.

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.6.3A.0-1 with the uplink configuration set according to Table 7.3A.0-1 for the applicable carrier aggregation configuration. For UE(s) supporting one uplink, the uplink configuration of the PCC shall be in accordance with Table 7.3.3-2.

The UE shall fulfil the minimum requirement in presence of an interfering signal specified in Table 7.6.3A.0-1 being on either side of the aggregated signal. The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.3A.0-1. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Table 7.6.3A.0-1.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, the narrow band blocking requirements are defined with the uplink configuration in accordance with Table 7.3A.0-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.6.3.3 and 7.6.3A.0 for one component carrier and two component carriers per sub-block, respectively. The requirements apply for in-gap and out-of-gap interferers while all downlink carriers are active.

**Table 7.6.3A.0-1: Narrow-band blocking**

| Parameter | Unit | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |

| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
|---|---|---|---|---|---|---|
| | | 16 | 16[4] | 16 | 16 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 |
| $F_{uw}$ (offset for $\Delta$f = 7.5 kHz) | MHz | | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A.
Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The $F_{uw}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer} / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.
Note 4: The requirement is applied for the band combinations whose component carriers' BW≥5 MHz.

For combinations of intra-band and inter-band carrier aggregation with up to five downlink carriers (up to two non-contiguously sub-blocks per band and up to four contiguously aggregated carriers per band) and one uplink carrier assigned to one E-UTRA band, the requirement is defined with the uplink active in a band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3A.0-3 when the uplink is active in the band supporting two non-contiguous component carriers, Table 7.3A.0-1 when the uplink is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.3-2 when the uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to four component carriers. For these uplink configurations, the UE shall meet the narrow-band blocking requirements for intra-band non-contiguous carrier aggregation of two downlink sub-blocks with $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps (Table 7.3A.0-3) for the two non-contiguous downlink sub-blocks, the requirements for intra-band contiguous carrier aggregation for the contiguously aggregated downlink carriers and for any remaining component carrier(s) the requirements specified in subclause 7.6.3. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with the single uplink carrier active in each band capable of UL operation.

For E-UTRA CA configurations with a component carriers assigned in Band 46, narrow-band blocking requirements do not apply in the presence of a narrow-band interferer in Band 46.

The normative reference for this requirement is TS 36.101 [2] clause 7.6.3.1A.

## 7.6.3A.1 Narrow band blocking for CA (intra-band contiguous DL CA and UL CA)

### 7.6.3A.1.1 Test Purpose

Verifies a receiver's ability to receive an E-UTRA signal at its assigned CA channel frequencies in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

The lack of narrow-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

### 7.6.3A.1.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

### 7.6.3A.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.3A.0.

### 7.6.3A.1.4 Test Description

#### 7.6.3A.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and CC combinations based on E-UTRA CA configurations specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.6.3A.1.4.1-1. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.3A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | | | C: Mid range | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Note 3) | | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | **UL Allocation** | | | |
| **PCC $N_{RB}$** | **SCC $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 50 | 25 | QPSK | 50+25 | QPSK | 25 | P_25@25 | S_0@0 |
| 50 | 50 | QPSK | 50+50 | QPSK | 25 | P_25@25 | S_0@0 |
| 50 | 100 | QPSK | 50+100 | QPSK | 150 | P_50@0 | S_100@0 |
| 75 | 50 | QPSK | 75+50 | QPSK | 75 | P_75@0 | S_0@0 |
| 75 | 75 | QPSK | 75+75 | QPSK | 75 | P_75@0 | S_0@0 |
| 75 | 75 | QPSK | 75+75 | QPSK | 129 | P_75@0 | S_54@0 |
| 75 | 75 | QPSK | 75+75 | QPSK | 150 | P_75@0 | S_75@0 |
| 100 | 25 | QPSK | 100+25 | QPSK | 50 | P_50@50 | S_0@0 |
| 100 | 25 | QPSK | 100+25 | QPSK | 125 | P_100@0 | S_25@0 |
| 100 | 50 | QPSK | 100+50 | QPSK | 75 | P_75@25 | S_0@0 |
| 100 | 50 | QPSK | 100+50 | QPSK | 150 | P_100@0 | S_50@0 |
| 100 | 75 | QPSK | 100+75 | QPSK | 50 | P_50@0 | S_0@0 |
| 100 | 100 | QPSK | 100+100 | QPSK | 50 | P_50@50 | S_0@0 |
| 100 | 100 | QPSK | 100+100 | QPSK | 75 | P_75@25 | S_0@0 |
| 100 | 100 | QPSK | 100+100 | QPSK | 130 | P_100@0 | S_30@0 |
| 100 | 100 | QPSK | 100+100 | QPSK | 200 | P_100@0 | S_100@0 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.

Note 2: Depending on CA Configuration only the appropriate Uplink RB allocation value according to table 7.3A.0-1 is tested per CA Configuration Test CC combination.

Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg,}$ only the fcombination with the highest NRB_PCC irst of those is tested, according to the order on the Test Configuration Table list.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.34 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are for PCC initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.6.3A.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.3A.1.4.3.

#### 7.6.3A.1.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.3A.1.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.3A.1.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.3A.1.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal below the aggregated component carriers according to Table 7.6.3A.1.5-1.

7. Set the downlink signal level according to the table 7.6.3A.1.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that for at least the duration of the throughput measurement:
   The PCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.6.3A.1.5-1 + $10\log(P_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
   or within (+0dB, -4 dB) of (target level in Table 7.6.3A.1.5-1 + $10\log(P_L_{CRB}/N_{RB_alloc})$) for carrier frequency 3.0GHz < $f \leq 4.2$GHz.
   The SCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.6.3A.1.5-1 + $10\log(S_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
   or within (+0dB, -4 dB) of (target level in Table 7.6.3A.1.5-1 + $10\log(S_L_{CRB}/N_{RB_alloc})$) for carrier frequency 3.0GHz < $f \leq 4.2$GHz.

8. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the aggregated component carriers at step 6.

#### 7.6.3A.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

**Table 7.6.3A.1.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

**Table 7.6.3A.1.4.3-2: UplinkPowerControlDedicatedSCell-r10**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH-r10 | 0 | | |
| deltaMCS-Enabled-r10 | en0 | | |
| accumulationEnabled-r10 | TRUE | | |
| pSRS-Offset-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| pSRS-OffsetAp-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| filterCoefficient-r10 | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| pathlossReferenceLinking-r10 | sCell | | |
| } | | | |

### 7.6.3A.1.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.6.3A.5-1.

**Table 7.6.3A.1.5-1: Narrow-band blocking**

| **Parameter** | **Unit** | **CA Bandwidth Class** | | | | |
|---|---|---|---|---|---|---|
| | | **B** | **C** | **D** | **E** | **F** |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | | 16 | | | |
| $P_{uw}$ (CW) | dBm | | -55 | | | |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | | | |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier and in subclause 6.2.5A for two uplink carriers. | | | | | | |
| Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | |
| Note 3: The $F_{uw}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor \lvert F_{uw}(\text{offset for } \Delta f = 15\,\text{kHz}) \rvert / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster. | | | | | | |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.6.3A.1.5-1 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.3A.2 Narrow band blocking for CA (intra-band contiguous DL CA without UL CA)

### 7.6.3A.2.1 Test Purpose

Same test purpose as 7.6.3A.1.

### 7.6.3A.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA. This test case applies only for CA Configurations that do not support UL CA.

### 7.6.3A.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.3A.0.

### 7.6.3A.2.4 Test Description

#### 7.6.3A.2.4.1 Initial Conditions

Same initial conditions as in clause 7.6.3A.1.4.1 with the following exceptions:

- instead of Table 7.6.3A.1.4.1-1 → use Table 7.6.3A.2.4.1-1.
- Instead of clause 7.6.3A.1.4.3 → use clause 7.6.3A.2.4.3.

**Table 7.6.3A.2.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | | | B: Mid range<br>C: Mid range (Note 4) | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest $N_{RB_agg}$<br>Highest $N_{RB_agg}$<br>(Notes 3, 4) | | | | |
| **Test Parameters for CA Configurations** | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | **UL Allocation** | | | |
| **PCC $N_{RB}$** | **SCC $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | |
| 6 | 25 | QPSK | 6+25 | QPSK | 6 | P_6@0 | - |
| 15 | 50 | QPSK | 15+50 | QPSK | 15 | P_15@0 | - |
| 25 | 25 | QPSK | 25+25 | QPSK | 20 | P_20@0 | - |
| 25 | 25 | QPSK | 25+25 | QPSK | 25 | P_25@0 | |
| 25 | 50 | QPSK | 25+50 | QPSK | 20 | P_20@0 | - |
| 25 | 100 | QPSK | 25+100 | QPSK | 25 | P_25@0 | - |
| 50 | 25 | QPSK | 50+25 | QPSK | 25 | P_25@25 | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 25 | P_25@25 | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 50 | P_50@0 | - |
| 50 | 75 | QPSK | 50+75 | QPSK | 50 | P_50@0 | - |
| 75 | 25 | QPSK | 75+25 | QPSK | 75 | P_75@0 | - |
| 75 | 50 | QPSK | 75+50 | QPSK | 75 | P_75@0 | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 75 | P_75@0 | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 50 | P_50@50 | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 100 | P_100@0 | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 75 | P_75@25 | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 100 | P_100@0 | - |
| 100 | 75 | QPSK | 100+75 | QPSK | 100 | P_100@0 | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 50 | P_50@75 | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 75 | P_75@25 | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 100 | P 100@0 | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.<br>Note 2: Depending on CA Configuration only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per CA Configuration Test CC combination.<br>Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$, only the combination with the highest NRB_PCC is tested.<br>Note 4: For CA_70C all test frequency IDs shall be tested according to table 4.3.1.1.70A-1, in TS 36.508 [7]. | | | | | | | |

7.6.3A.2.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.3A.2.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.3A.2.4.1-1 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal below the aggregated component carriers according to Table 7.6.3A.1.5-1. The interferer frequency is adjusted in analogy with table 7.6.3A.2.4.2-1.

7. Set the downlink signal level according to the table 7.6.3A.1.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.3A.1.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.

8. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the aggregated component carriers at step 6.

**Table 7.6.3A.2.4.2-1: Example for interferer frequencies**

| | Lower frequency | Upper frequency |
|---|---|---|
| $F_{DL}$ = CA_1C Mid range (BW 20MHz + 20MHz) | 2130.1 MHz | 2149.9 MHz |
| $F_{offset}$ | 10 MHz | 10 MHz |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | -10.2 MHz | +10.2 MHz |
| $\lfloor \lvert F_{uw}(\text{offset for } \Delta f = 15\,\text{kHz}) \rvert / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ | 10.2075 MHz | 10.2075 MHz |
| Adjusted $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | -10.2075 MHz | +10.2075 MHz |
| $F_{uw}$ = $F_{DL}$ + Adjusted $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | 2117.5975 MHz | 2162.4025 MHz |

### 7.6.3A.2.4.3 Message Contents

Same message contents as in clause 7.6.3.4.3.

## 7.6.3A.2.5 Test Requirement

Same test requirement as in clause 7.6.3A.1.5 with the following exceptions:

- Instead of Table 7.6.3A.1.5-1 → use Table 7.6.3A.2.5-1.

**Table 7.6.3A.2.5-1: Narrow-band blocking**

| Parameter | Unit | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 16 | 16 | | | |
| $P_{uw}$ (CW) | dBm | -55 | -55 | | | |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | | | |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5.
Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The $F_{uw}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor \lvert F_{uw}(\text{offset for } \Delta f = 15\,\text{kHz}) \rvert / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.

For the UE which supports inter band CA configuration in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.6.3A.2.5-1 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.3A.3 Narrow band blocking for CA (inter-band DL CA without UL CA)

### 7.6.3A.3.1 Test Purpose

Same test purpose as 7.6.3A.1.

### 7.6.3A.3.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support inter-band DL CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 2DL CA with FDD-TDD inter-band CA.

### 7.6.3A.3.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.3A.0.

### 7.6.3A.3.4 Test Description

#### 7.6.3A.3.4.1 Initial Conditions

Same initial conditions as in clause 7.6.3A.1.4.1 with the following exceptions:

- Instead of Table 5.4.2A.1-1→ use Table 5.4.2A.1-2.
- instead of Table 7.6.3A.1.4.1-1 → use Table 7.6.3A.3.4.1-1.
- Instead of clause 7.6.3A.1.4.3 → use clause 7.6.3A.3.4.3.

**Table 7.6.3A.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | | A: Mid range for PCC and SCC | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE | | Highest $N_{RB_agg}$ for PCC and SCC | | | | |
| **Test Parameters for CA Configurations** | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | | **UL Allocation** | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | | **CC MOD** | **PCC $N_{RB_alloc}$** |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 50 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 25 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 20 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 16 |
| 50 | 75 | QPSK | 50 | 75 | QPSK | 25 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 50 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 25 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 20 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 16 |
| 75 | 25 | QPSK | 75 | 25 | QPSK | 75 |
| 75 | 25 | QPSK | 75 | 25 | QPSK | 20 |
| 75 | 50 | QPSK | 75 | 50 | QPSK | 25 |
| 75 | 75 | QPSK | 75 | 75 | QPSK | 25 |
| 75 | 100 | QPSK | 75 | 100 | QPSK | 25 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 100 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 75 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 50 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 100 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 50 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 100 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 75 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 50 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 45 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 25 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 20 |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2.

Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3A.3.5-2 for UE supporting one uplink carrier is tested per Test CA configuration.

Note 3: The UL resource blocks shall be located as close as possible to the downlink PCC but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1).

Note 4: The frequencies of PCC and SCC shall be switched and tested in each configuration, according to the UE declared capability for UL support (within CA operation) in the individual bands. (given UL is supported in PCC band as per Table 5.2-1).

#### 7.6.3A.3.4.2 Test Procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.3A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.3A.3.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal below the SCC according to Table 7.6.3A.3.5-1.
7. Set the downlink signal level according to the table 7.6.3A.3.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.3A.3.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the throughput measurement.
8. Measure the average throughput of SCC for duration sufficient to achieve statistical significance according to Annex G.2.
9. Repeat steps from 6 to 8, using an interfering signal above the SCC at step 6.

#### 7.6.3A.3.4.3 Message Contents

Same message contents as in clause 7.6.3.4.3.

### 7.6.3A.3.5 Test Requirement

For inter-band carrier aggregation with uplink assigned to one E-UTRA band the narrow-band blocking requirements are defined with the uplink active on the band other than the band whose downlink is being tested, i.e. the requirements are tested only for the SCell downlink. The UE shall meet the requirement for each component carrier, when operated as SCell, while both downlink carriers are active.

The throughput measured during the test procedure for each component carrier, when operated as SCell, shall be $\geq$ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.6.3A.3.5-1 (originated from the single carrier Table 7.6.3.5-1).

**Table 7.6.3A.3.5-1: Narrow-band blocking**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz from SCC) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz from SCC) | MHz | | | | | | |
| Note 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.6.3A.3.5-1 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.3A.4 Narrow band blocking for CA (intra-band non-contiguous DL CA without UL CA)

### 7.6.3A.4.1 Test Purpose

Same as in clause 7.6.3A.1.1.

### 7.6.3A.4.2 Test Applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA but no UL CA.

### 7.6.3A.4.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.3A.0.

### 7.6.3A.4.4 Test description

#### 7.6.3A.4.4.1 Initial Conditions

Same as in clause 7.6.3A.1.4.1 with the following exceptions:

- Instead of Table 7.6.3A.1.4.1-1→ use Table 7.6.3A.4.4.1-1.

**Table 7.6.3A.4.4.1-1: Test Configuration Table**

| **Initial Conditions** | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes , and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | A: N/A (Range is not relevant) |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration. | Refer to test point |
| **Test Parameters for CA Configurations** | |
| use the content of Table 7.3A.4.4.1-1 | |

#### 7.6.3A.4.4.2 Test Procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.3A.4.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.3A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.3A.4.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
6. Set the parameters of the signal generator for the interfering signal below the PCC according to Tables 7.6.3A.4.5-1.
7. Set the downlink signal level for PCC and SCC according to the table 7.6.3.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within

+0, - 3.4 dB of the target level in table 7.6.3A.4.5-1 for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the throughput measurement.

8. Measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using the interfering signal above the PCC at step 6.

10. Repeat the steps from 6 to 9, using the interferer signal to the SCC.

#### 7.6.3A.4.4.3 Message Contents

Same message contents as in clause 7.6.3.4.3.

### 7.6.3A.4.5 Test Requirement

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink carriers, the narrow band blocking requirements are defined with the uplink configuration of the PCC being in accordance with Table 7.3A.0-3. The UE shall meet the requirements specified in table 7.6.3A.4.5-1 for each component carrier while both downlink carriers are active. The requirements for each component carrier are the same as single carrier requirements in Table 7.6.3.5-1.

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.6.3A.4.5-1.

**Table 7.6.3A.4.5-1: Narrow-band blocking**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | | |
| Note 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.6.3A.4.5-1 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.3A.5 Narrow band blocking for 3DL CA

### 7.6.3A.5.1 Test Purpose

Same test purpose as 7.6.3A.1.

### 7.6.3A.5.2 Test Applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support 3DL with Intra-band contiguous CA or 3DL with Inter-band CA or 3DL with Intra-band contiguous and Inter-band CA.

This test case also applies to all types of E-UTRA UE release 11 and forward that support 3DL with Intra-band non-contiguous and Inter-band CA or 3DL with Intra-band non-contiguous and Intra-band contiguous CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 3DL with FDD-TDD CA.

### 7.6.3A.5.3 Minimum Conformance Requirements

Same as in clause 7.6.3A.1.

### 7.6.3A.5.4 Test Description

#### 7.6.3A.5.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.3A.5.4.1-1 through table 7.6.3A.5.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.3A.5.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | | | | | | | NC | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | | | | | | | | | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” column | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | | | | Refer to “PCC NRB” and “SCCs NRB” column | | | | |
| Network signalling value | | | | | | | | | NS_01 by default | | | | |
| **Test Parameters for CA Configurations** | | | | | | | | | | | | | |
| **ID** | **PCC** | | | | **SCC1** | | | | **SCC2** | | | | |
| | **Band** | **Range** | **NRB** | | **Band** | **Range** | **NRB** | | **Band** | **Range** | **NRB** | | |
| | **UL MOD** | **DL MOD** | **ULalloc (Note 2,3)** | **DLalloc** | **UL MOD** | **DL MOD** | **ULalloc** | **DLalloc** | **UL MOD** | **DL MOD** | **ULalloc** | **DLa** | |
| **Default Test Settings for a CA_XD Configuration (Intra-band contiguous)** | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | X | Mid/CC3 | N/A | All R | |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Low $N_{RB}$ | |
| **2** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | X | Mid/CC3 | N/A | All R | |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | High $N_{RB}$ | |
| **Default Test Settings for a CA_XA-YA-ZA Configuration (Inter-band)** | | | | | | | | | | | | | |
| **1** | X | Mid | REFSENS | All RBs | Y | Mid | N/A | All RBs | Z | Mid | N/A | All R | |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | High $N_R$ | |
| **2** | Y | Mid | REFSENS | All RBs | X | Mid | N/A | All RBs | Z | Mid | N/A | All R | |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | High $N_R$ | |
| **3** | Z | Mid | REFSENS | All RBs | X | Mid | N/A | All RBs | Y | Mid | N/A | All R | |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | High $N_R$ | |
| **Test Settings for CA_1A-18A-28A Configuration** | | | | | | | | | | | | | |
| **1** | 1 | Low | 50@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All R | |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 5 | |
| **2** | 1 | Low | 75@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All R | |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | 5 | |
| **3** | 1 | Low | 100@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All R | |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | 5 | |
| **4** | 1 | Low | 100@0 | All RBs | 18 | Mid | N/A | All RBs | 28 | High | N/A | All R | |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | 5 | |
| **5** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All R | |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | 5 | |
| **6** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All R | |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | 5 | |
| **7** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All R | |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 5 | |
| **8** | 18 | Mid | 25@50 | All RBs | 1 | Low | N/A | All RBs | 28 | High | N/A | All R | |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 2 | |
| **9** | 18 | Mid | 25@50 | All RBs | 1 | Low | N/A | All RBs | 28 | High | N/A | All R | |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | 5 | |
| **10** | 28 | High | 25@0 | All RBs | 1 | Low | N/A | All RBs | 18 | Mid | N/A | All R | |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 7 | |
| **11** | 28 | Mid | 25@25 | All RBs | 1 | Low | N/A | All RBs | 18 | Low | N/A | All R | |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 5 | |
| **12** | 28 | High | 25@25 | All RBs | 1 | High | N/A | All RBs | 18 | Mid | N/A | All R | |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | 7 | |
| **Default Test Settings for CA_XB-YA and CA_XC-YA Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | Y | Mid | N/A | All R | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | High $N_R$ |
| **2** | X | Mid/CC1 | REFSENS | All RBs | X | Mid/CC2 | N/A | All RBs | Y | Mid | N/A | All R |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | High $N_R$ |
| **3** | Y | Mid | REFSENS | All RBs | X | Mid/CC1 | N/A | All RBs | X | Mid/CC2 | N/A | All R |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | High $N_{RB}$ |
| **4** | Y | Mid | REFSENS | All RBs | X | Mid/CC1 | N/A | All RBs | X | Mid/CC2 | N/A | All R |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Low $N_{RB}$ |
| **Default Test Settings for CA_XA-YB and CA_XA-YC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | |
| **1** | Y | Mid/CC1 | REFSENS | All RBs | Y | Mid/CC2 | N/A | All RBs | X | Mid | N/A | All R |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | High $N_R$ |
| **2** | Y | Mid/CC1 | REFSENS | All RBs | Y | Mid/CC2 | N/A | All RBs | X | Mid | N/A | All R |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | High $N_R$ |
| **3** | X | Mid | REFSENS | All RBs | Y | Mid/CC1 | N/A | All RBs | Y | Mid/CC2 | N/A | All R |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | High $N_{RB}$ |
| **4** | X | Mid | REFSENS | All RBs | Y | Mid/CC1 | N/A | All RBs | Y | Mid/CC2 | N/A | All R |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Low $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL i an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band contiguous:** X corresponds to the band in the CA Configuration. E.g. for CA_41D, X=41
Note 5: **Inter-band:** X,Y,Z correspond to the 1st, 2nd and 3rd band in the CA Configuration. E.g. for CA_1A-3A-19A, X=1, Y=3, Z=1
Note 6: **Intra-band contiguous + Inter-band:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_1C-3A, X=1 and Y=3
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according table 7.3.5-2.
Note 8: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 9: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC} = N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.
Note 10: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 11: ID/test points that result in no refsens requirement shall be skipped.

**Table 7.6.3A.5.4.1-2: Test Configuration Table with $W_{gap}$**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3,4) | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for CA_XA-XA-YA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | X | CC2 | REFSENS | All RBs | Max | X | CC1 | N/A | All RBs | - | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| 2 | Y | Mid | REFSENS | All RBs | - | X | CC2 | N/A | All RBs | Max | X | CC1 | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| **Default Test Settings for CA_XA-YA-YA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | Y | CC2 | REFSENS | All RBs | Max | Y | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| 2 | X | Mid | REFSENS | All RBs | - | Y | CC2 | N/A | All RBs | Max | Y | CC1 | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| **Test Settings for CA_29A-66A-66A Configuration (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | 29 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **Test Settings for a CA_41C-41A Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 1 | 41 | CC3 | 100@0 | All RBs | 134.2 | 41 | CC2 | N/A | All RBs | - | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_41A-41C Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 2 | 41 | CC3 | 100@0 | All RBs | - | 41 | CC2 | N/A | All RBs | 134.2 | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Group Test Settings for CA_66A-66A-XA or CA_XA-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| 2 | X | Mid | REFSENS | All RBs | - | 66 | CC1 | N/A | All RBs | 50 | 66 | CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_66A-66C Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 30.2 | 66 | CC2 | N/A | All RBs | - | 66 | CC3 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.

Note 2: **Intra-band non-contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.

Note 3: **Intra-band non-contiguous + Intra-band contiguous:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.

Note 4: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.

Note 5: **Intra-band non-contiguous + Inter-band:** X and Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A,X=2,Y=5

Note 6: **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A,X=41.
Note 7: **Intra-band non-contiguous + Inter-band:** REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RE allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.
Note 10: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 11: ID/test points that result in no refsens requirement shall be skipped.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.58 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 7.6.3A.5.4.1-1 through Table 7.6.3A.5.4.1-2 as appropriate.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.3A.5.4.3.

### 7.6.3A.5.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.3A.5.4.3
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.3A.5.4.1-1 through Table 7.6.3A.5.4.1-5 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.3A.5.4.1-1 through Table 7.6.3A.5.4.1-2 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal below the aggregated component carriers according to Table 7.6.3A.5.4.2-1.
7. Set the downlink signal level according to the table 7.6.3A.5.4.2-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.3A.5.4.2-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.
8. Measure the average throughput for the carrier(s) indicated in Table 7.6.3A.5.4.2-1 for duration sufficient to achieve statistical significance according to Annex G.2A.
9. Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to Table 7.6.3A.5.4.2-1 at step 6.
10. Repeat steps 1 to 9 for component carriers listed in Table 7.6.3A.5.4.2-1.

**Table 7.6.3A.5.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2 | 7.6.3A.5.5-1 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.6.3A.5.5-2 |
| | | SCC2 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| Intra-band contiguous + Inter-band | 1 | SCC2 | 7.6.3A.5.5-2 |
| | 2 | | |
| | 3 | SCC1, SCC2 | 7.6.3A.5.5-1 |
| | 4 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC2 | 7.6.3A.5.5-2 |
| | 2 | SCC1, | 7.6.3A.5.5-2 |
| | | SCC2 | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.6.3A.5.5-2 |
| | | SCC1, SCC2 | 7.6.3A.5.5-1 |
| | 2 | SCC2 | 7.6.3A.5.5-2 |
| | | PCC, SCC1 | 7.6.3A.5.5-1 |

Note 1: Test point ID for the particular CA configuration as defined in section 7.6.3A.5.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.

### 7.6.3A.5.4.3 Message Contents

Same message contents as in clause 7.6.3.4.3 for without UL CA.

Same message contents as in clause 7.6.3A.1.4.3 for UL CA.

## 7.6.3A.5.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table Tables below, according to the type of CA.

**Table 7.6.3A.5.5-1: Narrow-band blocking (intra-band contiguous)**

| Parameter | Unit | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |

| Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
|---|---|---|---|---|---|---|
| | | 16 | 16[4] | 16 | | |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | | |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | | |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5. | | | | | | |
| Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | |
| Note 3: The $F_{uw}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor \lvert F_{uw}(\text{offset for } \Delta f = 15\,\text{kHz}) \rvert / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster. | | | | | | |
| Note 4: The requirement is applied for the band combinations whose component carriers' BW≥5 MHz. | | | | | | |

**Table 7.6.3A.5.5-2: Narrow-band blocking (inter-band, intra-band non-contiguous)**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_w$ for each CC | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz from SCC) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz from SCC) | MHz | | | | | | |
| Note 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| Note 3: For intra-band non-contiguous + inter-band CA, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps. | | | | | | | |

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.6.3A.5.5-1 and 7.6.3A.5.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.3A.6

## 7.6.3A.7 Narrow band blocking for 4DL CA

### 7.6.3A.7.1 Test Purpose

Same test purpose as 7.6.3A.1.

### 7.6.3A.7.2 Test Applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support 4DL with TDD Intra-band contiguous CA, or 4DL with Inter-band CA, or 4DL with Intra-band contiguous and Inter-band CA.

This test case also applies to all types of E-UTRA UE release 11 and forward that support4DL Intra-band non-contiguous CA + Inter-band CA or 4DL Intra-band non-contiguous + Intra-band contiguous CA, or 4DL with Intra-band non-contiguous and Intra-band non-contiguous CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 4DL CA with FDD-TDD CA.

### 7.6.3A.7.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.3A.0.

### 7.6.3A.7.4 Test Description

#### 7.6.3A.7.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.3A.7.4.1-1 through table 7.6.3A.7.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.3A.7.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for a CA_XE Configuration (Intra-band contiguous)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YD, YD-XA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **4** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | X | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | R | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings for CA_XB-YA-ZA and CA_XC-YA-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-XB-ZA and CA_YA-XC-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XB and CA_YA-ZA-XC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |
| **Test Settings for CA_2A-66C-71A Configuration** | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 66 | Mid/CC1 | 100@0 | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 66 | Mid/CC1 | 100@0 | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 2 | Low | 100@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 2 | Low | 100@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **5** | 71 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 71 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |
| **Default Test Settings for CA_XC-YC Configuration (Intra-band contiguous + Inter-band(2))** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |
| **3** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.

Note 4: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41E, X=41.
Note 6: **Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-8A,X=1,Y=3,Z=7,R=8.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_3C-7A-28A, X=3,Y=7 and Z=28.
Note 8: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC}$ = $N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.
Note 11: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 12: ID/test points that result in no refsens requirement shall be skipped.

**Table 7.6.3A.7.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | | $W_{gap}$ [MHz] | SCC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for CA_XA-XA-YA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-XA-XA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XA-XA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-66A-66A-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC1 | REFSENS | ALL RBs | Max | X | CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC1 | N/A | ALL RBs | Max | X | CC2 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPS | 64- | | $N_{RB_agg}$ | | N/A | 64- | | $N_{RB_a}$ | | N/A | 64- | | $N_{RB_a}$ | | N/A | 64- | | $N_{RB_agg}$ |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | K | QAM | | | | | QAM | | gg | | | QAM | | gg | | | QAM | | |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC1 | N/A | ALL RBs | Max | X | CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YC Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YC-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | REFSENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Y | Mid/CC1 | N/A | ALL RBs | - | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ |
| **2** | Y | Mid/CC1 | REFSENS | ALL RBs | - | Y | Mid/CC2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XD/XD-XA/XC-XC Configurations (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | |
| **TBD** | | | | | | | | | | | | | | | | | | | |
| **Default Test Settings for CA_XA-XA-YA-YA Configurations (Intra-band non-contiguous + Intra-band non-contiguous)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC4 | REFSENS | ALL RBs | Max | X | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | Max | Y | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | CC4 | REFSENS | ALL RBs | Max | Y | CC3 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band non-contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-12A,X=2,Y=4,Z=12.
Note 5: **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A-41A,X=41.
Note 6: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-4A,X=2,Y=4.
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.
Note 9: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 10: ID/test points that result in no refsens requirement shall be skipped.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.58 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 7.6.3A.7.4.1-1 through Table 7.6.3A.7.4.1-2 as appropriate.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.3A.7.4.3.

#### 7.6.3A.7.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.3A.7.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.3A.7.4.1-1 through Table 7.6.3A.7.4.1-6 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.3A.7.4.1-1 through Table 7.6.3A.7.4.1-2 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal below the aggregated component carriers according to Table 7.6.3A.7.4.2-1.
7. Set the downlink signal level according to the table 7.6.3A.7.4.2-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.3A.7.4.2-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq 4.2$GHz, for at least the duration of the throughput measurement.
8. Measure the average throughput for the carrier(s) indicated in Table 7.6.3A.7.4.2-1 for duration sufficient to achieve statistical significance according to Annex G.2A.
9. Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to Table 7.6.3A.7.4.2-1 at step 6.
10. Repeat steps 1 to 9 for component carriers listed in Table 7.6.3A.7.4.2-1.

**Table 7.6.3A.7.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2,SCC3 | 7.6.3A.7.5-1 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.6.3A.7.5-2 |
| | | SCC2 | |
| | | SCC3 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | 4 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| Intra-band contiguous + Inter-band | 1 | SCC2 SCC3 | 7.6.3A.7.5-2 |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3 | 7.6.3A.7.5-1 |
| | 4 | | |
| | 5 | SCC1, SCC2, SCC3 | 7.6.3A.7.5-1 |
| | 6 | | |
| Intra-band contiguous + Inter-band(2) | 1 | SCC2 SCC3 | 7.6.3A.7.5-1 |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC2, SCC3 | 7.6.3A.7.5-2 |
| | 2 | SCC1, | 7.6.3A.7.5-2 |
| | | SCC2 | |
| | | SCC3 | |
| | 3 | SCC1 | 7.6.3A.7.5-2 |
| | | SCC2 | |
| | | SCC3 | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.6.3A.7.5-2 |
| | | SCC1, SCC2, SCC3 | 7.6.3A.7.5-1 |
| | 2 | SCC2 | 7.6.3A.7.5-2 |
| | | PCC, SCC1, SCC3 | 7.6.3A.7.5-1 |
| Intra-band non-contiguous + Intra-band non-contiguous | 1 | SCC2 | 7.6.3A.7.5-2 |
| | | SCC3 | |
| | 2 | SCC2 | |
| | | SCC3 | |

Note 1: Test point ID for the particular CA configuration as defined in section 7.6.3A.7.4.1.

Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.

Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.

### 7.6.3A.7.4.3 Message Contents

Same message contents as in clause 7.6.3.4.3 for without UL CA.

Same message contents as in clause 7.6.3A.1.4.3 for UL CA.

### 7.6.3A.7.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table Tables below, according to the type of CA.

**Table 7.6.3A.7.5-1: Narrow-band blocking (intra-band contiguous)**

| Parameter | Unit | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 16 | 16[4] | 16 | 16 | |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A. | | | | | | |
| Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | |
| Note 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster. | | | | | | |
| Note 4: The requirement is applied for the band combinations whose component carriers' BW≥5 MHz. | | | | | | |

**Table 7.6.3A.7.5-2: Narrow-band blocking (inter-band, intra-band non-contiguous)**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_w$ for each CC | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz from SCC) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz from SCC) | MHz | | | | | | |
| Note 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| Note 3: For intra-band non-contiguous + inter-band CA, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps. | | | | | | | |

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.6.3A.7.5-1 and 7.6.3A.7.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.3A.8 Narrow band blocking for 5DL CA

### 7.6.3A.8.1 Test Purpose

Same test purpose as 7.6.3A.1.

### 7.6.3A.8.2 Test Applicability

This test case applies to all types of E-UTRA UE and forward that support 5DL with CA configurations in Table 7.1-2c.

### 7.6.3A.8.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.3A.0.

### 7.6.3A.8.4 Test Description

#### 7.6.3A.8.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.3A.8.4.1-1 through table 7.6.3A.8.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

| Table 7.6.3A.8.4.1-1: Test Configuration TableInitial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC $N_{RB}$” and “SCCs $N_{RB}$” columns |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3,4) | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for a CA_XF Configuration** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | X | Mid/ CC5 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | X | Mid/ CC5 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA-SA Configuration** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | R | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | S | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest | N/A | QPSK | | Highest | N/A | QPSK | | Highest | N/A | QPSK | | Highest | N/A | QPSK | | Highest |

| | | | | $N_{RB}$ | | | | $N_{RB}$ | | | | $N_{RB}$ | | | | $N_{RB}$ | | | | $N_{RB}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Default Test Settings for a CA_XE-YA, YA-XE Configuration** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **Default Test Settings for CA_XB-YA-ZA-RA and CA_XC-YA-ZA-RA Configuration** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Z | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **7** | R | Mid | REF | ALL | Z | Mid | N/A | ALL | Y | Mid | N/A | ALL | X | Mid/ | N/A | ALL | X | Mid/ | N/A | ALL |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SENS | RBs | | | | RBs | | | | RBs | | CC1 | | RBs | | CC2 | | RBs |
| | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **8** | R | Mid | REF SENS | ALL RBs | Z | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs |
| | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **Default Test Settings for CA_XD-YA-ZA Configuration** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **6** | Z | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| Default Test Settings CA_XB-YB-ZA, CA_XB-YC-ZA, CA_XC-YB-ZA, and CA_XC-YC-ZA Configuration | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid/ CC1 | REF SENS | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid/ CC1 | REF SENS | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **6** | Z | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 4: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41F, X=41.
Note 6: **Inter-band:** X,Y,Z,R,S correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-20A-42A,X=1,Y=3,Z=7,R=20,S=42.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-28A-42C, X=1, Y=3, Z=28 and R=42.
Note 8: REFSENS refers to the PCC bands and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose the Combination with $N_{RB_PCC} = N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.

**Table 7.6.3A.8.4.1-2: Test Configuration Table with $W_{gap}$**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to "Range" columns. For mapping within Band refer to "CC" columns |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | | $W_{gap}$ [MHz] | SCC3 | | | | $W_{gap}$ [MHz] | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for CA_XA-XA-YA-ZA-RA Configurations** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REF SENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | Mid | REF SENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Z | Mid | REF SENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **4** | R | Mid | REF SENS | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YD Configurations** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Y | CC3 | REF SENS | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ |
| **2** | X | CC2 | REF SENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YA-ZA-ZA Configurations** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Z | CC2 | REF SENS | ALL RBs | Max | Z | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | X | CC2 | REF | ALL | Max | X | CC1 | N/A | ALL | - | Z | CC2 | N/A | ALL | Max | Z | CC1 | N/A | ALL | - | Y | Mid | N/A | ALL |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SENS | RBs | | | | | RBs | | | | | RBs | | | | | RBs | | | | RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | CC2 | N/A | ALL RBs | Max | Z | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YA-ZC Configurations Intra-band non-contiguous + Intra-band non-contiguous** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Z | Mid/CC1 | REF SENS | ALL RBs | - | Z | Mid/CC2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | 66 | CC1 | REF SENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Z | Mid/CC1 | N/A | ALL RBs | - | Z | Mid/CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Z | Mid/CC1 | N/A | ALL RBs | - | Z | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band non-contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-12A-66A,X=2,Y=5,Z=12,R=66.
Note 5: **Intra-band non-contiguous + Intra-band contiguous:** X,Y corresponds to the band of the CA Configuration. E.g. for CA_5A-5A-66D,X=5,Y=66.
Note 6: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-66A-66A,X=2,Y=5,Z=66.
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.58 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 7.6.3A.8.4.1-1 through Table 7.6.3A.8.4.1-2 as appropriate.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.3A.8.4.3.

### 7.6.3A.8.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.6.3A.8.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.3A.8.4.1-1 through Table 7.6.3A.8.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.3A.8.4.1-1 through Table 7.6.3A.8.4.1-2 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal below the aggregated component carriers according to Table 7.6.3A.8.4.2-1.
7. Set the downlink signal level according to the table 7.6.3A.8.4.2-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.3A.8.4.2-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq 4.2$GHz, for at least the duration of the throughput measurement.
8. Measure the average throughput for the carrier(s) indicated in Table 7.6.3A.8.4.2-1 for duration sufficient to achieve statistical significance according to Annex G.2A.
9. Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to Table 7.6.3A.8.4.2-1 at step 6.
10. Repeat steps 1 to 9 for component carriers listed in Table 7.6.3A.8.4.2-1.

**Table 7.6.3A.8.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| CA_XF | 1 | PCC, SCC1, SCC2,SCC3, SCC4 | 7.6.3A.8.5-1 |
| | 2 | | |
| CA_XA-YA-ZA-RA-SA | 1 | SCC1 | 7.6.3A.8.5-2 |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 4 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 5 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| CA_XE-YA | 1 | SCC4 | 7.6.3A.8.5-2 |
| | 2 | SCC1,SCC2, SCC3,SCC4 | 7.6.3A.8.5-1 |
| | 3 | | |
| | 4 | | |
| CA_XB-YA-ZA-RA<br>CA_XC-YA-ZA-RA | 1 | SCC2 | 7.6.3A.8.5-2 |
| | | SCC3 | |
| | | SCC4 | |
| | 2 | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 3 | SCC1,SCC2 | 7.6.3A.8.5-1 |
| | | SCC3 | 7.6.3A.8.5-2 |
| | | SCC4 | |
| | 4 | SCC1,SCC2 | 7.6.3A.8.5-1 |
| | | SCC3 | 7.6.3A.8.5-2 |
| | | SCC4 | |
| | 5 | SCC1 | 7.6.3A.8.5-2 |
| | | SCC2,SCC3 | 7.6.3A.8.5-1 |
| | | SCC4 | 7.6.3A.8.5-2 |
| | 6 | SCC1 | 7.6.3A.8.5-2 |
| | | SCC2,SCC3 | 7.6.3A.8.5-1 |
| | | SCC4 | 7.6.3A.8.5-2 |
| | 7 | SCC1 | 7.6.3A.8.5-2 |
| | | SCC2 | |
| | | SCC3,SCC4 | 7.6.3A.8.5-1 |
| | 8 | SCC1 | 7.6.3A.8.5-2 |
| | | SCC2 | |
| | | SCC3,SCC4 | 7.6.3A.8.5-1 |
| CA_XD-YA-ZA | 1 | SCC3 | 7.6.3A.8.5-2 |
| | | SCC4 | |
| | 2 | SCC3 | 7.6.3A.8.5-2 |
| | | SCC4 | |
| | 3 | SCC1,SCC2, SCC3 | 7.6.3A.8.5-1 |
| | | SCC4 | 7.6.3A.8.5-2 |
| | 4 | SCC1,SCC2, | 7.6.3A.8.5-1 |

| | | | |
|---|---|---|---|
| | | SCC3 | |
| | | SCC4 | 7.6.3A.8.5-2 |
| | 5 | SCC1 | 7.6.3A.8.5-2 |
| | | SCC2,SCC3, SCC4 | 7.6.3A.8.5-1 |
| | 6 | SCC1 | 7.6.3A.8.5-2 |
| | | SCC2,SCC3, SCC4 | 7.6.3A.8.5-1 |
| CA_XB-YB-ZA<br>CA_XB-YC-ZA<br>CA_XC-YB-ZA<br>CA_XC-YC-ZA | 1 | SCC2,SCC3 | 7.6.3A.8.5-1 |
| | | SCC4 | 7.6.3A.8.5-2 |
| | 2 | SCC2,SCC3 | 7.6.3A.8.5-1 |
| | | SCC4 | 7.6.3A.8.5-2 |
| | 3 | SCC2,SCC3 | 7.6.3A.8.5-1 |
| | | SCC4 | 7.6.3A.8.5-2 |
| | 4 | SCC2,SCC3 | 7.6.3A.8.5-1 |
| | | SCC4 | 7.6.3A.8.5-2 |
| | 5 | SCC1,SCC2, SCC3,SCC4 | 7.6.3A.8.5-1 |
| | 6 | SCC1,SCC2, SCC3,SCC4 | 7.6.3A.8.5-1 |
| CA_XA-XA-YA-ZA-RA | 1 | SCC2,SCC3, SCC4 | 7.6.3A.8.5-2 |
| | 2 | SCC1,SCC2, SCC3,SCC4 | |
| | 3 | | |
| | 4 | | |
| CA_XA-XA-YD | 1 | SCC3, SCC4 | 7.6.3A.8.5-2 |
| | 2 | SCC2,SCC3, SCC4 | 7.6.3A.8.5-1 |
| CA_XA-XA-YA-ZA-ZA | 1 | SCC2,SCC3, SCC4 | 7.6.3A.8.5-2 |
| | 2 | | |
| | 3 | SCC1,SCC2, SCC3,SCC4 | |

Note 1: Test point ID for the particular CA configuration as defined in section 7.6.3A.8.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.

### 7.6.3A.8.4.3 Message Contents

Same message contents as in clause 7.6.3.4.3 for without UL CA.

Same message contents as in clause 7.6.3A.1.4.3 for UL CA.

## 7.6.3A.8.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table Tables below, according to the type of CA.

**Table 7.6.3A.8.5-1: Narrow-band blocking (intra-band contiguous)**

| Parameter | Unit | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |

| Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
|---|---|---|---|---|---|---|
| | | 16 | 16[4] | 16 | 16 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 | - $F_{offset}$ – 0.2 / + $F_{offset}$ + 0.2 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A. | | | | | | |
| Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | |
| Note 3: The $F_{interferer}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster. | | | | | | |
| Note 4: The requirement is applied for the band combinations whose component carriers' BW≥5 MHz. | | | | | | |

**Table 7.6.3A.8.5-2: Narrow-band blocking (inter-band, intra-band non-contiguous)**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_w$ for each CC | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz from SCC) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz from SCC) | MHz | | | | | | |
| Note 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| Note 3: For intra-band non-contiguous + inter-band CA, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps. | | | | | | | |

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B, 7.3.3-1C and 7.3.3-1D, $P_{uw}$ power defined in Table 7.6.3A.8.5-1 and 7.6.3A.8.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B, 7.3.3-1C and 7.3.3-1D.

# 7.6.3B Narrow band blocking for UL-MIMO

## 7.6.3B.1 Test Purpose

Narrow band blocking for UL-MIMO is defined for an unwanted CW interfering signal falling near the UE that supports UL-MIMO receive band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels,

The lack of narrow-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

## 7.6.3B.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

## 7.6.3B.3 Minimum Conformance Requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in clause 7.6 shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2. For UL-MIMO, the parameter $P_{CMAX_L}$ is defined as the total transmitter power over the two transmit antenna connectors.

## 7.6.3B.4 Test Description

### 7.6.3B.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.3B.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.6.3B.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS 36.508 [7] clause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD | TDD | | FDD | TDD |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[4] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2). | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.30.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1
4. The UL and DL Reference Measurement channels are set according to Table 7.6.3B.4.1-1.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.6.3B.4.3.

### 7.6.3B.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.3B.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 7.6.3B.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.3B.5-1.

4. Set the downlink signal level according to the table 7.6.3B.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.3B.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the throughput measurement and the UE output power is mean sum power of each antenna connector for UE.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 3.

### 7.6.3B.4.3 Message Contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception.

**Table 7.6.3B.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.6.3B.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.6.3B.5-1.

**Table 7.6.3B.5-1: Narrow-band blocking**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_w$ | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | | |
| Note 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.6.3B.5-1 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.3D Narrow band blocking for ProSe

### 7.6.3D.0 Minimum conformance requirements

The relative throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Table 7.6.3D.0-1 and Table 7.6.3D.0-2.

**Table 7.6.3D.0-1: Narrow-band blocking for ProSe Direct Discovery**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_w$ | dBm | $P_{REFSENS_ProSe}$ + channel-bandwidth specific value below + $P_{offset}$ | | | | | |
| | | | | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | | | -55 | -55 | -55 | -55 |
| $P_{offset}$ | dB | | | 10.9 | 13.9 | 15.7 | 16.9 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | | | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | | |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2. | | | | | | | |

**Table 7.6.3D.0-2: Narrow-band blocking for ProSe Direct Communication**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_w$ | dBm | $P_{REFSENS_ProSe}$ + channel-bandwidth specific value below | | | | | |
| | | | | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | | | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | | | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | | |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2. | | | | | | | |

For the UE which supports inter-band CA configuration in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{UW}$ power defined in Table 7.6.3D.0-1 and Table 7.6.3D.0-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

The normative reference for this requirement is TS 36.101 [2] clause 7.6.3.1D.

### 7.6.3D.1 Narrow band blocking for ProSe Direct Discovery

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Use of OCNG for Downlink has not been considered and is still FFS.
- Message exceptions content needs further investigation (some values still TBD).
- Test time is FFS.

### 7.6.3D.1.1 Test Purpose

Narrow-band blocking verifies the receiver's ability to receive a E-UTRA signal at its assigned channel frequency in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

### 7.6.3D.1.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Discovery, but not ProSe Direct Communication.

### 7.6.3D.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.3D.0.

### 7.6.3D.1.4 Test Description

#### 7.6.3D.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA ProSe bands specified in table 5.4.2D.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.3D.1.4.1-1. The details of the downlink, uplink and sidelink reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.6.

**Table 7.6.3D.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range(Note 4) | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, Highest | | | | | |
| | **Downlink Configuration (Note 2)** | | **Uplink Configuration (Note 2)** | | **Sidelink Configuration (Reception) (Note 3)** | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Mod'n | RB allocation |
| 5MHz | QPSK | 8 | QPSK | 8 | QPSK | 2 |
| 10MHz | QPSK | 16 | QPSK | 16 | QPSK | 2 |
| 15MHz | QPSK | 25 | QPSK | 25 | QPSK | 2 |
| 20MHz | QPSK | 30 | QPSK | 30 | QPSK | 2 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA ProSe and Operating band, according to the applicability specified respectively in Table 5.4.2D.1-1 and Table 5.4.2.1-1.<br>Note 2: After DRX configuration, DL-RMC (PDSCH) and DCI-0 for scheduling UL-RMC (PUSCH) are applied only in the DRX On subframes.<br>Note 3: The RB start for the transmission of Sidelink RMC is RB#0.<br>Note 4: Sidelink uses the frequencies defined for Uplink. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.71.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.6.3D.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents exceptions are defined in clause 7.6.1D.1.4.3.
7. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is activated.

#### 7.6.1D.1.4.2 Test Procedure

1. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions (only those marked with "…Step 1…" ) are defined in clause 7.6.3D.1.4.3.
2. The UE shall transmit RRCConnectionReconfigurationComplete message.
3. Initialise the variables Ptot and Pok as 0.
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.3D.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.3D.1.4.1-1. When the UE has no payload data to send, it transmits uplink MAC padding bits on the UL RMC.
6. SS transmits PSDCH to transmit the SL RMC according to Table 7.6.3D.1.4.1-1. Set the Sidelink signal level to the appropriate value defined in Table 7.6.3D.1.5-1.
7. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.3D.1.5-1.
8. SS shall send SL Discovery Packets (MAC padding bits) on the SL RMC for the test time [FFS]. SS stores the number of the transmitted Discovery Packets in the current test iteration in the variable Ptot.
10. SS shall send (on the available PDSCH) a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER REQUEST" message and wait for the UE to respond (on the available PUSCH) with a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER RESPONSE".
11. SS calculates the variable Pok as (current counter value - counter value at last test iteration).
12. SS shall compute the throughput as following:

    TP = Pok / Ptot * 100%

13. Repeat steps from 6 to 12, using an interfering signal above the wanted signal in step 7.

#### 7.6.1D.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

- Table A.7.1.1-1 for FDD
- Table A.7.1.2-1 for TDD

**Table 7.6.3D.1.4.3-1: ACTIVATE TEST MODE: Reference sensitivity for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 7.6.3D.1.4.3-2: CLOSE UE TEST LOOP: Reference sensitivity for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 7.6.3D.1.4.3-3: MAC-MainConfig-RBC: Reference sensitivity for ProSe Direct Discovery (applicable only for Step 1 of Test procedure)**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | TBD | | |
| periodicBSR-Timer | TBD | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | TBD | | |
| } | | | |

### 7.6.3D.1.5 Test Requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Tables 7.6.3D.1.5-1.

**Table 7.6.3D.1.5-1: Narrow-band blocking for ProSe Direct Discovery**

| **Parameter** | **Unit** | **Channel Bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| $P_w$ | dBm | $P_{REFSENS_ProSe}$ + channel-bandwidth specific value below + $P_{offset}$ | | | | | |
| | | | | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | | | -55 | -55 | -55 | -55 |
| $P_{offset}$ | dB | | | 10.9 | 13.9 | 15.7 | 16.9 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | | | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | | |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2. | | | | | | | |

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Table 7.6.1D.1.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.6.3D.2 Narrow band blocking for ProSe Direct Communication

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Test description is TBD

### 7.6.3D.2.1 Test Purpose

Same test purpose as in clause 7.6.3D.1.1.

### 7.6.3D.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Communication.

### 7.6.3D.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.6.3D.0.

### 7.6.3D.2.4 Test Description

TBD

### 7.6.3D.2.5 Test Requirement

Same test requirement as in clause 7.6.3D.1.5 with the following exceptions:

- Instead of Table 7.6.3D.1.5-1 → use Table 7.6.3D.2.5-1.

**Table 7.6.3D.2.5-1: Narrow-band blocking for ProSe Direct Communication**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_w$ | dBm | $P_{REFSENS_ProSe}$ + channel-bandwidth specific value below | | | | | |
| | | | | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | | | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | | | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | | |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2. | | | | | | | |

## 7.6.3E Narrow band blocking for UE category 0

### 7.6.3E.1 Test Purpose

Same test purpose as in clause 7.6.3.

### 7.6.3E.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 7.6.3E.3 Minimum Conformance Requirements

Same minimum conformance requirements as in clause 7.6.3.3.

### 7.6.3E.4 Test Description

#### 7.6.3E.4.1 Initial Conditions

Same initial conditions as in clause 7.5.4.1 with the following exceptions:

- Instead of Table 7.6.3.4.1-1 → use Table 7.6.3E.4.1-1.
- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.5 using only main UE Tx/Rx antenna.

**Table 7.6.3E.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD and HD-FDD | TDD | | FDD and HD-FDD | TDD |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 14 | 14 | QPSK | 15 | 15 |
| 5MHz | QPSK | 14 | 14 | QPSK | 25 | 25 |
| 5MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 10MHz | QPSK | 14 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 15MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 15MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 20MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3E.3-3 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Downlink RB position shall be $RB_{start}$ = 0 | | | | | | |

### 7.6.3E.4.2 Test Procedure

Same test procedure as in clause 7.6.3.4.2

### 7.6.3E.4.3 Message Contents

Same message contents as in clause 7.6.3.4.3

## 7.6.3E.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in clause A.3.2 with parameters specified in Table 7.6.3E.5-1.

**Table 7.6.3E.5-1: Narrow-band blocking**

| **Parameter** | **Unit** | **Channel Bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| $P_w$ | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | | |
| Note 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5E. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in clauses A.5.1.1/A.5.2.1. | | | | | | | |

# 7.6.3EA Narrow band blocking for UE Category M1

## 7.6.3EA.1 Test Purpose

Verifies a receiver's ability to receive an E-UTRA signal at its assigned channel frequency in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

The lack of narrow-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

## 7.6.3EA.2 Test Applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category M1.

## 7.6.3EA.3 Minimum Conformance Requirements

The relative throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.3EA.3-1. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.6.3EA.3-1: Narrow-band blocking**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_w$ | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | | |
| NOTE 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in subclause 6.2.5EA. | | | | | | | |
| NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| NOTE 3: For DL category M1 UE, the reference sensitivity for category M1 in table 7.3EA-1 and 7.3EA-2should be used as $P_{REFSENS}$ for $P_w$. | | | | | | | |
| NOTE 4: For DL category M1 UE, the parameters for the applicable channel bandwidth apply. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.6.3.

## 7.6.3EA.4 Test Description

### 7.6.3EA.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for CAT M1 in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.1EA.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

**Table 7.6.3EA.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | | |
| | | FDD | TDD | | FDD and HD-FDD | TDD | Narrowband index (Note 1) |
| 5MHz | QPSK | 4 | 4 | QPSK | 6 | 6 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4. | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.5 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1

4. The UL and DL Reference Measurement channels are set according to Table 7.6.3EA.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 7.6.3EA.4.3.

### 7.6.3EA.4.2 Test Procedure

1. SS transmits PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 7.6.1EA.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

2. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 7.6.3EA.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.3EA.5-1.

4. Set the downlink signal level according to the table 7.6.3EA.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.6.3EA.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the throughput measurement.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 3.

### 7.6.3EA.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the condition CEModeA and the following exception.

**Table 7.6.3EA.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-UE-PUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.6.3EA.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.6.3EA.5-1.

**Table 7.6.3EA.5-1: Narrow-band blocking**

| **Parameter** | **Unit** | **Channel Bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| $P_w$ | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | | |
| NOTE 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in subclause 6.2.5EA.<br>NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.<br>NOTE 3: For DL category M1 UE, the reference sensitivity for category M1 in table 7.3EA-1 and 7.3EA-2 should be used as $P_{REFSENS}$ for $P_w$.<br>NOTE 4: For DL category M1 UE, the parameters for the applicable channel bandwidth apply. | | | | | | | |

# 7.6.3EB Narrow band blocking for UE category 1bis

Editor's note

- Test case incomplete with Annex F.3.3 needing update. TT shall be same as legacy test case.

## 7.6.3EB.1 Test Purpose

Same test purpose as in clause 7.6.3.

## 7.6.3EB.2 Test Applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

## 7.6.3EB.3 Minimum Conformance Requirements

Same minimum conformance requirements as in clause 7.6.3.3.

### 7.6.3EB.4 Test Description

#### 7.6.3EB.4.1 Initial Conditions

Same initial conditions as in clause 7.5.4.1 with the following exceptions:

Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.5 using only main UE Tx/Rx antenna.

#### 7.6.3E.4.2 Test Procedure

Same test procedure as in clause 7.6.3.4.2

#### 7.6.3EB.4.3 Message Contents

Same message contents as in clause 7.6.3.4.3

### 7.6.3EB.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in clause A.3.2 with parameters specified in Table 7.6.3EB.5-1.

**Table 7.6.3EB.5-1: Narrow-band blocking**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_w$ | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | | |
| Note 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5E.<br>Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in clauses A.5.1.1/A.5.2.1.<br>Note 3: The REFSENS power level is specified in Table 7.3EB.3-1 for main antenna port. | | | | | | | |

## 7.6.3EC Narrow band blocking for UE category M2

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Downlink RB allocation is TBD
- The test applicability needs to be added to TS36.521-2

### 7.6.3EC.1 Test purpose

Same as in clause 7.6.3EA.1

### 7.6.3EC.2 Test applicability

This test applies to all types of E-UTRA UE release 14 and forward of category M2.

### 7.6.3EC.3 Minimum conformance requirements

The relative throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.3EC.3-1. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.6.3EC.3-1: Narrow-band blocking**

| Parameter | Unit | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |

| $P_w$ | dBm | $P_{REFSENS}$ + channel-bandwidth specific value below | | | | | |
|---|---|---|---|---|---|---|---|
| | | 22 | 18 | 16 | 13 | 14 | 16 |
| $P_{uw}$ (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 |
| $F_{uw}$ (offset for $\Delta f$ = 15 kHz) | MHz | 0.9075 | 1.7025 | 2.7075 | 5.2125 | 7.7025 | 10.2075 |
| $F_{uw}$ (offset for $\Delta f$ = 7.5 kHz) | MHz | | | | | | |
| NOTE 1: The transmitter shall be set a 4 dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in subclause 6.2.5EA. | | | | | | | |
| NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| NOTE 3: For DL category M1 and M2 UE, the reference sensitivity for category M1 in table 7.3EA-1 and 7.3EA-2 and category M2 in Table 7.3 EC-1 should be used as $P_{REFSENS}$ for $P_w$. | | | | | | | |
| NOTE 4: For DL category M1 and M2 UE, the parameters for the applicable channel bandwidth apply. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.6.3.

## 7.6.3EC.4 Test description

### 7.6.3EC.4.1 Initial conditions

Same as in clause 7.6.3EA.4.1 with the following exceptions:

- Instead of Table 7.6.3EA.4.1-1 → use Table 7.6.3EC.4.1-1
- Instead of CAT M1 → use CAT M2

**Table 7.6.3EC.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3. | 1.4, 3MHz, 5MHz | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD and HD-FDD | TDD | | FDD and HD-FDD | TDD |
| 1.4MHz | QPSK | TBD | TBD | QPSK | 6 | 6 |
| 3MHz | QPSK | TBD | TBD | QPSK | 15 | 15 |
| 5MHz | QPSK | TBD | TBD | QPSK | 24 | 24 |
| Note 1: Downlink RB position shall be $RB_{start}$ = 0 within the narrowband. | | | | | | |
| Note 2: Use narrowband index (TS36.211, 5.2.4) 0 when interferer is below carrier, and max narrowband index when interferer is above carrier. | | | | | | |

### 7.6.3EC.4.2 Test procedure

Same as in clause 7.6.3EA.4.2 with the following exceptions:

- Instead of Table 7.6.3EA.4.1-1 → use Table 7.6.3EC.4.1-1

### 7.6.3EC.4.3 Message contents

Same as in clause 7.6.3EA.4.3.

## 7.6.3EC.5 Test requirement

Same as in clause 7.6.3EA.5.

# 7.7 Spurious response

## 7.7.1 Test Purpose

Spurious response verifies the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6.2 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

## 7.7.2 Test Applicability

This test applies to all types of E-UTRA UE release 8 and forward.

## 7.7.3 Minimum Conformance Requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.7.3-1 and 7.7.3-2. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.7.3-1: Spurious response parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| Note 3: The REFSENS power level is specified in Table 7.3.3-1 and Table 7.3.3-1a for two and four antenna ports, respectively. | | | | | | | |

**Table 7.7.3-2: Spurious Response**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, $P_{uw}$ power defined in Table 7.7.3-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A.

The normative reference for this requirement is TS 36.101 [2] clause 7.7.

## 7.7.4 Test Description

### 7.7.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2.4.1 in order to test spurious responses obtained in clause 7.6.2 under the same conditions.

### 7.7.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6.2.4.2.

4. Set the downlink signal level according to the table 7.7.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.7.5-1 for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the throughput measurement.

5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.7.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

**Table 7.7.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.7.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.7.5-1 and 7.7.5-2.

**Table 7.7.5-1: Spurious response parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.7.5-2: Spurious Response**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.7.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

# 7.7_1 Spurious response with 4 Rx antenna ports

## 7.7_1.1 Test Purpose

To verify the ability of UE that supports 4 Rx antenna ports to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6.2_2 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

## 7.7_1.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that supports 4 Rx antenna ports.

## 7.7_1.3 Minimum Conformance Requirements

Same as in clause 7.7.3.

## 7.7_1.4 Test Description

### 7.7_1.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2_1.4.1 in order to test spurious responses obtained in clause 7.6.2_1 under the same conditions.

### 7.7_1.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2_1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2_1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7_1.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6.2_1.4.2.
4. Set the downlink signal level according to the table 7.7_1.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.7_1.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.
5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.7_1.4.3 Message Contents

Same as in clause 7.7.4.3.

## 7.7_1.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.7_1.5-1 and 7.7_1.5-2.

**Table 7.7_1.5-1: Spurious response parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |

| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
|---|---|---|---|---|---|---|---|
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| Note 3: The REFSENS power level is specified in Table 7.3.3-1a. | | | | | | | |

**Table 7.7_1.5-2: Spurious Response**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.7_1.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

# 7.7A Spurious response for CA

## 7.7A.0 Minimum conformance requirements

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the spurious response requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The throughput measured in each downlink with $F_{interferer}$ in Table 7.6.2A.0-0 and Table 7.6.2A.0-0a at spurious response frequencies shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.7.3-1 and 7.7.3-2. The UE shall meet these requirements for each component carrier while all downlink carriers are active.

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the spurious response requirements applicable specified above shall be met with the transmitter power for the uplink set to 7 dB below $P_{CMAX_L,c}$ for each serving cell *c*.

For E-UTRA CA configurations including an operating band without uplink band or an operating band with an unpaired DL part (as noted in Table 5.2-1), the requirements for all downlinks shall be met with the single uplink active in each band capable of UL operation. For E-UTRA CA configurations listed in Table 7.3A.0-0a under conditions for which reference sensitivity for the operating band being tested is N/A, the spurious response requirements of subclause 7.7A.0 do not apply.

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall configure closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.7A.0-1 with the uplink configuration set according to Table 7.3A.0-1 for the applicable carrier aggregation configuration. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.3-2. The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.7A.0-1 and 7.7A.0-2. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Tables 7.7A.0-1 and 7.7A.0-2.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, the spurious response requirements are defined with the uplink configuration in accordance with Table 7.3A.0-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.7.3 and 7.7A.0 for one component carrier and two component carriers per sub-block, respectively. The requirements apply with all downlink carriers active.

For intra-band non-contiguous carrier aggregation with two uplink carriers and two downlink carriers, the spurious response requirements applicable specified above shall be met with the transmitter powers for the uplinks set to $P_{CMAX_L,c}$ – 7 dBm.

**Table 7.7A.0-1: Spurious response parameters**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 9 | 9 | 9 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A. Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | |

**Table 7.7A.0-2: Spurious response**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

For combinations of intra-band and inter-band carrier aggregation with up to five downlink carriers (up to two non-contiguously sub-blocks per band and up to four contiguously aggregated carriers per band) and one uplink carrier assigned to one E-UTRA band, the requirement is defined with the uplink active in a band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3A.0-3 when the uplink is active in the band supporting two non-contiguous component carriers, Table 7.3A.0-1 when the uplink is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.3-2 when the uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to four component carriers. For the two non-contiguous component carriers within the same band, $P_{wanted}$ in Table 7.6.2A.0-0 is set using $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps (Table 7.3A.0-3) while a band supporting contiguously aggregated carriers the out-of-band blocking parameters in Table 7.7.3-1 are replaced by those specified in Table 7.7A.0-1. For each downlink the UE shall meet the spurious-response requirements applicable for inter-band carrier aggregation with one component carrier per operating band but with up to three component carriers assigned to the same band. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with the single uplink carrier active in each band capable of UL operation.

The normative reference for this requirement is TS 36.101 [2] clause 7.7.1A.

# 7.7A.1 Spurious response for CA (intra-band contiguous DL CA and UL CA)

## 7.7A.1.1 Test Purpose

Spurious response for CA verifies the receiver's ability to receive a wanted aggregated signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6.2A is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

## 7.7A.1.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA and UL CA.

## 7.7A.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7A.0.

## 7.7A.1.4 Test Description

### 7.7A.1.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2A.1.4.1 in order to test spurious responses obtained in clause 7.6.2A.1 under the same conditions.

### 7.7A.1.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.7A.1.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.1.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.1.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7A.1.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6.2A.1.4.2.

7. Set the downlink signal level according to the table 7.7A.1.5-1 for both carriers. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that for at least the duration of the throughput measurement:
   The PCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.7A.1.5-1 + $10\log(P_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
   or within (+0dB, -4 dB) of (target level in Table 7.7A.1.5-1 + $10\log(P_L_{CRB}/N_{RB_alloc})$) for carrier frequency $3.0\text{GHz} < f \leq 4.2\text{GHz}$.
   The SCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.7A.1.5-1 + $10\log(S_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
   or within (+0dB, -4 dB) of (target level in Table 7.7A.1.5-1 + $10\log(S_L_{CRB}/N_{RB_alloc})$) for carrier frequency $3.0\text{GHz} < f \leq 4.2\text{GHz}$.

8. For each spurious frequency, measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.7A.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

**Table 7.7A.1.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

**Table 7.7A.1.4.3-2: UplinkPowerControlDedicatedSCell-r10**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH-r10 | 0 | | |
| deltaMCS-Enabled-r10 | en0 | | |
| accumulationEnabled-r10 | TRUE | | |
| pSRS-Offset-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| pSRS-OffsetAp-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| filterCoefficient-r10 | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| pathlossReferenceLinking-r10 | sCell | | |
| } | | | |

## 7.7A.1.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.7A.1.5-1 and 7.7A.1.5-2.

**Table 7.7A.1.5-1: Spurious response parameters**

| **Rx Parameter** | **Units** | **CA Bandwidth Class** | | | | |
|---|---|---|---|---|---|---|
| | | **B** | **C** | **D** | **E** | **F** |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 9 | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier and in subclause 6.2.5A for two uplink carriers. | | | | | | |
| Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | |

**Table 7.7A.1.5-2: Spurious response**

| **Parameter** | **Unit** | **Level** |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Table 7.7A.1.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.7A.2 Spurious response for CA (intra-band contiguous DL CA without UL CA)

### 7.7A.2.1 Test Purpose

Same test purpose as in clause 7.7A.1.

### 7.7A.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support intra-band contiguous DL CA. This test case applies only for CA Configurations that do not support UL CA.

### 7.7A.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7A.0.

### 7.7A.2.4 Test Description

#### 7.7A.2.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2A.2.4.1 in order to test spurious responses obtained in clause 7.6.2A.2 under the same conditions.

#### 7.7A.2.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.2.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.2.4.1-1 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7A.1.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6.2A.2.4.2.
7. Set the downlink signal level according to the table 7.7A.1.5-1 for both carriers. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.7A.1.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.
8. For each spurious frequency, measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

#### 7.7A.2.4.3 Message Contents

Same message contents as in clause 7.7.4.3.

### 7.7A.2.5 Test Requirement

Same test requirement as in clause 7.7A.1.5 with the following exceptions :

- Instead of Table 7.7A.1.5-1 → use Table 7.7A.2.5-1.

**Table 7.7A.2.5-1: Spurious response parameters**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |

| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
|---|---|---|---|---|---|---|
| | | 9 | 9 | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5.<br>Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | |

## 7.7A.3 Spurious response for CA (inter-band DL CA without UL CA)

### 7.7A.3.1 Test Purpose

Same test purpose as in clause 7.7A.1.

### 7.7A.3.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support inter-band DL CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 2DL CA with FDD-TDD inter-band CA.

This test case also applies to all types of E-UTRA UE release 13 and forward that support DL LAA.

### 7.7A.3.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7A.0.

### 7.7A.3.4 Test Description

#### 7.7A.3.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2A.3.4.1 in order to test spurious responses obtained in clause 7.6.2A.3 under the same conditions.

#### 7.7A.3.4.2 Test Procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.3.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7A.3.5-2. The spurious frequencies are taken from records in the step 9 of test procedures in clause 7.6.2A.3.4.2.
7. Set the downlink signal level according to the table 7.7A.3.5-1 for both carriers. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.7A.3.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.
8. For each spurious frequency, measure the average throughput of SCC for duration sufficient to achieve statistical significance according to Annex G.2.

#### 7.7A.3.4.3 Message Contents

Same message contents as in clause 7.7.4.3.

### 7.7A.3.5 Test Requirement

For inter-band carrier aggregation with uplink assigned to one E-UTRA band the spurious response requirements are defined with the uplink active on the band other than the band whose downlink is being tested i.e. the requirements are tested only for the SCell downlink. The UE shall meet the requirement for each component carrier, when operated as SCell, while both downlink carriers are active.

The throughput measured during the test procedure for each component carrier, when operated as SCell, shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.7A.3.5-1 (originated from the single carrier Table 7.7.5-1) and 7.7A.3.5-2 (originated from Table 7.6.2A.3.5-2).

**Table 7.7A.3.5-1: Spurious response parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.7A.3.5-2: Spurious Response**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.7A.3.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.7A.4 Spurious response for CA (intra-band non-contiguous DL CA without UL CA)

### 7.7A.4.1 Test Purpose

Same test purpose as in clause 7.7A.1.

### 7.7A.4.2 Test Applicability

This test applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA without UL CA.

### 7.7A.4.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7A.0.

### 7.7A.4.4 Test Description

#### 7.7A.4.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2A.4.4.1 in order to test spurious responses obtained in clause 7.6.2A.4 under the same conditions.

### 7.7A.4.4.2 Test Procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.7A.4.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.4.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.4.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal below or above the wanted aggregated signal according to Table 7.7A.4.5-2. The spurious frequencies are taken from records in the step 9 of test procedures in clause 7.6.2A.4.4.2.
7. Set the downlink signal level according to the table 7.7A.4.5-1 for both carriers. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.7A.4.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.
8. For each spurious frequency, measure the average throughput of each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.7A.4.4.3 Message Contents

Same message contents as in clause 7.7.4.3.

## 7.7A.4.5 Test Requirement

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink carriers, the spurious response requirements are defined with the uplink configuration of the PCC being in accordance with Table 7.3A.0-3. The UE shall meet the requirements specified in tables 7.7A.4.5-1and 7.7A.4.5-2 for each component carrier while both downlink carriers are active.

The requirements for each component carrier are the same as single carrier requirements in Tables 7.7.5-1 and 7.7.5-2.

**Table 7.7A.4.5-1: Spurious response parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.7A.4.5-2: Spurious Response**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.7A.4.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

# 7.7A.5 Spurious response for 3DL CA

## 7.7A.5.1 Test Purpose

Same test purpose as in clause 7.7A.1.

## 7.7A.5.2 Test Applicability

This test case applies to all types of E-UTRA UE and forward that support 3DL with CA configurations in Table 7.1-2a.

This test case also applies to all types of E-UTRA UE release 13 and forward that support 3DL CA involving Band 46.

## 7.7A.5.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7A.0.

## 7.7A.5.4 Test Description

### 7.7A.5.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2A.5.4.1 in order to test spurious responses obtained in clause 7.6.2A.5 under the same conditions.

### 7.7A.5.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.7A.5.4.3
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.5.4.1-1 through Table 7.6.2A.5.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.5.4.1-1 through Table 7.6.2A.5.4.1-2 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7A.5.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6.2A.5.4.2.
7. Set the downlink signal level according to the tables 7.7A.5.5-1 and 7.7A.5.5-3 for all carriers accordingly. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in corresponding tables 7.7A.5.5-1 and 7.7A.5.5-3 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the throughput measurement.
8. For each spurious frequency, measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.7A.5.4.3 Message Contents

Same message contents as in clause 7.7.4.3 for without UL CA.

Same message contents as in clause 7.7A.1.4.3 for UL CA.

### 7.7A.5.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table s below, according to the type of CA.

**Table 7.7A.5.5-1: Spurious response parameters (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 9 | 9 | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5. | | | | | | |
| Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | |

**Table 7.7A.5.5-2: Spurious response (All types of CA)**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

**Table 7.7A.5.5-3: Spurious response parameters (Inter-band, Intra-band non-contiguous)**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| Note 3: For intra-band non-contiguous + inter-band CA, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps. | | | | | | | |

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.7A.5.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.7A.6

## 7.7A.7 Spurious response for 4DL CA

### 7.7A.7.1 Test Purpose

Same test purpose as in clause 7.7A.1.

### 7.7A.7.2 Test Applicability

This test case applies to all types of E-UTRA UE and forward that support 4DL with CA configurations in Table 7.1-2b.

### 7.7A.7.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7A.0.

## 7.7A.7.4 Test Description

### 7.7A.7.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2A.7.4.1 in order to test spurious responses obtained in clause 7.6.2A.7 under the same conditions.

### 7.7A.7.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.7A.7.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.7.4.1-1 through Table 7.6.2A.7.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.7.4.1-1 through Table 7.6.2A.7.4.1-2 on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7A.7.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6.2A.7.4.2.
7. Set the downlink signal level according to the tables 7.7A.7.5-1 and 7.7A.7.5-3 for all carriers accordingly. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in corresponding tables 7.7A.7.5-1 and 7.7A.7.5-3 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq 4.2$GHz, for at least the duration of the throughput measurement.
8. For each spurious frequency, measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.7A.7.4.3 Message Contents

Same message contents as in clause 7.7.4.3 for without UL CA.

Same message contents as in clause 7.7A.1.4.3 for UL CA.

## 7.7A.7.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table s below, according to the type of CA.

**Table 7.7A.7.5-1: Spurious response parameters (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 9 | 9 | 9 | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A.<br>Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | |

**Table 7.7A.7.5-2: Spurious response (All types of CA)**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

**Table 7.7A.7.5-3: Spurious response parameters (Inter-band, Intra-band non-contiguous)**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| Note 3: For intra-band non-contiguous + inter-band CA, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps. | | | | | | | |

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.7A.7.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

# 7.7A.8 Spurious response for 5DL CA

## 7.7A.8.1 Test Purpose

Same test purpose as in clause 7.7A.1.

## 7.7A.8.2 Test Applicability

This test case applies to all types of E-UTRA UE and forward that support 5DL with CA configurations in Table 7.1-2c.

## 7.7A.8.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7A.0.

## 7.7A.8.4 Test Description

### 7.7A.8.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2A.8.4.1 in order to test spurious responses obtained in clause 7.6.2A.8 under the same conditions.

### 7.7A.8.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.7A.8.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2A.8.4.1-1 through Table FFS as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2A.8.4.1-1 through Table FFS on PCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7A.8.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6.2A.8.4.2.

7. Set the downlink signal level according to the tables 7.7A.8.5-1 and 7.7A.8.5-3 for all carriers accordingly. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in corresponding tables 7.7A.8.5-1 and 7.7A.8.5-3 for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the throughput measurement.

8. For each spurious frequency, measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex G.2A.

### 7.7A.8.4.3 Message Contents

Same message contents as in clause 7.7.4.3 for without UL CA.

Same message contents as in clause 7.7A.1.4.3 for UL CA.

## 7.7A.8.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table s below, according to the type of CA.

**Table 7.7A.8.5-1: Spurious response parameters (Intra-band contiguous)**

| Rx Parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 9 | 9 | 9 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A. | | | | | | |
| Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | |

**Table 7.7A.8.5-2: Spurious response (All types of CA)**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

**Table 7.7A.8.5-3: Spurious response parameters (Inter-band, Intra-band non-contiguous)**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| Note 3: For intra-band non-contiguous + inter-band CA, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps. | | | | | | | |

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B, 7.3.3-1C and 7.3.3-1D, $P_{uw}$ power defined in Table 7.7A.8.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B, 7.3.3-1C and 7.3.3-1D.

# 7.7B Spurious response for UL-MIMO

## 7.7B.1 Test Purpose

Spurious response verifies the ability of the UE that support UL-MIMO to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6.2 B is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

## 7.7B.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

## 7.7B.3 Minimum Conformance Requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in Clause 7.7.3 shall be met with the UL-MIMO configurations specified in Table 6.2.2B.3-2. For UL-MIMO, the parameter $P_{CMAX_L}$ is defined as the total transmitter power over the two transmitter antenna connectors.

The normative reference for this requirement is TS 36.101 [2] clause 7.7.1B.

## 7.7B.4 Test Description

### 7.7B.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2 B.4.1 in order to test spurious responses obtained in clause 7.6.2 B under the same conditions.

### 7.7B.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2B.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 7.6.2 B.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7B.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6.2 B.4.2.

4. Set the downlink signal level according to the table 7.7B.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.7B.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.

5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.7B.4.3 Message Contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception.

**Table 7.7B.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.7B.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.7B.5-1 and 7.7B.5-2.

**Table 7.7B.5-1: Spurious response parameters**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.7B.5-2: Spurious Response**

| **Parameter** | **Unit** | **Level** |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{uw}$ power defined in Table 7.7B.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

# 7.7D Spurious response for ProSe

## 7.7D.0 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Tables 7.7.1D-1, 7.7.1D-2, and 7.7.1D-3.

**Table 7.7D.0-1: Spurious response parameters for ProSe Direct Discovery**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below+ $P_{offset}$ | | | | | |
| | | | | 6 | 6 | 7 | 9 |
| $P_{offset}$ | dB | | | 10.9 | 13.9 | 15.7 | 16.9 |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2. | | | | | | | |

**Table 7.7D.0-2: Spurious response parameters for ProSe Direct Communication**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below | | | | | |
| | | | | 6 | 6 | 7 | 9 |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2. | | | | | | | |

**Table 7.7D.0-3: Spurious response for ProSe**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{interferer}$ power defined in Table 7.7D.0-3 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

The normative reference for this requirement is TS 36.101 [2] clause 7.7.1D.

## 7.7D.1 Spurious response for ProSe Direct Discovery

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Use of OCNG for Downlink has not been considered and is still FFS.
- Message exceptions content needs further investigation (some values still TBD).
- Test time is FFS.

### 7.7D.1.1 Test Purpose

Spurious response for ProSe verifies the receiver's ability to receive a wanted aggregated signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6.2D is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

### 7.7D.1.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Discovery, but not ProSe Direct Communication.

### 7.7D.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7D.0.

## 7.7D.1.4 Test Description

### 7.7D.1.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2D.1.4.1 in order to test spurious responses obtained in clause 7.6.2D.1 under the same conditions.

### 7.7D.1.4.2 Test Procedure

1. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions (only those marked with "…Step 1…" ) are defined in clause 7.7D.1.4.3.
2. The UE shall transmit RRCConnectionReconfigurationComplete message.
3. Initialise the variables Ptot and Pok as 0.
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.6.2D.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.6.2D.1.4.1-1. When the UE has no payload data to send, it transmits uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7D.1.5-2. The spurious frequencies are taken from records in step 12 of test procedures in clause 7.6.2D.1.4.2.
7. SS transmits PSDCH to transmit the SL RMC according to Table 7.6.2D.1.4.1-1. Set the Sidelink signal level to the appropriate value defined in Table 7.7D.1.5-1.
8. SS shall send SL Discovery Packets (MAC padding bits) on the SL RMC for the test time [FFS]. SS stores the number of the transmitted Discovery Packets in the current test iteration in the variable Ptot.
9. SS shall send (on the available PDSCH) a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER REQUEST" message and wait for the UE to respond (on the available PUSCH) with a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER RESPONSE".
10. SS calculates the variable Pok as (current counter value - counter value at last test iteration).
11. SS shall compute the throughput as following:

    TP = Pok / Ptot * 100%

12. Repeat steps from 6 to 11 for all frequencies recorded in step 12 of the test procedure in clause 7.6.2D.1.4.2.

### 7.7D.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

- Table A.7.1.1-1 for FDD
- Table A.7.1.2-1 for TDD

**Table 7.7D.1.4.3-1: ACTIVATE TEST MODE: Reference sensitivity for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 7.7D.1.4.3-2: CLOSE UE TEST LOOP: Reference sensitivity for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 7.7D.1.4.3-3: MAC-MainConfig-RBC: Reference sensitivity for ProSe Direct Discovery (applicable only for Step 1 of Test procedure)**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | TBD | | |
| periodicBSR-Timer | TBD | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | TBD | | |
| } | | | |

## 7.7D.1.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Table 7.7D.1.5-1 and 7.7D.1.5-2.

**Table 7.7D.1.5-1: Spurious response parameters for ProSe Direct Discovery**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below+ $P_{offset}$ | | | | | |
| | | | | 6 | 6 | 7 | 9 |
| $P_{offset}$ | dB | | | 10.9 | 13.9 | 15.7 | 16.9 |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2. | | | | | | | |

**Table 7.7D.1.5-2: Spurious response for ProSe**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer}$ power defined in Table 7.7D.1.5-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

# 7.7D.2 Spurious response for ProSe Direct Communication

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Test procedure is TBD
- Message contents are TBD
- Test system uncertainties and test tolerances are TBD

### 7.7D.2.1 Test Purpose

Same test purpose as in clause 7.7D.1.

### 7.7D.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Communication.

### 7.7D.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7D.0.

### 7.7D.2.4 Test Description

#### 7.7D.2.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2D.2.4.1 in order to test spurious responses obtained in clause 7.6.2D.2 under the same conditions.

#### 7.7D.2.4.2 Test Procedure

TBD

#### 7.7D.2.4.3 Message Contents

TBD

### 7.7D.2.5 Test Requirement

Same test requirement as in clause 7.7D.1.5 with the following exceptions:

- Instead of Table 7.7D.1.5-1 → use Table 7.7D.2.5-1.

**Table 7.7D.2.5-1: Spurious response parameters for ProSe Direct Communication**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below | | | | | |
| | | | | 6 | 6 | 7 | 9 |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2. | | | | | | | |

## 7.7E Spurious response for UE category 0

## 7.7E.1 Test Purpose

Same test purpose as in clause 7.7.1.

## 7.7E.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward of UE category 0.

## 7.7E.3 Minimum Conformance Requirements

Same minimum conformance requirements as in clause 7.7.3.

## 7.7E.4 Test Description

### 7.7E.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2E.4.1 in order to test spurious responses obtained in clause 7.6.2E under the same conditions.

### 7.7E.4.2 Test Procedure

Same test procedure as in clause 7.7.4.2

### 7.7E.4.3 Message Contents

Same message contents as in clause 7.7.4.3

## 7.7E.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.7E.5-1 and 7.7E.5-2.

**Table 7.7E.5-1: Spurious response parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.7E.5-2: Spurious Response**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

# 7.7EA Spurious response for UE category M1

## 7.7EA.1 Test Purpose

Spurious response verifies the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6.2EA is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

## 7.7EA.2 Test Applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category M1.

## 7.7EA.3 Minimum Conformance Requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.7EA.3-1 and 7.7EA.3-2. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.7EA.3-1: Spurious response parameters**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3.<br>NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.7EA.3-2: Spurious response**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

The normative reference for this requirement is TS 36.101 [2] clause 7.7.

# 7.7EA.4 Test Description

## 7.7EA.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2EA.4.1 in order to test spurious responses obtained in clause 7.6.2EA under the same conditions.

## 7.7EA.4.2 Test Procedure

1. SS transmits PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 7.7EA.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

2. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 7.7EA.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7EA.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6.2EA.4.2.

4. Set the downlink signal level according to the table 7.7EA.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.7EA.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < $f \leq 4.2$GHz, for at least the duration of the throughput measurement.

5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

## 7.7EA.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

**Table 7.7EA.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.7EA.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.7EA.5-1 and 7.7EA.5-2.

**Table 7.7EA.5-1: Spurious response parameters**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5EA. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |

**Table 7.7EA.5-2: Spurious Response**

| **Parameter** | **Unit** | **Level** |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

# 7.7EB Spurious response for UE Category 1bis

Editor's note

- Test case incomplete with Annex F.3.3 needing update. TT shall be same as legacy test case.

## 7.7EB.1 Test Purpose

Same test purpose as in clause 7.7.1.

## 7.7EB.2 Test Applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

## 7.7EB.3 Minimum Conformance Requirements

Same minimum conformance requirements as in clause 7.7.3.

## 7.7EB.4 Test Description

### 7.7EB.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2EB.4.1 in order to test spurious responses obtained in clause 7.6.2EB under the same conditions.

### 7.7EB.4.2 Test Procedure

Same test procedure as in clause 7.7.4.2

### 7.7EB.4.3 Message Contents

Same message contents as in clause 7.7.4.3

## 7.7EB.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.7EB.5-1 and 7.7EB.5-2.

**Table 7.7EB.5-1: Spurious response parameters**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 6 | 6 | 6 | 6 | 7 | 9 |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5. | | | | | | | |
| Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | | |
| Note 3: The REFSENS power level is specified in Table 7.3EB.3-1 for main antenna port. | | | | | | | |

**Table 7.7EB.5-2: Spurious Response**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

# 7.7F Spurious response for category NB1 and NB2

## 7.7F.1 Test purpose

Spurious response verifies the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6.2 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

## 7.7F.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

## 7.7F.3 Minimum conformance requirements

The category NB1 and NB2 UE throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in Annexe A.3.2 with parameters specified in Tables 7.7F.3-1.

**Table 7.7F.3-1: Spurious response parameters for category NB1 and NB2**

| Parameter | Unit | Level |
|---|---|---|
| $P_{signal}$ | dBm | REFSENS+6 |
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |
| Number of spurious response frequencies | | 24 (in OOB range 1, 2, 3) |
| NOTE 1: Reference measurement channel is specified in Annex FFS.<br>NOTE 2: The REFSENS power level is specified in 7.3.1F.1-1.<br>NOTE 3: OOB range 1, 2, 3 refers to Table 7.6.2.1F-1. | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.7.1F.

## 7.7F.4 Test description

### 7.7F.4.1 Initial conditions

The initial conditions shall be the same as in clause 7.6.2F.4.1 in order to test spurious responses obtained in clause 7.6.2F under the same conditions.

### 7.7F.4.2 Test procedure

1. SS transmits NPDSCH via NPDCCH DCI format N1 for C_RNTI to transmit the DL RMC according to Table 7.6.2F.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The UE will send HARQ feedback based on information contained in DCI format N1.

2. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7F.5-1. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6.2F.4.2

3. Set the Downlink signal level according to the Table 7.7F.5-1.

4. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.7F.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.6.

## 7.7F.5 Test requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.7F.5-1.

**Table 7.7F.5-1: Spurious response parameters for category NB1 and NB2**

| Parameter | Unit | Level |
|---|---|---|
| $P_{signal}$ | dBm | REFSENS+6 |
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |
| Number of spurious response frequencies | | 24 (in OOB range 1, 2, 3) |
| NOTE 1: Reference measurement channel is specified in Annex FFS.<br>NOTE 2: The REFSENS power level is specified in 7.3.1F.1-1.<br>NOTE 3: OOB range 1, 2, 3 refers to Table 7.6.2.1F-1. | | |

# 7.7G Spurious response for V2X Communication

## 7.7G.1 Spurious response for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 7.7G.1.1 Test Purpose

Spurious response for V2X verifies the receiver's ability to receive a wanted aggregated signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6.2G is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

### 7.7G.1.2 Test Applicability

This test applies to all types of UE that support V2X Sidelink Communication and Band 47.

### 7.7G.1.3 Minimum Conformance Requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Tables 7.7G.3-1 and 7.7G.3-2.

**Table 7.7G.3-1: Spurious response parameters**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| NOTE 1: Reference measurement channel is specified in TS36.101[2] Annex A.8.2. | | | | | | | |

**Table 7.7G.3-2: Spurious response**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

The normative reference for this requirement is TS 36.101 [2] clause 7.7.1G.

### 7.7G.1.4 Test Description

#### 7.7G.1.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2G.1.4.1 in order to test spurious responses obtained in clause 7.6.2G under the same conditions.

#### 7.7G.1.4.2 Test Procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration and to schedule the V2X RMC according to Table 7.6.2G.1.4.1-1.

3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7G.1.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6.2G.1.4.2.

4. Set the signal level of V2X to the value defined in table 7.7G.1.5-1.

5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

### 7.7G.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.10.

## 7.7G.1.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Tables 7.7G.1.5-1 and 7.7G.1.5-2.

**Table 7.7G.1.5-1: Spurious response parameters**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| NOTE 1: Reference measurement channel is specified in TS36.101[2] Annex A.8.2. | | | | | | | |

**Table 7.7G.1.5-2: Spurious response**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

# 7.7G.2 Spurious response for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Initial condition is incomplete due to 7.6.2G.2 is not made
- Test procedure is investigating and incomplete due to 7.6.2G.2 is not made

## 7.7G.2.1 Test Purpose

Same test purpose as in clause 7.7G.1.

## 7.7G.2.2 Test applicability

This test case applies to all types of E-UTRA UE release 14 and forward that support V2X Communication.

## 7.7G.2.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Tables 7.7G.2.3-1 and 7.7G.2.3-2.

**Table 7.7G.2.3-1: Spurious response parameters**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| NOTE 1: Reference measurement channel is specified in Annex A.8.2. | | | | | | | |

**Table 7.7G.2.3-2: Spurious response**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA downlink reception for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.5G-2, the requirements in subclause 7.7G.2.3 apply for the E-UTRA V2X sidelink reception and the requirements in subclause 7.7.3 apply for the E-UTRA downlink reception while all downlink carriers are active.

The normative reference for this requirement is TS 36.101 [2] clause 7.7.1G.

## 7.7G.2.4 Test description

### 7.7G.2.4.1 Initial conditions

The initial conditions shall be the same as in clause [TBD] in order to test spurious responses obtained in clause 7.6.2G under the same conditions.

### 7.7G.2.4.2 Test Procedure

1. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables [TBD] on E-UTRA Band. The SS sends downlink MAC padding bits on the DL RMC.
2. SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table [TBD]. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.
3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7G.2.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause [TBD].
4. Set the signal level of V2X to the value defined in table 7.7G.2.5-1.
5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex [TBD].

### 7.7G.2.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 7.7G.2.5 Test Requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Tables 7.7G.2.5-1 and 7.7G.2.5-2.

**Table 7.7G.2.5-1: Spurious response parameters**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| NOTE 1: Reference measurement channel is specified in Annex A.8.2. | | | | | | | |

**Table 7.7G.2.5-2: Spurious response**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA downlink reception for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.5G-2, the requirements in subclause 7.7G.2.5 apply for the E-UTRA V2X sidelink reception and the requirements in subclause 7.7.3 apply for the E-UTRA downlink reception while all downlink carriers are active.

## 7.7G.3 Spurious response for V2X Communication / Intra-band contiguous multi-carrier operation

### 7.7G.3.1 Test Purpose

Same test purpose as in clause 7.7G.1.

### 7.7G.3.2 Test applicability

This test case applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 7.7G.3.3 Minimum conformance requirements

For intra-band contiguous multi-carrier operation, the V2X UE throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Table 7.7G.3.3-1 and Table 7.7G.3.3-2.

**Table 7.7G.3.3-1: Spurious response parameters for intra-band contiguous multi-carrier for V2X UE**

| Rx Parameter | Units | V2X Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C/ $C_1$ | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + V2X Bandwidth Class specific value below | | | | |
| | | 9 | 9 | | | |
| NOTE 1: The requirement is applied for multi carrier intra-band con-concurrent receptions when 2 carrier transmission are activated at the same time | | | | | | |

**Table 7.7.G.3.3-2: Spurious response for intra-band contiguous multi-carrier for V2X UE**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |
| NOTE 1: The requirement is applied for multi- carrier intra-band con -concurrent receptions when 2 carrier transmissions are activated at the same time | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.7.1G.

### 7.7G.3.4 Test description

#### 7.7G.3.4.1 Initial conditions

The initial conditions shall be the same as in clause [TBD] in order to test spurious responses obtained in clause 7.6.2G under the same conditions.

#### 7.7G.3.4.2 Test Procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration and to schedule the V2X RMC according to Table [TBD]. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.

2. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7G.3.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause [TBD].

3. Set the signal level of V2X to the value defined in table 7.7G.3.5-1.

4. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2 .

#### 7.7G.3.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 7.7G.3.5 Test Requirement

For intra-band contiguous multi-carrier operation, the V2X UE throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Table 7.7G.3.5-1 and Table 7.7G.3.5-2.

**Table 7.7G.3.5-1: Spurious response parameters for intra-band contiguous multi-carrier for V2X UE**

| Rx Parameter | Units | V2X Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C/ $C_1$ | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + V2X Bandwidth Class specific value below | | | | |
| | | 9 | 9 | | | |
| NOTE 1: The requirement is applied for multi- carrier intra--band con concurrent receptions when 2 carrier transmissions are activated at the same time | | | | | | |

**Table 7.7.G.3.5-2: Spurious response for intra-band contiguous multi-carrier for V2X UE**

| Parameter | Unit | Level |
|---|---|---|
| $P_{Interferer}$ (CW) | dBm | -44 |
| $F_{Interferer}$ | MHz | Spurious response frequencies |
| NOTE 1: The requirement is applied for multi- carrier intra--band con concurrent receptions when 2 carrier transmissions are activated at the same time | | |

# 7.8 Intermodulation characteristics

## 7.8.1 Wide band Intermodulation

### 7.8.1.1 Test purpose

Intermodulation response tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

### 7.8.1.2 Test applicability

This test applies to all types of E-UTRA UE release 8 and forward.

### 7.8.1.3 Minimum conformance requirements

Intermodulation response rejection is a measure of the capability of the receiver to receiver a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.8.1.3-1 for the specified wanted signal mean power in the presence of two interfering signals. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.8.1.3-1: Wide band intermodulation**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 | | | |
| $F_{Interferer\ 1}$ (Offset) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 | | | |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.3-2 with $P_{CMAX_L}$ as defined in clause 6.2.5.
Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz.
Note 4: The REFSENS power level is specified in Table 7.3.3-1 and Table 7.3.3-1a for two and four antenna ports, respectively.

For the UE which supports inter band CA configuration in Table 7.3.1A-2, $P_{interferer1}$ and $P_{interferer2}$ powers defined in Table 7.8.1.1-1 are increased by the amount given by $\Delta R_{IB}$ in Table 7.3.1A-2.

The normative reference for this requirement is TS 36.101 [2] clause 7.8.1 and TS 36.101 [2] Annexes A and D.

[FFS: Although it is not explicitly stated in TS 36.101 [2] whether the modulated interferer defined in 36.101 Annex D applies to wanted channel bandwidths of less than 5MHz, this test specification has assumed that the modulated interferer definition applies to all channel bandwidths. The content of TS 36.101 [2] Annex D.2 has been copied into Annex FFS of the present document]

### 7.8.1.4 Test description

#### 7.8.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.8.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.8.1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[4] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at Restart 10 (according to Table 7.3.3-2). | | | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Figure A.6.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.8.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.8.1.4.3.

### 7.8.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.8.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.8.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.8.1.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.8.1.5-1 for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the Throughput measurement.

4. Set the Interfering signal levels to the values as defined in Table 7.8.1.5-1 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 4.

#### 7.8.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

**Table 7.8.1.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

### 7.8.1.5 Test requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1.5-1: Test parameters for Wide band intermodulation**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |

| | | | | |
|---|---|---|---|---|
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 |
| $F_{Interferer\ 1}$ (Offset) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.
Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz
Note 4: For the UE which supports inter band CA configuration in Tables 7.3.3-1A and 7.3.3-1B, $P_{interferer1}$ and $P_{interferer2}$ powers are increased by the amount given by $\Delta R_{IB}$ in Tables 7.3.3-1A and 7.3.3-1B.

# 7.8.1_1 Wide band Intermodulation with 4 Rx antenna ports

## 7.8.1_1.1 Test purpose

To test the ability of UE that supports 4 Rx antenna ports to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

## 7.8.1_1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that supports 4 Rx antenna ports.

## 7.8.1_1.3 Minimum conformance requirements

Same as in clause 7.8.1.3.

## 7.8.1_1.4 Test description

### 7.8.1_1.4.1 Initial condition

Same as in clause 7.8.1.4.1 with following exceptions:

- Instead of Figure A.6 → use Figure A.81.
- Instead of Table 7.8.1.4.1-1 → use Table 7.8.1_1.4.1-1.

**Table 7.8.1_1.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |

### 7.8.1_1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.8.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.8.1_1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.8.1_1.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.8.1_1.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq 4.2$GHz, for at least the duration of the Throughput measurement.

4. Set the Interfering signal levels to the values as defined in Table 7.8.1_1.5-1 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 4.

### 7.8.1_1.4.3 Message contents

Same as in clause 7.8.1.4.3.

## 7.8.1_1.5 Test requirements

The throughput shall be $\geq$ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1_1.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1_1.5-1: Test parameters for Wide band intermodulation**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 | | | |
| $F_{Interferer\ 1}$ (Offset) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 | | | |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.
Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz
Note 4: For the UE which supports inter band CA configuration in Tables 7.3.3-1A and 7.3.3-1B, $P_{interferer1}$ and $P_{interferer2}$ powers are increased by the amount given by $\Delta R_{IB}$ in Tables 7.3.3-1A and 7.3.3-1B.
Note 5: The REFSENS power level is specified in Table 7.3.3-1a.

# 7.8.1A Wide band Intermodulation for CA

## 7.8.1A.0 Minimum conformance requirements

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the wide band intermodulation requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.8.1.3 for each component carrier while all downlink carriers are active. For E-UTRA CA configurations including an operating band without uplink band or an operating band with an unpaired DL part (as noted in Table 5.2-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. For a component carrier configured in Band 46, the requirements specified in subclause 7.8.1.3 are replaced by the requirements in Table 7.8.1A.0-0. For E-UTRA CA configurations listed in Table 7.3A.0-0a under conditions for which reference sensitivity for the operating band being tested is N/A, the wideband intermodulation requirements of subclause 7.8.1A.0 do not apply.

**Table 7.8.1A.0-0: Wide band intermodulation**

| E-UTRA band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | | | | | 6 | | 9 |
| | $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| | $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| | $BW_{Interferer\ 2}$ | | | | | 20 | | 20 |
| | $F_{Interferer\ 1}$ (Offset) | MHz | | | | -BW/2-30 / +BW/2+30 | | -BW/2 – 30 / +BW/2 + 30 |
| | $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.
NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.8.1A.0-1 with the uplink configuration set according to Table 7.3A.0-1 for the applicable carrier aggregation configuration. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.3-2. The UE shall fulfil the minimum requirement in presence of an interfering signal specified in Table 7.8.1A.0-1 being on either side of the aggregated signal. The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.8.1A.0-1. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Tables 7.8.1A.0-1.

**Table 7.8.1A.0-1: Wide band intermodulation**

| Rx parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 12 | 13.8 | 15 | 16 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | |
| $BW_{Interferer\ 2}$ | MHz | 5 | 5 | 5 | 5 | 5 |
| $F_{Interferer\ 1}$ (Offset) | MHz | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A.
Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1.
Note 4: The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz
Note 5: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, the wide band intermodulation requirements are defined with the uplink configuration in accordance with Table 7.3A.0-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclause 7.8.1.3 and in this subclause for one component carrier and two component carriers per sub-block, respectively. The requirements apply for out-of-gap interferers while all downlink carriers are active.

For combinations of intra-band and inter-band carrier aggregation with up to five downlink carriers (up to two non-contiguously sub-blocks per band and up to four contiguously aggregated carriers per band) and one uplink carrier assigned to one E-UTRA band, the requirement is defined with the uplink active in a band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3A.0-3 when the uplink is active in the band supporting two non-contiguous component carriers, Table 7.3A.0-1 when the uplink is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.3-2 when the uplink is active in a band supporting one carrier per band. For these uplink configurations, the UE shall meet the wide-band intermodulation requirements for intra-band non-contiguous carrier aggregation of two downlink sub-blocks with $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps (Table 7.3A.0-3) for the two non-contiguous downlink sub-blocks, the requirements for intra-band contiguous carrier aggregation for the contiguously aggregated downlink carriers and for any remaining component carrier(s) the requirements specified in subclause 7.8.1. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with the single uplink carrier active in each band capable of UL operation.

For contiguously aggregated component carriers configured in Band 46, the said requirements for intra-band contiguous carrier aggregation of two downlink carriers are replaced by requirements in Table 7.8.1A.0-2. For non-contiguously aggregated component carriers configured in Band 46, the said requirements are applied to each sub-block for out-of-gap interferers. For the sub-block with a single component carrier, the requirement is replaced by Table 7.8.1A.0-0. For the sub-block with two or more contiguous component carriers, the requirement is replaced by Table 7.8.1A.0-1. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with the single uplink carrier active in each band capable of UL operation.

**Table 7.8.1A.0-2: Wide band intermodulation**

| E-UTRA Band | Rx parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | | | 12 | 13.8 | 15 | |
| | $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | |
| | $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | |
| | $BW_{Interferer\ 2}$ | MHz | | 20 | 20 | 20 | |
| | $F_{Interferer\ 1}$ (Offset) | MHz | | $-F_{offset}$-30 / + $F_{offset}$+30 | $-F_{offset}$-30 / + $F_{offset}$+30 | $-F_{offset}$-30 / + $F_{offset}$+30 | |
| | $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1.
NOTE 4: The interfering modulated signal is 20 MHz E-UTRA signal as described in Annex D interference setting 2;
NOTE 5: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

The normative reference for this requirement is TS 36.101 [2] clause 7.8.1A and TS 36.101 [2] Annexes A and D.

## 7.8.1A.1 Wideband intermodulation for CA (intra-band contiguous DL CA and UL CA)

### 7.8.1A.1.1 Test purpose

Intermodulation response tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

### 7.8.1A.1.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that supports intra-band contiguous DL CA and UL CA.

### 7.8.1A.1.3 Minimum conformance requirements

Minimum conformance requirements are specified in clause 7.8.1A.0.

### 7.8.1A.1.4 Test description

#### 7.8.1A.1.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA bands specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.8.1A.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.8.1A.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | | | Mid range | | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE | | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ (Note 3) | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | **UL Allocation** | | | | | |
| **PCC $N_{RB}$** | **SCC NRB** | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 50 | 25 | QPSK | 50+25 | QPSK | 25 | P_25@25 | S_0@0 | - | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 25 | P_25@25 | S_0@0 | - | - |
| 50 | 100 | QPSK | 50+100 | QPSK | 150 | P_50@0 | S_100@0 | - | - |
| 75 | 50 | QPSK | 75+50 | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 75 | P_75@0 | S_0@0 | - | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 129 | P_75@0 | S_54@0 | - | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 150 | P_75@0 | S_75@0 | - | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 50 | P_50@50 | S_0@0 | - | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 125 | P_100@0 | S_25@0 | - | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 75 | P_75@25 | S_0@0 | - | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 150 | P_100@0 | S_50@0 | - | - |
| 100 | 75 | QPSK | 100+75 | QPSK | 175 | P_100@0 | S_75@0 | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 50 | P_50@50 | S_0@0 | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 75 | P_75@25 | S_0@0 | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 130 | P_100@0 | S_30@0 | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 200 | P_100@0 | S_100@0 | - | - |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1. | | | | | | | | | |
| Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3A.0-1 is tested per Test CA configuration. | | | | | | | | | |
| Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested. | | | | | | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Figure group A.34 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.8.1A.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.8.1.1A.4.3.

### 7.8.1A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.8.1A.1.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.8.1A.1.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.8.1A.1.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.8.1A.1.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that for at least the duration of the Throughput measurement:
The PCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.8.1A.1.5-1 + $10\log(P_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
or within (+0dB, -4 dB) of (target level in Table 7.8.1A.1.5-1 + $10\log(P_L_{CRB}/N_{RB_alloc})$) for carrier frequency 3.0GHz < $f \leq 4.2$GHz.
The SCC output power is within (+0dB, -3.4 dB) of (target level in Table 7.8.1A.1.5-1 + $10\log(S_L_{CRB}/N_{RB_alloc})$), for carrier frequency $f \leq 3.0$GHz,
or within (+0dB, -4 dB) of (target level in Table 7.8.1A.1.5-1 + $10\log(S_L_{CRB}/N_{RB_alloc})$) for carrier frequency 3.0GHz < $f \leq 4.2$GHz.

7. Set the Interfering signal levels to the values as defined in Table 7.8.1A.1.5-1 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

8. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal at step 7.

### 7.8.1A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

**Table 7.8.1A.1.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

**Table 7.8.1A.1.4.3-2: UplinkPowerControlDedicatedSCell-r10**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UE-PUSCH-r10 | 0 | | |
| deltaMCS-Enabled-r10 | en0 | | |
| accumulationEnabled-r10 | TRUE | | |
| pSRS-Offset-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| pSRS-OffsetAp-r10 | 7 (0 dB) | The actual parameter value is -10.5 + 1.5*pSRS-Offset value; 0 is the actual value in dB (-10.5 + 1.5*7 dB). | |
| filterCoefficient-r10 | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| pathlossReferenceLinking-r10 | sCell | | |
| } | | | |

### 7.8.1A.1.5 Test requirements

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1A.1.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1A.1.5-1: Test parameters for Wide band intermodulation**

| Rx parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 12 | | | |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | |
| $BW_{Interferer\ 2}$ | MHz | 5 | 5 | | | |
| $F_{Interferer\ 1}$ (Offset) | MHz | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | | | |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5 for one uplink carrier and in subclause 6.2.5 for two uplink carriers A.

Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.

Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1.

Note 4: The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer\ 1}$ and $P_{Interferer\ 2}$ power defined in Table 7.8.1A.1.5-1 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.8.1A.2 Wideband intermodulation for CA (intra-band contiguous DL CA without UL CA)

### 7.8.1A.2.1 Test purpose

Same as 7.8.1A.1

### 7.8.1A.2.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that supports intra-band contiguous DL CA. This test case applies only for CA Configurations that do not support UL CA.

### 7.8.1A.2.3 Minimum conformance requirements

Same as 7.8.1A.1

### 7.8.1A.2.4 Test description

#### 7.8.1A.2.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA bands specified in table 5.4.2A.1-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.8.1A.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.8.1A.2.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | Normal |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | B: Mid range<br>C: Mid range (Note 4) |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$<br>(Notes 3, 4) |

Test Parameters for CA Configurations

| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | **UL Allocation** | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **PCC $N_{RB}$** | **SCCs NRB** | **CC MOD** | **PCC & SCC RB allocation** | **CC MOD** | **$N_{RB_alloc}$** | **PCC & SCC RB allocations ($L_{CRB}$ @ $RB_{start}$)** | | | |
| 6 | 25 | QPSK | 6+25 | QPSK | 6 | P_6@0 | - | - | - |
| 15 | 50 | QPSK | 15+50 | QPSK | 15 | P_15@0 | - | - | - |
| 25 | 25 | QPSK | 25+25 | QPSK | 20 | P_20@0 | - | - | - |
| 25 | 25 | QPSK | 25+25 | QPSK | 25 | P_25@0 | - | - | - |
| 25 | 50 | QPSK | 25+50 | QPSK | 20 | P_20@0 | - | - | - |
| 25 | 100 | QPSK | 25+100 | QPSK | 25 | P_25@0 | - | - | - |
| 50 | 25 | QPSK | 50+25 | QPSK | 25 | P_25@25 | - | - | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 25 | P_25@25 | - | - | - |
| 50 | 50 | QPSK | 50+50 | QPSK | 50 | P_50@0 | - | - | - |
| 50 | 75 | QPSK | 50+75 | QPSK | 50 | P_50@0 | - | - | - |
| 75 | 25 | QPSK | 75+25 | QPSK | 75 | P_75@0 | - | - | - |
| 75 | 50 | QPSK | 75+50 | QPSK | 75 | P_75@0 | - | - | - |
| 75 | 75 | QPSK | 75+75 | QPSK | 75 | P_75@0 | - | - | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 50 | P_50@50 | - | - | - |
| 100 | 25 | QPSK | 100+25 | QPSK | 100 | P_100@0 | - | - | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 75 | P_75@25 | - | - | - |
| 100 | 50 | QPSK | 100+50 | QPSK | 100 | P_100@0 | - | - | - |
| 100 | 75 | QPSK | 100+75 | QPSK | 100 | P_100@0 | - | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 50 | P_50@50 | - | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 75 | P_75@25 | - | - | - |
| 100 | 100 | QPSK | 100+100 | QPSK | 100 | P_100@0 | - | - | - |

Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-1.
Note 2: Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test CA configuration.
Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same $N_{RB_agg}$ , only the combination with the highest NRB_PCC is tested.
Note 4: For CA_70C all test frequency IDs shall be tested according to table 4.3.1.1.70A-1, in TS 36.508 [7].

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Figure group A.34 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.8.1.2A.4.3.

#### 7.8.1A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.8.1A.2.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.8.1A.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level to the value as defined in Table 7.8.1A.1.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.8.1A.1.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

7. Set the Interfering signal levels to the values as defined in subclause 7.8.1A.2.5 and frequency below the aggregated component carriers, using a modulated interferer bandwidth as defined in Annex D of the present document.

8. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex G.2.

9. Repeat steps from 6 to 8, using an interfering signal above the aggregated component carriers at step 7.

#### 7.8.1A.2.4.3 Message contents

Same message contents as in clause 7.8.1.4.3.

### 7.8.1A.2.5 Test requirements

Same as 7.8.1A.1.5. with the following exceptions:

- Instead of Table 7.8.1A.1.5-1 → use Table 7.8.1A.2.5-1.

**Table 7.8.1A.2.5-1: Test parameters for Wide band intermodulation**

| Rx parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 12 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | |
| $BW_{Interferer\ 2}$ | MHz | 5 | 5 | | | |
| $F_{Interferer\ 1}$ (Offset) | MHz | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | | | |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5. | | | | | | |
| Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. | | | | | | |
| Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1. | | | | | | |
| Note 4: The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz | | | | | | |

For the UE which supports inter band CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer\ 1}$ and $P_{Interferer\ 2}$ power defined in Table 7.8.1A.2.5-1 is increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.8.1A.3 Wideband intermodulation for CA (inter-band DL CA without UL CA)

### 7.8.1A.3.1 Test purpose

Intermodulation response tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

### 7.8.1A.3.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that supports inter-band contiguous DL CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 2DL CA with FDD-TDD inter-band CA.

This test case also applies to all types of E-UTRA UE release 13 and forward that support DL LAA.

### 7.8.1A.3.3 Minimum conformance requirements

Same as 7.8.1A.1

### 7.8.1A.3.4 Test description

#### 7.8.1A.3.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA bands specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.8.1A.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.8.1A.3.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | | A: Mid range for PCC and SCC | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE | | Highest $N_{RB_agg}$ for PCC and SCC | | | | |
| **Test Parameters for CA Configurations** | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | | **UL Allocation** | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | | **CC MOD** | **PCC $N_{RB_alloc}$** |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 50 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 25 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 20 |
| 50 | 50 | QPSK | 50 | 50 | QPSK | 16 |
| 50 | 75 | QPSK | 50 | 75 | QPSK | 25 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 50 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 25 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 20 |
| 50 | 100 | QPSK | 50 | 100 | QPSK | 16 |
| 75 | 25 | QPSK | 75 | 25 | QPSK | 75 |
| 75 | 25 | QPSK | 75 | 25 | QPSK | 20 |
| 75 | 50 | QPSK | 75 | 50 | QPSK | 25 |
| 75 | 75 | QPSK | 75 | 75 | QPSK | 25 |
| 75 | 100 | QPSK | 75 | 100 | QPSK | 25 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 100 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 75 |
| 100 | 50 | QPSK | 100 | 50 | QPSK | 50 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 100 |
| 100 | 75 | QPSK | 100 | 75 | QPSK | 50 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 100 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 75 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 50 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 45 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 25 |
| 100 | 100 | QPSK | 100 | 100 | QPSK | 20 |

| | |
|---|---|
| Note 1: | CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. |
| Note 2: | Depending on CA configurations, only the appropriate Uplink RB allocation value according to table 7.3A.3.5-2 for UE supporting one uplink carrier is tested per Test CA configuration. |
| Note 3: | The UL resource blocks shall be located as close as possible to the downlink PCC but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). |
| Note 4: | The frequencies of PCC and SCC shall be switched and tested in each configuration, according to the UE declared capability for UL support (within CA operation) in the individual bands. |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Figure group A.34 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.8.1A.3.4.3.

#### 7.8.1A.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.8.1A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.8.1A.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level to the value as defined in Table 7.8.1A.3.5-0 for operating band 46 or Table 7.8.1A.3.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.8.1A.3.5-0 for operating band 46 or Table 7.8.1A.3.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

7. Set the Interfering signal levels to the values as defined in Table 7.8.1A.3.5-0 for operating band 46 without uplink band or Table 7.8.1A.3.5-1 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

8. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex G.2.

9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal at step 4.

#### 7.8.1A.3.4.3 Message contents

Same message contents as in clause 7.8.1.4.3.

### 7.8.1A.3.5 Test requirements

For inter-band carrier aggregation with uplink assigned to one E-UTRA band the in-band blocking requirements are defined with the uplink active on the band other than the band whose downlink is being tested, i.e., the requirements are

tested only for the SCell downlink. The UE shall meet the requirement for each component carrier, when operated as SCell, while both downlink carriers are active.

The throughput measured during the test procedure for each component carrier, when operated as SCell, shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1A.3.5-0 for band combinations including operating band 46 without uplink operation and Table 7.8.1A.3.5-1 (originated from the single carrier Table 7.8.1.5-1).

The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of any downlink CC.

**Table 7.8.1A.3.5-0: Test Parameters for Wide band intermodulation**

| E-UTRA band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | 9 |
| | $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| | $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| | $BW_{Interferer\ 2}$ | | | | | | | 20 |
| | $F_{Interferer\ 1}$ (Offset) | MHz | | | | | | -BW/2 – 30 / +BW/2 + 30 |
| | $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.
NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.3.1.

**Table 7.8.1A.3.5-1: Test parameters for Wide band intermodulation**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 | | | |
| $F_{Interferer\ 1}$ (Offset from SCC) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 | | | |
| $F_{Interferer\ 2}$ (Offset from SCC) | MHz | $2*F_{Interferer\ 1}$ | | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.
Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz
Note 4: For the UE which supports inter band CA configuration in Tables 7.3.3-1A and 7.3.3-1B, $P_{interferer1}$ and $P_{interferer2}$ powers are increased by the amount given by $\Delta R_{IB}$ in Tables 7.3.3-1A and 7.3.3-1B

## 7.8.1A.4 Wideband intermodulation for CA (intra band non-contiguous DL CA without UL CA)

### 7.8.1A.4.1 Test purpose

Same as 7.8.1A.1

### 7.8.1A.4.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support intra-band non-contiguous DL CA but no UL CA.

### 7.8.1A.4.3 Minimum conformance requirements

Same as 7.8.1A.1

### 7.8.1A.4.4 Test description

#### 7.8.1A.4.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA bands specified in table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in table 7.8.1A.4.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.8.1A.4.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes , and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | A: N/A (Range is not relevant) |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration. | Refer to test point |
| **Test Parameters for CA Configurations** | |
| use the content of Table 7.3A.4.4.1-1 | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Figure group A.34 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.8.1A.3.4.3.

### 7.8.1A.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.8.1A.4.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.8.1A.4.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
6. Set the Downlink signal level to the value as defined in Table 7.8.1A.4.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in Table 7.8.1A.4.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq 4.2$GHz, for at least the duration of the Throughput measurement.
7. Set the Interfering signal levels to the values as defined in Table 7.8.1A.4.5-1 and frequency below SCC, using a modulated interferer bandwidth as defined in Annex D of the present document.
8. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex G.2A.
9. Repeat steps from 6 to 8, using an interfering signal above PCC at step 7.

### 7.8.1A.4.4.3 Message contents

Same message contents as in clause 7.8.1.4.3.

### 7.8.1A.4.5 Test requirements

The throughput measured during the test procedure for each component carrier, shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1A.4.5-1 (originated from the single carrier Table 7.8.1.5-1).

**Table 7.8.1A.4.5-1: Test parameters for Wide band intermodulation**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 | | | |
| $F_{Interferer\ 1}$ (Offset) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 | | | |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.
Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz
Note 4: For the UE which supports inter band CA configuration in Tables 7.3.3-1A and 7.3.3-1B, $P_{interferer1}$ and $P_{interferer2}$ powers are increased by the amount given by $\Delta R_{IB}$ in Tables 7.3.3-1A and 7.3.3-1B

## 7.8.1A.5 Wideband intermodulation for 3DL CA

### 7.8.1A.5.1 Test purpose

Same as 7.8.1A.1

### 7.8.1A.5.2 Test applicability

This test case applies to all types of E-UTRA UE release 10 and forward that support 3DL with Intra-band contiguous CA or 3DL with Inter-band CA, or 3DL with Inter-band and Intra-band contiguous CA.

This test case also applies to all types of E-UTRA UE release 11 and forward that support 3DL with Intra-band non-contiguous CA and Inter-band CA, or 3DL with Intra-band non-contiguous and Intra-band contiguous CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 3DL with FDD-TDD CA.

This test case also applies to all types of E-UTRA UE release 13 and forward that support 3DL CA involving Band 46.

### 7.8.1A.5.3 Minimum conformance requirements

Same as 7.8.1A.1.

### 7.8.1A.5.4 Test description

#### 7.8.1A.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be

tested with applicable test parameters for each channel bandwidth, and are shown in table 7.8.1A.5.4.1-1 through table 7.8.1A.5.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.8.1A.5.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns mapping within Band refer to “CC” columns |
| CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration s bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columr |
| ork signalling value | NS_01 by default |

**Test Parameters for CA Configurations**

| | PCC | | | | SCC1 | | | | SCC2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3) | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | a |
| **Default Test Settings for a CA_XD Configuration (Intra-band contiguous)** | | | | | | | | | | | | |
| | X | Mid/ CC1 | REFSENS | All RBs | X | Mid/ CC2 | N/A | All RBs | X | Mid/ CC3 | N/A | All |
| | QPSK | QPSK | | LowHighest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Hig $N_R$ |
| | X | Mid/ CC1 | REFSENS | All RBs | X | Mid/ CC2 | N/A | All RBs | X | Mid/ CC3 | N/A | All |
| | QPSK | QPSK | | HighLowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lo $N_R$ |
| **Default Test Settings for a CA_XA-YA-ZA Configuration (Inter-band)** | | | | | | | | | | | | |
| | X | Mid | REFSENS | All RBs | Y | Mid | N/A | All RBs | Z | Mid | N/A | All |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Hig N |
| | Y | Mid | REFSENS | All RBs | X | Mid | N/A | All RBs | Z | Mid | N/A | All |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Hig N |
| | Z | Mid | REFSENS | All RBs | X | Mid | N/A | All RBs | Y | Mid | N/A | All |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Hig N |
| **Test Settings for CA_1A-18A-28A Configuration** | | | | | | | | | | | | |
| **1** | 1 | Low | 50@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | |
| **2** | 1 | Low | 75@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 50 | N/A | QPSK | | |
| **3** | 1 | Low | 100@0 | All RBs | 18 | Low | N/A | All RBs | 28 | Mid | N/A | All |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 50 | N/A | QPSK | | |
| **4** | 1 | Low | 100@0 | All RBs | 18 | Mid | N/A | All RBs | 28 | High | N/A | All |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 75 | N/A | QPSK | | |
| **5** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 50 | N/A | QPSK | | |
| **6** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 75 | N/A | QPSK | | |
| **7** | 18 | Low | 25@25 | All RBs | 1 | Low | N/A | All RBs | 28 | Mid | N/A | All |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | |
| **8** | 18 | Mid | 25@50 | All RBs | 1 | Low | N/A | All RBs | 28 | High | N/A | All |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | |
| **9** | 18 | Mid | 25@50 | All RBs | 1 | Low | N/A | All RBs | 28 | High | N/A | All |
| | QPSK | QPSK | | 75 | N/A | QPSK | | 100 | N/A | QPSK | | |
| **10** | 28 | High | 25@0 | All RBs | 1 | Low | N/A | All RBs | 18 | Mid | N/A | All |
| | QPSK | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | |
| **11** | 28 | Mid | 25@25 | All RBs | 1 | Low | N/A | All RBs | 18 | Low | N/A | All |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | |
| **12** | 28 | High | 25@25 | All RBs | 1 | High | N/A | All RBs | 18 | Mid | N/A | All |
| | QPSK | QPSK | | 50 | N/A | QPSK | | 100 | N/A | QPSK | | |
| **Default Test Settings for CA_XB-YA and CA_XC-YA Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | Mid/ CC1 | REFSENS | All RBs | X | Mid/ CC2 | N/A | All RBs | Y | Mid | N/A | All |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Hig N |
| | X | Mid/ CC1 | REFSENS | All RBs | X | Mid/ CC2 | N/A | All RBs | Y | Mid | N/A | All |
| | QPSK | QPSK | | HLowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Hig N |
| | Y | Mid | REFSENS | All RBs | X | Mid/ CC1 | N/A | All RBs | X | Mid/CC2 | N/A | All |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Hig $N_R$ |
| | Y | Mid | REFSENS | All RBs | X | Mid/ CC1 | N/A | All RBs | X | Mid/CC2 | N/A | All |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lo $N_R$ |
| **Default Test Settings for CA_XA-YB and CA_XA-YC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | |
| | Y | Mid/ CC1 | REFSENS | All RBs | Y | Mid/ CC2 | N/A | All RBs | X | Mid | N/A | All |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Hig N |
| | Y | Mid/ CC1 | REFSENS | All RBs | Y | Mid/ CC2 | N/A | All RBs | X | Mid | N/A | All |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Hig N |
| | X | Mid | REFSENS | All RBs | Y | Mid/ CC1 | N/A | All RBs | Y | Mid/ CC2 | N/A | All |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Hig $N_R$ |
| | X | Mid | REFSENS | All RBs | Y | Mid/ CC1 | N/A | All RBs | Y | Mid/ CC2 | N/A | All |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lo $N_R$ |

1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
2: Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
3: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual b within the CA Configuration, test points with that individual band as PCC are not applicable.
4: **Intra-band contiguous:** X corresponds to the band in the CA Configuration. E.g. for CA_41D, X=41
5: **Inter-band:** X,Y,Z correspond to the 1st, 2nd and 3rd band in the CA Configuration. E.g. for CA_1A-3A-19A, X=1, Y=3, Z=19
6: **Intra-band contiguous + Inter-band:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_1C-3A, X=1 and Y=3
7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
8: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
9: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose th Combination with $N_{RB_PCC} = N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testi
10: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
11: ID/test points that result in no refsens requirement shall be skipped.

**Table 7.8.1A.5.4.1-2: Test Configuration Table with $W_{gap}$**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to "Range" columns. For mapping within Band refer to "CC" columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3,4) | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for CA_XA-XA-YA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | X | CC2 | REFSENS | All RBs | Max | X | CC1 | N/A | All RBs | - | Y | Mid | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| 2 | Y | Mid | REFSENS | All RBs | - | X | CC2 | N/A | All RBs | Max | X | CC1 | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| **Default Test Settings for CA_XA-YA-YA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | Y | CC2 | REFSENS | All RBs | Max | Y | CC1 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| 2 | X | Mid | REFSENS | All RBs | - | Y | CC2 | N/A | All RBs | Max | Y | CC1 | N/A | All RBs |
| | QPSK | QPSK | | | | N/A | QPSK | | | | N/A | QPSK | | |
| **Test Settings for CA_29A-66A-66A Configuration (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | 29 | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 50 |
| **Test Settings for a CA_41C-41A Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 1 | 41 | CC3 | 100@0 | All RBs | 134.2 | 41 | CC2 | N/A | All RBs | - | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_41A-41C Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 2 | 41 | CC3 | 100@0 | All RBs | - | 41 | CC2 | N/A | All RBs | 134.2 | 41 | CC1 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Group Test Settings for CA_66A-66A-XA or CA_XA-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 50 | 66 | CC2 | N/A | All RBs | - | X | Mid | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | Highest NRB |
| 2 | X | Mid | REFSENS | All RBs | - | 66 | CC1 | N/A | All RBs | 50 | 66 | CC2 | N/A | All RBs |
| | QPSK | QPSK | | Highest NRB | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |
| **Test Settings for a CA_66A-66C Configuration (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | |
| 1 | 66 | CC1 | 100@0 | All RBs | 30.2 | 66 | CC2 | N/A | All RBs | - | 66 | CC3 | N/A | All RBs |
| | QPSK | QPSK | | 100 | | N/A | QPSK | | 100 | | N/A | QPSK | | 100 |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.

Note 2: **Intra-band non-contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.

Note 3: **Intra-band non-contiguous + Intra-band contiguous:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.

Note 4: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.

Note 5: **Intra-band non-contiguous + Inter-band:** X and Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A,X=2,Y=5

Note 6: **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A,X=41.
Note 7: **Intra-band non-contiguous + Inter-band:** REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RE allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.
Note 10: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 11: ID/test points that result in no refsens requirement shall be skipped.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.58 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 7.8.1A.5.4.1-1 through Table 7.8.1A.5.4.1-2 as appropriate.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.8.1A.5.4.3.

### 7.8.1A.5.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.8.1A.5.4.3

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.8.1A.5.4.1-1 through Table 7.8.1A.5.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.8.1A.5.4.1-1 through Table 7.8.1A.5.4.1-2 as appropriate on PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level to the value as defined in Table 77.8.1A.5.4.2-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

7. Set the Interfering signal levels to the values as defined in Table 7.8.1A.5.4.2-1 and frequency below the measured carrier(s) according to table 7.8.1A.5.4.2-1, using a modulated interferer bandwidth as defined in Annex D of the present document.

8. Measure the average throughput for the carrier(s) indicated in table 7.8.1A.5.4.2-1 for a duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to table 7.8.1A.5.4.2-1.

10. Repeat steps 6 to 9 for component carriers listed in table 7.8.1A.5.4.2-1.

**Table 7.8.1A.5.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2 | 7.8.1A.5.5-2 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.8.1A.5.5-0<br>7.8.1A.5.5-1 |
| | | SCC2 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| Intra-band contiguous + Inter-band | 1 | SCC2 | 7.8.1A.5.5-0<br>7.8.1A.5.5-1 |
| | 2 | | |
| | 3 | SCC1, SCC2 | 7.8.1A.5.5-2<br>7.8.1A.5.5-3 |
| | 4 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC2 | 7.8.1A.5.5-0<br>7.8.1A.5.5-1 |
| | 2 | SCC1 | |
| | | SCC2 | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.8.1A.5.5-1 |
| | | SCC1, SCC2 | 7.8.1A.5.5-2<br>7.8.1A.5.5-3 |
| | 2 | SCC2 | 7.8.1A.5.5-1 |
| | | PCC, SCC1 | 7.8.1A.5.5-2<br>7.8.1A.5.5-3 |

Note 1: Test point ID for the particular CA configuration as defined in section 7.8.1A.5.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.
Note 4: Skip the parts of the test procedure configuring in-gap interferer positions for a non-contiguous component carrier

### 7.8.1A.5.4.3 Message contents

Same message contents as in clause 7.8.1.4.3 for without UL CA.

Same message contents as in clause 7.8.1A.1.4.3 for UL CA.

## 7.8.1A.5.5 Test requirement

The throughput of the carrier(s) under test shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1A.5.5-0, Table 7.8.1A.5.5-1, Table 7.8.1A.5.5-2, or Table 7.8.1A.5.5-3 for the specified wanted signal mean power in the presence of two interfering signals.

The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of any downlink CC.

**Table 7.8.1A.5.5-0: Test Parameters for Wide band intermodulation (band 46)**

| E-UTRA band | Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| 46 | Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | | | | | | | 9 |
| | $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| | $BW_{Interferer\ 2}$ | | | | | | | 20 |
| | $F_{Interferer\ 1}$ (Offset) | MHz | | | | | | -BW/2 – 30 / +BW/2 + 30 |
| | $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3.1-2 with $P_{CMAX_L}$ as defined in subclause 6.2.5.
NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD/FS3 as described in Annex A.5.1.1/A.5.2.1/A.5.3.1.

**Table 7.8.1A.5.5-1: Test parameters for Wide band intermodulation**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 | | | |
| $F_{Interferer\ 1}$ (Offset from SCC) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 | | | |
| $F_{Interferer\ 2}$ (Offset from SCC) | MHz | $2*F_{Interferer\ 1}$ | | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.
Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz
Note 4: For the UE which supports inter band CA configuration in Tables 7.3.3-1A and 7.3.3-1B, $P_{interferer1}$ and $P_{interferer2}$ powers are increased by the amount given by $\Delta R_{IB}$ in Tables 7.3.3-1A and 7.3.3-1B
Note 5: For intra-band non-contiguous + inter-band CA, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps

**Table 7.8.1A.5.5-2: Wide band intermodulation**

| Rx parameter | Units | Table 7.8.1A.5.5-2 CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 12 | 13.8 | | |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | |
| $BW_{Interferer\ 2}$ | MHz | 5 | 5 | 5 | | |
| $F_{Interferer\ 1}$ (Offset) | MHz | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | | |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A.
Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1.
Note 4: The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz
Note 5: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

**Table 7.8.1A.5.5-3: Wide band intermodulation (band 46, intra-band contiguous)**

| E-UTRA Band | Rx parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F |
| 46 | Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | | | 12 | 13.8 | | |
| | $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | |
| | $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | |
| | $BW_{Interferer\ 2}$ | MHz | | 20 | 20 | | |
| | $F_{Interferer\ 1}$ (Offset) | MHz | | $-F_{offset}$-30 / + $F_{offset}$+30 | $-F_{offset}$-30 / + $F_{offset}$+30 | | |
| | $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | |

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX_L,c}$ or $P_{CMAX_L}$ as defined in subclause 6.2.5A.
NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1.
NOTE 4: The interfering modulated signal is 20 MHz E-UTRA signal as described in Annex D interference setting 2;
NOTE 5: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer\ 1}$ and $P_{Interferer\ 2}$ power defined in Table 7.8.1A.5.5-2 increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.8.1A.6

## 7.8.1A.7 Wideband intermodulation for 4DL CA

### 7.8.1A.7.1 Test purpose

Same as 7.8.1A.1.

### 7.8.1A.7.2 Test applicability

This test case applies to all types of E-UTRA UE release 11 and forward that support 4DL with TDD Intra-band contiguous CA, or 4DL with Inter-band CA, or 4DL with Intra-band contiguous and Inter-band CA.

This test case also applies to all types of E-UTRA UE release 11 and forward that support 4DL with Intra-band non-contiguous CA and Inter-band CA, or 4DL with Intra-band non-contiguous and Intra-band contiguous CA, or 4DL with Intra-band non-contiguous and Intra-band non-contiguous CA.

This test case also applies to all types of E-UTRA UE release 12 and forward that support 4DL CA with FDD-TDD CA.

### 7.8.1A.7.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.8.1A.0.

### 7.8.1A.7.4 Test description

#### 7.8.1A.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.8.1A.7.4.1-1 through table 7.8.1A.7.4.1-6 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.8.1A.7.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC NRB” and “SCCs NRB” columns |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for a CA_XE Configuration (Intra-band contiguous)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | X | Mid/CC3 | N/A | ALL RBs | X | Mid/CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YD, YD-XA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs | X | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **4** | X | Mid | REFSENS | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA Configuration (Inter-band)** | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | X | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | R | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings for CA_XB-YA-ZA and CA_XC-YA-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-XB-ZA and CA_YA-XC-ZA Configuration (Intra-band contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XB and CA_YA-ZA-XC Configuration (Intra-band contiguous + Inter-band)** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid | REFSENS | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Z | Mid | REFSENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |
| **Test Settings for CA_2A-66C-71A Configuration** | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 66 | Mid/CC1 | 100@0 | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **2** | 66 | Mid/CC1 | 100@0 | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 2 | Mid | N/A | ALL RBs | 71 | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **3** | 2 | Low | 100@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **4** | 2 | Low | 100@0 | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs | 71 | High | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 | N/A | QPSK | | 100 |
| **5** | 71 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 |
| **6** | 71 | Mid | 100@0 | ALL RBs | 2 | Mid | N/A | ALL RBs | 66 | Mid/CC1 | N/A | ALL RBs | 66 | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 100 | N/A | QPSK | | 25 |
| **Default Test Settings for CA_XC-YC Configuration (Intra-band contiguous + Inter-band(2))** | | | | | | | | | | | | | | | | |
| **1** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/CC1 | REFSENS | ALL RBs | X | Mid/CC2 | N/A | ALL RBs | Y | Mid/CC1 | N/A | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |
| **3** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid/CC1 | REFSENS | ALL RBs | Y | Mid/CC2 | N/A | ALL RBs | X | Mid/CC1 | N/A | ALL RBs | X | Mid/CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.
Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.

Note 4: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41E, X=41.
Note 6: **Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-8A,X=1,Y=3,Z=7,R=8.
Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_3C-7A-28A, X=3,Y=7 and Z=28.
Note 8: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.
Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_PCC}$ = $N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing.
Note 11: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 12: ID/test points that result in no refsens requirement shall be skipped.

**Table 7.8.1A.7.4.1-2: Test Configuration Table with Wgap**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | | $W_{gap}$ [MHz] | SCC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc | | UL MOD | DL MOD | ULalloc | DLalloc |
| **Default Test Settings for CA_XA-XA-YA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-XA-XA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-XA-XA Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REFSENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YA-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-66A-66A-ZA Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YA-ZA-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC1 | REFSENS | ALL RBs | Max | X | CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **2** | Y | Mid | REFSENS | ALL RBs | - | X | CC1 | N/A | ALL RBs | Max | X | CC2 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs |
| | QPS | 64- | | $N_{RB_agg}$ | | N/A | 64- | | $N_{RB_a}$ | | N/A | 64- | | $N_{RB_a}$ | | N/A | 64- | | $N_{RB_agg}$ |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | K | QAM | | | | | QAM | | gg | | | QAM | | gg | | | QAM | | |
| **3** | Z | Mid | REFSENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC1 | N/A | ALL RBs | Max | X | CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YC Configurations (Intra-band non-contiguous + Inter-band)**<br>**Default Test Settings for CA_YC-66A-66A Configurations (Intra-band non-contiguous + Inter-band)** | | | | | | | | | | | | | | | | | | | |
| **1** | 66 | CC1 | REFSENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Y | Mid/CC1 | N/A | ALL RBs | - | Y | Mid/CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ |
| **2** | Y | Mid/CC1 | REFSENS | ALL RBs | - | Y | Mid/CC2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs |
| | QPSK | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | Highest $N_{RB}$ | | N/A | 64-QAM | | $N_{RB_agg}$ | | N/A | 64-QAM | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XD/XD-XA/XC-XC Configurations (Intra-band non-contiguous + Intra-band contiguous)** | | | | | | | | | | | | | | | | | | | |
| **TBD** | | | | | | | | | | | | | | | | | | | |
| **Default Test Settings for CA_XA-XA-YA-YA Configurations (Intra-band non-contiguous + Intra-band non-contiguous)** | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC4 | REFSENS | ALL RBs | Max | X | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | Max | Y | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | CC4 | REFSENS | ALL RBs | Max | Y | CC3 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band non-contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-12A,X=2,Y=4,Z=12.
Note 5: **Intra-band non-contiguous + Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41C-41A-41A,X=41.
Note 6: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-4A-4A,X=2,Y=4.
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$ , choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.
Note 9: The orders and numbering of SCCs in this table does not imply any order in test implementation of SCCs.
Note 10: ID/test points that result in no refsens requirement shall be skipped.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.58 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 7.8.1A.7.4.1-1 through Table 7.8.1A.7.4.1-2 as appropriate.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.3A.5.4.3.

### 7.8.1A.7.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.8.1A.7.4.3.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.8.1A.7.4.1-1 through Table7.8.1A.7.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.8.1A.7.4.1-1 through Table 7.8.1A.7.4.1-2 as appropriate on PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level to the value as defined in Table 7.8.1A.7.5-1 or 7.8.1A.7.5-2. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.

7. Set the Interfering signal levels to the values as defined in 7.8.1A.7.5-1 or 7.8.1A.7.5-2 and frequency below the measured carrier(s) according to table 7.8.1A.7.4.2-1, using a modulated interferer bandwidth as defined in Annex D of the present document.

8. Measure the average throughput for the carrier(s) indicated in table 7.8.1A.7.4.2-1 for a duration sufficient to achieve statistical significance according to Annex G.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to table 7.8.1A.7.4.2-1.

10. Repeat steps 6 to 9 for component carriers listed in table 7.8.1A.7.4.2-1.

**Table 7.8.1A.7.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| Intra-band contiguous | 1 | PCC, SCC1, SCC2,SCC3 | 7.8.1A.7.5-2 |
| | 2 | | |
| Inter-band | 1 | SCC1 | 7.8.1A.7.5-1 |
| | | SCC2 | |
| | | SCC3 | |
| | 2 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | 4 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| Intra-band contiguous + Inter-band | 1 | SCC2 SCC3 | 7.8.1A.7.5-1 |
| | 2 | | |
| | 3 | SCC1, SCC2, SCC3 | 7.8.1A.7.5-2 7.8.1A.7.5-1 |
| | 4 | | |
| | 5 | SCC1, SCC2, SCC3 | 7.8.1A.7.5-1 7.8.1A.7.5-2 |
| | 6 | | |
| Intra-band contiguous + Inter-band(2) | 1 | SCC2 SCC3 | 7.8.1A.7.5-1 7.8.1A.7.5-2 |
| | 2 | | |
| | 3 | | |
| | 4 | | |
| Intra-band non-contiguous + Inter-band | 1 | SCC2, SCC3 | 7.8.1A.7.5-1 |
| | 2 | SCC1, | 7.8.1A.7.5-1 |
| | | SCC2 | |
| | | SCC3 | |
| | 3 | SCC1 | 7.8.1A.7.5-1 |
| | | SCC2 | |
| | | SCC3 | |
| Intra-band non-contiguous + Intra-band contiguous | 1 | PCC | 7.8.1A.7.5-1 |
| | | SCC1, SCC2, SCC3 | 7.8.1A.7.5-1 7.8.1A.7.5-2 |
| | 2 | SCC2 | 7.8.1A.7.5-2 |
| | | PCC, SCC1, SCC3 | 7.8.1A.7.5-1 7.8.1A.7.5-2 |
| Intra-band non-contiguous + Intra-band non-contiguous | 1 | SCC2 | 7.8.1A.7.5-1 |
| | | SCC3 | |
| | 2 | SCC2 | |
| | | SCC3 | |

Note 1: Test point ID for the particular CA configuration as defined in section 7.8.1A.7.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.
Note 4: Skip the parts of the test procedure configuring in-gap interferer positions for a non-contiguous component carrier.

### 7.8.1A.7.4.3 Message contents

Same message contents as in clause 7.8.1.4.3 for without UL CA.

Same message contents as in clause 7.8.1A.1.4.3 for UL CA.

### 7.8.1A.7.5 Test requirement

The throughput of the carrier(s) under test shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1A.7.5-1 or Table 7.8.1A.7.5-2 for the specified wanted signal mean power in the presence of two interfering signals.

The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of any downlink CC.

**Table 7.8.1A.7.5-1: Test parameters for Wide band intermodulation (inter-band)**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 | | | |
| $F_{Interferer\ 1}$ (Offset from SCC) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 | | | |
| $F_{Interferer\ 2}$ (Offset from SCC) | MHz | $2*F_{Interferer\ 1}$ | | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.

Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.

Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz.

Note 4: For the UE which supports inter band CA configuration in Tables 7.3.3-1A and 7.3.3-1B, $P_{interferer1}$ and $P_{interferer2}$ powers are increased by the amount given by $\Delta R_{IB}$ in Tables 7.3.3-1A and 7.3.3-1B.

Note 5: For intra-band non-contiguous + inter-band CA, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps.

**Table 7.8.1A.7.5-2: Wide band intermodulation (Intra-band contiguous)**

| Rx parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 12 | 13.8 | 15 | |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | |
| $BW_{Interferer\ 2}$ | MHz | 5 | 5 | 5 | 5 | |
| $F_{Interferer\ 1}$ (Offset) | MHz | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A.
Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1.
Note 4: The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz.
Note 5: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C, $P_{Interferer\ 1}$ and $P_{Interferer\ 2}$ power defined in Table 7.8.1A.7.5-2 increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B and 7.3.3-1C.

## 7.8.1A.8 Wideband intermodulation for 5DL CA

### 7.8.1A.8.1 Test purpose

Same as 7.8.1A.1.

### 7.8.1A.8.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 5DL with CA configurations in Table 7.1-2a.

### 7.8.1A.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.8.1A.0.

### 7.8.1A.8.4 Test description

#### 7.8.1A.8.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA configurations specified in table 5.4.2A.1-1 through table 5.4.2A.1-2a. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.8.1A.8.4.1-1 through table 7.8.1A.8.4.1-2 as appropriate. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.8.1A.8.4.1-1: Test Configuration Table**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to “Range” columns. For mapping within Band refer to “CC” columns |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “PCC $N_{RB}$” and “SCCs $N_{RB}$” columns |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | SCC1 | | | | SCC2 | | | | SCC3 | | | | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | | Band | Range | NRB | |
| | UL MOD | DL MOD | ULalloc (Note 2,3,4) | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for a CA_XF Configuration** | | | | | | | | | | | | | | | | | | | | |
| 1 | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | X | Mid/ CC5 | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| 2 | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | X | Mid/ CC5 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **Default Test Settings for a CA_XA-YA-ZA-RA-SA Configuration** | | | | | | | | | | | | | | | | | | | | |
| 1 | X | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| 2 | Y | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| 3 | Z | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4** | R | Mid | REF SENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | S | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | S | Mid | REFSENS | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **Default Test Settings for a CA_XE-YA, YA-XE Configuration** | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **4** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | X | Mid/ CC4 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **Default Test Settings for CA_XB-YA-ZA-RA and CA_XC-YA-ZA-RA Configuration** | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest | N/A | QPSK | | Highest | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | $N_{RB_agg}$ | | | | $N_{RB_agg}$ | | | | | | | | |
| **4** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **6** | Z | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **7** | R | Mid | REF SENS | ALL RBs | Z | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs |
| | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **8** | R | Mid | REF SENS | ALL RBs | Z | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs |
| | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |
| **Default Test Settings for CA_XD-YA-ZA Configuration** | | | | | | | | | | | | | | | | | | | | |
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid | N/A | ALL RBs | Y | Mid | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4** | Y | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **6** | Z | Mid | REF SENS | ALL RBs | Y | Mid | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC3 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |

| Default Test Settings CA_XB-YB-ZA, CA_XB-YC-ZA, CA_XC-YB-ZA, and CA_XC-YC-ZA Configuration | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | X | Mid/ CC1 | REF SENS | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid/ CC1 | REF SENS | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **4** | Y | Mid/ CC1 | REF SENS | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Z | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB}$ |
| **5** | Z | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ | N/A | QPSK | | Highest $N_{RB_agg}$ |
| **6** | Z | Mid | REF SENS | ALL RBs | X | Mid/ CC1 | N/A | ALL RBs | X | Mid/ CC2 | N/A | ALL RBs | Y | Mid/ CC1 | N/A | ALL RBs | Y | Mid/ CC2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ | N/A | QPSK | | Lowest $N_{RB_agg}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.

Note 2: **Intra-band contiguous & Intra-band contiguous + Inter-band:** Use CA Configuration – specific test points if present in the table, otherwise use Default Test Settings test points.

Note 3: **Inter-band:** Use CA Configuration – specific test points if present in the table, Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.

Note 4: **Inter-band & Intra-band contiguous + Inter-band:** If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.

Note 5: **Intra-band contiguous:** X corresponds to the band of the CA Configuration. E.g. for CA_41F, X=41.

Note 6: **Inter-band:** X,Y,Z,R,S correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-7A-20A-42A,X=1,Y=3,Z=7,R=20,S=42.

Note 7: **Intra-band contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_1A-3A-28A-42C, X=1, Y=3, Z=28 and R=42.

Note 8: REFSENS refers to the PCC bands and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.

Note 9: **Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose for testing the Combination with maximum $N_{RB_PCC}$ and then select maximum $N_{RB_SCC1}$ for the chosen $N_{RB_PCC}$.

Note 10: **Intra-band contiguous + Inter-band:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose the Combination with $N_{RB_PCC}$ =

| |
|---|
| $N_{RB_SCC1}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_PCC}$ for testing. |

**Table 7.8.1A.8.4.1-2: Test Configuration Table with $W_{gap}$**

| Initial Conditions | |
|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes. | For test frequencies refer to "Range" columns. For mapping within Band refer to "CC" columns |
| Test CC Combination setting (NRB_agg) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest $N_{RB}$ |
| Network signalling value | NS_01 by default |

Test Parameters for CA Configurations

| ID | PCC | | | | $W_{gap}$ [MHz] | SCC1 | | | | $W_{gap}$ [MHz] | SCC2 | | | | $W_{gap}$ [MHz] | SCC3 | | | | $W_{gap}$ [MHz] | SCC4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | | | Band | Range | NRB | |
| | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc | | UL MOD | DL MOD | UL alloc | DL alloc |
| **Default Test Settings for CA_XA-XA-YA-ZA-RA Configurations** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | X | CC2 | REF SENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | Y | Mid | REF SENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Z | Mid | REF SENS | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | R | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **4** | R | Mid | REF SENS | ALL RBs | - | Z | Mid | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YD Configurations** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Y | CC3 | REF SENS | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ |
| **2** | X | CC2 | REF SENS | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | CC3 | N/A | ALL RBs | - | Y | CC2 | N/A | ALL RBs | - | Y | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_XA-XA-YA-ZA-ZA Configurations** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Z | CC2 | REF SENS | ALL RBs | Max | Z | CC1 | N/A | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **2** | X | CC2 | REF | ALL | Max | X | CC1 | N/A | ALL | - | Z | CC2 | N/A | ALL | Max | Z | CC1 | N/A | ALL | - | Y | Mid | N/A | ALL |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SENS | RBs | | | | | RBs | | | | | RBs | | | | | RBs | | | | RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | - | X | CC2 | N/A | ALL RBs | Max | X | CC1 | N/A | ALL RBs | - | Z | CC2 | N/A | ALL RBs | Max | Z | CC1 | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ |
| **Default Test Settings for CA_66A-66A-YA-ZC Configurations Intra-band non-contiguous + Intra-band non-contiguous** | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Z | Mid/C C1 | REF SENS | ALL RBs | - | Z | Mid/C C2 | N/A | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ |
| **2** | 66 | CC1 | REF SENS | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Z | Mid/C C1 | N/A | ALL RBs | - | Z | Mid/C C2 | N/A | ALL RBs | - | Y | Mid | N/A | ALL RBs |
| | QPSK | QPSK | | $N_{RB_agg}$ | | QPSK | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ |
| **3** | Y | Mid | REF SENS | ALL RBs | - | 66 | CC1 | N/A | ALL RBs | Max | 66 | CC2 | N/A | ALL RBs | - | Z | Mid/C C1 | N/A | ALL RBs | - | Z | Mid/C C2 | N/A | ALL RBs |
| | QPSK | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | $N_{RB_agg}$ | | N/A | QPSK | | Highest $N_{RB}$ | | N/A | QPSK | | Highest $N_{RB}$ |

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table. Otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use Default Test Settings test points.
Note 3: If, according to the UE declared capability, UE does not support UL in an individual band within the CA Configuration, test points with that individual band as PCC are not applicable.
Note 4: **Intra-band non-contiguous + Inter-band:** X,Y,Z,R correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-12A-66A,X=2,Y=5,Z=12,R=66.
Note 5: **Intra-band non-contiguous + Intra-band contiguous:** X,Y corresponds to the band of the CA Configuration. E.g. for CA_5A-5A-66D,X=5,Y=66.
Note 6: **Intra-band non-contiguous + Intra-band non-contiguous:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_2A-2A-5A-66A-66A,X=2,Y=5,Z=66.
Note 7: REFSENS refers to the PCC band's and PCC $N_{RB}$ 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.5-2.
Note 8: **Intra-band non-contiguous + Intra-band contiguous:** If in the CA Configuration UE supports multiple CC Combinations with the same $N_{RB_agg}$, choose the Combination with $N_{RB_CC1} = N_{RB_CC2}$ for testing. If no such combination is supported, choose Combination with maximum $N_{RB_CC1}$ for testing.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure group A.58 as appropriate if the UE supports 2 Rx antennas or Figure A.82 if the UE supports 4 Rx antennas in the band.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, and C.3.1, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 7.8.1A.8.4.1-1 through Table 7.8.1A.8.4.1-2 as appropriate.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.8.1A.8.4.3.

### 7.8.1A.8.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.8.1A.8.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.8.1A.8.4.1-1 through Table 7.8.1A.8.4.1-2 as appropriate on PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.8.1A.8.4.1-1 through Table 7.8.1A.8.4.1-2 as appropriate on PCC and SCCs. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
6. Set the Downlink signal level to the value as defined in Table 7.8.1A.8.5-1 or 7.8.1A.8.5-2. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the Throughput measurement.
7. Set the Interfering signal levels to the values as defined in 7.8.1A.8.5-1 or 7.8.1A.8.5-2 and frequency below the measured carrier(s) according to table 7.8.1A.8.4.2-1, using a modulated interferer bandwidth as defined in Annex D of the present document.
8. Measure the average throughput for the carrier(s) indicated in table 7.8.1A.8.4.2-1 for a duration sufficient to achieve statistical significance according to Annex G.2A.
9. Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to table 7.8.1A.8.4.2-1.
10. Repeat steps 6 to 9 for component carriers listed in table 7.8.1A.8.4.2-1.

**Table 7.8.1A.8.4.2-1: Test repetition and measurement configuration**

| CA configuration | ID (Note 1) | Throughput measured on (Note 3) | Table with test parameters to select (Note 2) |
|---|---|---|---|
| CA_XF | 1 | PCC, SCC1, SCC2,SCC3, SCC4 | 7.8.1A.8.5-2 |
| | 2 | | |
| CA_XA-YA-ZA-RA-SA | 1 | SCC1 | 7.8.1A.8.5-1 |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 2 | SCC1 | |

| | | | |
|---|---|---|---|
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 3 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 4 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 5 | SCC1 | |
| | | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| CA_XE-YA | 1 | SCC4 | 7.6.3A.8.5-1 |
| | 2 | SCC1,SCC2, SCC3,SCC4 | 7.6.3A.8.5-2 |
| | 3 | | |
| | 4 | | |
| CA_XB-YA-ZA-RA<br>CA_XC-YA-ZA-RA | 1 | SCC2 | 7.8.1A.8.5-1 |
| | | SCC3 | |
| | | SCC4 | |
| | 2 | SCC2 | |
| | | SCC3 | |
| | | SCC4 | |
| | 3 | SCC1,SCC2 | 7.8.1A.8.5-2 |
| | | SCC3 | 7.8.1A.8.5-1 |
| | | SCC4 | |
| | 4 | SCC1,SCC2 | 7.8.1A.8.5-2 |
| | | SCC3 | 7.8.1A.8.5-1 |
| | | SCC4 | |
| | 5 | SCC1 | 7.8.1A.8.5-1 |
| | | SCC2,SCC3 | 7.8.1A.8.5-2 |
| | | SCC4 | 7.8.1A.8.5-1 |
| | 6 | SCC1 | 7.8.1A.8.5-1 |
| | | SCC2,SCC3 | 7.8.1A.8.5-2 |
| | | SCC4 | 7.8.1A.8.5-1 |
| | 7 | SCC1 | 7.8.1A.8.5-1 |
| | | SCC2 | |
| | | SCC3,SCC4 | 7.8.1A.8.5-2 |
| | 8 | SCC1 | 7.8.1A.8.5-1 |
| | | SCC2 | |
| | | SCC3,SCC4 | 7.8.1A.8.5-2 |
| CA_XD-YA-ZA | 1 | SCC3 | 7.8.1A.8.5-1 |
| | | SCC4 | |
| | 2 | SCC3 | 7.8.1A.8.5-1 |
| | | SCC4 | |
| | 3 | SCC1,SCC2, SCC3 | 7.8.1A.8.5-2 |
| | | SCC4 | 7.8.1A.8.5-1 |
| | 4 | SCC1,SCC2, SCC3 | 7.8.1A.8.5-2 |
| | | SCC4 | 7.8.1A.8.5-1 |
| | 5 | SCC1 | 7.8.1A.8.5-1 |
| | | SCC2,SCC3, SCC4 | 7.8.1A.8.5-2 |
| | 6 | SCC1 | 7.8.1A.8.5-1 |
| | | SCC2,SCC3, SCC4 | 7.8.1A.8.5-2 |

| | | | |
|---|---|---|---|
| CA_XB-YB-ZA<br>CA_XB-YC-ZA<br>CA_XC-YB-ZA<br>CA_XC-YC-ZA | 1 | SCC2,SCC3 | 7.6.3A.8.5-2 |
| | | SCC4 | 7.6.3A.8.5-1 |
| | 2 | SCC2,SCC3 | 7.6.3A.8.5-2 |
| | | SCC4 | 7.6.3A.8.5-1 |
| | 3 | SCC2,SCC3 | 7.6.3A.8.5-2 |
| | | SCC4 | 7.6.3A.8.5-1 |
| | 4 | SCC2,SCC3 | 7.6.3A.8.5-2 |
| | | SCC4 | 7.6.3A.8.5-1 |
| | 5 | SCC1,SCC2, SCC3,SCC4 | 7.6.3A.8.5-2 |
| | 6 | SCC1,SCC2, SCC3,SCC4 | 7.6.3A.8.5-2 |
| CA_XA-XA-YA-ZA-RA | 1 | SCC2,SCC3, SCC4 | 7.8.1A.8.5-1 |
| | 2 | SCC1,SCC2, SCC3,SCC4 | |
| | 3 | | |
| | 4 | | |
| CA_XA-XA-YD | 1 | SCC3, SCC4 | 7.8.1A.8.5-1 |
| | 2 | SCC2,SCC3, SCC4 | 7.8.1A.8.5-2 |
| CA_XA-XA-YA-ZA-ZA | 1 | SCC2,SCC3, SCC4 | 7.8.1A.8.5-1 |
| | 2 | | |
| | 3 | SCC1,SCC2, SCC3,SCC4 | |

Note 1: Test point ID for the particular CA configuration as defined in section 7.8.1A.8.4.1.
Note 2: The reference for the placement of the interferer signals is the centre frequency of the carrier closest to the interferer among the carriers throughput is measured on.
Note 3: Where there are multiple rows for a single Test point ID, the test is repeated for each row.
Note 4: Skip the parts of the test procedure configuring in-gap interferer positions for a non-contiguous component carrier.

### 7.8.1A.8.4.3 Message contents

Same message contents as in clause 7.8.1.4.3 for without UL CA.

Same message contents as in clause 7.8.1A.1.4.3 for UL CA.

## 7.8.1A.8.5 Test requirement

The throughput of the carrier(s) under test shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1A.8.5-1 or Table 7.8.1A.8.5-2 for the specified wanted signal mean power in the presence of two interfering signals.

The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of any downlink CC.

**Table 7.8.1A.8.5-1: Test parameters for Wide band intermodulation (inter-band , intra-band non-contiguous)**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration for each CC | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 | | | |
| $F_{Interferer\ 1}$ (Offset from SCC) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 | | | |
| $F_{Interferer\ 2}$ (Offset from SCC) | MHz | $2*F_{Interferer\ 1}$ | | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.
Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz.
Note 4: For the UE which supports inter band CA configuration in Tables 7.3.3-1A and 7.3.3-1B, $P_{interferer1}$ and $P_{interferer2}$ powers are increased by the amount given by $\Delta R_{IB}$ in Tables 7.3.3-1A and 7.3.3-1B.
Note 5: For intra-band non-contiguous + inter-band CA, $\Delta R_{IBNC}$ = 0 dB for all sub-block gaps.

**Table 7.8.1A.8.5-2: Wide band intermodulation (Intra-band contiguous)**

| Rx parameter | Units | CA Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| Power per CC in Aggregated Transmission Bandwidth Configuration | dBm | REFSENS + CA Bandwidth Class specific value below | | | | |
| | | 9 | 12 | 13.8 | 15 | 16 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | |
| $BW_{Interferer\ 2}$ | MHz | 5 | 5 | 5 | 5 | 5 |
| $F_{Interferer\ 1}$ (Offset) | MHz | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 | $-F_{offset}$-7.5 / + $F_{offset}$+7.5 |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ or $P_{CMAX_L_CA}$ as defined in subclause 6.2.5A.
Note 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1.
Note 4: The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz.
Note 5: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

For a UE, which supports CA configuration in Tables 7.3.3-1A, 7.3.3-1B, 7.3.3-1C and 7.3.3-1D, $P_{Interferer\ 1}$ and $P_{Interferer\ 2}$ power defined in Table 7.8.1A.8.5-2 increased by the amount given by $\Delta R_{IB,c}$ in Tables 7.3.3-1A, 7.3.3-1B, 7.3.3-1C and 7.3.3-1D.

# 7.8.1B Wide band Intermodulation for UL-MIMO

## 7.8.1B.1 Test purpose

Intermodulation response tests the ability of UE that support UL-MIMO to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

## 7.8.1B.2 Test applicability

This test applies to all types of E-UTRA UE release 10 and forward that support UL-MIMO.

## 7.8.1B.3 Minimum conformance requirements

For UE(s) with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in subclause 7.8.1B.3 shall be met with the UL-MIMO configurations specified in Table 6.2.2B.3-2. For UL-MIMO, the parameter $P_{CMAX_L}$ is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 36.101 [2] clause 7.8.1B and TS 36.101 [2] Annexes A and D.

## 7.8.1B.4 Test description

### 7.8.1B.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.8.1B.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.8.1B.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 15 | 15 | QPSK | 15 | 15 |
| 5MHz | QPSK | 25 | 25 | QPSK | 25 | 25 |
| 5MHz | QPSK | 25 | N/A | QPSK | 20 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 15 | N/A |
| 5MHz | QPSK | 25 | N/A | QPSK | 5[4] | N/A |
| 10MHz | QPSK | 50 | 50 | QPSK | 50 | 50 |
| 10MHz | QPSK | 50 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 50 | N/A | QPSK | 15 | N/A |
| 15MHz | QPSK | 75 | 75 | QPSK | 75 | 75 |
| 15MHz | QPSK | 75 | N/A | QPSK | 50 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 25 | N/A |
| 15MHz | QPSK | 75 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 100 | 100 | QPSK | 100 | 100 |
| 20MHz | QPSK | 100 | N/A | QPSK | 75 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 50 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 25 | N/A |
| 20MHz | QPSK | 100 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth. | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Applicable only to E-UTRA FDD Bands 31 and 72. The UL resource blocks shall be located at RBstart 10 (according to Table 7.3.3-2). | | | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Figure A.31.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.8.1B.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.8.1B.4.3.

### 7.8.1B.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.8.1B.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 4 for C_RNTI to schedule the UL RMC according to Table 7.8.1B.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
3. Set the Downlink signal level to the value as defined in Table 7.8.1B.5-1. Send Uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4

dB of the target level in Table 7.8.1B.5-1 for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the throughput measurement.

4. Set the Interfering signal levels to the values as defined in Table 7.8.1B.5-1 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 4.

### 7.8.1B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception.

**Table 7.8.1B.4.3-1: UplinkPowerControlDedicated**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE { | | | |
| p0-UePUSCH | 0 | | |
| deltaMCS-Enabled | en0 | | |
| accumulationEnabled | TRUE | | |
| p0-uePUCCH | 0 | | |
| pSRS-Offset | 3 (-6 dB) | | |
| filterCoefficient | fc8 | larger filter length is used to reduce the RSRP measurement variation | |
| } | | | |

## 7.8.1B.5 Test requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1B.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1B.5-1: Test parameters for Wide band intermodulation**

| **Rx Parameter** | **Units** | **Channel bandwidth** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 | | | |
| $F_{Interferer\ 1}$ (Offset) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 | | | |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.
Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz.

# 7.8.1C

# 7.8.1D Wide band intermodulation for ProSe

## 7.8.1D.0 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Table 7.8.1D.0-1, Table 7.8.1D.0-2, and Table 7.8.1D.0-3 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1D.0-1: Wide band intermodulation parameters for ProSe Direct Discovery**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_{offset}$ | dB | | | 10.9 | 13.9 | 15.7 | 16.9 |

**Table 7.8.1D.0-2: Wide band intermodulation for ProSe Direct Communication**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_{offset}$ | dB | | | 0 | 0 | 0 | 0 |

**Table 7.8.1D.0-3: Wide band intermodulation for ProSe**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below+ $P_{offset}$ | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 | | | |
| $F_{Interferer\ 1}$ (Offset) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 | | | |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2.<br>NOTE 2: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, 7.3.3.-1B and 7.3.3-1C, $P_{interferer1}$ and $P_{interferer2}$ powers defined in Table 7.8.1D.0-3 are increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.1-1A, 7.3.3.-1B and 7.3.3-1C.

The normative reference for this requirement is TS 36.101 [2] clause 7.8.1D.

## 7.8.1D.1 Wide band intermodulation for ProSe Direct Discovery

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Use of OCNG for Downlink has not been considered and is still FFS.
- Message exceptions content needs further investigation (some values still TBD).
- Test time is FFS.

### 7.8.1D.1.1 Test Purpose

The wide band intermodulation requirement is defined following the same principles using modulated E-UTRA carrier and CW signal as interferer.

### 7.8.1D.1.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Discovery, but not ProSe Direct Communication.

### 7.8.1D.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.8.1D.0.

### 7.8.1D.1.4 Test Description

#### 7.8.1D.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA ProSe bands specified in table 5.4.2D.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.8.1D.1.4.1-1. The details of the downlink, uplink and sidelink reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.6.

**Table 7.8.1D.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range(Note 4) | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz, Highest | | | | | |
| | **Downlink Configuration (Note 2)** | | **Uplink Configuration (Note 2)** | | **Sidelink Configuration (Reception) (Note 3)** | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Mod'n | RB allocation |
| 5MHz | QPSK | 8 | QPSK | 8 | QPSK | 2 |
| 10MHz | QPSK | 16 | QPSK | 16 | QPSK | 2 |
| 15MHz | QPSK | 25 | QPSK | 25 | QPSK | 2 |
| 20MHz | QPSK | 30 | QPSK | 30 | QPSK | 2 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA ProSe and Operating band, according to the applicability specified respectively in Table 5.4.2D.1-1 and Table 5.4.2.1-1.<br>Note 2: After DRX configuration, DL-RMC (PDSCH) and DCI-0 for scheduling UL-RMC (PUSCH) are applied only in the DRX On subframes.<br>Note 3: The RB start for the transmission of Sidelink RMC is RB#0.<br>Note 4: Sidelink uses the frequencies defined for Uplink. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.72.
2. The parameter settings for the cell are set up according to TS 36.508 [7] clause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.6.1D.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents exceptions are defined in clause 7.6.1D.1.4.3.

7. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is activated.

#### 7.8.1D.1.4.2 Test Procedure

1. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions (only those marked with "…Step 1…" ) are defined in clause 7.8.1D.1.4.3.
2. The UE shall transmit RRCConnectionReconfigurationComplete message.
3. Initialise the variables Ptot and Pok as 0.
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 7.8.1D.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 7.8D.1.4.1-1. When the UE has no payload data to send, it transmits uplink MAC padding bits on the UL RMC.
6. SS transmits PSDCH to transmit the SL RMC according to Table 7.8.1D.1.4.1-1. Set the Sidelink signal level to the appropriate value defined in Table 7.8.1D.1.5-2.
7. Set the Interfering signal levels to the values as defined in Table 7.8.1D.1.5-2 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.
8. SS shall send SL Discovery Packets (MAC padding bits) on the SL RMC for the test time [FFS]. SS stores the number of the transmitted Discovery Packets in the current test iteration in the variable Ptot.
10. SS shall send (on the available PDSCH) a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER REQUEST" message and wait for the UE to respond (on the available PUSCH) with a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER RESPONSE".
11. SS calculates the variable Pok as (current counter value - counter value at last test iteration).
12. SS shall compute the throughput as following:

    TP = Pok / Ptot * 100%

13. Repeat steps from 6 to 12, using an interfering signal above the wanted signal at step 7.

#### 7.8.1D.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

- Table A.7.1.1-1 for FDD
- Table A.7.1.2-1 for TDD

**Table 7.8.1D.1.4.3-1: ACTIVATE TEST MODE: Wide band Intermodulation for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 7.8.1D.1.4.3-2: CLOSE UE TEST LOOP: Wide band Intermodulation for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 7.8.1D.1.4.3-3: MAC-MainConfig-RBC: Wide band Intermodulation for ProSe Direct Discovery (applicable only for Step 1 of Test procedure)**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | TBD | | |
| periodicBSR-Timer | TBD | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | TBD | | |
| } | | | |

## 7.8.1D.1.5 Test Requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Tables 7.8.1D.1.5-1 and 7.8.1D.1.5-2.

**Table 7.8.1D.1.5-1: Wide band intermodulation parameters for ProSe Direct Discovery**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_{offset}$ | dB | | | 10.9 | 13.9 | 15.7 | 16.9 |

**Table 7.8.1D.1.5-2: Wide band intermodulation for ProSe**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_ProSe}$ + channel bandwidth specific value below+ $P_{offset}$ | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 | | | |
| $F_{Interferer\ 1}$ (Offset) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 | | | |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |
| NOTE 1: Reference measurement channel is specified in Annex A.6.2<br>NOTE 2: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211 | | | | | | | |

For the UE which supports inter band CA configuration in Table 7.3.3-1A, 7.3.3.-1B and 7.3.3-1C, $P_{interferer1}$ and $P_{interferer2}$ powers defined in Table 7.8.1D.0-3 are increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.1-1A, 7.3.3.-1B and 7.3.3-1C.

### 7.8.1D.2 Wide band intermodulation for ProSe Direct Communication

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Test description is TBD

#### 7.8.1D.2.1 Test Purpose

Same test purpose as in clause 7.8.1D.1.1.

#### 7.8.1D.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward which support ProSe Direct Communication.

#### 7.8.1D.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.8.1D.0.

#### 7.8.1D.2.4 Test Description

TBD

#### 7.8.1D.2.5 Test Requirement

Same test requirement as in clause 7.6.1D.1.5 with the following exceptions:

- Instead of Table 7.8.1D.1.5-1 → use Table 7.8.1D.2.5-1.

**Table 7.8.1D.2.5-1: Wide band intermodulation for ProSe Direct Communication**

| Rx parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| $P_{offset}$ | dB | | | 0 | 0 | 0 | 0 |

## 7.8.1E Wide band Intermodulation for UE category 0

### 7.8.1E.1 Test purpose

Same test purpose as in clause 7.8.1.1.

### 7.8.1E.2 Test applicability

This test applies to all types of E-UTRA UE release 12 and forward of UE category 0.

### 7.8.1E.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 7.8.1.3.

### 7.8.1E.4 Test description

#### 7.8.1E.4.1 Initial condition

Same initial conditions as in clause 7.8.1.4.1 with the following exceptions:

- Instead of Table 7.8.1.4.1-1 → use Table 7.8.1E.4.1-1.
- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.6 using only main UE Tx/Rx antenna.

**Table 7.8.1E.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD and HD-FDD** | **TDD** | | **FDD and HD-FDD** | **TDD** |
| 1.4MHz | QPSK | 6 | 6 | QPSK | 6 | 6 |
| 3MHz | QPSK | 14 | 14 | QPSK | 15 | 15 |
| 5MHz | QPSK | 14 | 14 | QPSK | 25 | 25 |
| 5MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 10MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 10MHz | QPSK | 14 | N/A | QPSK | 25 | N/A |
| 10MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 15MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 15MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| 20MHz | QPSK | 14 | 14 | QPSK | 36 | 36 |
| 20MHz | QPSK | 14 | N/A | QPSK | 20 | N/A |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | |
| Note 2: Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3E.3-3 is tested per Test Channel Bandwidth. The allocation shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.4.2-1). | | | | | | |
| Note 3: For the DL signal one sided dynamic OCNG Pattern OP.1 FDD/TDD is used. | | | | | | |
| Note 4: Downlink RB position shall be RBstart = 0. | | | | | | |

### 7.8.1E.4.2 Test procedure

Same test procedure as in clause 7.8.1.4.2

### 7.8.1E.4.3 Message contents

Same message contents as in clause 7.8.1.4.3

## 7.8.1E.5 Test requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1E.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1E.5-1: Test parameters for Wide band intermodulation**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |

| | | | | |
|---|---|---|---|---|
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 |
| $F_{Interferer\ 1}$ (Offset) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | |
| Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.<br>Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.<br>Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz | | | | |

# 7.8.1EA Wide band Intermodulation for UE category M1

## 7.8.1EA.1 Test purpose

Intermodulation response tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

## 7.8.1EA.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category M1.

## 7.8.1EA.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.8.1EA.3-1 for the specified wanted signal mean power in the presence of two interfering signals. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.8.1EA.3-1: Wide band intermodulation for category M1**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |

| | | | | |
|---|---|---|---|---|
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 |
| $F_{Interferer\ 1}$ (Offset) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in clause 6.2.5EA.
Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz.
Note 4: For DL category M1 UE, the reference sensitivity for category M1 in table 7.3EA-1 and 7.3EA-2 should be used as REFSENS for the power in Transmission Bandwidth Configuration.
Note 5: For DL category M1 UE, the parameters for the applicable channel bandwidth apply, and BW refers to the corresponding channel bandwidth.

The normative reference for this requirement is TS 36.101 [2] clause 7.8.1.

## 7.8.1EA.4 Test description

### 7.8.1EA.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.8.1EA.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2

**Table 7.8.1EA.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Mid range | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | | |
| | | FDD | TDD | | FDD and HD-FDD | TDD | Narrowband index (Note 1) |
| 5MHz | QPSK | 4 | 4 | QPSK | 6 | 6 | 0 |

Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4.
Note 2: Downlink RB position shall be $RB_{start}$ = 0 within the narrowband.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.6 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.8.1EA.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 7.8.1EA.4.3.

### 7.8.1EA.4.2 Test procedure

1. SS transmits PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 7.8.1EA.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via MPDCCH DCI format 6-0A for C_RNTI to schedule the UL RMC according to Table 7.8.1EA.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the downlink signal level according to the value as defined in Table 7.8.1EA.5-1. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.8.1EA.5-1 for carrier frequency $f \leq 3.0$GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz $< f \leq$ 4.2GHz, for at least the duration of the throughput measurement.

4. Set the Interfering signal levels to the values as defined in Table 7.8.1EA.5-1 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 4.

### 7.8.1EA.4.3 Message contents

Same message contents as in clause 7.8.1.4.3

## 7.8.1EA.5 Test requirements

The throughput shall be $\geq$ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1EA.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1EA.5-1: Test parameters for Wide band intermodulation for category M1**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |

| | | | | |
|---|---|---|---|---|
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 |
| $F_{Interferer\ 1}$ (Offset) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in clause 6.2.5EA.
Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz
Note 4: For DL category M1 UE, the reference sensitivity for category M1 in table 7.3EA-1 and 7.3EA-2 should be used as REFSENS for the power in Transmission Bandwidth Configuration.
Note 5: For DL category M1 UE, the parameters for the applicable channel bandwidth apply, and BW refers to the corresponding channel bandwidth.

## 7.8.1EB Wide band Intermodulation for UE category 1bis

Editor's note

- Test case incomplete with Annex F.3.3 needing update. TT shall be same as legacy test case.

### 7.8.1EB.1 Test purpose

Same test purpose as in clause 7.8.1.1.

### 7.8.1EB.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

### 7.8.1EB.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 7.8.1.3.

### 7.8.1EB.4 Test description

#### 7.8.1EB.4.1 Initial condition

Same initial conditions as in clause 7.8.1.4.1 with the following exceptions:

Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.6 using only main UE Tx/Rx antenna.

#### 7.8.1EB.4.2 Test procedure

Same test procedure as in clause 7.8.1.4.2

#### 7.8.1EB.4.3 Message contents

Same message contents as in clause 7.8.1.4.3

### 7.8.1EB.5 Test requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1EB.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1EB.5-1: Test parameters for Wide band intermodulation**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 | | | |
| $F_{Interferer\ 1}$ (Offset) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 | | | |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ with $P_{CMAX_L}$ as defined in clause 6.2.5.
Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz
Note 4: The reference sensitivity for category 1bis in table 7.3EB-1 should be used as REFSENS for the power in Transmission Bandwidth Configuration.

# 7.8.1EC Wide band intermodulation for UE category M2

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Downlink RB allocation is TBD
- The test applicability needs to be added to TS36.521-2

## 7.8.1EC.1 Test purpose

Same as in clause 7.8.1EA.1

## 7.8.1EC.2 Test applicability

This test applies to all types of E-UTRA UE release 14 and forward of category M2.

## 7.8.1EC.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.8.1EC.3-1 for the specified wanted signal mean power in the presence of two interfering signals. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

**Table 7.8.1EC.3-1: Wide band intermodulation for category M1**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + channel bandwidth specific value below | | | | | |
| | | 12 | 8 | 6 | 6 | 7 | 9 |

| | | | | |
|---|---|---|---|---|
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | |
| $BW_{Interferer\ 2}$ | | 1.4 | 3 | 5 |
| $F_{Interferer\ 1}$ (Offset) | MHz | -BW/2 –2.1 / +BW/2+ 2.1 | -BW/2 –4.5 / +BW/2 + 4.5 | -BW/2 – 7.5 / +BW/2 + 7.5 |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | |

Note 1: The transmitter shall be set to 4dB below $P_{CMAX_L}$ at the minimum uplink configuration specified in Table 7.3EA-3 with $P_{CMAX_L}$ as defined in clause 6.2.5EA.
Note 2: The reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
Note 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz.
Note 4: For DL category M1 and M2 UE, the reference sensitivity for category M1 in table 7.3EA-1 and 7.3EA-2 and category M2 in Table 7.3EC-1 should be used as REFSENS for the power in Transmission Bandwidth Configuration.
Note 5: For DL category M1 and M2 UE, the parameters for the applicable channel bandwidth apply, and BW refers to the corresponding channel bandwidth.

The normative reference for this requirement is TS 36.101 [2] clause 7.8.1.

## 7.8.1EC.4 Test description

### 7.8.1EC.4.1 Initial conditions

Same as in clause 7.8.1EA.4.1 with the following exceptions:

- Instead of Table 7.8.1EA.4.1-1 → use Table 7.8.1EC.4.1-1
- Instead of CAT M1 → use CAT M2

**Table 7.8.1EC.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] clause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] clause 4.3.1 | Mid range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] clause 4.3. | 1.4, 3MHz, 5MHz | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | |
| | | FDD and HD-FDD | TDD | | FDD and HD-FDD | TDD |
| 1.4MHz | QPSK | TBD | TBD | QPSK | 6 | 6 |
| 3MHz | QPSK | TBD | TBD | QPSK | 15 | 15 |
| 5MHz | QPSK | TBD | TBD | QPSK | 24 | 24 |

Note 1: Downlink RB position shall be $RB_{start}$ = 0 within the narrowband.
Note 2: Use narrowband index (TS36.211, 5.2.4) 0 when interferer is below carrier, and max narrowband index when interferer is above carrier.

### 7.8.1EC.4.2 Test procedure

Same as in clause 7.8.1EA.4.2 with the following exceptions:

- Instead of Table 7.8.1EA.4.1-1 → use Table 7.8.1EC.4.1-1

### 7.8.1EC.4.3 Message contents

Same message contents as in clause7.8.1EA.4.3.

### 7.8.1EC.5 Test requirement

Same as in clause 7.8.1EA.5.

## 7.8.1F Wide band Intermodulation for category NB1 and NB2

### 7.8.1F.1 Test purpose

Intermodulation response tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

### 7.8.1F.2 Test applicability

This test case applies to all types of UE release 13 and forward of category NB1.

This test case applies to all types of UE release 14 and forward of category NB2.

### 7.8.1F.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in Annex A.3.2 with parameters specified in Table 7.8.1F.3-1 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1F.3-1: Wide band intermodulation for category NB1 and NB2**

| Parameters for wideband intermodulation | |
|---|---|
| Category NB1 or NB2 Signal power | REFSENS + 12 dB |
| CW interferer signal power | - 46 dBm |
| 1.4 MHz E-UTRA interferer signal power | - 46 dBm |
| CW interferer offset | ± 2.2 MHz |
| 1.4 MHz E-UTRA interferer | ± 4.4 MHz |

The normative reference for this requirement is TS 36.101 [2] clause 7.8.1F.

### 7.8.1F.4 Test description

#### 7.8.1F.4.1 Initial condition

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters, and are shown in table 7.8.1F.4.1-1. The details of the downlink reference measurement channels (RMCs) are specified in Annex A.3. Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

**Table 7.8.1F.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | |
|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 8.1.1 | | | NC | | |
| Test Frequencies as specified in TS36.508 [7] clause 8.1.3.1 | | | Frequency ranges defined in Annex K.1.1 | | |
| **Configuration ID** | **Downlink Configuration** | | **Uplink Configuration** | | |
| | Modulation | Subcarriers | Modulation | $N_{tones}$ | Subcarrier spacing |
| 1 | QPSK | 12 | BPSK | 1@0 | 15 kHz |

1. Connect the SS to the UE antenna connector as shown in TS 36.508 [7] Annex A, Figure A.6 using only the main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.2, and NPUSCH Format 2 is used to carry ACK/NACK on the uplink.
4. The DL Reference Measurement channel is set according to Table 7.8.1F.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 7.8.1F.4.3.

### 7.8.1F.4.2 Test procedure

1. SS transmits NPDSCH via NPDCCH DCI format N1 for C_RNTI to transmit the DL RMC according to Table 7.8.1F.4.1-1. The SS sends downlink MAC padding bits on the DL RMC. The UE will send HARQ feedback based on information contained in DCI format N1.
2. Set the Downlink signal level according to the Table 7.8.1F.5-1.
3. Set the Interfering signal levels to the values as defined in Table 7.8.1F.5-1 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.
5. Repeat steps from 2 to 4, using an interfering signal above the wanted signal at step 3.

### 7.8.1F.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 8.1.6

## 7.8.1F.5 Test requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1F.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1F.5-1: Test parameters for Wide band intermodulation for category NB1 and NB2**

| Parameters for wideband intermodulation | |
|---|---|
| Category NB1 or NB2 Signal power | REFSENS + 12 dB |
| CW interferer signal power | - 46 dBm |
| 1.4 MHz E-UTRA interferer signal power | - 46 dBm |
| CW interferer offset [MHz] | -BW/2 – 2.1<br>/<br>+BW/2 + 2.1 |
| 1.4 MHz E-UTRA interferer offset [MHz] | 2*CW interferer offset |

# 7.8.1G Wide band Intermodulation for V2X Communication

## 7.8.1G.1 Wide band Intermodulation for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 7.8.1G.1.1 Test Purpose

Intermodulation response for V2X tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

### 7.8.1G.1.2 Test Applicability

This test applies to all types of UE that support V2X Sidelink Communication and Band 47.

### 7.8.1G.1.3 Minimum Conformance Requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Table 7.8.1G.1.3-1 for the specified wanted signal mean power in the presence of two interfering signals

**Table 7.8.1G.1.3-1: Wide band intermodulation**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | | | | 10 | | 10 |
| $F_{Interferer\ 1}$ (Offset) | MHz | | | | -BW/2 – 15 / +BW/2 + 15 | | -BW/2 – 15 / +BW/2 + 15 |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |
| NOTE 1: Reference measurement channel is specified in Annex A.8.2.<br>NOTE 2: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.8.1G.

### 7.8.1G.1.4 Test Description

#### 7.8.1G.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.8.1G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 7.8.1G.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | [48] |
| 20MHz | QPSK | [96] |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.89.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 6.8.2. Message content exceptions are defined in clause 7.8.1G.1.4.3.

3. The V2X reference measurement channel is set according to Table 7.8.1G.1.4.1-1.

3a. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 5A-V2X in Receive Mode according to TS 36.508 [7] clause 4.5.9.

6. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 7.8.1G.1.4.2 Test Procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.

2. Set the Downlink signal level to the value as defined in Table 7.8.1G.1.5-1.

3. Set the Interfering signal levels to the values as defined in Table 7.8.1G.1.5-1 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

5. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 3.

#### 7.8.1G.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 7.8.1G.1.5 Test Requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1G.1.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1G.1.5-1: Wide band intermodulation**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | | | | 10 | | 10 |
| $F_{Interferer\ 1}$ (Offset) | MHz | | | | -BW/2 – 15 / +BW/2 + 15 | | -BW/2 – 15 / +BW/2 + 15 |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |
| NOTE 1: Reference measurement channel is specified in Annex A.8.2.<br>NOTE 2: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

## 7.8.1G.2 Wide band Intermodulation for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Test tolerance is TBD.
- Connection diagram is TBD.

### 7.8.1G.2.1 Test Purpose

Same as in clause 7.8.1G.1.

### 7.8.1G.2.2 Test Applicability

This test applies to all types of E-UTRA UE release 14 and forward that support V2X Communication.

### 7.8.1G.2.3 Minimum Conformance Requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Table 7.8.1G.2.3-1 for the specified wanted signal mean power in the presence of two interfering signals

**Table 7.8.1G.2.3-1: Wide band intermodulation**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | | | | 10 | | 10 |
| $F_{Interferer\ 1}$ (Offset) | MHz | | | | -BW/2 – 15 / +BW/2 + 15 | | -BW/2 – 15 / +BW/2 + 15 |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |
| NOTE 1: Reference measurement channel is specified in Annex A.8.2.<br>NOTE 2: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA downlink reception for inter-band E-UTRA V2X / E-UTRA bands specified in Table 5.2G-2, the requirements in subclause 7.8.1G.2.3 apply for the E-UTRA V2X sidelink reception and the requirements in subclause 7.8.1.3 apply for the E-UTRA downlink reception while all downlink carriers are active.

The normative reference for this requirement is TS 36.101 [2] clause 7.8.1G.

## 7.8.1G.2.4 Test Description

### 7.8.1G.2.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-2. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.8.1G.2.4.1-1. The details of the uplink, downlink and V2X reference measurement channels (RMCs) are specified in Annexes A.2, A.3 and A.8.3 respectively.

**Table 7.8.1G.2.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, 5MHz, Highest for uplink<br>Lowest, Highest for V2X | | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | | |
| | **Downlink** | | **Uplink Configuration** | | **V2X Configuration** | | |
| Ch BW | Mod'n | RB allocation | Mod'n | RB allocation | Ch BW | Mod'n | RB allocation |
| 1.4 MHz | QPSK | 1 | QPSK | 1 | 10 MHz | QPSK | [48] |
| 1.4 MHz | QPSK | 5 | QPSK | 5 | 20 MHz | QPSK | [96] |
| 3 MHz | QPSK | 1 | QPSK | 1 | | | |
| 3 MHz | QPSK | 4 | QPSK | 4 | | | |
| 5 MHz | QPSK | 1 | QPSK | 1 | | | |
| 5 MHz | QPSK | 8 | QPSK | 8 | | | |
| 10 MHz | QPSK | 1 | QPSK | 1 | | | |
| 10 MHz | QPSK | 12 | QPSK | 12 | | | |
| 15 MHz | QPSK | 1 | QPSK | 1 | | | |
| 15 MHz | QPSK | 16 | QPSK | 16 | | | |
| 20 MHz | QPSK | 1 | QPSK | 1 | | | |
| 20 MHz | QPSK | 18 | QPSK | 18 | | | |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure [TBD].
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3. Message content exceptions are defined in clause 7.8.1G.2.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and V2X Reference Measurement Channels are set according to Table 7.8.1G.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-V2X according to TS 36.508 [7] clause 5.2A.2C. Message content exceptions are defined in clause 7.6.2G.2.4.3.

### 7.8.1G.2.4.2 Test Procedure

1. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 7.6.2G.2.4.1-1 on E-UTRA Band. The SS sends downlink MAC padding bits on the DL RMC.
2. SS simultaneously sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC and V2X scheduling information via PDCCH DCI format 5A for SL_V_RNTI to schedule the V2X RMC according to Table 7.8.1G.2.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL and V2X RMCs.
3. Set the Downlink signal level to the value as defined in Table 7.8.1G.2.5-1.
4. Set the Interfering signal levels to the values as defined in Table 7.8.1G.2.5-1 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.
5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.
6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 3.

### 7.8.1G.2.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 7.8.1G.2.5 Test Requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1G.2.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1G.2.5-1: Wide band intermodulation**

| Rx Parameter | Units | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Power in Transmission Bandwidth Configuration | dBm | $P_{REFSENS_V2X}$ + channel bandwidth specific value below | | | | | |
| | | | | | 6 | | 9 |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | | |
| $BW_{Interferer\ 2}$ | | | | | 10 | | 10 |
| $F_{Interferer\ 1}$ (Offset) | MHz | | | | -BW/2 – 15 / +BW/2 + 15 | | -BW/2 – 15 / +BW/2 + 15 |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | | |
| NOTE 1: Reference measurement channel is specified in Annex A.8.2.<br>NOTE 2: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211. | | | | | | | |

## 7.8.1G.3 Wide band Intermodulation for V2X Communication / Intra-band contiguous multi-carrier operation

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Test tolerance is TBD.

### 7.8.1G.3.1 Test Purpose

Same as in clause 7.8.1G.1.

### 7.8.1G.3.2 Test Applicability

This test applies to all types of UE that support Intra-band contiguous multi-carrier operation V2X Sidelink Communication and Band 47.

### 7.8.1G.3.3 Minimum Conformance Requirements

For intra-band contiguous multi-carrier operation, the V2X UE throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.8.2 with parameters specified in Table 7.8.1G.3.3-1 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1G.3.3-1: Wide band intermodulation for intra-band contiguous multi-carrier for V2X UE**

| Rx parameter | Units | V2X Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| $P_w$ in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + V2X Bandwidth Class specific value below | | | | |
| | | 9 | | | | |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | |
| $BW_{Interferer\ 2}$ | MHz | 10 | | | | |
| $F_{Interferer\ 1}$ (Offset) | MHz | $-F_{offset}$-15 / + $F_{offset}$+15 | | | | |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | |
| NOTE 1: The requirement is applied for 2 carrier intra-concurrent receptions when 2 carrier transmission are activated at the same time | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.8.1G.

## 7.8.1G.3.4 Test Description

### 7.8.1G.3.4.1 Initial Conditions

Same initial conditions as in clause 7.8.1G.1.4.1 with the following exceptions:

- Instead of Table 7.8.1G.1.4.1-1 → use Table 7.8.1G.3.4.1-1.

The details of the GNSS configuration are specified in TS 36.508 [7] subclause 4.11.

**Table 7.8.1G.3.4.1-1: Test Configuration Table**

| Initial Conditions | | | |
|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | | Lowest $N_{RB_agg}$, Highest $N_{RB_agg}$ | |
| **Test Parameters for Channel Bandwidths** | | | |
| **V2X MCC Configuration** | | **V2X PSSCH Allocation** | |
| **CC1 $N_{RB}$** | **CC2 $N_{RB}$** | **CC1 & CC2 Mod** | **CC1 and CC2 RB Allocation** |
| 10MHz | 10MHz | QPSK | [48+48] |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.92d.

2. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

3. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)

4. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 7.8.1G.3.4.2 Test Procedure

1. The UE starts to perform the V2X sidelink communication according to SL-V2X-Preconfiguration. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the V2X RMC.

2. Set the Downlink signal level to the value as defined in Table 7.8.1G.3.5-1.
3. Set the Interfering signal levels to the values as defined in Table 7.8.1G.3.5-1 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D of the present document.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.
5. Repeat steps from 2 to 4, using an interfering signal above the wanted signal at step 2.

#### 7.8.1G.3.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

### 7.8.1G.3.5 Test Requirement

For intra-band contiguous multi-carrier operation, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1G.3.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

**Table 7.8.1G.3.5-1: Wide band intermodulation for intra-band contiguous multi-carrier for V2X UE**

| Rx parameter | Units | V2X Bandwidth Class | | | | |
|---|---|---|---|---|---|---|
| | | B | C | D | E | F |
| $P_w$ in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + V2X Bandwidth Class specific value below | | | | |
| | | 9 | | | | |
| $P_{Interferer\ 1}$ (CW) | dBm | -46 | | | | |
| $P_{Interferer\ 2}$ (Modulated) | dBm | -46 | | | | |
| $BW_{Interferer\ 2}$ | MHz | 10 | | | | |
| $F_{Interferer\ 1}$ (Offset) | MHz | $-F_{offset}$-15 / + $F_{offset}$+15 | | | | |
| $F_{Interferer\ 2}$ (Offset) | MHz | $2*F_{Interferer\ 1}$ | | | | |
| NOTE 1: The requirement is applied for 2 carrier intra-concurrent receptions when 2 carrier transmission are activated at the same time | | | | | | |

## 7.8.2 Void

# 7.9 Spurious emissions

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

## 7.9.1 Test Purpose

Test verifies the UE's spurious emissions meet the requirements described in clause 7.9.3.

Excess spurious emissions increase the interference to other systems.

## 7.9.2 Test Applicability

This test applies to all types of E-UTRA UE release 8 and forward.

## 7.9.3 Minimum Conformance Requirements

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.9.3-1

**Table 7.9.3-1: General receiver spurious emission requirements**

| Frequency Band | Measurement Bandwidth | Maximum level | Note |
|---|---|---|---|
| 30MHz ≤ f < 1GHz | 100 kHz | -57 dBm | |
| 1GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm | |
| 12.75 GHz ≤ f ≤ 5th harmonic of the upper frequency edge of the DL operating band in GHz | 1 MHz | -47 dBm | Note 1 |
| Note 1: Applies only for Band 22, Band 42, Band 43 and Band 48.<br>Note 2: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.9.1.

## 7.9.4 Test Description

### 7.9.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.9.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.3 and A.2 respectively.

**Table 7.9.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 3MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 5MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 10MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 15MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 20MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band. The applicable channel bandwidths are specified in Table 7.3.3-2. | | | | | | |

1. Connect a spectrum analyzer (or other suitable test equipment) to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.8.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1.
4. The DL Reference Measurement channels are set according to Table 7.9.4.1-1.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.9.4.3.

### 7.9.4.2 Test Procedure

1. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission.

2. Repeat step 1 for all E-UTRA Rx antennas of the UE.

### 7.9.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 7.9.5 Test Requirement

The measured spurious emissions derived in step 1), shall not exceed the maximum level specified in Table 7.9.5-1.

**Table 7.9.5-1: General receiver spurious emission requirements**

| Frequency Band | Measurement Bandwidth | Maximum level | Note |
|---|---|---|---|
| 30MHz ≤ f < 1GHz | 100 kHz | -57 dBm | |
| 1GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm | |
| 12.75 GHz ≤ f ≤ 5th harmonic of the upper frequency edge of the DL operating band in GHz | 1 MHz | -47 dBm | Note 1 |
| Note 1: Applies only for Band 22, Band 42, Band 43 and Band 48.<br>Note 2: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1. | | | |

# 7.9_1 Spurious emissions with 4 Rx antenna ports

## 7.9_1.1 Test Purpose

Test verifies the UE's spurious emissions meet the requirements described in clause 7.9_1.3.

Excess spurious emissions increase the interference to other systems.

## 7.9_1.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that supports 4 Rx antenna ports.

## 7.9_1.3 Minimum Conformance Requirements

Same minimum conformance requirements as in clause 7.9.3.

## 7.9_1.4 Test Description

### 7.9_1.4.1 Initial Conditions

Same as in clause 7.9.4.1 with following exceptions:

- Instead of Table 7.9.4.1-1→ use Table 7.9_1.4.1-1.

- Instead of Figure A.8→ use Figure A.83 configuration Table.

| Initial Conditions | | |
|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **Downlink Configuration** | **Uplink Configuration** |

- Instead of clause 7.9.4.3→ use clause 7.9_1.4.3.

| **Table 7.9_1.4.1-1: Test ConfiCh BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
|---|---|---|---|---|---|---|
| | | **FDD** | **TDD** | | **FDD** | **TDD** |
| 1.4MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 3MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 5MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 10MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 15MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 20MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band. The applicable channel bandwidths are specified in Table 7.3.3-2. | | | | | | |

### 7.9_1.4.2 Test Procedure

Same as in clause 7.9.4.2.

### 7.9_1.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 7.9_1.5 Test Requirement

The measured spurious emissions derived in step 1), shall not exceed the maximum level specified in Table 7.9_1.5-1.

**Table 7.9_1.5-1: General receiver spurious emission requirements**

| Frequency Band | Measurement Bandwidth | Maximum level | Note |
|---|---|---|---|
| 30MHz ≤ f < 1GHz | 100 kHz | -57 dBm | |
| 1GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm | |
| 12.75 GHz ≤ f ≤ 5th harmonic of the upper frequency edge of the DL operating band in GHz | 1 MHz | -47 dBm | Note 1 |
| Note 1: Applies only for Band 22, Band 42 and Band 43.<br>Note 2: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1. | | | |

# 7.9A Spurious emissions for CA

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

## 7.9A.1 Test Purpose

Test verifies the UE's spurious emissions meet the requirements described in clause 7.9A.3.

Excess spurious emissions increase the interference to other systems.

## 7.9A.2 Test Applicability

This test applies to all types of E-UTRA UE release 10 and forward that support inter-band DL CA with a DL-only band.

## 7.9A.3 Minimum Conformance Requirements

For E-UTRA CA configurations including an operating band without uplink band (as noted in Table 5.2-1), the power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.9A.3-1.

**Table 7.9A.3-1: General receiver spurious emission requirements**

| Frequency band | Measurement bandwidth | Maximum level | Note |
|---|---|---|---|
| 30MHz ≤ f < 1GHz | 100 kHz | -57 dBm | |
| 1GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm | |
| 12.75 GHz ≤ f ≤ 26 GHz | 1 MHz | -47 dBm | 3 |
| NOTE 1: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1.<br>NOTE 2: The requirements apply when the UE is configured for carrier aggregation but is not transmitting.<br>NOTE 3: Applies only for Band 46 | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.9.1A

## 7.9A.4 Test Description

### 7.9A.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA CA bands specified in Table 5.4.2A.1-1 and Table 5.4.2A.1-2. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in Table 7.9A.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

**Table 7.9A.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 for different CA bandwidth classes, and PCC and SCCs are mapped onto physical frequencies according to Table 7.1-2 | A: Low range, Mid range, High range for PCC and SCC | | | | | |
| Test CC Combination setting ($N_{RB_agg}$) as specified in subclause 5.4.2A.1 for the CA Configuration across bandwidth combination sets supported by the UE | Highest $N_{RB_agg}$ for PCC and SCC | | | | | |
| Test Parameters for CA Configurations | | | | | | |
| **CA Configuration / $N_{RB_agg}$** | | **DL Allocation** | | | **UL Allocation** | |
| **PCC $N_{RB}$** | **SCCs $N_{RB}$** | **CC MOD** | **PCC & SCC RB allocation** | | **CC MOD** | **PCC $N_{RB_alloc}$** |
| 50 | 50 | QPSK | 0 | 0 | QPSK | 0 |
| 50 | 75 | QPSK | 0 | 0 | QPSK | 0 |
| 50 | 100 | QPSK | 0 | 0 | QPSK | 0 |
| 75 | 50 | QPSK | 0 | 0 | QPSK | 0 |
| 75 | 100 | QPSK | 0 | 0 | QPSK | 0 |
| 100 | 50 | QPSK | 0 | 0 | QPSK | 0 |
| 100 | 75 | QPSK | 0 | 0 | QPSK | 0 |
| 100 | 100 | QPSK | 0 | 0 | QPSK | 0 |
| Note 1: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.4.2A.1-2. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.8a as appropriate if the UE supports 2 Rx antennas or Figure TBD if the UE supports 4 Rx antennas in the band.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.0.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 7.9A.4.3.

## 7.9A.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.1 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 7.9A.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission. During measurement SS sends no uplink scheduling information to the UE
5. Repeat step 4 for all E-UTRA Rx antennas of the UE.

### 7.9A.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 7.9A.5 Test Requirement

The measured spurious emissions derived in step 4), shall not exceed the maximum level specified in Table 7.9A.5-1

**Table 7.9A.5-1: General receiver spurious emission requirements**

| Frequency band | Measurement bandwidth | Maximum level | Note |
|---|---|---|---|
| 30MHz ≤ f < 1GHz | 100 kHz | -57 dBm | |
| 1GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm | |
| 12.75 GHz ≤ f ≤ 26 GHz | 1 MHz | -47 dBm | 3 |
| NOTE 1: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1.<br>NOTE 2: The requirements apply when the UE is configured for carrier aggregation but is not transmitting.<br>NOTE 3: Applies only for Band 46 | | | |

# 7.9E Spurious emissions for UE category 0

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

## 7.9E.1 Test Purpose

Same test purpose as in clause 7.9.1.

## 7.9E.2 Test Applicability

This test applies to all types of E-UTRA UE release 12 and forward of UE category 0.

## 7.9E.3 Minimum Conformance Requirements

Same minimum conformance requirements as in clause 7.9.3.

## 7.9E.4 Test Description

### 7.9E.4.1 Initial Conditions

Same initial conditions as in clause 7.9.4.1 with the following exceptions:

- Instead of Table 7.9.4.1-1 → use Table 7.9E.4.1-1.
- Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.8 using only main UE Tx/Rx antenna.

**Table 7.9E.4.1-1: Test Configuration Table**

| Initial Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Highest | | | | | |
| **Test Parameters for Channel Bandwidths** | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | |
| **Ch BW** | **Mod'n** | **RB allocation** | | **Mod'n** | **RB allocation** | |
| | | **FDD and HD-FDD** | **TDD** | | **FDD and HD-FDD** | **TDD** |
| 1.4MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 3MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 5MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 10MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 15MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| 20MHz | QPSK | 0 | 0 | QPSK | 0 | 0 |
| Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band. The applicable channel bandwidths are specified in Table 7.3E.3-3. | | | | | | |

### 7.9E.4.2 Test Procedure

Same test procedure as in clause 7.9.4.2

### 7.9E.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 7.9E.5 Test Requirement

The measured spurious emissions derived in step 1), shall not exceed the maximum level specified in Table 7.9E.5-1.

**Table 7.9E.5-1: General receiver spurious emission requirements**

| Frequency Band | Measurement Bandwidth | Maximum level | Note |
|---|---|---|---|
| 30MHz ≤ f < 1GHz | 100 kHz | -57 dBm | |
| 1GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm | |
| 12.75 GHz ≤ f ≤ 5$^{th}$ harmonic of the upper frequency edge of the DL operating band in GHz | 1 MHz | -47 dBm | Note 1 |
| Note 1: Applies only for Band 22, Band 42 and Band 43.<br>Note 2: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1. | | | |

# 7.9EA Spurious emissions for UE category M1

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

## 7.9EA.1 Test Purpose

Test verifies the UE's spurious emissions meet the requirements described in clause 7.9.3.

Excess spurious emissions increase the interference to other systems.

## 7.9EA.2 Test Applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category M1.

# 7.9EA.3 Minimum Conformance Requirements

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.9EA.3-1

**Table 7.9EA.3-1: General receiver spurious emission requirements**

| Frequency Band | Measurement Bandwidth | Maximum level | Note |
|---|---|---|---|
| 30MHz ≤ f < 1GHz | 100 kHz | -57 dBm | |
| 1GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm | |
| 12.75 GHz ≤ f ≤ 5th harmonic of the upper frequency edge of the DL operating band in GHz | 1 MHz | -47 dBm | Note 1 |
| Note 1: Applies only for Band 22, Band 42 and Band 43.<br>Note 2: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.9.1.

# 7.9EA.4 Test Description

## 7.9EA.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in clause 5.2E. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.9EA.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively.

**Table 7.9EA.4.1-1: Test Configuration Table**

| **Initial Conditions** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | | | | | | |
| Test Frequencies as specified in TS36.508 [7] subclause 4.3.1 | Low range, Mid range, High range | | | | | | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | 5MHz | | | | | | |
| **Test Parameters for Channel Bandwidths and Narrowband positions** | | | | | | | |
| | **Downlink Configuration** | | | **Uplink Configuration** | | | |
| Ch BW | Mod'n | RB allocation | | Mod'n | RB allocation | | |
| | | FDD | TDD | | FDD and HD-FDD | TDD | Narrowband index (Note 1) |
| 5MHz | QPSK | 0 | 0 | QPSK | 0 | 0 | 0 |
| Note 1: Denotes where in the channel Bandwidth the narrowband shall be placed. Narrowband and Narrowband index are defined in TS36.211, 5.2.4 | | | | | | | |

1. Connect a spectrum analyzer (or other suitable test equipment) to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.7 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.1.
4. The DL Reference Measurement channels are set according to Table 7.9EA.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 7.9EA.4.3.

### 7.9EA.4.2 Test Procedure

1. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission.

2. Repeat step 1 for all E-UTRA Rx antennas of the UE.

### 7.9EA.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 7.9EA.5 Test Requirement

The measured spurious emissions derived in step 1), shall not exceed the maximum level specified in Table 7.9EA.5-1.

**Table 7.9EA.5-1: General receiver spurious emission requirements**

| Frequency Band | Measurement Bandwidth | Maximum level | Note |
|---|---|---|---|
| 30MHz ≤ f < 1GHz | 100 kHz | -57 dBm | |
| 1GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm | |
| 12.75 GHz ≤ f ≤ 5th harmonic of the upper frequency edge of the DL operating band in GHz | 1 MHz | -47 dBm | Note 1 |
| Note 1: Applies only for Band 22, Band 42 and Band 43.<br>Note 2: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1. | | | |

# 7.9EB Spurious emissions for UE Category 1bis

Editor's note

- Test case incomplete with Annex F.3.3 needing update. TT shall be same as legacy test case.

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

## 7.9EB.1 Test Purpose

Same test purpose as in clause 7.9.1.

## 7.9EB.2 Test Applicability

This test applies to all types of E-UTRA UE release 13 and forward of UE category 1bis.

## 7.9EB.3 Minimum Conformance Requirements

Same minimum conformance requirements as in clause 7.9.3.

## 7.9EB.4 Test Description

### 7.9EB.4.1 Initial Conditions

Same initial conditions as in clause 7.9.4.1 with the following exceptions:

Connect the SS to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A.8 using only main UE Tx/Rx antenna.

### 7.9EB.4.2 Test Procedure

Same test procedure as in clause 7.9.4.2

### 7.9EB.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 7.9EB.5 Test Requirement

The measured spurious emissions derived in step 1), shall not exceed the maximum level specified in Table 7.9EB.5-1.

**Table 7.9EB.5-1: General receiver spurious emission requirements**

| Frequency Band | Measurement Bandwidth | Maximum level | Note |
|---|---|---|---|
| 30MHz ≤ f < 1GHz | 100 kHz | -57 dBm | |
| 1GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm | |
| 12.75 GHz ≤ f ≤ 5th harmonic of the upper frequency edge of the DL operating band in GHz | 1 MHz | -47 dBm | Note 1 |
| Note 1: Applies only for Band 22, Band 42 and Band 43.<br>Note 2: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1. | | | |

# 7.9F Spurious emissions for Category NB1

## 7.9F.1 Test Purpose

Same test purpose as in clause 7.9.1.

## 7.9F.2 Test Applicability

This test applies to all types of E-UTRA UE release 13 and forward that support Category NB1.

## 7.9F.3 Minimum Conformance Requirements

Minimum conformance requirements as in Table 7.9F.3-1.

**Table 7.9F.3-1: Minimum Receiver Spurious Emission Requirements**

| Frequency band | Measurement bandwidth | Maximum level | NOTE |
|---|---|---|---|
| 30MHz ≤ f < 1GHz | 100 kHz | -57 dBm | |
| 1GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm | |
| | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.9.1.

## 7.9F.4 Test Description

### 7.9F.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions and test frequencies based on the subset of E-UTRA operating bands defined for NB-IoT in clause 5.2F. All of these configurations shall be tested with applicable test parameters, and are shown in table 7.9F.4.1-1. The details of the downlink reference measurement channels (RMCs) are specified in Annex A.3.

**Table 7.9F.4.1-1: Test Configuration Table**

| Initial Conditions | | | | |
|---|---|---|---|---|
| Test Environment as specified in TS 36.508 [7] clause 8.1.1 | | | NC | |
| Test Frequencies as specified in TS36.508 [7] clause 8.1.3.1 | | | Frequency ranges defined in Annex K.1.1 | |
| **Configuration ID** | **Downlink Configuration** | | **Uplink Configuration** | |
| | Modulation | $N_{tones}$ | Modulation | $N_{tones}$ |
| 1 | QPSK | 0 | BPSK | 0 |

1. Connect the SS to the UE antenna connector as shown in TS 36.508 [7] Annex A, Figure A.8 using only the main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 8.1.4.3
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.2,
4. The DL Reference Measurement channel is set according to Table 7.9F.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 7.9F.4.3.

### 7.9F.4.2 Test Procedure

1. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission.

### 7.9F.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 8.1.6.

## 7.9F.5 Test Requirement

The measured spurious emissions derived in step 1), shall not exceed the maximum level specified in Table 7.9F.5-1

**Table 7.9F.5-1: General receiver spurious emission requirements**

| Frequency band | Measurement bandwidth | Maximum level | NOTE |
|---|---|---|---|
| 30MHz ≤ f < 1GHz | 100 kHz | -57 dBm | |
| 1GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm | |
| | | | |

# 7.9G Spurious emissions for V2X Communication

## 7.9G.1 Spurious emissions for V2X Communication / Non-concurrent with E-UTRA uplink transmissions

### 7.9G.1.1 Test Purpose

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

### 7.9G.1.2 Test Applicability

This test applies to all types of UE that support V2X Sidelink Communication and Band 47.

## 7.9G.1.3 Minimum Conformance Requirements

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.9G.1.3-1.

**Table 7.9G.1.3-1: General receiver spurious emission requirements**

| Frequency band | Measurement bandwidth | Maximum level | NOTE |
|---|---|---|---|
| 30MHz ≤ f < 1GHz | 100 kHz | -57 dBm | |
| 1GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm | |
| 12.75 GHz ≤ f ≤ 5th harmonic of the upper frequency edge of the DL operating band in GHz | 1 MHz | -47 dBm | 1 |
| 12.75 GHz – 26GHz | 1 MHz | -47dBm | 3 |
| NOTE 1: Applies only for Band 22, Band 42, Band 43 and Band 48<br>NOTE 2: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1.<br>NOTE 3: Applies for Band 47 | | | |

In addition, for a V2X UE operating in Region 1, the power of any spurious emission shall not exceed the levels specified in Table 7.9G.1.3-2.

**Table 7.9G.1.3-2: Additional RX spurious emissions limits in Region 1**

| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
|---|---|---|---|
| 5795 MHz ≤ f < 5815MHz | [-65 dBm] | 1 MHz | |
| NOTE: The additional Rx spurious emission limits, however, are specified in EIRP in Region 1. Furthermore, the requirement varies based on antenna installation. It is FFS how to convert this to conducted requirements. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 7.9.

## 7.9G.1.4 Test Description

### 7.9G.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2G.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.9G.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annex A.8.3 and the GNSS configuration in TS 36.508 [7] subclause 4.11.

**Table 7.9G.1.4.1-1: Test Configuration Table**

| **Initial Conditions** | | |
|---|---|---|
| Test Environment as specified in TS 36.508[7] subclause 4.1 | NC | |
| Test Frequencies as specified in TS 36.508 [7] subclause 4.3.1 | Mid range | |
| Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1 | Lowest, Highest | |
| **Test Parameters for Channel Bandwidths** | | |
| | **V2X Configuration to Transmit** | |
| Ch BW | Modulation | RB allocation |
| 10MHz | QPSK | [48] |
| 20MHz | QPSK | [96] |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.89.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 36.508 [7] subclause 6.8.2. Message content exceptions are defined in clause 7.9G.1.4.3.

3. The V2X reference measurement channel is set according to Table 7.9G.1.4.1-1.

3a. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [7] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 5A-V2X in Transmit Mode according to TS 36.508 [7] clause 4.5.9.

6. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)

7. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 7.9G.1.4.2 Test Procedure

1. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission.

2. Repeat step 1 for all E-UTRA Rx antennas of the UE.

### 7.9G.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6.

## 7.9G.1.5 Test Requirement

The measured spurious emissions derived in step 1), shall not exceed the maximum level specified in Table 7.9G.1.5-1

**Table 7.9G.1.5-1: General receiver spurious emission requirements**

| Frequency band | Measurement bandwidth | Maximum level | NOTE |
|---|---|---|---|
| 30MHz ≤ f < 1GHz | 100 kHz | -57 dBm | |
| 1GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm | |
| 12.75 GHz ≤ f ≤ 5$^{th}$ harmonic of the upper frequency edge of the DL operating band in GHz | 1 MHz | -47 dBm | 1 |
| 12.75 GHz – 26GHz | 1 MHz | -47dBm | 3 |
| NOTE 1: Applies only for Band 22, Band 42, Band 43 and Band 48<br>NOTE 2: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1.<br>NOTE 3: Applies for Band 47 | | | |

In addition, for a V2X UE operating in Region 1, the measured spurious emissions derived in step 1) shall not exceed the levels specified in Table 7.9G.1.5-2.

**Table 7.9G.1.5-2: Additional RX spurious emissions limits in Region 1**

| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
|---|---|---|---|
| 5795 MHz ≤ f < 5815MHz | [-65 dBm] | 1 MHz | |
| NOTE: The additional Rx spurious emission limits, however, are specified in EIRP in Region 1. Furthermore, the requirement varies based on antenna installation. It is FFS how to convert this to conducted requirements. | | | |

# 7.10 Void

# 7.10A Receiver image for CA

TS 36.101 [2] clause 7.10.1A specifies minimum requirements for receiver image for CA but recommends that these requirements do not need to be tested.

# 8 Performance Requirement

## 8.1 General

The performance requirements for the physical channels specified in TS 36.211 [8] clause 6 (for downlink physical channels) shall be as defined in the respective sections below.

The requirements for the UE in this clause are specified for the downlink reference measurement channels specified in Annex A, the propagation conditions specified in Annex B and the downlink physical channels specified in Annex C.

Unless otherwise stated the throughput measurements in clause 8 shall be performed according to the general rules for statistical testing in Annex G clause G.3.

The requirement for a UE that support E-UTRA in downlink shall be tested according to the declared UE PDSCH category and CA capabilities.

The fading of the signals and the AWGN signals applied to each receiver antenna connector shall be uncorrelated. The levels of the test signal applied to each of the antenna connectors shall be as defined in the respective test cases.

The UE performance in this section is considered to be operating band independent. Therefore, the required performance in the respective test cases can be verified in one of the operating bands supported by the UE under test. All the test points supported by the bands of the multiband UE (based on channel bandwidth, DL and UL configuration) need to be tested.

For CA testing, unless otherwise stated, the logical carriers PCC / SCC are mapped on physical frequencies as defined in Table 8.1-1.

**Table 8.1-1: PCC/SCCs frequency mapping**

| CA Configuration | PCC mapping | Notes |
|---|---|---|
| Intra-band CA | CC1 | 1 |
| Inter-band CA (CA_x-y-z-…-n) | Bx (if not supported by the UE, then any one of the supported bands) | 2 |
| Note 1: Notation CCi means PCC on component carrier CCi and SCCs on all remaining component carriers, with frequencies defined in the corresponding intra-band contiguous / non-contiguous CA band in TS 36.508. | | |
| Note 2: Notation Bi means PCC on component Band i and SCCs on all remaining component carriers, with frequencies defined in TS 36.508. | | |
| Note 3: The ordering and numbering of the SCCs does not imply any order in the TC implementation of the SCCs. | | |

### 8.1.1 Receiver antenna capability

The performance requirements are based on UE(s) that utilize one or more antenna receivers.

For all test cases, the SNR is defined as:

$$SNR = \frac{\sum_{j=1}^{N_{RX}} \hat{E}_s^{(j)}}{\sum_{j=1}^{N_{RX}} N_{oc}^{(j)}},$$

where $N_{RX}$ denotes the number of receiver antenna connectors and the superscript receiver antenna connector $j$. The above SNR definition assumes that the REs are not precoded. The SNR definition does not account for any gain which can be associated to the precoding operation. The relative power of physical channels transmitted is defined in Table C.3.2-1. The SNR requirement applies for the UE categories and CA capabilities given for each test.

For enhanced performance requirements type A, the SINR is defined as

$$SINR = \frac{\sum_{j=1}^{N_{RX}} \hat{E}_s^{(j)}}{\sum_{j=1}^{N_{RX}} N_{oc}^{(j)}},$$

where $N_{RX}$ denotes the number of receiver antenna connectors and the superscript receiver antenna connector $j$. The above SINR definition assumes that the REs are not precoded. The SINR definition does not account for any gain which can be associated to the precoding operation. The relative power of physical channels transmitted is defined in Table C.3.2-1. The SINR requirement applies for the UE categories given for each test.

For the performance requirements specified in this clause, it is assumed that $N_{RX}$=2 unless otherwise stated.

**Table 8.1.1-1: Void**

### 8.1.1.1 Simultaneous unicast and MBMS operations

### 8.1.1.2 Dual-antenna receiver capability in idle mode

## 8.1.2 Applicability of requirements

### 8.1.2.1 Applicability of requirements for different channel bandwidths

In Clause 8 the test cases may be defined with different channel bandwidth to verify the same target FRC conditions with the same propagation conditions, correlation matrix and antenna configuration.

Test cases defined for 5MHz channel bandwidth that reference this clause are applicable to UEs that support only Band 31, 72 and/or 73.

### 8.1.2.2 Definition of CA capability

The definition with respect to CA capabilities for 2CCs is given as in Table 8.1.2.2-1. The definition with respect to CA capabilities for 3CCs is given in Table 8.1.2.2-3.

**Table 8.1.2.2-1: Definition of CA capability with 2DL CCs**

| CA Capability | CA Capability Description |
|---|---|
| CA2_C | Intra-band contiguous CA |
| CA2_A2 | Inter-band CA (two bands) |
| CA2_N2 | Intra-band non-contiguous CA (with two sub-blocks) |
| Note 1: CA2_C corresponds to E-UTRA CA configurations and bandwidth combination sets defined in Table 5.4.2A.1-1 for 2 DL CCs. CA2_A2 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in Table 5.4.2A.1-2 for 2 DL CCs. CA2_N2 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in Table 5.4.2A.1-3 for 2 DL CCs. | |

The supported testable aggregated CA bandwidth combinations for 2CCs for each CA capability are listed in Table 8.1.2.2-2.

**Table 8.1.2.2-2: Supported testable aggregated CA bandwidth combinations for different CA capability with 2DL CCs**

| CA Capability | Bandwidth combination for FDD CA | Bandwidth combination for TDD CA | Bandwidth combination for TDD-FDD CA | Bandwidth combination for CA with LAA SCell(s) |
|---|---|---|---|---|
| CA2_C | 5+5MHz,<br>5+10MHz,<br>5+15MHz,<br>10+10MHz,<br>20+20MHz | 20+20MHz,<br>15+20MHz | NA | NA |
| CA2_A2 | 10+10MHz,<br>20+5MHz,<br>10+15MHz,<br>10+20MHz,<br>15+20MHz,<br>20+20MHz | 20+20MHz | 10(FDD)+20(TDD)MHz,<br>15(FDD)+20(TDD)MHz,<br>20(FDD)+20(TDD)MHz | 20(FDD)+20(LAA)MHz,<br>10(FDD)+20(LAA)MHz,<br>15(FDD)+20(LAA)MHz,<br>20(TDD)+20(LAA)MHz |
| CA2_N2 | 5+10MHz,<br>10+10MHz,<br>10+20MHz,<br>20+20MHz | 20+20MHz | NA | NA |
| NOTE 1: This table is only for information and applicability and test rules of CA performance requirements are specified in 8.1.2.3 and 9.1.1.2. | | | | |

**Table 8.1.2.2-3: Definition of CA capability with 3 DL CCs**

| CA Capability | CA Capability Description |
|---|---|
| CA3_C | Intra-band contiguous CA |
| CA3_A2 | Inter-band CA (two bands) |
| CA3_A3 | Inter-band CA (three bands) |
| CA3_N2 | Intra-band non-contiguous CA (with two sub-blocks) |
| Note 1: CA3_C corresponds to E-UTRA CA configurations and bandwidth combination sets defined in Table 5.4.2A.1-1 for 3 DL CCs.<br>CA3_A2 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in Table 5.4.2A.1-2 for 3 DL CCs.<br>CA3_A3 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in and Table 5.4.2A.1-2a for 3 DL CCs.<br>CA3_N2 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in Table 5.4.2A.1-3 for 3 DL CCs. | | |

The supported testable largest aggregated CA bandwidth combinations for 3CCs for each CA capability are listed in Table 8.1.2.2-4.

**Table 8.1.2.2-4: Supported largest aggregated CA bandwidth combinations for different CA capability with 3 CCs**

| CA capability | Bandwidth combination for FDD CA | Bandwidth combination for TDD CA | Bandwidth combination for TDD-FDD CA | Bandwidth combination for CA with LAA SCell(s) |
|---|---|---|---|---|
| CA3_C | NA | 20+20+20MHz | NA | NA |
| CA3_A2 | 5+5+10MHz, 5+10+10MHz 5+5+20MHz, 10+10+10MHz, 5+10+20MHz, 5+15+20MHz, 10+10+20MHz, 10+20+20MHz, 15+20+20MHz, 20+20+20MHz | 15+20+20MHz, 20+20+20MHz | 10(FDD)+20(TDD)+20(TDD)MHz 15(FDD)+20(TDD)+20(TDD)MHz, 20(FDD)+20(TDD)+20(TDD)MHz | 10(FDD)+ 2×20(LAA)MHz, 15(FDD)+ 2×20(LAA)MHz, 20(FDD)+ 2×20(LAA)MHz, 20(TDD)+ 2×20(LAA)MHz |
| CA3_A3 | 10+10+20MHz, 10+15+15MHz, 10+15+20MHz, 10+20+20MHz, 15+15+20MHz, 15+20+20MHz, 20+20+20MHz | NA | 2×20(FDD)+20(TDD)MHz, 20(FDD)+ 2×20(TDD)MHz, 20(FDD)+15(FDD)+20(TDD)MHz, 20(FDD)+10(FDD)+20(TDD)MHz, 2×15(FDD)+20(TDD)MHz | NA |
| CA3_N2 | NA | 20+20+20MHz | NA | NA |
| NOTE 1: This table is only for information and applicability and test rules of CA performance requirements are specified in 8.1.2.3 and 9.1.1.2. | | | | |

**Table 8.1.2.2-5: Definition of CA capability with 4 DL CCs**

| CA Capability | CA Capability Description |
|---|---|
| CA4_C | Intra-band contiguous CA |
| CA4_A2 | Inter-band CA (two bands) |
| CA4_A3 | Inter-band CA (three bands) |
| CA4_A4 | Inter-band CA (four bands) |
| CA4_N2 | Intra-band non-contiguous CA (with two sub-blocks) |
| NOTE 1: CA4_C corresponds to E-UTRA CA configurations and bandwidth combination sets defined in Table 5.4.2A.1-1 for 4 DL CCs. CA4_A2 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in Table 5.4.2A.1-2 for 4 DL CCs. CA4_A3 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in and Table 5.4.2A.1-2a for 4 DL CCs. CA4_A4 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in and Table 5.4.2A.1-2b for 4 DL CCs CA4_N2 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in Table 5.4.2A.1-3 for 4 DL CCs. | |

The supported testable largest aggregated CA bandwidth combinations for 4CCs for each CA capability are listed in Table 8.1.2.2-6.

**Table 8.1.2.2-6: Supported largest aggregated CA bandwidth combinations for different CA capability with 4 CCs**

| CA capability | Bandwidth combination for FDD CA | Bandwidth combination for TDD CA | Bandwidth combination for TDD-FDD CA | Bandwidth combination for CA with LAA SCell(s) |
|---|---|---|---|---|
| CA4_C | NA | 20+20+20+20MHz | NA | NA |
| CA4_A2 | 4x20MHz<br>10+3x20MHz<br>2x10+2x20MHz<br>10+5+2x20MHz<br>2x5+2x20MHz<br>3x10+20MHz<br>4x10MHz | 20+20+20+20MHz<br>15+20+20+20MHz | 20(FDD)+3x20(TDD)MHz<br>2x20(FDD)+2x20(TDD)MHz<br>10(FDD)+3x20(TDD)MHz<br>2x10(FDD)+2x20(TDD)MHz<br>2x10(FDD)+20+15(TDD)MHz | 10(FDD)+ 3×20(LAA)MHz,<br>15(FDD)+ 3×20(LAA)MHz,<br>20(FDD)+ 3×20(LAA)MHz,<br>20(TDD)+ 3×20(LAA)MHz |
| CA4_A3 | 4x20MHz<br>15+3x20MHz<br>10+3x20MHz<br>2x10+2x20MHz<br>5+10+2x20MHz<br>2x5+2x20MHz<br>3x10+20MHz<br>5+2x10+20MHz<br>2x5+10+20MHz | NA | 20(FDD)+3x20(TDD)MHz<br>2×20(FDD)+2×20(TDD)MHz,<br>3x20(FDD)+20(TDD)MHz<br>20(FDD)+15(FDD)+2×20(TDD)MHz,<br>2×15(FDD)+2x20(TDD)MHz<br>10(FDD)+20(FDD)+2x20(TDD)MHz<br>10(FDD)+3x20(TDD)MHz<br>10(FDD)+15(FDD)+2x20(TDD)MHz<br>2x10(FDD)+2x20(TDD)MHz | NA |
| CA4_A4 | 4x20MHz<br>15+3x20MHz<br>10+3x20MHz<br>2x15+2x20MHz<br>10+15+2x20MHz<br>2x10+2x20MHz | NA | 3x20(FDD)+20(TDD)MHz<br>2×20(FDD)+15(FDD)+20(TDD)MHz,<br>2×15(FDD)+20(FDD)+20(TDD)MHz<br>2×20(FDD)+10(FDD)+20(TDD)MHz<br>10(FDD)+20(FDD)+2x20(TDD)MHz<br>10(FDD)+15(FDD)+20(FDD)+20(TDD)MHz | NA |
| CA4_N2 | NA | 20+20+20+20MHz | NA | NA |
| NOTE 1: This table is only for information and applicability and test rules of CA performance requirements are specified in 8.1.2.3 and 9.1.1.2. | | | | |

**Table 8.1.2.2-7: Definition of CA capability with 5 DL CCs**

| CA Capability | CA Capability Description |
|---|---|
| CA5_C | Intra-band contiguous CA |
| CA5_A2 | Inter-band CA (two bands) |
| CA5_A3 | Inter-band CA (three bands) |
| CA5_A4 | Inter-band CA (four bands) |
| CA5_A5 | Inter-band CA (five bands) |
| CA5_N2 | Intra-band non-contiguous CA (with two sub-blocks) |
| NOTE 1: CA5_C corresponds to E-UTRA CA configurations and bandwidth combination sets defined in Table 5.4.2A.1-1 for 5 DL CCs.<br>CA5_A2 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in Table 5.4.2A.1-2 for 5 DL CCs.<br>CA5_A3 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in and Table 5.4.2A.1-2a for 5 DL CCs.<br>CA5_A4 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in and Table 5.4.2A.1-2b for 5 DL CCs<br>CA5_A5 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in and Table 5.4.2A.1-xx for 5 DL CCs<br>CA5_N2 corresponds to E-UTRA CA configurations and bandwidth combination sets defined in Table 5.4.2A.1-3 for 5 DL CCs. | |

The supported testable largest aggregated CA bandwidth combinations for 5CCs for each CA capability are listed in Table 8.1.2.2-8.

**Table 8.1.2.2-8: Supported largest aggregated CA bandwidth combinations for different CA capability with 5 CCs**

| CA capability | Bandwidth combination for FDD CA | Bandwidth combination for TDD CA | Bandwidth combination for TDD-FDD CA | Bandwidth combination for CA with LAA SCell(s) |
|---|---|---|---|---|
| CA5_C | 5×20MHz<br>3x20+2x10MHz<br>20+4x10MHz | 5×20MHz<br>15+4X20MHz | 5×20MHz | NA |
| CA5_A2 | 5×20MHz<br>3x20+2x10MHz<br>20+4x10MHz | 5×20MHz<br>15+4X20MHz | 2x20(FDD)+3x20(TDD)<br>20(FDD)+4x20(TDD)MHz<br>2x10(FDD)+3x20(TDD)MH | 10(FDD)+ 4×20(LAA)MHz,<br>15(FDD)+ 4×20(LAA)MHz,<br>20(FDD)+ 4×20(LAA)MHz,<br>20(TDD)+ 4×20(LAA)MHz |
| CA5_A3 | 5×20MHz<br>10+4x20MHz<br>2x10+3x20MHz<br>5+10+3x20MHz<br>3x10+2x20MHz<br>4x10+20MHz | NA | 3x20(FDD)+2x20(TDD)MHz<br>20(FDD)+4x20(TDD)MHz<br>2x20(FDD)+3x20(TDD)MHz<br>10(FDD)+4x20(TDD)MHz | NA |
| CA5_A4 | 5×20MHz<br>15+4x20MHz<br>10+4x20MHz<br>2x10+3x20MHz<br>3x10+2x20MHz | NA | 3x20(FDD)+2x20(TDD)MHz<br>15+2×20(FDD)+2×20(TDD)MHz<br>10+2×20(FDD)+2×20(TDD)MHz<br>2×15+20(FDD)+2×20(TDD)MHz<br>10+15+20(FDD)+2x20(TDD)MHz<br>10+20(FDD)+3x20MHz | NA |
| CA5_A5 | 5×20MHz | NA | 4x20(FDD)+20(TDD)MHz | NA |
| CA5_N2 | NA | 5×20MHz | NA | NA |
| NOTE 1: This table is only for information and applicability and test rules of CA performance requirements are specified in 8.1.2.3 and 9.1.1.2. | | | | |

For test cases with more than one component carrier, "Fraction of Maximum Throughput" in the performance requirement refers to the ratio of the sum of throughput values of all component carriers to the sum of the nominal maximum throughput values of all component carriers, unless otherwise stated.

## 8.1.2.2A Definition of dual connectivity capability

The definition with respect to dual connectivity capabilities for configurations with 2CCs is given as in Table 8.1.2.2A-1.

**Table 8.1.2.2A-1: Definition of dual connectivity capability with 2DL CCs**

| Dual connectivity Capability | Dual connectivity capability Description |
|---|---|
| DC_A_2 | Inter-band dual connectivity (two bands) |
| Note 1: DC_A_2 corresponds to E-UTRA dual connectivity configurations and bandwidth combination sets defined for inter-band dual connectivity (two bands) in Table 5.4.2C.1-1. | |

The supported testable dual connectivity bandwidth combinations for 2CCs for each dual connectivity capability are listed in Table 8.1.2.2A-2.

**Table 8.1.2.2A-2: Supported testable dual connectivity bandwidth combinations for different dual connectivities capability with 2DL CCs**

| Dual connectivity capability | Bandwidth combination for FDD dual connectivity | Bandwidth combination for TDD dual connectivity |
|---|---|---|
| DC_A_2 | 10+10MHz, 10+20MHz,<br>15+15MHz, 15+20MHz,<br>20+20MHz | 20+20MHz |
| Note 1: This table is only for information and applicability and test rules of dual connectivity performance requirements are specified in 8.1.2.3A | | |

### 8.1.2.3 Applicability and test rules for different CA configurations and bandwidth combination sets

The performance requirement for CA UE demodulation tests in Clause 8 are defined independent of CA configurations and bandwidth combination sets specified in Clause 5.4.2A.1. For UEs supporting different CA configurations and bandwidth combination sets, the applicability and test rules are defined for the tests for 2 DL CCs in Table 8.1.2.3-1, and 3 or more DL CCs in Table 8.2.2.3-2. For simplicity, CA configuration below refers to combination of CA configuration and bandwidth combination set.

**Table 8.1.2.3-1: Applicability and test rules for CA UE demodulation tests with 2 DL CCs**

| Tests | CA capability where the tests apply | CA configuration from the selected CA capability where the tests apply | CA Bandwidth combination to be tested in priority order |
|---|---|---|---|
| CA tests with 2CCs in Clause 8.2.1.1.1_A.1, 8.2.1.4.2_A.1 | Any one of the supported CA capabilities | Any one of the supported FDD CA configurations | 10+10 MHz, 20+20 MHz, 5+5 MHz, 10MHz+5MHz, 15MHz+5MHz |
| CA tests with 2CCs in Clause 8.2.1.3.1_A.1 | Each supported CA capability | Any one of the supported FDD CA configurations in each CA capability | 10+10 MHz, 20+20 MHz, 5+5 MHz, 10MHz+5MHz, other combinations |
| CA tests with 2CCs in Clause 8.2.1.3.1A_A.1, 8.7.1.1_A.1, 8.7.1.1_H.2 | Any one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported FDD CA configurations with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 2CCs in Clause 8.2.1.7_A.1 | CA_C | Supported FDD intra-band contiguous CA configurations covering the lowest and highest operating bands | Largest aggregated CA bandwidth combinations |
| CA tests with 2CCs in Clause 8.2.2.1.1_A.1, 8.2.2.4.2_A.1 | Any one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported TDD CA configurations with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 2CCs in Clause 8.2.2.3.1_A.1 | Each supported CA capability | Any one of the supported TDD CA configurations in each CA capability with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 2CCs in Clause 8.2.2.3.1A_A.1, 8.7.2.1_A.1, 8.7.2.1_H.2 | Any one of the supported CA capabilities with largest aggregated CA bandwidth | Any one of the supported TDD CA configurations with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 2CCs in 8.2.2.7_A.1 | CA_C | Supported TDD intra-band contiguous CA configurations covering the lowest and highest operating bands | Largest aggregated CA bandwidth combinations |
| CA tests with 2CCs in Clause [8.2.1.8.1] | CA_N | CA_3A-3A defined in Table 5.4.2A.1-3 | 10+10 MHz |
| CA tests with 2CCs in Clause [8.2.2.8.1] | CA2_C | CA_41C defined in Table 5.4.2A.1-1 | 20+20 MHz |

Note 1: The applicability and test rules are specified in this table, unless otherwise stated.
Note 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.
Note 3: A single Uplink CC is configured for all tests

**Table 8.1.2.3-2: Applicability and test rules for CA UE demodulation tests with 3 or more DL CCs**

| Tests | CA capability where the tests apply | CA configuration from the selected CA capability where the tests apply | CA Bandwidth combination to be tested in priority order |
|---|---|---|---|
| CA tests with 3 or more CCs in Clause 8.2.1.1.1_A.2, 8.2.1.1.1_A.4, 8.2.1.1.1_A.5, 8.2.1.4.2_A.2, 8.2.1.4.2_A.3, 8.2.1.4.2_A.4, 8.7.1.1_A.2, 8.7.1.1_A.4, 8.7.1.1_A.5, 8.7.1.1_H.3 | Any one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported FDD CA configurations with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 3 or more CCs in Clause 8.2.1.3.1_A.2, 8.2.1.3.1_A.3, 8.2.1.3.1_A.4 | Each supported CA capability | Any one of the supported FDD CA configurations in each CA capability with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 3 or more CCs in Clause 8.2.2.1.1_A.2, 8.2.2.1.1_A.3, 8.2.2.1.1_A.4, 8.2.2.4.2_A.2, 8.2.2.4.2_A.3, 8.2.2.4.2_A.4, 8.7.2.1_A.2, 8.7.2.1_A.3, 8.7.2.1_A.5, 8.7.2.1_H.3 | Any one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported TDD CA configurations with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 3 or more CCs in Clause 8.2.2.3.1_A.2, 8.2.2.3.1_A.3, 8.2.2.3.1_A.4 | Each supported CA capability | Any one of the supported TDD CA configurations in each CA capability with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 3CCs in Clause [8.2.2.8.1] | CA3_C | CA_41D defined in Table 5.4.2A.1-1 | 20+20+20 MHz |
| Note 1: The applicability and test rules are specified in this table, unless otherwise stated.<br>Note 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.<br>Note 3: A single Uplink CC is configured for all tests | | | |

## 8.1.2.3A Applicability and test rules for different dual connectivity configuration and bandwidth combination set

The performance requirement for dual connectivity UE demodulation tests in Clause 8 are defined independent of dual connectivity configurations and bandwidth combination sets specified in Clause 5.4.2C.1. For UEs supporting different dual connectivity configurations and bandwidth combination sets, the applicability and test rules are defined for the tests for the configurations with 2CCs in Table 8.1.2.3A-1. For simplicity, dual connectivity configuration below refers to combination of dual connectivity configuration and bandwidth set.

Both CA performance requirements and dual connectivity performance requirements are applied for dual connectivity capable UE.

**Table 8.1.2.3A-1: Applicability and test rules for dual connectivity UE demodulation tests with 2DL CCs**

| Tests | Dual connectivity capability where the tests apply | Dual connectivity configuration from the selected CA capability where the tests apply | Dual connectivity Bandwidth combination to be tested in priority order |
|---|---|---|---|
| Dual connectivity test in Clause 8.2.1.4.3A, 8.7.6.1, 8.7.6.2 | Any one of the supported dual connectivity capabilities with largest aggregated dual connectivity bandwidth combination | Any one of the supported FDD dual connectivity configurations with the largest aggregated dual connectivity bandwidth combination | Largest dual connectivity aggregated bandwidth combination |
| Dual connectivity test in Clause 8.2.2.4.4, 8.7.7.1, 8.7.7.2 | Any one of the supported dual connectivity capabilities with largest aggregated dual connectivity bandwidth combination | Any one of the supported TDD dual connectivity configurations with the largest aggregated dual connectivity bandwidth combination | Largest dual connectivity aggregated bandwidth combination |
| Note 1: The applicability and test rules are specified in this table, unless otherwise stated.<br>Note 2: Number of the supported bandwidth combinations to be tested from each selected DC or CA configuration is 1. | | | |

## 8.1.2.3B Applicability and test rules for different TDD-FDD CA configurations and bandwidth combination sets

The performance requirement for TDD-FDD CA UE demodulation tests in Clause 8 are defined independent of CA configurations and bandwidth combination sets specified in Clause 5.4.2A.1. For UEs supporting different CA configurations and bandwidth combination sets, the applicability and test rules are defined for the tests for 2 DL TDD-FDD CA in Table 8.1.2.3B-1, in Table 8.1.2.3B-2 and for 3 DL TDD-FDD CA, in Table 8.1.2.3B-3 and for 4 DL TDD-FDD CA, in Table 8.1.2.3B-4 and for 5 DL TDD-FDD CA. For simplicity, CA configuration below refers to combination of CA configuration and bandwidth combination set.

**Table 8.1.2.3B-1: Applicability and test rules for CA UE demodulation tests for TDD-FDD CA with 2 DL CCs**

| Tests | CA capability where the tests apply | CA configuration from the selected CA capability where the tests apply | CA Bandwidth combination to be tested in priority order |
|---|---|---|---|
| CA tests with 2CCs in Clause 8.2.3.1.1.1, 8.2.3.2.1A, 8.2.3.3.1.1, 8.7.5.1.1, 8.7.5.1_H.1 | Any one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported TDD-FDD CA configurations with FDD PCell with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 2CCs in Clause 8.2.3.2.1.1 | Each supported CA capability | Any one of the supported TDD-FDD CA configurations with FDD PCell in each CA capability with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 2CCs in Clause 8.2.3.1.2.1, 8.2.3.2.2A, 8.2.3.3.2.1, 8.7.5.2.1, 8.7.5.2_H.1 | Any one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported TDD-FDD CA configurations with TDD PCell with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 2CCs in Clause 8.2.3.2.2.1 | Each supported CA capability | Any one of the supported TDD-FDD CA configurations with TDD PCell in each CA capability with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| NOTE 1: The applicability and test rules are specified in this table, unless otherwise stated.<br>NOTE 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.<br>NOTE 3: A single Uplink CC is configured for all tests. | | | |

**Table 8.1.2.3B-2: Applicability and test rules for CA UE demodulation tests for TDD-FDD CA with 3 or more DL CCs**

| Tests | CA capability where the tests apply | CA configuration from the selected CA capability where the tests apply | CA Bandwidth combination to be tested in priority order |
|---|---|---|---|
| CA tests with 3CCs, 4CCs, 5CCs in Clause 8.2.3.1.1.2, 8.2.3.1.1.3, 8.2.3.1.1.4, 8.2.3.3.1.2, 8.2.3.3.1.3, 8.2.3.3.1.4, 8.7.5.1.2, 8.7.5.1.3, 8.7.5.1.4, 8.7.5.1_H.2, 8.7.5.1_H.3, 8.7.5.1_H.4 | Any one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported TDD-FDD CA configurations with FDD PCell with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 3CCs, 4CCs, 5CCs in Clause 8.2.3.2.1.2, 8.2.3.2.1.3, 8.2.3.2.1.4 | Each supported CA capability | Any one of the supported TDD-FDD CA configurations with FDD PCell in each CA capability with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 3CCs, 4CCs, 5CCs in Clause 8.2.3.1.2.2, 8.2.3.1.2.3, 8.2.3.1.2.4, 8.2.3.3.2.2, 8.2.3.3.2.3, 8.2.3.3.2.4, 8.7.5.2.2, 8.7.5.2.3, 8.7.5.2.4, 8.7.5.2_H.2, 8.7.5.2_H.3, 8.7.5.2_H.4 | Any one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported TDD-FDD CA configurations with TDD PCell with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 3CCs, 4CCs, 5CCs in Clause 8.2.3.2.2.2, 8.2.3.2.2.3, 8.2.3.2.2.4 | Each supported CA capability | Any one of the supported TDD-FDD CA configurations with TDD PCell in each CA capability with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| NOTE 1: The applicability and test rules are specified in this table, unless otherwise stated.<br>NOTE 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.<br>NOTE 3: A single Uplink CC is configured for all tests. | | | |

## 8.1.2.3D Applicability and test rules for different CA with LAA SCell(s) configurations and bandwidth combination sets

The performance requirement for CA with LAA SCell(s) UE demodulation tests in Clause 8 are defined independent of CA configurations and bandwidth combination sets specified in Clause 5.4.2A.1. For UEs supporting different CA with LAA SCell(s) configurations and bandwidth combination sets, the applicability and test rules are defined for the tests for 2 DL CA with LAA SCell(s) in Table 8.1.2.3D-1 and in Table 8.1.2.3D-2 for 3 or more DL CA with LAA SCell(s). For simplicity, CA configuration below refers to combination of CA with LAA SCell(s) configuration and bandwidth combination set.

**Table 8.1.2.3D-1: Applicability and test rules for CA UE demodulation tests for CA with LAA SCell(s) with 2 DL CCs**

| Tests | CA capability where the tests apply | CA configuration from the selected CA capability where the tests apply | CA Bandwidth combination to be tested in priority order |
|---|---|---|---|
| CA tests with 2CCs in Clause 8.2.4.1.1, 8.3.3.1.1 | Any one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported CA with LAA SCell(s) configurations with FDD PCell with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 2CCs in Clause 8.2.4.1.2, 8.3.3.1.2 | Any one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported CA with LAA SCell(s) configurations with TDD PCell with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| NOTE 1: The applicability and test rules are specified in this table, unless otherwise stated.<br>NOTE 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.<br>NOTE 3: A single Uplink CC is configured for all tests. | | | |

**Table 8.1.2.3D-2: Applicability and test rules for CA UE demodulation tests for CA with LAA SCell(s) with 3 or more DL CCs**

| Tests | CA capability where the tests apply | CA configuration from the selected CA capability where the tests apply | CA Bandwidth combination to be tested in priority order |
|---|---|---|---|
| CA tests with 2CCs in Clause 8.2.4.1.1, 8.3.3.1.1 | Any one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported CA with LAA SCell(s) configurations with FDD PCell with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 2CCs in Clause 8.2.4.1.2, 8.3.3.1.2 | Any one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported CA with LAA SCell(s) configurations with TDD PCell with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| NOTE 1: The applicability and test rules are specified in this table, unless otherwise stated.<br>NOTE 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.<br>NOTE 3: A single Uplink CC is configured for all tests. | | | |

### 8.1.2.4 Test coverage for different number of component carriers

For FDD tests specified in 8.2.1.1.1, 8.2.1.3.1, 8.2.1.4.2, and 8.7.1.1, if corresponding CA tests are tested, the test coverage can be considered fulfilled without executing single carrier tests.

For TDD tests specified in 8.2.2.1.1, 8.2.2.3.1, 8.2.2.4.2, and 8.7.2.1, if corresponding CA tests are tested, the test coverage can be considered fulfilled without executing single carrier tests.

For TDD FDD tests specified in 8.2.3.1, 8.2.3.2, 8.2.3.3, and 8.7.5, if corresponding TDD FDD CA tests are tested, the test coverage can be considered fulfilled without executing both FDD and TDD single carrier tests.

For FDD CA tests specified in 8.2.1.1.1_A, 8.2.1.4.2_A, and 8.7.1.1_A, among all supported CA capabilities, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA tests with less than the largest number of CCs supported by the UE.

For FDD CA tests specified in 8.2.1.3.1_A, for each supported CA capability, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA tests with less than the largest number of CCs supported by the UE.

For TDD CA tests specified in 8.2.2.1.1_A, 8.2.2.4.2_A, and 8.7.2.1_A, among all supported CA capabilities, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA tests with less than the largest number of CCs supported by the UE.

For TDD CA tests specified in 8.2.2.3.1_A, for each supported CA capability, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA tests with less than the largest number of CCs supported by the UE.

For TDD FDD CA tests specified in 8.2.3.1, 8.2.3.3, and 8.7.5, among all supported CA capabilities, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the TDD FDD CA tests with less than the largest number of CCs supported by the UE.

For TDD FDD CA tests specified in 8.2.3.2, for each supported CA capability, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the TDD FDD CA tests with less than the largest number of CCs supported by the UE.

For FDD CA power imbalance tests specified in 8.2.1.7, if they are tested with FDD intra-band contiguous CA configurations with 2 DL CCs, the test coverage can be considered fulfilled with FDD intra-band contiguous CA configurations with 3 DL CCs supported by the UE.

For TDD CA power imbalance tests specified in 8.2.2.7, if they are tested with TDD intra-band contiguous CA configurations with 2 DL CCs, the test coverage can be considered fulfilled with TDD intra-band contiguous CA configurations with 3 DL CCs supported by the UE.

For LAA SCell(s) with FDD PCell tests specified in 8.2.4.1.1 and 8.3.3.1.1, for each supported CA capability, if corresponding CA with LAA SCell(s) tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA with LAA SCell(s) tests with less than the largest number of CCs supported by the UE.

For LAA SCell(s) with TDD PCell tests specified in 8.2.4.1.2 and 8.3.3.1.2, for each supported CA capability, if corresponding CA with LAA SCell(s) tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA with LAA SCell(s) tests with less than the largest number of CCs supported by the UE.

### 8.1.2.6 Applicability of performance requirements for 4Rx capable UEs

For 4Rx capable UEs, the 2Rx supported RF bands and 4Rx supported RF bands are up to UE’s declaration.

#### 8.1.2.6.1 Applicability rule and antenna connection for single carrier tests with 2Rx

For 4Rx capable UEs all single carrier tests specified in 8.2 to 8.8 with 2Rx are tested on any of the 2 Rx supported RF bands by connecting 2 out of the 4Rx with data source from system simulator, and the other 2 Rx are connected with zero input, depending on UE’s declaration and AP configuration. Same requirements specified with 2Rx should be applied.

For 4Rx capable UEs without any 2Rx RF bands (see note), all single carrier tests specified in 8.2 to 8.8 with 2Rx are tested on any of the 4Rx supported RF bands by duplicating the fading channel from each Tx antenna and add independent noise for each Rx antenna. Figure 8.1.2.6.1-1 shows an example of antenna connection for 4Rx UE in any one 4Rx supported RF band to perform a 2Rx performance test with antenna configuration as 2x2 without interference for information. The SNR requirements should be applied with 1.5 dB less than the number specified with 2Rx for test configuration with CRS-based TM and with 1.5 dB less than the number specified with 2Rx for test configuration with DMRS-based TM.

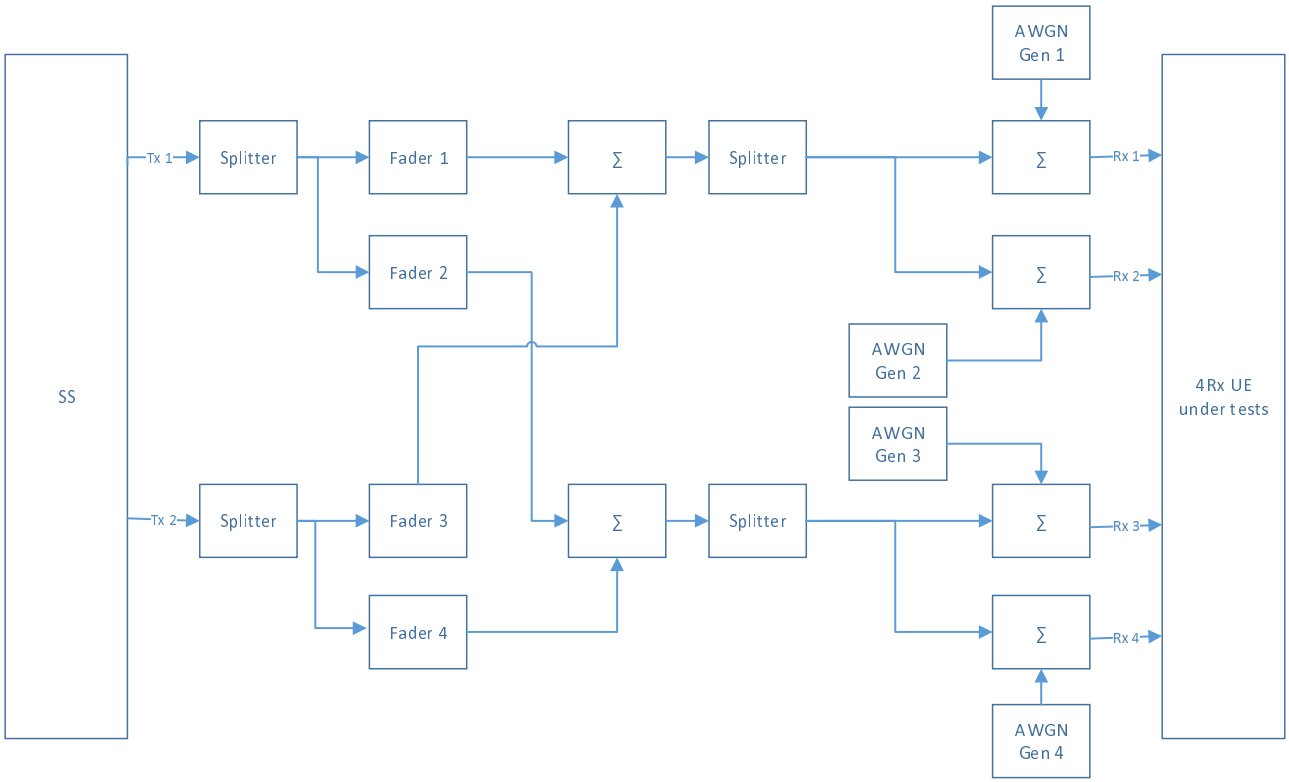



**Figure 8.1.2.6.1-1: Antenna connection example for 2Rx tests with antenna configuration as 2x2 without interference (informative)**

For 4Rx capable UEs without any 2Rx supported RF bands (see note), for all single carrier tests listed in Table 8.1.2.6.1-0 specified from 8.2 to 8.8 with 2Rx can be skipped.

Note: The band capability of the 4Rx UEs and corresponding test case applicability needs to be determined separately per frame structure {FDD, TDD, FS3}

**Table 8.1.2.6.1-0: Requirement lists for 4Rx capable UEs**

| Requirement lists |
|---|
| Enhanced downlink control channel performance requirements type A |
| Enhanced downlink control channel performance requirements type B |
| Enhanced performance requirements type B |
| Enhanced performance requirements type C |
| Requirements with demodulation subframe overlaps with aggressor cell ABS |
| Requirements with demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured |
| Requirements with CRS assistance information configured |

For 4Rx capable UEs, if corresponding tests listed from the 4Rx test lists from Table 8.1.2.6.1-1 are tested, the test coverage can be considered fulfilled without executing the corresponding tests listed from the 2Rx test lists from Table 8.1.2.6.1-1.

**Table 8.1.2.6.1-1: Applicability rules for single carrier tests with 2Rx**

| 4Rx test lists | 2Rx test lists |
|---|---|
| 8.10.1.1.1 Test 1 | 8.2.1.2.1 Test 1 |
| 8.10.1.1.2 Test 1 | 8.2.1.3.1 Test 1 |
| 8.10.1.1.3 Test 1 | 8.2.1.4.1B Test 1 |
| 8.10.1.1.4 Test 1 | 8.2.1.4.2 Test 1 |
| 8.10.1.1.4 Test 2 | 8.2.1.4.2 Test 3 |
| 8.10.1.1.5 Test 1 | 8.3.1.1A Test 1 |
| 8.10.1.1.6 Test 1 | 8.3.1.2 Test 1 |
| 8.10.1.2.1 Test 1 | 8.2.2.2.1 Test 1 |
| 8.10.1.2.2 Test 1 | 8.2.2.3.1 Test 1 |
| 8.10.1.2.3 Test 1 | 8.2.2.4.1B Test 1 |
| 8.10.1.2.4 Test 1 | 8.2.2.4.2 Test 1 |
| 8.10.1.2.4 Test 2 | 8.2.2.4.2 Test 3 |
| 8.10.1.2.5 Test 1 | 8.3.2.1B Test 1 |
| 8.10.1.2.6 Test 1 | 8.3.2.2 Test 2 |
| 8.10.2.1.1 Test 1 | 8.4.1.1 Test 1 |
| 8.10.2.1.2 Test 1 | 8.4.1.2.1 Test 1 |
| 8.10.2.1.3 Test 1 | 8.4.1.2.2 Test 1 |
| 8.10.2.2.1 Test 1 | 8.4.2.1 Test 1 |
| 8.10.2.2.2 Test 1 | 8.4.2.2.1 Test 1 |
| 8.10.2.2.3 Test 1 | 8.4.2.2.2 Test 1 |
| 8.10.3.1.1 Test 1 | 8.5.1.1 Test 1 |
| 8.10.3.1.2 Test 1 | 8.5.1.2.1 Test 1 |
| 8.10.3.1.3 Test 1 | 8.5.1.2.2 Test 1 |
| 8.10.3.2.1 Test 1 | 8.5.2.1 Test 1 |
| 8.10.3.2.2 Test 1 | 8.5.2.2.1 Test 1 |
| 8.10.3.2.3 Test 1 | 8.5.2.2.2 Test 1 |
| 8.10.4.1.1 Test 1 | 8.8.1.1 Test 1 |
| 8.10.4.1.1 Test 2 | 8.8.1.1 Test 2 |
| 8.10.4.1.2 Test 1 | 8.8.1.2 Test 1 |
| 8.10.4.1.2 Test 2 | 8.8.1.2 Test 2 |
| 8.10.4.2.1 Test 1 | 8.8.2.1 Test 1 |
| 8.10.4.2.1 Test 2 | 8.8.2.1 Test 2 |
| 8.10.4.2.2 Test 1 | 8.8.2.2 Test 1 |
| 8.10.4.2.2 Test 2 | 8.8.2.2 Test 2 |

### 8.1.2.6.2 Applicability rule and antenna connection for CA and DC tests with 2Rx

All tests specified in 8.2 to 8.8 with 2Rx with CA, TDD-FDD CA and DC are tested with 4 Rx capable UEs.

Within the CA/DC configuration if any of the PCell and/or the SCells and/or PSCells is a 2Rx supported RF band, the antenna connection should follow the same method as defined in 8.1.2.6.1 for single carrier tests on any of the 2Rx supported RF bands, with same requirements specified with 2Rx applied. Within the CA configuration if any of the PCell and/or the SCells and/or PSCells is a 4Rx supported RF band, the antenna connection should follow the same as defined in 8.1.2.6.1 for single carrier tests on any of the 4 Rx supported RF bands, with the SNR requirements applied with 1.5 dB less than the number specified with 2Rx.

Same applicability rules defined in 8.1.2.3, 8.1.2.3A, and 8.1.2.3B for CA, TDD-FDD CA and DC applied for different CA and DC configurations and bandwidth combination sets should be applied for 4 Rx capable UEs.

### 8.1.2.6.3 Applicability rule and antenna connection for single carrier tests with 4Rx

For 4Rx capable UEs all single carrier tests specified in 8.10 with 4Rx are tested on any of the 4Rx supported RF bands by connecting all 4Rx with data source from system simulator.

### 8.1.2.6.4 Applicability rule for 256QAM tests

For 256QAM capable UE, if corresponding tests specified in 8.10.1.1.4 Test 2 and 8.10.1.2.4 Test 2 are tested, the test coverage can be considered fulfilled without executing the tests specified in 8.10.1.1.4 Test 1 and 8.10.1.2.4 Test 1. For a UE which does not have 256QAM capability, the test specified in 8.10.1.1.4 Test 1 and 8.10.1.2.4 Test 1 should be used.

#### 8.1.2.6.5 Applicability rule and antenna connection for CA and DC tests with 4Rx

All tests specified in 8.13 with FDD CA/DC, TDD CA/DC and TDD-FDD CA/DC are tested with 4 Rx capable UEs.

Within the CA/DC configuration if any of the PCell and/or the SCells/PSCell is a 2Rx supported RF band, 2 out of the 4Rx should be connected with data source from system simulator, and the other 2Rx are connected with zero input, depending on UE's declaration and AP configuration. Within the CA/DC configuration if any of the PCell and/or the SCells is a 4Rx supported RF band, all 4Rx should be connected with data source from system simulator.

For 4Rx capable UEs supporting different CA/DC configurations and bandwidth combination sets, the applicability and test rules are defined in Table 8.1.2.6.5-1 for FDD CA/DC, TDD CA/DC and TDD-FDD CA/DC. For simplicity, CA/DC configuration below refers to combination of CA/DC configuration and bandwidth combination set.

**Table 8.1.2.6.5-1: Applicability and test rules for CA/DC/TDD-FDD CA UE demodulation tests**

| Tests | Step 1 | Step 2 | Step 3 | Step 4 |
|---|---|---|---|---|
| CA tests in Clause 8.13.1.1.1, 8.13.1.2.1 | Select FDD CA configurations with the maximum number of CCs excluding the 2Rx only CA configuration among all supported FDD CA configurations with any CA capability | Select FDD CA configurations with maximum number of 4Rx CCs among all the selected FDD CA configurations from Step 1 | Select any one of the FDD CA configuration with the largest aggregated CA bandwidth combination among all the selected FDD CA configurations from Step 2 | NA |
| DC tests in Clause 8.13.1.1.2 | Select FDD DC configurations with the maximum number of CCs excluding the 2Rx only DC configuration among all supported FDD DC configurations with any DC capability | Select FDD DC configurations with maximum number of 4Rx CCs among all the selected FDD DC configurations from Step 1 | Select any one of the FDD DC configuration with the largest aggregated DC bandwidth combination among all the selected FDD DC configurations from Step 2 | NA |
| CA tests in Clause 8.13.2.1.1, 8.13.2.2.1 | Select TDD CA configurations with the maximum number of CCs excluding the 2Rx only CA configuration among all supported TDD CA configurations with any CA capability | Select TDD CA configurations with maximum number of 4Rx CCs among all the selected TDD CA configurations from Step 1 | Select any one of the TDD CA configuration with the largest aggregated CA bandwidth combination among all the selected TDD CA configurations from Step 2 | NA |
| DC tests in Clause 8.13.2.1.2 | Select TDD DC configurations with the maximum number of CCs excluding the 2Rx only DC configuration among all supported TDD DC configurations with any DC capability | Select TDD DC configurations with maximum number of 4Rx CCs among all the selected TDD DC configurations from Step 1 | Select any one of the TDD DC configuration with the largest aggregated DC bandwidth combination among all the selected TDD DC configurations from Step 2 | NA |
| CA tests in Clause 8.13.3.1.1, 8.13.3.1.2, 8.13.3.2.1, 8.13.3.2.2 | Select TDD-FDD CA configurations with the maximum number of CCs excluding the 2Rx only CA configuration among all supported TDD-FDD CA configurations with any CA capability | Select TDD-FDD CA configurations with maximum number of 4Rx CCs among all the selected TDD-FDD CA configurations from Step 1 | Select any one of the TDD-FDD CA configuration with the largest aggregated CA bandwidth combination among all the selected TDD-FDD CA configurations from Step 2 | NA |
| DC tests in Clause 8.13.3.5.1, 8.13.3.5.2 | Select TDD-FDD DC configurations with the maximum number of CCs excluding the 2Rx only DC configuration among all supported TDD-FDD DC configurations with any DC capability | Select TDD-FDD DC configurations with maximum number of 4Rx CCs among all the selected TDD-FDD DC configurations from Step 1 | Select any one of the TDD-FDD DC configuration with the largest aggregated DC bandwidth combination among all the selected TDD-FDD DC configurations from Step 2 | NA |

| | | | | |
|---|---|---|---|---|
| CA tests in Clause 8.13.1.3.1, 8.13.1.4.1, 8.13.1.1.3 | Select FDD CA configurations with the maximum number of CCs excluding the 2Rx only CA configuration among all supported FDD CA configurations with any CA capability | Select FDD CA configurations with maximum number of 4Rx CCs among all the selected FDD CA configurations from Step 1 | Select any one of the FDD CA configuration with the largest aggregated CA bandwidth combination among all the selected FDD CA configurations from Step 2 | Select 2CCs with maximum number of 4Rx CCs with the largest aggregated CA bandwidth combination among the selected FDD CA configuration from Step 3 |
| CA tests in Clause 8.13.2.3.1, 8.13.2.4.1, 8.13.2.1.3 | Select TDD CA configurations with the maximum number of CCs excluding the 2Rx only CA configuration among all supported TDD CA configurations with any CA capability | Select TDD CA configurations with maximum number of 4Rx CCs among all the selected TDD CA configurations from Step 1 | Select any one of the TDD CA configuration with the largest aggregated CA bandwidth combination among all the selected TDD CA configurations from Step 2 | Select 2CCs with maximum number of 4Rx CCs with the largest aggregated CA bandwidth combination among the selected TDD CA configuration from Step 3 |
| CA tests in Clause 8.13.3.3.1, 8.13.3.3.2, 8.13.3.4.1, 8.13.3.4.2, 8.13.3.6.1, 8.13.3.6.2 | Select TDD-FDD CA configurations with the maximum number of CCs excluding the 2Rx only CA configuration among all supported TDD-FDD CA configurations with any CA capability | Select TDD-FDD CA configurations with maximum number of 4Rx CCs among all the selected TDD-FDD CA configurations from Step 1 | Select any one of the TDD-FDD CA configuration with the largest aggregated CA bandwidth combination among all the selected TDD CA configurations from Step 2 | Select 2CCs with maximum number of 4Rx CCs with the largest aggregated CA bandwidth combination among the selected TDD-FDD CA configuration from Step 3 |
| CA tests in Clause 8.13.1.1.4 | Select FDD CA configurations with the maximum number of CCs supporting 4 layers MIMO among all supported FDD CA configurations with any CA capability | Select any one of the FDD CA configuration with the largest aggregated CA bandwidth combinations on any 2CCs among all the CCs among all the selected FDD CA configuration from Step 1 | NA | NA |
| CA tests in Clause 8.13.2.1.4 | Select TDD CA configurations with the maximum number of CCs supporting 4 layers MIMO among all supported TDD CA configurations with any CA capability | Select any one of the TDD CA configuration with the largest aggregated CA bandwidth combinations on any 2CCs among all the CCs among all the selected TDD CA configuration from Step 1 | NA | NA |
| CA tests in Clause 8.13.3.7.1, 8.13.3.7.2 | Select TDD-FDD CA configurations with the maximum number of CCs supporting 4 layers MIMO among all supported TDD-FDD CA configurations with any CA capability | Select any one of the TDD-FDD CA configuration with the largest aggregated CA bandwidth combinations on any 2CCs among all the CCs among all the selected TDD-FDD CA configuration from Step 1 | NA | NA |
| NOTE 1: The applicability and test rules are specified in this table, unless otherwise stated.<br>NOTE 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.<br>NOTE 3: A single Uplink CC is configured for all CA tests and 2 Uplink CCs are configured for all DC tests. | | | | |

For 4Rx capable UEs, if corresponding tests listed from the 4Rx CA/DC test lists from Table 8.1.2.6.5-2 are tested, the test coverage can be considered fulfilled without executing the corresponding tests listed from the 2Rx CA/DC test lists from Table 8.1.2.6.5-2.

**Table 8.1.2.6.5-2: Test lists for applicability rules for CA/DC/TDD-FDD CA tests with 4Rx**

| 4Rx test lists | 2Rx test lists |
|---|---|
| 8.13.1.1.1 CA tests | 8.2.1.4.3 CA tests |
| 8.13.1.1.2 DC tests | 8.2.1.4.3A DC tests |
| 8.13.1.2.1 CA tests | 8.2.1.1.1 CA tests |
| 8.13.2.1.1 CA tests | 8.2.2.4.3 CA tests |
| 8.13.2.1.2 DC tests | 8.2.2.4.3A DC tests |
| 8.13.2.2.1 CA tests | 8.2.2.1.1 CA tests |
| 8.13.3.1.1 CA tests | 8.2.3.3.1 CA tests |
| 8.13.3.1.2 CA tests | 8.2.3.3.2 CA tests |
| 8.13.3.2.1 CA tests | 8.2.3.1.1 CA tests |
| 8.13.3.2.2 CA tests | 8.2.3.1.2 CA tests |
| 8.13.1.1.3 CA tests | 8.2.1.4.2 test 3 and 8.10.1.1.4 test 2 |
| 8.13.1.1.4 CA tests | 8.10.1.1.8 test 1 |
| 8.13.1.3.1 CA tests | 8.2.1.4.1B test 1 and 8.10.1.1.3 test 1 |
| 8.13.1.4.1 CA tests | 8.3.1.1A test 1 and 8.10.1.1.5 test 1 |
| 8.13.2.1.3 CA tests | 8.2.2.4.2 test 3 and 8.10.1.2.4 test 2 |
| 8.13.2.1.4 CA tests | 8.10.1.2.8 test 1 |
| 8.13.2.3.1 CA tests | 8.2.2.4.1B test 1 and 8.10.1.2.3 test 1 |
| 8.13.2.4.1 CA tests | 8.3.2.1B test 1 and 8.10.1.2.5 test 1 |

### 8.1.2.6.6 Applicability rule for Type C with 4Rx

For Type C with 4Rx capable UEs, if the tests from the 4Rx test lists are tested from Table 8.1.2.6.6-1, the test coverage can be considered fulfilled without executing the corresponding test from 2Rx test lists from Table 8.1.2.6.6-1.

**Table 8.1.2.6.6-1: Applicability rules for Type C with 4Rx**

| Test category | Type C with 2Rx test lists | Type C with 4Rx test lists |
|---|---|---|
| FDD Tests | 8.2.1.3.1B | 8.2.1.3.1B |
| | 8.2.1.3.1C | 8.2.1.3.1C |
| | 8.2.1.4.2A | 8.10.1.1.4A |
| | 8.3.1.2A | 8.10.1.1.6A |
| TDD Tests | 8.2.2.3.1B | 8.2.2.3.1B |
| | 8.2.2.3.1C | 8.2.2.3.1C |
| | 8.2.2.4.2A | 8.10.1.2.4A |
| | 8.3.2.2A | 8.10.1.2.6A |

## 8.1.2.7 Applicability of Enhanced Downlink Control Channel Performance Requirements

For UE which supports downlink control channel Type A or Type B interference mitigation capabilities the tests from Table 8.1.2.7-1 rows corresponding should be applied in accordance to the supported UE-EUTRA-Capability [5].

**Table 8.1.2.7-1: Applicability rules for enhanced downlink control channel performance requirements**

| UE-EUTRA-Capability | Test category | | Test list | Applicability notes |
|---|---|---|---|---|
| cch-InterfMitigation-RefRecTypeA-r13 | FDD | PDCCH/PCFICH | 8.4.1.2.5 Test 1<br>8.4.1.2.6 Test 1 | |
| | | PHICH | 8.5.1.2.5 Test 1<br>8.5.1.2.6 Test 1 | |
| | | EPDCCH | 8.8.4.1 Test 1<br>8.8.6.1 Test 1 | |
| | TDD | PDCCH/PCFICH | 8.4.2.2.5 Test 1<br>8.4.2.2.6 Test 1 | |
| | | PHICH | 8.5.2.2.5 Test 1<br>8.5.2.2.6 Test 1 | |
| | | EPDCCH | 8.8.4.2 Test 1<br>8.8.5.1 Test 1 | |

| | | | | |
|---|---|---|---|---|
| cch-InterfMitigation-RefRecTypeB-r13 | FDD | PDCCH/PCFICH | 8.4.1.2.5 Test 1<br>8.4.1.2.7 Test 1<br>8.4.1.2.8 Test 1 | The test coverage can be considered fulfilled without executing the tests corresponding to cch-InterfMitigation-RefRecTypeA-r13 |
| | | PHICH | 8.5.1.2.5 Test 1<br>8.5.1.2.7 Test 1<br>8.5.1.2.8 Test 1 | |
| | | EPDCCH | 8.8.4.1 Test 1<br>8.8.6.1 Test 1 | |
| | TDD | PDCCH/PCFICH | 8.4.2.2.7 Test 1<br>8.4.2.2.8 Test 1 | |
| | | PHICH | 8.5.2.2.7 Test 1<br>8.5.2.2.8 Test 1 | |
| | | EPDCCH | 8.8.4.2 Test 1<br>8.8.5.1 Test 1 | |

# 8.2 Demodulation of PDSCH (Cell-Specific Reference Symbols)

## 8.2.1 FDD (Fixed Reference Channel)

The parameters specified in Table 8.2.1-1 are valid for all FDD tests unless otherwise stated.

**Table 8.2.1-1: Common Test Parameters (FDD)**

| Parameter | Unit | Value | Comments |
|---|---|---|---|
| Inter-TTI Distance | | 1 | |
| Number of HARQ processes | Processes | 8 | For FDD, 8 HARQ processes in the DL, as specified in TS 36.213 [10] clause 7. All 8 HARQ processes are used. |
| Scheduling of retransmissions | | | 1. Retransmissions use the same Transport Block Size (TBS) as the initial transmission.<br>2. HARQ processes are scheduled consecutively, independent of the fact, whether retransmissions (for negatively acknowledged HARQ processes) or new transmissions (for positively acknowledged HARQ processes) occur. |
| Maximum number of HARQ transmission | | 4 | It is always 4 for FDD, as specified in TS 36.213 [10] clause 8 |
| Redundancy version coding sequence | | {0,1,2,3} for QPSK and 16QAM<br>{0,0,1,2} for 64QAM and 256QAM | |
| Number of OFDM symbols for PDCCH | OFDM symbols | 4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths, 2 for 10 MHz, 15 MHz and 20 MHz bandwidths unless otherwise stated | The PCFICH carries information about the number of OFDM symbols used for transmission of PDCCHs in a subframe, as specified in TS 36.211 [8] clause 6.7 |
| Cyclic Prefix | | Normal | CP consist of the following physical resource blocks (RBs) parameters: 12 consecutive subcarriers at a 15 kHz spacing and 7 OFDM symbols, as specified in TS 36.211 [8] clause 6.2.3 |
| Cell ID | | 0 (Note 1) | The Cell ID is uniquely defined by a number in the range of 0 to 503, representing the physical-layer cell identity, as specified in TS 36.211 [8] clause 6.11. |
| Cross carrier scheduling | | Not configured | |
| Note 1: For CA tests, Cell ID = 0 applies to P-Cell. For (n)*th* S-Cell, Cell ID = n is used. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.

## 8.2.1.1 FDD PDSCH Single Antenna Port Performance (Cell-Specific Reference Symbols)

### 8.2.1.1.1 FDD PDSCH Single Antenna Port Performance

Editor's note: SNR requirement for 4Rx UE without 2Rx RF bands are still in square brackets

#### 8.2.1.1.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

#### 8.2.1.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.1.1.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.1, with the addition of the relevant parameters in Tables 8.2.1-1, 8.2.1.1.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.1.1.3-2 for the specified SNR. For QPSK and 64QAM performance the bandwidths specified in Table 5.4.2.1-1 are verified.

**Table 8.2.1.1.1.3-1: Test Parameters for Testing**

| Parameter | | Unit | Test 1- 5 | Test 6- 8 | Test 9- 15 | Test 16-18 |
|---|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 (Note 1) | 0 (Note 1) | 0 (Note 1) |
| | σ | dB | 0 | 0 | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 | -98 | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) | OCNG (Note 2) | OCNG (Note 2) | OCNG (Note 2) |
| Modulation | | | QPSK | 16QAM | 64QAM | 16QAM |
| PDSCH transmission mode | | | 1 | 1 | 1 | 1 |
| Note 1: $P_B = 0$<br>Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UE's with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | | | | |

**Table 8.2.1.1.1.3-2: Minimum performance (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz (Note 1) | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.0 | ≥1 |
| 2 | 10 MHz | R.2 FDD | OP.1 FDD | ETU70 | 1x2 Low | 70 | -0.4 | ≥1 |
| 3 | 10 MHz | R.2 FDD | OP.1 FDD | ETU300 | 1x2 Low | 70 | 0.0 | ≥1 |
| 4 | 10 MHz | R.2 FDD | OP.1 FDD | HST | 1x2 | 70 | -2.4 | ≥1 |
| 5 | 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 0.0 | ≥1 |
| 6 | 10 MHz | R.3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 6.7 | ≥2 |
| | 5 MHz (Note 2) | R.3-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 6.7 | ≥2 |
| 7 | 10 MHz | R.3 FDD | OP.1 FDD | ETU70 | 1x2 Low | 30 | 1.4 | ≥2 |
| | 5 MHz (Note 2) | R.3-1 FDD | OP.1 FDD | ETU70 | 1x2 Low | 30 | 1.4 | ≥2 |
| 8 | 10 MHz | R.3 FDD | OP.1 FDD | ETU300 | 1x2 High | 70 | 9.4 | ≥2 |
| | 5 MHz (Note 2) | R.3-1 FDD | OP.1 FDD | ETU300 | 1x2 High | 70 | 9.4 | ≥2 |
| 9 | 3 MHz | R.5 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 17.6 | ≥1 |
| 10 | 5 MHz | R.6 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 17.4 | ≥2 |
| 11 | 10 MHz | R.7 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 17.7 | ≥2 |
| 12 | 10 MHz | R.7 FDD | OP.1 FDD | ETU70 | 1x2 Low | 70 | 19.0 | ≥2 |
| 13 | 10 MHz | R.7 FDD | OP.1 FDD | EVA5 | 1x2 High | 70 | 19.1 | ≥2 |
| 14 | 15 MHz | R.8 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 17.7 | ≥2 |
| 15 | 20 MHz | R.9 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 17.6 | ≥3 |
| 16 | 3 MHz | R.0 FDD | OP.1 FDD | ETU70 | 1x2 Low | 30 | 1.9 | ≥1 |
| 17 | 10 MHz | R.1 FDD | OP.1 FDD | ETU70 | 1x2 Low | 30 | 1.9 | ≥1 |
| 18 | 20 MHz | R.1 FDD | OP.1 FDD | ETU70 | 1x2 Low | 30 | 1.9 | ≥1 |

Note 1: Test 1 may not be executed for UE-s for which Test 1 in section 8.2.1.1.1_A.2 is applicable.
Note 2: Test case applicability is defined in 8.1.2.1.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.1.

#### 8.2.1.1.1.4 Test description

##### 8.2.1.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Frequencies to be tested for 1PRB allocation: Low Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.1.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9 for UE with 2Rx RF band and Annex A, Figure A.9a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 8.2.1-1and 8.2.1.1.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.1.1.4.3.

#### 8.2.1.1.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.1.1.3-1 and 8.2.1.1.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 8.2.1.1.1.5-1as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
4. Repeat steps from 1 to 3 for each subtest in Table 8.2.1.1.1.5-1 as appropriate.

#### 8.2.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 8.2.1.1.1.5 Test requirement

Table 8.2.1.1.1.3-1defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 for each throughput test shall meet or exceed the specified value in Table 8.2.1.1.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.1.1.5-1: Test requirement (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for UE with 2Rx RF band | SNR (dB) for 4Rx UE without 2Rx RF bands | |
| 1 | 10 MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.2 | [-1.7] | ≥1 |
| 2 | 10 MHz | R.2 FDD | OP.1 FDD | ETU70 | 1x2 Low | 70 | +0.4 | [-1.1] | ≥1 |
| 3 | 10 MHz | R.2 FDD | OP.1 FDD | ETU300 | 1x2 Low | 70 | +0.8 | [-0.7] | ≥1 |
| 4 | 10 MHz | R.2 FDD | OP.1 FDD | HST | 1x2 | 70 | -1.8 | [-3.3] | ≥1 |
| 5 | 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +0.8 | [-0.7] | ≥1 |
| 6 | 10 MHz | R.3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +7.5 | [+6.0] | ≥2 |
| | 5 MHz (Note 2) | R.3-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +7.5 | [+6.0] | ≥2 |
| 7 | 10 MHz | R.3 FDD | OP.1 FDD | ETU70 | 1x2 Low | 30 | +2.2 | [+0.7] | ≥2 |
| | 5 MHz (Note 2) | R.3-1 FDD | OP.1 FDD | ETU70 | 1x2 Low | 30 | +2.2 | [+0.7] | ≥2 |
| 8 | 10 MHz | R.3 FDD | OP.1 FDD | ETU300 | 1x2 High | 70 | +10.2 | [+8.7] | ≥2 |
| | 5 MHz (Note 2) | R.3-1 FDD | OP.1 FDD | ETU300 | 1x2 High | 70 | +10.2 | [+8.7] | ≥2 |
| 9 | 3 MHz | R.5 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +18.4 | [+16.9] | ≥1 |
| 10 | 5 MHz | R.6 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +18.2 | [+16.7] | ≥2 |
| 11 | 10 MHz | R.7 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +18.5 | [+16.0] | ≥2 |
| 12 | 10 MHz | R.7 FDD | OP.1 FDD | ETU70 | 1x2 Low | 70 | +19.8 | [+18.3] | ≥2 |
| 13 | 10 MHz | R.7 FDD | OP.1 FDD | EVA5 | 1x2 High | 70 | +19.9 | [+18.4] | ≥2 |
| 14 | 15 MHz | R.8 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +18.5 | [+17.0] | ≥2 |
| 15 | 20 MHz | R.9 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +18.4 | [+16.9] | ≥3 |
| 16 | 3 MHz | R.0 FDD | OP.1 FDD | ETU70 | 1x2 Low | 30 | +2.7 | [+1.2] | ≥1 |
| 17 | 10 MHz | R.1 FDD | OP.1 FDD | ETU70 | 1x2 Low | 30 | +2.7 | [+1.2] | ≥1 |
| 18 | 20 MHz | R.1 FDD | OP.1 FDD | ETU70 | 1x2 Low | 30 | +2.7 | [+1.2] | ≥1 |

Note 1: N/A.
Note 2: Test case is applicable (according to sub clause 8.1.2.1) to UE's which, from the E-UTRA operating bands defined in Table 5.2-1, support only E-UTRA band 31.
NOTE 3: The SNR requirement for 4Rx capable UEs is as specified in 8.1.2.6.1.

## 8.2.1.1.1_1 FDD PDSCH Single Antenna Port Performance (Release 9 and forward)

### 8.2.1.1.1_1.1 Test purpose

Same test purpose as in clause 8.2.1.1.1.1.

### 8.2.1.1.1_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward of UE category 1 and 2.

8.2.1.1.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.1.1.1.3 with the following exceptions:

- Instead of Table 8.2.1.1.1.3-1 → use Table 8.2.1.1.1_1.3-1.
- Instead of Table 8.2.1.1.1.3-2 → use Table 8.2.1.1.1_1.3-2.

**Table 8.2.1.1.1_1.3-1: Test Parameters for Testing**

| Parameter | | Unit | Test 1- 5 | Test 6- 8 | Test 9 | Test 10-15 | Test 16-18 |
|---|---|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | N/A | 0 | N/A | 0 | N/A |
| | $\rho_B$ | dB | | 0 (Note 1) | | 0 (Note 1) | |
| | $\sigma$ | dB | | 0 | | 0 | |
| $N_{oc}$ at antenna port | | dBm/15kHz | | -98 | | -98 | |
| Symbols for unused PRBs | | | | OCNG (Note 2) | | OCNG (Note 2) | |
| Modulation | | | | 16QAM | | 64QAM | |
| PDSCH transmission mode | | | | 1 | | 1 | |

Note 1: $P_B = 0$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.2.1.1.1_1.3-2: Minimum performance (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | N/A | | | | | | | |
| 2 | N/A | | | | | | | |
| 3 | N/A | | | | | | | |
| 4 | N/A | | | | | | | |
| 5 | N/A | | | | | | | |
| 6 | 5 MHz | R.3-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 6.7 | 1 |
| 7 | 5 MHz | R.3-1 FDD | OP.1 FDD | ETU70 | 1x2 Low | 30 | 1.4 | 1 |
| 8 | 5 MHz | R.3-1 FDD | OP.1 FDD | ETU300 | 1x2 High | 70 | 9.4 | 1 |
| 9 | N/A | | | | | | | |
| 10 | 5 MHz | R.6-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 17.5 | 1 |
| 11 | 10 MHz | R.7-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 16.7 | 1 |
| 12 | 10 MHz | R.7-1 FDD | OP.1 FDD | ETU70 | 1x2 Low | 70 | 18.1 | 1 |
| 13 | 10 MHz | R.7-1 FDD | OP.1 FDD | EVA5 | 1x2 High | 70 | 17.8 | 1 |
| 14 | 15 MHz | R.8-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 16.8 | 1 |
| 15 | 20 MHz | R.9-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 17.3 | 2 |
| | 20 MHz | R.9-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | 16.7 | 1 |
| 16 | N/A | | | | | | | |
| 17 | N/A | | | | | | | |
| 18 | N/A | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.1.

#### 8.2.1.1.1_1.4 Test description

Same test description as in clause 8.2.1.1.1.4 with the following exceptions:

- Instead of Table 8.2.1.1.1.3-1 → use Table 8.2.1.1.1_1.3-1.
- Instead of Table 8.2.1.1.1.3-2 → use Table 8.2.1.1.1_1.3-2.
- Instead of Table 8.2.1.1.1.5-1 → use Table 8.2.1.1.1_1.5-1.

#### 8.2.1.1.1_1.5 Test requirement

Same test requirements as in clause 8.2.1.1.1.5 with the following exceptions:

- Instead of Table 8.2.1.1.1.3-1 → use Table 8.2.1.1.1_1.3-1.
- Instead of Table 8.2.1.1.1.5-1 → use Table 8.2.1.1.1_1.5-1.

**Table 8.2.1.1.1_1.5-1: Test requirement (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | N/A | | | | | | | |
| 2 | N/A | | | | | | | |
| 3 | N/A | | | | | | | |
| 4 | N/A | | | | | | | |
| 5 | N/A | | | | | | | |
| 6 | 5 MHz | R.3-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +7.5 | 1 |
| 7 | 5 MHz | R.3-1 FDD | OP.1 FDD | ETU70 | 1x2 Low | 30 | +2.2 | 1 |
| 8 | 5 MHz | R.3-1 FDD | OP.1 FDD | ETU300 | 1x2 High | 70 | +10.2 | 1 |
| 9 | N/A | | | | | | | |
| 10 | 5 MHz | R.6-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +18.3 | 1 |
| 11 | 10 MHz | R.7-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +17.5 | 1 |
| 12 | 10 MHz | R.7-1 FDD | OP.1 FDD | ETU70 | 1x2 Low | 70 | +18.9 | 1 |
| 13 | 10 MHz | R.7-1 FDD | OP.1 FDD | EVA5 | 1x2 High | 70 | +18.6 | 1 |
| 14 | 15 MHz | R.8-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +17.6 | 1 |
| 15 | 20 MHz | R.9-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +18.1 | 2 |
| | 20 MHz | R.9-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | +17.5 | 1 |
| 16 | N/A | | | | | | | |
| 17 | N/A | | | | | | | |
| 18 | N/A | | | | | | | |

### 8.2.1.1.1_2 FDD PDSCH Single Antenna Port Performance (Release 10 and forward)

#### 8.2.1.1.1_2.1 Test purpose

Same test purpose as in clause 8.2.1.1.1.1.

#### 8.2.1.1.1_2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward.

### 8.2.1.1.1_2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.1.1.1.3 with the following exceptions:

- Instead of Table 8.2.1.1.1.3-1 → use Table 8.2.1.1.1_2.3-1.
- Instead of Table 8.2.1.1.1.3-2 → use Table 8.2.1.1.1_2.3-2.

**Table 8.2.1.1.1_2.3-1: Test Parameters for Testing**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| PDSCH transmission mode | | | 1 |
| Note 1: $P_B = 0$<br>Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |

**Table 8.2.1.1.1_2.3-2: Minimum performance (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.41 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -5.4 | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.1.

### 8.2.1.1.1_2.4 Test description

Same test description as in clause 8.2.1.1.1.4 with the following exceptions:

- Instead of Table 8.2.1.1.1.3-1 → use Table 8.2.1.1.1_2.3-1.
- Instead of Table 8.2.1.1.1.3-2 → use Table 8.2.1.1.1_2.3-2.
- Instead of Table 8.2.1.1.1.5-1 → use Table 8.2.1.1.1_2.5-1.

### 8.2.1.1.1_2.5 Test requirement

Same test requirements as in clause 8.2.1.1.1.5 with the following exceptions:

- Instead of Table 8.2.1.1.1.3-1 → use Table 8.2.1.1.1_2.3-1.
- Instead of Table 8.2.1.1.1.5-1 → use Table 8.2.1.1.1_2.5-1.

**Table 8.2.1.1.1_2.5-1: Test requirement (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 10 MHz | R.41 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -4.6 | ≥1 |

## 8.2.1.1.1_A FDD PDSCH Single Antenna Port Performance for CA

## 8.2.1.1.1_A.1 FDD PDSCH Single Antenna Port Performance for CA (2DL CA)

### 8.2.1.1.1_A.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

### 8.2.1.1.1_A.1.2 Test applicability

This test applies to E-UTRA FDD release 10 and forward UE of category 2 or higher that supports inter-band OR intra-band contiguous DL CA.
This test also applies to E-UTRA FDD release 11 and forward UE of category 2 or higher that supports intra-band non-contiguous DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports

### 8.2.1.1.1_A.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.1, with the addition of the relevant parameters in Tables 8.2.1-1, 8.2.1.1.1_A.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.1.1_A.1.3-2 for the specified SNR. For QPSK and 64QAM performance the bandwidths specified in Table 5.4.2.1-1 are verified.

**Table 8.2.1.1.1_A.1.3-1: Test Parameters for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| PDSCH transmission mode | | | 1 |
| Note 1: $P_B = 0$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |
| Note 3: PUCCH format 1b with channel selection is used to feedback ACK/NACK for Tests in Table 8.2.1.1.1_A.1.3-2. | | | |
| Note 4: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.1.1.1_A.1.3-2: Minimum performance (FRC) for CA with 2DL CCs**

| Test num. | Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | UE category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| 1 | 2x10 MHz | R.2 FDD | OP.1 FDD (Note 1) | EVA5 | 1x2 Low | 70 | -1.1 | ≥3 (Note 2) |
| 2 | 2x20 MHz | R.42 FDD | OP.1 FDD (Note 1) | EVA5 | 1x2 Low | 70 | -1.3 | ≥5 |
| 3 | 2x5 MHz | R.42-2 FDD | OP.1 FDD (NOTE 1) | EVA5 | 1x2 Low | 70 | -1.0 | ≥2 |
| 4 | 10MHz+5 MHz | R.2 FDD for 10MHz CC | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 | ≥3 |
| | | R.42-2 FDD for 5MHz CC | OP.1 FDD | | | 70 | -1.0 | |
| 5 | 15MHz+5 MHz | R.42-3 FDD for 15MHz CC | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.6 | ≥3 |
| | | R.42-2 FDD for 5MHz CC | OP.1 FDD | | | 70 | -1.0 | |
| Note 1: The OCNG pattern applies for each CC.<br>Note 2: 30usec timing difference between two CCs is applied in inter-band CA case.<br>Note 3: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.1.1 with 2 DL CCs.

### 8.2.1.1.1_A.1.4 Test description

#### 8.2.1.1.1_A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.1.1.1_A.1.4-1.

CA Capability to be tested: Select one according to Table 8.2.1.1.1_A.1.4-1

**Table 8.2.1.1.1_A.1.4-1: Test point selection for TM1 CA**

| CA Capability | Bandwidth combination | | | | |
|---|---|---|---|---|---|
| | 10+10 | 20+20 | 5+5 | 10+5 | 15+5 |
| Inter-band CA (two bands) (CA2_A2) | Test1 | Test2 | Test3 | Test4 | Test5 |
| Intra-band contiguous CA (CA2_C) | Test1 | Test2 | Test3 | Test4 | Test5 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA2_N2) | Test1 | Test2 | Test3 | Test5 | Test5 |
| Note 1: Only one test point is tested. Select any one of the UE supported CA capabilities and then moving from left to right select the first CA bandwidth combination supported by the UE within the chosen CA capability. | | | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.35 as appropriate for CC on 2Rx supported RF band and Annex A, Figure A.86 for CC on 4Rx supported RF band.
2. The parameter settings for the cell are set up according to Table 8.2.1-1 and 8.2.1.1.1_A.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.1.1_A.1.4.3.

#### 8.2.1.1.1_A.1.4.2 Test procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.1.1.1_A.1.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.1.1_A.1.3-1 and 8.2.1.1.1_A.1.3-2 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.1.1.1_A.1.5-1 as appropriate.
6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.1.1.1_A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCC configuration there are no additional message contents.

### 8.2.1.1.1_A.1.5 Test requirement

Table 8.2.1.1.1_A.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 for the throughput test shall meet or exceed the specified value in Table 8.2.1.1.1_A.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.1.1_A.1.5-1: Test requirement (FRC)**

| Test num. | Bandwidth Combination | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | | | UE category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band | |
| 1 | 2x10 MHz | R.2 FDD | OP.1 FDD (Note 1) | EVA5 | 1x2 Low | 70 | -0.3 | -1.8 | ≥3 |
| 2 | 2x20 MHz | R.42 FDD | OP.1 FDD (Note 1) | EVA5 | 1x2 Low | 70 | -0.5 | -2.0 | ≥5 |
| 3 | 2x5 MHz | R.42-2 FDD | OP.1 FDD (Note 1) | EVA5 | 1x2 Low | 70 | -0.2 | -1.7 | ≥2 |
| 4 | 10MHz+5MHz | R.2 FDD for 10MHz CC | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 | -2.4 | ≥3 |
| | | R.42-2 FDD for 5MHz CC | OP.1 FDD | | | 70 | -0.2 | -1.7 | |
| 5 | 15MHz+5MHz | R.42-3 FDD for 15MHz CC | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.8 | -2.3 | ≥3 |
| | | R.42-2 FDD for 5MHz CC | OP.1 FDD | | | 70 | -0.2 | -1.7 | |

Note 1: The OCNG pattern applies for each CC.
Note 2: 30usec or 922*Ts timing difference between two CCs is applied in inter-band CA case.
Note 3: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.
Note 4: The SNR requirement for CC on 4Rx supported RF band is as specified in 8.1.2.6.2.

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.1.1_A.2 FDD PDSCH Single Antenna Port Performance for CA (3DL CA)

### 8.2.1.1.1_A.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

### 8.2.1.1.1_A.2.2 Test applicability

This test case applies to all types of E-UTRA FDD release 10 and forward UE of categories 5 or higher that support 3DL with CA configurations in Table 7.1-2a (UE categories 5 and onwards).

This test case also applies to all types of E-UTRA FDD release 11 and forward UE of categories 5 or higher that support 3DL with CA configurations in Table 7.1-2a.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.1.1.1_A.2.3 Minimum conformance requirements

For CA with 3DL CCs, the requirements are specified in Table 8.2.1.1.1_A.2.3-3, based on single carrier requirement specified in Table 8.2.1.1.1_A.2.3-2, with the addition of the parameters in Table 8.2.1.1.1_A.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.1.1.1_A.2.3-1: Test Parameters for CA (3DL CA)**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | $\sigma$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| PDSCH transmission mode | | | 1 |
| Note 1: $P_B = 0$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |
| Note 3: PUCCH format 3 is used to feedback ACK/NACK for Tests in Table 8.2.1.1.1_A.2.3-3. | | | |
| Note 4: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.1.1.1_A.2.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.3 |
| 3MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.1 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.0 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |

**Table 8.2.1.1.1_A.2.3-3: Minimum performance (FRC) based on single carrier performance for CA with 3DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.2.1.1.1_A.2.3-2 per CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.2.1.1.1_A.2.3-2 per CC | ≥5 |
| 3 | 20MHz+20MHz+10MHz | As specified in Table 8.2.1.1.1_A.2.3-2 per CC | ≥5 |
| 4 | 20MHz+15MHz+15MHz | As specified in Table 8.2.1.1.1_A.2.3-2 per CC | ≥5 |
| 5 | 20MHz+15MHz+10MHz | As specified in Table 8.2.1.1.1_A.2.3-2 per CC | ≥5 |
| 6 | 20MHz+10MHz+10MHz | As specified in Table 8.2.1.1.1_A.2.3-2 per CC | ≥5 |
| 7 | 15MHz+15MHz+10MHz | As specified in Table 8.2.1.1.1_A.2.3-2 per CC | ≥5 |
| 8 | 20MHz+10MHz+5MHz | As specified in Table 8.2.1.1.1_A.2.3-2 per CC | ≥5 |
| 9 | 20MHz+15MHz+5MHz | As specified in Table 8.2.1.1.1_A.2.3-2 per CC | ≥5 |
| 10 | 10MHz+10MHz+5MHz | As specified in Table 8.2.1.1.1_A.2.3-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |
| Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.1.

### 8.2.1.1.1_A.2.4 Test description

#### 8.2.1.1.1_A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.1.1.1_A.2.4-1.

CA Capability to be tested: Select one according to Table 8.2.1.1.1_A.2.4-1

**Table 8.2.1.1.1_A.2.4-1: Test point selection for TM1 CA**

| CA Capability | Bandwidth combination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 3x20 | 20+20+15 | 20+20+10 | 20+15+15 | 20+15+10 | 20+10+10 | 15+15+10 | 20+10+5 | 20+15+5 | 10+10+5 |
| Intra-band contiguous CA (CA3_C) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Inter-band CA (two bands) (CA3_A2) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Inter-band CA (three bands) (CA3_A3) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA3_N2) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | | | | | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.59 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.1-1 and 8.2.1.1.1_A.2.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.1.1_A.2.4.3.

#### 8.2.1.1.1_A.2.4.2 Test procedure

1. Configure SCCs according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.1.1.1_A.2.4.3.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.1.1_A.2.3-1 and 8.2.1.1.1_A.2.3-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.1.1.1_A.2.5-1 as appropriate.

6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

### 8.2.1.1.1_A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

### 8.2.1.1.1_A.2.5 Test requirement

Table 8.2.1.1.1_A.1.3-1 defines the primary level settings.

For CA with 3DL CCs, the requirements are specified in Table 8.2.1.1.1_A.2.5-2, based on single carrier requirement specified in Table 8.2.1.1.1_A.2.5-1.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 for the throughput test shall meet or exceed the specified value in Table 8.2.1.1.1_A.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.1.1_A.2.5-1: Single carrier Test requirement for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2RX Supported RF band | SNR (dB) for CC on 4RX Supported RF band |
| 1.4MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.5 | -2.0 |
| 3MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.3 | -1.8 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.2 | -1.7 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 | -2.4 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.8 | -2.3 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 | -2.4 |

**Table 8.2.1.1.1_A.2.5-2: Test requirement (FRC) based on single carrier performance for CA with 3DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.2.1.1.1_A.2.5-1 per CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.2.1.1.1_A.2.5-1 per CC | ≥5 |
| 3 | 20MHz+20MHz+10MHz | As specified in Table 8.2.1.1.1_A.2.5-1 per CC | ≥5 |
| 4 | 20MHz+15MHz+15MHz | As specified in Table 8.2.1.1.1_A.2.5-1 per CC | ≥5 |
| 5 | 20MHz+15MHz+10MHz | As specified in Table 8.2.1.1.1_A.2.5-1 per CC | ≥5 |
| 6 | 20MHz+10MHz+10MHz | As specified in Table 8.2.1.1.1_A.2.5-1 per CC | ≥5 |
| 7 | 15MHz+15MHz+10MHz | As specified in Table 8.2.1.1.1_A.2.5-1 per CC | ≥5 |
| 8 | 20MHz+10MHz+5MHz | As specified in Table 8.2.1.1.1_A.2.5-1 per CC | ≥5 |
| 9 | 20MHz+15MHz+5MHz | As specified in Table 8.2.1.1.1_A.2.5-1 per CC | ≥5 |
| 10 | 10MHz+10MHz+5MHz | As specified in Table 8.2.1.1.1_A.2.5-1 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3<br>Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.1.1_A.3 Void

## 8.2.1.1.1_A.4 FDD PDSCH Single Antenna Port Performance for CA (4DL CA)

### 8.2.1.1.1_A.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

### 8.2.1.1.1_A.4.2 Test applicability

This test case applies to all types of E-UTRA FDD release 11 and forward UE of categories 8 or higher that support 4DL with CA configurations in Table 7.1-2b.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.1.1.1_A.4.3 Minimum conformance requirements

For CA with 4DL CCs, the requirements are specified in Table 8.2.1.1.1_A.4.3-3, based on single carrier requirement specified in Table 8.2.1.1.1_A.4.3-2, with the addition of the parameters in Table 8.2.1.1.1_A.4.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.1.1.1_A.4.3-1: Test Parameters for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | $\sigma$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| PDSCH transmission mode | | | 1 |
| Note 1: $P_B = 0$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |
| Note 3: PUCCH format 3 is used to feedback ACK/NACK for Tests in Table 8.2.1.1.1_A.4.3-3. | | | |
| Note 4: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.1.1.1_A.4.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.3 |
| 3MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.1 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.0 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |

**Table 8.2.1.1.1_A.4.3-3: Minimum performance (FRC) based on single carrier performance for CA with 4DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.2.1.1.1_A.4.3-2 per CC | ≥8 |
| 2 | 10MHz+20MHz+20MHz+20MHz | As specified in Table 8.2.1.1.1_A.4.3-2 per CC | ≥8 |
| 3 | 10MHz+10MHz+20MHz+20MHz | As specified in Table 8.2.1.1.1_A.4.3-2 per CC | ≥8 |
| 4 | 5MHz+10MHz+20MHz+20MHz | As specified in Table 8.2.1.1.1_A.4.3-2 per CC | ≥8 |
| 5 | 5MHz+10MHz+10MHz+20MHz | As specified in Table 8.2.1.1.1_A.4.3-2 per CC | ≥8 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | |
| NOTE 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.1.

### 8.2.1.1.1_A.4.4 Test description

#### 8.2.1.1.1_A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.1.1.1_A.4.4-1.

CA Capability to be tested: Select one according to Table 8.2.1.1.1_A.4.4-1

**Table 8.2.1.1.1_A.4.4-1: Test point selection for TM1 CA**

| **CA Capability** | **Bandwidth combination** | | | | |
|---|---|---|---|---|---|
| | 4x20 | 10+20+20+20 | 10+10+20+20 | 5+10+20+20 | 5+10+10+20 |
| Inter-band CA (two bands) (CA4_A2) | Test1 | Test2 | Test3 | Test4 | Test5 |
| Inter-band CA (three bands) (CA4_A3) | Test1 | Test2 | Test3 | Test4 | Test5 |
| Inter-band CA (four bands) (CA4_A4) | Test1 | Test2 | Test3 | Test4 | Test5 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA4_N2) | Test1 | Test2 | Test3 | Test4 | Test5 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.59 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.2.1-1 and 8.2.1.1.1_A.4.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.1.1_A.4.4.3.

### 8.2.1.1.1_A.4.4.2 Test procedure

1. Configure SCCs according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.1.1.1_A.4.4.3.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.1.1_A.4.3-1 and 8.2.1.1.1_A.4.3-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.1.1.1_A.4.5-1 as appropriate.

6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.1.1.1_A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

#### 8.2.1.1.1_A.4.5 Test requirement

Table 8.2.1.1.1_A.1.3-1 defines the primary level settings.

For CA with 4DL CCs, the requirements are specified in Table 8.2.1.1.1_A.4.5-2, based on single carrier requirement specified in Table 8.2.1.1.1_A.4.5-1.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 for the throughput test shall meet or exceed the specified value in Table 8.2.1.1.1_A.4.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.1.1_A.4.5-1: Single carrier Test requirement for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.5 |
| 3MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.3 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.2 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |

**Table 8.2.1.1.1_A.4.5-2: Test requirement (FRC) based on single carrier performance for CA with 4DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.2.1.1.1_A.4.5-1 per CC | ≥8 |
| 2 | 10MHz+20MHz+20MHz+20MHz | As specified in Table 8.2.1.1.1_A.4.5-1 per CC | ≥8 |
| 3 | 10MHz+10MHz+20MHz+20MHz | As specified in Table 8.2.1.1.1_A.4.5-1 per CC | ≥8 |
| 4 | 5MHz+10MHz+20MHz+20MHz | As specified in Table 8.2.1.1.1_A.4.5-1 per CC | ≥8 |
| 5 | 5MHz+10MHz+10MHz+20MHz | As specified in Table 8.2.1.1.1_A.4.5-1 per CC | ≥8 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3<br>NOTE 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.1.1_A.5 FDD PDSCH Single Antenna Port Performance for CA (5 DL CA)

### 8.2.1.1.1_A.5.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

### 8.2.1.1.1_A.5.2 Test applicability

This test case applies to all types of E-UTRA FDD release 11 and forward UE of categories 8, category 11 or higher that support 5DL with CA configurations in Table 7.1-2c.

This test case also applies to all types of E-UTRA FDD release 12 and forward UE of categories 8, category 11 or higher that support 5DL with CA configurations in Table 7.1-2c.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.1.1.1_A.5.3 Minimum conformance requirements

For CA with 5DL CCs, the requirements are specified in Table 8.2.1.1.1_A.5.3-3, based on single carrier requirement specified in Table 8.2.1.1.1_A.5.3-2, with the addition of the parameters in Table 8.2.1.1.1_A.5.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.1.1.1_A.5.3-1: Test Parameters for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | $\sigma$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| PDSCH transmission mode | | | 1 |
| Note 1: $P_B = 0$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |
| Note 3: PUCCH format 3 is used to feedback ACK/NACK for Tests in Table 8.2.1.1.1_A.5.3-3. | | | |
| Note 4: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.1.1.1_A.5.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.3 |
| 3MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.1 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.0 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |

**Table 8.2.1.1.1_A.5.3-3: Minimum performance (FRC) based on single carrier performance for CA with 5DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.2.1.1.1_A.5.3-2 per CC | 8, ≥11 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3<br>NOTE 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.1.

### 8.2.1.1.1_A.5.4 Test description

#### 8.2.1.1.1_A.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.1.1.1_A.5.4-1.

CA Capability to be tested: Select one according to Table 8.2.1.1.1_A.5.4-1

**Table 8.2.1.1.1_A.5.4-1: Test point selection for TM1 CA**

| CA Capability | Bandwidth combination |
|---|---|
| | 5x20 |
| Inter-band CA (two bands) (CA5_A2) | Test1 |
| Inter-band CA (three bands) (CA5_A3) | Test1 |
| Inter-band CA (four bands) (CA5_A4) | Test1 |
| Inter-band CA (five bands) (CA5_A5) | Test1 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA5_N2) | Test1 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.59 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.1-1 and 8.2.1.1.1_A.5.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.1.1_A.5.4.3.

#### 8.2.1.1.1_A.5.4.2 Test procedure

1. Configure SCCs according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.1.1.1_A.5.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.1.1_A.5.3-1 and 8.2.1.1.1_A.5.3-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.1.1.1_A.5.5-1 as appropriate.
6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.1.1.1_A.5.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

#### 8.2.1.1.1_A.5.5 Test requirement

Table 8.2.1.1.1_A.1.3-1 defines the primary level settings.

For CA with 5DL CCs, the requirements are specified in Table 8.2.1.1.1_A.5.5-2, based on single carrier requirement specified in Table 8.2.1.1.1_A.5.5-1.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 for the throughput test shall meet or exceed the specified value in Table 8.2.1.1.1_A.5.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.1.1_A.5.5-1: Single carrier Test requirement for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.5 |
| 3MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.3 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.2 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |

**Table 8.2.1.1.1_A.5.5-2: Test requirement (FRC) based on single carrier performance for CA with 5DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.2.1.1.1_A.5.5-1 per CC | 8, ≥11 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | |
| NOTE 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.1.2 FDD PDSCH Single Antenna Port Performance with 1 PRB in presence of MBSFN

### 8.2.1.1.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS for 1 PRB allocation in presence of MBSFN.

### 8.2.1.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

### 8.2.1.1.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.1, with the addition of the relevant parameters in Tables 8.2.1-1, 8.2.1.1.2.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.1.1.2.3-2, for the specified SNR.

**Table 8.2.1.1.2.3-1: Test Parameters for Testing 1 PRB allocation**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for MBSFN portion of MBSFN subframes (Note 2) | | | OCNG (Note 3) |
| PDSCH transmission mode | | | 1 |
| Note 1: $P_B = 0$<br>Note 2: The MBSFN portion of an MBSFN subframe comprises the whole MBSFN subframe except the first two symbols in the first slot.<br>Note 3: The MBSFN portion of the MBSFN subframes shall contain QPSK modulated data. Cell-specific reference signals are not inserted in the MBSFN portion of the MBSFN subframes, QPSK modulated MBSFN data is used instead. | | | |

**Table 8.2.1.1.2.3-2: Minimum performance 1 PRB allocation (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.29 FDD | OP.3 FDD | ETU70 | 1x2 Low | 30 | 2.0 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.1.

### 8.2.1.1.2.4 Test description

#### 8.2.1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Low Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Tables 8.2.1.1.2.3-2as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1, 8.2.1.1.2.3-1as appropriate.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.1.2.4.3.

#### 8.2.1.1.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.1.2.3-1 and 8.2.1.1.2.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.2.1.1.2.5-1as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.1.1.2.4.3-1: *SystemInformationBlockType2*: Additional FDD PDSCH Single Antenna Port Performance for 1 PRB allocation with MBSFN subframes test point 1 requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 SystemInformationBlockType2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2 ::= SEQUENCE { | | | |
| mbsfn-SubframeConfig ::= SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | Every radio frame is with MBSFN subframe | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE { | | | |
| oneFrame | 111111 | Subframe 1, 2, 3, 6, 7, 8 is used for MBSFN | FDD |
| } | | | |
| } | | | |

8.2.1.1.2.5 Test requirement

Table 8.2.1.1.2.3-1defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.1.2.5-1for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.1.2.5-1: Test requirement 1 PRB allocation with MBSFN subframes (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.29 FDD | OP.3 FDD | ETU70 | 1x2 Low | 30 | +2.8 | 1-8 |

## 8.2.1.2 FDD PDSCH Transmit Diversity Performance (Cell-Specific Reference Symbols)

### 8.2.1.2.1 FDD PDSCH Transmit Diversity 2x2

Editor's note: SNR requirement for 4Rx UE without 2Rx RF bands are still in square brackets

#### 8.2.1.2.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using transmit diversity (SFBC).

#### 8.2.1.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.1.2.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.2.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.2.1.3-2 for the specified SNR. For transmit diversity (SFBC) performance with 2 transmitter antennas as specified.

**Table 8.2.1.2.1.3-1: Test Parameters for Testing Transmit Diversity Performance**

| Parameter | | Unit | Test 1-2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 2 |
| Note 1: $P_B = 1$ | | | |

**Table 8.2.1.2.1.3-2: Minimum performance Transmit Diversity (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11 FDD | OP.1 FDD | EVA5 | 2x2 Medium | 70 | 6.8 | 2-8 |
| | 5 MHz (Note 1) | R.11-2 FDD | OP.1 FDD | EVA5 | 2x2 Medium | 70 | 5.9 | 2-8 |
| 2 | 10 MHz | R.10 FDD | OP.1 FDD | HST | 2x2 | 70 | -2.3 | 1-8 |
| Note 1: Test case applicability is defined in 8.1.2.1. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.2.

### 8.2.1.2.1.4 Test description

#### 8.2.1.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.2.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2 for UE with 2Rx RF band and Annex A, Figure A.10a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.2.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.2.1.4.3.

#### 8.2.1.2.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.2.1.3-1 and 8.2.1.2.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.1.2.1.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
4. Repeat steps from 1 to 3 for each test interval in Table 8.2.1.2.1.5-1 as appropriate.

#### 8.2.1.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 8.2.1.2.1.5 Test requirement

Table 8.2.1.2.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.2.1.2.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.2.1.5-1: Test requirement Transmit Diversity (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for UE with 2Rx RF band | SNR (dB) for 4Rx UE without 2Rx RF bands | |
| 1 | 10 MHz | R.11 FDD | OP.1 FDD | EVA5 | 2x2 Medium | 70 | 7.7 | NA | 2-8 |
| | 5 MHz (Note 1) | R.11-2 FDD | OP.1 FDD | EVA5 | 2x2 Medium | 70 | 6.8 | NA | 2-8 |
| 2 | 10 MHz | R.10 FDD | OP.1 FDD | HST | 2x2 | 70 | -1.7 | [-3.2] | 1-8 |

Note 1: Test case is applicable (according to sub clause 8.1.2.1) to UE's which, from the E-UTRA operating bands defined in Table 5.2-1, support only E-UTRA band 31.
NOTE 2: The SNR requirement for 4Rx capable UEs is as specified in 8.1.2.6.1

## 8.2.1.2.1_1 FDD PDSCH Transmit Diversity 2x2 (Release 9 and forward)

### 8.2.1.2.1_1.1 Test purpose

Same test purpose as in clause 8.2.1.2.1.1.

### 8.2.1.2.1_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward of UE category 1.

### 8.2.1.2.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.1.2.1.3 with the following exceptions:

- Instead of Table 8.2.1.2.1.3-1 → use Table 8.2.1.2.1_1.3-1.
- Instead of Table 8.2.1.2.1.3-2 → use Table 8.2.1.2.1_1.3-2.

**Table 8.2.1.2.1_1.3-1: Test Parameters for Testing Transmit Diversity Performance**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 2 |
| Note 1: $P_B = 1$ | | | |

**Table 8.2.1.2.1_1.3-2: Minimum performance Transmit Diversity (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 5 MHz | R.11-2 FDD | OP.1 FDD | EVA5 | 2x2 Medium | 70 | 5.9 | 1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.2.

### 8.2.1.2.1_1.4 Test description

Same test description as in clause 8.2.1.2.1.4 with the following exceptions:

- Instead of Table 8.2.1.2.1.3-1 → use Table 8.2.1.2.1_1.3-1.
- Instead of Table 8.2.1.2.1.3-2 → use Table 8.2.1.2.1_1.3-2.
- Instead of Table 8.2.1.2.1.5-1 → use Table 8.2.1.2.1_1.5-1.

### 8.2.1.2.1_1.5 Test requirement

Same test requirements as in clause 8.2.1.2.1.5 with the following exceptions:

- Instead of Table 8.2.1.2.1.3-1 → use Table 8.2.1.2.1_1.3-1.
- Instead of Table 8.2.1.2.1.5-1 → use Table 8.2.1.2.1_1.5-1.

**Table 8.2.1.2.1_1.5-1: Test requirement Transmit Diversity (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 5 MHz | R.11-2 FDD | OP.1 FDD | EVA5 | 2x2 Medium | 70 | +6.8 | 1 |

## 8.2.1.2.2 FDD PDSCH Transmit Diversity 4x2

### 8.2.1.2.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using transmit diversity (SFBC-FSTD).

#### 8.2.1.2.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

#### 8.2.1.2.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.2.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.2.2.3-2 for the specified SNR. For transmit diversity (SFBC) performance with 4 transmitter antennas as specified.

**Table 8.2.1.2.2.3-1: Test Parameters for Testing Transmit Diversity Performance**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 2 |
| Note 1: $P_B = 1$ | | | |

**Table 8.2.1.2.2.3-2: Minimum performance Transmit Diversity (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 1.4 MHz | R.12 FDD | OP.1 FDD | EPA5 | 4x2 Medium | 70 | 0.6 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.2.

#### 8.2.1.2.2.4 Test description

##### 8.2.1.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.2.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.11 for antenna configuration 4x2.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.2.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.2.2.4.3.

#### 8.2.1.2.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.2.2.3-1 and 8.2.1.2.2.3-2. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.1.2.2.5-1 as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.1.2.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH transmit diversity performance downlink power allocation test point 1 requirement**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | |
| } | | | |

#### 8.2.1.2.2.5 Test requirement

Table 8.2.1.2.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.2.1.2.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.2.2.5-1: Test requirement Transmit Diversity (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 1.4 MHz | R.12 FDD | OP.1 FDD | EPA5 | 4x2 Medium | 70 | 1.5 | 1-8 |

### 8.2.1.2.2_1 FDD PDSCH Transmit Diversity 4x2 (Release 9 and forward)

#### 8.2.1.2.2_1.1 Test purpose

Same test purpose as in clause 8.2.1.2.2.1.

#### 8.2.1.2.2_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward.

#### 8.2.1.2.2_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.1.2.2.3 with the following exceptions:

- Instead of Table 8.2.1.2.2.3-1 → use Table 8.2.1.2.2_1.3-1.

- Instead of Table 8.2.1.2.2.3-2 → use Table 8.2.1.2.2_1.3-2.

**Table 8.2.1.2.2_1.3-1: Test Parameters for Testing Transmit Diversity Performance**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 2 |
| Note 1: $P_B = 1$ | | | |

**Table 8.2.1.2.2_1.3-2: Minimum performance Transmit Diversity (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.13 FDD | OP.1 FDD | ETU70 | 4x2 Low | 70 | -0.9 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.2.

### 8.2.1.2.2_1.4 Test description

Same test description as in clause 8.2.1.2.2.4 with the following exceptions:

- Instead of Table 8.2.1.2.2.3-1 → use Table 8.2.1.2.2_1.3-1.
- Instead of Table 8.2.1.2.2.3-2 → use Table 8.2.1.2.2_1.3-2.
- Instead of Table 8.2.1.2.2.5-1 → use Table 8.2.1.2.2_1.5-1.

### 8.2.1.2.2_1.5 Test requirement

Same test requirements as in clause 8.2.1.2.2.5 with the following exceptions:

- Instead of Table 8.2.1.2.2.3-1 → use Table 8.2.1.2.2_1.3-1.
- Instead of Table 8.2.1.2.2.5-1 → use Table 8.2.1.2.2_1.5-1.

**Table 8.2.1.2.2_1.5-1: Test requirement Transmit Diversity (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.13 FDD | OP.1 FDD | ETU70 | 4x2 Low | 70 | 0 | 1-8 |

8.2.1.2.3

## 8.2.1.2.3_C FDD PDSCH Transmit diversity 2x2 for eICIC

## 8.2.1.2.3_C.1 FDD PDSCH Transmit diversity 2x2 for eICIC (non-MBSFN ABS)

### 8.2.1.2.3_C.1.1 Test purpose

To verify the UE's performance of transmit diversity (SFBC) with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

### 8.2.1.2.3_C.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward. Applicability requires support for FGI bit 115.

### 8.2.1.2.3_C.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.2.3_C.1.3-1.

In Table 8.2.1.2.3_C.1.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Table C.3.2-1 in Annex C.3.2 and for Cell 2 is according to Table C.3.3-1 in Annex C.3.3, respectively.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.2.3_C.1.3-2 for the specified SNR.

**Table 8.2.1.2.3_C.1.3-1: Test Parameters for Transmit diversity Performance (FRC)**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -102 (Note 2) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -94.8 (Note 4) | N/A |

| | | | | |
|---|---|---|---|---|
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.1.2.3_C.1.3-2 | 6 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 1 |
| ABS pattern (Note 5) | | | N/A | 11000100<br>11000000<br>11000000<br>11000000`<br>11000000 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 11000100<br>11000000<br>11000000<br>11000000<br>11000000 | N/A |
| | $C_{CSI,1}$ | | 00111011<br>00111111<br>00111111<br>00111111<br>00111111 | N/A |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 2 | N/A |
| Cyclic prefix | | | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 9: SIB-1 will not be transmitted in Cell2 in this test.

**Table 8.2.1.2.3_C.1.3-2: Minimum Performance Transmit Diversity (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) Note 5 | SNR (dB) (Note 2) | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | R.11-4 FDD Note 4 | OP.1 FDD | OP.1 FDD | EVA5 | EVA 5 | 2x2 Medium | 70 | 3.4 | 2-8 |
| Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent. | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1. | | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | | |
| Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. | | | | | | | | | |
| Note 5: The maximum Throughput is calculated from the total Payload in 9 subframes, averaged over 40ms. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.2.3.

### 8.2.1.2.3_C.1.4 Test description

#### 8.2.1.2.3_C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.2.3_C.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the cell1 are set up according to Tables 8.2.1-1 and 8.2.1.2.3_C.1.3-1 as appropriate.
3. Downlink signals are initially set up for Cell1 according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.2.3_C.1.4.3.

#### 8.2.1.2.3_C.1.4.2 Test procedure

1. Set the parameters for Cell1 and Cell2 according to Tables 8.2.1.2.3_C.1.5-1, 8.2.1.2.3_C.1.5-2, C.3.3-1 of Annex C.3.3 as appropriate, and SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC. The SS sends downlink MAC padding bits on the DL RMC. Propagation conditions are set according to Annex B clause B.2
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.1.2.3_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.1.2.3_C.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional FDD PDSCH transmit diversity performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '10000000100000001000 00001000000010000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.2.3_C.1.4.3-2: *CQI-ReportConfig-r10-DEFAULT*: Additional FDD PDSCH transmit diversity performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '11000100110000001100 00001100000011000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '00111011001111110011 11110011111100111111' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.1.2.3_C.1.5 Test requirement

Table 8.2.1.2.3_C.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.2.1.2.3_C.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.2.3_C.1.5-1: Test Parameters for Transmit Diversity (FRC)**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -102.1 (Note 2) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -94.9 (Note 4) | N/A |

| | | | | |
|---|---|---|---|---|
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.1.2.3_C.1.5-2 | 5.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 1 |
| ABS pattern (Note 5) | | | N/A | 11000100<br>11000000<br>11000000<br>11000000<br>11000000 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 11000100<br>11000000<br>11000000<br>11000000<br>11000000 | N/A |
| | $C_{CSI,1}$ | | 00111011<br>00111111<br>00111111<br>00111111<br>00111111 | N/A |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 2 | N/A |
| Cyclic prefix | | | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 9: SIB-1 will not be transmitted in Cell2 in this test.

**Table 8.2.1.2.3_C.1.5-2: Test requirement Transmit Diversity (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) Note 5 | SNR (dB) (Note 2) | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | R.11-4 FDD Note 4 | OP.1 FDD | OP.1 FDD | EVA5 | EVA 5 | 2x2 Medium | 70 | 4.3 | 2-8 |
| Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent. | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1. | | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | | |
| Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. | | | | | | | | | |
| Note 5: The maximum Throughput is calculated from the total Payload in 9 subframes, averaged over 40ms. | | | | | | | | | |

## 8.2.1.2.3_D

## 8.2.1.2.3_E FDD PDSCH Transmit diversity 2x2 for feICIC

## 8.2.1.2.3_E.1 FDD PDSCH Transmit diversity 2x2 for feICIC (non-MBSFN ABS)

### 8.2.1.2.3_E.1.1 Test purpose

To verify the UE's performance of transmit diversity (SFBC) with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [14] of the aggressor cells with CRS assistance information.

### 8.2.1.2.3_E.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE and CRS interference handling – Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

### 8.2.1.2.3_E.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.2.3_E.1.3-1.

In Table 8.2.1.2.3_E.1-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information TS 36.331 [5] includes Cell 2 and Cell 3.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.2.3_E.1.3-2 for the specified SNR.

**Table 8.2.1.2.3_E.1.3-1: Test Parameters for Transmit diversity Performance (FRC)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93 (Note 4) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.1.2.3_E.1.3-2 | 12 | 10 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 5) | | | N/A | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 | N/A | N/A |
| | $C_{CSI,1}$ | | 00111111<br>00111111<br>00111111<br>00111111<br>00111111 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| PDSCH transmission mode | | | 2 | Note 9 | Note 9 |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by “0” of ABS pattern.
Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern as defined in TS 36.521-1 [10] Annex A.5.
Note 10: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 11: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

**Table 8.2.1.2.3_E.1.3-2: Minimum Performance Transmit Diversity (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) (Note 5) | SNR (dB) (Note 3) | |
| 1 | R.11-4 FDD (Note 4) | OP.1 FDD | OP.1 FDD | OP.1 FDD | EVA5 | EVA5 | EVA5 | 2x2 Medium | 70 | 3.4 | ≥2 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1.
Note 4: Cell 1 reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: The maximum throughput is calculated from the total Payload in 9 subframes, averaged over 40ms.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.2.3A.

### 8.2.1.2.3_E.1.4 Test description

#### 8.2.1.2.3_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.2.3_E.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.2.3_E.1.3-1 as appropriate.
3. Downlink signals are initially set up for Cell 1 according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.2.3_E.1.4.3.

#### 8.2.1.2.3_E.1.4.2 Test procedure

1. Set the parameters for Cell 1, Cell 2 and Cell 3, according to Tables 8.2.1.2.3_E.1.5-1, 8.2.1.2.3_E.1.5-2, and C.3.3.2 of Annex C.3.3. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC.
2. The SS sends downlink MAC padding bits on the DL RMC. Propagation conditions are set according to Annex B clause B.2
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

8.2.1.2.3_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 8.2.1.2.3_E.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional FDD PDSCH transmit diversity performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.2A.5, Table 5.2A.5.1.1-2 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '1000000010000000 1000000010000000 10000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 126 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.2.3_E.1.4.3-2: *CQI-ReportConfig-r10-DEFAULT*: Additional FDD PDSCH transmit diversity performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '11000000 11000000 11000000 11000000 11000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '00111111 00111111 00111111 00111111 00111111' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.1.2.3_E.1.5 Test requirement

Table 8.2.1.2.3_E.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.2.1.2.3_E.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.2.3_E.1.5-1: Test Parameters for Transmit diversity Performance (FRC)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93.1 (Note 4) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.1.2.3_E.1.5-2 | 11.8 | 9.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 5) | | | N/A | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 | N/A | N/A |
| | $C_{CSI,1}$ | | 00111111<br>00111111<br>00111111<br>00111111<br>00111111 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| PDSCH transmission mode | | | 2 | Note 9 | Note 9 |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by “0” of ABS pattern.
Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern as defined in TS 36.521-1 [10] Annex A.5.
Note 10: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 11: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

**Table 8.2.1.2.3_E.1.5-2: Test requirement Transmit Diversity (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) (Note 5) | SNR (dB) (Note 3) | |
| 1 | R.11-4 FDD (Note 4) | OP.1FDD | OP.1FDD | OP.1FDD | EVA5 | EVA5 | EVA5 | 2x2 Medium | 70 | 4.3 | ≥2 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1.
Note 4: Cell 1 reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: The maximum throughput is calculated from the total Payload in 9 subframes, averaged over 40ms.

## 8.2.1.2.4 FDD PDSCH Transmit Diversity 2x2 with TM3 Interference Model – Enhanced Performance Requirement Type A

### 8.2.1.2.4.1 Test purpose

The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two dominant interfering cells applying transmission mode 3 interference model defined in clause B.5.2.

### 8.2.1.2.4.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward that support enhanced receiver Type A.

### 8.2.1.2.4.3 Minimum conformance requirements

The requirements are specified in Table 8.2.1.2.4.3-2, with the addition of parameters in Table 8.2.1.2.4.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.2.1.2.4.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.2.1.2.4.3-1: Test Parameters for Transmit diversity Performance (FRC) with TM3 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 | -3 |
| | σ | dB | 0 | 0 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A | N/A |
| DIP (Note 2) | | dB | N/A | -2.23 | -8.06 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 2 |
| Number of control OFDM symbols | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 2 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.5.2 | As specified in clause B.5.2 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 | 80 |
| | Rank 2 | % | N/A | 20 | 20 |
| Reporting interval | | ms | 5 | N/A | N/A |
| Reporting mode | | | PUCCH 1-0 | N/A | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note5) | N/A | N/A |
| cqi-pmi-ConfigurationIndex | | | 2 | N/A | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: Cell 2 transmission is delayed with respect to Cell 1 by 0.33 ms and Cell 3 transmission is delayed with respect to Cell 1 by 0.67 ms.

Note 5: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5 and #0.

**Table 8.2.1.2.4.3-2: Enhanced Performance Requirement Type A, Transmit Diversity (FRC) with TM3 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.46 FDD | OP.1 FDD | N/A | N/A | EVA70 | EVA70 | EVA70 | 2x2 Low | 70 | -1.1 | 1-8 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.2.4.

### 8.2.1.2.4.4 Test description

#### 8.2.1.2.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.2.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.2.1.2.4.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.2.4.4.3.

#### 8.2.1.2.4.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.2.4.5-1 and 8.2.1.2.4.5-2. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1 and #6 (Table A.2.2.1.1-1).
2. SS sets up parameters for cell 2 and cell 3 according to table 8.2.1.2.4.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SINR according to Tables 8.2.1.2.4.5-1 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5-14 in Annex G clause G.3.

#### 8.2.1.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

**Table 8.2.1.2.4.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 8.2.1.2.4.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 2 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

8.2.1.2.4.5 Test requirement

Table 8.2.1.2.4.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.2.1.2.4.5-2 for the specified SINR including test tolerances.

**Table 8.2.1.2.4.5-1: Test Parameters for Transmit diversity Performance (FRC) with TM3 interference model**

| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** | **Cell 3** |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 | -3 |
| | σ | dB | 0 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A | N/A |
| DIP (Note 2) | | dB | N/A | -1.88 | -7.21 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 2 |
| Number of control OFDM symbols | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 2 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.5.2 | As specified in clause B.5.2 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 | 80 |
| | Rank 2 | % | N/A | 20 | 20 |

| | | | | |
|---|---|---|---|---|
| Reporting interval | ms | 5 | N/A | N/A |
| Reporting mode | | PUCCH 1-0 | N/A | N/A |
| Physical channel for CQI reporting | | PUSCH(Note5) | N/A | N/A |
| cqi-pmi-ConfigurationIndex | | 2 | N/A | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: Cell 2 transmission is delayed with respect to Cell 1 by 0.33 ms and Cell 3 transmission is delayed with respect to Cell 1 by 0.67 ms.

Note 5: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5 and #0.

**Table 8.2.1.2.4.5-2: Test requirement for Enhanced Performance Requirement Type A, Transmit Diversity (FRC) with TM3 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.46 FDD | OP.1 FDD | N/A | N/A | EVA70 | EVA70 | EVA70 | 2x2 Low | 70 | -0.15 | 1-8 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

## 8.2.1.2.5 FDD PDSCH Transmit Diversity 2x2 with TM2 Interference Model – Enhanced Performance Requirement Type B

### 8.2.1.2.5.1 Test purpose

The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 2 interference model defined in clause B.6.1.

### 8.2.1.2.5.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward that support enhanced performance requirement Type B.

### 8.2.1.2.5.3 Minimum conformance requirements

The requirements are specified in Table 8.2.1.2.5.3-2, with the addition of parameters in Table 8.2.1.2.5.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.2.1.2.5.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.2.1.2.5.3-1: Test Parameters for Transmit diversity Performance (FRC) with TM2 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (NOTE 1) | -3 | -3 |
| | σ | dB | 0 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 6 | 1 |
| Number of control OFDM symbols | | | 3 | 3 | 3 |
| CFI indicated in PCFICH | | | 3 | 3 | 3 |
| PDSCH transmission mode | | | 2 | 2 | 2 |
| Interference model | | | N/A | As specified in clause B.6.1 | As specified in clause B.6.1 |
| MBSFN | | | Not configured | Not configured | Not configured |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| NeighCellsInfo-r12 (NOTE 3) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

NOTE 1: $P_B = 1$
NOTE 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
NOTE 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331[5].

**Table 8.2.1.2.5.3-2: Minimum Performance for Enhanced Performance Requirement Type B, Transmit Diversity (FRC) with TM2 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (NOTE 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (NOTE 2) | |
| 1 | R.11-10 FDD | OP.1 FDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 15.5 | ≥1 |

NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
NOTE 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1.
NOTE 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.2.5.

### 8.2.1.2.5.4 Test description

#### 8.2.1.2.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.2.5.3-2, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.2.1.2.5.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.2.5.4.3.

#### 8.2.1.2.5.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.2.5.5-1 and 8.2.1.2.5.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 and cell 3 according to table 8.2.1.2.5.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.1.2.5.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.
5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

#### 8.2.1.2.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m).

### 8.2.1.2.5.5 Test requirement

Table 8.2.1.2.5.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.2.1.2.5.5-2 for the specified SNR including test tolerances.

**Table 8.2.1.2.5.5-1: Test Parameters for Transmit diversity Performance (FRC) with TM2 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (NOTE 1) | -3 | -3 |
| | σ | dB | 0 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 14.71 | 4.14 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 6 | 1 |
| Number of control OFDM symbols | | | 3 | 3 | 3 |
| CFI indicated in PCFICH | | | 3 | 3 | 3 |
| PDSCH transmission mode | | | 2 | 2 | 2 |
| Interference model | | | N/A | As specified in clause B.6.1 | As specified in clause B.6.1 |
| MBSFN | | | Not configured | Not configured | Not configured |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| NeighCellsInfo-r12 (NOTE 3) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

NOTE 1: $P_B = 1$
NOTE 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
NOTE 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331[5].

**Table 8.2.1.2.5.5-2: Test Requirement for Enhanced Performance Requirement Type B, Transmit Diversity (FRC) with TM2 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (NOTE 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (NOTE 2) | |
| 1 | R.11-10 FDD | OP.1 FDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 17.35 | ≥1 |

NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
NOTE 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1.
NOTE 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

### 8.2.1.2.6 FDD PDSCH Transmit Diversity 2x2 with TM9 Interference Model – Enhanced Performance Requirement Type B

#### 8.2.1.2.6.1 Test purpose

The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 9 interference model defined in clause B.6.4.

#### 8.2.1.2.6.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward that support enhanced performance requirement Type B.

#### 8.2.1.2.6.3 Minimum conformance requirements

The requirements are specified in Table 8.2.1.2.6.3-2, with the addition of parameters in Table 8.2.1.2.6.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.2.1.2.6.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.2.1.2.6.3-1: Test Parameters for Transmit diversity Performance (FRC) with TM9 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | 0 | 0 |
| | $\rho_B$ | dB | -3 (NOTE 1) | 0 | 0 |
| | $\sigma$ | dB | 0 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 3.28 | 0.74 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols | | | 3 | 3 | 3 |
| CFI indicated in PCFICH | | | 3 | Random from set {1,2,3} | Random from set {1,2,3} |
| PDSCH transmission mode | | | 2 | 9 | 9 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI reference signals | | | N/A | Antenna ports 15,16 | Antenna ports 15,16 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | N/A | 10 / 1 | 10 / 1 |
| CSI reference signal configuration | | | N/A | 6 | 7 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | N/A | 6 / 0100000000000000 | 6 / 0010000000000000 |
| Time offset to cell 1 | | us | N/A | 5 | -5 |
| Frequency offset to cell 1 | | Hz | N/A | 600 | -600 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (NOTE 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

NOTE 1: $P_B = 1$
NOTE 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
NOTE 3: CSI-RS configurations are according to [8] subclause 6.10.5.2.
NOTE 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331[5].

**Table 8.2.1.2.6.3-2: Minimum Performance for Enhanced Performance Requirement Type B, Transmit Diversity (FRC) with TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (NOTE 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (NOTE 2) | |
| 1 | R.11-9 FDD | OP.1 FDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 8.4 | ≥1 |
| NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | |
| NOTE 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| NOTE 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. | | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.2.6.

### 8.2.1.2.6.4 Test description

#### 8.2.1.2.6.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.2.6.3-2, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.2.1.2.6.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.2.6.4.3.

#### 8.2.1.2.6.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.2.6.5-1 and 8.2.1.2.6.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 and cell 3 according to table 8.2.1.2.6.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.1.2.6.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.
5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

#### 8.2.1.2.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m).

### 8.2.1.2.6.5 Test requirement

Table 8.2.1.2.6.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.2.1.2.6.5-2 for the specified SNR including test tolerances.

**Table 8.2.1.2.6.5-1: Test Parameters for Transmit diversity Performance (FRC) with TM9 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | 0 | 0 |
| | $\rho_B$ | dB | -3 (NOTE 1) | 0 | 0 |
| | σ | dB | 0 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 4.08 | 1.54 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols | | | 3 | 3 | 3 |
| CFI indicated in PCFICH | | | 3 | Random from set {1,2,3} | Random from set {1,2,3} |
| PDSCH transmission mode | | | 2 | 9 | 9 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI reference signals | | | N/A | Antenna ports 15,16 | Antenna ports 15,16 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | N/A | 10 / 1 | 10 / 1 |
| CSI reference signal configuration | | | N/A | 6 | 7 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | N/A | 6 / 0100000000000000 | 6 / 0010000000000000 |
| Time offset to cell 1 | | us | N/A | 5 | -5 |
| Frequency offset to cell 1 | | Hz | N/A | 600 | -600 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (NOTE 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

NOTE 1: $P_B = 1$
NOTE 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
NOTE 3: CSI-RS configurations are according to [8] subclause 6.10.5.2.
NOTE 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331[5].

**Table 8.2.1.2.6.5-2: Test Requirement for Enhanced Performance Requirement Type B, Transmit Diversity (FRC) with TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (NOTE 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (NOTE 2) | |
| 1 | R.11-9 FDD | OP.1 FDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 9.94 | ≥1 |
| NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | |
| NOTE 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| NOTE 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. | | | | | | | | | | | |

## 8.2.1.3 FDD PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)

### 8.2.1.3.1 FDD PDSCH Open Loop Spatial Multiplexing 2x2

#### 8.2.1.3.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

#### 8.2.1.3.1.2 Test applicability

This test applies to all types of E-UTRA FDD release 8 and forward UE of category 2 or higher..

#### 8.2.1.3.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.3.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.3.1.3-1 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.1.3.1.3-1: Test Parameters for Large Delay CDD (FRC)**

| Parameter | | Unit | Test 1-2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$ | | | |

**Table 8.2.1.3.1.3-2: Minimum performance Large Delay CDD (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 (Note 1) | 10 MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.0 | ≥2 |
| 2 (Note 2) | 5 MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.7 | ≥2 |
| Note 1: Test 1 may not be executed for UE-s for which Test 1 in 8.2.1.3.1_A.2 is applicable.<br>Note 2: Test case applicability is defined in 8.1.2.1. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.

### 8.2.1.3.1.4 Test description

#### 8.2.1.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.3.1.3-2, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.3.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.3.1.4.3.

#### 8.2.1.3.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.3.1.3-1 and 8.2.1.3.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.2.1.3.1.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.1.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.1.3.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.1.3.1.5 Test requirement

Table 8.2.1.3.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.3.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.3.1.5-1: Test Requirement Large Delay CDD (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.9 | ≥2 |
| 2 (Note 2) | 5 MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.6 | ≥2 |
| Note 1: N/A<br>Note 2: Test case is applicable (according to sub clause 8.1.2.1) to UE's which, from the E-UTRA operating bands defined in Table 5.2-1, support only E-UTRA band 31. | | | | | | | | |

8.2.1.3.1_1 FDD PDSCH Open Loop Spatial Multiplexing 2x2 (Release 11 and forward)

8.2.1.3.1_1.1 Test purpose

Same test purpose as in clause 8.2.1.3.1.1.

8.2.1.3.1_1.2 Test applicability

This test applies to all types of E-UTRA FDD release 11 and forward UE of category 2 or higher

8.2.1.3.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.1.3.1.3 with the following exceptions:

- Instead of Table 8.2.1.3.1.3-1 → use Table 8.2.1.3.1_1.3-1.
- Instead of Table 8.2.1.3.1.3-2 → use Table 8.2.1.3.1_1.3-2.

**Table 8.2.1.3.1_1.3-1: Test Parameters for Large Delay CDD (FRC)**

| Parameter | | Unit | Test 1-2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$ | | | |

**Table 8.2.1.3.1_1.3-2: Minimum performance Large Delay CDD (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.35 FDD | OP.1 FDD | EVA200 | 2x2 Low | 70 | 20.2 | ≥2 |
| 2 | 10 MHz | R.35-4 FDD | OP.1 FDD | ETU300 | 2x2 Low | 70 | 19.7 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.

### 8.2.1.3.1_1.4 Test description

Same test description as in clause 8.2.1.3.1.4 with the following exceptions:

- Instead of Table 8.2.1.3.1.3-1 → use Table 8.2.1.3.1_1.3-1.
- Instead of Table 8.2.1.3.1.3-2 → use Table 8.2.1.3.1_1.3-2.
- Instead of Table 8.2.1.3.1.5-1 → use Table 8.2.1.3.1_1.5-1.

### 8.2.1.3.1_1.5 Test requirement

Same test requirements as in clause 8.2.1.3.1.5 with the following exceptions:

- Instead of Table 8.2.1.3.1.3-1 → use Table 8.2.1.3.1_1.3-1.
- Instead of Table 8.2.1.3.1.5-1 → use Table 8.2.1.3.1_1.5-1.

**Table 8.2.1.3.1_1.5-1: Test Requirement Large Delay CDD (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.35 FDD | OP.1 FDD | EVA200 | 2x2 Low | 70 | [21.1] | ≥2 |
| 2 | 10 MHz | R.35-4 FDD | OP.1 FDD | ETU300 | 2x2 Low | 70 | 20.6 | ≥2 |

## 8.2.1.3.1_A FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA

## 8.2.1.3.1_A.1 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (2DL CA)

### 8.2.1.3.1_A.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

### 8.2.1.3.1_A.1.2 Test applicability

This test applies to

E-UTRA FDD release 10 and forward UE of category 2 or higher that supports inter-band OR intra-band contiguous DL CA

This test also applies to E-UTRA FDD release 11 and forward UE of category 2 or higher that supports intra-band non-contiguous DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.1.3.1_A.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.3.1_A.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.3.1_A.1.3-1 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.1.3.1_A.1.3-1: Test Parameters for Large Delay CDD (FRC) for CA**

| Parameter | | Unit | Test 1 -5 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| dB $N_{oc}$ 0at antenna port | | dBm/15kHz | -98 |
| PDSCH Transmission mode | | | 3 |
| Note 1: $P_B = 1$<br>Note 2: PUCCH format 1b with channel selection is used to feedback ACK/NACK.<br>Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.1.3.1_A.1.3-2: Minimum performance Large Delay CDD (FRC) for CA**

| Test num | Bandwidth | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | UE category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum Throughput (%) | SNR (dB) | |
| 1 | 2x10 MHz | R.11 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.7 | ≥3 |
| 2 | 2x20 MHz | R.30 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.2 | ≥5 |
| 3 | 2x5 MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.7 | ≥2 |
| 4 | 10MHz+5 MHz | R.11 FDD for 10MHz CC, | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.0 | ≥3 |
| | | R.11-2 FDD for 5MHz CC | OP.1 FDD (Note 1) | | | 70 | 12.7 | |
| 5 | 15MHz+5 MHz | R.11-7 FDD for 15MHz CC | OP.1 FDD (NOTE 1) | EVA70 | 2x2 Low | 70 | 12.8 | ≥3 |
| | | R.11-2 FDD for 5MHz CC | OP.1 FDD (NOTE 1) | | | 70 | 12.7 | |
| Note 1: The OCNG pattern applies for each CC.<br>Note 2: Void<br>Note 3: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.

### 8.2.1.3.1_A.1.4 Test description

#### 8.2.1.3.1_A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select according to Table 8.2.1.3.1_A.1.4.1-1.

CA Capability to be tested: Select according to Table 8.2.1.3.1_A.1.4.1-1

**Table 8.2.1.3.1_A.1.4.1-1: Test point selection for TM3 2DLCA**

| CA Capability | Bandwidth Combination | | | | |
|---|---|---|---|---|---|
| | 10+10 | 20+20 | 5+5 | 10+5 | 15+5 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 | Test 2 | Test 3 | Test4 | Test5 |
| Intra-band contiguous CA (CA2_C) | Test 1 | Test 2 | Test 3 | Test4 | Test5 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA2_N2) | Test 1 | Test 2 | Test 3 | Test4 | Test5 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the first bandwidth combination (moving from left to right) supported by the UE within the chosen CA capability. | | | | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.36 as appropriate for UE supporting only 2Rx RF bands on all CC and Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.3.1_A.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.3.1_A.1.4.3.

### 8.2.1.3.1_A.1.4.2 Test procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for PhysicalConfigDedicated-DEFAULT is defined in Table 8.2.1.3.1_A.1.4.3-1, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.2.1.3.1_A.1.4.3-1A.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.3.1_A.1.3-1 and 8.2.1.3.1_A.1.3-2 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carrier according to Table 8.2.1.3.1_A.1.5-1 as appropriate.
6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval on both the component carrier.
7. Repeat steps from 1 to 6 for each subtest in Table 8.2.1.3.1_A.1.5-1 depending on UE CA capability as defined in Table 8.2.1.3.1_A.1.4.1-1 and as appropriate.

### 8.2.1.3.1_A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions

**Table 8.2.1.3.1_A.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.3.1_A.1.4.3-1A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 11 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.1.3.1_A.1.5 Test requirement

Table 8.2.1.3.1_A.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for the throughput test shall meet or exceed the specified value in Tables 8.2.1.3.1_A.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.3.1_A.1.5-1: Test Requirement Large Delay CDD (FRC) for CA**

| Test num | Bandwidth | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1 | 2x10 MHz | R.11 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 14.6 | 13.1 |
| 2 | 2x20 MHz | R.30 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 14.1 | 12.6 |
| 3 | 2x5 MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.6 | 12.1 |
| 4 | 10MHz+5 MHz | R.11 FDD for 10MHz CC, | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.9 | 12.4 |
| | | R.11-2 FDD for 5MHz CC | OP.1 FDD (Note 1) | | | 70 | 12.6 | 11.1 |
| 5 | 15MHz+5 MHz | R.11-7 FDD for 15MHz CC | OP.1 FDD (NOTE 1) | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| | | R.11-2 FDD for 5MHz CC | OP.1 FDD (NOTE 1) | | | 70 | 13.6 | 12.1 |

Note 1: The OCNG pattern applies for each CC.
Note 2: Void.
Note 3: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.3.1_A.2 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (3DL CA)

### 8.2.1.3.1_A.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

### 8.2.1.3.1_A.2.2 Test applicability

This test case applies to all types of E-UTRA FDD release 10 and forward UE of category 5 or higher that support 3DL with CA configurations in Table 7.1-2a.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.1.3.1_A.2.3 Minimum conformance requirements

For CA with 3 DL CCs, the requirements are specified in Table 8.2.1.3.1_A.2.3-3, based on single carrier requirement specified in Table 8.2.1.3.1_A.2.3-2, with the addition of the parameters in Table 8.2.1.3.1_A.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.1.3.1_A.2.3-1: Test Parameters for Large Delay CDD (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$. | | | |
| Note 2: PUCCH format 3 with channel selection is used to feedback ACK/NACK for Tests in Table 8.2.1.3.1_A.2.3-3. | | | |
| Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.1.3.1_A.2.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.6 |
| 3MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.3 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.3 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.9 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.9 |

**Table 8.2.1.3.1_A.2.3-2: Minimum performance (FRC) based on single carrier performance for CA with 3DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.2.1.3.1_A.2.3-2 per CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.2.1.3.1_A.2.3-2 per CC | ≥5 |
| 3 | 20MHz+20MHz+10MHz | As specified in Table 8.2.1.3.1_A.2.3-2 per CC | ≥5 |
| 4 | 20MHz+15MHz+15MHz | As specified in Table 8.2.1.3.1_A.2.3-2 per CC | ≥5 |
| 5 | 20MHz+15MHz+10MHz | As specified in Table 8.2.1.3.1_A.2.3-2 per CC | ≥5 |
| 6 | 20MHz+10MHz+10MHz | As specified in Table 8.2.1.3.1_A.2.3-2 per CC | ≥5 |
| 7 | 15MHz+15MHz+10MHz | As specified in Table 8.2.1.3.1_A.2.3-2 per CC | ≥5 |
| 8 | 20MHz+10MHz+5MHz | As specified in Table 8.2.1.3.1_A.2.3-2 per CC | ≥5 |
| 9 | 20MHz+15MHz+5MHz | As specified in Table 8.2.1.3.1_A.2.3-2 per CC | ≥5 |
| 10 | 10MHz+10MHz+5MHz | As specified in Table 8.2.1.3.1_A.2.3-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.

### 8.2.1.3.1_A.2.4 Test description

#### 8.2.1.3.1_A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select according to Table 8.2.1.3.1_A.2.4.1-1.

CA Capability to be tested: Select according to Table 8.2.1.3.1_A.2.4.1-1.

**Table 8.2.1.3.1_A.2.4.1-1: Test point selection for TM3 3DL CA**

| CA Capability | Bandwidth combination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 3x20 | 20+20+15 | 20+20+10 | 20+15+15 | 20+15+10 | 20+10+10 | 15+15+10 | 20+10+5 | 20+15+5 | 10+10+5 |
| Intra-band contiguous (CA3_C) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Inter-band CA (two bands) (CA3_A2) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Inter-band CA (three bands) (CA3_A3) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA3_N2) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | | | | | | | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.60 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.
2. Theparameter settings for the cell are set up according to Table 8.2.1-1 and 8.2.1.3.1_A.2.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.3.1_A.2.4.3.

### 8.2.1.3.1_A.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.1.3.1_A.2.4.3.
3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.
4. The SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.3.1_A.2.3-1 and 8.2.1.3.1_A.2.3-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.1.3.1_A.2.5-1 as appropriate.
6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

### 8.2.1.3.1_A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions

**Table 8.2.1.3.1_A.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.3.1_A.2.4.3-1A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 11 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.1.3.1_A.2.5 Test requirement

Table 8.2.1.3.1_A.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.1 for the throughput test shall meet or exceed the specified value in Table 8.2.1.3.1_A.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.3.1_A.2.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 14.5 | 13 |
| 3MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |

**Table 8.2.1.3.1_A.2.5-2: Test requirement (FRC) based on single carrier performance for CA with 3DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.2.1.3.1_A.2.5-1 per CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.2.1.3.1_A.2.5-1 per CC | ≥5 |
| 3 | 20MHz+20MHz+10MHz | As specified in Table 8.2.1.3.1_A.2.5-1 per CC | ≥5 |
| 4 | 20MHz+15MHz+15MHz | As specified in Table 8.2.1.3.1_A.2.5-1 per CC | ≥5 |
| 5 | 20MHz+15MHz+10MHz | As specified in Table 8.2.1.3.1_A.2.5-1 per CC | ≥5 |
| 6 | 20MHz+10MHz+10MHz | As specified in Table 8.2.1.3.1_A.2.5-1 per CC | ≥5 |
| 7 | 15MHz+15MHz+10MHz | As specified in Table 8.2.1.3.1_A.2.5-1 per CC | ≥5 |
| 8 | 20MHz+10MHz+5MHz | As specified in Table 8.2.1.3.1_A.2.5-1 per CC | ≥5 |
| 9 | 20MHz+15MHz+5MHz | As specified in Table 8.2.1.3.1_A.2.5-1 per CC | ≥5 |
| 10 | 10MHz+10MHz+5MHz | As specified in Table 8.2.1.3.1_A.2.5-1 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.3.1_A.3 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (4DL CA)

### 8.2.1.3.1_A.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

### 8.2.1.3.1_A.3.2 Test applicability

This test case applies to all types of E-UTRA FDD release 11 and forward UE of categories 8 or higher that support 4DL with CA configurations in Table 7.1-2b

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.1.3.1_A.3.3 Minimum conformance requirements

For CA with 4 DL CCs, the requirements are specified in Table 8.2.1.3.1_A.3.3-3, based on single carrier requirement specified in Table 8.2.1.3.1_A.3.3-2, with the addition of the parameters in Table 8.2.1.3.1_A.3.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.1.3.1_A.3.3-1: Test Parameters for Large Delay CDD (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$. | | | |
| Note 2: PUCCH format 3 with channel selection is used to feedback ACK/NACK for Tests in Table 8.2.1.3.1_A.3.3-3. | | | |
| Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.1.3.1_A.3.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.6 |
| 3MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.3 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.3 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.9 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.9 |

**Table 8.2.1.3.1_A.3.3-2: Minimum performance (FRC) based on single carrier performance for CA with 4DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.2.1.3.1_A.3.3-2 per CC | ≥8 |
| 2 | 10MHz+20MHz+20MHz+20MHz | As specified in Table 8.2.1.3.1_A.3.3-2 per CC | ≥8 |
| 3 | 10MHz+10MHz+20MHz+20MHz | As specified in Table 8.2.1.3.1_A.3.3-2 per CC | ≥8 |
| 4 | 5MHz+10MHz+20MHz+20MHz | As specified in Table 8.2.1.3.1_A.3.3-2 per CC | ≥8 |
| 5 | 5MHz+10MHz+10MHz+20MHz | As specified in Table 8.2.1.3.1_A.3.3-2 per CC | ≥8 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.

### 8.2.1.3.1_A.3.4 Test description

#### 8.2.1.3.1_A.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select according to Table 8.2.1.3.1_A.3.4.1-1.

CA Capability to be tested: Select according to Table 8.2.1.3.1_A.3.4.1-1.

**Table 8.2.1.3.1_A.3.4.1-1: Test point selection for TM3 4DL CA**

| **CA Capability** | **Bandwidth combination** | | | | |
|---|---|---|---|---|---|
| | 4x20 | 10+20+20+20 | 10+10+20+20 | 5+10+20+20 | 5+10+10+20 |
| Inter-band CA (two bands) (CA4_A2) | Test1 | Test2 | Test3 | Test4 | Test5 |
| Inter-band CA (three bands) (CA4_A3) | Test1 | Test2 | Test3 | Test4 | Test5 |
| Inter-band CA (four bands) (CA4_A4) | Test1 | Test2 | Test3 | Test4 | Test5 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA4_N2) | Test1 | Test2 | Test3 | Test4 | Test5 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.60 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.2.1-1 and 8.2.1.3.1_A.3.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.3.1_A.3.4.3.

### 8.2.1.3.1_A.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.1.3.1_A.3.4.3.

3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.

4. The SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.3.1_A.3.3-1 and 8.2.1.3.1_A.3.3-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.1.3.1_A.3.5-1 as appropriate.

6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

### 8.2.1.3.1_A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions

**Table 8.2.1.3.1_A.3.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.3.1_A.3.4.3-1A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 11 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.1.3.1_A.3.5 Test requirement

Table 8.2.1.3.1_A.3.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.1 for the throughput test shall meet or exceed the specified value in Table 8.2.1.3.1_A.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.3.1_A.3.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 14.5 |
| 3MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 |

**Table 8.2.1.3.1_A.3.5-2: Test requirement (FRC) based on single carrier performance for CA with 4DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.2.1.3.1_A.3.5-1 per CC | ≥8 |
| 2 | 10MHz+20MHz+20MHz+20MHz | As specified in Table 8.2.1.3.1_A.3.5-1 per CC | ≥8 |
| 3 | 10MHz+10MHz+20MHz+20MHz | As specified in Table 8.2.1.3.1_A.3.5-1 per CC | ≥8 |
| 4 | 5MHz+10MHz+20MHz+20MHz | As specified in Table 8.2.1.3.1_A.3.5-1 per CC | ≥8 |
| 5 | 5MHz+10MHz+10MHz+20MHz | As specified in Table 8.2.1.3.1_A.3.5-1 per CC | ≥8 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.3.1_A.4 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (5DL CA)

### 8.2.1.3.1_A.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

### 8.2.1.3.1_A.4.2 Test applicability

This test case applies to all types of E-UTRA FDD release 11 and forward UE of categories 8, category 11 or higher that support 5DL with CA configurations in Table 7.1-2c.

This test case also applies to all types of E-UTRA FDD release 12 and forward UE of categories 8, category 11 or higher that support 5DL CA configurations in Table 7.1-2c.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.1.3.1_A.4.3 Minimum conformance requirements

For CA with 5 DL CCs, the requirements are specified in Table 8.2.1.3.1_A.4.3-3, based on single carrier requirement specified in Table 8.2.1.3.1_A.4.3-2, with the addition of the parameters in Table 8.2.1.3.1_A.4.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.1.3.1_A.4.3-1: Test Parameters for Large Delay CDD (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$. | | | |
| Note 2: PUCCH format 3 with channel selection is used to feedback ACK/NACK for Tests in Table 8.2.1.3.1_A.4.3-3. | | | |
| Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.1.3.1_A.4.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.6 |
| 3MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.3 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.3 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.9 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.9 |

**Table 8.2.1.3.1_A.4.3-2: Minimum performance (FRC) based on single carrier performance for CA with 5DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.2.1.3.1_A.4.3-2 per CC | 8, ≥11 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.

### 8.2.1.3.1_A.4.4 Test description

#### 8.2.1.3.1_A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select according to Table 8.2.1.3.1_A.4.4.1-1.

CA Capability to be tested: Select according to Table 8.2.1.3.1_A.4.4.1-1.

**Table 8.2.1.3.1_A.4.4.1-1: Test point selection for TM3 5DL CA**

| CA Capability | Bandwidth combination |
|---|---|

| | |
|---|---|
| | 5x20 |
| Inter-band CA (two bands) (CA5_A2) | Test1 |
| Inter-band CA (three bands) (CA5_A3) | Test1 |
| Inter-band CA (four bands) (CA5_A4) | Test1 |
| Inter-band CA (five bands) (CA5_A5) | Test1 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA5_N2) | Test1 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.60 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.2.1-1 and 8.2.1.3.1_A.4.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.3.1_A.4.4.3.

#### 8.2.1.3.1_A.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.1.3.1_A.4.4.3.

3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.

4. The SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.3.1_A.4.3-1 and 8.2.1.3.1_A.4.3-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.1.3.1_A.4.5-1 as appropriate.

6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.1.3.1_A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions

**Table 8.2.1.3.1_A.4.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.3.1_A.4.4.3-1A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 11 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.1.3.1_A.4.5 Test requirement

Table 8.2.1.3.1_A.4.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.1 for the throughput test shall meet or exceed the specified value in Table 8.2.1.3.1_A.4.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.3.1_A.4.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 14.5 |
| 3MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 |

**Table 8.2.1.3.1_A.4.5-2: Test requirement (FRC) based on single carrier performance for CA with 5DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.2.1.3.1_A.4.5-1 per CC | 8, ≥11 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.3.1A FDD Soft buffer management test

## 8.2.1.3.1A_A.1 FDD PDSCH Soft buffer management test for CA (2 DL CA)

### 8.2.1.3.1A_A.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

### 8.2.1.3.1A_A.1.2 Test applicability

This test applies to E-UTRA FDD UE category 3 and 4 release 10 and forward that support intra-band contiguous DL CA or inter-band DL CA.

This test applies also to E-UTRA FDD UE category 3 and 4 release 11 and forward that support intra-band non-contiguous DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.1.3.1A_A.1.3 Minimum conformance requirements

The requirements are specified in Table 8.2.1.3.1A_A.1.3-2, with the addition of the parameters in Table 8.2.1.3.1A_A.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C. The purpose is to verify the UE performance with proper instantaneous buffer implementation.

**Table 8.2.1.3.1A_A.1.3-1: Test Parameters for soft buffer management test (FRC) for CA**

| Parameter | | Unit | Test 1-7 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$ | | | |
| Note 2: For CA test cases, PUCCH format 1b with channel selection is used to feedback ACK/NACK. | | | |
| Note 3: For CA test cases, the same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.1.3.1A_A.1.3-2: Minimum performance soft buffer management test (FRC) for CA**

| Test num | Bandwidth | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum Throughput (%) | SNR (dB) |
| 1 | 2x20 MHz | R.30 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.2 |
| 2 | 15MHz + 10MHz | R.35-2 FDD for 15MHz CC | OP.1 FDD (Note 1) | EVA5 | 2x2 Low | 70 | 15.1 |
| | | R.35-3 FDD for 10MHz CC | OP.1 FDD (Note 1) | | | 70 | 15.1 |
| 3 | 20MHz + 10MHz | R.30 FDD for 20MHz CC | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.5 |
| | | R.11 FDD for 10MHz CC | OP.1 FDD (Note 1) | | | 70 | 13.5 |
| 4 | 20MHz + 15MHz | R.30 FDD for 20MHz CC | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.5 |
| | | R.30-1 FDD for 15MHz CC | OP.1 FDD (Note 1) | | | 70 | 13.5 |
| 5 | 2x20 MHz | R.35-1 FDD | OP.1 FDD (Note 1) | EVA5 | 2x2 Low | 70 | 15.8 |
| 6 | 20MHz + 10MHz | R.35-1 FDD for 20MHz CC | OP.1 FDD (Note 1) | EVA5 | 2x2 Low | 70 | 15.9 |
| | | R.35-3 FDD for 10MHz CC | OP.1 FDD (Note 1) | | | 70 | 15.9 |
| 7 | 20MHz + 15MHz | R.35-1 FDD for 20MHz CC | OP.1 FDD (Note 1) | EVA5 | 2x2 Low | 70 | 15.9 |
| | | R.35-2 FDD for 15MHz CC | OP.1 FDD (Note 1) | | | 70 | 15.9 |

Note 1: For CA test cases, the OCNG pattern applies for each CC.
Note 2: For Test 2, 3, 4, 6, 7 the Fraction of maximum Throughput applies to each CC.
Note 3: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

**Table 8.2.1.3.1A_A.1.3-3: Test points for soft buffer management tests for CA**

| UE category | Bandwidth combination with maximum aggregated bandwidth (Note 1) | | | |
|---|---|---|---|---|
| | 2x20MHz | 15MHz+10MHz | 20MHz+10MHz | 20MHz+15MHz |
| 3 | 1 | 2 | 3 | 4 |
| 4 | 5 | N/A | 6 | 7 |

Note 1: Maximum over all supported CA configurations and bandwidth combination sets according to Table 5.4.2A.1-1 and Table 5.4.2A.1-2.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.1A.

### 8.2.1.3.1A_A.1.4 Test description

#### 8.2.1.3.1A_A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.1.3.1A_A.1.4-1.

CA Capability to be tested: Select one according to Table 8.2.1.3.1A_A.1.4-1.

**Table 8.2.1.3.1A_A.1.4-1: Test point selection soft buffer management tests for CA**

| CA Capability | Bandwidth combination | | | |
|---|---|---|---|---|
| | 20+20 | 20+15 | 20+10 | 15+10 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 or 5 | Test 4 or 7 | Test 3 or 6 | Test 2 |
| Intra-band contiguous CA (CA2_C) | Test 1 or 5 | Test 4 or 7 | Test 3 or 6 | Test 2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA2_N2) | Test 1 or 5 | Test 4 or 7 | Test 3 or 6 | Test 2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 2: One of the two tests per table position is selected, depending on UE category. | | | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.36 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.3.1A_A.1.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.3.1_A.1.4.3.

### 8.2.1.3.1A_A.1.4.2 Test procedure

1 Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for PhysicalConfigDedicated-DEFAULT is defined in Table 8.2.1.3.1_A.1.4.3-1, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.2.1.3.1_A.1.4.3-1A.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.3.1A_A.1.3-1 and 8.2.1.3.1A_A.1.3-2 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carrier according to Table 8.2.1.3.1A_A.1.5-1 as appropriate.

6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval on both the component carrier.

### 8.2.1.3.1A_A.1.4.3 Message contents

Same Message contents as 8.2.1.3.1_A.1.4.3

### 8.2.1.3.1A_A.1.5 Test requirement

Table 8.2.1.3.1A_A.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for the throughput test shall meet or exceed the specified value in Tables 8.2.1.3.1A_A.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.3.1A_A.1.5-1: Test Requirement soft buffer management test (FRC) for CA**

| Test num | Bandwidth | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1 | 2x20 MHz | R.30 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 14.1 | 12.6 |
| 2 | 15MHz + 10MHz | R.35-2 FDD for 15MHz CC | OP.1 FDD (Note 1) | EVA5 | 2x2 Low | 70 | 16.0 | 14.5 |
| | | R.35-3 FDD for 10MHz CC | OP.1 FDD (Note 1) | | | 70 | 16.0 | 14.5 |
| 3 | 20MHz + 10MHz | R.30 FDD for 20MHz CC | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 14.4 | 12.9 |
| | | R.11 FDD for 10MHz CC | OP.1 FDD (Note 1) | | | 70 | 14.4 | 12.9 |
| 4 | 20MHz + 15MHz | R.30 FDD for 20MHz CC | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 14.4 | 12.9 |
| | | R.30-1 FDD for 15MHz CC | OP.1 FDD (Note 1) | | | 70 | 14.4 | 12.9 |
| 5 | 2x20 MHz | R.35-1 FDD | OP.1 FDD (Note 1) | EVA5 | 2x2 Low | 70 | 16.7 | 15.2 |
| 6 | 20MHz + 10MHz | R.35-1 FDD for 20MHz CC | OP.1 FDD (Note 1) | EVA5 | 2x2 Low | 70 | 16.8 | 15.3 |
| | | R.35-3 FDD for 10MHz CC | OP.1 FDD (Note 1) | | | 70 | 16.8 | 15.3 |
| 7 | 20MHz + 15MHz | R.35-1 FDD for 20MHz CC | OP.1 FDD (Note 1) | EVA5 | 2x2 Low | 70 | 16.8 | 15.3 |
| | | R.35-2 FDD for 15MHz CC | OP.1 FDD (Note 1) | | | 70 | 16.8 | 15.3 |

Note 1: For CA test cases, the OCNG pattern applies for each CC.
Note 2: For Test 2, 3, 4, 6, 7 the Fraction of maximum Throughput applies to each CC.
Note 3: There is no applicable test point for a UE supporting max 10+10 MHz bandwidth combination.
Note 4: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

Decide pass or fail for each subtest according to Annex G.3A.4.

## 8.2.1.3.1A_A.2 Void

## 8.2.1.3.1B FDD PDSCH Open Loop Spatial Multiplexing 2x2 – Enhanced Performance Requirement Type C

### 8.2.1.3.1B.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

### 8.2.1.3.1B.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward UE of Category 2 or higher that support enhanced receiver Type C.

### 8.2.1.3.1B.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.3.1B.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.3.1B.3-2 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.1.3.1B.3-1: Test Parameters for Large Delay CDD (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$. | | | |

**Table 8.2.1.3.1B.3-2: Enhanced Performance Requirement Type C, Large Delay CDD (FRC)**

| Test num | Bandwidth | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | UE cate gory |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Medium | 70 | 17.8 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.1B.

### 8.2.1.3.1B.4 Test description

#### 8.2.1.3.1B.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.3.1B.3-2, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.3.1B.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.3.1B.4.3.

### 8.2.1.3.1B.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.3.1B.3-1 and 8.2.1.3.1B.3-2. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.2.1.3.1B.5-1 as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

### 8.2.1.3.1B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.1.3.1B.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.1.3.1B.5 Test requirement

Table 8.2.1.3.1B.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.3.1B.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.3.1B.5-1: Test requirement for Enhanced Performance Requirement Type C, Large Delay CDD (FRC)**

| Test num | Bandwidth | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | UE cate gory |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Medium | 70 | 18.7 | ≥2 |

## 8.2.1.3.1C FDD PDSCH Open Loop Spatial Multiplexing 2x2 with TM1 Interference – Enhanced Performance Requirement Type C

### 8.2.1.3.1C.1 Test purpose

The purpose is to verify the performance of open-loop spatial multiplexing performance with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell with transmission mode 1.

### 8.2.1.3.1C.2 Test applicability

This test applies to all types of E-UTRA FDD release 12 and forward UE of Category 2 or higher that support enhanced receiver Type C.

### 8.2.1.3.1C.3 Minimum conformance requirements

The requirements are specified in Table 8.2.1.3.1C.3-2, with the addition of parameters in Table 8.2.1.3.1C.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.2.1.3.1C.3-1, Cell 1 is the serving cell, and Cell 2 is interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2 respectively.

**Table 8.2.1.3.1C.3-1: Test Parameters for Large Delay CDD (FRC) with TM1 interference**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | |
| Downlink power allocation | $\rho_A$ | dB | -3 | 0 |
| | $\rho_B$ | | -3 (Note 1) | 0 |
| | σ | | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna port 0 |
| Cyclic Prefix | | | Normal | Normal |
| Cell ID | | | 0 | 1 |
| Transmission mode | | | 3 | Note 2 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| $\hat{E}_s / N_{oc}$ (Note 3) | | dB | Reference Value in Table 8.2.1.3.1C.3-2 | 12.95 |
| Correlation and antenna configuration | | | Medium (2x2) | Medium(1x2) |
| Number of OFDM symbols for PDCCH | | | 2 | N/A |
| Max number of HARQ transmissions | | | 4 | N/A |
| Redundancy version coding sequence | | | {0,1,2,3} | N/A |

Note 1: $P_B = 1$
Note 2: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.2 applying OCNG pattern OP.5 FDD as defined in Annex A.5.1.5.
Note 3: Cell 1 is the serving cell. Cell 2 is the interfering cell.
Note 4: All cells are time-synchronous.
Note 5: SIB-1 will not be transmitted in Cell2 in this test.

**Table 8.2.1.3.1C.3-2: Enhanced Performance Requirement Type C, Large Delay CDD (FRC) with TM1 interference**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.11-8 FDD | OP.1 FDD | OP.5 FDD | EVA70 | EVA70 | 70 | 19.9 | ≥2 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s/N_{oc}$ of Cell 1. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.1C.

### 8.2.1.3.1C.4 Test description

#### 8.2.1.3.1C.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.3.1C.3-2, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.62.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.2.1.3.1C.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.3.1C.4.3.

#### 8.2.1.3.1C.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.3.1C.5-1 and 8.2.1.3.1C.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 according to Table 8.2.1.3.1C.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.2.1.3.1C.5-1 and Table 8.2.1.3.1C.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.1.3.1C.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.1.3.1C.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

## 8.2.1.3.1C.5 Test requirement

Table 8.2.1.3.1C.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.3.1C.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.3.1C.5-1: Test Parameters for Large Delay CDD (FRC) with TM1 interference**

| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | |
| Downlink power allocation | $\rho_A$ | dB | -3 | 0 |
| | $\rho_B$ | | -3 (Note 1) | 0 |
| | σ | | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna port 0 |
| Cyclic Prefix | | | Normal | Normal |
| Cell ID | | | 0 | 1 |
| Transmission mode | | | 3 | Note 2 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| $\hat{E}_s / N_{oc}$ (Note 3) | | dB | Reference Value in Table 8.2.1.3.1C.5-2 | 13.75 |
| Correlation and antenna configuration | | | Medium (2x2) | Medium(1x2) |
| Number of OFDM symbols for PDCCH | | | 2 | N/A |
| Max number of HARQ transmissions | | | 4 | N/A |
| Redundancy version coding sequence | | | {0,1,2,3} | N/A |
| Note 1: $P_B = 1$ | | | | |
| Note 2: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.2 applying OCNG pattern OP.5 FDD as defined in Annex A.5.1.5. | | | | |
| Note 3: Cell 1 is the serving cell. Cell 2 is the interfering cell. | | | | |
| Note 4: All cells are time-synchronous. | | | | |
| Note 5: SIB-1 will not be transmitted in Cell2 in this test. | | | | |

**Table 8.2.1.3.1C.5-2: Test requirement for Enhanced Performance Requirement Type C, Large Delay CDD (FRC) with TM1 interference**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.11-8 FDD | OP.1 FDD | OP.5 FDD | EVA70 | EVA70 | 70 | 21.8 | ≥2 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s/N_{oc}$ of Cell 1. | | | | | | | | |

## 8.2.1.3.2 FDD PDSCH Open Loop Spatial Multiplexing 4x2

### 8.2.1.3.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

### 8.2.1.3.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward of UE category ≥2.

### 8.2.1.3.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.3.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.3.2.3-1 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.1.3.2.3-1: Test Parameters for Large Delay CDD (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$ | | | |

**Table 8.2.1.3.2.3-2: Minimum performance Large Delay CDD (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.14 FDD | OP.1 FDD | EVA70 | 4x2 Low | 70 | 14.3 | 2-8 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.

#### 8.2.1.3.2.4 Test description

##### 8.2.1.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.3.2.3-2, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.11 for antenna configuration 4x2.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.3.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.3.2.4.3.

##### 8.2.1.3.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.3.2.3-1 and 8.2.1.3.2.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.2.1.3.2.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.2.1.3.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.1.3.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation for Test number 1**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.1.3.2.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation for Test number 1**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm3 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.1.3.2.5 Test requirement

Table 8.2.1.3.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.3.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.3.2.5-1: Test Requirement Large Delay CDD (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.14 FDD | OP.1 FDD | EVA70 | 4x2 Low | 70 | 15.2 | 2-8 |

## 8.2.1.3.3_C FDD PDSCH Open Loop Spatial Multiplexing 2x2 for eICIC

### 8.2.1.3.3_C.1 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for eICIC (non-MBSFN ABS)

#### 8.2.1.3.3_C.1.1 Test purpose

To verify the UE's performance of large delay CDD with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

#### 8.2.1.3.3_C.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward. Applicability requires support for FGI bit 115.

#### 8.2.1.3.3_C.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.3.3_C.1.3-1.

In Table 8.2.1.3.3_C.1.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Table C.3.2-1 in Annex C.3.2 and for Cell 2 is according to Table C.3.3-1 in Annex C.3.3, respectively.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.3.3_C.1.3-1 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.1.3.3_C.1.3-1: Test Parameters for Large Delay CDD (FRC) non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -102 (Note 2) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -94.8 (Note 4) | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.1.3.3_C.1.3-2 | 6 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Cell Id | | | 0 | 1 |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| ABS pattern (Note 5) | | | N/A | 11000100<br>11000000<br>11000000<br>11000000<br>11000000 |
| RLM/RRM Measurement Subframe Pattern(Note 6) | | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A |
| CSI Subframe Sets (Note 7) | $C_{CSI,0}$ | | 11000100<br>11000000<br>11000000<br>11000000<br>11000000 | N/A |
| | $C_{CSI,1}$ | | 00111011<br>00111111<br>00111111<br>00111111<br>00111111 | N/A |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 3 | N/A |
| Cyclic prefix | | | Normal | Normal |

Note 1: $P_B = 1$
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5]
Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 9: SIB-1 will not be transmitted in Cell2 in this test.

**Table 8.2.1.3.3_C.1.3-2: Minimum performance Large Delay CDD (FRC) non-MBSFN ABS**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) Note 5 | SNR (dB) (Note 2) | |
| 1 | R.11 FDD Note 4 | OP.1 FDD | OP.1 FDD | EVA 5 | EVA 5 | 2x2 Low | 70 | 13.3 | 2-8 |
| Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent. | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1. | | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | | |
| Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. | | | | | | | | | |
| Note 5: The maximum Throughput is calculated from the total Payload in 9 subframes, averaged over 40ms. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.3.

### 8.2.1.3.3_C.1.4 Test description

#### 8.2.1.3.3_C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.3.3_C.1.3-2, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.2.1.3.3_C.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.3.3_C.1.4.3.

#### 8.2.1.3.3_C.1.4.2 Test procedure

1. Set the parameters for Cell1 and Cell2 according to Tables 8.2.1.3.3_C.1.5-1, 8.2.1.3.3_C.1.5-2, C.3.3-1 of Annex C.3.3 as appropriate, and SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC. The SS sends downlink MAC padding bits on the DL RMC. Propagation conditions are set according to Annex B clause B.2.
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

8.2.1.3.3_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.1.3.3_C.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| `antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.3.3_C.1.4.3-2: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '10000000100000001000 00001000000010000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.3.3_C.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '11000100110000001100 00001100000011000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '00111011001111110011 11110011111100111111' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.1.3.3_C.1.5 Test requirement

Table 8.2.1.3.3_C.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.3.3_C.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.3.3_C.1.5-1: Test Parameters for Large Delay CDD (FRC) non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -102.1 (Note 2) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -94.9 (Note 4) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.1.3.3_C.1.5-2 | 5.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Cell Id | | | 0 | 1 |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| ABS pattern (Note 5) | | | N/A | 11000100<br>11000000<br>11000000<br>11000000<br>11000000 |
| RLM/RRM Measurement Subframe Pattern(Note 6) | | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A |
| CSI Subframe Sets (Note 7) | $C_{CSI,0}$ | | 11000100<br>11000000<br>11000000<br>11000000<br>11000000 | N/A |
| | $C_{CSI,1}$ | | 00111011<br>00111111<br>00111111<br>00111111<br>00111111 | N/A |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 3 | N/A |
| Cyclic prefix | | | Normal | Normal |

Note 1: $P_B = 1$
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5]
Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 9: SIB-1 will not be transmitted in Cell2 in this test.

**Table 8.2.1.3.3_C.1.5-2: Test Requirement Large Delay CDD (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of | SNR | |

| | | | | | | | Maximum Throughput (%) Note 5 | (dB) (Note 2) | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | R.11 FDD Note 4 | OP.1 FDD | OP.1 FDD | EVA 5 | EVA 5 | 2x2 Low | 70 | 14.2 | 2-8 |

Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.

Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1.

Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.

Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.

Note 5: The maximum Throughput is calculated from the total Payload in 9 subframes, averaged over 40ms.

## 8.2.1.3.3_C.2 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for eICIC (MBSFN ABS)

### 8.2.1.3.3_C.2.1 Test purpose

To verify the UE's performance of large delay CDD with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

### 8.2.1.3.3_C.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward. Applicability requires support for FGI bit 115.

### 8.2.1.3.3_C.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.3.3_C.2.3-1.

In Table 8.2.1.3.3_C.2.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Table C.3.2-1 in Annex C.3.2 and for Cell 2 is according to Table C.3.3-1 in Annex C.3.3, respectively.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.3.3_C.2.3-2 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.1.3.3_C.2.3-1: Test Parameters for Large Delay CDD (FRC) MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -102 (Note 2) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -94.8 (Note 4) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.1.3.3_C.2.3-2 | 6 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | MBSFN |
| Cell Id | | | 0 | 126 |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| ABS pattern (Note 5) | | | N/A | 0001000000<br>0100000010<br>0000001000<br>0000000000 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0001000000<br>0100000010<br>0000001000<br>0000000000 | N/A |
| CSI Subframe Sets (Note 7) | $C_{CSI,0}$ | | 0001000000<br>0100000010<br>0000001000<br>0000000000 | N/A |
| | $C_{CSI,1}$ | | 1110111111<br>1011111101<br>1111110111<br>1111111111 | N/A |
| MBSFN Subframe Allocation (Note 10) | | | N/A | 001000<br>100001<br>000100<br>000000 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 3 | N/A |
| Cyclic prefix | | | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbol #0 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 5: ABS pattern as defined in [14]. The 4th, 12th, 19th and 27th subframes indicated by ABS pattern are MBSFN ABS subframes.
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 9: SIB-1 will not be transmitted in Cell2 in this test.
Note 10: MBSFN Subframe Allocation as defined in [5], four frames with 24 bits is chosen for MBSFN subframe allocation.
Note 11: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel transmission is in a subframe protected by MBSFN ABS in this test.

**Table 8.2.1.3.3_C.2.3-2: Minimum performance Large Delay CDD (FRC) MBSFN ABS**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) Note 5 | SNR (dB) (Note 2) | |
| 1 | R.11 FDD Note 4 | OP.1 FDD | OP.1 FDD | EVA 5 | EVA 5 | 2x2 Low | 70 | 12.0 | 2-8 |

Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.

Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1.

Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.

Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.

Note 5: The maximum Throughput is calculated from the total Payload in 4 subframes, averaged over 40ms.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.3.

### 8.2.1.3.3_C.2.4 Test description

#### 8.2.1.3.3_C.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.3.3_C.2.3-2, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.2.1.3.3_C.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.3.3_C.2.4.3.

#### 8.2.1.3.3_C.2.4.2 Test procedure

1. Set the parameters for Cell1 and Cell2 according to Tables 8.2.1.3.3_C.2.5-1, 8.2.1.3.3_C.2.5-2, C.3.3-1 of Annex C.3.3 as appropriate, and SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC. The SS sends downlink MAC padding bits on the DL RMC. Propagation conditions are set according to Annex B clause B.2.
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

8.2.1.3.3_C.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.1.3.3_C.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.3.3_C.2.4.3-2: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '00010000000100000010 00000010000000000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.3.3_C.2.4.3-3: *CQI-ReportConfig-r10-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '00010000000100000010 00000010000000000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '11101111111011111101 11111101111111111111' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.3.3_C.2.4.3-4: *SystemInformationBlockType3*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-2 SystemInformationBlockType3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| neighCellConfig | '00'B (Not all neighbour cells have the same MBSFN subframe allocation as serving cell) | | Cell 1 |
| } | | | |

### 8.2.1.3.3_C.2.5 Test requirement

Table 8.2.1.3.3_C.2.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.3.3_C.2.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.3.3_C.2.5-1: Test Parameters for Large Delay CDD (FRC) MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -102.1 (Note 2) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -94.9 (Note 4) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.1.3.3_C.2.5-2 | 5.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | MBSFN |
| Cell Id | | | 0 | 126 |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| ABS pattern (Note 5) | | | N/A | 0001000000<br>0100000010<br>0000001000<br>0000000000 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0001000000<br>0100000010<br>0000001000<br>0000000000 | N/A |
| CSI Subframe Sets (Note 7) | $C_{CSI,0}$ | | 0001000000<br>0100000010<br>0000001000<br>0000000000 | N/A |
| | $C_{CSI,1}$ | | 1110111111<br>1011111101<br>1111110111<br>1111111111 | N/A |
| MBSFN Subframe Allocation (Note 10) | | | N/A | 001000<br>100001<br>000100<br>000000 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 3 | N/A |
| Cyclic prefix | | | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbol #0 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 5: ABS pattern as defined in [14]. The 4th, 12th, 19th and 27th subframes indicated by ABS pattern are MBSFN ABS subframes.
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 9: SIB-1 will not be transmitted in Cell2 in this test.
Note 10: MBSFN Subframe Allocation as defined in [5], four frames with 24 bits is chosen for MBSFN subframe allocation.
Note 11: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel transmission is in a subframe protected by MBSFN ABS in this test.

**Table 8.2.1.3.3_C.2.5-2: Test Requirement Large Delay CDD (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) Note 5 | SNR (dB) (Note 2) | |
| 1 | R.11 FDD Note 4 | OP.1 FDD | OP.1 FDD | EVA 5 | EVA 5 | 2x2 Low | 70 | 12.9 | 2-8 |

Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.

Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1.

Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.

Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.

Note 5: The maximum Throughput is calculated from the total Payload in 4 subframes, averaged over 40ms.

## 8.2.1.3.3_D

## 8.2.1.3.3_E FDD PDSCH Open Loop Spatial Multiplexing 2x2 for feICIC

## 8.2.1.3.3_E.1 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for feICIC (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured, non-MBSFN ABS)

### 8.2.1.3.3_E.1.1 Test purpose

To verify the UE's performance of large delay CDD with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cells with CRS assistance information.

### 8.2.1.3.3_E.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE and CRS interference handling – Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

### 8.2.1.3.3_E.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.3.3_E.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.3.3_E.1.3-2 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.1.3.3_E.1.3-1: Test Parameters for Large Delay CDD (FRC) non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93 (Note 4) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.1.3.3_E.1.3-2 | Reference Value in Table 8.2.1.3.3_E.1.3-2 | Reference Value in Table 8.2.1.3.3_E.1.3-2 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 1 | 126 |
| ABS pattern (Note 5) | | | N/A | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 | N/A | N/A |
| | $C_{CSI,1}$ | | 00111111<br>00111111<br>00111111<br>00111111<br>00111111 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| PDSCH transmission mode | | | 3 | Note 9 | Note 9 |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.
Note 10: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 11: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

**Table 8.2.1.3.3_E.1.3-2: Minimum performance Large Delay CDD (FRC) non-MBSFN ABS**

| Test Number | Reference Channel | $\hat{E}_s/N_{oc2}$ | | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) (Note 5) | SNR (dB) (Note 3) | |
| 1 | R.11 FDD (Note 4) | 9 | 7 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 70 | 13.9 | ≥2 |
| 2 | R.35 FDD (Note 4) | 9 | 1 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 70 | 22.6 | ≥2 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s/N_{oc2}$ of Cell 1.
Note 4: Cell 1 reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: The maximum throughput is calculated from the total Payload in 9 subframes, averaged over 40ms.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.4.

### 8.2.1.3.3_E.1.4 Test description

#### 8.2.1.3.3_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.3.3_E.1.3-2, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.2.1.3.3_E.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 8.2.1.3.3_E.1.4.3.

#### 8.2.1.3.3_E.1.4.2 Test procedure

1. Set the parameters for Cell 1, Cell 2 and Cell 3 according to Tables 8.2.1.3.3_E.1.5-1, 8.2.1.3.3_E.1.5-2 and C.3.3-2 of Annex C.3.3 as appropriate. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC.
2. The SS sends downlink MAC padding bits on the DL RMC. Propagation conditions are set according to Annex B clause B.2.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

### 8.2.1.3.3_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 8.2.1.3.3_E.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.3.3_E.1.4.3-2: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.2A.5, Table 5.2A.5.1.1-2 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '1000000010000000 1000000010000000 10000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 1 | | Cell 2 |
| | 126 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.3.3_E.1.4.3-3: PhysicalConfigDedicated-DEFAULT: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.2.1.3.3_E.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '11000000 11000000 11000000 11000000 11000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '00111111 00111111 00111111 00111111 00111111' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.1.3.3_E.1.5 Test requirement

Table 8.2.1.3.3_E.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.3.3_E.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.3.3_E.1.5-1: Test Parameters for Large Delay CDD (FRC) non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93.1 (Note 4) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.1.3.3_E.1.3-2 | Reference Value in Table 8.2.1.3.3_E.1.3-2 | Reference Value in Table 8.2.1.3.3_E.1.3-2 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 1 | 126 |
| ABS pattern (Note 5) | | | N/A | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 | N/A | N/A |
| | $C_{CSI,1}$ | | 00111111<br>00111111<br>00111111<br>00111111<br>00111111 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| PDSCH transmission mode | | | 3 | Note 9 | Note 9 |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by “0” of ABS pattern.
Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.
Note 10: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 11: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

**Table 8.2.1.3.3_E.1.5-2: Test Requirement Large Delay CDD (FRC)**

| Test Number | Reference Channel | $\hat{E}_s/N_{oc2}$ | | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) (Note 5) | SNR (dB) (Note 3) | |
| 1 | R.11 FDD (Note 4) | 8.8 | 6.8 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 70 | 14.8 | ≥2 |
| 2 | R.35 FDD (Note 4) | 8.8 | 0.8 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 70 | 23.5 | ≥2 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s/N_{oc2}$ of Cell 1.
Note 4: Cell 1 reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: The maximum throughput is calculated from the total Payload in 9 subframes, averaged over 40ms.

## 8.2.1.4 FDD PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)

### 8.2.1.4.1 FDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 2x2

#### 8.2.1.4.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

#### 8.2.1.4.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8.

#### 8.2.1.4.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1, 8.2.1.4.1.3-1 and 8.2.1.4.1.3-3 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.1.4.1.3-2 and 8.2.1.4.1.3-4 for the specified SNR. For single-layer spatial multiplexing closed loop rank-one performance with wideband and frequency selective precoding is specified. For multi-layer spatial multiplexing closed loop rank-two performance with wideband and frequency selective precoding is specified.

**Table 8.2.1.4.1.3-1: Test Parameters for Testing Single-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Test 1 | Test 1A | Test 2 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 | -98 |
| Precoding granularity | | PRB | 6 | 4 | 50 |
| PMI delay (Note 2) | | ms | 8 | 8 | 8 |
| Reporting interval | | ms | 1 | 1 | 1 |
| Reporting mode | | | PUSCH 1-2 | PUSCH 1-2 | PUSCH 3-1 |
| CodeBookSubsetRestriction bitmap | | | 001111 | 001111 | 001111 |
| PDSCH transmission mode | | | 4 | 4 | 4 |

Note 1: $P_B = 1$

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

**Table 8.2.1.4.1.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.10 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | -2.5 | 1-5 |
| 1A(Note 1) | 5 MHz | R.10-2 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | -2.9 | 1-5 |
| 2 | 10 MHz | R.10 FDD | OP.1 FDD | EPA5 | 2x2 High | 70 | -2.3 | 1-5 |
| Note 1: Test case applicability is defined in 8.1.2.1. | | | | | | | | |

**Table 8.2.1.4.1.3-3: Test Parameters for Testing Multi-Layer Spatial Multiplexing**

| Parameter | | Unit | Test 3 | Test 4 | Test 4A |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 | -98 |
| Precoding granularity | | PRB | 50 | 50 | 25 |
| PMI delay (Note 2) | | ms | 8 | 8 | 8 |
| Reporting interval | | ms | 1 | 1 | 1 |
| Reporting mode | | | PUSCH 3-1 | PUSCH 3-1 | PUSCH 3-1 |
| CodeBookSubsetRestriction bitmap | | | 110000 | 110000 | 110000 |
| PDSCH transmission mode | | | 4 | 4 | 4 |

Note 1: $P_B = 1$

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)

**Table 8.2.1.4.1.3-4: Minimum performance Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 3 | 10 MHz | R.11 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | 12.9 | 2-5 |
| 4 | 10 MHz | R.11 FDD | OP.1 FDD | ETU70 | 2x2 Low | 70 | 14.3 | 2-5 |
| 4A (Note 1) | 5 MHz | R.11-2 FDD | OP.1 FDD | ETU70 | 2x2 Low | 70 | 14.0 | 2-5 |
| Note 1: Test case applicability is defined in 8.1.2.1. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.

### 8.2.1.4.1.4 Test description

#### 8.2.1.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Tables 8.2.1.4.1.3-2 and 8.2.1.4.1.3-4 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1, 8.2.1.4.1.3-1 and 8.2.1.4.1.3-3 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.4.1.4.3.

#### 8.2.1.4.1.4.2 Test procedure

1. For single-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.1.4.1.3-1 and 8.2.1.4.1.3-2. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.1.4.1.3-3 and 8.2.1.4.1.3-4. The SS sends downlink MAC padding bits on the DL RMC.
2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.1.4.1.5-1 and 8.2.1.4.1.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
5. Repeat steps from 1 to 4 for each test interval in Tables 8.2.1.4.1.5-1 and 8.2.1.4.1.5-2 as appropriate.

8.2.1.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.1.4.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation for Test number 1, 1A, 2**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 001111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.1.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation for Test number 3, 4, 4A**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 110000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.1.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional FDD PDSCH closed loop single -layer spatial multiplexing performance downlink power allocation for Test number 1, 1A**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.2.1.4.1.4.3-4: *CQI-ReportConfig-DEFAULT:* Additional FDD PDSCH closed loop single/multi-layer spatial multiplexing performance downlink power allocation for Test number 2, 3, 4, 4A**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

8.2.1.4.1.5 Test requirement

Tables 8.2.1.4.1.3-1 and 8.2.1.4.1.3-3 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.4.1.5-1 and 8.2.1.4.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.4.1.5-1: Test requirement Single-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.10 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | -1.6 | 1-5 |
| 1A(Note 1) | 5 MHz | R.10-2 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | -2.0 | 1-5 |
| 2 | 10 MHz | R.10 FDD | OP.1 FDD | EPA5 | 2x2 High | 70 | -1.4 | 1-5 |
| Note 1: Test case is applicable (according to sub clause 8.1.2.1) to UE's which, from the E-UTRA operating bands defined in Table 5.2-1, support only E-UTRA band 31. | | | | | | | | |

**Table 8.2.1.4.1.5-2: Test requirement Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 3 | 10 MHz | R.11 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | 13.8 | 2-5 |
| 4 | 10 MHz | R.11 FDD | OP.1 FDD | ETU70 | 2x2 Low | 70 | 15.2 | 2-5 |
| 4A (Note 1) | 5 MHz | R.11-2 FDD | OP.1 FDD | ETU70 | 2x2 Low | 70 | 14.9 | 2-5 |
| Note 1: Test case is applicable (according to sub clause 8.1.2.1) to UE's which, from the E-UTRA operating bands defined in Table 5.2-1, support only E-UTRA band 31. | | | | | | | | |

## 8.2.1.4.1_1 FDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 2x2 (Release 9 and forward)

### 8.2.1.4.1_1.1 Test purpose

Same test purpose as in clause 8.2.1.4.1.1

### 8.2.1.4.1_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward.

### 8.2.1.4.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.1.4.1.3 with the following exceptions:

- Instead of Table 8.2.1.4.1.3-2 → use Table 8.2.1.4.1_1.3-1.
- Instead of Table 8.2.1.4.1.3-4 → use Table 8.2.1.4.1_1.3-2.

**Table 8.2.1.4.1_1.3-1: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.10 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | -2.5 | 1-8 |
| 1A (Note 1) | 5 MHz | R.10-2 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | -2.9 | 1-8 |
| 2 | 10 MHz | R.10 FDD | OP.1 FDD | EPA5 | 2x2 High | 70 | -2.3 | 1-8 |
| Note 1: Test case applicability is defined in 8.1.2.1. | | | | | | | | |

**Table 8.2.1.4.1_1.3-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 3 | 10 MHz | R.35 FDD | OP.1 FDD | EPA5 | 2x2 Low | 70 | 18.9 | 2-8 |
| 4 | 10 MHz | R.11 FDD | OP.1 FDD | ETU70 | 2x2 Low | 70 | 14.3 | 2-8 |
| 4A (Note 1) | 5 MHz | R.11-2 FDD | OP.1 FDD | ETU70 | 2x2 Low | 70 | 14.0 | 2-8 |
| Note 1: Test case applicability is defined in 8.1.2.1. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.

### 8.2.1.4.1_1.4 Test description

Same test description as in clause 8.2.1.4.1.4 with the following exceptions:

- Instead of Table 8.2.1.4.1.3-2 → use Table 8.2.1.4.1_1.3-1.
- Instead of Table 8.2.1.4.1.3-4 → use Table 8.2.1.4.1_1.3-2.
- Instead of Table 8.2.1.4.1.5-1 → use Table 8.2.1.4.1_1.5-1.
- Instead of Table 8.2.1.4.1.5-2 → use Table 8.2.1.4.1_1.5-2.

### 8.2.1.4.1_1.5 Test requirement

Same test requirement as in clause 8.2.1.4.1.5 with the following exceptions:

- Instead of Table 8.2.1.4.1.5-1 → use Table 8.2.1.4.1_1.5-1.
- Instead of Table 8.2.1.4.1.5-2 → use Table 8.2.1.4.1_1.5-2.

**Table 8.2.1.4.1_1.5-1: Test requirement Single-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.10 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | -1.6 | 1-8 |
| 1A (Note 1) | 5 MHz | R.10-2 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | -2.0 | 1-8 |
| 2 | 10 MHz | R.10 FDD | OP.1 FDD | EPA5 | 2x2 High | 70 | -1.4 | 1-8 |
| Note 1: Test case is applicable (according to sub clause 8.1.2.1) to UE's which, from the E-UTRA operating bands defined in Table 5.2-1, support only E-UTRA band 31. | | | | | | | | |

**Table 8.2.1.4.1_1.5-2: Test requirement Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 3 | 10 MHz | R.35 FDD | OP.1 FDD | EPA5 | 2x2 Low | 70 | +19.8 | 2-8 |
| 4 | 10 MHz | R.11 FDD | OP.1 FDD | ETU70 | 2x2 Low | 70 | +15.2 | 2-8 |
| 4A (Note 1) | 5 MHz | R.11-2 FDD | OP.1 FDD | ETU70 | 2x2 Low | 70 | 14.9 | 2-8 |
| Note 1: Test case is applicable (according to sub clause 8.1.2.1) to UE's which, from the E-UTRA operating bands defined in Table 5.2-1, support only E-UTRA band 31. | | | | | | | | |

## 8.2.1.4.1_A to D

## 8.2.1.4.1_E FDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 2x2 for feICIC

## 8.2.1.4.1_E.1 FDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS)

### 8.2.1.4.1_E.1 Test purpose

To verify The purpose is to verify the closed loop rank-one performance with wideband precoding if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [14] of the aggressor cell with CRS assistance information.

### 8.2.1.4.1_E.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE and CRS interference handling – UE Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

### 8.2.1.4.1_E.1.3 Minimum conformance requirements

The requirements are specified in Table 8.2.1.4.1_E.1.3-2, with the addition of parameters in Table 8.2.1.4.1_E.1.3-1. In Table 8.2.1.4.1_E.1.3-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information TS 36.331 [5] includes Cell 2 and Cell 3.

**Table 8.2.1.4.1_E.1.3-1: Test Parameters for Testing Single-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93 (Note 4) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.1.4.1_E.1.3-2 | 12 | 10 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 5) | | | N/A | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 | N/A | N/A |
| | $C_{CSI,1}$ | | 00111111<br>00111111<br>00111111<br>00111111<br>00111111 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| PDSCH transmission mode | | | 6 | Note 9 | Note 9 |
| Precoding granularity | | PRB | 50 | N/A | N/A |
| PMI delay (Note 10) | | ms | 8 | N/A | N/A |
| Reporting interval | | ms | 1 | N/A | N/A |
| Reporting mode | | | PUSCH 3-1 | N/A | N/A |
| CodeBookSubsetRestriction bitmap | | | 1111 | N/A | N/A |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern as defined in TS 36.521-1 [10] Annex A.5.
Note 10: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 11: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 12: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

**Table 8.2.1.4.1_E.1.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) (Note 5) | SNR (dB) (Note 3) | |
| 1 | R.11 FDD (Note 4) | OP.1FDD | OP.1FDD | OP.1FDD | EPA5 | EPA5 | EPA5 | 2x2 High | 70 | 6.1 | ≥2 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1.
Note 4: Cell 1 reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: The maximum throughput is calculated from the total Payload in 9 subframes, averaged over 40ms.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.1C.

### 8.2.1.4.1_E.1.4 Test description

#### 8.2.1.4.1_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.4.1_E.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.

2. The parameter settings for the cell are set up according to Tables 8.2.1.4.1_E.1.3-1 as appropriate.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 8.2.1.4.1_E.1.4.3.

#### 8.2.1.4.1_E.1.4.2 Test procedure

1. Set the parameters for Cell 1, Cell 2 and Cell 3, according to Tables 8.2.1.4.1_E.1.5-1, 8.2.1.4.1_E.1.5-2, and C.3.3.2 of Annex C.3.3. SS transmits PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC.

2. The SS sends downlink MAC padding bits on the DL RMC. Propagation conditions are set according to Annex B clause B.2

3. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.

4. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.1.4.1_E.1.5-2 as appropriate.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.1.4.1_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 8.2.1.4.1_E.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional FDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.2A.5, Table 5.2A.5.1.1-2 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '1000000010000000 1000000010000000 10000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 126 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.1_E.1.4.3-2: PhysicalConfigDedicated-DEFAULT: Additional FDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.2.1.4.1_E.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT*: Additional FDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '11000000 11000000 11000000 11000000 11000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '00111111 00111111 00111111 00111111 00111111' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.1_E.1.4.3-4: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.1.4.1_E.1.5 Test requirement

Table 8.2.1.4_E.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.4.1_E.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.4.1_E.1.5-1: Test Parameters for Testing Single-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93.1 (Note 4) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.1.4.1_E.1.5-2 | 11.8 | 9.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 5) | | | N/A | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 11000000<br>11000000<br>11000000<br>11000000<br>11000000 | N/A | N/A |
| | $C_{CSI,1}$ | | 00111111<br>00111111<br>00111111<br>00111111<br>00111111 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| PDSCH transmission mode | | | 6 | Note 9 | Note 9 |
| Precoding granularity | | PRB | 50 | N/A | N/A |
| PMI delay (Note 10) | | ms | 8 | N/A | N/A |
| Reporting interval | | ms | 1 | N/A | N/A |
| Reporting mode | | | PUSCH 3-1 | N/A | N/A |
| CodeBookSubsetRestriction bitmap | | | 1111 | N/A | N/A |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14]. Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern as defined in TS 36.521-1 [10] Annex A.5.
Note 10: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 11: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 12: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

**Table 8.2.1.4.1_E.1.5-2: Test requirement Single-Layer Spatial Multiplexing (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) (Note 5) | SNR (dB) (Note 3) | |
| 1 | R.11 FDD (Note 4) | OP.1 FDD | OP.1 FDD | OP.1 FDD | EPA5 | EPA5 | EPA5 | 2x2 High | 70 | 7.0 | ≥2 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1.
Note 4: Cell 1 reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: The maximum throughput is calculated from the total Payload in 9 subframes, averaged over 40ms.

## 8.2.1.4.1_H FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 2x2 for 256QAM in DL

### 8.2.1.4.1_H.1 Test purpose

Same test purpose as in clause 8.2.1.4.1.1

### 8.2.1.4.1_H.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward that support 256QAM in DL.

### 8.2.1.4.1_H.3 Minimum conformance requirements

The requirements are specified in Table 8.2.1.4.1_H.3-2,with the addition of the parameters in Table 8.2.1.4.1_H.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

**Table 8.2.1.4.1_H.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Test 1-2 | Test 2A | Test 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 | -98 |
| Precoding granularity | | PRB | 50 | 25 | 6 |
| PMI delay (Note 2) | | ms | 8 | 8 | 8 |
| Reporting interval | | ms | 1 | 1 | 1 |
| Reporting mode | | | PUSCH 3-1 | PUSCH 3-1 | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 110000 | 110000 | 110000 |
| PDSCH transmission mode | | | 4 | 4 | 4 |
| Number of OFDM symbols for PDCCH per component carrier | | OFDM symbol | 2 | 3 | 2 |

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

**Table 8.2.1.4.1_H.3-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category | UE DL category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | | |
| 3 | 10MHz 256QAM | R. 65 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | 25.3 | 11-12 | ≥11 |

Note 1: Void.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.2.

### 8.2.1.4.1_H.4 Test description

#### 8.2.1.4.1_H.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.4.1_H.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.4.1_H.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.4.1_H.4.3.

### 8.2.1.4.1_H.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.1.4.1_H.3-1 and 8.2.1.4.1_H.3-2. The SS sends downlink MAC padding bits on the DL RMC.

2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.

3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.1.4.1_H.5-1 as appropriate.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

5. Repeat steps from 1 to 4 for each test interval in Tables 8.2.1.4.1_H.5-1 as appropriate.

### 8.2.1.4.1_H.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.1.4.1_H.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation for Test number 3**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 110000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.1_H.4.3-2: *CQI-ReportConfig-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation for Test number 3**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

### 8.2.1.4.1_H.5 Test requirement

Tables 8.2.1.4.1_H.3-1 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.4.1_H.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.4.1_H.5-1: Test requirement Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category | UE DL category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | | |
| 3 | 10MHz 256QAM | R.65 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | 26.2 | 11-12 | ≥11 |
| Note 1: Void. | | | | | | | | | |

## 8.2.1.4.2A FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 2x2 – Enhanced Performance Requirement Type C

### 8.2.1.4.2A.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed loop rank-two spatial multiplexing with wideband and frequency selective precoding.

### 8.2.1.4.2A.2 Test applicability

This test applies to all types of E-UTRA FDD release 12 and forward UE of Category ≥ 2 that support enhanced receiver Type C.

### 8.2.1.4.2A.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.4.2A.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.4.2A.3-2 for the specified SNR.

**Table 8.2.1.4.2A.3-1: Test Parameters for Testing Multi-Layer Spatial Multiplexing**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 50 |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 3-1 |
| CodeBookSubsetRestriction bitmap | | | 110000 |
| PDSCH transmission mode | | | 4 |
| Note 1: $P_B = 1$. | | | |
| Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). | | | |

**Table 8.2.1.4.2A.3-2: Enhanced Performance Requirement Type C, Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11 FDD | OP.1 FDD | ETU70 | 2x2 Medium | 70 | 18.3 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.2A.

### 8.2.1.4.2A.4 Test description

#### 8.2.1.4.2A.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.4.2A.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.4.2A.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.4.2A.4.3.

#### 8.2.1.4.2A.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.1.4.2A.3-1 and 8.2.1.4.2A.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.1.4.2A.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.1.4.2A.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.1.4.2A.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 110000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.2A.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

### 8.2.1.4.2A.5 Test requirement

Table 8.2.1.4.2A.3-1 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.2.1.4.2A.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.4.2A.5-1: Test requirement for Enhanced Performance Requirement Type C, Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11 FDD | OP.1 FDD | ETU70 | 2x2 Medium | 70 | 19.2 | ≥2 |

## 8.2.1.4.2 FDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 4x2

### 8.2.1.4.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

### 8.2.1.4.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8.

#### 8.2.1.4.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1, 8.2.1.4.2.3-1 and 8.2.1.4.2.3-3 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.1.4.2.3-2 and 8.2.1.4.2.3-4 for the specified SNR. For single-layer spatial multiplexing closed loop rank-one performance with wideband and frequency selective precoding is specified. For multi-layer spatial multiplexing closed loop rank-two performance with wideband and frequency selective precoding is specified.

**Table 8.2.1.4.2.3-1: Test Parameters for Testing Single-Layer Spatial Multiplexing**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000<br>00000000000000<br>00000000000000<br>00000011111111<br>11111111 |
| PDSCH transmission mode | | | 4 |
| Note 1: $P_B = 1$<br>Note 2: | | | |

**Table 8.2.1.4.2.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.13 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | -3.2 | 1-5 |

**Table 8.2.1.4.2.3-3: Test Parameters for Testing Multi-Layer Spatial Multiplexing**

| Parameter | | Unit | Test 2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000 00000000000000 00001111111111 11111100000000 00000000 |
| PDSCH transmission mode | | | 4 |
| Note 1: $P_B = 1$ | | | |
| Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4) | | | |

**Table 8.2.1.4.2.3-4: Minimum performance Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.5 | 2-5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.

### 8.2.1.4.2.4 Test description

#### 8.2.1.4.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Tables 8.2.1.4.2.3-2 and 8.2.1.4.2.3-4 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.11 for antenna configuration 4x2.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1, 8.2.1.4.2.3-1 and 8.2.1.4.2.3-3 as appropriate.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.4.2.4.3.

#### 8.2.1.4.2.4.2 Test procedure

1. For single-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.1.4.2.3-1 and 8.2.1.4.2.3-2. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.1.4.2.3-3 and 8.2.1.4.2.3-4. The SS sends downlink MAC padding bits on the DL RMC.

2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.

3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.1.4.2.5-1 and 8.2.1.4.2.5-2 as appropriate.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

5. Repeat steps from 1 to 4 for each test interval in Tables 8.2.1.4.2.5-1 and 8.2.1.4.2.5-2 as appropriate.

#### 8.2.1.4.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.1.4.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop spatial multiplexing performance downlink power allocation for Test numbers 1, 2**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.1.4.2.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop single-layer spatial multiplexing performance downlink power for Test number 1**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000000000000 00000001111111111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.2.4.3-3: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation Test number 2**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.2.4.3-4: *CQI-ReportConfig-DEFAULT:* Additional FDD PDSCH closed loop single/multi-layer spatial multiplexing performance downlink power allocation Test number 1, 2**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

8.2.1.4.2.5 Test requirement

Tables 8.2.1.4.2.3-1 and 8.2.1.4.2.3-3 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.4.25-1 and 8.2.1.4.2.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.4.2.5-1: Test requirement Single-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.13 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | -2.3 | 1-5 |

**Table 8.2.1.4.2.5-2: Test requirement Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.4 | 2-5 |

## 8.2.1.4.2_1 FDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 4x2 (Release 9 and forward)

### 8.2.1.4.2_1.1 Test purpose

Same test purpose as in clause 8.2.1.4.2.1

### 8.2.1.4.2_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward.

### 8.2.1.4.2_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.1.4.2.3 with the following exceptions:

- Instead of Table 8.2.1.4.2.3-2 → use Table 8.2.1.4.2_1.3-1.
- Instead of Table 8.2.1.4.2.3-4 → use Table 8.2.1.4.2_1.3-2.

**Table 8.2.1.4.2_1.3-1: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.13 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | -3.2 | 1-8 |

**Table 8.2.1.4.2_1.3-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz | R.36 FDD | OP.1 FDD | EPA5 | 4x2 Low | 70 | 14.7 | 2-8 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.

### 8.2.1.4.2_1.4 Test description

Same test description as in clause 8.2.1.4.2.4 with the following exceptions:

- Instead of Table 8.2.1.4.2.3-2 → use Table 8.2.1.4.2_1.3-1.
- Instead of Table 8.2.1.4.2.3-4 → use Table 8.2.1.4.2_1.3-2.
- Instead of Table 8.2.1.4.2.5-1 → use Table 8.2.1.4.2_1.5-1.
- Instead of Table 8.2.1.4.2.5-2 → use Table 8.2.1.4.2_1.5-2.

### 8.2.1.4.2_1.5 Test requirement

Same test requirement as in clause 8.2.1.4.2.5 with the following exceptions:

- Instead of Table 8.2.1.4.2.5-1 → use Table 8.2.1.4.2_1.5-1.
- Instead of Table 8.2.1.4.2.5-2 → use Table 8.2.1.4.2_1.5-2.

**Table 8.2.1.4.2_1.5-1: Test requirement Single-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.13 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | -2.3 | 1-8 |

**Table 8.2.1.4.2_1.5-2: Test requirement Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz | R.36 FDD | OP.1 FDD | EPA5 | 4x2 Low | 70 | +15.6 | 2-8 |

## 8.2.1.4.2_A FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA

## 8.2.1.4.2_A.1 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (2DL CA)

### 8.2.1.4.2_A.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

### 8.2.1.4.2_A.1.2 Test applicability

This test applies to E-UTRA FDD release10 and forward UE of category ≥ 2 which supports inter-band OR intra-band contiguous DL CA.

This test also applies to E-UTRA FDD release 11 and forward UE of category ≥ 2 that supports intra-band non-contiguous DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.1.4.2_A.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1, 8.2.1.4.2_A.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.1.4.2_A.1.3-2 for the specified SNR. For multi-layer spatial multiplexing closed loop rank-two performance with wideband and frequency selective precoding is specified.

**Table 8.2.1.4.2_A.1.3-1: Test Parameters for Testing Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | $\sigma$ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000<br>00111111111111111000000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers.
Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for Tests in Table 8.2.1.4.2_A.1.3-2.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.2.1.4.2_A.1.3-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC) for CA with 2DL CCs**

| Test num. | Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | UE category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| 1 | 2x10 MHz | R.14 FDD | OP.1 FDD (Note 1) | EVA5 | 4x2 Low | 70 | 10.8 | ≥3 |
| 2 | 2x20 MHz | R.14-3 FDD | OP.1 FDD (Note 1) | EVA5 | 4x2 Low | 70 | 10.9 | ≥5 |
| 3 | 2x5 MHz | R.14-6 FDD | OP.1 FDD (Note 1) | EVA5 | 4x2 Low | 70 | 9.5 | ≥2 |
| 4 | 10MHz +5MHz | R.14 FDD for 10MHz CC | OP.1 FDD (Note 1) | EVA5 | 4x2 Low | 70 | 10.1 | ≥3 |
| | | R.14-6 FDD for 5MHz CC | OP.1 FDD (Note 1) | | | 70 | 9.5 | |
| 5 | 15MHz +5MHz | R.14-7 FDD for 15MHz CC | OP.1 FDD (Note 1) | EVA5 | 4x2 Low | 70 | 10.1 | ≥3 |
| | | R.14-6 FDD for 5MHz CC | OP.1 FDD (Note 1) | | | 70 | 9.5 | |

Note 1: The OCNG pattern applies for each CC.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.3 for 2 DL CC.

### 8.2.1.4.2_A.1.4 Test description

#### 8.2.1.4.2_A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.1.4.2_A.1.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.1.4.2_A.1.4.1-1.

**Table 8.2.1.4.2_A.1.4.1-1: Test point selection for TM4 2DL CA**

| **CA Capability** | **Bandwidth combination** | | | | |
|---|---|---|---|---|---|
| | 10+10 | 20+20 | 5+5 | 10+5 | 15+5 |
| Inter-band CA (two bands) (CA2_A2) | Test1 | Test2 | Test3 | Test4 | Test5 |
| Intra-band contiguous CA (CA2_C) | Test1 | Test2 | Test3 | Test4 | Test5 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA2_N2) | Test1 | Test2 | Test3 | Test5 | Test5 |
| Note 1: Only one test point is tested. Select any one of the UE supported CA capabilities and then moving from left to right select the first CA bandwidth combination supported by the UE within the chosen CA capability. | | | | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.46 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Tables 8.2.1-1, 8.2.1.4.2_A.1.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.4.2_A.1.4.3.

#### 8.2.1.4.2_A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *PDSCH-ConfigDedicated-DEFAULT* is defined in Table 8.2.1.4.2_A.1.4.3-1, *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.2.1.4.2_A.1.4.3-2, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.2.1.4.2_A.1.4.3-2A, *CQI-ReportConfig-r10-DEFAULT* is defined in Table 8.2.1.4.2_A.1.4.3-4, *CQI-ReportAperiodic-r10-DEFAULT* is defined in Table 8.2.1.4.2_A.1.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 8.2.1.4.2_A.1.4.3-6, *PUSCH-ConfigDedicated-DEFAULT* is defined in Table 8.2.1.4.2_A.1.4.3-7.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.1.4.2_A.1.3-1 and 8.2.1.4.2_A.1.3-3. The SS sends downlink MAC padding bits on the DL RMC.

5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.1.4.2_A.1.5-1 as appropriate.

7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

### 8.2.1.4.2_A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.2.1.4.2_A.1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.1.4.2_A.1.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.2.1.4.2_A.1.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000000011111111111111111000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.2_A.1.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | RBC |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.2.1.4.2_A.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.2.1.4.2_A.1.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.2_A.1.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.2.1.4.2_A.1.4.3-7: PUSCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.2.1.4.2_A.1.5 Test requirement

Tables 8.2.1.4.2_A.1.3-1 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.4.2_A.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.4.2_A.1.5-1: Test requirement Multi-Layer Spatial Multiplexing (FRC) for CA**

| Test num. | Band-width | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | | | UE catego |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band | |
| 1 | 2x10 MHz | R.14 FDD | OP.1 FDD (Note 1) | EVA5 | 4x2 Low | 70 | 11.7 | 10.2 | ≥3 |
| 2 | 2x20 MHz | R.14-3 FDD | OP.1 FDD (Note 1) | EVA5 | 4x2 Low | 70 | 11.8 | 10.3 | ≥5 |
| 3 | 2x5 MHz | R.14-6 FDD | OP.1 FDD (Note 1) | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 | ≥2 |
| 4 | 10MHz +5MHz | R.14 FDD for 10MHz CC | OP.1 FDD (Note 1) | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 | ≥3 |
| | | R.14-6 FDD for 5MHz CC | OP.1 FDD (Note 1) | | | 70 | 10.4 | 8.9 | |
| 5 | 15MHz +5MHz | R.14-7 FDD for 15MHz CC | OP.1 FDD (Note 1) | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 | ≥3 |
| | | R.14-6 FDD for 5MHz CC | OP.1 FDD (NOTE 1) | | | 70 | 10.4 | 8.9 | |
| Note 1: The OCNG pattern applies for each CC. | | | | | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.4.2_A.2 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (3DL CA)

### 8.2.1.4.2_A.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

### 8.2.1.4.2_A.2.2 Test applicability

This test case applies to all types of E-UTRA FDD release 10 and forward UE of category ≥ 5 that support 3DL with CA configurations in Table 7.1-2a.

This test case also applies to all types of E-UTRA FDD release 11 and forward UE of category ≥ 5 that support 3DL with CA configurations in Table 7.1-2a.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.1.4.2_A.2.3 Minimum conformance requirements

For CA with 3 DL CCs, the requirements are specified in Table 8.2.1.4.2_A.2.3-3, based on single carrier requirement specified in Table 8.2.1.4.2_A.2.3-2, with the addition of the parameters in Table 8.2.1.4.2_A.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.1.4.2_A.2.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | $\sigma$ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000011111111111111111000000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | 4 |
| Note 1: $P_B = 1$. | | | |
| Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). | | | |
| Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers. | | | |
| Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 3 with channel selection configured for Tests in Table 8.2.1.4.2_A.2.3-3. | | | |
| Note 5: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.1.4.2_A.2.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 3MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 10 MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.3 |

**Table 8.2.1.4.2_A.2.3-3: Minimum performance (FRC) based on single carrier performance for CA with 3DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.2.1.4.2_A.2.3-2 per CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.2.1.4.2_A.2.3-2 per CC | ≥5 |
| 3 | 20MHz+20MHz+10MHz | As specified in Table 8.2.1.4.2_A.2.3-2 per CC | ≥5 |
| 4 | 20MHz+15MHz+15MHz | As specified in Table 8.2.1.4.2_A.2.3-2 per CC | ≥5 |
| 5 | 20MHz+15MHz+10MHz | As specified in Table 8.2.1.4.2_A.2.3-2 per CC | ≥5 |
| 6 | 20MHz+10MHz+10MHz | As specified in Table 8.2.1.4.2_A.2.3-2 per CC | ≥5 |
| 7 | 15MHz+15MHz+10MHz | As specified in Table 8.2.1.4.2_A.2.3-2 per CC | ≥5 |
| 8 | 20MHz+10MHz+5MHz | As specified in Table 8.2.1.4.2_A.2.3-2 per CC | ≥5 |
| 9 | 20MHz+15MHz+5MHz | As specified in Table 8.2.1.4.2_A.2.3-2 per CC | ≥5 |
| 10 | 10MHz+10MHz+5MHz | As specified in Table 8.2.1.4.2_A.2.3-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.

### 8.2.1.4.2_A.2.4 Test description

#### 8.2.1.4.2_A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.1.4.2_A.2.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.1.4.2_A.2.4.1-1.

**Table 8.2.1.4.2_A.2.4.1-1: Test point selection for TM4 3DL CA**

| CA Capability | Bandwidth combination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 3x20 | 20+20+15 | 20+20+10 | 20+15+15 | 20+15+10 | 20+10+10 | 15+15+10 | 20+10+5 | 20+15+5 | 10+10+5 |
| Intra-band contiguous (CA3_C) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Inter-band CA (two bands) (CA3_A2) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Inter-band CA (three bands) (CA3_A3) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA3_N2) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | | | | | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.61 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.1-1 and 8.2.1.4.2_A.2.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.4.2_A.2.4.3.

#### 8.2.1.4.2_A.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.1.4.2_A.2.4.3.

3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.

4. The SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.1.3.1_A.2.3-1 and 8.2.1.3.1_A.2.3-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.1.4.2_A.2.5-1 as appropriate.

7. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

### 8.2.1.4.2_A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 8.2.1.4.2_A.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.1.4.2_A.2.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.2.1.4.2_A.2.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000000011111111111111110000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.2_A.2.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | RBC |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.2.1.4.2_A.2.4.3-4: *CQI-ReportConfig-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.2.1.4.2_A.2.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11100000 | P-Cell, S-Cells report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.2_A.2.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.2.1.4.2_A.2.4.3-7: PUSCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.2.1.4.2_A.2.5 Test requirement

Table 8.2.1.4.2_A.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.2.1.4.2_A.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.4.2_A.2.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.3 | 9.8 |
| 3MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 10MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.2 | 9.7 |

**Table 8.2.1.4.2_A.2.5-2: Test requirement (FRC) based on single carrier performance for CA with 3DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.2.1.4.2_A.2.5-1 per CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.2.1.4.2_A.2.5-1 per CC | ≥5 |
| 3 | 20MHz+20MHz+10MHz | As specified in Table 8.2.1.4.2_A.2.5-1 per CC | ≥5 |
| 4 | 20MHz+15MHz+15MHz | As specified in Table 8.2.1.4.2_A.2.5-1 per CC | ≥5 |
| 5 | 20MHz+15MHz+10MHz | As specified in Table 8.2.1.4.2_A.2.5-1 per CC | ≥5 |
| 6 | 20MHz+10MHz+10MHz | As specified in Table 8.2.1.4.2_A.2.5-1 per CC | ≥5 |
| 7 | 15MHz+15MHz+10MHz | As specified in Table 8.2.1.4.2_A.2.5-1 per CC | ≥5 |
| 8 | 20MHz+10MHz+5MHz | As specified in Table 8.2.1.4.2_A.2.5-1 per CC | ≥5 |
| 9 | 20MHz+15MHz+5MHz | As specified in Table 8.2.1.4.2_A.2.5-1 per CC | ≥5 |
| 10 | 10MHz+10MHz+5MHz | As specified in Table 8.2.1.4.2_A.2.3-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.4.2_A.3 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (4DL CA)

### 8.2.1.4.2_A.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

### 8.2.1.4.2_A.3.2 Test applicability

This test case applies to all types of E-UTRA FDD release 11 and forward UE of category ≥ 5 that support 4DL with CA configurations in Table 7.1-2b.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.1.4.2_A.3.3 Minimum conformance requirements

For CA with 3 DL CCs, the requirements are specified in Table 8.2.1.4.2_A.3.3-3, based on single carrier requirement specified in Table 8.2.1.4.2_A.3.3-2, with the addition of the parameters in Table 8.2.1.4.2_A.3.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.1.4.2_A.3.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | $\sigma$ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000011111111111111111000000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | 4 |
| Note 1: $P_B = 1$. | | | |
| Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). | | | |
| Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers. | | | |
| Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 3 with channel selection configured for Tests in Table 8.2.1.4.2_A.3.3-3. | | | |
| Note 5: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.1.4.2_A.3.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 3MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 10 MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.3 |

**Table 8.2.1.4.2_A.3.3-3: Minimum performance (FRC) based on single carrier performance for CA with 4DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.2.1.4.2_A.3.3-2 per CC | ≥5 |
| 2 | 20MHz+20MHz+20MHz+15MHz | As specified in Table 8.2.1.4.2_A.3.3-2 per CC | ≥5 |
| 3 | 20MHz+20MHz+20MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.3-2 per CC | ≥5 |
| 4 | 20MHz+20MHz+15MHz+15MHz | As specified in Table 8.2.1.4.2_A.3.3-2 per CC | ≥5 |
| 5 | 20MHz+20MHz+15MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.3-2 per CC | ≥5 |
| 6 | 20MHz+20MHz+10MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.3-2 per CC | ≥5 |
| 7 | 20MHz+15MHz+15MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.3-2 per CC | ≥5 |
| 8 | 20MHz+15MHz+10MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.3-2 per CC | ≥5 |
| 9 | 20MHz+10MHz+10MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.3-2 per CC | ≥5 |
| 10 | 15MHz+15MHz+15MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.3-2 per CC | ≥5 |
| 11 | 20MHz+20MHz+10MHz+5MHz | As specified in Table 8.2.1.4.2_A.3.3-2 per CC | ≥5 |
| 12 | 5MHz+10MHz+10MHz+20MHz | As specified in Table 8.2.1.4.2_A.3.3-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.

### 8.2.1.4.2_A.3.4 Test description

#### 8.2.1.4.2_A.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.1.4.2_A.3.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.1.4.2_A.3.4.1-1.

**Table 8.2.1.4.2_A.3.4.1-1: Test point selection for TM4 4DL CA**

| CA Capability | Bandwidth combination | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4x20 | 20+20+ 20+15 | 20+20+ 20+10 | 20+20+ 15+15 | 20+20+ 15+10 | 20+20+ 10+10 | 20+15+ 15+10 | 20+15+ 10+10 | 20+10+ 10+10 | 15+15+ 15+10 | 20+20+ 10+5 | 5+1( 10+2 |
| Intra-band contiguous (CA4_C) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 | Test11 | Test |
| Inter-band CA (three bands) (CA4_A3) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 | Test11 | Test |
| Inter-band CA (four bands) (CA4_A4) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 | Test11 | Test |
| Intra-band non-contiguous CA (with two sub-blocks) (CA4_N2) | Test1 | Test2 | Test3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 | Test11 | Test |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities | | | | | | | | | | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.61 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.1-1 and 8.2.1.4.2_A.3.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.4.2_A.3.4.3.

#### 8.2.1.4.2_A.3.4.2 Test procedure

Same test procedure as in clause 8.2.1.4.2_A.2.4.2 with the following exceptions:

- Instead of Table 8.2.1.4.2_A.2.5-1 → use Table 8.2.1.4.2_A.3.5-1

8.2.1.4.2_A.3.4.3 Message contents

Same message contents as in clause 8.2.1.4.2_A.2.4.3 with the following exceptions:

**Table 8.2.1.4.2_A.3.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11110000 | P-Cell, S-Cells report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

8.2.1.4.2_A.3.5 Test requirement

Table 8.2.1.4.2_A.3.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.2.1.4.2_A.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.4.2_A.3.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.3 |
| 3MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 10MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.2 |

**Table 8.2.1.4.2_A.3.5-2: Test requirement (FRC) based on single carrier performance for CA with 4DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.2.1.4.2_A.3.5-1 per CC | ≥5 |
| 2 | 20MHz+20MHz+20MHz+15MHz | As specified in Table 8.2.1.4.2_A.3.5-1 per CC | ≥5 |
| 3 | 20MHz+20MHz+20MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.5-1 per CC | ≥5 |
| 4 | 20MHz+20MHz+15MHz+15MHz | As specified in Table 8.2.1.4.2_A.3.5-1 per CC | ≥5 |
| 5 | 20MHz+20MHz+15MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.5-1 per CC | ≥5 |
| 6 | 20MHz+20MHz+10MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.5-1 per CC | ≥5 |
| 7 | 20MHz+15MHz+15MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.5-1 per CC | ≥5 |
| 8 | 20MHz+15MHz+10MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.5-1 per CC | ≥5 |
| 9 | 20MHz+10MHz+10MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.5-1 per CC | ≥5 |
| 10 | 15MHz+15MHz+15MHz+10MHz | As specified in Table 8.2.1.4.2_A.3.5-1 per CC | ≥5 |
| 11 | 20MHz+20MHz+10MHz+5MHz | As specified in Table 8.2.1.4.2_A.3.5-1 per CC | ≥5 |
| 12 | 5MHz+10MHz+10MHz+20MHz | As specified in Table 8.2.1.4.2_A.3.5-1 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.4.2_A.4 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (5DL CA)

### 8.2.1.4.2_A.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

### 8.2.1.4.2_A.4.2 Test applicability

This test case applies to all types of E-UTRA FDD release 11 and forward UE of category 8, 11 or higher that support 5DL with CA configurations in Table 7.1-2c.

This test case also applies to all types of E-UTRA FDD release 12 and forward UE of category 8, 11 or higher that support 5DL with CA configurations in Table 7.1-2c.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.1.4.2_A.4.3 Minimum conformance requirements

For CA with 5 DL CCs, the requirements are specified in Table 8.2.1.4.2_A.4.3-3, based on single carrier requirement specified in Table 8.2.1.4.2_A.4.3-2, with the addition of the parameters in Table 8.2.1.4.2_A.4.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.1.4.2_A.4.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | $\sigma$ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000011111111111111111000000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers.

Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 3 with channel selection configured for Tests in Table 8.2.1.4.2_A.4.3-3.

Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.2.1.4.2_A.4.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 3MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 10 MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.3 |

**Table 8.2.1.4.2_A.4.3-3: Minimum performance (FRC) based on single carrier performance for CA with 5DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.2.1.4.2_A.4.3-2 per CC | 8, ≥11 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.

### 8.2.1.4.2_A.4.4 Test description

#### 8.2.1.4.2_A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.1.4.2_A.4.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.1.4.2_A.4.4.1-1.

**Table 8.2.1.4.2_A.4.4.1-1: Test point selection for TM4 5DL CA**

| CA Capability | Bandwidth combination |
|---|---|
| | 5x20 |
| Intra-band contiguous (CA5_C) | Test1 |
| Inter-band CA (two bands) (CA5_A2) | Test1 |
| Inter-band CA (three bands) (CA5_A3) | Test1 |
| Inter-band_CA (four bands) (CA_A4) | Test1 |
| Inter-band_CA (five bands) (CA_A5) | Test1 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA5_N2) | Test1 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.61.

2. The parameter settings for the cell are set up according to Table 8.2.1-1 and 8.2.1.4.2_A.4.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.4.2_A.4.4.3.

### 8.2.1.4.2_A.4.4.2 Test procedure

Same test procedure as in clause 8.2.1.4.2_A.2.4.2 with the following exceptions:

- Instead of Table 8.2.1.4.2_A.2.5-1 → use Table 8.2.1.4.2_A.4.5-1

### 8.2.1.4.2_A.4.4.3 Message contents

Same message contents as in clause 8.2.1.4.2_A.2.4.3 with the following exceptions:

- Instead of Table 8.2.1.4.2_A.2.4.3-5 → use Table 8.2.1.4.2_A.4.4.3-1

**Table 8.2.1.4.2_A.4.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11111000 | P-Cell, S-Cells report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.1.4.2_A.4.5 Test requirement

Table 8.2.1.4.2_A.4.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.2.1.4.2_A.4.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.4.2_A.4.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4 | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.3 |
| 3 | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 5 | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 10 | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 |
| 15 | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 |
| 20 | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.2 |

**Table 8.2.1.4.2_A.4.5-2: Test requirement (FRC) based on single carrier performance for CA with 5DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.2.1.4.3-5 per CC | 8, ≥11 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.4.3 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 with TM4 Interference Model – Enhanced Performance Requirement Type A

### 8.2.1.4.3.1 Test purpose

The purpose of these tests is to verify the closed loop rank one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two dominant interfering cells applying transmission mode 4 interference model defined in clause B.5.3.

### 8.2.1.4.3.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward that support enhanced receiver Type A.

### 8.2.1.4.3.3 Minimum conformance requirements

The requirements are specified in Table 8.2.1.4.3-2, with the addition of parameters in Table 8.2.1.4.3.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.2.1.4.3.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.2.1.4.3.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 | -3 |
| | σ | dB | 0 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 | -8.66 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 2 |
| Number of control OFDM symbols | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 6 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.5.3 | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 | 80 |
| | Rank 2 | % | N/A | 20 | 20 |
| Precoding granularity | | PRB | 50 | 6 | 6 |
| PMI delay (Note 4) | | ms | 8 | N/A | N/A |
| Reporting interval | | ms | 5 | N/A | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note6) | N/A | N/A |
| cqi-pmi-ConfigurationIndex | | | 2 | N/A | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Note 6: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5 and #0.

**Table 8.2.1.4.3.3-2: Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.47 FDD | OP.1 FDD | N/A | N/A | EVA5 | EVA5 | EVA5 | 2x2 Low | 70 | 0.8 | 1-8 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.1B.

#### 8.2.1.4.3.4 Test description

##### 8.2.1.4.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.4.3.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.2.1.4.3.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.4.3.4.3.

##### 8.2.1.4.3.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to Tables 8.2.1.4.3.5-1 and 8.2.1.4.3.5-2. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1 and #6 (Table A.2.2.1.2-1).
2. SS sets up parameters for cell 2 and cell 3 according to table 8.2.1.4.3.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SINR according to Tables 8.2.1.4.3.5-2 as appropriate.
4. Measure the average throughput for duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5-15 in Annex G clause G.3.

##### 8.2.1.4.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.2.1.4.3.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.3.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 2 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 483 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.1.4.3.5 Test requirement

Table 8.2.1.4.3.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.2.1.4.3.5-2 for the specified SINR including test tolerances.

**Table 8.2.1.4.3.5-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 | -3 |
| | σ | dB | 0 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A | N/A |
| DIP (Note 2) | | dB | N/A | -1.44 | -7.77 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 2 |
| Number of control OFDM symbols | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 6 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.5.3 | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 | 80 |
| | Rank 2 | % | N/A | 20 | 20 |
| Precoding granularity | | PRB | 50 | 6 | 6 |
| PMI delay (Note 4) | | ms | 8 | N/A | N/A |
| Reporting interval | | ms | 5 | N/A | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note6) | N/A | N/A |
| cqi-pmi-ConfigurationIndex | | | 2 | N/A | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Note 6: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5 and #0.

**Table 8.2.1.4.3.5-2: Test requirement for Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.47 FDD | OP.1 FDD | N/A | N/A | EVA5 | EVA5 | EVA5 | 2x2 Low | 70 | 1.79 | 1-8 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

## 8.2.1.4.3A FDD PDSCH Closed Loop Multi-Layer Spatial Multiplexing 4x2 for Dual Connectivity

### 8.2.1.4.3A.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing for Dual Connectivity.

### 8.2.1.4.3A.2 Test applicability

This test case applies to all types of E-UTRA FDD release 12 and forward UE of category ≥ 3 that support Dual Connectivity.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.1.4.3A.3 Minimum conformance requirements

For dual connectivity the requirements are specified in Table 8.2.1.4.3A.3-3, based on single carrier requirement specified in Table 8.2.1.4.3A.3-2, with the addition of the parameters in Table 8.2.1.4.3A.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.2.1.4.3A.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for dual connectivity**

| Parameter | | Unit | Values |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 for 1.4MHz, 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, and 8 for 15MHz CCs and 20MHz CCs |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000111111111111111111000000000000000 |
| PDSCH transmission mode | | | 4 |
| ACK/NACK transmission | | | Separate ACK/NACK feedbacks with PUCCH format 1b on the MCG and SCG |
| CSI feedback | | | Separate PUSCH feedbacks on the MCG and SCG |
| Time offset between MCG CC and SCG CC | | μs | 0 for UE under test supporting synchronous dual connectivity; 334 for UE under test supporting both asynchronous and synchronous dual connectivity (Note 4). |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: The same PDSCH transmission mode is applied to each component carrier.
Note 4: Asynchronous and synchronous dual connectivity are defined in TS36.300 [18].
Note 5: If the UE supports both SCG bearer and Split bearer, the SCG bearer is configured.

**Table 8.2.1.4.3A.3-2: Single carrier performance for multiple dual connectivity configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.14-4 FDD | OP. 1 FDD | EVA5 | 4x2 Low | 70 | 10.36 |
| 3MHz | R.14-5 FDD | OP. 1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 5MHz | R.14-6 FDD | OP. 1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 10 MHz | R.14 FDD | OP. 1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 15MHz | R.14-7 FDD | OP. 1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 20MHz | R.14-3 FDD | OP. 1 FDD | EVA5 | 4x2 Low | 70 | 10.3 |

**Table 8.2.1.4.3A.3-3: Minimum performance Multi-Layer Spatial Multiplexing (FRC) for dual connectivity**

| Test num. | Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20 MHz | As specified in Table 8.2.1.4.3A.3-2 per CC | ≥5 |
| 2 | 15+20 MHz | As specified in Table 8.2.1.4.3A.3-2 per CC | ≥5 |
| 3 | 10+20MHz | As specified in Table 8.2.1.4.3A.3-2 per CC | ≥5 |
| 4 | 2x15 MHz | As specified in Table 8.2.1.4.3A.3-2 per CC | ≥5 |
| 5 | 2x10 MHz | As specified in Table 8.2.1.4.3A.3-2 per CC | ≥3 |
| Note 1: The OCNG pattern applies for each CC.<br>Note 2: The applicability of requirements for different dual connectivity configurations and bandwidth combination sets is defined in 8.1.2.3A. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.3A.

### 8.2.1.4.3A.4 Test description

#### 8.2.1.4.3A.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: Select one according to Tables 8.1.2.3A.3-1 and 8.2.1.4.3A.4.1-1.

**Table 8.2.1.4.3A.4.1-1: Test point selection for TM4 DC**

| DC Capability | Band Configuration | | | | |
|---|---|---|---|---|---|
| | 2x20 | 15+20 | 10+20 | 2x15 | 2x10 |
| Inter-band DC (two bands) (DC_A_2) | Test1 | Test2 | Test3 | Test4 | Test5 |
| Note 1: Only one test point is tested. Select the largest aggregated dual connectivity bandwidth combination supported by the UE among the UE supported dual connectivity capabilities. | | | | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.46 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.4.3A.3-1 as appropriate.

3. Downlink signals for the MCG CC (PCell) and SCG CC (PSCell) are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. If the Split bearer is only supported, ensure the UE is in State 3A-RF-DC2 according to TS 36.508 [7] clause 5.2A.2B. Otherwise, ensure that the UE is in State 3A-RF-DC1 according to TS 36.508 [7] clause 5.2A.2A. Message contents are defined in clause 8.2.1.4.3A.4.3.

#### 8.2.1.4.3A.4.2 Test procedure

1. The SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.1.4.3A.3-1 and 8.2.1.4.3A.3-2 on both MCG CC and SCG CC. The SS sends downlink MAC padding bits on the DL RMC.

2. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.

3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Table 8.2.1.4.3A.5-1 as appropriate.

4. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.1.4.3A.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 4.6 and 5.5 with the following exceptions:

**Table 8.2.1.4.3A.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop spatial multiplexing performance downlink power allocation (PCell and PSCell)**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.1.4.3A.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation (PCell and PSCell)**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.3A.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation (PCell and PSCell)**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 CQI-ReportConfig-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | RBC |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

### 8.2.1.4.3A.5 Test requirement

Table 8.2.1.4.3A.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.2.1.4.3A.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.4.3A.5-1: Single carrier performance for multiple dual connectivity configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4MHz | R.14-4 FDD | OP. 1 FDD | EVA5 | 4x2 Low | 70 | 11.26 | 9.76 |
| 3MHz | R.14-5 FDD | OP. 1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 5MHz | R.14-6 FDD | OP. 1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 10 MHz | R.14 FDD | OP. 1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 15MHz | R.14-7 FDD | OP. 1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 20MHz | R.14-3 FDD | OP. 1 FDD | EVA5 | 4x2 Low | 70 | 11.2 | 9.7 |

**Table 8.2.1.4.3A.5-2: Test requirement Multi-Layer Spatial Multiplexing (FRC) for dual connectivity**

| Test num. | Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20 MHz | As specified in Table 8.2.1.4.3A.5-1 per CC | ≥5 |
| 2 | 15+20 MHz | As specified in Table 8.2.1.4.3A.5-1 per CC | ≥5 |
| 3 | 10+20MHz | As specified in Table 8.2.1.4.3A.5-1 per CC | ≥5 |
| 4 | 2x15 MHz | As specified in Table 8.2.1.4.3A.5-1 per CC | ≥5 |
| 5 | 2x10 MHz | As specified in Table 8.2.1.4.3A.5-1 per CC | ≥3 |
| Note 1: The OCNG pattern applies for each CC.<br>Note 2: The applicability of requirements for different dual connectivity configurations and bandwidth combination sets is defined in 8.1.2.3A. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.4.4 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 with TM4 Interference Model – Enhanced Performance Requirement Type B

### 8.2.1.4.4.1 Test purpose

The purpose of these tests is to verify the closed loop rank-one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 4 interference model defined in clause B.6.3.

### 8.2.1.4.4.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward that support enhanced performance requirement Type B.

### 8.2.1.4.4.3 Minimum conformance requirements

The requirements are specified in Table 8.2.1.4.4-2, with the addition of parameters in Table 8.2.1.4.4.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.2.1.4.4.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.2.1.4.4.3-1: Test Parameters for Single-layer Spatial Multiplexing (FRC) with TM4 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | | -3 | |
| | $\rho_B$ | dB | -3 (Note 1) | -3 | | -3 | |
| | σ | dB | 0 | 0 | | 0 | |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | | Antenna ports 0,1 | |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 | | | | |
| Test number (Note 4) | | | | Test 1 | Test 2 | Test 1 | Test 2 |
| $\hat{E}_s/N_{oc}$ | | dB | N/A | 13.91 | 3.28 | 3.34 | 0.74 |
| Cell Id | | | | 6 | 1 | 1 | 6 |
| CFI indicated in PCFICH | | | | 3 | Random from set {1,2,3} | 3 | Random from set {1,2,3} |
| $BW_{Channel}$ | | MHz | 10 | 10 | | 10 | |
| Cyclic Prefix | | | Normal | Normal | | Normal | |
| Number of control OFDM symbols | | | 3 | 3 | | 3 | |
| PDSCH transmission mode | | | 4 | 4 | | 4 | |
| Interference model | | | N/A | As specified in clause B.6.3 | | As specified in clause B.6.3 | |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.3 | | As specified in clause B.6.3 | |
| Time offset to cell 1 | | us | N/A | 2 | | 3 | |
| Frequency offset to cell 1 | | Hz | N/A | 200 | | 300 | |
| MBSFN | | | Not configured | Not configured | | Not configured | |
| NeighCellsInfo-r12 (Note 3) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | | {dB-6, dB-3, dB0} | |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | | {2,3,4,8,9} | |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331 [5].
Note 4: Test 1 and Test 2 are defined in Table 8.2.1.4.4.3-2.

**Table 8.2.1.4.4.3-2: Minimum Performance for Enhanced Performance Requirement Type B, Single-layer Spatial Multiplexing (FRC) with TM4 interference model**

| Test Num | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.11-10 FDD | OP.1 FDD | N/A | N/A | EVA 5 | EVA 5 | EVA 5 | 2x2 Low | 85 | 17.0 | ≥1 |
| 2 | R.11-9 FDD | OP.1 FDD | N/A | N/A | EPA 5 | EPA 5 | EPA 5 | 2x2 Low | 85 | 10.1 | ≥1 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: SNR corresponds to $\hat{E}_s/N_{oc}$ of Cell 1 as defined in clause 8.1.1.
Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.1D.

#### 8.2.1.4.4.4 Test description

##### 8.2.1.4.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.4.4.3-2, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.2.1.4.4.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.4.4.4.3.

##### 8.2.1.4.4.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS36.211 [8]) every TTI according to Tables 8.2.1.4.4.5-1 and 8.2.1.4.4.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 and cell 3 according to table 8.2.1.4.4.5-1 as appropriate. The CFIs indicated in PCFICH are randomly selected per TTI.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.1.4.4.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.
5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.
6. Repeat steps from 1 to 5 for each subtest in Tables 8.2.1.4.4.5-1 and 8.2.1.4.4.5-2 as appropriate.

##### 8.2.1.4.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m) with the following exceptions.

**Table 8.2.1.4.4.4.3-1: *PhysicalConfigDedicated-DEFAULT* message disabling CQI reporting**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| } | | | |

8.2.1.4.4.5 Test requirement

Table 8.2.1.4.4.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.2.1.4.4.5-2 for the specified SNR including test tolerances.

**Table 8.2.1.4.4.5-1: Test Parameters for Single-layer Spatial Multiplexing (FRC) with TM4 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | | -3 | |
| | $\rho_B$ | dB | -3 (Note 1) | -3 | | -3 | |
| | σ | dB | 0 | 0 | | 0 | |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | | Antenna ports 0,1 | |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 | | | | |
| Test number (Note 4) | | | | Test 1 | Test 2 | Test 1 | Test 2 |
| $\widehat{E}_s / N_{oc}$ | | dB | N/A | 14.71 | 4.08 | 4.14 | 1.54 |
| Cell Id | | | | 6 | 1 | 1 | 6 |
| CFI indicated in PCFICH | | | | 3 | Random from set {1,2,3} | 3 | Random from set {1,2,3} |
| $BW_{Channel}$ | | MHz | 10 | 10 | | 10 | |
| Cyclic Prefix | | | Normal | Normal | | Normal | |
| Number of control OFDM symbols | | | 3 | 3 | | 3 | |
| PDSCH transmission mode | | | 4 | 4 | | 4 | |
| Interference model | | | N/A | As specified in clause B.6.3 | | As specified in clause B.6.3 | |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.3 | | As specified in clause B.6.3 | |
| Time offset to cell 1 | | us | N/A | 2 | | 3 | |
| Frequency offset to cell 1 | | Hz | N/A | 200 | | 300 | |
| MBSFN | | | Not configured | Not configured | | Not configured | |
| NeighCellsInfo-r12 (Note 3) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | | {dB-6, dB-3, dB0} | |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | | {2,3,4,8,9} | |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331 [5].
Note 4: Test 1 and Test 2 are defined in Table 8.2.1.4.4.5-2.

**Table 8.2.1.4.4.5-2: Test Requirement for Enhanced Performance Requirement Type B, Single-layer Spatial Multiplexing (FRC) with TM4 interference model**

| Test Num | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.11-10 FDD | OP.1 FDD | N/A | N/A | EVA 5 | EVA 5 | EVA 5 | 2x2 Low | 85 | 18.85 | ≥1 |
| 2 | R.11-9 FDD | OP.1 FDD | N/A | N/A | EPA 5 | EPA 5 | EPA 5 | 2x2 Low | 85 | 11.64 | ≥1 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. | | | | | | | | | | | |

## 8.2.1.5

## 8.2.1.6

## 8.2.1.7 Carrier aggregation with power imbalance

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Connection diagram in Annex A of TS 36.508 is TBD

- Test tolerances are undefined

- The minimum test time need to be added to G.3A.5

### 8.2.1.7_A.1 FDD Carrier aggregation with power imbalance (intra-band contiguous DL CA)

#### 8.2.1.7_A.1.1 Test purpose

To verify the ability of an intraband adjacent carrier aggregation UE to demodulate the signal transmitted by the PCell or SCell in the presence of a stronger SCell signal on an adjacent frequency. Throughput is measured on the PCell or SCell only.

#### 8.2.1.7_A.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support intra-band contiguous DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.1.7_A.1.3 Minimum conformance requirements

The requirements are specified in Table 8.2.1.7_A.1.3-2, with the addition of the parameters in Table 8.2.1.7_A.1.3-1 and the downlink physical channel setup according to table C.3.2-1 in Annex C.

**Table 8.2.1.7_A.1.3-1: Test Parameters for CA**

| Parameter | | Unit | Test 1 | Test 2-3 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 (Note 1) |
| | σ | dB | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | Off (Note 2) | Off (Note 2) |
| Symbols for unused PRBs | | | OCNG (Note 3) | OCNG (Note 3) |
| Modulation | | | 64 QAM | 64 QAM |
| Maximum number of HARQ transmission | | | 1 | 1 |
| Redundancy version coding sequence | | | {0} | {0} |
| PDSCH transmission mode of PCell | | | 1 | 3 |
| PDSCH transmission mode of SCell | | | 3 | 1 |
| OCNG Pattern | PCell | | OP.1 FDD | OP.5 FDD |
| | SCell | | OP.5 FDD | OP.1 FDD |
| Propagation Conditions | PCell | | Clause B.1 | Clause B.1 |
| | SCell | | Clause B.1 | Clause B.1 |
| Correlation Matrix and Antenna | PCell | | 1x2 | 2x2 |
| | SCell | | 2x2 | 1x2 |

Note 1: $P_B = 0$ for 1x2 and $P_B = 1$ for 2x2 antenna configuration.
Note 2: No external noise sources are applied
Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated. pseudo random data, which is QPSK modulated.
Note 4: Void

**Table 8.2.1.7_A.1.3-2: Minimum performance (FRC) for CA**

| Test Number | Bandwidth (MHz) | | Reference channel | | Power at antenna port (dBm/15KHz) | | Reference value Fraction of Maximum Throughput (%) | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | PCell | SCell | PCell | SCell | $\hat{E}_{s_PCell}$ for PCell | $\hat{E}_{s_SCell}$ for Scell | PCell | SCell | |
| 1 | 20 | 20 | R.49 FDD | NA | -85 | -79 | 85 | NA | ≥5 |
| 2 | 10 | 10 | NA | R.49-1 FDD | -79 | [-85.8] | NA | 85 | ≥5 |
| 3 | 5 | 5 | NA | R.49-2 FDD | -79 | [-85.9] | NA | 85 | ≥5 |

Note 1: The OCNG pattern for PCell is used to fill the control channel. The OCNG pattern for SCell is used to fill the control channel and PDSCH.
Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.7.

### 8.2.1.7_A.1.4 Test description

#### 8.2.1.7_A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.7_A.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group TBD for UE supporting only 2Rx RF bands on all CC. Annex A, Figure TBD for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.2.1-1and 8.2.1.7_A.1.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.7_A.1.4.3.

#### 8.2.1.7_A.1.4.2 Test procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels except control channel and PDSCH.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.1.7_A.1.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.7_A.1.3-1 and 8.2.1.7_A.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition and the correlation matrix on each of the component carriers according to Tables 8.2.1.7_A.1.5-1 as appropriate.

6. Measure the average throughput on PCC in test number 1 or measure the average throughput on SCC in test number 2 or 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.3A, Table G.3A.5-1. Count the number of NACKs, ACKs and statDTXs on the UL during the test on PCC in test number 1 or on SCC in test number 2 or 3.

#### 8.2.1.7_A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 3, for SCC configuration there are no additional message contents.

### 8.2.1.7_A.1.5 Test requirement

Table 8.2.1.7_A.1.5-1defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 for the throughput test shall meet or exceed the specified value in Table 8.2.1.7_A.1.5-1 for the specified cell power levels including test tolerances for all throughput tests.

**Table 8.2.1.7_A.1.5-1: Test Requirement (FRC) for CA**

| Test Number | Bandwidth (MHz) | | Reference channel | | Power at antenna port (dBm/15KHz) | | Reference value Fraction of Maximum Throughput (%) | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | PCell | SCell | PCell | SCell | $\hat{E}_{s_PCell}$ for PCell | $\hat{E}_{s_SCell}$ for Scell | PCell | SCell | |
| 1 | 20 | 20 | R.49 FDD | NA | -85 | -79 | 85 | NA | ≥5 |
| 2 | 10 | 10 | NA | R.49-1 FDD | -79 | [-85.8] | NA | 85 | ≥5 |
| 3 | 5 | 5 | NA | R.49-2 FDD | -79 | [-85.9] | NA | 85 | ≥5 |
| Note 1: The OCNG pattern for PCell is used to fill the control channel. The OCNG pattern for SCell is used to fill the control channel and PDSCH. | | | | | | | | | |
| Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.1.8 FFS

## 8.2.1.9 FDD PDSCH performance in HST-SFN scenario

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- 36.521-2 spec need to be introduced

### 8.2.1.9.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports in the HST-SFN scenario defined in B.3A when *highSpeedEnhancedDemodulationFlag* is received.

### 8.2.1.9.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 14 and forward that support *demodulationEnhancements-r14*.

### 8.2.1.9.3 Minimum conformance requirements

The requirements are specified in Table 8.2.1.9.3-2, with the addition of the parameters in Table 8.2.1.9.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.2.1.9.3-1: Test Parameters for UE performance in HST-SFN scenario (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (NOTE 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 3 |
| NOTE 1: $P_B = 1$. | | | |

**Table 8.2.1.9.3-2: Minimum performance UE in HST-SFN scenario (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.87 FDD | OP.1 FDD | HST-SFN | 2x2 | 70 | 13.3 | ≥1 |
| NOTE 1: The requirement defined is based on the normalized channel model, i.e., the power of each tap is normalized to the instantaneous total received power from four taps. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.9.

## 8.2.1.9.4 Test description

### 8.2.1.9.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.9.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 8.2.1-1and 8.2.1.9.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.3A.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.1.9.3.

### 8.2.1.9.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.1.9.3-1 and 8.2.1.9.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 8.2.1.9.3-2as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

### 8.2.1.9.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

## 8.2.1.9.5 Test requirement

Table 8.2.1.9.3-2 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.2.1.9.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.1.9.5-1: Test requirement for UE in HST-SFN scenario (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.87 FDD | OP.1 FDD | HST-SFN | 2x2 | 70 | 13.9 | ≥1 |
| NOTE 1: The requirement defined is based on the normalized channel model. | | | | | | | | |

## 8.2.2 TDD (Fixed Reference Channel)

The parameters specified in Table 8.2.2-1 are valid for all TDD tests unless otherwise stated.

**Table 8.2.2-1: Common Test Parameters (TDD)**

| Parameter | Unit | Value | Comments |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | 1 | |
| Special subframe configuration (Note 2) | | 4 | |
| Inter-TTI Distance | | 1 | |
| Number of HARQ processes | Processes | 7 | For TDD, 7 HARQ processes in the DL, as specified in TS 36.213 [10] clause 7.<br>All 7 HARQ processes are used. |
| Scheduling of retransmissions | | | 1. Retransmissions use the same Transport Block Size (TBS) as the initial transmission.<br>2. HARQ processes are scheduled consecutively, independent of the fact, whether retransmissions (for negatively acknowledged HARQ processes) or new transmissions (for positively acknowledged HARQ processes) occur.<br>3. In case when the initial transmission and the retransmissions are scheduled in subframes with a different $N_{PRB}$ (in terms of TS 36.213 [10] subclause 7.1.7) $29 \le I_{MCS} \le 31$ according to TS 36.213 [10] subclause 7.1.7.2 and the appropriate modulation is used. |
| Maximum number of HARQ transmission | | 4 | It is always 4 for TDD, as specified in TS 36.213 [10] clause 8 |
| Redundancy version coding sequence | | {0,1,2,3} for QPSK and 16QAM<br>{0,0,1,2} for 64QAM and 256QAM | |
| Number of OFDM symbols for PDCCH | OFDM symbols | 4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths,<br>2 for 10 MHz, 15 MHz and 20 MHz bandwidths unless otherwise stated | The PCFICH carries information about the number of OFDM symbols used for transmission of PDCCHs in a subframe, as specified in TS 36.211 [8] clause 6.7 |
| Cyclic Prefix | | Normal | CP consist of the following physical resource blocks (RBs) parameters: 12 consecutive subcarriers at a 15 kHz spacing and 7 OFDM symbols, as specified in TS 36.211 [8] clause 6.2.3 |
| Cell ID | | 0 (Note 3) | The Cell ID is uniquely defined by a number in the range of 0 to 503, representing the physical-layer cell identity, as specified in TS 36.211 [8] clause 6.11. |
| Cross carrier scheduling | | Not configured | |

Note 1: as specified in Table 4.2-2 in TS 36.211 [8]
Note 2: as specified in Table 4.2-1 in TS 36.211 [8]
Note 3: For CA tests, Cell ID = 0 applies only to P-Cell. For (n)*th* S-Cell, Cell ID = n is used.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.

## 8.2.2.1 TDD PDSCH Single Antenna Port Performance (Cell-Specific Reference Symbols)

### 8.2.2.1.1 TDD PDSCH Single Antenna Port Performance

#### 8.2.2.1.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

#### 8.2.2.1.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

#### 8.2.2.1.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.1, with the addition of the relevant parameters in Tables 8.2.2-1, 8.2.2.1.1.3-1 and the downlink physical channel setup according to table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.1.1.3-2 for the specified SNR.

**Table 8.2.2.1.1.3-1: Test Parameters**

| Parameter | | Unit | Test 1- 5 | Test 6- 8 | Test 9- 15 | Test 16- 18 |
|---|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 (Note 1) | 0 (Note 1) | 0 (Note 1) |
| | σ | dB | 0 | 0 | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 | -98 | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) | OCNG (Note 2) | OCNG (Note 2) | OCNG (Note 2) |
| Modulation | | | QPSK | 16QAM | 64QAM | 16QAM |
| ACK/NACK feedback mode | | | Multiplexing | Multiplexing | Multiplexing | Multiplexing |
| PDSCH transmission mode | | | 1 | 1 | 1 | 1 |

Note 1: $P_B = 0$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.2.2.1.1.3-2: Minimum performance (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.2 | ≥1 |
| 2 | 10 MHz | R.2 TDD | OP.1 TDD | ETU70 | 1x2 Low | 70 | -0.6 | ≥1 |
| 3 | 10 MHz | R.2 TDD | OP.1 TDD | ETU300 | 1x2 Low | 70 | -0.2 | ≥1 |
| 4 | 10 MHz | R.2 TDD | OP.1 TDD | HST | 1x2 | 70 | -2.6 | ≥1 |
| 5 | 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.0 | ≥1 |
| 6 | 10 MHz | R.3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 6.7 | ≥2 |
| 7 | 10 MHz | R.3 TDD | OP.1 TDD | ETU70 | 1x2 Low | 30 | 1.4 | ≥2 |
| 8 | 10 MHz | R.3 TDD | OP.1 TDD | ETU300 | 1x2 High | 70 | 9.3 | ≥2 |
| 9 | 3 MHz | R.5 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 17.6 | ≥1 |
| 10 | 5 MHz | R.6 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 17.6 | ≥2 |
| 11 | 10 MHz | R.7 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 17.6 | ≥2 |
| 12 | 10 MHz | R.7 TDD | OP.1 TDD | ETU70 | 1x2 Low | 70 | 19.1 | ≥2 |
| 13 | 10 MHz | R.7 TDD | OP.1 TDD | EVA5 | 1x2 High | 70 | 19.1 | ≥2 |
| 14 | 15 MHz | R.8 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 17.8 | ≥2 |
| 15 | 20 MHz | R.9 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 17.7 | ≥3 |
| 16 | 3 MHz | R.0 TDD | OP.1 TDD | ETU70 | 1x2 Low | 30 | 2.1 | ≥1 |
| 17 | 10 MHz | R.1 TDD | OP.1 TDD | ETU70 | 1x2 Low | 30 | 2.0 | ≥1 |
| 18 | 20 MHz | R.1 TDD | OP.1 TDD | ETU70 | 1x2 Low | 30 | 2.1 | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.

#### 8.2.2.1.1.4 Test description

##### 8.2.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Frequencies to be tested for 1PRB allocation: Low Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Tables 8.2.2.1.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9.

2. The parameter settings for the cell are set up according to Tables 8.2.2-1, 8.2.2.1.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.1.1.4.3.

#### 8.2.2.1.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.1.1.3-1 and 8.2.2.1.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the reference channel, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 8.2.2.1.1.5-1as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
4. Repeat steps from 1 to 3 for each subtest in Tables 8.2.2.1.1.5-1 as appropriate.

#### 8.2.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 8.2.2.1.1.5 Test requirement

Table 8.2.2.1.1.3-1 defines the primary level settings including test tolerances for all throughput tests.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A for each throughput test shall meet or exceed the specified value in Tables 8.2.2.1.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.1.1.5-1: Test Requirement (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.4 | ≥1 |
| 2 | 10 MHz | R.2 TDD | OP.1 TDD | ETU70 | 1x2 Low | 70 | 0.2 | ≥1 |
| 3 | 10 MHz | R.2 TDD | OP.1 TDD | ETU300 | 1x2 Low | 70 | 0.6 | ≥1 |
| 4 | 10 MHz | R.2 TDD | OP.1 TDD | HST | 1x2 | 70 | -2.0 | ≥1 |
| 5 | 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.8 | ≥1 |
| 6 | 10 MHz | R.3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 7.5 | ≥2 |
| 7 | 10 MHz | R.3 TDD | OP.1 TDD | ETU70 | 1x2 Low | 30 | 2.2 | ≥2 |
| 8 | 10 MHz | R.3 TDD | OP.1 TDD | ETU300 | 1x2 High | 70 | 10.1 | ≥2 |
| 9 | 3 MHz | R.5 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 18.4 | ≥1 |
| 10 | 5 MHz | R.6 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 18.4 | ≥2 |
| 11 | 10 MHz | R.7 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 18.4 | ≥2 |
| 12 | 10 MHz | R.7 TDD | OP.1 TDD | ETU70 | 1x2 Low | 70 | 19.9 | ≥2 |
| 13 | 10 MHz | R.7 TDD | OP.1 TDD | EVA5 | 1x2 High | 70 | 19.9 | ≥2 |
| 14 | 15 MHz | R.8 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 18.6 | ≥2 |
| 15 | 20 MHz | R.9 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 18.5 | ≥3 |
| 16 | 3 MHz | R.0 TDD | OP.1 TDD | ETU70 | 1x2 Low | 30 | 2.9 | ≥1 |
| 17 | 10 MHz | R.1 TDD | OP.1 TDD | ETU70 | 1x2 Low | 30 | 2.8 | ≥1 |
| 18 | 20 MHz | R.1 TDD | OP.1 TDD | ETU70 | 1x2 Low | 30 | 2.9 | ≥1 |

## 8.2.2.1.1_1 TDD PDSCH Single Antenna Port Performance (Release 9 and forward)

### 8.2.2.1.1_1.1 Test purpose

Same test purpose as in clause 8.2.2.1.1.1.

### 8.2.2.1.1_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward of UE category 1 and 2.

### 8.2.2.1.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.2.1.1.3 with the following exceptions:

- Instead of Table 8.2.2.1.1.3-2 → use Table 8.2.2.1.1_1.3-2.

**Table 8.2.2.1.1_1.3-1: Void**

**Table 8.2.2.1.1_1.3-2: Minimum performance (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | N/A | | | | | | | |
| 2 | N/A | | | | | | | |
| 3 | N/A | | | | | | | |
| 4 | N/A | | | | | | | |
| 5 | N/A | | | | | | | |
| 6 | 5 MHz | R.3-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 6.7 | 1 |
| 7 | 5 MHz | R.3-1 TDD | OP.1 TDD | ETU70 | 1x2 Low | 30 | 1.4 | 1 |
| 8 | 5 MHz | R.3-1 TDD | OP.1 TDD | ETU300 | 1x2 High | 70 | 9.3 | 1 |
| 9 | N/A | | | | | | | |
| 10 | 5 MHz | R.6-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 17.6 | 1 |
| 11 | 10 MHz | R.7-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 17.6 | 1 |
| 12 | 10 MHz | R.7-1 TDD | OP.1 TDD | ETU70 | 1x2 Low | 70 | 19.1 | 1 |
| 13 | 10 MHz | R.7-1 TDD | OP.1 TDD | EVA5 | 1x2 High | 70 | 19.1 | 1 |
| 14 | 15 MHz | R.8-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 17.8 | 1 |
| 15 | 20 MHz | R.9-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 17.7 | 2 |
| | 20 MHz | R.9-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 17.7 | 1 |
| 16 | N/A | | | | | | | |
| 17 | N/A | | | | | | | |
| 18 | N/A | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.

### 8.2.2.1.1_1.4 Test description

Same test description as in clause 8.2.2.1.1.4 with the following exceptions:

- Instead of Table 8.2.2.1.1.3-1 → use Table 8.2.2.1.1_1.3-1.
- Instead of Table 8.2.2.1.1.3-2 → use Table 8.2.2.1.1_1.3-2.
- Instead of Table 8.2.2.1.1.5-1 → use Table 8.2.2.1.1_1.5-1.

### 8.2.2.1.1_1.5 Test requirement

Same test requirements as in clause 8.2.2.1.1.5 with the following exceptions:

- Instead of Table 8.2.2.1.1.3-1 → use Table 8.2.2.1.1_1.3-1.
- Instead of Table 8.2.2.1.1.5-1 → use Table 8.2.2.1.1_1.5-1.

**Table 8.2.2.1.1_1.5-1: Test Requirement (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | N/A | | | | | | | |
| 2 | N/A | | | | | | | |
| 3 | N/A | | | | | | | |
| 4 | N/A | | | | | | | |
| 5 | N/A | | | | | | | |
| 6 | 5 MHz | R.3-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 7.5 | 1 |
| 7 | 5 MHz | R.3-1 TDD | OP.1 TDD | ETU70 | 1x2 Low | 30 | 2.2 | 1 |
| 8 | 5 MHz | R.3-1 TDD | OP.1 TDD | ETU300 | 1x2 High | 70 | 10.1 | 1 |
| 9 | N/A | | | | | | | |
| 10 | 5 MHz | R.6-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | +18.4 | 1 |
| 11 | 10 MHz | R.7-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | +18.4 | 1 |
| 12 | 10 MHz | R.7-1 TDD | OP.1 TDD | ETU70 | 1x2 Low | 70 | +19.9 | 1 |
| 13 | 10 MHz | R.7-1 TDD | OP.1 TDD | EVA5 | 1x2 High | 70 | +19.9 | 1 |
| 14 | 15 MHz | R.8-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | +18.6 | 1 |
| 15 | 20 MHz | R.9-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | +18.5 | 2 |
| | 20 MHz | R.9-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | +18.5 | 1 |
| 16 | N/A | | | | | | | |
| 17 | N/A | | | | | | | |
| 18 | N/A | | | | | | | |

## 8.2.2.1.1_2 TDD PDSCH Single Antenna Port Performance (Release 10 and forward)

### 8.2.2.1.1_2.1 Test purpose

Same test purpose as in clause 8.2.2.1.1.1.

### 8.2.2.1.1_2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward.

### 8.2.2.1.1_2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.2.1.1.3 with the following exceptions:

- Instead of Table 8.2.2.1.1.3-1 → use Table 8.2.2.1.1_2.3-1.
- Instead of Table 8.2.2.1.1.3-2 → use Table 8.2.2.1.1_2.3-2.

**Table 8.2.2.1.1_2.3-1: Test Parameters**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| ACK/NACK feedback mode | | | Multiplexing |
| PDSCH transmission mode | | | 1 |

Note 1: $P_B = 0$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.2.2.1.1_2.3-2: Minimum performance (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.41 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -5.3 | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.1.

### 8.2.2.1.1_2.4 Test description

Same test description as in clause 8.2.2.1.1.4 with the following exceptions:

- Instead of Table 8.2.2.1.1.3-1 → use Table 8.2.2.1.1_2.3-1.
- Instead of Table 8.2.2.1.1.3-2 → use Table 8.2.2.1.1_2.3-2.
- Instead of Table 8.2.2.1.1.5-1 → use Table 8.2.2.1.1_2.5-1.

### 8.2.2.1.1_2.5 Test requirement

Same test requirements as in clause 8.2.2.1.1.5 with the following exceptions:

- Instead of Table 8.2.2.1.1.3-1 → use Table 8.2.2.1.1_2.3-1.
- Instead of Table 8.2.2.1.1.5-1 → use Table 8.2.2.1.1_2.5-1.

**Table 8.2.2.1.1_1.5-1: Test Requirement (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.41 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -4.5 | ≥1 |

## 8.2.2.1.1_A TDD PDSCH Single Antenna Port Performance for CA

## 8.2.2.1.1_A.1 TDD PDSCH Single Antenna Port Performance for CA (2DL CA)

### 8.2.2.1.1_A.1.1 Test purpose

Same test purpose as 8.2.2.1.1.

### 8.2.2.1.1_A.1.2 Test applicability

This test applies to E-UTRA TDD release 10 and forward UE of category 5 or higher that supports inter-band OR intra-band contiguous DL CA

This test also applies to E-UTRA TDD release 11 and forward UE of category 5 or higher that supports intra-band non-contiguous DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.2.1.1_A.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.1, with the addition of the relevant parameters in Tables 8.2.2-1, 8.2.2.1.1_A.1.3-1 and the downlink physical channel setup according to table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.1.1_A.1.3-2 for the specified SNR. For QPSK and 64QAM performance the bandwidths specified in Table 5.4.2.1-1 are verified.

**Table 8.2.2.1.1_A.1.3-1: Test Parameters for CA**

| Parameter | | Unit | Test 1-2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| ACK/NACK feedback mode | | | PUCCH format 1b with channel selection |
| PDSCH transmission mode | | | 1 |

Note 1: $P_B = 0$
Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.
Note 3: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.2.2.1.1_A.1.3-2: Minimum performance (FRC) for CA**

| Test number | Band-width | Refe-rence Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Cate-gory |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 2x20 MHz | R.42 TDD | OP.1 TDD (Note 1) | EVA5 | 1x2 Low | 70 | -1.2 | `≥5 |
| 2 | 20MHz+ 15MHz | R.42 TDD for 20MHz CC | OP.1 TDD (Note 1) | EVA5 | 1x2 Low | 70 | -1.4 | ≥5 |
| | | R.42-3 TDD for 15MHz CC | OP.1 TDD (Note 1) | | | 70 | -1.4 | |
| Note 1: The OCNG pattern applies for each CC.<br>Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.<br>Note 3: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | | | | | | |

**Table 8.2.2.1.1_A.1.3-3: Void**

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.1.

### 8.2.2.1.1_A.1.4 Test description

#### 8.2.2.1.1_A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: Select one according to Table 8.2.2.1.1_A.1.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.2.1.1_A.1.4.1

**Table 8.2.2.1.1_A.1.4.1-1: Test point selection for TM1 2DL CA**

| CA Capability | Bandwidth Combination | |
|---|---|---|
| | 20+20 | 20+15 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 | Test 2 |
| Intra-band contiguous CA (CA2_C) | Test 1 | Test 2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA2_N2) | Test 1 | Test 2 |
| Note 1: Only one test point to be tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.35 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1, 8.2.2.1.1_A.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.1.1_A.1.4.3.

#### 8.2.2.1.1_A.1.4.2 Test procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.2.1.1_A.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4 SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.1.1_A.1.3-1 and 8.2.2.1.1_A.1.3-2 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the reference channel, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 8.2.2.1.1_A.1.5-1 as appropriate.
6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A, Table G.3A.5-6 on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.2.1.1_A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

In test procedure step 2, for SCC configuration there are no additional message contents.

### 8.2.2.1.1_A.1.5 Test requirement

Table 8.2.2.1.1_A.1.3-1 defines the primary level settings including test tolerances for all throughput tests.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause 3.3.1 for the throughput test shall meet or exceed the specified value in Table 8.2.2.1.1_A.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.1.1_A.1.5-1: Test Requirement (FRC) for CA**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band | |
| 1 | 2x20 MHz | R.42 TDD | OP.1 TDD (Note 1) | EVA5 | 1x2 Low | 70 | -0.4 | -1.9 | ≥5 |
| 2 | 20MHz+ 15MHz | R.42 TDD for 20MHz CC | OP.1 TDD (Note 1) | EVA5 | 1x2 Low | 70 | -0.6 | -2.1 | ≥5 |
| | | R.42-3 TDD for 15MHz CC | OP.1 TDD (Note 1) | | | 70 | -0.6 | -2.1 | |
| | Note 1: The OCNG pattern applies for each CC.<br>Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.<br>Note 3: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | | | | | | |

**Table 8.2.2.1.1_A.1.5-3: Void**

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.2.1.1_A.2 TDD PDSCH Single Antenna Port Performance for CA (3DL CA)

### 8.2.2.1.1_A.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

### 8.2.2.1.1_A.2.2 Test applicability

This test case applies to all types of E-UTRA TDD UE release 10 and forward of UE categories 5 and onwards that support 3DL with CA configurations in Table 7.1-2a.

This test case also applies to all types of E-UTRA TDD UE release 11 and forward of UE categories 5 and onwards that support 3DL with CA configurations in Table 7.1-2a.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.2.1.1_A.2.3 Minimum conformance requirements

For CA with 3 DL CCs, the requirements are specified in Table 8.2.2.1.1_A.2.3-2, based on single carrier requirement specified in Table 8.2.2.1.1_A.2.3-1, with the addition of the parameters in Table 8.2.2.1.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.2.1.1_A.2.3-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 3MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.2 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |

**Table 8.2.2.1.1_A.2.3-2: Minimum performance (FRC) based on single carrier performance for CA with 3 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.2.2.1.1_A.2.3-1 per CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.2.2.1.1_A.2.3-1 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.<br>Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.1.

### 8.2.2.1.1_A.2.4 Test description

#### 8.2.2.1.1_A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.2.1.1_A.2.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.2.1.1_A.2.4.1-1

**Table 8.2.2.1.1_A.2.4.1-1: Test point selection for TM1 CA**

| CA Capability | Bandwidth combination | |
|---|---|---|
| | 3x20 | 20+20+15 |
| Intra-band contiguous (CA3_C) | Test1 | NA |
| Inter-band (CA3_A2) | Test1 | Test2 |
| Inter-band CA (three bands) (CA_A3) | NA | NA |
| Intra-band non-contiguous (with two sub-blocks) (CA3_N2) | Test1 | NA |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.59 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.2-1 and 8.2.2.1.1_A.2.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.1.1_A.2.4.3.

#### 8.2.2.1.1_A.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.2.1.1_A.2.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.1.1_A.1.3-1 and 8.2.2.1.1_A.2.3-1 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.2.1.1_A.2.5-1 as appropriate.
6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.1.1.1_A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

#### 8.2.2.1.1_A.2.5 Test requirement

Table 8.2.2.1.1_A.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 for the throughput test shall meet or exceed the specified value in Table 8.2.2.1.1_A.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.1.1_A.2.5-1: Single carrier performance test requirement (FRC) for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.2 | -1.3 |
| 3MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.0 | -1.5 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.4 | -1.9 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 | -2.3 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 | -2.1 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 | -2.1 |

**Table 8.2.2.1.1_A.2.5-2: Test requirement (FRC) based on single carrier performance for CA with 3DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.2.2.1.1_A.2.5-1 per CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.2.2.1.1_A.2.5-1 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | |
| Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.2.1.1_A.3 TDD PDSCH Single Antenna Port Performance for CA (4DL CA)

### 8.2.2.1.1_A.3.1 Test purpose

Same test purpose as 8.2.2.1.1.1.

### 8.2.2.1.1_A.3.2 Test applicability

This test case applies to all types of E-UTRA TDD UE release 11 and forward of UE categories 8 and onwards that support 4DL with CA configurations in Table 7.1-2b.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.2.1.1_A.3.3 Minimum conformance requirements

For CA with 4 DL CCs, the requirements are specified in Table 8.2.2.1.1_A.3.3-2, based on single carrier requirement specified in Table 8.2.2.1.1_A.3.3-1, with the addition of the parameters in Table 8.2.2.1.1_A.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.2.1.1_A.3.3-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput | SNR (dB) |

| | | | | | (%) | |
|---|---|---|---|---|---|---|
| 1.4MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 3MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.2 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |

**Table 8.2.2.1.1_A.3.3-2: Minimum performance (FRC) based on single carrier performance for CA with 4 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.2.2.1.1_A.3.3-1 per CC | ≥8 |
| 2 | 20MHz+20MHz+20MHz+15MHz | As specified in Table 8.2.2.1.1_A.3.3-1 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.1.

### 8.2.2.1.1_A.3.4 Test description

#### 8.2.2.1.1_A.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.2.1.1_A.3.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.2.1.1_A.3.4.1-1

**Table 8.2.2.1.1_A.3.4.1-1: Test point selection for TM4 4DL CA**

| CA Capability | Bandwidth combination | |
|---|---|---|
| | 4x20 | 20+20+20+15 |
| Intra-band contiguous (CA4_C) | Test1 | Test2 |
| Inter-band CA (two bands) (CA4_A2) | Test1 | Test2 |
| Inter-band CA (three bands) (CA4_A3) | Test1 | Test2 |
| Inter-band CA (four bands) (CA4_A4) | Test1 | Test2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA4_N2) | Test1 | Test2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.59 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.2-1 and 8.2.2.1.1_A.3.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.1.1_A.3.4.3.

#### 8.2.2.1.1_A.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.2.1.1_A.3.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.1.1_A.1.3-1 and 8.2.2.1.1_A.3.3-1 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.2.1.1_A.3.5-1 as appropriate.
6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.2.1.1_A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

#### 8.2.2.1.1_A.3.5 Test requirement

Table 8.2.2.1.1_A.3.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 for the throughput test shall meet or exceed the specified value in Table 8.2.2.1.1_A.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.1.1_A.3.5-1: Single carrier performance test requirement (FRC) for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.2 |
| 3MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.4 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.2.2.1.1_A.4 TDD PDSCH Single Antenna Port Performance for CA (5DL CA)

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The feedback mode in table 8.2.2.1.1_A.1.3-1 is not defined for 5DL CA by RAN4 Spec. TS36.101.

### 8.2.2.1.1_A.4.1 Test purpose

Same test purpose as 8.2.2.1.1.1.

### 8.2.2.1.1_A.4.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 5DL with CA configurations in Table 7.1-2c.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.2.1.1_A.4.3 Minimum conformance requirements

For CA with 5 DL CCs, the requirements are specified in Table 8.2.2.1.1_A.4.3-2, based on single carrier requirement specified in Table 8.2.2.1.1_A.4.3-1, with the addition of the parameters in Table 8.2.2.1.1_A.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.2.1.1_A.4.3-1: Minimum performance (FRC) based on single carrier performance for CA with 5 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.2.2.1.1-5 per CC | 8, ≥11 |
| 2 | 15MHz+4x20MHz | As specified in Table 8.2.2.1.1-5 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

**Table 8.2.2.1.1_A.4.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 3MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.2 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.1.

### 8.2.2.1.1_A.4.4 Test description

#### 8.2.2.1.1_A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.2.1.1_A.4.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.2.1.1_A.4.4.1-1

**Table 8.2.2.1.1_A.4.4.1-1: Test point selection for TM4 5DL CA**

| CA Capability | Bandwidth combination | |
|---|---|---|
| | 5x20 | 15+4x20 |
| Intra-band contiguous (CA5_C) | Test1 | Test2 |
| Inter-band CA (two bands) (CA5_A2) | Test1 | Test2 |
| Inter-band CA (three bands) (CA5_A3) | Test1 | Test2 |
| Inter-band CA (four bands) (CA5_A4) | Test1 | Test2 |
| Inter-band CA (five bands) (CA5_A5) | Test1 | Test2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA5_N2) | Test1 | Test2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.59 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.2-1 and 8.2.2.1.1_A.4.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.1.1_A.4.4.3.

### 8.2.2.1.1_A.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.2.1.1_A.4.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.1.1_A.1.3-1 and 8.2.2.1.1_A.4.3-1 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.2.1.1_A.4.5-1 as appropriate.
6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

### 8.2.1.1.1_A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

### 8.2.2.1.1_A.4.5 Test requirement

Table 8.2.2.1.1_A.4.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 for the throughput test shall meet or exceed the specified value in Table 8.2.2.1.1_A.4.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.1.1_A.4.5-1: Single carrier performance test requirement (FRC) for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.2 | -1.2 |
| 3MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0 | -1.4 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.4 | -1.8 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 | -2.2 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 | -2 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 | -2 |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.2.1.2 TDD PDSCH Single Antenna Port Performance with 1 PRB in the presence of MBSFN

### 8.2.2.1.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS and also for the transmission on a single-antenna port with single RB allocation in the presence of MBSFN.

### 8.2.2.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

### 8.2.2.1.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.1, with the addition of the relevant parameters in Tables 8.2.2-1, 8.2.2.1.2.3-1 and the downlink physical channel setup according to table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.1.2.3-2 for the specified SNR.

**Table 8.2.2.1.2.3-1: Test Parameters for Testing 1 PRB allocation**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for MBSFN portion of MBSFN subframes (Note 2) | | | OCNG (Note 3) |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: $P_B = 0$<br>Note 2: The MBSFN portion of an MBSFN subframe comprises the whole MBSFN subframe except the first two symbols in the first slot.<br>Note 3: The MBSFN portion of the MBSFN subframes shall contain QPSK modulated data. Cell-specific reference signals are not inserted in the MBSFN portion of the MBSFN subframes, QPSK modulated MBSFN data is used instead. | | | |

**Table 8.2.2.1.2.3-2: Minimum performance 1 PRB allocation (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.29 TDD | OP.3 TDD | ETU70 | 1x2 Low | 30 | 2.0 | 1-5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.

### 8.2.2.1.2.4 Test description

#### 8.2.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Low Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Bandwidths to be tested: As specified per test number in Tables 8.2.2.1.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1, 8.2.2.1.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.1.2.4.3.

#### 8.2.2.1.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.1.2.3-1 and 8.2.2.1.2.3-2. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the reference channel, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 8.2.2.1.1.2.5-1as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.2.2.1.2.4.3-1: SystemInformationBlockType2: Additional TDD PDSCH Single Antenna Port Performance for 1 PRB allocation with MBSFN subframes test point 1 requirement**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 SystemInformationBlockType2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2 ::= SEQUENCE { | | | |
| mbsfn-SubframeConfig ::= SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | Every radio frame is with MBSFN subframe | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE { | | | |
| oneFrame | 01001x | subframe 4 and 9 is used for MBSFN. | TDD |
| } | | | |
| } | | | |
| } | | | |

#### 8.2.2.1.2.5 Test requirement

Table 8.2.2.1.2.3-1 defines the primary level settings including test tolerances for all throughput tests.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A for each throughput test shall meet or exceed the specified value in Tables 8.2.2.1.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.1.2.5-1: Test Requirement 1PRB with MBSFN subframes (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.29 TDD | OP.3 TDD | ETU70 | 1x2 Low | 30 | 2.8 | 1-5 |

## 8.2.2.2 TDD PDSCH Transmit Diversity Performance (Cell-Specific Reference Symbols)

### 8.2.2.2.1 TDD PDSCH Transmit Diversity 2x2

#### 8.2.2.2.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement

Channel (RMC) not falling below a specified value for transmission on two antenna ports using transmit diversity (SFBC).

#### 8.2.2.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

#### 8.2.2.2.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1 and 8.2.2.2.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.2.2.1.3-2 for the specified SNR. For transmit diversity (SFBC) performance with 2 and 4 transmitter antennas as specified.

**Table 8.2.2.2.1.3-1: Test Parameters for Testing Transmit Diversity Performance (FRC)**

| Parameter | | Unit | Test 1-2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| ACK/NACK feedback mode | | | Multiplexing |
| PDSCH transmission mode | | | 2 |
| Note 1: $P_B = 1$ | | | |

**Table 8.2.2.2.1.3-2: Minimum performance Transmit Diversity (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11 TDD | OP.1 TDD | EVA5 | 2x2 Medium | 70 | 6.8 | ≥2 |
| 2 | 10 MHz | R.10 TDD | OP.1 TDD | HST | 2x2 | 70 | -2.3 | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.2.

#### 8.2.2.2.1.4 Test description

##### 8.2.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.2.2.2.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.

2. The parameter settings for the cell are set up according to Tables 8.2.2-1 and 8.2.2.2.1.3-1 as appropriate.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.2.1.4.3.

#### 8.2.2.2.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.2.1.3-1 and 8.2.2.2.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.2.1.5-1 as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

4. Repeat steps from 1 to 3 for each test interval in Table 8.2.2.2.1.5-1 as appropriate.

#### 8.2.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 8.2.2.2.1.5 Test requirement

Table 8.2.2.2.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Table 8.2.2.2.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.2.1.5-1: Test requirement Transmit Diversity (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11 TDD | OP.1 TDD | EVA5 | 2x2 Medium | 70 | 7.7 | ≥2 |
| 2 | 10 MHz | R.10 TDD | OP.1 TDD | HST | 2x2 | 70 | -1.7 | ≥1 |

## 8.2.2.2.1_1 TDD PDSCH Transmit Diversity 2x2 (Release 9 and forward)

### 8.2.2.2.1_1.1 Test purpose

Same test purpose as in clause 8.2.2.2.1.1

### 8.2.2.2.1_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward of UE category 1.

### 8.2.2.2.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.2.2.1.3 with the following exceptions:

- Instead of Table 8.2.2.2.1.3-2 → use Table 8.2.2.2.1_1.3-1.

**Table 8.2.2.2.1_1.3-1: Minimum performance Transmit Diversity (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 5 MHz | R.11-2 TDD | OP.1 TDD | EVA5 | 2x2 Medium | 70 | 6.8 | 1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.2.

### 8.2.2.2.1_1.4 Test description

Same test description as in clause 8.2.2.2.1.4 with the following exceptions:

- Instead of Table 8.2.2.2.1.3-2 → use Table 8.2.2.2.1_1.3-1.
- Instead of Table 8.2.2.2.1.5-1 → use Table 8.2.2.2.1_1.5-1.

### 8.2.2.2.1_1.5 Test requirement

Same test requirements as in clause 8.2.2.2.1.5 with the following exceptions:

- Instead of Table 8.2.2.2.1.5-1 → use Table 8.2.2.2.1_1.5-1.

**Table 8.2.2.2.1_1.5-1: Test requirement Transmit Diversity (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 5 MHz | R.11-2 TDD | OP.1 TDD | EVA5 | 2x2 Medium | 70 | +7.7 | 1 |

## 8.2.2.2.2 TDD PDSCH Transmit Diversity 4x2

### 8.2.2.2.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on four antenna ports using transmit diversity (SFBC-FSTD).

### 8.2.2.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

### 8.2.2.2.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1 and 8.2.2.2.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.2.2.2.3-2 for the specified SNR. For transmit diversity (SFBC) performance with 2 and 4 transmitter antennas as specified.

**Table 8.2.2.2.2.3-1: Test Parameters for Testing Transmit Diversity Performance (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| ACK/NACK feedback mode | | | Multiplexing |
| PDSCH transmission mode | | | 2 |
| Note 1: $P_B = 1$ | | | |

**Table 8.2.2.2.2.3-2: Minimum performance Transmit Diversity (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 1.4 MHz | R.12 TDD | OP.1 TDD | EPA5 | 4x2 Medium | 70 | 0.2 | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.2.

### 8.2.2.2.2.4 Test description

#### 8.2.2.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.2.2.2.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.11 for antenna configuration 4x2.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1 and 8.2.2.2.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.2.2.4.3.

#### 8.2.2.2.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.2.2.3-1 and 8.2.2.2.2.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.2.2.5-1 as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.2.2.2.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH transmit diversity performance downlink power allocation test point 1 requirement**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | |
| } | | | |

#### 8.2.2.2.2.5 Test requirement

Table 8.2.2.2.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Table 8.2.2.2.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.2.2.5-1: Test requirement Transmit Diversity (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 1.4 MHz | R.12 TDD | OP.1 TDD | EPA5 | 4x2 Medium | 70 | 1.1 | ≥1 |

### 8.2.2.2.2_1 TDD PDSCH Transmit Diversity 4x2 (Release 9 and forward)

#### 8.2.2.2.2_1.1 Test purpose

Same test purpose as in clause 8.2.2.2.2.1.

#### 8.2.2.2.2_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward.

#### 8.2.2.2.2_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.2.2.2.3 with the following exceptions:

- Instead of Table 8.2.2.2.2.3-2 → use Table 8.2.2.2.2_1.3-1.

**Table 8.2.2.2.2_1.3-1: Minimum performance Transmit Diversity (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.13 TDD | OP.1 TDD | ETU70 | 4x2 Low | 70 | -0.5 | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.2.

#### 8.2.2.2.2_1.4 Test description

Same test description as in clause 8.2.2.2.2.4 with the following exceptions:

- Instead of Table 8.2.2.2.2.3-2 → use Table 8.2.2.2.2_1.3-1.
- Instead of Table 8.2.2.2.2.5-1 → use Table 8.2.2.2.2_1.5-1.

#### 8.2.2.2.2_1.5 Test requirement

Same test requirements as in clause 8.2.2.2.2.5 with the following exceptions:

- Instead of Table 8.2.2.2.2.5-1 → use Table 8.2.2.2.2_1.5-1.

**Table 8.2.2.2.2_1.5-1: Test requirement Transmit Diversity (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.13 TDD | OP.1 TDD | ETU70 | 4x2 Low | 70 | +0.4 | ≥1 |

### 8.2.2.2.3_C TDD PDSCH Transmit diversity 2x2 for eICIC

### 8.2.2.2.3_C.1 TDD PDSCH Transmit diversity 2x2 for eICIC (non-MBSFN ABS)

#### 8.2.2.2.3_C.1.1 Test purpose

To verify the UE's performance of transmit diversity (SFBC) with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

#### 8.2.2.2.3_C.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit 115.

#### 8.2.2.2.3_C.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1 and 8.2.2.2.3_C.1.3-1.

In Table 8.2.2.2.3_C.1.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Table C.3.2-1 in Annex C.3.2 and for Cell 2 is according to Table C.3.3-1 in Annex C.3.3, respectively.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.2.2.3_C.1.3-2 for the specified SNR.

**Table 8.2.2.2.3_C.1.3-1: Test Parameters for Transmit diversity Performance (FRC)**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 |
| Special subframe configuration | | | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -102 (Note 2) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -94.8 (Note 4) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.2.2.3_C. 1.3-2 | 6 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 1 |
| ABS pattern (Note 5) | | | N/A | 0000010001 0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0000000001 0000000001 | N/A |
| CSI Subframe Sets (Note 7) | $C_{CSI,0}$ | | 0000010001 0000000001 | N/A |
| | $C_{CSI,1}$ | | 1100101000 1100111000 | N/A |
| Number of control OFDM symbols | | | 2 | 2 |
| ACK/NACK feedback mode | | | Multiplexing | N/A |
| PDSCH transmission mode | | | 2 | N/A |
| Cyclic prefix | | | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 9: SIB-1 will not be transmitted in Cell2 in this test.

**Table 8.2.2.2.3_C.1.3-2: Minimum Performance Transmit Diversity (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) Note 5 | SNR (dB) (Note 2) | |
| 1 | R.11-4 TDD Note 4 | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | 2x2 Medium | 70 | 3.8 | 2-8 |

Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.

Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1.

Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.

Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.

Note 5: The maximum Throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.2.3.

### 8.2.2.2.3_C.1.4 Test description

#### 8.2.2.2.3_C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.2.2.3_C.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the cell1 are set up according to Tables 8.2.2-1 and 8.2.2.2.3_C.1.3-1 as appropriate.
3. Downlink signals are initially set up for Cell1 according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.2.3_C.1.4.3.

#### 8.2.2.2.3_C.1.4.2 Test procedure

1. Set the parameters for Cell1 and Cell2 according to Tables 8.2.2.2.3_C.1.5-1, 8.2.2.2.3_C.1.5-2, C.3.3-1 of Annex C.3.3 as appropriate, and SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC. The SS sends downlink MAC padding bits on the DL RMC. Propagation conditions are set according to Annex B clause B.2.
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

8.2.2.2.3_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.2.2.3_C.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional TDD PDSCH transmit diversity performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000000010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.2.3_C.1.4.3-2: *CQI-ReportConfig-r10-DEFAULT*: Additional TDD PDSCH transmit diversity performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000100010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '11001010001100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.2.2.3_C.1.5 Test requirement

Table 8.2.2.2.3_C.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for each throughput test shall meet or exceed the specified value in Table 8.2.2.2.3_C.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.2.3_C.1.5-1: Test Parameters for Transmit Diversity (FRC)**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 |
| Special subframe configuration | | | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -102.1 (Note 2) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -94.9 (Note 4) | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.2.2.3_C. 1.5-2 | 5.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 1 |
| ABS pattern (Note 5) | | | N/A | 0000010001 0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0000000001 0000000001 | N/A |
| CSI Subframe Sets (Note 7) | $C_{CSI,0}$ | | 0000010001 0000000001 | N/A |
| | $C_{CSI,1}$ | | 1100101000 1100111000 | N/A |
| Number of control OFDM symbols | | | 2 | 2 |
| ACK/NACK feedback mode | | | Multiplexing | N/A |
| PDSCH transmission mode | | | 2 | N/A |
| Cyclic prefix | | | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 9: SIB-1 will not be transmitted in Cell2 in this test.

**Table 8.2.2.2.3_C.1.5-2: Test requirement Transmit Diversity (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) Note 5 | SNR (dB) (Note 2) | |
| 1 | R.11-4 TDD Note 4 | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | 2x2 Medium | 70 | 4.7 | 2-8 |

Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.

Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1.

Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.

Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.

Note 5: The maximum Throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

## 8.2.2.2.3_D

## 8.2.2.2.3_E TDD PDSCH Transmit diversity 2x2 for feICIC

### 8.2.2.2.3_E.1 TDD PDSCH Transmit diversity 2x2 for feICIC (non-MBSFN ABS)

#### 8.2.2.2.3_E.1.1 Test purpose

To verify the UE's performance of transmit diversity (SFBC) with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [14] of the aggressor cells with CRS assistance information.

#### 8.2.2.2.3_E.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE and CRS interference handling and ss-CCH interference handling – Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

#### 8.2.2.2.3_E.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.2.2.3_E.1.3-1.

In Table 8.2.2.2.3_E.1-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information TS 36.331 [5] includes Cell 2 and Cell 3.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.2.2.3_E.1.3-2 for the specified SNR.

**Table 8.2.2.2.3_E.1.3-1: Test Parameters for Transmit diversity Performance (FRC)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93 (Note 4) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.2.2.3_E.1.3-2 | 12 | 10 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 5) | | | N/A | 0000000001 0000000001 | 0000000001 0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0000000001 0000000001 | N/A | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 0000000001 0000000001 | N/A | N/A |
| | $C_{CSI,1}$ | | 1100111000 1100111000 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| PDSCH transmission mode | | | 2 | Note 9 | Note 9 |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern as defined in TS 36.521-1 [10] Annex A.5.
Note 10: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 11: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

**Table 8.2.2.2.3_E.1.3-2: Minimum Performance Transmit Diversity (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughp | SNR (dB) (Note 3) | |

| | | | | | | | | | ut (%) (Note 5) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | R.11-4 TDD (Note 4) | OP.1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | EVA5 | 2x2 Medium | 70 | 3.5 | ≥2 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1.
Note 4: Cell 1 reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: The maximum throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.2.3A.

### 8.2.2.2.3_E.1.4 Test description

#### 8.2.2.2.3_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.2.2.3_E.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell1 are set up according to Tables 8.2.2-1 and 8.2.2.2.3_E.1.3-1 as appropriate.
3. Downlink signals are initially set up for Cell1 according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.2.3_E.1.4.3.

#### 8.2.2.2.3_E.1.4.2 Test procedure

1. Set the parameters for Cell 1, Cell 2 and Cell 3, according to Tables 8.2.2.2.3_E.1.5-1, 8.2.2.2.3_E.1.5-2, and C.3.3.2 of Annex C.3.3. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC.
2. The SS sends downlink MAC padding bits on the DL RMC. Propagation conditions are set according to Annex B clause B.2
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.2.2.3_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 8.2.2.2.3_E.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional TDD PDSCH transmit diversity performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.2A.5, Table 5.2A.5.1.1-2 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '0000000001 0000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 126 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.2.3_E.1.4.3-2: *CQI-ReportConfig-r10-DEFAULT*: Additional TDD PDSCH transmit diversity performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '0000000001 0000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '1100111000 1100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.2.2.3_E.1.5 Test requirement

Table 8.2.2.2.3_E.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.2.2.2.3_E.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.2.3_E.1.5-1: Test Parameters for Transmit diversity Performance (FRC)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93.1 (Note 4) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.2.2.3_E.1.5-2 | 11.8 | 9.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 5) | | | N/A | 0000000001 0000000001 | 0000000001 0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0000000001 0000000001 | N/A | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 0000000001 0000000001 | N/A | N/A |
| | $C_{CSI,1}$ | | 1100111000 1100111000 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| PDSCH transmission mode | | | 2 | Note 9 | Note 9 |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern as defined in TS 36.521-1 [10] Annex A.5.
Note 10: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 11: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

**Table 8.2.2.2.3_E.1.5-2: Test requirement Transmit Diversity (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughp | SNR (dB) (Note 3) | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **ut (%) (Note 5)** | | |
| 1 | R.11-4 TDD (Note 4) | OP.1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | EVA5 | 2x2 Medium | 70 | 4.4 | ≥2 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1.
Note 4: Cell 1 reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: The maximum throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

### 8.2.2.2.4 TDD PDSCH Transmit Diversity 2x2 with TM3 Interference Model – Enhanced Performance Requirement Type A

#### 8.2.2.2.4.1 Test purpose

To verify the performance of transmit diversity (SFBC) with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two dominant interfering cells applying transmission mode 3 interference model.

#### 8.2.2.2.4.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 11 and forward that support enhanced receiver Type A.

#### 8.2.2.2.4.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1, 8.2.2.2.4.3-1 and 8.2.2.2.4.3-2 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.2.4.3-2 for the specified SINR.

**Table 8.2.2.2.4.3-1: Test Parameters for Transmit diversity Performance (FRC) with TM3 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 | -3 |
| | σ | dB | 0 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 | -8.66 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 2 |
| Number of control OFDM symbols | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 2 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.5.2 | As specified in clause B.5.2 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 | 80 |
| | Rank 2 | % | N/A | 20 | 20 |
| Reporting interval | | ms | 5 | N/A | N/A |
| Reporting mode | | | PUCCH 1-0 | N/A | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note5) | N/A | N/A |
| cqi-pmi-ConfigurationIndex | | | 4 | N/A | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: All cells are time-synchronous.

Note 5: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

**Table 8.2.2.2.4.3-2: Enhanced Performance Requirement Type A, Transmit Diversity (FRC) with TM3 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.46 TDD | OP.1 TDD | N/A | N/A | EVA 70 | EVA 70 | EVA 70 | 2x2 Low | 70 | -1.4 | 1-8 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.2.

#### 8.2.2.2.4.4 Test description

##### 8.2.2.2.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Tables 8.2.2.2.4.5-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell1 are set up according to Tables 8.2.2-1, 8.2.2.2.4.5-1 and 8.2.2.2.4.5-2 as appropriate.
3. Downlink signals are initially set up for cell1 according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.2.4.4.3.

##### 8.2.2.2.4.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 8.2.2.2.4.5-1 and 8.2.2.2.4.5-2. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #4 and #9 (Table A.2.3.1.1-1).
2. SS sets up the parameters for cell 2 and cell 3 according to Tables 8.2.2.2.4.5-1 and 8.2.2.2.4.5-2 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SINR according to Tables 8.2.2.2.4.5-1 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5-14 and G.3.6 in Annex G clause G.3.

##### 8.2.2.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

**Table 8.2.2.2.4.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 8.2.2.2.4.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 4 | (see Table 7.2.2-1C in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.2.2.4.5 Test requirement

Table 8.2.2.2.4.5-1defines the primary level settings.

**Table 8.2.2.2.4.5-1: Test Parameters for Transmit diversity Performance (FRC) with TM3 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 | -3 |
| | σ | dB | 0 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A | N/A |
| DIP (Note 2) | | dB | N/A | -1.44 | -7.77 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 2 |
| Number of control OFDM symbols | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 2 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.5.2 | As specified in clause B.5.2 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 | 80 |
| | Rank 2 | % | N/A | 20 | 20 |
| Reporting interval | | ms | 5 | N/A | N/A |
| Reporting mode | | | PUCCH 1-0 | N/A | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note5) | N/A | N/A |
| cqi-pmi-ConfigurationIndex | | | 4 | N/A | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: All cells are time-synchronous.

Note 5: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Table 8.2.2.4.3.5-2 for the specified SINR including test tolerances for all throughput tests.

**Table 8.2.2.2.4.5-2: Enhanced Performance Requirement Type A, Transmit Diversity (FRC) with TM3 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.46 TDD | OP.1 TDD | N/A | N/A | EVA 70 | EVA 70 | EVA 70 | 2x2 Low | 70 | -0.41 | 1-8 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

### 8.2.2.2.5 TDD PDSCH Transmit Diversity 2x2 for eIMTA(when *EIMTA-MainConfigServCell-r12* is configured)

#### 8.2.2.2.5.1 Test purpose

To verify the performance of transmit diversity (SFBC) with 2 transmitter antennas in case of using eIMTA TDD UL-DL reconfiguration for TDD serving cell(s) via monitoring PDCCH with eIMTA-RNTI on a PCell.

#### 8.2.2.2.5.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward that support eIMTA TDD UL-DL reconfiguration for TDD serving cell(s) via monitoring PDCCH with eIMTA-RNTI.

#### 8.2.2.2.5.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1, 8.2.2.2.5.3-1 and 8.2.2.2.5.3-2 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.2.5.3-2 for the specified SINR.

**Table 8.2.2.2.5.3-1: Test Parameters for Transmit diversity Performance (FRC) when EIMTA-MainConfigServCell-r12 is configured**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Uplink downlink configuration in SIB1 (Note 2) | | | 0 |
| Downlink HARQ reference configuration (eimta-HarqReferenceConfig-r12) (Note 2) | | | 5 |
| Set of dynamic TDD UL-DL configurations (NOTES 2,3) | | | {0, 1, 2, 3, 4, 5, 6} |
| Periodicity of monitoring the L1 reconfiguration DCI (eimta-CommandPeriodicity-r12) | | ms | 10 |
| Set of subframes to monitor the L1 reconfiguration DCI (eimta-CommandSubframeSet-r12) (Note 4) | | | {0,1,5,6} |
| Number of DL HARQ processes | | Processes | 15 |
| PDSCH transmission mode | | | 2 |
| ACK/NACK feedback mode (Note 5) | | | Multiplexing |

Note 1: $P_B = 1$
Note 2: As specified in Table 4.2-2 in TS 36.211.
Note 3: UL/DL configuration in PDCCH with eIMTA-RNTI is randomly selected from the given set on a per-DCI basis with equal probability.
Note 4: The set of subframes to monitor PDCCH with eIMTA-RNTI for frame n includes subframes {1,5,6} in frame n-1 and subframe 0 in frame n. Subframes for reconfiguration DCI transmission are chosen in a random way on a per-DCI basis with equal probability.
Note 5: PUCCH Format 3 is used for DL HARQ feedback.

**Table 8.2.2.2.5.3-2: Minimum performance Transmit diversity when EIMTA-MainConfigServCell-r12 is configured**

| Test | Reference channel | OCNG Pattern | Propagation Conditions | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | R.67 TDD | OP.1 TDD | EVA5 | 2x2 Medium | 70 | 5.0 | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.2.5.

#### 8.2.2.2.5.4 Test description

##### 8.2.2.2.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Tables 8.2.2.2.5.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1, 8.2.2.2.5.3-1 and 8.2.2.2.5.3-2 as appropriate.
3. Downlink signals are initially set up for cell according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.2.5.4.3.

##### 8.2.2.2.5.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 8.2.2.2.5.3-1 and 8.2.2.2.5.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.2.2.5.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.2.2.2.5.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 8.2.2.2.5.4.3-1: *TDD-Config-DEFAULT*: TDD PDSCH Transmit Diversity 2x2 for eIMTA requirement**

| Derivation Path: 36.508 Table 4.6.3-23 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa0 | | |
| } | | | |

**Table 8.2.2.2.5.4.3-2: *PhysicalConfigDedicated-DEFAULT*: TDD PDSCH Transmit Diversity 2x2 for eIMTA requirement**

| Derivation Path: 36.508 Table 4.8.2.1.6-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue SEQUENCE { | | | |
| transmissionMode-r10 | tm2 | | |
| } | | | |
| } | | | |
| eimta-MainConfig-r12 | EIMTA-MainConfig-r12-DEFAULT condition TDD | | |
| eimta-MainConfigPCell-r12 CHOICE { | | | |
| setup SEQUENCE { | | | |
| eimta-UL-DL-ConfigIndex-r12 | 1 | | |
| eimta-HARQ-ReferenceConfig-r12 | sa5 | | |
| mbsfn-SubframeConfigList-v1250 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

8.2.2.2.5.5 Test requirement

Table 8.2.2.2.5.3-1defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Table 8.2.2.2.5.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.2.5.5-1: Minimum performance Transmit diversity when EIMTA-MainConfigServCell-r12 is configured**

| Test | Reference channel | OCNG Pattern | Propagation Conditions | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | R.67 TDD | OP.1 TDD | EVA5 | 2x2 Medium | 70 | 5.9 | ≥1 |

## 8.2.2.2.6 TDD PDSCH Transmit Diversity 2x2 with TM2 Interference Model – Enhanced Performance Requirement Type B

### 8.2.2.2.6.1 Test purpose

The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 2 interference model defined in clause B.6.1.

### 8.2.2.2.6.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward that support enhanced performance requirement Type B.

### 8.2.2.2.6.3 Minimum conformance requirements

The requirements are specified in Table 8.2.2.2.6.3-2, with the addition of parameters in Table 8.2.2.2.6.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.2.2.2.6.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.2.2.2.6.3-1: Test Parameters for Transmit diversity Performance (FRC) with TM2 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (NOTE 1) | -3 | -3 |
| | σ | dB | 0 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 6 | 1 |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | 3 |
| CFI indicated in PCFICH in normal subframes | | | 3 | 3 | 3 |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | 2 |
| CFI indicated in PCFICH in special subframes | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 2 | 2 | 2 |
| Interference model | | | N/A | As specified in clause B.6.1 | As specified in clause B.6.1 |
| MBSFN | | | Not configured | Not configured | Not configured |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| NeighCellsInfo-r12 (NOTE 3) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

NOTE 1: $P_B = 1$
NOTE 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
NOTE 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331[5].

**Table 8.2.2.2.6.3-2: Minimum Performance for Enhanced Performance Requirement Type B, Transmit Diversity (FRC) with TM2 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (NOTE 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (NOTE 2) | |
| 1 | R.11-12 TDD | OP.1 TDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 15.3 | ≥1 |

NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
NOTE 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1.
NOTE 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.2.6.

#### 8.2.2.2.6.4 Test description

##### 8.2.2.2.6.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.2.2.6.3-2, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.2-1 and 8.2.2.2.6.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.2.6.4.3.

##### 8.2.2.2.6.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.2.6.5-1 and 8.2.2.2.6.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 and cell 3 according to table 8.2.2.2.6.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.2.6.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.
5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

##### 8.2.2.2.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m).

#### 8.2.2.2.6.5 Test requirement

Table 8.2.2.2.6.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for throughput test shall meet or exceed the specified value in Table 8.2.2.2.6.5-2 for the specified SNR including test tolerances.

**Table 8.2.2.2.6.5-1: Test Parameters for Transmit diversity Performance (FRC) with TM2 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (NOTE 1) | -3 | -3 |
| | σ | dB | 0 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 14.71 | 4.14 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 6 | 1 |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | 3 |
| CFI indicated in PCFICH in normal subframes | | | 3 | 3 | 3 |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | 2 |
| CFI indicated in PCFICH in special subframes | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 2 | 2 | 2 |
| Interference model | | | N/A | As specified in clause B.6.1 | As specified in clause B.6.1 |
| MBSFN | | | Not configured | Not configured | Not configured |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| NeighCellsInfo-r12 (NOTE 3) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

NOTE 1: $P_B = 1$
NOTE 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
NOTE 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331[5].

**Table 8.2.2.2.6.5-2: Test Requirement for Enhanced Performance Requirement Type B, Transmit Diversity (FRC) with TM2 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (NOTE 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (NOTE 2) | |
| 1 | R.11-12 TDD | OP.1 TDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 17.15 | ≥1 |

NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
NOTE 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1.
NOTE 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

### 8.2.2.2.7 TDD PDSCH Transmit Diversity 2x2 with TM9 Interference Model – Enhanced Performance Requirement Type B

#### 8.2.2.2.7.1 Test purpose

The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 9 interference model defined in clause B.6.4.

#### 8.2.2.2.7.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward that support enhanced performance requirement Type B.

#### 8.2.2.2.7.3 Minimum conformance requirements

The requirements are specified in Table 8.2.2.2.7.3-2, with the addition of parameters in Table 8.2.2.2.7.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.2.2.2.7.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.2.2.2.7.3-1: Test Parameters for Transmit diversity Performance (FRC) with TM9 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | 0 | 0 |
| | $\rho_B$ | dB | -3 (NOTE 1) | 0 | 0 |
| | σ | dB | 0 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 3.28 | 0.74 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | 3 |
| CFI indicated in PCFICH in normal subframes | | | 3 | Random from set {1,2,3} | Random from set {1,2,3} |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | 2 |
| CFI indicated in PCFICH in special subframes | | | 2 | Random from set {1,2} | Random from set {1,2} |
| PDSCH transmission mode | | | 2 | 9 | 9 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI reference signals | | | N/A | Antenna ports 15,16 | Antenna ports 15,16 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | N/A | 10 / 4 | 10 / 4 |
| CSI reference signal configuration | | | N/A | 6 | 7 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | N/A | 9 / 0100000000000000 | 9 / 0010000000000000 |
| Time offset to cell 1 | | us | N/A | 5 | -5 |
| Frequency offset to cell 1 | | Hz | N/A | 600 | -600 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (NOTE 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

NOTE 1: $P_B = 1$
NOTE 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
NOTE 3: CSI-RS configurations are according to [8] subclause 6.10.5.2.
NOTE 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331[5].

**Table 8.2.2.2.7.3-2: Minimum Performance for Enhanced Performance Requirement Type B, Transmit Diversity (FRC) with TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (NOTE 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (NOTE 2) | |
| 1 | R.11-11 TDD | OP.1 TDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 8.1 | ≥1 |
| NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | |
| NOTE 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| NOTE 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. | | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.2.7.

### 8.2.2.2.7.4 Test description

#### 8.2.2.2.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.2.2.7.3-2, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.2.2.2.7.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.2.7.4.3.

#### 8.2.2.2.7.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.2.7.5-1 and 8.2.2.2.7.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 and cell 3 according to table 8.2.2.2.7.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.2.7.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.
5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

#### 8.2.2.2.7.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m).

### 8.2.2.2.7.5 Test requirement

Table 8.2.2.2.7.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for throughput test shall meet or exceed the specified value in Table 8.2.2.2.7.5-2 for the specified SNR including test tolerances.

**Table 8.2.2.2.7.5-1: Test Parameters for Transmit diversity Performance (FRC) with TM9 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | 0 | 0 |
| | $\rho_B$ | dB | -3 (NOTE 1) | 0 | 0 |
| | σ | dB | 0 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 4.08 | 1.54 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | 3 |
| CFI indicated in PCFICH in normal subframes | | | 3 | Random from set {1,2,3} | Random from set {1,2,3} |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | 2 |
| CFI indicated in PCFICH in special subframes | | | 2 | Random from set {1,2} | Random from set {1,2} |
| PDSCH transmission mode | | | 2 | 9 | 9 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI reference signals | | | N/A | Antenna ports 15,16 | Antenna ports 15,16 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | N/A | 10 / 4 | 10 / 4 |
| CSI reference signal configuration | | | N/A | 6 | 7 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | N/A | 9 / 0100000000000000 | 9 / 0010000000000000 |
| Time offset to cell 1 | | us | N/A | 5 | -5 |
| Frequency offset to cell 1 | | Hz | N/A | 600 | -600 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (NOTE 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

NOTE 1: $P_B = 1$

NOTE 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
NOTE 3: CSI-RS configurations are according to [8] subclause 6.10.5.2.
NOTE 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331[5].

**Table 8.2.2.2.7.5-2: Test Requirement for Enhanced Performance Requirement Type B, Transmit Diversity (FRC) with TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (NOTE 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (NOTE 2) | |
| 1 | R.11-11 TDD | OP.1 TDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 9.64 | ≥1 |
| NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | |
| NOTE 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| NOTE 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. | | | | | | | | | | | |

## 8.2.2.3 TDD PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)

### 8.2.2.3.1 TDD PDSCH Open Loop Spatial Multiplexing 2x2

#### 8.2.2.3.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

#### 8.2.2.3.1.2 Test applicability

This test applies to all types of E-UTRA TDD release 8 and forward UE of category 2-8.

#### 8.2.2.3.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1 and 8.2.2.3.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.3.1.3-2 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.2.3.1.3-1: Test Parameters for Large Delay CDD (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| ACK/NACK feedback mode | | | Bundling |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$ | | | |

**Table 8.2.2.3.1.3-2: Minimum performance Large Delay CDD (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.1 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3.

### 8.2.2.3.1.4 Test description

#### 8.2.2.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.2.2.3.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1 and 8.2.2.3.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.3.1.4.3.

#### 8.2.2.3.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.3.1.3-1 and 8.2.2.3.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.3.1.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.2.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.2.2.3.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation for Test number 1**

| Derivation Path: 36.508 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.2.3.1.5 Test requirement

Table 8.2.2.3.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Tables 8.2.2.3.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.3.5-1: Test requirement Large Delay CDD (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 14.0 | ≥2 |

8.2.2.3.1_1 TDD PDSCH Open Loop Spatial Multiplexing 2x2 (Release 11 and forward)

8.2.2.3.1_1.1 Test purpose

Same test purpose as in clause 8.2.2.3.1.1.

8.2.2.3.1_1.2 Test applicability

This test applies to all types of E-UTRA TDD release 11 and forward UE of category 2-8.

8.2.2.3.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.2.3.1.3 with the following exceptions:

- Instead of Table 8.2.2.3.1.3-2 → use Table 8.2.2.3.1_1.3-1.

**Table 8.2.2.3.1_1.3-1: Minimum performance Large Delay CDD (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.35 TDD | OP.1 TDD | EVA200 | 2x2 Low | 70 | 20.3 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3.

#### 8.2.2.3.1_1.4 Test description

Same test description as in clause 8.2.2.3.1.4 with the following exceptions:

- Instead of Table 8.2.2.3.1.3-2 → use Table 8.2.2.3.1_1.3-1.
- Instead of Table 8.2.2.3.1.5-1 → use Table 8.2.2.3.1_1.5-1.

#### 8.2.2.3.1_1.5 Test requirement

Same test requirements as in clause 8.2.2.3.1.5 with the following exceptions:

- Instead of Table 8.2.2.3.1.5-1 → use Table 8.2.2.3.1_1.5-1.

**Table 8.2.2.3.1_1.5-1: Test Requirement Large Delay CDD (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.35 TDD | OP.1 TDD | EVA200 | 2x2 Low | 70 | 21.2 | ≥2 |

## 8.2.2.3.1_A TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA

### 8.2.2.3.1_A.1 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (2DL CA)

#### 8.2.2.3.1_A.1.1 Test purpose

Same test purpose as 8.2.2.3.1.1.

#### 8.2.2.3.1_A.1.2 Test applicability

This test applies to E-UTRA TDD release 10 and forward UE of category 5 or higher that supports inter-band or intra-band contiguous DL CA

This test also applies to E-UTRA TDD release 11 and forward UE of category 5 or higher that supports intra-band non-contiguous DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.2.3.1_A.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1 and 8.2.2.3.1_A.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.3.1_A.1.3-2 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.2.3.1_A.1.3-1: Test Parameters for Large Delay CDD (FRC) for CA**

| Parameter | | Unit | Test 1-2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| ACK/NACK feedback mode | | | PUCCH format 1b with channel selection |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$<br>Note 2: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.2.3.1_A.1.3-2: Minimum performance Large Delay CDD (FRC) for CA**

| Test number | Band width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 2x20 MHz | R.30-1 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.7 | ≥5 |
| 2 | 20MHz +15MHz | R.30-1 TDD for 20MHz CC | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.0 | ≥5 |
| | | R.11-9 TDD for 15MHz CC | OP.1 TDD (Note 1) | EVA70 | | 70 | 12.9 | |
| Note 1: The OCNG pattern applies for each CC<br>Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | | | | |

**Table 8.2.2.3.1_A.1.3-3: Void**

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3.

### 8.2.2.3.1_A.1.4 Test description

#### 8.2.2.3.1_A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select according to Table 8.2.2.3.1_A.1.4.1-1.

CA Capability to be tested: Select according to Table 8.2.2.3.1_A.1.4.1

**Table 8.2.2.3.1_A.1.4.1-1: Test point selection for TM3 2DL CA**

| CA Capability | Bandwidth Combination |
|---|---|

| | 20+20 | 20+15 |
|---|---|---|
| Inter-band CA (two bands) (CA2_A2) | Test 1 | Test 2 |
| Intra-band contiguous CA (CA2_C) | Test 1 | Test 2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA2_N2) | Test 1 | Test 2 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.36 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Tables 8.2.2-1 and 8.2.2.3.1_A.1.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.3.1_A.1.4.3.

### 8.2.2.3.1_A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.2.2.3.1_A.1.4.3-1. *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.2.2.3.1_A.1.4.3-1A.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.3.1_A.1.3-1 and 8.2.2.3.1_A.1.5-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.3.1_A.1.5-1 as appropriate.

6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A, Table G.3A.5-7 on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers

7. Repeat steps from 1 to 6 for each subtest in Tables 8.2.2.3.1_A.1.5-1 as appropriate depending on UE CA capability as defined in Table 8.2.2.3.1_A.1.4.1-1.

### 8.2.2.3.1_A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions.

**Table 8.2.2.3.1_A.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.3.1_A.1.4.3-1A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 11 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.2.3.1_A.1.5 Test requirement

Table 8.2.2.3.1_A.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for the throughput test shall meet or exceed the specified value in Tables 8.2.2.3.1_A.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.3.1_A.1.5-1: Test requirement Large Delay CDD (FRC) for CA**

| Test number | Band width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | | UE Cate |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band | |
| 1 | 2x20 MHz | R.30-1 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 14.6 | 13.1 | ≥5 |
| 2 | 20MHz+15MHz | R.30-1 TDD for 20MHz CC | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.9 | 12.4 | ≥5 |
| | | R.11-9 TDD for 15MHz CC | OP.1 TDD (Note 1) | EVA70 | | 70 | 13.8 | 12.3 | |
| Note 1: For CA capable UE, the OCNG pattern applies for each CC<br>Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.2.3.1_A.2 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (3DL CA)

### 8.2.2.3.1_A.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

### 8.2.2.3.1_A.2.2 Test applicability

This test case applies to all types of E-UTRA TDD release 10 and forward UE of category 5 or higher that support 3DL with CA configurations in Table 7.1-2a.

This test case also applies to all types of E-UTRA TDD release 11 and forward UE of category 5 or higher that support 3DL with CA configurations in Table 7.1-2a.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.2.3.1_A.2.3 Minimum conformance requirements

For CA with 3 DL CCs, the requirements are specified in Table 8.2.2.3.1_A.2.3-3, based on single carrier requirement specified in Table 8.2.2.3.1_A.2.3-2, with the addition of the parameters in Table 8.2.2.3.1_A.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.2.3.1_A.2.3-1: Test Parameters for Large Delay CDD (FRC) for CA with 3DL CCs**

| Parameter | | Unit | Test 1, 2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| ACK/NACK feedback mode | | | PUCCH format 3 |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$<br>Note 2: Void<br>Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.2.3.1_A.2.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 3MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.6 |
| 10 MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.9 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.0 |

**Table 8.2.2.3.1_A.2.3-3: Minimum performance (FRC) based on single carrier performance for CA with 3 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.2.2.3.1_A.2.3-2 per CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.2.2.3.1_A.2.3-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3

### 8.2.2.3.1_A.2.4 Test description

#### 8.2.2.3.1_A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select according to Table 8.2.2.3.1_A.2.4.1-1.

CA Capability to be tested: Select according to Table 8.2.2.3.1_A.2.4.1-1.

**Table 8.2.2.3.1_A.2.4.1-1: Test point selection for TM3 3DL CA**

| CA Capability | Bandwidth combination |
|---|---|

| | 3x20 | 20+20+15 |
|---|---|---|
| Intra-band contiguous (CA3_C) | Test1 | Test2 |
| Inter-band CA (two bands) (CA3_A2) | Test1 | Test2 |
| Inter-band CA (three bands) (CA3_A3) | Test1 | Test2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA3_N2) | Test1 | Test2 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.60 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.2.2-1 and 8.2.2.3.1_A.2.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.3.1_A.2.4.3.

### 8.2.2.3.1_A.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.2.3.1_A.2.4.3.

3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.

4. The SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.3.1_A.2.3-1 and 8.2.2.3.1_A.2.3-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.2.3.1_A.2.5-1 as appropriate.

6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

### 8.2.2.3.1_A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions.

**Table 8.2.2.3.1_A.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.3.1_A.2.4.3-1A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 11 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.2.3.1_A.2.5 Test requirement

Table 8.2.2.3.1_A.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2.1 for the throughput test shall meet or exceed the specified value in Table 8.2.2.3.1_A.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.3.1_A.2.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 14.1 | 12.6 |
| 3MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.5 | 12 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.9 | 12.4 |

**Table 8.2.2.3.1_A.2.5-2: Test requirement (FRC) based on single carrier performance for CA with 3 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.2.2.3.1_A.2.5-1 per CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.2.2.3.1_A.2.5-1 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

2

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.2.3.1_A.3 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (4DL CA)

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The feedback mode in table 8.2.2.3.1_A.3.3-1 is not defined for 4DL CA in RAN4 Spec. TS36.101.

### 8.2.2.3.1_A.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

### 8.2.2.3.1_A.3.2 Test applicability

This test case applies to all types of E-UTRA TDD UE release 11 and forward of UE categories 8 and onwards that support 4DL with CA configurations in Table 7.1-2b.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.2.3.1_A.3.3 Minimum conformance requirements

For CA with 4 DL CCs, the requirements are specified in Table 8.2.2.3.1_A.3.3-3, based on single carrier requirement specified in Table 8.2.2.3.1_A.3.3-2, with the addition of the parameters in Table 8.2.2.3.1_A.3.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.2.3.1_A.3.3-1: Test Parameters for Large Delay CDD (FRC) for CA with 4DL CCs**

| Parameter | | Unit | Test 1, 2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| ACK/NACK feedback mode | | | TBD |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$<br>Note 2: Void.<br>Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.2.3.1_A.3.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1.4MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 3MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.6 |
| 10 MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.9 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.0 |

**Table 8.2.2.3.1_A.3.3-3: Minimum performance (FRC) based on single carrier performance for CA with 4DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.2.2.3.1_A.3.3-2per CC | ≥8 |
| 2 | 20MHz+20MHz+20MHz+15MHz | As specified in Table 8.2.2.3.1_A.3.3-2per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3

### 8.2.2.3.1_A.3.4 Test description

#### 8.2.2.3.1_A.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select according to Table 8.2.2.3.1_A.3.4.1-1.

CA Capability to be tested: Select according to Table 8.2.2.3.1_A.3.4.1-1.

**Table 8.2.2.3.1_A.3.4.1-1: Test point selection for TM3 4DL CA**

| CA Capability | Bandwidth combination | |
|---|---|---|
| | 4x20 | 20+20+20+15 |
| Intra-band contiguous (CA4_C) | Test1 | Test2 |
| Inter-band CA (two bands) (CA4_A2) | Test1 | Test2 |
| Inter-band CA (three bands) (CA4_A3) | Test1 | Test2 |
| Inter-band CA (four bands) (CA4_A4) | Test1 | Test2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA4_N2) | Test1 | Test2 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.60 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.2.2-1 and 8.2.2.3.1_A.3.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.3.1_A.3.4.3.

#### 8.2.2.3.1_A.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.2.3.1_A.3.4.3.
3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.
4. The SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.3.1_A.3.3-1 and 8.2.2.3.1_A.3.3-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.2.3.1_A.3.5-1 as appropriate.
6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.2.3.1_A.3.4.3 Message contents

Same as the section 8.2.2.3.1_A.2.4.3.

#### 8.2.2.3.1_A.3.5 Test requirement

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2.1 for the throughput test shall meet or exceed the specified value in Table 8.2.2.3.1_A.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.3.1_A.3.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 14.1 |
| 3MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.5 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.8 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.9 |

**Table 8.2.2.3.1_A.3.5-2: Test requirement (FRC) based on single carrier performance for CA with 4 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.2.2.3.1_A.3.5-1per CC | ≥8 |
| 2 | 20MHz+20MHz+20MHz+15MHz | As specified in Table 8.2.2.3.1_A.3.5-1per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.2.2.3.1_A.4 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (5DL CA)

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The feedback mode in table 8.2.2.3.1_A.4.3-1 is not defined for 5DL CA by RAN4 Spec. TS36.101.

#### 8.2.2.3.1_A.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

#### 8.2.2.3.1_A.4.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 5DL with CA configurations in Table 7.1-2c.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.2.3.1_A.4.3 Minimum conformance requirements

For CA with 5 DL CCs, the requirements are specified in Table 8.2.2.3.1_A.4.3-3, based on single carrier requirement specified in Table 8.2.2.3.1_A.4.3-2, with the addition of the parameters in Table 8.2.2.3.1_A.4.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.2.3.1_A.4.3-1: Test Parameters for Large Delay CDD (FRC) for CA with 4DL CCs**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| ACK/NACK feedback mode | | | [TBD] |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$<br>Note 2: Void<br>Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.2.3.1_A.4.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 3MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.6 |
| 10 MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.9 |
| 20MHz | R.30-1 TDD | OP. 1 TDD | EVA70 | 2x2 Low | 70 | 13.0 |

**Table 8.2.2.3.1_A.4.3-3: Minimum performance (FRC) based on single carrier performance for CA with 5 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.2.2.3.1_A.4.3-2 per CC | 8, ≥11 |
| 2 | 15MHz+4x20MHz | As specified in Table 8.2.2.3.1_A.4.3-2 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3

### 8.2.2.3.1_A.4.4 Test description

#### 8.2.2.3.1_A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select according to Table 8.2.2.3.1_A.4.4.1-1.

CA Capability to be tested: Select according to Table 8.2.2.3.1_A.4.4.1-1.

**Table 8.2.2.3.1_A.4.4.1-1: Test point selection for TM3 5DL CA**

| **CA Capability** | **Bandwidth combination** | |
|---|---|---|
| | 5x20 | 15+4x20 |
| Intra-band contiguous (CA5_C) | Test1 | Test2 |
| Inter-band CA (two bands) (CA5_A2) | Test1 | Test2 |
| Inter-band CA (three bands) (CA5_A3) | Test1 | Test2 |
| Inter-band CA (four bands) (CA5_A4) | Test1 | Test2 |
| Inter-band CA (five bands) (CA5_A5) | Test1 | Test2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA5_N2) | Test1 | Test2 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.60 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.2-1 and 8.2.2.3.1_A.4.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.3.1_A.4.4.3.

#### 8.2.2.3.1_A.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.2.3.1_A.4.4.3.
3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.

4. The SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.3.1_A.4.3-1 and 8.2.2.3.1_A.4.3-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.2.3.1_A.4.5-1 as appropriate.

6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

### 8.2.2.3.1_A.4.4.3 Message contents

Same as the section 8.2.2.3.1_A.2.4.3.

### 8.2.2.3.1_A.4.5 Test requirement

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2.1 for the throughput test shall meet or exceed the specified value in Table 8.2.2.3.1_A.4.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.3.1_A.4.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2RX supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 14.1 | 12.6 |
| 3MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.5 | 12 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.9 | 12.4 |

**Table 8.2.2.3.1_A.4.5-2: Test requirement (FRC) based on single carrier performance for CA with 5 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.2.2.3.1_A.4.5-1 per CC | 8, ≥11 |
| 2 | 15MHz+4x20MHz | As specified in Table 8.2.2.3.1_A.4.5-1 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.2.3.1A TDD Soft buffer management test

### 8.2.2.3.1A_A.1 TDD PDSCH Soft buffer management test for CA (2 DL CA)

#### 8.2.2.3.1A_A.1.1 Test purpose

The test purpose is to verify UE performance with proper instantaneous buffer implementation.

#### 8.2.2.3.1A_A.1.2 Test applicability

This test applies to E-UTRA TDD release 10 and forward UE of category 3 and 4 which support intra-band contiguous DL CA or inter-band DL CA.

This test applies also to E-UTRA TDD release 11 and forward UE of category 3 and 4 which support intra-band non-contiguous DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.2.3.1A_A.1.3 Minimum conformance requirements

The requirements are specified in Table 8.2.2.3.1A_A.1.3-2, with the addition of the parameters in Table 8.2.2.3.1A_A.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C. The purpose is to verify UE performance with proper instantaneous buffer implementation.

**Table 8.2.2.3.1A_A.1.3-1: Test Parameters for soft buffer management (FRC) for CA**

| Parameter | | Unit | Test 1-2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| ACK/NACK feedback mode | | | - (Note 2) |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$<br>Note 2: PUCCH format 1b with channel selection is used to feedback ACK/NACK.<br>Note 3: For CA test cases, the same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.2.3.1A_A.1.3-2: Minimum performance soft buffer management test (FRC) for CA**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | Cat |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 2x20 MHz | R.30-2 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.2 | |
| 2 | 2x20 MHz | R.35-1 TDD | OP.1 TDD (Note 1) | EVA5 | 2x2 Low | 70 | 15.7 | |
| Note 1: The OCNG pattern applies for each CC.<br>Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3.1A.

### 8.2.2.3.1A_A.1.4 Test description

#### 8.2.2.3.1A_A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.2.3.1A_A.1.4.1-1

CA Capability to be tested: Select one according to Table 8.2.2.3.1A_A.1.4.1-1

**Table 8.2.2.3.1A_A.1.4.1-1: Test point selection soft buffer management tests for CA**

| CA Capability | Bandwidth combination |
|---|---|
| | 20+20 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 or 2 |
| Intra-band contiguous CA (CA2_C) | Test 1 or 2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA2_N2) | Test 1 or 2 |
| Only one test point is tested.<br>Note 1: Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 2: One of the two tests per table position is selected, depending on UE category. | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.36 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1 and 8.2.2.3.1A_A.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.3.1_A.1.4.3.

#### 8.2.2.3.1A_A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.2.2.3.1A.1.4.3-1. *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.2.2.3.1_A.1.4.3-1A.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.3.1A_A.1.3-1 and 8.2.2.3.1A_A.1.5-1 or 8.2.2.3.1A_A.1.5-2 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.3.1A_A.1.5-1 or 8.2.2.3.1A_A.1.5-2 as appropriate.

6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A, Table G.3A.5-14 on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers

#### 8.2.2.3.1A_A.1.4.3 Message contents

Same Message contents as 8.2.2.3.1_A.1.4.3.

#### 8.2.2.3.1A_A.1.5 Test requirement

Table 8.2.2.3.1A_A.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for the throughput test shall meet or exceed the specified value in Tables 8.2.2.3.1A_A.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.3.1A_A.1.5-1: Test requirement Large Delay CDD (FRC) for CA**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band | |
| 1 | 2x20 MHz | R.30-2 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 14.1 | 12.6 | 3 |
| 2 | 2x20 MHz | R.35-1 TDD | OP.1 TDD (Note 1) | EVA5 | 2x2 Low | 70 | 16.6 | 15.1 | 4 |
| Note 1: The OCNG pattern applies for each CC.<br>Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4.

#### 8.2.2.3.1A_A.2 Void

#### 8.2.2.3.1A_A.3 Void

### 8.2.2.3.1B TDD PDSCH Open Loop Spatial Multiplexing 2x2 - Enhanced Performance Requirement Type C

#### 8.2.2.3.1B.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

#### 8.2.2.3.1B.2 Test applicability

This test applies to all types of E-UTRA TDD release 12 and forward UE of Category ≥ 2 that support enhanced receiver Type C.

#### 8.2.2.3.1B.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1, 8.2.2.3.1B.3-1 and the downlink physical channel setup according to table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.3.1B.3-2 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.2.3.1B.3-1: Test Parameters for Large Delay CDD (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| ACK/NACK feedback mode | | | Bundling |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$ | | | |

**Table 8.2.2.3.1B.3-2: Enhanced Performance Requirement Type C, Large Delay CDD (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11-1 TDD | OP.1 TDD | EVA70 | 2x2 Medium | 70 | 17.4 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3.1B.

### 8.2.2.3.1B.4 Test description

#### 8.2.2.3.1B.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.2.2.3.1B.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1 and 8.2.2.3.1B.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.3.1B.4.3.

#### 8.2.2.3.1B.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.3.1B.3-1 and 8.2.2.3.1B.3-2. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.3.1B.5-1 as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.2.3.1B.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.2.2.3.1B.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.2.2.3.1B.5 Test requirement

Table 8.2.2.3.1B.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Tables 8.2.2.3.1B.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.3.1B.5-1: Test requirement for Enhanced Performance Requirement Type C, Large Delay CDD (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11-1 TDD | OP.1 TDD | EVA70 | 2x2 Medium | 70 | 18.3 | ≥2 |

### 8.2.2.3.1C TDD PDSCH Open Loop Spatial Multiplexing 2x2 with TM1 Interference – Enhanced Performance Requirement Type C

#### 8.2.2.3.1C.1 Test purpose

The purpose is to verify the performance of open-loop spatial multiplexing performance with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell with transmission mode 1.

### 8.2.2.3.1C.2 Test applicability

This test applies to all types of E-UTRA TDD release 12 and forward UE of Category 2 or higher that support enhanced receiver Type C.

### 8.2.2.3.1C.3 Minimum conformance requirements

The requirements are specified in Table 8.2.2.3.1C.3-2, with the addition of parameters in Table 8.2.2.3.1C.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.2.2.3.1C.3-1, Cell 1 is the serving cell, and Cell 2 is interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2 respectively.

**Table 8.2.2.3.1C.3-1: Test Parameters for Large Delay CDD (FRC) with TM1 interference**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | |
| Downlink power allocation | $\rho_A$ | dB | -3 | 0 |
| | $\rho_B$ | | -3 (Note 1) | 0 |
| | σ | | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna port 0 |
| Cyclic Prefix | | | Normal | Normal |
| Cell ID | | | 0 | 1 |
| Transmission mode | | | 3 | Note 2 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| $\hat{E}_s/N_{oc}$ (Note 3) | | dB | Reference Value in Table 8.2.2.3.1C.3-2 | 12.95 |
| Correlation and antenna configuration | | | Medium (2x2) | Medium(1x2) |
| Number of OFDM symbols for PDCCH | | | 2 | N/A |
| Max number of HARQ transmissions | | | 4 | N/A |
| Redundancy version coding sequence | | | {0,1,2,3} | N/A |

Note 1: $P_B = 1$
Note 2: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.2 applying OCNG pattern OP.5 TDD as defined in Annex A.5.2.5.
Note 3: Cell 1 is the serving cell. Cell 2 is the interfering cell.
Note 4: All cells are time-synchronous.
Note 5: SIB-1 will not be transmitted in Cell2 in this test.

**Table 8.2.2.3.1C.3-2: Enhanced Performance Requirement Type C, Large Delay CDD (FRC) with TM1 interference**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.11-10 TDD | OP.1 TDD | OP.5 TDD | EVA70 | EVA70 | 70 | 19.6 | ≥2 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.
Note 2: SNR corresponds to $\hat{E}_s/N_{oc}$ of Cell 1.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3.1C.

### 8.2.2.3.1C.4 Test description

#### 8.2.2.3.1C.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.2.2.3.1C.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.62.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.2-1 and 8.2.2.3.1C.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.3.1C.4.3.

#### 8.2.2.3.1C.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.3.1C.5-1 and 8.2.2.3.1C.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 according to Table 8.2.2.3.1C.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.3.1C.5-1 and Table 8.2.2.3.1C.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.2.3.1C.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.2.2.3.1C.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

## 8.2.2.3.1C.5 Test requirement

Table 8.2.2.3.1C.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Tables 8.2.2.3.1C.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.3.1C.5-1: Test Parameters for Large Delay CDD (FRC) with TM1 interference**

| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | |
| Downlink power allocation | $\rho_A$ | dB | -3 | 0 |
| | $\rho_B$ | | -3 (Note 1) | 0 |
| | σ | | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna port 0 |
| Cyclic Prefix | | | Normal | Normal |
| Cell ID | | | 0 | 1 |
| Transmission mode | | | 3 | Note 2 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| $\hat{E}_s / N_{oc}$ (Note 3) | | dB | Reference Value in Table 8.2.2.3.1C.5-2 | 13.75 |
| Correlation and antenna configuration | | | Medium (2x2) | Medium(1x2) |
| Number of OFDM symbols for PDCCH | | | 2 | N/A |
| Max number of HARQ transmissions | | | 4 | N/A |
| Redundancy version coding sequence | | | {0,1,2,3} | N/A |
| Note 1: $P_B = 1$ | | | | |
| Note 2: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.2 applying OCNG pattern OP.5 TDD as defined in Annex A.5.2.5. | | | | |
| Note 3: Cell 1 is the serving cell. Cell 2 is the interfering cell. | | | | |
| Note 4: All cells are time-synchronous. | | | | |
| Note 5: SIB-1 will not be transmitted in Cell2 in this test. | | | | |

**Table 8.2.2.3.1C.5-2: Test requirement for Enhanced Performance Requirement Type C, Large Delay CDD (FRC) with TM1 interference**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.11-10 TDD | OP.1 TDD | OP.5 TDD | EVA70 | EVA70 | 70 | 21.5 | ≥2 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s/N_{oc}$ of Cell 1. | | | | | | | | |

## 8.2.2.3.2 TDD PDSCH Open Loop Spatial Multiplexing 4x2

### 8.2.2.3.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on four antenna ports using large delay CDD.

### 8.2.2.3.2.2 Test applicability

This test applies to all types of E-UTRA TDD release 8 and forward UE of category $\geq 2$.

### 8.2.2.3.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1 and 8.2.2.3.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.3.2.3-2 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.2.3.2.3-1: Test Parameters for Large Delay CDD (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| ACK/NACK feedback mode | | | Bundling |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$ | | | |

**Table 8.2.2.3.2.3-2: Minimum performance Large Delay CDD (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.14 TDD | OP.1 TDD | EVA70 | 4x2 Low | 70 | 14.2 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3.

#### 8.2.2.3.2.4 Test description

##### 8.2.2.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.2.2.3.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.11 for antenna configuration 4x2.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1 and 8.2.2.3.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.3.2.4.3.

##### 8.2.2.3.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.3.2.3-1 and 8.2.2.3.2.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.3.2.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.2.2.3.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions.

**Table 8.2.2.3.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation for Test number 1**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.2.3.2.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power for Test number 1**

| Derivation Path: 36.508 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm3 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.2.3.2.5 Test requirement

Table 8.2.2.3.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Tables 8.2.2.3.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.3.2.5-1: Test requirement Large Delay CDD (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.14 TDD | OP.1 TDD | EVA70 | 4x2 Low | 70 | 15.1 | ≥2 |

## 8.2.2.3.3_C TDD PDSCH Open Loop Spatial Multiplexing 2x2 for eICIC

### 8.2.2.3.3_C.1 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for eICIC (non-MBSFN ABS)

#### 8.2.2.3.3_C.1.1 Test purpose

To verify the UE's performance of large delay CDD with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

#### 8.2.2.3.3_C.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit 115.

#### 8.2.2.3.3_C.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1 and 8.2.2.3.3_C.1.3-1,and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

The requirements for non-MBSFN ABS are specified in Table 8.2.2.3.3_C.1.3-2, with the addition of parameters in Table 8.2.2.3.3_C.1.3-1and the downlink physical channel setup according to Annex C.3.2 and Annex C.3.3.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.3.3_C.1.3-2for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.2.3.3_C.1.3-1: Test Parameters for Large Delay CDD (FRC) – non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 |
| Special subframe configuration | | | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -102 (Note 2) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -94.8 (Note 4) | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.2.3.3_C.1.3-2 | 6 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Cell Id | | | 0 | 1 |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| ABS pattern (Note 5) | | | N/A | 0000010001, 0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0000000001, 0000000001 | N/A |
| CSI Subframe Sets (Note 7) | $C_{CSI,0}$ | | 0000010001, 0000000001 | N/A |
| | $C_{CSI,1}$ | | 1100101000 1100111000 | N/A |
| Number of control OFDM symbols | | | 2 | 2 |
| ACK/NACK feedback mode | | | Multiplexing | N/A |
| PDSCH transmission mode | | | 3 | N/A |
| Cyclic prefix | | | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 9: SIB-1 will not be transmitted in Cell2 in this test.

**Table 8.2.2.3.3_C.1.3-2: Minimum performance Large Delay CDD (FRC) – non-MBSFN ABS**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) Note 5 | SNR (dB) (Note 2) | |
| 1 | R.11 TDD Note 4 | OP.1 TDD | OP.1 TDD | EVA 5 | EVA 5 | 2x2 Low | 70 | 14.0 | 2-8 |

Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.

Note 2: SNR corresponds to $\widehat{E}_s / N_{oc2}$ of cell 1.

Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.

Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.

Note 5: The maximum Throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3.3.

### 8.2.2.3.3_C.1.4 Test description

#### 8.2.2.3.3_C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.2.3.3_C.1.3-2, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.2-1 and 8.2.2.3.3_C.1.3-1 as appropriate.
3. Downlink signa3ls are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.3.3_C.1.4.3.

#### 8.2.2.3.3_C.1.4.2 Test procedure

1. Set the parameters for Cell1 and Cell2 according to Tables 8.2.2.3.3_C.1.5-1 and 8.2.2.3.3_C.1.5-2 , C.3.3-1 of Annex C.3.3 as appropriate, and SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC. The SS sends downlink MAC padding bits on the DL RMC. Propagation conditions are set according to Annex B clause B.2.
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

8.2.2.3.3_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.2.3.3_C.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.3.3_C.1.4.3-2: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000000010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.3.3_C.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000100010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '11001010001100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.2.3.3_C.1.5 Test requirement

Table 8.2.2.3.3_C.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.2.3.3_C.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.3.3_C.1.5-1: Test Parameters for Large Delay CDD (FRC) non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 |
| Special subframe configuration | | | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -102.1 (Note 2) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -94.9 (Note 4) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.2.3.3_C.1.5-2 | 5.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Cell Id | | | 0 | 1 |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| ABS pattern (Note 5) | | | N/A | 0000010001, 0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0000000001, 0000000001 | N/A |
| CSI Subframe Sets (Note 7) | $C_{CSI,0}$ | | 0000010001, 0000000001 | N/A |
| | $C_{CSI,1}$ | | 1100101000 1100111000 | N/A |
| Number of control OFDM symbols | | | 2 | 2 |
| ACK/NACK feedback mode | | | Multiplexing | N/A |
| PDSCH transmission mode | | | 3 | N/A |
| Cyclic prefix | | | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 9: SIB-1 will not be transmitted in Cell2 in this test.

**Table 8.2.2.3.3_C.1.5-2: Test Requirement Large Delay CDD (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) Note 5 | SNR (dB) (Note 2) | |
| 1 | R.11 TDD Note 4 | OP.1 TDD | OP.1 TDD | EVA 5 | EVA 5 | 2x2 Low | 70 | 14.9 | 2-8 |

Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.

Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1.

Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.

Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.

Note 5: The maximum Throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

## 8.2.2.3.3_C.2 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for eICIC (MBSFN ABS)

### 8.2.2.3.3_C.2.1 Test purpose

To verify the UE's performance of large delay CDD with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

### 8.2.2.3.3_C.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit 115.

### 8.2.2.3.3_C.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1 and 8.2.2.3.3_C.2.3-1and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

The requirements for MBSFN ABS are specified in Table 8.2.2.3.3_C.2.3-2, with the addition of parameters in Table 8.2.2.3.3_C.2.3-1and the downlink physical channel setup according to Annex C.3.2 and Annex C.3.3.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.3.3_C.2.3-2for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.2.3.3_C.2.3-1: Test Parameters for Large Delay CDD (FRC) – MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 |
| Special subframe configuration | | | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -102 (Note 2) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -94.8 (Note 4) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.2.3.3_C.2.3-2 | 6 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | MBSFN |
| Cell Id | | | 0 | 126 |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| ABS pattern (Note 5) | | | N/A | 0000000001 0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0000000001 0000000001 | N/A |
| CSI Subframe Sets (Note 7) | $C_{CSI,0}$ | | 0000000001 0000000001 | N/A |
| | $C_{CSI,1}$ | | 1100111000 1100111000 | N/A |
| MBSFN Subframe Allocation (Note 10) | | | N/A | 000010 |
| Number of control OFDM symbols | | | 2 | 2 |
| ACK/NACK feedback mode | | | Multiplexing | N/A |
| PDSCH transmission mode | | | 3 | N/A |
| Cyclic prefix | | | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10,#11, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbol #0 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 5: ABS pattern as defined in [14]. The 10th and 20th subframes indicated by ABS pattern are MBSFN ABS subframes.
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 9: SIB-1 will not be transmitted in Cell2 in this test.
Note 10: MBSFN Subframe Allocation as defined in [5], one frame with 6 bits is chosen for MBSFN subframe allocation.

**Table 8.2.2.3.3_C.2.3-2: Minimum performance Large Delay CDD (FRC) – MBSFN ABS**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) Note 5 | SNR (dB) (Note 2) | |
| 1 | R.11 TDD Note 4 | OP.1 TDD | OP.1 TDD | EVA 5 | EVA 5 | 2x2 Low | 70 | 12.2 | 2-8 |
| Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent. | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1. | | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | | |
| Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. | | | | | | | | | |
| Note 5: The maximum Throughput is calculated from the total Payload in 2 subframes, averaged over 20ms. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3.3.

### 8.2.2.3.3_C.2.4 Test description

#### 8.2.2.3.3_C.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.2.3.3_C.2.3-2, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.2-1 and 8.2.2.3.3_C.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.3.3_C.2.4.3.

#### 8.2.2.3.3_C.2.4.2 Test procedure

1. Set the parameters for Cell1 and Cell2 according to Tables 8.2.2.3.3_C.2.5-1, 8.2.2.3.3_C.2.5-2, C.3.3-1 of Annex C.3.3 as appropriate, and SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC. The SS sends downlink MAC padding bits on the DL RMC. Propagation conditions are set according to Annex B clause B.2.
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

8.2.2.3.3_C.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.2.3.3_C.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.3.3_C.2.4.3-2: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 | | | |
| subframeConfig1-5-r10 | ‘00000000010000000001’ | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.3.3_C.2.4.3-3: *CQI-ReportConfig-r10-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000000010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '11001110001100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.3.3_C.2.4.3-4: *SystemInformationBlockType3* exceptions**

| Derivation Path: 36.508 [7] clause 4.6.2, Table 4.4.3.3-2 SystemInformationBlockType3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| neighCellConfig | '00'B (Not all neighbour cells have the same MBSFN subframe allocation as the serving cell) | | |

### 8.2.2.3.3_C.2.5 Test requirement

Table 8.2.2.3.3_C.2.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.2.3.3_C.2.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.3.3_C.2.5-1: Test Parameters for Large Delay CDD (FRC) – MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 |
| Special subframe configuration | | | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -102.1 (Note 2) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -94.9 (Note 4) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.2.3.3_C.2.5-2 | 5.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | MBSFN |
| Cell Id | | | 0 | 126 |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| ABS pattern (Note 5) | | | N/A | 0000000001 0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0000000001 0000000001 | N/A |
| CSI Subframe Sets (Note 7) | $C_{CSI,0}$ | | 0000000001 0000000001 | N/A |
| | $C_{CSI,1}$ | | 1100111000 1100111000 | N/A |
| MBSFN Subframe Allocation (Note 10) | | | N/A | 000010 |
| Number of control OFDM symbols | | | 2 | 2 |
| ACK/NACK feedback mode | | | Multiplexing | N/A |
| PDSCH transmission mode | | | 3 | N/A |
| Cyclic prefix | | | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10,#11, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbol #0 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 5: ABS pattern as defined in [14]. The 10th and 20th subframes indicated by ABS pattern are MBSFN ABS subframes.
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 9: SIB-1 will not be transmitted in Cell2 in this test.
Note 10: MBSFN Subframe Allocation as defined in [5], one frame with 6 bits is chosen for MBSFN subframe allocation.

**Table 8.2.2.3.3_C.2.5-2: Test Requirement Large Delay CDD (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) Note 5 | SNR (dB) (Note 2) | |
| 1 | R.11 TDD Note 4 | OP.1 TDD | OP.1 TDD | EVA 5 | EVA 5 | 2x2 Low | 70 | 13.1 | 2-8 |
| Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.<br>Note 2: SNR corresponds to of cell 1.<br>Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.<br>Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.<br>Note 5: The maximum Throughput is calculated from the total Payload in 2 subframes, averaged over 20ms. | | | | | | | | | |

## 8.2.2.3.3_D

## 8.2.2.3.3_E TDD PDSCH Open Loop Spatial Multiplexing 2x2 for feICIC

## 8.2.2.3.3_E.1 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for feICIC (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured, non-MBSFN ABS)

### 8.2.2.3.3_E.1.1 Test purpose

To verify the UE's performance of large delay CDD with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cells with CRS assistance information.

### 8.2.2.3.3_E.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE and CRS interference handling and ss-CCH interference handling – Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

### 8.2.2.3.3_E.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1 and 8.2.2.3.3_E.1.3-1,and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

The requirements for non-MBSFN ABS are specified in Table 8.2.2.3.3_E.1.3-2, with the addition of parameters in Table 8.2.2.3.3_E.1.3-1and the downlink physical channel setup according to Annex C.3.2 and Annex C.3.3.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.3.3_E.1.3-2for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

**Table 8.2.2.3.3_E.1.3-1: Test Parameters for Large Delay CDD (FRC) – non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93 (Note 4) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.2.3.3_E.1.3-2 | Reference Value in Table 8.2.2.3.3_E.1.3-2 | Reference Value in Table 8.2.2.3.3_E.1.3-2 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 1 | 126 |
| ABS pattern (Note 5) | | | N/A | 0000000001 0000000001 | 0000000001 0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0000000001 0000000001 | N/A | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 0000000001 0000000001 | N/A | N/A |
| | $C_{CSI,1}$ | | 1100111000 1100111000 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| PDSCH transmission mode | | | 3 | Note 9 | Note 9 |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by “0” of ABS pattern.
Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.
Note 10: The number of the CRS ports in Cell1, Cell2 and Cell 3 is the same.
Note 11: SIB-1 will not be transmitted in Cell2 and Cell 3 in this test.

**Table 8.2.2.3.3_E.1.3-2: Minimum performance Large Delay CDD (FRC) – non-MBSFN ABS**

| Test Number | Reference Channel | $\hat{E}_s/N_{oc2}$ | | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) (Note 5) | SNR (dB) (Note 3) | |
| 1 | R.11 TDD (Note 4) | 9 | 7 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 70 | 14.2 | ≥2 |
| 2 | R.35 TDD (Note 4) | 9 | 1 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 70 | 22.7 | ≥2 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s/N_{oc2}$ of Cell 1.
Note 4: Cell 1 reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: The maximum throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3.3.

### 8.2.2.3.3_E.1.4 Test description

#### 8.2.2.3.3_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.2.3.3_E.1.3-2, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.2-1 and 8.2.2.3.3_E.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 8.2.2.3.3_E.1.4.3.

#### 8.2.2.3.3_E.1.4.2 Test procedure

1. Set the parameters for Cell1, Cell2 and Cell3 according to Tables 8.2.2.3.3_E.1.5-1, 8.2.2.3.3_E.1.5-2 and C.3.3-2 of Annex C.3.3 as appropriate. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC. The SS sends downlink MAC padding bits on the DL RMC. Propagation conditions are set according to Annex B clause B.2.
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

8.2.2.3.3_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 8.2.2.3.3_E.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.3.3_E.1.4.3-2: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.2A.5, Table 5.2A.5.1.1-2 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000000010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 1 | | Cell 2 |
| | 126 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.3.3_E.1.4.3-3: PhysicalConfigDedicated-DEFAULT: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.2.2.3.3_E.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000100010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '11001010001100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

## 8.2.2.3.3_E.1.5 Test requirement

Table 8.2.2.3.3_E.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.2.3.3_E.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.3.3_E.1.5-1: Test Parameters for Large Delay CDD (FRC) – non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93.1 (Note 4) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.2.3.3_E.1.5-2 | Reference Value in Table 8.2.2.3.3_E.1.5-2 | Reference Value in Table 8.2.2.3.3_E.1.5-2 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 1 | 126 |
| ABS pattern (Note 5) | | | N/A | 0000000001 0000000001 | 0000000001 0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0000000001 0000000001 | N/A | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 0000000001 0000000001 | N/A | N/A |
| | $C_{CSI,1}$ | | 1100111000 1100111000 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| PDSCH transmission mode | | | 3 | Note 9 | Note 9 |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by “0” of ABS pattern.
Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.
Note 10: The number of the CRS ports in Cell1, Cell2 and Cell 3 is the same.
Note 11: SIB-1 will not be transmitted in Cell2 and Cell 3 in this test.

**Table 8.2.2.3.3_E.1.5-2: Test Parameters for Large Delay CDD (FRC) non-MBSFN ABS**

| Test Number | Reference Channel | $\hat{E}_s/N_{oc2}$ | | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) (Note 5) | SNR (dB) (Note 3) | |
| 1 | R.11 TDD (Note 4) | 8.8 | 6.8 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 70 | 15.1 | ≥2 |
| 2 | R.35 TDD (Note 4) | 8.8 | 0.8 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 70 | 23.6 | ≥2 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s/N_{oc2}$ of Cell 1.
Note 4: Cell 1 reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: The maximum throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

## 8.2.2.4 TDD PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)

### 8.2.2.4.1 TDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 2x2

#### 8.2.2.4.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed loop spatial multiplexing with wideband and frequency selective precoding.

#### 8.2.2.4.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8.

#### 8.2.2.4.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1, 8.2.2.4.1.3-1 and 8.2.2.4.1.3-3 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.4.1.3-2 and 8.2.2.4.1.3-4 for the specified SNR. For single-layer spatial multiplexing closed loop rank-one performance with wideband and frequency selective precoding is specified. For multi-layer spatial multiplexing closed loop rank-two performance with wideband and frequency selective precoding is specified.

**Table 8.2.2.4.1.3-1: Test Parameters for Testing Single-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Precoding granularity | | PRB | 6 | 50 |
| PMI delay (Note 2) | | ms | 10 or 11 | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) | 1or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 | PUSCH 3-1 |
| CodeBookSubsetRestriction bitmap | | | 001111 | 001111 |
| ACK/NACK feedback mode | | | Multiplexing | Multiplexing |
| PDSCH transmission mode | | | 4 | 4 |

Note 1: $P_B = 1$
Note 2: If the UE reports in an available uplink reporting instance at SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms

**Table 8.2.2.4.1.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.10 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | -3.1 | 1-5 |
| 2 | 10 MHz | R.10 TDD | OP.1 TDD | EPA5 | 2x2 High | 70 | -2.8 | 1-5 |

**Table 8.2.2.4.1.3-3: Test Parameters for Testing Multi-Layer Spatial Multiplexing**

| Parameter | | Unit | Test 3 | Test 4 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Precoding granularity | | PRB | 50 | 50 |
| PMI delay (Note 2) | | ms | 10 or 11 | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 3-1 | PUSCH 3-1 |
| ACK/NACK feedback mode | | | Bundling | Bundling |
| CodeBookSubsetRestriction bitmap | | | 110000 | 110000 |
| PDSCH transmission mode | | | 4 | 4 |

Note 1: $P_B = 1$
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms

**Table 8.2.2.4.1.3-4: Minimum performance Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 3 | 10 MHz | R.11-1 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | 12.8 | 2-5 |
| 4 | 10 MHz | R.11-1 TDD | OP.1 TDD | ETU70 | 2x2 Low | 70 | 13.9 | 2-5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.

### 8.2.2.4.1.4 Test description

#### 8.2.2.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Tables 8.2.2.4.1.3-2 and 8.2.2.4.1.3-4 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1, 8.2.2.4.1.3-1 and 8.2.2.4.1.3-3 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.4.1.4.3.

#### 8.2.2.4.1.4.2 Test procedure

1. For single-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.2.4.1.3-1 and 8.2.2.4.1.3-2. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.2.4.1.3-3 and 8.2.2.4.1.3-4. The SS sends downlink MAC padding bits on the DL RMC.
2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.2.4.1.5-1 and 8.2.2.4.1.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
5. Repeat steps from 1 to 4 for each test interval in Tables 8.2.2.4.1.5-1 and 8.2.2.4.1.5-2 as appropriate.

#### 8.2.2.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.2.2.4.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation for Test number 1,2**

| Derivation Path: 36.508 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 001111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.1.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation for Test number 3,4**

| Derivation Path: 36.508 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 110000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.1.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop single -layer spatial multiplexing performance downlink power allocation for Test number 1**

| Derivation Path: 36.508 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.2.2.4.1.4.3-4: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop single/multi-layer spatial multiplexing performance downlink power allocation for Test number 2, 3, 4**

| Derivation Path: 36.508 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.2.2.4.1.4.3-5: PUCCH-ConfigDedicated-DEFAULT: Additional TDD PDSCH closed loop single/multi-layer spatial multiplexing performance downlink power allocation for Test number 3, 4**

| Derivation Path: 36.508 Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| tddAckNackFeedbackMode | bundling | | |
| } | | | |

### 8.2.2.4.1.5 Test requirement

Tables 8.2.2.4.1.3-1 and 8.2.2.4.1.3-3 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Tables 8.2.2.4.1.5-1 and 8.2.2.4.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.4.1.5-1: Test requirement Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.10 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | -2.2 | 1-5 |
| 2 | 10 MHz | R.10 TDD | OP.1 TDD | EPA5 | 2x2 High | 70 | -2.0 | 1-5 |

**Table 8.2.2.4.1.5-2: Test requirement Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 3 | 10 MHz | R.11-1 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | 13.7 | 2-5 |
| 4 | 10 MHz | R.11-1 TDD | OP.1 TDD | ETU70 | 2x2 Low | 70 | 14.8 | 2-5 |

## 8.2.2.4.1_1 TDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 2x2 (Release 9 and forward)

### 8.2.2.4.1_1.1 Test purpose

Same test purpose as in clause 8.2.2.4.1.1.

### 8.2.2.4.1_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward.

### 8.2.2.4.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.2.4.1.3 with the following exceptions:

- Instead of Table 8.2.2.4.1.3-2 → use Table 8.2.2.4.1_1.3-1.
- Instead of Table 8.2.2.4.1.3-4 → use Table 8.2.2.4.1_1.3-2.

**Table 8.2.2.4.1_1.3-1: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.10 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | -3.1 | ≥1 |
| 2 | 10 MHz | R.10 TDD | OP.1 TDD | EPA5 | 2x2 High | 70 | -2.8 | ≥1 |

**Table 8.2.2.4.1_1.3-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 3 | 10 MHz | R.35 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 19.5 | ≥2 |
| 4 | 10 MHz | R.11-1 TDD | OP.1 TDD | ETU70 | 2x2 Low | 70 | 13.9 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.

### 8.2.2.4.1_1.4 Test description

Same test description as in clause 8.2.2.4.1.4 with the following exceptions:

- Instead of Table 8.2.2.4.1.3-2 → use Table 8.2.2.4.1_1.3-1.
- Instead of Table 8.2.2.4.1.3-4 → use Table 8.2.2.4.1_1.3-2.
- Instead of Table 8.2.2.4.1.5-1 → use Table 8.2.2.4.1_1.5-1.
- Instead of Table 8.2.2.4.1.5-2 → use Table 8.2.2.4.1_1.5-2.

### 8.2.2.4.1_1.5 Test requirement

Same test requirements as in clause 8.2.2.4.1.5 with the following exceptions:

- Instead of Table 8.2.2.4.1.5-1 → use Table 8.2.2.4.1_1.5-1.
- Instead of Table 8.2.2.4.1.5-2 → use Table 8.2.2.4.1_1.5-2.

**Table 8.2.2.4.1_1.5-1: Test requirement Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.10 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | -2.2 | ≥1 |
| 2 | 10 MHz | R.10 TDD | OP.1 TDD | EPA5 | 2x2 High | 70 | -2.0 | ≥1 |

**Table 8.2.2.4.1_1.5-2: Test requirement Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 3 | 10 MHz | R.35 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | +20.4 | ≥2 |
| 4 | 10 MHz | R.11-1 TDD | OP.1 TDD | ETU70 | 2x2 Low | 70 | +14.8 | ≥2 |

## 8.2.2.4.1_A to D

## 8.2.2.4.1_E TDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 2x2 for feICIC

## 8.2.2.4.1_E.1 TDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS)

### 8.2.2.4.1_E.1 Test purpose

To verify The purpose is to verify the closed loop rank-one performance with wideband precoding if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [14] of the aggressor cell with CRS assistance information.

### 8.2.2.4.1_E.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE and CRS interference handling and ss-CCH interference handling – UE Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

### 8.2.2.4.1_E.1.3 Minimum conformance requirements

The requirements are specified in Table 8.2.2.4.1_E.1.3-2, with the addition of parameters in Table 8.2.2.4.1_E.1.3-1. In Table 8.2.2.4.1_E.1.3-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information TS 36.331 [5] includes Cell 2 and Cell 3.

**Table 8.2.2.4.1_E.1.3-1: Test Parameters for Testing Single-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93 (Note 4) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.2.4.1_E.1.3-2 | 12 | 10 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 5) | | | N/A | 0000000001 0000000001 | 0000000001 0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0000000001 0000000001 | N/A | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 0000000001 0000000001 | N/A | N/A |
| | $C_{CSI,1}$ | | 1100111000 1100111000 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| PDSCH transmission mode | | | 6 | Note 9 | Note 9 |
| Precoding granularity | | PRB | 50 | N/A | N/A |
| PMI delay (Note 10) | | ms | 10 or 11 | N/A | N/A |
| Reporting interval | | ms | 1 or 4 (Note 11) | N/A | N/A |
| Reporting mode | | | PUSCH 3-1 | N/A | N/A |
| CodeBookSubsetRestriction bitmap | | | 1111 | N/A | N/A |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern as defined in TS 36.521-1 [10] Annex A.5.
Note 10: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 11: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.
Note 12: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 13: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

**Table 8.2.2.4.1_E.1.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%)(Note 5) | SNR (dB) (Note 3) | |
| 1 | R.11 TDD (Note 4) | OP.1 TDD | OP.1 FDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 High | 70 | 6.4 | ≥2 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1.
Note 4: Cell 1 reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: The maximum throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.1C.

### 8.2.2.4.1_E.1.4 Test description

#### 8.2.2.4.1_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.2.4.1_E.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.

2. The parameter settings for the cell are set up according to Tables 8.2.2.4.1_E.1.3-1 as appropriate.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 8.2.2.4.1_E.1.4.3.

#### 8.2.2.4.1_E.1.4.2 Test procedure

1. Set the parameters for Cell 1, Cell 2 and Cell 3, according to Tables 8.2.2.4.1_E.1.5-1, 8.2.2.4.1_E.1.5-2, and C.3.3.2 of Annex C.3.3. SS transmits PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC.

2. The SS sends downlink MAC padding bits on the DL RMC. Propagation conditions are set according to Annex B clause B.2

3. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.

4. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.4.1_E.1.5-2 as appropriate.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.2.4.1_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 8.2.2.4.1_E.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional TDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.2A.5, Table 5.2A.5.1.1-2 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '0000000001 0000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 126 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.1_E.1.4.3-2: PhysicalConfigDedicated-DEFAULT: Additional TDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.2.2.4.1_E.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT*: Additional TDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '0000000001 0000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '1100111000 1100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.1_E.1.4.3-4: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.1.4.1_E.1.4.3-3-5: TDD-Config-DEFAULT: Additional TDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 8.2.1.4.1_E.1.4.3-3-6: PUCCH-ConfigDedicated-DEFAULT: Additional TDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | | |
| } | | | |

### 8.2.2.4.1_E.1.5 Test requirement

Table 8.2.2.4_E.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.2.4.1_E.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.4.1_E.1.5-1: Test Parameters for Testing Single-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | N/A | N/A |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 3) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93.1 (Note 4) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.2.2.4.1_E.1.5-2 | 11.8 | 9.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 5) | | | N/A | 0000000001 0000000001 | 0000000001 0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 6) | | | 0000000001 0000000001 | N/A | N/A |
| CSI Subframe Sets (Note7) | $C_{CSI,0}$ | | 0000000001 0000000001 | N/A | N/A |
| | $C_{CSI,1}$ | | 1100111000 1100111000 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| PDSCH transmission mode | | | 6 | Note 9 | Note 9 |
| Precoding granularity | | PRB | 50 | N/A | N/A |
| PMI delay (Note 10) | | ms | 10 or 11 | N/A | N/A |
| Reporting interval | | ms | 1 or 4 (Note 11) | N/A | N/A |
| Reporting mode | | | PUSCH 3-1 | N/A | N/A |
| CodeBookSubsetRestriction bitmap | | | 1111 | N/A | N/A |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: $P_B = 1$.
Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5: ABS pattern as defined in [14].
Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern as defined in TS 36.521-1 [10] Annex A.5.
Note 10: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 11: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.
Note 12: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 13: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

**Table 8.2.2.4.1_E.1.5-2: Test requirement Single-Layer Spatial Multiplexing (FRC)**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) (Note 5) | SNR (dB) (Note 3) | |
| 1 | R.11 TDD (Note 4) | OP.1TDD | OP.1FDD | OP.1TDD | EPA5 | EPA5 | EPA5 | 2x2 High | 70 | 7.3 | ≥2 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1.
Note 4: Cell 1 reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: The maximum throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

## 8.2.2.4.1_H TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 2x2 for 256QAM in DL

### 8.2.2.4.1_H.1 Test purpose

Same test purpose as defined in clause 8.2.2.4.1.1.

### 8.2.2.4.1_H.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward that support 256QAM in DL.

### 8.2.2.4.1_H.3 Minimum conformance requirements

The requirements are specified in Table 8.2.2.4.1_H-2, with the addition of the parameters in Table 8.2.2.4.1_H-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

**Table 8.2.2.4.1_H.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Test 1-2 | Test 3 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Precoding granularity | | PRB | 50 | 8 |
| PMI delay (Note 2) | | ms | 10 or 11 | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 3-1 | PUSCH 1-2 |
| ACK/NACK feedback mode | | | Bundling | Bundling |
| CodeBookSubsetRestriction bitmap | | | 110000 | 110000 |
| PDSCH transmission mode | | | 4 | 4 |
| Number of OFDM symbols for PDCCH per component carrier | | OFDM symbol | 2 | 1 |

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.

**Table 8.2.2.4.1_H.3-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category | UE DL category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | | |
| 3 | 20 MHz 256QAM | R. 65 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | 24.9 | 11-12 | ≥11 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.2.

### 8.2.2.4.1_H.4 Test description

#### 8.2.2.4.1_H.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Tables 8.2.2.4.1_H.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1 and 8.2.2.4.1_H.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.4.1_H.4.3.

### 8.2.2.4.1_H.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.2.4.1_H.3-1 and 8.2.2.4.1_H.3-2. The SS sends downlink MAC padding bits on the DL RMC.

2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.

3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.4.1_H.5-1 as appropriate.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

5. Repeat steps from 1 to 4 for each test interval in Tables 8.2.2.4.1_H.5-1 as appropriate.

### 8.2.2.4.1_H.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.2.2.4.1_H.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation for Test number 3**

| Derivation Path: 36.508 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 110000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.1_H.4.3-2: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation for Test number 3**

| Derivation Path: 36.508 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.2.2.4.1_H.4.3-3: PUCCH-ConfigDedicated-DEFAULT: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation for Test number 3**

| Derivation Path: 36.508 Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| tddAckNackFeedbackMode | bundling | | |
| } | | | |

### 8.2.2.4.1_H.5 Test requirement

Table 8.2.2.4.1_H.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Table 8.2.2.4.1_H.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.4.1_H.5-1: Test requirement Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category | UE DL category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | | |
| 3 | 20 MHz 256QAM | R. 65 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | 25.8 | 11-12 | ≥11 |

## 8.2.2.4.2 TDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 4x2

### 8.2.2.4.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on four antenna ports using closed loop spatial multiplexing with wideband and frequency selective precoding.

### 8.2.2.4.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8.

### 8.2.2.4.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1, 8.2.2.4.2.3-1 and 8.2.2.4.2.3-3 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.4.3-2 and 8.2.2.4.2.3-4 for the specified SNR. For single-layer spatial multiplexing closed loop rank-one performance with wideband and frequency selective precoding is specified. For multi-layer spatial multiplexing closed loop rank-two performance with wideband and frequency selective precoding is specified.

**Table 8.2.2.4.2.3-1: Test Parameters for Testing Single-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 0000000000000 0000000000000 0000000000000 0000000001111 111111111111 |
| ACK/NACK feedback mode | | | Multiplexing |
| PDSCH transmission mode | | | 4 |
| Note 1: $P_B = 1$<br>Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)<br>Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms | | | |

**Table 8.2.2.4.2.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.13 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | -3.5 | 1-5 |

**Table 8.2.2.4.2.3-3: Test Parameters for Testing Multi-Layer Spatial Multiplexing**

| Parameter | | Unit | Test 2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| ACK/NACK feedback mode | | | Bundling |
| CodeBookSubsetRestriction bitmap | | | 0000000000000 0000000000000 0000001111111 1111111110000 000000000000 |
| PDSCH transmission mode | | | 4 |
| Note 1: $P_B = 1$<br>Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)<br>Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms | | | |

**Table 8.2.2.4.2.3-4: Minimum performance Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz | R.14 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 | 2-5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.

### 8.2.2.4.2.4 Test description

#### 8.2.2.4.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Tables 8.2.2.4.2.3-2 and 8.2.2.4.2.3-4 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 Figure A.11 for antenna configuration 4x2.

2. The parameter settings for the cell are set up according to Tables 8.2.2-1, 8.2.2.4.2.3-1 and 8.2.2.4.2.3-3 as appropriate.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.4.2.4.3.

#### 8.2.2.4.2.4.2 Test procedure

1. For single-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.2.4.2.3-1 and 8.2.2.4.2.3-2. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.2.4.2.3-3 and 8.2.2.4.2.3-4. The SS sends downlink MAC padding bits on the DL RMC.

2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.

3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.2.4.2.5-1 and 8.2.2.4.2.5-2 as appropriate.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

5. Repeat steps from 1 to 4 for each test interval in Tables 8.2.2.4.2.5-1 and 8.2.2.4.2.5-2 as appropriate.

#### 8.2.2.4.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.2.2.4.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop spatial multiplexing performance downlink power allocation for Test numbers 1,2**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.2.4.2.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation for Test number 1**

| Derivation Path: 36.508 Table 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000000000000 00000001111111111111 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.2.4.3-3: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation for Test number 2**

| Derivation Path: 36.508 Table 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000000011111111111111111000000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.2.4.3-4: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop single/multi-layer spatial multiplexing performance downlink power allocation for Test number 1, 2**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.2.2.4.2.4.3-5: *PUCCH-ConfigDedicated-DEFAULT:* Additional TDD PDSCH closed loop single/multi-layer spatial multiplexing performance downlink power allocation for Test number 2**

| Derivation Path: 36.508 Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| tddAckNackFeedbackMode | bundling | | |
| } | | | |

### 8.2.2.4.2.5 Test requirement

Tables 8.2.2.4.2.3-1 and 8.2.2.4.2.3-3 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Tables 8.2.2.4.2.5-1 and 8.2.2.4.2.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.4.2.5-1: Test requirement Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.13 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | -2.6 | 1-5 |

**Table 8.2.2.4.2.5-2: Test requirement Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz | R.14 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.6 | 2-5 |

## 8.2.2.4.2_1 TDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 4x2 (Release 9 and forward)

### 8.2.2.4.2_1.1 Test purpose

Same test purpose as in clause 8.2.2.4.2.1.

### 8.2.2.4.2_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward.

### 8.2.2.4.2_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.2.2.4.2.3 with the following exceptions:

- Instead of Table 8.2.2.4.2.3-2 → use Table 8.2.2.4.2_1.3-1.
- Instead of Table 8.2.2.4.2.3-4 → use Table 8.2.2.4.2_1.3-2.

**Table 8.2.2.4.2_1.3-1: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.13 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | -3.5 | ≥1 |

**Table 8.2.2.4.2_1.3-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz | R.36 TDD | OP.1 TDD | EPA5 | 4x2 Low | 70 | 15.7 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.

### 8.2.2.4.2_1.4 Test description

Same test description as in clause 8.2.2.4.2.4 with the following exceptions:

- Instead of Table 8.2.2.4.2.3-2 → use Table 8.2.2.4.2_1.3-1.
- Instead of Table 8.2.2.4.2.3-4 → use Table 8.2.2.4.2_1.3-2.
- Instead of Table 8.2.2.4.2.5-1 → use Table 8.2.2.4.2_1.5-1.
- Instead of Table 8.2.2.4.2.5-2 → use Table 8.2.2.4.2_1.5-2.

#### 8.2.2.4.2_1.5 Test requirement

Same test requirements as in clause 8.2.2.4.2.5 with the following exceptions:

- Instead of Table 8.2.2.4.2.5-1 → use Table 8.2.2.4.2_1.5-1.
- Instead of Table 8.2.2.4.2.5-2 → use Table 8.2.2.4.2_1.5-2.

**Table 8.2.2.4.2_1.5-1: Test requirement Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.13 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | -2.6 | ≥1 |

**Table 8.2.2.4.2_1.5-2: Test requirement Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz | R.36 TDD | OP.1 TDD | EPA5 | 4x2 Low | 70 | +16.6 | ≥2 |

### 8.2.2.4.2_A TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA

### 8.2.2.4.2_A.1 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (2DL CA)

#### 8.2.2.4.2_A.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

#### 8.2.2.4.2_A.1.2 Test applicability

E-UTRA TDD release 10 and forward UE of category 5 or higher that supports inter-band OR intra-band contiguous DL CA

This test also applies to E-UTRA TDD release 11 and forward UE of category 5 or higher that supports intra-band non-contiguous DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.2.4.2_A.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1, 8.2.2.4.2_A.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.4.2_A.1.3-2 for the specified SNR. For multi-layer spatial multiplexing closed loop rank-two performance with wideband and frequency selective precoding is specified.

For CA with 2 DL CCs except for 2x20MHz, the requirements are specified in Table 8.2.2.4.2_A.1.3-4, based on single carrier requirement specified in Table 8.2.2.4.2_A.1.3-3.

**Table 8.2.2.4.2_A.1.3-1: Test Parameters for Testing Multi-Layer Spatial Multiplexing for CA**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 8 |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| ACK/NACK feedback mode | | | PUCCH format 1b with channel selection |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000111111111111111111000000000000000 |
| CSI request field (Note 4) | | | '10' |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.
Note 4: Multiple CC-s under test are configured as the 1st set of serving cells by high layers.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.2.2.4.2_A.1.3-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC) for CA**

| Test number | Band width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 2x20 MHz | R.43 TDD | OP.1 TDD (Note 1) | EVA5 | 4x2 Low | 70 | 11.1 | ≥5 |
| 2 | 20MHz +15MHz | R.43 TDD for 20MHz CC | OP.1 TDD (Note 1) | EVA5 | 4x2 Low | 70 | 10.7 | ≥5 |
| | | R.43-5TDD for 15MHz CC | OP.1 TDD (Note 1) | EVA5 | | 70 | 10.6 | |

Note 1: The OCNG pattern applies for each CC
Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.

### 8.2.2.4.2_A.1.4 Test description

#### 8.2.2.4.2_A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.2.4.2_A.1.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.2.3.1_A.1.4.1

**Table 8.2.2.4.2_A.1.4.1-1: Test point selection for TM4 2DLCA**

| CA Capability | Bandwidth Combination | |
|---|---|---|
| | 20+20 | 20+15 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 | Test 2 |
| Intra-band contiguous CA (CA2_C) | Test 1 | Test 2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA2_N2) | Test 1 | Test 2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group 46 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1, 8.2.2.4.2_A.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.4.2_A.1.4.3.

### 8.2.2.4.2_A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *PDSCH-ConfigDedicated-DEFAULT* is defined in Table 8.2.2.4.2_A.1.4.3-1, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.2.2.4.2_A.1.4.3-2A , *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.2.2.4.2_A.1.4.3-2, *CQI-ReportConfigSCell-DEFAULT* is defined in Table 8.2.2.4.2_A.1.4.3-4, *CQI-ReportAperiodic-r10-DEFAULT* is defined in Table 8.2.2.4.2_A.1.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 8.2.2.4.2_A.1.4.3-6.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.2.4.2_A.1.3-1 and 8.2.2.4.2_A.1.3-2 or 8.2.2.3.1_A.1.3-4. The SS sends downlink MAC padding bits on the DL RMC.
5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.2.4.2_A.1.5-1 or 8.2.2.4.2_A.1.5-2 as appropriate.
7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

8.2.2.4.2_A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.2.2.4.2_A.1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.2.4.2_A.1.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.2_A.1.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |

**Table 8.2.2.4.2_A.1.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.2.2.4.2_A.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.2.2.4.2_A.1.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.2_A.1.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.2.2.4.2_A.1.4.3-7: *PUSCH-ConfigDedicated-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.2.2.4.2_A.1.5 Test requirement

Tables 8.2.2.4.2_A.1.3-1 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.2.4.2_A.1.5-1 or 8.2.2.4.2_A.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.4.2_A.1.5-1: Test requirement for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Test number | Band width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | | UE Cate |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band | |
| 1 | 2x20 MHz | R.43 TDD | OP.1 TDD (Note 1) | EVA5 | 4x2 Low | 70 | 12.0 | 10.5 | ≥5 |
| 2 | 20MHz+15MHz | R.43 TDD for 20MHz CC | OP.1 TDD (Note 1) | EVA5 | 4x2 Low | 70 | 11.6 | 10.1 | ≥5 |
| | | R.43-5 TDD for 15MHz CC | OP.1 TDD (Note 1) | EVA5 | | 70 | 11.5 | 10 | |
| Note 1: For CA capable UE, the OCNG pattern applies for each CC<br>Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.2.4.2_A.2 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (3DL CA)

### 8.2.2.4.2_A.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

### 8.2.2.4.2_A.2.2 Test applicability

This test case applies to all types of E-UTRA TDD release 10 and forward UE of category 5 or higher that support 3DL with CA configurations in Table 7.1-2a.

This test case also applies to all types of E-UTRA TDD release 11 and forward UE of category 5 or higher that support 3DL with CA configurations in Table 7.1-2a.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.2.4.2_A.2.3 Minimum conformance requirements

For CA with 3 DL CCs, the requirements are specified in Table 8.2.2.4.2_A.2.3-3, based on single carrier requirement specified in Table 8.2.2.4.2_A.2.3-2, with the addition of the parameters in Table 8.2.2.4.2_A.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

**Table 8.2.2.4.2_A.2.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Test 3, 4 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 8 |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| ACK/NACK feedback mode | | | PUCCH format 3 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000111111111111111111000000000000000 |
| CSI request field (Note 4) | | | '10' |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.
Note 4: Multiple CC-s under test are configured as the 1st set of serving cells by high layers.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.2.2.4.2_A.2.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.0 |
| 3MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 9.8 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.0 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.5 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.6 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 |

**Table 8.2.2.4.2_A.2.3-3: Minimum performance (FRC) based on single carrier performance for CA with 3 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.2.2.4.2_A.2.3-2 per CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.2.2.4.2_A.2.3-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4

### 8.2.2.4.2_A.2.4 Test description

#### 8.2.2.4.2_A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.2.4.2_A.2.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.2.4.2_A.2.4.1-1.

**Table 8.2.2.4.2_A.2.4.1-1: Test point selection for TM4 3DL CA**

| CA Capability | Bandwidth combination | |
|---|---|---|
| | 3x20 | 20+20+15 |
| Intra-band contiguous (CA3_C) | Test1 | Test2 |
| Inter-band CA (two bands) (CA3_A2) | Test1 | Test2 |
| Inter-band CA (three bands) (CA3_A3) | Test1 | Test2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA3_N2) | Test1 | Test2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.61 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.2-1 and 8.2.2.4.1_A.2.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.4.2_A.2.4.3.

#### 8.2.2.4.2_A.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.2.4.2_A.2.4.3.

3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.

4. The SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.2.4.2_A.2.3-1 and 8.2.2.4.2_A.2.3-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. The SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.2.4.2_A.2.5-1 as appropriate.

7. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

### 8.2.2.4.2_A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 8.2.2.4.2_A.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.2.4.2_A.2.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000111111111111111100000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.2.2.4.2_A.2.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000000011111111111111110000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.2_A.2.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | RBC |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.2.2.4.2_A.2.4.3-4: *CQI-ReportConfig-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.2.2.4.2_A.2.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11100000 | P-Cell, S-Cells report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.2_A.2.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.2.2.4.2_A.2.4.3-7: *PUSCH-ConfigDedicated-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.2.2.4.2_A.2.5 Test requirement

Table 8.2.2.4.2_A.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2.2 for the throughput test shall meet or exceed the specified value in Table 8.2.2.4.2_A.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.4.2_A.2.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.9 | 10.4 |
| 3MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 | 9.2 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.9 | 9.4 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11. | 9.5 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.5 | 10 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.6 | 10.1 |

**Table 8.2.2.4.2_A.2.5-2: Test requirement (FRC) based on single carrier performance for CA with 3 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.2.2.4.2_A.2.5-1 per CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.2.2.4.2_A.2.5-1 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.2.4.2_A.3 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (4DL CA)

### 8.2.2.4.2_A.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

### 8.2.2.4.2_A.3.2 Test applicability

This test case applies to all types of E-UTRA TDD release 11 and forward UE of category 8 or higher that support 4DL with CA configurations in Table 7.1-2c.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.2.4.2_A.3.3 Minimum conformance requirements

For CA with 4 DL CCs, the requirements are specified in Table 8.2.2.4.2_A.3.3-3, based on single carrier requirement specified in Table 8.2.2.4.2_A.3.3-2, with the addition of the parameters in Table 8.2.2.4.2_A.3.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.2.2.4.2_A.3.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 8 |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| ACK/NACK feedback mode | | | PUCCH format 3 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000111111111111111111000000000000000 |
| CSI request field (Note 4) | | | '10' |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.

Note 4: Multiple CC-s under test are configured as the 1st set of serving cells by high layers.

Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.2.2.4.2_A.3.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.0 |
| 3MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 9.8 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.0 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.5 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.6 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 |

**Table 8.2.2.4.2_A.3.3-3: Minimum performance (FRC) based on single carrier performance for CA with 4 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.2.2.4.2_A.3.3-2 per CC | ≥8 |
| 2 | 20MHz+20MHz+20MHz+15MHz | As specified in Table 8.2.2.4.2_A.3.3-2 per CC | ≥8 |

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4

### 8.2.2.4.2_A.3.4 Test description

#### 8.2.2.4.2_A.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.2.4.2_A.3.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.2.4.2_A.3.4.1-1.

**Table 8.2.2.4.2_A.3.4.1-1: Test point selection for TM4 4DL CA**

| CA Capability | Bandwidth combination | |
|---|---|---|
| | 4x20 | 20+20+20+15 |
| Intra-band contiguous (CA4_C) | Test1 | Test2 |
| Inter-band CA (two bands) (CA4_A2) | Test1 | Test2 |
| Inter-band CA (three bands) (CA4_A3) | Test1 | Test2 |
| Inter-band CA (four bands) (CA4_A4) | Test1 | Test2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA4_N2) | Test1 | Test2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.61 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.2-1 and 8.2.2.4.2_A.3.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.4.2_A.3.4.3.

### 8.2.2.4.2_A.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.2.4.2_A.3.4.3.
3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.
4. The SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.2.4.2_A.3.3-1 and 8.2.2.4.2_A.3.3-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. The SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.2.4.2_A.3.5-1 as appropriate.
7. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

### 8.2.2.4.2_A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 8.2.2.4.2_A.3.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.2.4.2_A.3.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.2.2.4.2_A.3.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.2_A.3.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | RBC |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.2.2.4.2_A.3.4.3-4: *CQI-ReportConfig-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.2.2.4.2_A.3.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11100000 | P-Cell, S-Cells report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.2_A.3.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.2.2.4.2_A.3.4.3-7: *PUSCH-ConfigDedicated-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.2.2.4.2_A.3.5 Test requirement

Table 8.2.2.4.2_A.3.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2.2 for the throughput test shall meet or exceed the specified value in Table 8.2.2.4.2_A.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.4.2_A.3.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.9 |
| 3MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.9 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.4 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.5 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.6 |

**Table 8.2.2.4.2_A.3.5-2: Test requirement (FRC) based on single carrier performance for CA with 4 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.2.2.4.2_A.3.5-1 per CC | ≥8 |
| 2 | 20MHz+20MHz+20MHz+15MHz | As specified in Table 8.2.2.4.2_A.3.5-1 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.2.4.2_A.4 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (5DL CA)

### 8.2.2.4.2_A.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

### 8.2.2.4.2_A.4.2 Test applicability

This test case applies to all types of E-UTRA UE and forward that support 5DL with CA configurations in Table 7.1-2c.

Note: This test also applies to UE supporting 4Rx antenna ports.

8.2.2.4.2_A.4.3 Minimum conformance requirements

For CA with 5 DL CCs, the requirements are specified in Table 8.2.2.4.2_A.4.3-3, based on single carrier requirement specified in Table 8.2.2.4.2_A.4.3-2, with the addition of the parameters in Table 8.2.2.4.2_A.4.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.2.2.4.2_A.4.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 8 |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| ACK/NACK feedback mode | | | PUCCH format 3 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000 00001111111111111111100000000000 |
| CSI request field (Note 4) | | | '10' |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.
Note 4: Multiple CC-s under test are configured as the 1st set of serving cells by high layers.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.2.2.4.2_A.4.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.0 |
| 3MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 9.8 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.0 |
| 10 MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.5 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.6 |
| 20MHz | R.43 TDD | OP. 1 TDD | EVA5 | 4x2 Low | 70 | 10.7 |

**Table 8.2.2.4.2_A.4.3-3: Minimum performance (FRC) based on single carrier performance for CA with 5 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.2.2.42_A.4.3-2. per CC | 8, ≥11 |
| 2 | 15MHz+4x20MHz | As specified in Table 8.2.2.4.2_A.4.3-2 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.3

### 8.2.2.4.2_A.4.4 Test description

#### 8.2.2.4.2_A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.2.4.2_A.4.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.2.4.2_A.4.4.1-1.

**Table 8.2.2.4.2_A.4.4.1-1: Test point selection for TM4 5DL CA**

| CA Capability | Bandwidth combination | |
|---|---|---|
| | 5x20 | 15+4x20 |
| Intra-band contiguous (CA5_C) | Test1 | Test2 |
| Inter-band CA (two bands) (CA5_A2) | Test1 | Test2 |
| Inter-band CA (three bands) (CA5_A3) | Test1 | Test2 |
| Inter-band CA (four bands) (CA5_A4) | Test1 | Test2 |
| Inter-band CA (five bands) (CA5_A5) | Test1 | Test2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA5_N2) | Test1 | Test2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.61 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.2-1 and 8.2.2.4.2_A.4.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.4.2_A.4.4.3.

#### 8.2.2.4.2_A.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.2.4.2_A.4.4.3.

3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.

4. The SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.2.4.2_A.4.3-1 and 8.2.2.4.2_A.4.3-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. The SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.2.4.2_A.4.5-1 as appropriate.

7. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

### 8.2.2.4.2_A.4.4.3 Message contents

Same as the section 8.2.2.4.2_A.3.4.3.

### 8.2.2.4.2_A.4.5 Test requirement

Table 8.2.2.4.2_A.4.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2.2 for the throughput test shall meet or exceed the specified value in Table 8.2.2.4.2_A.4.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.4.2_A.4.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.9 | 10.4 |
| 3MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 | 9.2 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.9 | 9.4 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.4 | 9.9 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.5 | 10 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.6 | 10.1 |

**Table 8.2.2.4.2_A.4.5-2: Test requirement (FRC) based on single carrier performance for CA with 5 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.2.2.4.2_A.4.5-1 per CC | 8, ≥11 |
| 2 | 15MHz+4x20MHz | As specified in Table 8.2.2.4.2_A.4.5-1 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.2.4.2A TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 2x2 – Enhanced Performance Requirement Type C

### 8.2.2.4.2A.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed loop rank-two spatial multiplexing with wideband and frequency selective precoding.

### 8.2.2.4.2A.2 Test applicability

This test applies to all types of E-UTRA TDD release 12 and forward UE of Category ≥ 2 that support enhanced receiver Type C.

### 8.2.2.4.2A.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1 and 8.2.2.4.2A.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.2.4.2A.3-2 for the specified SNR.

**Table 8.2.2.4.2A.3-1: Test Parameters for Testing Multi-Layer Spatial Multiplexing**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 50 |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 3-1 |
| ACK/NACK feedback mode | | | Bundling |
| CodeBookSubsetRestriction bitmap | | | 110000 |
| PDSCH transmission mode | | | 4 |
| Note 1: $P_B = 1$. | | | |
| Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). | | | |
| Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms. | | | |

**Table 8.2.2.4.2A.3-2: Enhanced Performance Requirement Type C, Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11-1 TDD | OP.1 TDD | ETU70 | 2x2 Medium | 70 | 17.8 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.2A.

### 8.2.2.4.2A.4 Test description

#### 8.2.2.4.2A.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.2.2.4.2A.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1 and 8.2.2.4.2A.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.4.2A.4.3.

#### 8.2.2.4.2A.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.2.4.2A.3-1 and 8.2.2.4.2A.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.4.2A.5-1 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.2.4.2A.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.2.2.4.2A.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 110000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.2A.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.2.2.4.2A.4.3-3: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.508 Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| tddAckNackFeedbackMode | bundling | | |
| } | | | |

### 8.2.2.4.2A.5 Test requirement

Table 8.2.2.4.2A.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Table 8.2.2.4.2A.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.4.2A.5-1: Test requirement for Enhanced Performance Requirement Type C, Multi-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.11-1 TDD | OP.1 TDD | ETU70 | 2x2 Medium | 70 | 18.7 | ≥2 |

### 8.2.2.4.3 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 with TM4 Interference Model – Enhanced Performance Requirement Type A

#### 8.2.2.4.3.1 Test purpose

To verify the closed loop rank-one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two dominant interfering cells applying transmission mode 4 interference model.

#### 8.2.2.4.3.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 11 and forward that support enhanced receiver Type A.

#### 8.2.2.4.3.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1, 8.2.2.4.3.3-1 and 8.2.2.4.3.3-2 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.2.4.3.3-2 for the specified SINR. For single-layer spatial multiplexing closed loop rank-one performance with wideband and frequency selective precoding is specified. For multi-layer spatial multiplexing closed loop rank-two performance with wideband and frequency selective precoding is specified.

**Table 8.2.2.4.3.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 | -3 |
| | $\sigma$ | dB | 0 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 | -8.66 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 2 |
| Number of control OFDM symbols | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 6 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.5.3 | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 | 80 |
| | Rank 2 | % | N/A | 20 | 20 |
| Precoding granularity | | PRB | 50 | 6 | 6 |
| PMI delay (Note 4) | | ms | 10 or 11 | N/A | N/A |
| Reporting interval | | ms | 5 | N/A | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note6) | N/A | N/A |
| cqi-pmi-ConfigurationIndex | | | 4 | N/A | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}$´ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Note 6: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

**Table 8.2.2.4.3.3-2: Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.47 TDD | OP.1 TDD | N/A | N/A | EVA5 | EVA5 | EVA5 | 2x2 Low | 70 | 1.1 | 1-8 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. | | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.

### 8.2.2.4.3.4 Test description

#### 8.2.2.4.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Tables 8.2.2.4.3.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for cell1 are set up according to Tables 8.2.2-1, 8.2.2.4.3.5-1 and 8.2.2.4.3.5-2 as appropriate.
3. Downlink signals are initially set up for cell1 according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.4.3.4.3.

#### 8.2.2.4.3.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to Tables 8.2.2.4.3.5-1 and 8.2.2.4.3.5-2. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #4 and #9 (Table A.2.3.1.2-1).
2. SS sets up the parameters for cell 2 and cell 3 according to Tables 8.2.2.4.3.5-1 and Tables 8.2.2.4.3.5-2.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SINR according to Tables 8.2.2.4.3.5-1 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5-15 and G.3.6 in Annex G clause G.3.

8.2.2.4.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.2.2.4.3.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.3.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 4 | (see Table 7.2.2-1C in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 483 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

8.2.2.4.3.5 Test requirement

Table 8.2.2.4.3.5-1 defines the primary level settings.

**Table 8.2.2.4.3.5-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 | -3 |
| | $\sigma$ | dB | 0 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A | N/A |
| DIP (Note 2) | | dB | N/A | -1.44 | -7.77 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 2 |
| Number of control OFDM symbols | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 6 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.5.3 | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 | 80 |
| | Rank 2 | % | N/A | 20 | 20 |
| Precoding granularity | | PRB | 50 | 6 | 6 |
| PMI delay (Note 4) | | ms | 10 or 11 | N/A | N/A |
| Reporting interval | | ms | 5 | N/A | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note6) | N/A | N/A |
| cqi-pmi-ConfigurationIndex | | | 4 | N/A | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Note 6: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Table 8.2.2.4.3.5-2 for the specified SINR including test tolerances for all throughput tests.

**Table 8.2.2.4.3.5-2: Test requirement for Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.47 TDD | OP.1 TDD | N/A | N/A | EVA5 | EVA5 | EVA5 | 2x2 Low | 70 | 2.09 | 1-8 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. | | | | | | | | | | | |

## 8.2.2.4.4 TDD PDSCH Closed Loop Multi-Layer Spatial Multiplexing 4x2 for Dual Connectivity

### 8.2.2.4.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing for Dual Connectivity.

### 8.2.2.4.4.2 Test applicability

This test case applies to all types of E-UTRA TDD release 12 and forward UE of category ≥5 that support Dual Connectivity.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.2.4.4.3 Minimum conformance requirements

For dual connectivity the requirements are specified in Table 8.2.2.4.4.3-3, based on single carrier requirement specified in Table 8.2.2.4.4.3-2, with the addition of the parameters in Table 8.2.2.4.4.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.2.2.4.4.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for dual connectivity**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 for 1.4MHz, 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, and 8 for 15MHz CCs and 20MHz CCs |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000111111111111111111000000000000000 |
| PDSCH transmission mode | | | 4 |
| ACK/NACK transmission | | | Separate ACK/NACK feedbacks with PUCCH format 1b on the MCG and SCG |
| CSI feedback | | | Separate PUSCH feedbacks on the MCG and SCG |
| Time offset between MCG CC and SCG CC | | μs | 0 for UE under test supporting synchronous dual connectivity; 334 for UE under test supporting both asynchronous and synchronous dual connectivity (Note 5) |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.
Note 4: The same PDSCH transmission mode is applied to each component carrier.
Note 5: Asynchronous and synchronous dual connectivity are defined in TS36.300 [18].
Note 6: If the UE supports both SCG bearer and Split bearer, the SCG bearer is configured.

**Table 8.2.2.4.4.3-2: Single carrier performance for multiple dual connectivity configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.0 |
| 3MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 9.8 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.0 |
| 10 MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.5 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.6 |
| 20MHz | R.43 TDD | OP. 1 TDD | EVA5 | 4x2 Low | 70 | 10.7 |

**Table 8.2.2.4.4.3-3: Minimum performance Multi-Layer Spatial Multiplexing (FRC) for dual connectivity**

| Test num. | Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20 MHz | As specified in Table 8.2.2.4.4.3-2 per CC | ≥5 |
| Note 1: The OCNG pattern applies for each CC.<br>Note 2: The applicability of requirements for different dual connectivity configurations and bandwidth combination sets is defined in 8.1.2.3A. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.3A.

### 8.2.2.4.4 Test description

#### 8.2.2.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: Select one according to Tables 8.2.2.4.4.3-1 and 8.2.2.4.4.3-3.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.46 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.2.4.4.3-1 as appropriate.

3. Downlink signals for the MCG CC (PCell) and SCG CC (PSCell) are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. If the Split bearer is only supported, ensure the UE is in State 3A-RF-DC2 according to TS 36.508 [7] clause 5.2A.2B. Otherwise, ensure that the UE is in State 3A-RF-DC1 according to TS 36.508 [7] clause 5.2A.2A. Message contents are defined in clause 8.2.2.4.4.3.

#### 8.2.2.4.4.2 Test procedure

1. The SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.2.4.4.3-1 and 8.2.2.4.4.3-2 on both MCG CC and SCG CC. The SS sends downlink MAC padding bits on the DL RMC.

2. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.

3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Table 8.2.2.4.4.5-1 as appropriate.

4. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 4.6 and 5.5 with the following exceptions:

**Table 8.2.2.4.4.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop spatial multiplexing performance downlink power allocation (PCell and PSCell)**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.2.4.4.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation (PCell and PSCell)**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.4.4.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation (PCell and PSCell)**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 CQI-ReportConfig-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | RBC |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

### 8.2.2.4.4.5 Test requirement

Table 8.2.2.4.4.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.2.2.4.4.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.4.4.5-1: Single carrier performance for multiple dual connectivity configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.9 | 10.4 |
| 3MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 | 9.2 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.9 | 9.4 |
| 10 MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.4 | 9.9 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.5 | 10 |
| 20MHz | R.43 TDD | OP. 1 TDD | EVA5 | 4x2 Low | 70 | 11.6 | 10.1 |

**Table 8.2.2.4.4.5-2: Test requirement Multi-Layer Spatial Multiplexing (FRC) for dual connectivity**

| Test num. | Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20 MHz | As specified in Table 8.2.2.4.4.5-1 per CC | ≥5 |
| Note 1: The OCNG pattern applies for each CC.<br>Note 2: The applicability of requirements for different dual connectivity configurations and bandwidth combination sets is defined in 8.1.2.3A. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to G.3A.6.

## 8.2.2.4.5 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 with TM4 Interference Model – Enhanced Performance Requirement Type B

### 8.2.2.4.5.1 Test purpose

The purpose of these tests is to verify the closed loop rank-one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 4 interference model defined in clause B.6.3.

### 8.2.2.4.5.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward that support enhanced performance requirement Type B.

### 8.2.2.4.5.3 Minimum conformance requirements

The requirements are specified in Table 8.2.2.4.5-2, with the addition of parameters in Table 8.2.2.4.5.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.2.2.4.5.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.2.2.4.5.3-1: Test Parameters for Single-layer Spatial Multiplexing (FRC) with TM4 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | | 1 | |
| Special subframe configuration | | | 4 | 4 | | 4 | |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | | -3 | |
| | $\rho_B$ | dB | -3 (Note 1) | -3 | | -3 | |
| | σ | dB | 0 | 0 | | 0 | |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | | Antenna ports 0,1 | |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 | | | | |
| Test number (Note 4) | | | | Test 1 | Test 2 | Test 1 | Test 2 |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.28 | 3.34 | 0.74 |
| Cell Id | | | | 6 | 1 | 1 | 6 |
| CFI indicated in PCFICH in normal subframes | | | | 3 | Random from set {1,2,3} | 3 | Random from set {1,2,3} |
| CFI indicated in PCFICH in special subframes | | | | 2 | Random from set {1,2} | 2 | Random from set {1,2} |
| $BW_{Channel}$ | | MHz | 10 | 10 | | 10 | |
| Cyclic Prefix | | | Normal | Normal | | Normal | |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | | 3 | |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | | 2 | |
| PDSCH transmission mode | | | 4 | 4 | | 4 | |
| Interference model | | | N/A | As specified in clause B.6.3 | | As specified in clause B.6.3 | |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.3 | | As specified in clause B.6.3 | |
| Time offset to cell 1 | | us | N/A | 2 | | 3 | |
| Frequency offset to cell 1 | | Hz | N/A | 200 | | 300 | |
| MBSFN | | | Not configured | Not configured | | Not configured | |
| NeighCellsInfo-r12 (Note 3) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | | {dB-6, dB-3, dB0} | |
| | transmissionMode List-r12 | | N/A | {2,3,4,8,9} | | {2,3,4,8,9} | |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331 [5].
Note 4: Test 1 and Test 2 are defined in Table 8.2.2.4.5.3-2.

**Table 8.2.2.4.5.3-2: Minimum Performance for Enhanced Performance Requirement Type B, Single-layer Spatial Multiplexing (FRC) with TM4 interference model**

| Test Num | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.11-12 TDD | OP.1 TDD | N/A | N/A | EVA 5 | EVA 5 | EVA 5 | 2x2 Low | 85 | 16.1 | ≥1 |
| 2 | R.11-11 TDD | OP.1 TDD | N/A | N/A | EPA 5 | EPA 5 | EPA 5 | 2x2 Low | 85 | 9.5 | ≥1 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. | | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.1D.

### 8.2.2.4.5.4 Test description

#### 8.2.2.4.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.2.4.5.3-2, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.2-1 and 8.2.2.4.5.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.4.5.4.3.

#### 8.2.2.4.5.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS36.211 [8]) every TTI according to Tables 8.2.2.4.5.5-1 and 8.2.2.4.5.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 and cell 3 according to table 8.2.2.4.5.5-1 as appropriate. The CFIs indicated in PCFICH are randomly selected per TTI.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.4.5.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.

5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

6. Repeat steps from 1 to 5 for each subtest in Tables 8.2.2.4.5.5-1 and 8.2.2.4.5.5-2 as appropriate.

#### 8.2.2.4.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m) with the following exceptions.

**Table 8.2.2.4.5.4.3-1: *PhysicalConfigDedicated-DEFAULT* message disabling CQI reporting**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| } | | | |

#### 8.2.2.4.5.5 Test requirement

Table 8.2.2.4.5.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.2.2.4.5.5-2 for the specified SNR including test tolerances.

**Table 8.2.2.4.5.5-1: Test Parameters for Single-layer Spatial Multiplexing (FRC) with TM4 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | | 1 | |
| Special subframe configuration | | | 4 | 4 | | 4 | |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | | -3 | |
| | $\rho_B$ | dB | -3 (Note 1) | -3 | | -3 | |
| | $\sigma$ | dB | 0 | 0 | | 0 | |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | | Antenna ports 0,1 | |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 | | | | |
| Test number (Note 4) | | | | Test 1 | Test 2 | Test 1 | Test 2 |
| $\hat{E}_s/N_{oc}$ | | dB | N/A | 14.71 | 4.08 | 4.14 | 1.54 |
| Cell Id | | | | 6 | 1 | 1 | 6 |
| CFI indicated in PCFICH in normal subframes | | | | 3 | Random from set {1,2,3} | 3 | Random from set {1,2,3} |
| CFI indicated in PCFICH in special subframes | | | | 2 | Random from set {1,2} | 2 | Random from set {1,2} |
| $BW_{Channel}$ | | MHz | 10 | 10 | | 10 | |
| Cyclic Prefix | | | Normal | Normal | | Normal | |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | | 3 | |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | | 2 | |
| PDSCH transmission mode | | | 4 | 4 | | 4 | |
| Interference model | | | N/A | As specified in clause B.6.3 | | As specified in clause B.6.3 | |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.3 | | As specified in clause B.6.3 | |
| Time offset to cell 1 | | us | N/A | 2 | | 3 | |
| Frequency offset to cell 1 | | Hz | N/A | 200 | | 300 | |
| MBSFN | | | Not configured | Not configured | | Not configured | |
| NeighCellsInfo-r12 (Note 3) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | | {dB-6, dB-3, dB0} | |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | | {2,3,4,8,9} | |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331 [5].
Note 4: Test 1 and Test 2 are defined in Table 8.2.2.4.5.5-2.

**Table 8.2.2.4.5.5-2: Test Requirement for Enhanced Performance Requirement Type B, Single-layer Spatial Multiplexing (FRC) with TM4 interference model**

| Test Num | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.11-12 TDD | OP.1 TDD | N/A | N/A | EVA 5 | EVA 5 | EVA 5 | 2x2 Low | 85 | 17.95 | ≥1 |
| 2 | R.11-11 TDD | OP.1 TDD | N/A | N/A | EPA 5 | EPA 5 | EPA 5 | 2x2 Low | 85 | 11.04 | ≥1 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. | | | | | | | | | | | |

## 8.2.2.5

## 8.2.2.6

## 8.2.2.7 Carrier aggregation with power imbalance

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Connection diagram in Annex A of TS 36.508 is TBD

- Test tolerances are undefined

- Power at antenna port in test 2 is still TBD

### 8.2.2.7_A.1 TDD Carrier aggregation with power imbalance (intra-band contiguous DL CA)

#### 8.2.2.7_A.1.1 Test purpose

To verify the ability of an intraband adjacent carrier aggregation UE to demodulate the signal transmitted by the PCell or SCell in the presence of a stronger SCell or PCell signal on an adjacent frequency. Throughput is measured on the PCell or SCell only.

#### 8.2.2.7_A.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support intra-band contiguous DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.2.7_A.1.3 Minimum conformance requirements

The requirements are specified in Table 8.2.2.7_A.1.3-2, with the addition of the parameters in Table 8.2.2.7_A.1.3-1 and the downlink physical channel setup according to table C.3.2-1 in Annex C.

**Table 8.2.2.7_A.1.3-1: Test Parameters for CA**

| Parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 (Note 1) |
| | σ | dB | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | Off (Note 2) | Off (Note 2) |
| Symbols for unused PRBs | | | OCNG (Note 3) | OCNG (Note 3) |
| Modulation | | | 64 QAM | 64 QAM |
| Maximum number of HARQ transmission | | | 1 | 1 |
| Redundancy version coding sequence | | | {0} | {0} |
| PDSCH transmission mode of PCell | | | 1 | 3 |
| PDSCH transmission mode of SCell | | | 3 | 1 |
| OCNG Pattern | PCell | | OP.1 TDD | OP.5 TDD |
| | SCell | | OP.5 TDD | OP.1 TDD |
| Propagation Conditions | PCell | | Clause B.1 | Clause B.1 |
| | SCell | | Clause B.1 | Clause B.1 |
| Correlation Matrix and Antenna | PCell | | 1x2 | 2x2 |
| | SCell | | 2x2 | 1x2 |

Note 1: $P_B = 0$ for 1x2 and $P_B = 1$ for 2x2 antenna configuration.
Note 2: No external noise sources are applied.
Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data.
Note 4: Void

**Table 8.2.2.7_A.1.3-2: Minimum performance (FRC) for CA**

| Test Number | Bandwidth (MHz) | | Reference channel | | Power at antenna port (dBm/15KHz) | | Reference value Fraction of Maximum Throughput (%) | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | PCell | SCell | PCell | SCell | $\hat{E}_{s_PCell}$ for PCell | $\hat{E}_{s_SCell}$ for Scell | PCell | SCell | |
| 1 | 20 | 20 | R.49 TDD | NA | -85 | -79 | 85 | NA | ≥5 |
| 2 | 20 | 15 | NA | R.49-1 TDD | -79 | [-85.8] | NA | 85 | ≥5 |

Note 1: The OCNG pattern for PCell is used to fill the control channel. The OCNG pattern for SCell is used to fill the control channel and PDSCH.
Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.7.

### 8.2.2.7_A.1.4 Test description

#### 8.2.2.7_A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.2.7_A.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group TBD for UE supporting only 2Rx RF bands on all CC. Annex A, Figure TBD for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.2.2-1and 8.2.2.7_A.1.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.7_A.1.4.3.

### 8.2.2.7_A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels except control channel and PDSCH.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.2.7_A.1.4.3

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.7_A.1.3-1 and 8.2.2.7_A.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition and the correlation matrix on each of the component carriers according to Tables 8.2.2.7_A.1.5-1 as appropriate.

6. Measure the average throughput on PCC in test number 1or measure the average throughput on SCC in test number 2 for a duration sufficient to achieve statistical significance according to Annex G clause G.3A, Table G.3A.5-6. Count the number of NACKs, ACKs and statDTXs on the UL during the test on PCC in test number 1 or on SCC in test number 2.

### 8.2.2.7_A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 3, for SCC configuration there are no additional message contents.

### 8.2.2.7_A.1.5 Test requirement

Table 8.2.2.7_A.1.5-1defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.1 for the throughput test shall meet or exceed the specified value in Table 8.2.2.7_A.1.5-1 for the specified cell power levels including test tolerances for all throughput tests.

**Table 8.2.2.7_A.1.5-1: Test Requirement (FRC) for CA**

| Test Number | Bandwidth (MHz) | | Reference channel | | Power at antenna port (dBm/15KHz) | | Reference value Fraction of Maximum Throughput (%) | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | PCell | SCell | PCell | SCell | $\hat{E}_{s_PCell}$ for PCell | $\hat{E}_{s_SCell}$ for Scell | PCell | SCell | |
| 1 | 20 | 20 | R.49 TDD | NA | -85+TT | -79+TT | 85 | NA | ≥5 |
| 2 | 20 | 15 | NA | R.49-1 TDD | -79+TT | [-85.8] +TT | NA | 85 | ≥5 |
| Note 1: The OCNG pattern for PCell is used to fill the control channel. The OCNG pattern for SCell is used to fill the control channel and PDSCH.<br>Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.2.8 FFS

## 8.2.2.9 TDD PDSCH HST-SFN performance in HST-SFN scenario

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- 36.521-2 spec need to be introduced

### 8.2.2.9.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports in the HST-SFN scenario defined in B.3A when *highSpeedEnhancedDemodulationFlag* is received.

### 8.2.2.9.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 14 and forward that support *demodulationEnhancements-r14*.

### 8.2.2.9.3 Minimum conformance requirements

The requirements are specified in Table 8.2.2.9.3-2, with the addition of the parameters in Table 8.2.2.9.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.2.2.9.3-1: Test Parameters for UE performance in HST-SFN scenario (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (NOTE 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| ACK/NACK feedback mode | | | Multiplexing |
| PDSCH transmission mode | | | 3 |
| NOTE 1: $P_B = 1$. | | | |

**Table 8.2.2.9.3-2: Minimum performance UE in HST-SFN scenario (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.87 TDD | OP.1 TDD | HST-SFN | 2x2 | 70 | 13.2 | ≥1 |
| NOTE 1: Test case applicability is defined in 8.1.2.1.<br>NOTE 2: The requirement defined is based on the normalized channel model, i.e., the power of each tap is normalized to the instantaneous total received power from four taps. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.9.

### 8.2.2.9.4 Test description

#### 8.2.2.9.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.2.9.3-2 as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 8.2.2-1and 8.2.2.9.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.3A.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.9.4.3.

#### 8.2.2.9.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.2.9.3-1 and 8.2.2.9.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 8.2.2.9.3-2as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.2.9.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 8.2.2.9.5 Test requirement

Table 8.2.2.9.3-2 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.2.2.9.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.2.9.5-1: Test requirement for UE in HST-SFN scenario (FRC)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.87 TDD | OP.1 TDD | HST-SFN | 2x2 | 70 | 13.8 | ≥1 |
| NOTE 1: Test case applicability is defined in 8.1.2.1.<br>NOTE 2: The requirement defined is based on the normalized channel model. | | | | | | | | |

## 8.2.3 TDD FDD CA (Fixed Reference Channel)

The parameters specified in Table 8.2.3-1 are valid for all the TDD FDD CA tests unless otherwise stated.

**Table 8.2.3-1: Common Test Parameters**

| Parameter | | Unit | Value |
|---|---|---|---|
| Uplink downlink configuration (Note 1) for TDD CC only | | | 1 |
| Special subframe configuration (Note 2) for TDD CC only | | | 4 |
| Inter-TTI Distance | | | 1 |
| Maximum number of HARQ processes per component carrier | FDD PCell | Processes | 8 for FDD and TDD CCs |
| | TDD PCell | Processes | 11 for FDD CC; 7 for TDD CC |
| Maximum number of HARQ transmission | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} for QPSK and 16QAM<br>{0,0,1,2} for 64QAM |
| Number of OFDM symbols for PDCCH per component carrier | | OFDM symbols | 4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths,<br>2 for 10 MHz, 15 MHz and 20 MHz bandwidths |
| Cyclic Prefix | | | Normal |
| Cell_ID | | | 0 |
| Cross carrier scheduling | | | Not configured |
| ACK/NACK feedback mode | | | PUCCH format 3 |
| Downlink HARQ-ACK timing | FDD PCell | | As specified in Clause 7.3.3 in TS36.213 [10] |
| | TDD PCell | | As specified in Clause 7.3.4 in TS36.213 [10] |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8].<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]. | | | |

The applicability of the requirements are specified in Clause 8.1.2.3. The single carrier performance with different bandwidths for multiple CA configurations specified in Clause 8.2.3 cannot be applied for UE single carrier test.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.

## 8.2.3.1 TDD FDD CA PDSCH Single Antenna Port Performance

### 8.2.3.1.1.1 TDD FDD CA PDSCH Single Antenna Port Performance for FDD PCell (2DL CA)

#### 8.2.3.1.1.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

#### 8.2.3.1.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support E-UTRA FDD and TDD and 2DL CA with FDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 8.2.3.1.1.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1, with the addition of the relevant parameters in Tables 8.2.3-1, 8.2.3.1.2.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.3.1.1.1.3-4 for the specified SNR. For QPSK and 64QAM performance the bandwidths specified in Table 5.4.2.1-1 are verified.

**Table 8.2.3.1.1.1.3-1: Test Parameters for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| PDSCH transmission mode | | | 1 |
| Note 1: $P_B = 0$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |
| Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.3.1.1.1.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.3 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.1 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.0 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |

**Table 8.2.3.1.1.1.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.2 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |

**Table 8.2.3.1.1.1.3-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | CA Bandwidth combination (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.3.1.1.1.3-2 and Table 8.2.3.1.1.1.3-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.2.3.1.1.1.3-2 and Table 8.2.3.1.1.1.3-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.2.3.1.1.1.3-2 and Table 8.2.3.1.1.1.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.<br>Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any FDD CC. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.1.

### 8.2.3.1.1.1.4 Test description

#### 8.2.3.1.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.1.1.1.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.1.1.1.4.1-1.

**Table 8.2.3.1.1.1.4.1-1: Test point selection for TM1 2DLCA**

| CA Capability | Bandwidth Combination | | |
|---|---|---|---|
| | 20+20 | 20+10 | 20+15 |
| Inter-band (CA_A_2) | Test 1 | Test 2 | Test3 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.35 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.3-1and 8.2.3.1.1.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.1.1.1.4.3.

#### 8.2.3.1.1.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.1.1.1.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.1.1.1.3-2 and 8.2.3.1.1.1.3-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.3.1.1.1.5-1 as appropriate.
6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.3.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

#### 8.2.3.1.1.1.5 Test requirement

Table 8.2.3.1.1.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1 for the throughput test shall meet or exceed the specified value in Table 8.2.3.1.1.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.1.1.1.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.5 | -2 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.3 | -1.8 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.2 | -1.7 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 | -2.4 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.8 | -2.3 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 | -2.4 |

**Table 8.2.3.1.1.1.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.2 | -1.3 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.0 | -1.5 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.4 | -1.9 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 | -2.3 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 | -2.1 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 | -2.1 |

**Table 8.2.3.1.1.1.5-3: Test requirement for multiple CA configurations with 2DL CCs (FRC)**

| Test number | CA Bandwidth combination (MHz) | | | Test Requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.3.1.1.1.5-1 and Table 8.2.3.1.1.1.5-2 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.2.3.1.1.1.5-1 and Table 8.2.3.1.1.1.5-2 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.2.3.1.1.1.5-1 and Table 8.2.3.1.1.1.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.<br>Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any FDD CC. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.2.3.1.1.2 TDD FDD CA PDSCH Single Antenna Port Performance for FDD PCell (3DL CA)

#### 8.2.3.1.1.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

#### 8.2.3.1.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support E-UTRA FDD and TDD and 3DL CA with FDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.3.1.1.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1, with the addition of the relevant parameters in Tables 8.2.3-1, 8.2.3.1.1.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.3.1.1.2.3-4 for the specified SNR. For QPSK and 64QAM performance the bandwidths specified in Table 5.4.2.1-1 are verified.

**Table 8.2.3.1.1.2.3-1: Test Parameters for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | $\sigma$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| PDSCH transmission mode | | | 1 |
| Note 1: $P_B = 0$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |
| Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.3.1.1.2.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.3 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.1 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.0 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |

**Table 8.2.3.1.1.2.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.2 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |

**Table 8.2.3.1.1.2.3-4: Minimum performance for multiple CA configurations with 3DL CCs (FRC)**

| Test number | CA Bandwidth combination (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.2.3.1.1.2.3-2 and Table 8.2.3.1.1.2.3-3 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.2.3.1.1.2.3-2 and Table 8.2.3.1.1.2.3-3 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.2.3.1.1.2.3-2 and Table 8.2.3.1.1.2.3-3 per CC | ≥5 |
| 4 | 3x20 | 2x20 | 20 | As defined in Table 8.2.3.1.1.2.3-2 and Table 8.2.3.1.1.2.3-3 per CC | ≥5 |
| 5 | 20+20+15 | 20+15 | 20 | As defined in Table 8.2.3.1.1.2.3-2 and Table 8.2.3.1.1.2.3-3 per CC | ≥5 |
| 6 | 20+20+10 | 20+10 | 20 | As defined in Table 8.2.3.1.1.2.3-2 and Table 8.2.3.1.1.2.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.<br>Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any FDD CC. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.1.

### 8.2.3.1.1.2.4 Test description

#### 8.2.3.1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.1.1.2.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.1.1.2.4.1-1

**Table 8.2.3.1.1.2.4.1-1: Test point selection for TM1 CA**

| CA Capability | Bandwidth combination | | |
|---|---|---|---|
| | 3x20 | 20+20+15 | 20+10+10 |
| Inter-band CA (three bands, one FDD CC) CA3_A3 | Test1 | Test2 | Test3 |
| Inter-band CA (three bands, two FDD | Test4 | Test5 | Test6 |

| | | | |
|---|---|---|---|
| CC) CA3_A3 | | | |
| Inter-band CA (two bands, one FDD CC) CA3_A2 | Test1 | Test2 | Test3 |
| Inter-band CA (two bands, two FDD CC) CA3_A2 | Test4 | Test5 | Test6 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.59 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.3-1 and 8.2.3.1.1.2.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.1.1.1.4.3.

#### 8.2.3.1.1.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.1.2.1.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.1.1.2.3-2 and 8.2.3.1.1.2.3-3 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.3.1.1.2.5-1 as appropriate.
6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.3.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

#### 8.2.3.1.1.2.5 Test requirement

Table 8.2.3.1.1.2.3-1 defines the primary level settings including test tolerances for all throughput tests.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1 for the throughput test shall meet or exceed the specified value in Table 8.2.3.1_A.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.1.1.2.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.5 | -2 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.3 | -1.8 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.2 | -1.7 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 | -2.4 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.8 | -2.3 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 | -2.4 |

**Table 8.2.3.1.1.2.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.2 | -1.3 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.0 | -1.5 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.4 | -1.9 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 | -2.3 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 | -2.1 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 | -2.1 |

**Table 8.2.3.1.1.2.5-3: Test requirement for multiple CA configurations with 3DL CCs (FRC)**

| Test number | CA Bandwidth combination (MHz) | | | Test Requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.2.3.1.1.2.5-1 and Table 8.2.3.1.1.2.5-2 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.2.3.1.1.2.5-1 and Table 8.2.3.1.1.2.5-2 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.2.3.1.1.2.5-1 and Table 8.2.3.1.1.2.5-2 per CC | ≥5 |
| 4 | 3x20 | 2x20 | 20 | As defined in Table 8.2.3.1.1.2.5-1 and Table 8.2.3.1.1.2.5-2 per CC | ≥5 |
| 5 | 20+20+15 | 20+15 | 20 | As defined in Table 8.2.3.1.1.2.5-1 and Table 8.2.3.1.1.2.5-2 per CC | ≥5 |
| 6 | 20+20+10 | 20+10 | 20 | As defined in Table 8.2.3.1.1.2.5-1 and Table 8.2.3.1.1.2.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |
| Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any FDD CC. | | | | | |

## 8.2.3.1.1.3 TDD FDD CA PDSCH Single Antenna Port Performance for FDD PCell (4DL CA)

### 8.2.3.1.1.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

### 8.2.3.1.1.3.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8 or higher that support E-UTRA FDD and TDD and 4DL CA with FDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.3.1.1.3.3 Minimum conformance requirements

For TDD FDD CA with FDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.1.1.3.3-4 based on single carrier requirement specified in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3, with the addition of the parameters in Table 8.2.3.1.1.3.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.2.3.1.1.3.3-1: Test Parameters for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| PDSCH transmission mode | | | 1 |
| Note 1: $P_B = 0$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |
| Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.3.1.1.3.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.3 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.1 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.0 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |

**Table 8.2.3.1.1.3.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.2 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |

**Table 8.2.3.1.1.3.3-4: Minimum performance for multiple CA configurations with 4DL CCs (FRC)**

| Test number | CA Bandwidth combination (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| 4 | 2x15+2x20 | 2x15 | 2x20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| 5 | 3x20+15 | 2x20+15 | 20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| 6 | 2x15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.<br>Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.1.

#### 8.2.3.1.1.3.4 Test description

##### 8.2.3.1.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.1.1.3.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.1.1.3.4.1-1

**Table 8.2.3.1.1.3.4.1-1: Test point selection for TM1 CA**

| CA Applicability | | Bandwidth combination | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | FDD cell | 20 | 2x20 | 20+15 | 2x15 | 2x20+15 | 2x15+20 | 2x20+10 |
| | TDD cell | 3x20 | 2x20 | 2x20 | 2x20 | 20 | 20 | 20 |
| Inter-band CA (two bands) (CA4_A2) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (three bands) (CA4_A3) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (four bands) (CA4_A4) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA | | | | | | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.59 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.3-1 and 8.2.3.1.1.3.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.1.1.1.4.3.

##### 8.2.3.1.1.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.1.1.3.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.1.1.3.3-2 and 8.2.3.1.1.3.3-3 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.3.1.1.3.5-1 as appropriate.

6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.3.1.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

#### 8.2.3.1.1.3.5 Test requirement

Table 8.2.3.1.1.3.3-1 defines the primary level settings including test tolerances for all throughput tests.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1 for the throughput test shall meet or exceed the specified value in Table 8.2.3.1.1.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.1.1.3.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.5 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.3 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.2 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |

**Table 8.2.3.1.1.3.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.2 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.0 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.4 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |

**Table 8.2.3.1.1.3.5-3: Test requirement for multiple CA configurations with 4DL CCs (FRC)**

| Test number | CA Bandwidth combination (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| 4 | 2x15+2x20 | 2x15 | 2x20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| 5 | 3x20+15 | 2x20+15 | 20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| 6 | 2x15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.2.3.1.1.3.3-2 and Table 8.2.3.1.1.3.3-3 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |
| Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | | | |

## 8.2.3.1.1.4 TDD FDD CA PDSCH Single Antenna Port Performance for FDD PCell (5DL CA)

### 8.2.3.1.1.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

### 8.2.3.1.1.4.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8, or categories 11 and above that support E-UTRA FDD and TDD and 5DL CA with FDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.3.1.1.4.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1, with the addition of the relevant parameters in Tables 8.2.3-1, 8.2.3.1.1.4.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.3.1.1.4.3-4 for the specified SNR. For QPSK performance the bandwidths specified in Table 5.4.2.1-1 are verified.

**Table 8.2.3.1.1.4.3-1: Test Parameters for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | $\sigma$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| PDSCH transmission mode | | | 1 |
| Note 1: $P_B = 0$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |
| Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.3.1.1.4.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.3 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.1 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.0 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |

**Table 8.2.3.1.1.4.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.2 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |

**Table 8.2.3.1.1.4.3-4: Minimum performance for multiple CA configurations with 5DL CCs (FRC)**

| Test number | CA Bandwidth combination (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.2.3.1.1.4.3-2and Table 8.2.3.1.1.4.3-3per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.2.3.1.1.4.3-2and Table 8.2.3.1.1.4.3-3per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.<br>Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.1.

### 8.2.3.1.1.4.4 Test description

#### 8.2.3.1.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.1.1.4.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.1.1.4.4.1-1

**Table 8.2.3.1.1.4.4.1-1: Test point selection for TM1 CA**

| CA Capability | Bandwidth combination | |
|---|---|---|
| FDD CELL | 15+2×20 | 2×15+20 |
| TDD CELL | 2×20 | 2×20 |
| Inter-band CA (two bands) (CA5_A2) | Test1 | Test2 |
| Inter-band CA (three bands) (CA5_A3) | Test1 | Test2 |
| Inter-band_CA (four bands) (CA_A4) | Test1 | Test2 |
| Inter-band_CA (five bands) (CA_A5) | Test1 | Test2 |
| Note 1: Only one test point is tested.<br>Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.59 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.2.3-1 and 8.2.3.1.1.3.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex .0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.1.1.4.4.3.

#### 8.2.3.1.1.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.1.1.4.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.1.1.4.3-2 and 8.2.3.1.1.4.3-3 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Table 8.2.3.1.1.4.5-1 and Table 8.2.3.1.1.4.5-2 as appropriate.
6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.3.1.1.4.4 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

#### 8.2.3.1.1.4.5 Test requirement

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1 for the throughput test shall meet or exceed the specified value in Table 8.2.3.1.1.4.5-3 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.1.1.4.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.5 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.3 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.2 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |

**Table 8.2.3.1.1.4.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.2 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.0 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.4 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |

**Table 8.2.3.1.1.4.5-3: Test requirement for multiple CA configurations with 5DL CCs (FRC)**

| Test number | CA Bandwidth combination (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.2.3.1.1.4.5-1 and Table 8.2.3.1.1.4.5-2 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.2.3.1.1.4.5-1 and Table 8.2.3.1.1.4.5-2 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |
| Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | | | |

Decide pass or fail for each subset according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.3.1.2.1 TDD FDD CA PDSCH Single Antenna Port Performance for TDD PCell (2DL CA)

### 8.2.3.1.2.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

### 8.2.3.1.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support E-UTRA FDD and TDD and 2DL CA with TDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.3.1.2.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1, with the addition of the relevant parameters in Tables 8.2.3-1, 8.2.3.1.2.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.3.1.2.1.3-2 and 8.2.3.1.2.1.3-3 for the specified SNR. For QPSK and 64QAM performance the bandwidths specified in Table 5.4.2.1-1 are verified.

**Table 8.2.3.1.2.1.3-1: Test Parameters for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | $\sigma$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| PDSCH transmission mode | | | 1 |

Note 1: $P_B = 0$.

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 3: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.2.3.1.2.1.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.3 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.1 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.0 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |

**Table 8.2.3.1.2.1.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.2 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |

**Table 8.2.3.1.2.1.3-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.3.1.2.1.3-2 and Table 8.2.3.1.2.1.3-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.2.3.1.2.1.3-2 and Table 8.2.3.1.2.1.3-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.2.3.1.2.1.3-2 and Table 8.2.3.1.2.1.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B<br>Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any TDD CC. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.1.

### 8.2.3.1.2.1.4 Test description

#### 8.2.3.1.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: Select one according to Table 8.2.3.1.1.1.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.1.1.1.4.1-1

**Table 8.2.3.1.1.1.4.1-1: Test point selection for TM1 2DLCA**

| CA Capability | Bandwidth Combination | | |
|---|---|---|---|
| | 20+20 | 20+10 | 20+15 |
| Inter-band (CA_A_2) | Test 1 | Test 2 | Test3 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA | | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.35 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Tables 8.2.3-1, 8.2.3.1.2.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.1.2.1.4.3.

#### 8.2.3.1.2.1.4.2 Test procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.1.2.1.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4 SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.1.2.1.3-1 and 8.2.3.1.2.1.3-2 or 8.2.3.1.2.1.3-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the reference channel, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 8.2.3.1.2.1.5-1 and 8.2.3.1.2.1.5-2 as appropriate.

6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.3.1.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

### 8.2.3.1.2.1.5 Test requirement

Table 8.2.3.1.2.1.3-1 defines the primary level settings including test tolerances for all throughput tests.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1 for the throughput test shall meet or exceed the specified value in Table 8.2.3.1.2.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.1.2.1.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.5 | -2 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.3 | -1.8 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.2 | -1.7 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 | -2.4 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.8 | -2.3 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 | -2.4 |

**Table 8.2.3.1.2.1.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.2 | -1.3 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.0 | -1.5 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.4 | -1.9 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 | -2.3 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 | -2.1 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 | -2.1 |

**Table 8.2.3.1.2.1.5-3: Test requirement for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Test requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.3.1.2.1.5-1 and Table 8.2.3.1.2.1.5-2 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.2.3.1.2.1.5-1 and Table 8.2.3.1.2.1.5-2 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.2.3.1.21.5-1 and Table 8.2.3.1.2.1.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B<br>Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any TDD CC. | | | | | |

## 8.2.3.1.2.2 TDD FDD CA PDSCH Single Antenna Port Performance for TDD PCell (3DL CA)

### 8.2.3.1.2.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

### 8.2.3.1.2.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support E-UTRA FDD and TDD and 3DL CA with TDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.3.1.2.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1, with the addition of the relevant parameters in Tables 8.2.3-1, 8.2.3.1.2.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.3.1.2.2.3-2 and 8.2.3.1.2.2.3-3 for the specified SNR. For QPSK and 64QAM performance the bandwidths specified in Table 5.4.2.1-1 are verified.

**Table 8.2.3.1.2.2.3-1: Test Parameters for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | $\sigma$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| PDSCH transmission mode | | | 1 |
| Note 1: $P_B = 0$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |
| Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.3.1.2.2.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.3 | -2.8 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.1 | -2.6 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.0 | -2.5 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 | -3.2 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.6 | -3.1 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 | -3.2 |

**Table 8.2.3.1.2.2.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 | -2.1 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 | -2.3 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.2 | -2.7 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.6 | -3.1 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 | -2.9 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 | -2.9 |

**Table 8.2.3.1.2.2.3-4: Minimum performance for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.2.3.1.2.2.3-2 and Table 8.2.3.1.2.2.3-3 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.2.3.1.2.2.3-2 and Table 8.2.3.1.2.2.3-3 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.2.3.1.2.2.3-2 and Table 8.2.3.1.2.2.3-3 per CC | ≥5 |
| 4 | 3x20 | 2x20 | 20 | As defined in Table 8.2.3.1.2.2.3-2 and Table 8.2.3.1.2.2.3-3 per CC | ≥5 |
| 5 | 20+20+15 | 20+15 | 20 | As defined in Table 8.2.3.1.2.2.3-2 and Table 8.2.3.1.2.2.3-3 per CC | ≥5 |
| 6 | 20+20+10 | 20+10 | 20 | As defined in Table 8.2.3.1.2.2.3-2 and Table 8.2.3.1.2.2.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.<br>Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any TDD CC. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.1.

### 8.2.3.1.2.2.4 Test description

#### 8.2.3.1.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.1.2.2.4.1-1

CA Capability to be tested: Select one according to Table 8.2.3.1.2.2.4.1-1

**Table 8.2.3.1.2.2.4.1-1: Test point selection for TM1 CA**

| CA Capability | Bandwidth combination | | |
|---|---|---|---|
| | 3x20 | 20+20+15 | 20+20+10 |
| Inter-band CA (three bands, two TDD CC) CA3_A3 | Test1 | Test2 | Test3 |
| Inter-band CA (three bands, one TDD CC) CA3_A3 | Test4 | Test5 | Test6 |
| Inter-band CA (two bands, two TDD CC) CA3_A2 | Test1 | Test2 | Test3 |
| Inter-band CA (two bands, one TDD CC) CA3_A2 | Test4 | Test5 | Test6 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.59 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.2.3-1 and 8.2.3.1.2.2.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.1.2.2.4.3.

#### 8.2.3.1.2.2.4.2 Test procedure

1. Configure SCCs according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.1.2.2.4.3.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.1.2.2.5-1 and 8.2.3.1.2.2.5-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.3.1.2.2.5-1 and 8.2.3.1.2.2.5-2 as appropriate.

6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.3.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

### 8.2.3.1.2.2.5 Test requirement

Table 8.2.3.1.2.2.3-1 defines the primary level settings including test tolerances for all throughput tests.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1 for the throughput test shall meet or exceed the specified value in Table 8.2.3.1.2.2.5-1 and 8.2.3.1.2.2.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.1.2.2.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.5 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.3 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.2 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |

**Table 8.2.3.1.2.2.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.2 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.0 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.4 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |

**Table 8.2.3.1.2.2.5-3: Test requirement for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Test Requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.2.3.1.2.2.5-1 and Table 8.2.3.1.2.2.5-2 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.2.3.1.2.2.5-1 and Table 8.2.3.1.2.2.5-1 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.2.3.1.2.2.5-1 and Table 8.2.3.1.2.2.5-1 per CC | ≥5 |
| 4 | 3x20 | 2x20 | 20 | As defined in Table 8.2.3.1.2.2.5-1 and Table 8.2.3.1.2.2.5-1 per CC | ≥5 |
| 5 | 20+20+15 | 20+15 | 20 | As defined in Table 8.2.3.1.2.2.5-1 and Table 8.2.3.1.2.2.5-1 per CC | ≥5 |
| 6 | 20+20+10 | 20+10 | 20 | As defined in Table 8.2.3.1.2.2.5-1 and Table 8.2.3.1.2.2.5-1 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.<br>Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any TDD CC. | | | | | |

## 8.2.3.1.2.3 TDD FDD CA PDSCH Single Antenna Port Performance for TDD PCell (4DL CA)

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- The test case needs to be added to Annex G

### 8.2.3.1.2.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

### 8.2.3.1.2.3.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8 and above that support E-UTRA FDD and TDD and 4DL CA with TDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.3.1.2.3.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1, with the addition of the relevant parameters in Tables 8.2.3-1, 8.2.3.1.2.3.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.3.1.2.3.3-2 and 8.2.3.1.2.3.3-3 for the specified SNR. For QPSK and 64QAM performance the bandwidths specified in Table 5.4.2.1-1 are verified.

**Table 8.2.3.1.2.3.3-1: Test Parameters for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| PDSCH transmission mode | | | 1 |
| Note 1: $P_B = 0$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |
| Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.3.1.2.3.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.3 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.1 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.0 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |

**Table 8.2.3.1.2.3.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.2 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |

**Table 8.2.3.1.2.3.3-4: Minimum performance for multiple CA configurations with 4DL CCs (FRC)**

| Test number | CA Bandwidth combination (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.2.3.1.2.3.3-2and Table 8.2.3.1.2.3.3-3per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.2.3.1.2.3.3-2and Table 8.2.3.1.2.3.3-3per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.2.3.1.2.3.3-2and Table 8.2.3.1.2.3.3-3per CC | ≥8 |
| 4 | 2×15+2x20 | 2×15 | 2x20 | As defined in Table 8.2.3.1.2.3.3-2and Table 8.2.3.1.2.3.3-3per CC | ≥8 |
| 5 | 3x20+15 | 2×20+15 | 20 | As defined in Table 8.2.3.1.2.3.3-2and Table 8.2.3.1.2.3.3-3per CC | ≥8 |
| 6 | 2×15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.1.2.3.3-2and Table 8.2.3.1.2.3.3-3per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.2.3.1.2.3.3-2and Table 8.2.3.1.2.3.3-3per CC | ≥8 |
| 8 | 2x15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.1.2.3.3-2and Table 8.2.3.1.2.3.3-3per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.<br>Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.1.

### 8.2.3.1.2.3.4 Test description

#### 8.2.3.1.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.1.2.3.4.1-1

CA Capability to be tested: Select one according to Table 8.2.3.1.2.3.4.1-1

**Table 8.2.3.1.2.3.4.1-1: Test point selection for TM1 CA**

| **CA Applicability** | | **Bandwidth combination** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | FDD cell | 20 | 2x20 | 20+15 | 2x15 | 2x20+15 | 2x15+20 | 2x20+10 |
| | TDD cell | 3x20 | 2x20 | 2x20 | 2x20 | 20 | 20 | 20 |
| Inter-band CA (two bands) (CA4_A2) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (three bands) (CA4_A3) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (four bands) (CA4_A4) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Note 1: Only one test point is tested.<br>Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA. | | | | | | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.59 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.2.3-1 and 8.2.3.1.2.3.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.1.2.3.4.3.

#### 8.2.3.1.2.3.4.2 Test procedure

1. Configure SCCs according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.1.2.3.4.3.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.1.2.3.5-1 and 8.2.3.1.2.3.5-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.3.1.2.3.5-1 and 8.2.3.1.2.3.5-2 as appropriate.

6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.3.1.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

#### 8.2.3.1.2.3.5 Test requirement

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1 for the throughput test shall meet or exceed the specified value in Table 8.2.3.1.2.3.5-1 and 8.2.3.1.2.3.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.1.2.3.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.5 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.3 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.2 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |

**Table 8.2.3.1.2.3.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.2 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.0 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.4 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |

**Table 8.2.3.1.2.3.5-3: Test requirement for multiple CA configurations with 4DL CCs (FRC)**

| Test number | CA Bandwidth combination (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.2.3.1.2.3.5-1and Table 8.2.3.1.2.3.5-2per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.2.3.1.2.3.5-1and Table 8.2.3.1.2.3.5-2per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.2.3.1.2.3.5-1and Table 8.2.3.1.2.3.5-2per CC | ≥8 |
| 4 | 2×15+2x20 | 2×15 | 2x20 | As defined in Table 8.2.3.1.2.3.5-1and Table 8.2.3.1.2.3.5-2per CC | ≥8 |
| 5 | 3x20+15 | 2×20+15 | 20 | As defined in Table 8.2.3.1.2.3.5-1and Table 8.2.3.1.2.3.5-2per CC | ≥8 |
| 6 | 2×15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.1.2.3.5-1and Table 8.2.3.1.2.3.5-2per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.2.3.1.2.3.5-1and Table 8.2.3.1.2.3.5-2per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |
| Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | | | |

## 8.2.3.1.2.4 TDD FDD CA PDSCH Single Antenna Port Performance for TDD PCell (5DL CA)

### 8.2.3.1.2.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

### 8.2.3.1.2.4.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8 or 11 and above that support E-UTRA FDD and TDD and 5DL CA with TDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.3.1.2.4.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1, with the addition of the relevant parameters in Tables 8.2.3-1, 8.2.3.1.2.4.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.3.1.2.4.3-2 and 8.2.3.1.2.4.3-3 for the specified SNR. For QPSK performance the bandwidths specified in Table 5.4.2.1-1 are verified.

**Table 8.2.3.1.2.4.3-1: Test Parameters for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | $\sigma$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Modulation | | | QPSK |
| PDSCH transmission mode | | | 1 |
| Note 1: $P_B = 0$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |
| Note 3: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.3.1.2.4.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.3 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.1 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.0 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -1.7 |

**Table 8.2.3.1.2.4.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.2 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.6 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -1.4 |

**Table 8.2.3.1.2.4.3-4: Minimum performance for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.2.3.1.2.4.3-2and Table 8.2.3.1.2.4.3-3per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.2.3.1.2.4.3-2and Table 8.2.3.1.2.4.3-3per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.<br>Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.1.

### 8.2.3.1.2.4.4 Test description

#### 8.2.3.1.2.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.1.2.4.4.1-1

CA Capability to be tested: Select one according to Table 8.2.3.1.2.4.4.1-1

**Table 8.2.3.1.2.4.4.1-1: Test point selection for TM1 CA**

| CA Applicability | | Bandwidth combination | |
|---|---|---|---|
| | FDD Cell | 15+2×20 | 2×15+20 |
| | TDD Cell | 2×20 | 2×20 |
| Inter-band CA (two bands) (CA5_A2) | | Test1 | Test2 |
| Inter-band CA (three bands) (CA5_A3) | | Test1 | Test2 |
| Inter-band_CA (four bands) (CA5_A4) | | Test1 | Test2 |
| Inter-band_CA (five bands) (CA5_A5) | | Test1 | Test2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.59 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.2.3-1 and 8.2.3.1.2.4.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.1.2.4.4.3.

#### 8.2.3.1.2.4.4.2 Test procedure

1. Configure SCCs according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.1.2.4.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.1.2.4.5-1 and 8.2.3.1.2.4.5-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.3.1.2.4.5-1 and 8.2.3.1.2.4.5-2 as appropriate.
6. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.2.3.1.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6. In test procedure step 2, for SCCs configuration there are no additional message contents.

#### 8.2.3.1.2.4.5 Test requirement

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 and A.3.4.1 for the throughput test shall meet or exceed the specified value in Table 8.2.3.1.2.4.5-1 and 8.2.3.1.2.4.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.1.2.4.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.5 |
| 3 MHz | R.42-1 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.3 |
| 5MHz | R.42-2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.2 |
| 10MHz | R.2 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |
| 15MHz | R.42-3 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 20MHz | R.42 FDD | OP.1 FDD | EVA5 | 1x2 Low | 70 | -0.9 |

**Table 8.2.3.1.2.4.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.4 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.2 |
| 3 MHz | R.42-1 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | 0.0 |
| 5MHz | R.42-2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.4 |
| 10MHz | R.2 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.8 |
| 15MHz | R.42-3 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |
| 20MHz | R.42 TDD | OP.1 TDD | EVA5 | 1x2 Low | 70 | -0.6 |

**Table 8.2.3.1.2.4.5-3: Test requirement for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.2.3.1.2.4.5-1 and Table 8.2.3.1.2.4.5-2 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.2.3.1.2.4.5-1 and Table 8.2.3.1.2.4.5-2 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |
| Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | | | |

## 8.2.3.2 TDD FDD CA PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)

### 8.2.3.2.1 TDD FDD CA PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols) for FDD PCell

#### 8.2.3.2.1.1 TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for FDD PCell (2DL CA)

##### 8.2.3.2.1.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

##### 8.2.3.2.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of category ≥5 that support E-UTRA FDD and TDD and 2DL CA with FDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

##### 8.2.3.2.1.1.3 Minimum conformance requirements

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.2.3.2.1.1.3-4 based on single carrier requirement specified in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3, with the addition of the parameters in Table 8.2.3.2.1.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.3.2.1.1.3-1: Test Parameters for Large Delay CDD (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$. | | | |
| Note 2: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.3.2.1.1.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.6 |
| 3 MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.3 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.3 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.9 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.9 |

**Table 8.2.3.2.1.1.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 3 MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.6 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.9 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.0 |

**Table 8.2.3.2.1.1.3-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.2.1.

#### 8.2.3.2.1.1.4 Test description

##### 8.2.3.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.2.1.1.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.2.1.1.4.1-1.

**Table 8.2.3.2.1.1.4.1-1: Test point selection for TM3 TDD FDD 2DL CA FDD PCell**

| **CA Capability** | **Bandwidth Combination** | | |
|---|---|---|---|
| | 20+20 | 20+10 | 20+15 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 | Test 2 | Test3 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.36 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.2.3.2.1.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.2.1.1.4.3.

##### 8.2.3.2.1.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.2.1.1.4.3
3. The SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4. The SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.2.1.1.3-1 and 8.2.3.2.1.1.3-2 or 8.2.3.2.1.1.3-3. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.3.2.1.1.5-1 and 8.2.3.2.1.1.5-2.

6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.3.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.2.3.2.1.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.3.2.1.1.4.3-2: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 11 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.2.3.2.1.1.5 Test requirement

Tables 8.2.3.2.1.1.5-1 and 8.2.3.2.1.1.5-2 define the primary level settings.

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.2.3.2.1.1.5-3 based on single carrier requirement specified in Tables 8.2.3.2.1.1.5-1 and 8.2.3.2.1.1.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.2.1.1.5-1 or 8.2.3.2.1.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.2.1.1.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 14.5 | 13 |
| 3 MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |

**Table 8.2.3.2.1.1.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 14.1 | 12.6 |
| 3 MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.5 | 12 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.9 | 12.4 |

**Table 8.2.3.2.1.1.5-3: Test requirement for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Test requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.3.2.1.1.5-2 and Table 8.2.3.2.1.1.5-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.2.3.2.1.1.5-2 and Table 8.2.3.2.1.1.5-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.2.3.2.1.1.5-2 and Table 8.2.3.2.1.1.5-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.2.3.2.1.2 TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for FDD PCell (3DL CA)

#### 8.2.3.2.1.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

#### 8.2.3.2.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of category ≥5 that support E-UTRA FDD and TDD and 3DL CA with FDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.3.2.1.2.3 Minimum conformance requirements

For TDD FDD CA with FDD PCell and 3DL CCs, the requirements are specified in Table 8.2.3.2.1.2.3-1 based on single carrier requirement specified in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3, with the addition of the parameters in Table 8.2.3.2.1.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.3.2.1.2.3-1: Minimum performance for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.2.1.

#### 8.2.3.2.1.2.4 Test description

##### 8.2.3.2.1.2.4.1 Initial conditions

Same as in clause 8.2.3.2.1.1.4.1 with the following exceptions:

- Instead of Table 8.2.3.2.1.1.4.1-1 → use Table 8.2.3.2.1.2.4.1-1

- Instead of Figure group A.36 as appropriate → Figure A.60 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC

- Instead of clause 8.2.3.2.1.1.4.3 → use clause 8.2.3.2.1.2.4.3

**Table 8.2.3.2.1.2.4.1-1: Test point selection for TM3 TDD FDD 3DL CA FDD PCell**

| CA Capability | Bandwidth Combination | | |
|---|---|---|---|
| | 20+20+20 | 20+20+15 | 20+20+10 |

| Inter-band CA (two bands) (CA3_A2) | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | | |

#### 8.2.3.2.1.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.2.1.2.4.3
3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.2.1.1.3-1 and 8.2.3.2.1.1.3-2 or 8.2.3.2.1.1.3-3. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.3.2.1.2.5-1 and 8.2.3.2.1.2.5-2.
6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.3.2.1.2.4.3 Message contents

Same as in clause 8.2.3.2.1.1.4.3.

### 8.2.3.2.1.2.5 Test requirement

Tables 8.2.3.2.1.2.5-1 and 8.2.3.2.1.2.5-2 define the primary level settings.

For TDD FDD CA with FDD PCell and 3DL CCs, the requirements are specified in Table 8.2.3.2.1.2.5-3 based on single carrier requirement specified in Tables 8.2.3.2.1.2.5-1 and 8.2.3.2.1.2.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.2.1.2.5-1 or 8.2.3.2.1.2.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.2.1.2.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 14.5 | 13.0 |
| 3 MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |

**Table 8.2.3.2.1.2.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 14.1 | 12.6 |
| 3 MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.5 | 12.0 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.9 | 12.4 |

**Table 8.2.3.2.1.2.5-3: Minimum performance for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Test Requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.2.3.2.1.2.5-1 and Table 8.2.3.2.1.2.5-2 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.2.3.2.1.2.5-1 and Table 8.2.3.2.1.2.5-2 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.2.3.2.1.2.5-1 and Table 8.2.3.2.1.2.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.3.2.1A TDD FDD CA PDSCH Soft buffer management test for FDD PCell (2DL CA)

### 8.2.3.2.1A.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports with different channel models and MCS using large delay CDD.

### 8.2.3.2.1A.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of Category 3 or 4 that support E-UTRA FDD and TDD and 2DL CA with FDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.3.2.1A.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2, with the addition of the relevant parameters in Tables 8.2.3-1, 8.2.3.2.1A.3-1: and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.3.2.1A.3-2 for the specified SNR. For performance the bandwidths specified in article 5.4.2A are verified.

**Table 8.2.3.2.1A.3-1: Test Parameters for CA**

| Parameter | | Unit | Value | |
|---|---|---|---|---|
| | | | FDD Carrier | TDD Carrier |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| PDSCH transmission mode | | | 3 | 3 |
| Note 1: $P_B = 1$. | | | | |
| Note 2: The same PDSCH transmission mode is applied to each component carrier. | | | | |

**Table 8.2.3.2.1A.3-2: Minimum performance (FRC) for CA**

| Test num. | Band-width | | Reference channel | OCNG pattern | Propa-gation condi-tion | Correl ation matrix and anten na config . | Reference value | | UE cate-gory |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| 1 | PCell | 20MHz | R.30 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.2 | 3 |
| | SCell | 20MHz | R.30 TDD | OP.1 TDD (Note 1) | | | 70 | 13.2 | |
| 2 | PCell | 20MHz | R.35-1 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.3 | 4 |
| | SCell | 20MHz | R.35-1 TDD | OP.1 TDD (Note 1) | | | 70 | 16.3 | |
| 3 | PCell | 10MHz | R.35-3 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.0 | 3 |
| | SCell | 20MHz | R.30-2 TDD | OP.1 TDD (Note 1) | | | 70 | 13.2 | |
| 4 | PCell | 10MHz | R.35-3 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.0 | 4 |
| | SCell | 20MHz | R.35-1 TDD | OP.1 TDD (Note 1) | | | 70 | 16.3 | |
| 5 | PCell | 15MHz | R.35-2 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.0 | 3 |
| | SCell | 20MHz | R.30-2 TDD | OP.1 TDD (Note 1) | | | 70 | 13.2 | |
| 6 | PCell | 15MHz | R.35-2 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.0 | 4 |
| | SCell | 20MHz | R.35-1 TDD | OP.1 TDD (Note 1) | | | 70 | 16.3 | |

Note 1: The OCNG pattern applies for each CC.
Note 2: The applicability and test rules of requirements for different CA configurations and bandwidth combination sets are defined in Table 8.1.2.3B-1

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.2.1A

### 8.2.3.2.1A.4 Test description

#### 8.2.3.2.1A.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.2.1A.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.2.1A.4.1-1.

**Table 8.2.3.2.1A.4.1-1: Test point selection soft buffer management tests for TDD/FDD CA for FDD Pcell**

| CA Capability | Bandwidth combination | | |
|---|---|---|---|
| | 20+20 | 10+20 | 15+20 |

| Inter-band CA2_A2 | Test1 or 2 | Test3 or 4 | Test5 or 6 |
|---|---|---|---|
| Only one test point is tested.<br>Note 1: Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 2: One of the two tests per table position is selected, depending on UE category. | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.36 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.2.3-1 and 8.2.3.2.1A.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.2.1A.4.3.

### 8.2.3.2.1A.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.2.1A.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4 SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.2.1A.3-1 and 8.2.3.2.1A.3-2 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the reference channel, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 8.2.3.2.1A.5-1 as appropriate.

6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

### 8.2.3.2.1A.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions

**Table 8.2.3.2.1A.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.3.2.1A.4.3-2: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 11 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.2.1A.5 Test Requirements

Table 8.2.3.2.1A.5-1 defines the primary level settings including test tolerances for all throughput tests.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for the throughput test shall meet or exceed the specified value in Table 8.2.3.2.1A.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.2.1A.5-1: Test Requirement (FRC) for CA**

| Test num. | Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | | UE cate gory |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | PCell | 20MHz | R.30 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 | 3 |
| | SCell | 20MHz | R.30 TDD | OP.1 TDD (Note 1) | | | 70 | 13.2 | 11.7 | |
| 2 | PCell | 20MHz | R.35-1 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.3 | 14.8 | 4 |
| | SCell | 20MHz | R.35-1 TDD | OP.1 TDD (Note 1) | | | 70 | 16.3 | 14.8 | |
| 3 | PCell | 10MHz | R.35-3 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.0 | 14.5 | 3 |
| | SCell | 20MHz | R.30-2 TDD | OP.1 TDD (Note 1) | | | 70 | 13.2 | 11.7 | |
| 4 | PCell | 10MHz | R.35-3 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.0 | 14.5 | 4 |
| | SCell | 20MHz | R.35-1 TDD | OP.1 TDD (Note 1) | | | 70 | 16.3 | 14.8 | |
| 5 | PCell | 15MHz | R.35-2 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.0 | 14.5 | 3 |
| | SCell | 20MHz | R.30-2 TDD | OP.1 TDD (Note 1) | | | 70 | 13.2 | 11.7 | |
| 6 | PCell | 15MHz | R.35-2 FDD | OP.1 FDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.0 | 14.5 | 4 |
| | SCell | 20MHz | R.35-1 TDD | OP.1 TDD (Note 1) | | | 70 | 16.3 | 14.8 | |

Note 1: The OCNG pattern applies for each CC.
Note 2: The applicability and test rules of requirements for different CA configurations and bandwidth combination sets are defined in 8.1.2.3B.

### 8.2.3.2.1.3 TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for FDD PCell (4DL CA)

#### 8.2.3.2.1.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

#### 8.2.3.2.1.3.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8 or higher that support E-UTRA FDD and TDD and 4DL CA with FDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.3.2.1.3.3 Minimum conformance requirements

For TDD FDD CA with FDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.2.1.3.3-1 based on single carrier requirement specified in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3, with the addition of the parameters in Table 8.2.3.2.1.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.3.2.1.3.3-1: Minimum performance for multiple CA configurations with 4DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥8 |
| 4 | 2×15+2x20 | 2×15 | 2x20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥8 |
| 5 | 3x20+15 | 2×20+15 | 20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥8 |
| 6 | 2×15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥8 |
| 8 | 2x15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.2.1.

### 8.2.3.2.1.3.4 Test description

#### 8.2.3.2.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.2.1.3.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.2.1.3.4.1-1.

**Table 8.2.3.2.1.3.4.1-1: Test point selection for TM3 TDD FDD 4DL CA FDD PCell**

| CA Applicability | | Bandwidth combination | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | FDD cell | 20 | 2x20 | 20+15 | 2x15 | 2x20+15 | 2x15+20 | 2x20+10 |
| | TDD cell | 3x20 | 2x20 | 2x20 | 2x20 | 20 | 20 | 20 |
| Inter-band CA (two bands) (CA4_A2) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (three bands) (CA4_A3) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (four bands) (CA4_A4) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | | | | | | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.60 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.2.3.2.1.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.2.1.3.4.3.

#### 8.2.3.2.1.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.2.1.3.4.3
3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.2.1.1.3-1 and 8.2.3.2.1.1.3-2 or 8.2.3.2.1.1.3-3. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.3.2.1.3.5-1 and 8.2.3.2.1.3.5-2.
6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.3.2.1.3.4.3 Message contents

Same as in clause 8.2.3.2.1.1.4.3.

### 8.2.3.2.1.3.5 Test requirement

Tables 8.2.3.2.1.3.5-1 and 8.2.3.2.1.3.5-2 define the primary level settings. For TDD FDD CA with FDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.2.1.3.5-3 based on single carrier requirement specified in Tables 8.2.3.2.1.3.5-1 and 8.2.3.2.1.3.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.2.1.2.5-1 or 8.2.3.2.1.2.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.2.1.3.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 14.5 |
| 3 MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 |

**Table 8.2.3.2.1.3.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 14.1 |
| 3 MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.5 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.8 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.9 |

**Table 8.2.3.2.1.3.5-3: Minimum performance for multiple CA configurations with 4DL CCs (FRC)**

| Test number | CA Bandwidth combination (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.2.3.2.1.3.5-1and Table 8.2.3.2.1.3.5-2 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.2.3.2.1.3.5-1and Table 8.2.3.2.1.3.5-2 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.2.3.2.1.3.5-1and Table 8.2.3.2.1.3.5-2 per CC | ≥8 |
| 4 | 2x15+2x20 | 2x15 | 2x20 | As defined in Table 8.2.3.2.1.3.5-1and Table 8.2.3.2.1.3.5-2 per CC | ≥8 |
| 5 | 3x20+15 | 2x20+15 | 20 | As defined in Table 8.2.3.2.1.3.5-1and Table 8.2.3.2.1.3.5-2 per CC | ≥8 |
| 6 | 2x15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.2.1.3.5-1and Table 8.2.3.2.1.3.5-2 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.2.3.2.1.3.5-1and Table 8.2.3.2.1.3.5-2 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |
| Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.2.3.2.1.4 TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for FDD PCell (5DL CA)

#### 8.2.3.2.1.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

#### 8.2.3.2.1.4.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8, or categories 11 and onwards that support E-UTRA FDD and TDD and 5DL CA with FDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.3.2.1.4.3 Minimum conformance requirements

For TDD FDD CA with FDD PCell and 5DL CCs, the requirements are specified in Table 8.2.3.2.1.4.3-1 based on single carrier requirement specified in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3, with the addition of the parameters in Table 8.2.3.2.1.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.3.2.1.4.3-1: Minimum performance for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.2.3.2.1.1.3-2 and Table 8.2.3.2.1.1.3-3 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.2.1.

#### 8.2.3.2.1.4.4 Test description

##### 8.2.3.2.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.2.1.4.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.2.1.4.4.1-1.

**Table 8.2.3.2.1.4.4.1-1: Test point selection for TM3 TDD FDD 5DL CA FDD PCell**

| CA Capability | Bandwidth combination | |
|---|---|---|
| FDD CELL | 15+2×20 | 2×15+20 |
| TDD CELL | 2×20 | 2×20 |
| Inter-band CA (two bands) (CA5_A2) | Test1 | Test2 |
| Inter-band CA (three bands) (CA5_A3) | Test1 | Test2 |
| Inter-band_CA (four bands) (CA_A4) | Test1 | Test2 |
| Inter-band_CA (five bands) (CA_A5) | Test1 | Test2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.60 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.2.3.2.1.1.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.2.1.4.4.3.

#### 8.2.3.2.1.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.2.1.4.4.3

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.2.1.1.3-1 and 8.2.3.2.1.1.3-2 or 8.2.3.2.1.1.3-3. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.3.2.1.4.5-1 and 8.2.3.2.1.4.5-2.

6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.3.2.1.4.4.3 Message contents

Same as in clause 8.2.3.2.1.1.4.3.

#### 8.2.3.2.1.4.5 Test requirement

Tables 8.2.3.2.1.4.5-1 and 8.2.3.2.1.4.5-2 define the primary level settings.

For TDD FDD CA with FDD PCell and 5DL CCs, the requirements are specified in Table 8.2.3.2.1.4.5-3 based on single carrier requirement specified in Tables 8.2.3.2.1.4.5-1 and 8.2.3.2.1.4.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.2.1.4.5-1 or 8.2.3.2.1.4.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.2.1.4.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 14.5 |
| 3 MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 |

**Table 8.2.3.2.1.4.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 14.1 |
| 3 MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.5 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.8 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.9 |

**Table 8.2.3.2.1.4.5-3: Minimum performance for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.2.3.2.1.4.5-1 and Table 8.2.3.2.1.4.5-2 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.2.3.2.1.4.5-1 and Table 8.2.3.2.1.4.5-2 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.3.2.2 TDD FDD CA PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols) for TDD PCell

### 8.2.3.2.2.1 TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for TDD PCell (2DL CA)

#### 8.2.3.2.2.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports with different channel models and MCS using large delay CDD.

#### 8.2.3.2.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories of ≥5 that support E-UTRA FDD and TDD and 2DL CA with TDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.3.2.2.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2, with the addition of the relevant parameters in Tables 8.2.3-1, 8.2.3.2.2.1.3-1: and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.3.2.2.1.3-2 and 8.2.3.2.2.1.3-3 for the specified SNR. For performance the bandwidths specified in article 5.4.2A are verified.

For TDD FDD CA with TDD PCell and 2 DL CCs, the requirements are specified in Table 8.2.3.2.2.1.3-4, based on single carrier requirement specified in Table 8.2.3.2.2.1.3-2 and 8.2.3.2.2.1.3-3.

**Table 8.2.3.2.2.1.3-1: Test Parameters for Large Delay CDD (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 0$. | | | |
| Note 2: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.2.3.2.2.1.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.6 |
| 3 MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.3 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.3 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.9 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.9 |

**Table 8.2.3.2.2.1.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 3 MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.6 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.9 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.0 |

**Table 8.2.3.2.2.1.3-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.3.2.2.1.3-2 and Table 8.2.3.2.2.1.3-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.2.3.2.2.1.3-2 and Table 8.2.3.2.2.1.3-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.2.3.2.2.1.3-2 and Table 8.2.3.2.2.1.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.2.2

### 8.2.3.2.2.1.4 Test description

#### 8.2.3.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.2.2.1.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.2.2.1.4.1-1.

**Table 8.2.3.2.2.1.4.1-1: Test point selection for TM3 TDD FDD 2DL CA TDD PCell**

| CA Capability | Bandwidth Combination | | |
|---|---|---|---|
| | 20+20 | 20+10 | 20+15 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 | Test 2 | Test3 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.36 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Tables 8.2.3-1 and 8.2.3.2.2.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.2.2.1.4.3.

#### 8.2.3.2.2.1.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in Table 8.2.3.2.2.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.2.2.1.3-1, 8.2.3.2.2.1.5-1 and 8.2.3.2.2.1.5-2 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.3.2.2.1.5-1 and Table 8.2.3.2.2.1.5-2 as appropriate.

6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.3.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions.

**Table 8.2.3.2.2.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.2.2.1.4.3-1A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 11 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.2.3.2.2.1.5 Test Requirements

Tables 8.2.3.2.2.1.5-1 and 8.2.3.2.2.1.5-2 define the primary level settings.

For TDD FDD CA with TDD PCell and 2DL CCs, the requirements are specified in Table 8.2.3.2.2.1.5-3 based on single carrier requirement specified in Tables 8.2.3.2.2.1.5-1 and 8.2.3.2.2.1.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.2.2.1.5-1 or 8.2.3.2.2.1.5-2 for the specified SNR including test tolerances for all throughput tests

**Table 8.2.3.2.2.1.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 14.5 | 13 |
| 3 MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |

**Table 8.2.3.2.2.1.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 14.1 | 12.6 |
| 3 MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.5 | 12 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.9 | 12.4 |

**Table 8.2.3.2.2.1.5-3: Test requirement for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Test requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.3.2.2.1.5-1 and Table 8.2.3.2.2.1.5-2 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.2.3.2.2.1.5-1 and Table 8.2.3.2.2.1.5-2 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.2.3.2.2.1.5-1 and Table 8.2.3.2.2.1.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.2.3.2.2.2 TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for TDD PCell (3DL CA)

#### 8.2.3.2.2.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports with different channel models and MCS using large delay CDD.

#### 8.2.3.2.2.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories ≥5 that support E-UTRA FDD and TDD and 3DL CA with TDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.3.2.2.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2, with the addition of the relevant parameters in Tables 8.2.3-1, 8.2.3.2.2.1.3-1: and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.3.2.2.1.3-2 and 8.2.3.2.2.1.3-3 for the specified SNR. For performance the bandwidths specified in article 5.4.2A are verified

For TDD FDD CA with TDD Pcell and 3 DL CCs, the requirements are specified in Table 8.2.3.2.2.2.3-4, based on single carrier requirement specified in Table 8.2.3.2.2.1.3-2 and 8.2.3.2.2.1.3-3.

**Table 8.2.3.2.2.2.3-4: Minimum performance for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.2.3.2.2.2.3-2 and Table 8.2.3.2.2.2.3-3 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.2.3.2.2.2.3-2 and Table 8.2.3.2.2.2.3-3 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.2.3.2.2.2.3-2 and Table 8.2.3.2.2.2.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.2.2

#### 8.2.3.2.2.2.4 Test description

##### 8.2.3.2.2.2.4.1 Initial conditions

Same as in clause 8.2.3.2.2.1.4.1 with the following exceptions:

- Instead of Table 8.2.3.2.2.1.4.1-1 → use Table 8.2.3.2.2.2.4.1-1

- Instead of Figure group 36 as appropriate → use Figure A.60 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC

- Instead of clause 8.2.3.2.2.1.4.3 → use clause 8.2.3.2.2.2.4.3

**Table 8.2.3.2.2.2.4.1-1: Test point selection for TM3 TDD FDD 3DL CA TDD PCell**

| CA Capability | Bandwidth Combination | | |
|---|---|---|---|
| | 20+20+20 | 20+20+15 | 20+20+10 |
| Inter-band CA (two bands) (CA3_A2) | Test 1 | Test 2 | Test 3 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | | |

### 8.2.3.2.2.2.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in Table 8.2.3.2.2.2.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.2.2.1.3-1, 8.2.3.2.2.2.5-1 and 8.2.3.2.2.2.5-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.3.2.2.2.5-1 and Table 8.2.3.2.2.2.5-2 as appropriate.
6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

### 8.2.3.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions.

**Table 8.2.3.2.2.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.2.2.2.1.4.3-1A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional TDD or FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 11 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.2.2.2.5 Test Requirements

Tables 8.2.3.2.2.2.5-1 and 8.2.3.2.2.2.5-2 define the primary level settings.

For TDD FDD CA with TDD PCell and 3DL CCs, the requirements are specified in Table 8.2.3.2.2.2.5-3 based on single carrier requirement specified in Tables 8.2.3.2.2.2.5-1 and 8.2.3.2.2.2.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.2.2.2.5-1 or 8.2.3.2.2.2.5-2 for the specified SNR including test tolerances for all throughput tests

**Table 8.2.3.2.2.2.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 14.5 | 13 |
| 3 MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |

**Table 8.2.3.2.2.2.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 14.1 | 12.6 |
| 3 MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.5 | 12 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 | 12.2 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.8 | 12.3 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.9 | 12.4 |

**Table 8.2.3.2.2.2.5-3: Test requirement for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Test requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.2.3.2.2.2.5-1 and Table 8.2.3.2.2.2.5-2 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.2.3.2.2.2.5-1 and Table 8.2.3.2.2.2.5-2 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.2.3.2.2.2.5-1 and Table 8.2.3.2.2.2.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.3.2.2.3 TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for TDD PCell (4DL CA)

### 8.2.3.2.2.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports with different channel models and MCS using large delay CDD.

### 8.2.3.2.2.3.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8 and above that support E-UTRA FDD and TDD and 4DL CA with TDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.3.2.2.3.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2, with the addition of the relevant parameters in Tables 8.2.3-1, 8.2.3.2.2.1.3-1: and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.3.2.2.1.3-2 and 8.2.3.2.2.1.3-3 for the specified SNR. For performance the bandwidths specified in article 5.4.2A are verified

For TDD FDD CA with TDD Pcell and 4DL CCs, the requirements are specified in Table 8.2.3.2.2.3.3-1, based on single carrier requirement specified in Table 8.2.3.2.2.1.3-2 and 8.2.3.2.2.1.3-3.

**Table 8.2.3.2.2.3.3-1: Minimum performance for multiple CA configurations with 4DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.2.3.2.2.1.3-2 and Table 8.2.3.2.2.1.3-3 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.2.3.2.2.1.3-2 and Table 8.2.3.2.2.1.3-3 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.2.3.2.2.1.3-2 and Table 8.2.3.2.2.1.3-3 per CC | ≥8 |
| 4 | 2×15+2x20 | 2×15 | 2x20 | As defined in Table 8.2.3.2.2.1.3-2 and Table 8.2.3.2.2.1.3-3 per CC | ≥8 |
| 5 | 3x20+15 | 2×20+15 | 20 | As defined in Table 8.2.3.2.2.1.3-2 and Table 8.2.3.2.2.1.3-3 per CC | ≥8 |
| 6 | 2×15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.2.2.1.3-2 and Table 8.2.3.2.2.1.3-3 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.2.3.2.2.1.3-2 and Table 8.2.3.2.2.1.3-3 per CC | ≥8 |
| 8 | 2x15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.2.2.1.3-2 and Table 8.2.3.2.2.1.3-3 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.2.2

### 8.2.3.2.2.3.4 Test description

#### 8.2.3.2.2.3.4.1 Initial conditions

Same as in clause 8.2.3.2.2.1.4.1 with the following exceptions:

- Instead of Table 8.2.3.2.2.1.4.1-1 → use Table 8.2.3.2.2.3.4.1-1

- Instead of Figure group 36 as appropriate → use Figure A.60 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC

- Instead of clause 8.2.3.2.2.1.4.3 → use clause 8.2.3.2.2.3.4.3

**Table 8.2.3.2.2.3.4.1-1: Test point selection for TM3 CA**

| CA Applicability | | Bandwidth combination | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | FDD cell | 20 | 2x20 | 20+15 | 2x15 | 2x20+15 | 2x15+20 | 2x20+10 | 2x15+20 |
| | TDD cell | 3x20 | 2x20 | 2x20 | 2x20 | 20 | 20 | 20 | 20 |
| Inter-band CA (two bands) (CA4_A2) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 | Test 8 |
| Inter-band CA (three bands) (CA4_A3) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 | Test 8 |
| Inter-band CA (four bands) (CA4_A4) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 | Test 8 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | | | | | | | | |

#### 8.2.3.2.2.3.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in Table 8.2.3.2.2.3.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.2.2.1.3-1, 8.2.3.2.2.3.5-1 and 8.2.3.2.2.3.5-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.3.2.2.2.5-1 and Table 8.2.3.2.2.2.5-2 as appropriate.
6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.3.2.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions.

**Table 8.2.3.2.2.3.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.3.2.2.3.4.3-1A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional TDD or FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 11 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.2.2.3.5 Test Requirements

Tables 8.2.3.2.2.3.5-1 and 8.2.3.2.2.3.5-2 define the primary level settings.

For TDD FDD CA with TDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.2.2.3.5-3 based on single carrier requirement specified in Tables 8.2.3.2.2.3.5-1 and 8.2.3.2.2.3.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.2.2.3.5-1 or 8.2.3.2.2.3.5-2 for the specified SNR including test tolerances for all throughput tests

**Table 8.2.3.2.2.3.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 14.5 |
| 3 MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 |

**Table 8.2.3.2.2.3.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 14.1 |
| 3 MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.5 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.8 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.9 |

**Table 8.2.3.2.2.3.5-3: Minimum performance for multiple CA configurations with 4DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.2.3.2.2.3.5-1 and Table 8.2.3.2.2.3.5-2 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.2.3.2.2.3.5-1 and Table 8.2.3.2.2.3.5-2 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.2.3.2.2.3.5-1 and Table 8.2.3.2.2.3.5-2 per CC | ≥8 |
| 4 | 2×15+2x20 | 2×15 | 2x20 | As defined in Table 8.2.3.2.2.3.5-1 and Table 8.2.3.2.2.3.5-2 per CC | ≥8 |
| 5 | 3x20+15 | 2×20+15 | 20 | As defined in Table 8.2.3.2.2.3.5-1 and Table 8.2.3.2.2.3.5-2 per CC | ≥8 |
| 6 | 2×15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.2.2.3.5-1 and Table 8.2.3.2.2.3.5-2 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.2.3.2.2.3.5-1 and Table 8.2.3.2.2.3.5-2 per CC | ≥8 |
| 8 | 2x15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.2.2.3.5-1 and Table 8.2.3.2.2.3.5-2 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.3.2.2.4 TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for TDD PCell (5DL CA)

### 8.2.3.2.2.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports with different channel models and MCS using large delay CDD.

### 8.2.3.2.2.4.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8 or 11 and above that support E-UTRA FDD and TDD and 5DL CA with TDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.2.3.2.2.4.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2, with the addition of the relevant parameters in Tables 8.2.3-1, 8.2.3.2.2.1.3-1: and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.3.2.2.1.3-2 and 8.2.3.2.2.1.3-3 for the specified SNR. For performance the bandwidths specified in article 5.4.2A are verified

For TDD FDD CA with TDD Pcell and 5DL CCs, the requirements are specified in Table 8.2.3.2.2.4.3-1, based on single carrier requirement specified in Table 8.2.3.2.2.1.3-2 and 8.2.3.2.2.1.3-3.

**Table 8.2.3.2.2.4.3-1: Minimum performance for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.2.3.2.2.1.3-2 and Table 8.2.3.2.2.1.3-3 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.2.3.2.2.1.3-2 and Table 8.2.3.2.2.1.3-3 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.2.2

### 8.2.3.2.2.4.4 Test description

#### 8.2.3.2.2.4.4.1 Initial conditions

Same as in clause 8.2.3.2.2.1.4.1 with the following exceptions:

- Instead of Table 8.2.3.2.2.1.4.1-1 → use Table 8.2.3.2.2.4.4.1-1

- Instead of Figure group 36 as appropriate → use Figure A.60 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC

- Instead of clause 8.2.3.2.2.1.4.3 → use clause 8.2.3.2.2.4.4.3

**Table 8.2.3.2.2.4.4.1-1: Test point selection for TM3 CA**

| CA Applicability | | Bandwidth combination | |
|---|---|---|---|
| | FDD Cell | 15+2×20 | 2×15+20 |
| | TDD Cell | 2×20 | 2×20 |
| Inter-band CA (two bands) (CA5_A2) | | Test1 | Test2 |
| Inter-band CA (three bands) (CA5_A3) | | Test1 | Test2 |
| Inter-band_CA (four bands) (CA5_A4) | | Test1 | Test2 |
| Inter-band_CA (five bands) (CA5_A5) | | Test1 | Test2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | |

#### 8.2.3.2.2.4.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in Table 8.2.3.2.2.4.4.3.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.2.3.2.2.1.3-1, 8.2.3.2.2.4.5-1 and 8.2.3.2.2.4.5-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.3.2.2.4.5-1 and Table 8.2.3.2.2.4.5-2 as appropriate.

6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.3.2.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions.

**Table 8.2.3.2.2.4.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.3.2.2.4.4.3-1A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional TDD or FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 11 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.2.3.2.2.4.5 Test Requirements

Tables 8.2.3.2.2.4.5-1 and 8.2.3.2.2.4.5-2 define the primary level settings.

For TDD FDD CA with TDD PCell and 5DL CCs, the requirements are specified in Table 8.2.3.2.2.4.5-3 based on single carrier requirement specified in Tables 8.2.3.2.2.4.5-1 and 8.2.3.2.2.4.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.2.2.4.5-1 or 8.2.3.2.2.4.5-2 for the specified SNR including test tolerances for all throughput tests

**Table 8.2.3.2.2.4.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 14.5 |
| 3 MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 |

**Table 8.2.3.2.2.4.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 14.1 |
| 3 MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.5 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.7 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.8 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.9 |

**Table 8.2.3.2.2.4.5-3: Minimum performance for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.2.3.2.2.4.5-1 and Table 8.2.3.2.2.4.5-2 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.2.3.2.2.4.5-1 and Table 8.2.3.2.2.4.5-2 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.3.2.2A TDD FDD CA PDSCH Soft buffer management test for TDD PCell (2DL CA)

### 8.2.3.2.2A.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports with different channel models and MCS using large delay CDD.

### 8.2.3.2.2A.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of Category 3 or 4 that support E-UTRA FDD and TDD and 2DL CA with TDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

8.2.3.2.2A.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2, with the addition of the relevant parameters in Tables 8.2.3-1, 8.2.3.2.2A.3-1: and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.3.2.2A.3-2 for the specified SNR. For performance the bandwidths specified in article 5.4.2A are verified.

**Table 8.2.3.2.2A.3-1: Test Parameters for CA**

| Parameter | | Unit | Value | |
|---|---|---|---|---|
| | | | FDD Carrier | TDD Carrier |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| PDSCH transmission mode | | | 3 | 3 |
| Note 1: $P_B = 1$. | | | | |
| Note 2: The same PDSCH transmission mode is applied to each component carrier. | | | | |

**Table 8.2.3.2.2A.3-2: Minimum performance (FRC) for CA**

| Test num. | Band-width | | Reference channel | OCNG pattern | Propa-gation condi-tion | Correl ation matrix and anten na config . | Reference value | | UE cate-gory |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| 1 | **PCell** | 20MHz | R.30-2 TDD | OP.1 TDD (Note 1)) | EVA70 | 2x2 Low | 70 | 13.2 | 3 |
| | **SCell** | 20MHz | R.30 FDD | OP.1 FDD (Note 1 | | | 70 | 13.2 | |
| 2 | **PCell** | 20MHz | R.35-1 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.2 | 4 |
| | **SCell** | 20MHz | R.35-1 FDD | OP.1 FDD (Note 1) | | | 70 | 16.2 | |
| 3 | **PCell** | 20MHz | R.30-2 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.2 | 3 |
| | **SCell** | 10MHz | R.35-3 FDD | OP.1 FDD (Note 1) | | | 70 | 16.0 | |
| 4 | **PCell** | 20MHz | R.35-1 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.2 | 4 |
| | **SCell** | 10MHz | R.35-3 FDD | OP.1 FDD (Note 1) | | | 70 | 15.8 | |
| 5 | **PCell** | 20MHz | R.30-2 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.2 | 3 |
| | **SCell** | 15MHz | R.35-2 FDD | OP.1 FDD (Note 1) | | | 70 | 15.8 | |
| 6 | **PCell** | 20MHz | R.35-1 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.2 | 4 |
| | **SCell** | 15MHz | R.35-2 FDD | OP.1 FDD (Note 1) | | | 70 | 15.8 | |
| Note 1: The OCNG pattern applies for each CC. | | | | | | | | | |
| Note 2: The applicability and test rules of requirements for different CA configurations and bandwidth combination sets are defined in Table 8.1.2.3B-1. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.2.2A.

### 8.2.3.2.2A.4 Test description

#### 8.2.3.2.2A.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.2.2A.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.2.2A.4.1-1.

**Table 8.2.3.2.2A.4.1-1: Test point selection soft buffer management tests for TDD/FDD CA for TDD Pcell**

| CA Capability | Bandwidth combination | | |
|---|---|---|---|
| | 20+20 | 20+10 | 20+15 |
| Inter-band CA2_A2 | Test1 or 2 | Test3 or 4 | Test5 or 6 |
| Only one test point is tested.<br>Note 1: Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 2: One of the two tests per table position is selected, depending on UE category. | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.36 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 8.2.3-1 and 8.2.3.2.2A.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.2.2A.4.3.

#### 8.2.3.2.2A.4.2 Test procedure

1. Configure SCC according to Annex C0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.3.2.2A.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4 SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Table 8.2.3.2.2A.3-1 and 8.2.3.2.2A.3-2 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the reference channel, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.2.3.2.2A.5-1 as appropriate.
6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

8.2.3.2.2A.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions

**Table 8.2.3.2.2A.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.3.2.2A.4.3-2: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 11 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.2.2A.5 Test Requirements

Table 8.2.3.2.2A.5-1 defines the primary level settings including test tolerances for all throughput tests.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A3.3.2 and A3.4.2 for the throughput test shall meet or exceed the specified value in Table 8.2.3.2.2A.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.2.2A.5-1: Test Requirement (FRC) for CA**

| Test num. | Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | | UE cate-gory |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **PCell** | 20MHz | R.30-2 TDD | OP.1 TDD (Note 1)) | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 | 3 |
| | **SCell** | 20MHz | R.30 FDD | OP.1 FDD (Note 1 | | | 70 | 13.2 | 11.7 | |
| 2 | **PCell** | 20MHz | R.35-1 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.2 | 13.7 | 4 |
| | **SCell** | 20MHz | R.35-1 FDD | OP.1 FDD (Note 1) | | | 70 | 16.2 | 13.7 | |
| 3 | **PCell** | 20MHz | R.30-2 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 | 3 |
| | **SCell** | 10MHz | R.35-3 FDD | OP.1 FDD (Note 1) | | | 70 | 16.0 | 14.5 | |
| 4 | **PCell** | 20MHz | R.35-1 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.2 | 14.7 | 4 |
| | **SCell** | 10MHz | R.35-3 FDD | OP.1 FDD (Note 1) | | | 70 | 15.8 | 14.3 | |
| 5 | **PCell** | 20MHz | R.30-2 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 13.2 | 11.7 | 3 |
| | **SCell** | 15MHz | R.35-2 FDD | OP.1 FDD (Note 1) | | | 70 | 15.8 | 14.3 | |
| 6 | **PCell** | 20MHz | R.35-1 TDD | OP.1 TDD (Note 1) | EVA70 | 2x2 Low | 70 | 16.2 | 14.7 | 4 |
| | **SCell** | 15MHz | R.35-2 FDD | OP.1 FDD (Note 1) | | | 70 | 15.8 | 14.3 | |
| Note 1: The OCNG pattern applies for each CC.<br>Note 2: The applicability and test rules of requirements for different CA configurations and bandwidth combination sets are defined in Table 8.1.2.3B-1. | | | | | | | | | | |

## 8.2.3.3 TDD FDD CA PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)

### 8.2.3.3.1 TDD FDD CA PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols) for FDD PCell

#### 8.2.3.3.1.1 TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for FDD PCell (2DL CA)

##### 8.2.3.3.1.1.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

##### 8.2.3.3.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support E-UTRA FDD and TDD and 2DL CA with FDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

##### 8.2.3.3.1.1.3 Minimum conformance requirements

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.2.3.3.1.1.3-4 based on single carrier requirement specified in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3, with the addition of the parameters in Table 8.2.3.3.1.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.3.3.1.1.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | Wideband precoding for 1.4MHz, 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | FDD CC | ms | 8 |
| | TDD CC | ms | 10 or 11 |
| Reporting interval | FDD CC | ms | 1 |
| | TDD CC | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000111111111111111111110000000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers.
Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 3.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.2.3.3.1.1.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 3 MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 10MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.3 |

**Table 8.2.3.3.1.1.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.0 |
| 3 MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 9.8 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.0 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.5 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.6 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 |

**Table 8.2.3.3.1.1.3-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.3.1.

### 8.2.3.3.1.1.4 Test description

#### 8.2.3.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.3.1.1.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.3.1.1.4.1-1.

**Table 8.2.3.3.1.1.4.1-1: Test point selection for TM4 TDD FDD 2DL CA FDD PCell**

| CA Capability | Bandwidth Combination | | |
|---|---|---|---|
| | 20+20 | 20+10 | 20+15 |
| Inter-band (CA_A2) | Test 1 | Test 2 | Test 3 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.46 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.2.3.3.1.1.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.3.1.1.4.3.

### 8.2.3.3.1.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *PDSCH-ConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-1, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-2A , *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-2, *CQI-ReportConfig--r10-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-4, *CQI-ReportAperiodic-r10-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-6.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.3.3.1.1.3-1 and 8.2.3.3.1.1.3-2 or 8.2.3.3.1.1.3-3. The SS sends downlink MAC padding bits on the DL RMC.

5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.3.3.1.1.5-1 or 8.2.3.3.1.1.5-2 as appropriate.

7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

8.2.3.3.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.2.3.3.1.1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.3.3.1.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.2.3.3.1.1.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.2.3.3.1.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.2.3.3.1.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.2.3.3.1.1.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.3.3.1.1.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.2.3.3.1.1.4.3-7: *PUSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

8.2.3.3.1.1.5 Test requirement

Tables 8.2.3.3.1.1.5-1 and 8.2.3.3.1.1.5-2 define the primary level settings.

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.2.3.3.1.1.5-3 based on single carrier requirement specified in Table 8.2.3.3.1.1.5-1 and Table 8.2.3.3.1.1.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.3.1.1.5-1 or 8.2.3.3.1.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.3.1.1.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.3 | 9.8 |
| 3 MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 10MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.2 | 9.7 |

**Table 8.2.3.3.1.1.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.9 | 10.4 |
| 3 MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 | 9.2 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.9 | 9.4 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.4 | 9.9 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.5 | 10.0 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.6 | 10.1 |

**Table 8.2.3.3.1.1.5-3: Test requirement for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Test requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.3.3.1.1.5-1 and Table 8.2.3.3.1.1.5-2 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.2.3.3.1.1.5-1 and Table 8.2.3.3.1.1.5-2 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.2.3.3.1.1.5-1 and Table 8.2.3.3.1.1.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.3.3.1.2 TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for FDD PCell (3DL CA)

### 8.2.3.3.1.2.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

### 8.2.3.3.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support E-UTRA FDD and TDD and 3DL CA with FDD as PCell.

### 8.2.3.3.1.2.3 Minimum conformance requirements

For TDD FDD CA with FDD PCell and 3DL CCs, the requirements are specified in Table 8.2.3.3.1.2.3-1 based on single carrier requirement specified in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3, with the addition of the parameters in Table 8.2.3.3.1.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.3.3.1.2.3-1: Minimum performance for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3 | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.3.1.

### 8.2.3.3.1.2.4 Test description

#### 8.2.3.3.1.2.4.1 Initial conditions

Same as in clause 8.2.3.3.1.1.4.1 with the following exceptions:

- Instead of Table 8.2.3.3.1.1.4.1-1 → use Table 8.2.3.3.1.2.4.1-1

- Instead of Figure group 46 as appropriate → use Figure A.61 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC

- Instead of clause 8.2.3.3.1.1.4.3 → use clause 8.2.3.3.1.2.4.3

- **Table 8.2.3.3.1.2.4.1-1: Test point selection for TM4 TDD FDD 3DL CA FDD PCell**

| CA Capability | Bandwidth Combination | | |
|---|---|---|---|
| | 20+20+20 | 20+20+15 | 20+20+10 |
| Inter-band CA (two bands) (CA3_A2) | Test 1 | Test 2 | Test 3 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | | |

### 8.2.3.3.1.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *PDSCH-ConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-1, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-2A , *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-2, *CQI-ReportConfig-r10--DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-4, *CQI-ReportAperiodic-r10-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-6.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.3.3.1.1.3-1 and 8.2.3.3.1.1.3-2 or 8.2.3.3.1.1.3-3. The SS sends downlink MAC padding bits on the DL RMC.

5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.3.3.1.2.5-1 or 8.2.3.3.1.2.5-2 as appropriate.

7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

### 8.2.3.3.1.2.4.3 Message contents

Same as in clause 8.2.3.3.1.1.4.3 with the following exceptions:

- Instead of Table 8.2.3.3.1.1.4.3-5 → use Table 8.2.3.3.1.2.4.3-1

- use Table 8.2.3.3.1.2.4.3-2

**Table 8.2.3.3.1.2.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11100000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.3.3.1.2.4.3-2: *PUSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.2.3.3.1.2.5 Test requirement

Tables 8.2.3.3.1.2.5-1 and 8.2.3.3.1.2.5-2 define the primary level settings.

For TDD FDD CA with FDD PCell and 3DL CCs, the requirements are specified in Table 8.2.3.3.1.2.5-3 based on single carrier requirement specified in Tables 8.2.3.3.1.2.5-1 and 8.2.3.3.1.2.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.3.1.2.5-1 or 8.2.3.3.1.2.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.3.1.2.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.3 |
| 3 MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 10MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.2 |

**Table 8.2.3.3.1.2.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.9 |
| 3 MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.9 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.4 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.5 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.6 |

**Table 8.2.3.3.1.2.5-3: Minimum performance for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Test Requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.2.3.3.1.2.5-1 and Table 8.2.3.3.1.2.5-2 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.2.3.3.1.2.5-1 and Table 8.2.3.3.1.2.5-2 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.2.3.3.1.2.5-1 and Table 8.2.3.3.1.2.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.2.3.3.1.3 TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for FDD PCell (4DL CA)

#### 8.2.3.3.1.3.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

#### 8.2.3.3.1.3.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8 or higher that support E-UTRA FDD and TDD and 4DL CA with FDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.3.3.1.3.3 Minimum conformance requirements

For TDD FDD CA with FDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.3.1.3.3-1 based on single carrier requirement specified in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3, with the addition of the parameters in Table 8.2.3.3.1.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.3.3.1.3.3-1: Minimum performance for multiple CA configurations with 4DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | ≥8 |
| 4 | 2×15+2x20 | 2×15 | 2x20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | ≥8 |
| 5 | 3x20+15 | 2×20+15 | 20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | ≥8 |
| 6 | 2×15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.3.1.

### 8.2.3.3.1.3.4 Test description

#### 8.2.3.3.1.3.4.1 Initial conditions

Same as in clause 8.2.3.3.1.1.4.1 with the following exceptions:

- Instead of Table 8.2.3.3.1.1.4.1-1 → use Table 8.2.3.3.1.3.4.1-1

- Instead of Figure group 46 as appropriate → use Figure A.61 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC

- Instead of clause 8.2.3.3.1.1.4.3 → use clause 8.2.3.3.1.3.4.3

**Table 8.2.3.3.1.3.4.1-1: Test point selection for TM4 TDD FDD 4DL CA FDD PCell**

| CA Applicability | | Bandwidth combination | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | FDD cell | 20 | 2x20 | 20+15 | 2x15 | 2x20+15 | 2x15+20 | 2x20+10 |
| | TDD cell | 3x20 | 2x20 | 2x20 | 2x20 | 20 | 20 | 20 |
| Inter-band CA (two bands) (CA4_A2) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (three bands) (CA4_A3) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (four bands) (CA4_A4) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA | | | | | | | | |

#### 8.2.3.3.1.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *PDSCH-ConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-1, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-2A , *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-2, *CQI-ReportConfig-r10--DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-4, *CQI-ReportAperiodic-r10-DEFAULT* is defined in Table 8.2.3.3.1.3.4.3-1, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-6.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.3.3.1.1.3-1, 8.2.3.3.1.1.3-2 and 8.2.3.3.1.3.3-1. The SS sends downlink MAC padding bits on the DL RMC.

5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.3.3.1.3.5-1 or 8.2.3.3.1.3.5-2 as appropriate.

7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.3.3.1.3.4.3 Message contents

Same as in clause 8.2.3.3.1.1.4.3 with the following exceptions:

- Instead of Table 8.2.3.3.1.1.4.3-5 → use Table 8.2.3.3.1.3.4.3-1

**Table 8.2.3.3.1.3.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11110000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

#### 8.2.3.3.1.3.5 Test requirement

For TDD FDD CA with FDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.3.1.3.5-3 based on single carrier requirement specified in Tables 8.2.3.3.1.3.5-1 and 8.2.3.3.1.3.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.3.1.3.5-1 or 8.2.3.3.1.3.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.3.1.3.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.3 | 9.8 |
| 3 MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 10MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.2 | 9.7 |

**Table 8.2.3.3.1.3.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.9 | 10.4 |
| 3 MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 | 9.2 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.9 | 9.4 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.4 | 9.9 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.5 | 10.0 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.6 | 10.1 |

**Table 8.2.3.3.1.3.5-3: Minimum performance for multiple CA configurations with 4DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.2.3.3.1.3.5-1 and Table 8.2.3.3.1.3.5-2 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.2.3.3.1.3.5-1 and Table 8.2.3.3.1.3.5-2 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.2.3.3.1.3.5-1 and Table 8.2.3.3.1.3.5-2 per CC | ≥8 |
| 4 | 2×15+2x20 | 2×15 | 2x20 | As defined in Table 8.2.3.3.1.3.5-1 and Table 8.2.3.3.1.3.5-2 per CC | ≥8 |
| 5 | 3x20+15 | 2×20+15 | 20 | As defined in Table 8.2.3.3.1.3.5-1 and Table 8.2.3.3.1.3.5-2 per CC | ≥8 |
| 6 | 2×15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.3.1.3.5-1 and Table 8.2.3.3.1.3.5-2 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.2.3.3.1.3.5-1 and Table 8.2.3.3.1.3.5-2 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.2.3.3.1.4 TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for FDD PCell (5DL CA)

#### 8.2.3.3.1.4.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

#### 8.2.3.3.1.4.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8, or categories 11 and above that support E-UTRA FDD and TDD and 5DL CA with FDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.3.3.1.4.3 Minimum conformance requirements

For TDD FDD CA with FDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.3.1.4.3-1 based on single carrier requirement specified in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3, with the addition of the parameters in Table 8.2.3.3.1.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.3.3.1.4.3-1: Minimum performance for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.2.3.3.1.1.3-2 and Table 8.2.3.3.1.1.3-3 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.3.1.

#### 8.2.3.3.1.4.4 Test description

##### 8.2.3.3.1.4.4.1 Initial conditions

Same as in clause 8.2.3.3.1.1.4.1 with the following exceptions:

- Instead of Table 8.2.3.3.1.1.4.1-1 → use Table 8.2.3.3.1.4.4.1-1

- Instead of Figure group 46 as appropriate → use Figure A.61 for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC

- Instead of clause 8.2.3.3.1.1.4.3 → use clause 8.2.3.3.1.4.4.3

**Table 8.2.3.3.1.4.4.1-1: Test point selection for TM4 CA TDD FDD 5DL CA FDD PCell**

| **CA Capability** | **Bandwidth combination** | |
|---|---|---|
| FDD CELL | 15+2×20 | 2×15+20 |
| TDD CELL | 2×20 | 2×20 |
| Inter-band CA (two bands) (CA5_A2) | Test1 | Test2 |
| Inter-band CA (three bands) (CA5_A3) | Test1 | Test2 |
| Inter-band_CA (four bands) (CA_A4) | Test1 | Test2 |
| Inter-band_CA (five bands) (CA_A5) | Test1 | Test2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

##### 8.2.3.3.1.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *PDSCH-ConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-1, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-2A , *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-2, *CQI-ReportConfig-r10--DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-4, *CQI-ReportAperiodic-r10-DEFAULT* is defined in Table 8.2.3.3.1.4.4.3-1, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 8.2.3.3.1.1.4.3-6.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.3.3.1.1.3-1, 8.2.3.3.1.1.3-2 and 8.2.3.3.1.4.3-1. The SS sends downlink MAC padding bits on the DL RMC.

5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.3.3.1.4.5-1 or 8.2.3.3.1.4.5-2 as appropriate.

7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.2.3.3.1.4.4.3 Message contents

Same as in clause 8.2.3.3.1.1.4.3 with the following exceptions:

- Instead of Table 8.2.3.3.1.1.4.3-5 → use Table 8.2.3.3.1.4.4.3-1

**Table 8.2.3.3.1.4.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11111000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.3.1.4.5 Test requirement

For TDD FDD CA with FDD PCell and 5DL CCs, the requirements are specified in Table 8.2.3.3.1.4.5-3 based on single carrier requirement specified in Tables 8.2.3.3.1.4.5-1 and 8.2.3.3.1.4.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.3.1.4.5-1 or 8.2.3.3.1.4.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.3.1.4.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.3 | 9.8 |
| 3 MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 10MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.2 | 9.7 |

**Table 8.2.3.3.1.4.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.9 | 10.4 |
| 3 MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 | 9.2 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.9 | 9.4 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.4 | 9.9 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.5 | 10.0 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.6 | 10.1 |

**Table 8.2.3.3.1.4.5-3: Minimum performance for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.2.3.3.1.4.5-1 and Table 8.2.3.3.1.4.5-2 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.2.3.3.1.4.5-1 and Table 8.2.3.3.1.4.5-2 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.3.3.2 TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell

### 8.2.3.3.2.1 TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (2DL CA)

#### 8.2.3.3.2.1.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

#### 8.2.3.3.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support E-UTRA FDD and TDD and 2DL CA with TDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.3.3.2.1.3 Minimum conformance requirements

For TDD FDD CA with TDD PCell and 2DL CCs, the requirements are specified in Table 8.2.3.3.2.1.3-4 based on single carrier requirement specified in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3, with the addition of the parameters in Table 8.2.3.3.2.1.3-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.3.3.2.1.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | Wideband pre-coding for 1.4MHz, 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | FDD CC | ms | 8 |
| | TDD CC | ms | 10 or 11 |
| Reporting interval | FDD CC | ms | 1 |
| | TDD CC | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000111111111111111111100000000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | TM4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers.
Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 3.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.2.3.3.2.1.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 3 MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 10MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.3 |

**Table 8.2.3.3.2.1.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1.4 MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.0 |
| 3 MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 9.8 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.0 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.5 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.6 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 |

**Table 8.2.3.3.2.1.3-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.2.3.3.3.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.3.2.

### 8.2.3.3.2.1.4 Test description

#### 8.2.3.3.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.3.2.1.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.3.2.1.4.1-1.

**Table 8.2.3.3.2.1.4.1-1: Test point selection for TM4 TDD FDD 2DL CA TDD PCell**

| CA Capability | Bandwidth Combination | | |
|---|---|---|---|
| | 20+20 | 20+10 | 20+15 |
| Inter-band (CA_A2) | Test 1 | Test 2 | Test 3 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group 46 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.2.3.3.2.1.3-1as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.3.2.1.4.3.

#### 8.2.3.3.2.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *PDSCH-ConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-1, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-2A , *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-2, *CQI-ReportConfig-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-4, *CQI-ReportAperiodic-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-6.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.3.3.2.1.3-1 and 8.2.3.3.2.1.3-2 or 8.2.3.3.2.1.3-3. The SS sends downlink MAC padding bits on the DL RMC.

5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.3.3.2.1.5-1 or 8.2.3.3.2.1.5-2 as appropriate.

7. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.3.3.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.2.3.3.2.1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.3.3.2.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000000011111111111111111000000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.3.3.2.1.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000000011111111111111111000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |

**Table 8.2.3.3.2.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.2.3.3.2.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.2.3.3.2.1.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.3.3.2.1.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.2.3.3.2.1.4.3-7: *PUSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.2.3.3.2.1.5 Test requirement

Tables 8.2.3.3.2.1.3-1 define the primary level settings.

For TDD FDD CA with TDD PCell and 2DL CCs, the requirements are specified in Table 8.2.3.3.2.1.5-3 based on single carrier requirement specified in Table 8.2.3.3.2.1.5-1 and Table 8.2.3.3.2.1.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.3.2.1.5-1 or 8.2.3.3.2.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.3.2.1.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.3 | [9.8] |
| 3 MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | [8.9] |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | [8.9] |
| 10MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | [9.5] |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | [9.5] |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.2 | [9.7] |

**Table 8.2.3.3.2.1.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.9 | [10.4] |
| 3 MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 | [9.2] |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.9 | [9.4] |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.4 | [9.9] |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.5 | [10] |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.6 | [10.1] |

**Table 8.2.3.3.2.1.5-3: Test requirement for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Test requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.3.3.2.1.5-1 and Table 8.2.3.3.2.1.5-2 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.2.3.3.2.1.5-1 and Table 8.2.3.3.2.1.5-2 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.2.3.3.2.1.5-1 and Table 8.2.3.3.2.1.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.2.3.3.2.2 TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (3DL CA)

#### 8.2.3.3.2.2.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

#### 8.2.3.3.2.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support E-UTRA FDD and TDD and 3DL CA with TDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.3.3.2.2.3 Minimum conformance requirements

For TDD FDD CA with TDD PCell and 3DL CCs, the requirements are specified in Table 8.2.3.3.2.2.3-1 based on single carrier requirement specified in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3, with the addition of the parameters in Table 8.2.3.3.2.1.3-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.3.3.2.2.3-1: Minimum performance for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.3.2.

#### 8.2.3.3.2.2.4 Test description

##### 8.2.3.3.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.3.2.2.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.3.2.2.4.1-1

**Table 8.2.3.3.2.2.4.1-1: Test point selection for TM4 TDD FDD 3DL CA TDD PCell**

| CA Capability | Bandwidth Combination | | |
|---|---|---|---|
| | 3x20 | 20+20+15 | 20+20+10 |
| Inter-band CA (two bands) (CA3_A2) | Test1 | Test2 | Test3 |
| Inter-band CA (three | Test1 | Test2 | Test3 |

| | | | |
|---|---|---|---|
| bands) (CA3_A3) | | | |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.61 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.2.3.3.2.1.3-1as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.3.2.2.4.3.

#### 8.2.3.3.2.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *PDSCH-ConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-1, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-2A , *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-2, *CQI-ReportConfig-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-4, *CQI-ReportAperiodic-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-6.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.3.3.2.1.3-1 and 8.2.3.3.2.1.3-2 or 8.2.3.3.2.1.3-3. The SS sends downlink MAC padding bits on the DL RMC.

5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.3.3.2.1.5-1 or 8.2.3.3.2.1.5-2 as appropriate.

7. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.3.3.2.2.4.3 Message contents

Same Message contents as in clause 8.2.3.3.2.1.4.3 with the following exceptions:

- Instead of Table 8.2.3.3.2.1.4.3-5 → use Table 8.2.3.3.2.2.4.3-1

**Table 8.2.3.3.2.2.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11100000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

### 8.2.3.3.2.2.5 Test requirement

Tables 8.2.3.3.2.1.3-1 define the primary level settings.

For TDD FDD CA with TDD PCell and 3DL CCs, the requirements are specified in Table 8.2.3.3.2.2.5-1 based on single carrier requirement specified in Table 8.2.3.3.2.1.5-1 and Table 8.2.3.3.2.1.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.3.2.1.5-1 or 8.2.3.3.2.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.3.2.2.5-1: Test requirement for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Test Requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.2.3.3.2.1.5-1 and Table 8.2.3.3.2.1.5-2 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.2.3.3.2.1.5-1 and Table 8.2.3.3.2.1.5-2 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.2.3.3.2.1.5-1 and Table 8.2.3.3.2.1.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.2.3.3.2.3 TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (4DL CA)

### 8.2.3.3.2.3.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

### 8.2.3.3.2.3.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8 and above that support E-UTRA FDD and TDD and 4DL CA with TDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.3.3.2.3.3 Minimum conformance requirements

For TDD FDD CA with TDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.3.2.3.3-1 based on single carrier requirement specified in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3, with the addition of the parameters in Table 8.2.3.3.2.1.3-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.3.3.2.3.3-1: Minimum performance for multiple CA configurations with 4DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | ≥8 |
| 4 | 2×15+2x20 | 2×15 | 2x20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | ≥8 |
| 5 | 3x20+15 | 2×20+15 | 20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | ≥8 |
| 6 | 2×15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.3.2.

#### 8.2.3.3.2.3.4 Test description

##### 8.2.3.3.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.3.2.3.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.3.2.3.4.1-1

**Table 8.2.3.3.2.3.4.1-1: Test point selection for TM4 TDD FDD 4DL CA TDD PCell**

| CA Applicability | | Bandwidth combination | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | FDD cell | 20 | 2x20 | 20+15 | 2x15 | 2x20+15 | 2x15+20 | 2x20+10 |
| | TDD cell | 3x20 | 2x20 | 2x20 | 2x20 | 20 | 20 | 20 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Inter-band CA (two bands) (CA4_A2) | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (three bands) (CA4_A3) | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (four bands) (CA4_A4) | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | | | | | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.61 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.2.3.3.2.1.3-1as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.3.2.3.4.3.

### 8.2.3.3.2.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *PDSCH-ConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-1, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-2A , *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-2, *CQI-ReportConfig-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-4, *CQI-ReportAperiodic-r10-DEFAULT* is defined in Table 8.2.3.3.2.3.4.3-1, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-6.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.3.3.2.1.3-1, 8.2.3.3.2.1.3-2 and 8.2.3.3.2.3.3-1. The SS sends downlink MAC padding bits on the DL RMC.

5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.3.3.2.3.5-1 or 8.2.3.3.2.3.5-2 as appropriate.

7. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

### 8.2.3.3.2.3.4.3 Message contents

Same Message contents as in clause 8.2.3.3.2.1.4.3 with the following exceptions:

- Instead of Table 8.2.3.3.2.1.4.3-5 → use Table 8.2.3.3.2.3.4.3-1

**Table 8.2.3.3.2.3.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11110000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.3.2.3.5 Test requirement

For TDD FDD CA with TDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.3.2.3.5-3 based on single carrier requirement specified in Table 8.2.3.3.2.3.5-1 and Table 8.2.3.3.2.3.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.3.2.3.5-1 or 8.2.3.3.2.3.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.3.2.3.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.3 | 9.8 |
| 3 MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 10MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.2 | 9.7 |

**Table 8.2.3.3.2.3.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.9 | 10.4 |
| 3 MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 | 9.2 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.9 | 9.4 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.4 | 9.9 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.5 | 10 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.6 | 10.1 |

**Table 8.2.3.3.2.3.5-3: Test requirement for multiple CA configurations with 4DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.2.3.3.2.3.5-1 and Table 8.2.3.3.2.3.5-2 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.2.3.3.2.3.5-1 and Table 8.2.3.3.2.3.5-2 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.2.3.3.2.3.5-1 and Table 8.2.3.3.2.3.5-2 per CC | ≥8 |
| 4 | 2×15+2x20 | 2×15 | 2x20 | As defined in Table 8.2.3.3.2.3.5-1 and Table 8.2.3.3.2.3.5-2 per CC | ≥8 |
| 5 | 3x20+15 | 2×20+15 | 20 | As defined in Table 8.2.3.3.2.3.5-1 and Table 8.2.3.3.2.3.5-2 per CC | ≥8 |
| 6 | 2×15+2x20 | 2x15+20 | 20 | As defined in Table 8.2.3.3.2.3.5-1 and Table 8.2.3.3.2.3.5-2 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.2.3.3.2.3.5-1 and Table 8.2.3.3.2.3.5-2 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.2.3.3.2.4 TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (5DL CA)

#### 8.2.3.3.2.4.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

#### 8.2.3.3.2.4.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8 or 11 and above that support E-UTRA FDD and TDD and 5DL CA with TDD as PCELL.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.2.3.3.2.4.3 Minimum conformance requirements

For TDD FDD CA with TDD PCell and 5DL CCs, the requirements are specified in Table 8.2.3.3.2.4.3-1 based on single carrier requirement specified in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3, with the addition of the parameters in Table 8.2.3.3.2.1.3-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.3.3.2.4.3-1: Minimum performance for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.2.3.3.2.1.3-2 and Table 8.2.3.3.2.1.3-3 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.2.3.3.2.

#### 8.2.3.3.2.4.4 Test description

##### 8.2.3.3.2.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.2.3.3.2.4.4.1-1.

CA Capability to be tested: Select one according to Table 8.2.3.3.2.4.4.1-1

**Table 8.2.3.3.2.4.4.1-1: Test point selection for TM4 TDD FDD 5DL CA TDD PCell**

| CA Applicability | | Bandwidth combination | |
|---|---|---|---|
| | FDD Cell | 15+2×20 | 2×15+20 |
| | TDD Cell | 2×20 | 2×20 |
| Inter-band CA (two bands) (CA5_A2) | | Test1 | Test2 |
| Inter-band CA (three bands) (CA5_A3) | | Test1 | Test2 |
| Inter-band_CA (four bands) (CA5_A4) | | Test1 | Test2 |
| Inter-band_CA (five bands) (CA5_A5) | | Test1 | Test2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | |

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.61 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.87 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.2.3.3.2.1.3-1as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.3.3.2.4.4.3.

#### 8.2.3.3.2.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *PDSCH-ConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-1, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-2A , *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-2, *CQI-ReportConfig-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-4, *CQI-ReportAperiodic-r10-DEFAULT* is defined in Table 8.2.3.3.2.4.4.3-1, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 8.2.3.3.2.1.4.3-6.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.3.3.2.1.3-1, 8.2.3.3.2.1.3-2 and 8.2.3.3.2.4.3-1. The SS sends downlink MAC padding bits on the DL RMC.

5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.3.3.2.4.5-1 or 8.2.3.3.2.4.5-2 as appropriate.

7. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.2.3.3.2.4.4.3 Message contents

Same Message contents as in clause 8.2.3.3.2.1.4.3 with the following exceptions:

- Instead of Table 8.2.3.3.2.1.4.3-5 → use Table 8.2.3.3.2.4.4.3-1

**Table 8.2.3.3.2.4.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11111000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

#### 8.2.3.3.2.4.5 Test requirement

For TDD FDD CA with TDD PCell and 5DL CCs, the requirements are specified in Table 8.2.3.3.2.4.5-3 based on single carrier requirement specified in Table 8.2.3.3.2.4.5-1 and Table 8.2.3.3.2.4.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.3.3.2.4.5-1 or 8.2.3.3.2.4.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.2.3.3.2.4.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.3 | 9.8 |
| 3 MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 | 8.9 |
| 10MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.0 | 9.5 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.2 | 9.7 |

**Table 8.2.3.3.2.4.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | |
|---|---|---|---|---|---|---|---|
| | | | | | Fraction of Maximum Throughput (%) | SNR (dB) for CC on 2Rx supported RF band | SNR (dB) for CC on 4Rx supported RF band |
| 1.4 MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.9 | 10.4 |
| 3 MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 | 9.2 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.9 | 9.4 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.4 | 9.9 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.5 | 10 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.6 | 10.1 |

**Table 8.2.3.3.2.4.5-3: Test requirement for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.2.3.3.2.4.5-1 and Table 8.2.3.3.2.4.5-2 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.2.3.3.2.4.5-1 and Table 8.2.3.3.2.4.5-2 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

# 8.2.4 LAA

## 8.2.4.1 LAA PDSCH CA Closed-Loop Spatial Multiplexing Performance

### 8.2.4.1.1 LAA PDSCH CA Closed Loop Spatial Multiplexing Performance with 4 Tx Antenna port and with FDD as Pcell (FDD single carrier)

#### 8.2.4.1.1.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with frequency selective precoding for CA with LAA SCell(s).

#### 8.2.4.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD Release 13 and forward UEs of category ≥5 that support LAA with E-UTRA FDD as PCell.

#### 8.2.4.1.1.3 Minimum conformance requirements

The parameters specified in Table 8.2.4.1.1.3-1 are valid for FDD CC and LAA SCell(s) unless otherwise stated. And the additional parameters specified in Table 8.2.4.1.1.3-2 are valid for LAA SCell(s).

**Table 8.2.4.1.1.3-1: Common Test Parameters**

| Parameter | Unit | Value |
|---|---|---|
| Inter-TTI Distance | | 1 |
| Number of HARQ processes per component carrier | Processes | 8 |
| Maximum number of HARQ transmission (Note 1) | | 4 |
| Redundancy version coding sequence | | {0,1,2,3} for QPSK and 16QAM<br>{0,0,1,2} for 64QAM and 256QAM |
| Cyclic Prefix | | Normal |
| Cell_ID | | 0 |
| Cross carrier scheduling | | Not configured |
| Note 1: For retransmission in partial subframes, the TB size should be kept the same as the initial transmission regardless of the initial transmission is performed in full subframes or partial subframes. | | |

**Table 8.2.4.1.1.3-2: Additional Test Parameters for LAA SCell(s)**

| Parameter | Unit | Value |
|---|---|---|
| DMTC Periodicity | ms | 80 |
| dmtc-PeriodOffset-r12 ms80-r12 | | 0 |
| Discovery signal occasion duration | subframe | 1 |
| Power allocation of discovery signal | | Same as power allocation of CRS within a transmission burst in the test |

For CA with LAA SCell(s), the requirements are specified in Table 8.2.4.1.1.3-4, with the addition of the parameters in Table 8.2.4.1.1.3-1, Table 8.2.4.1.1.3-2, Table 8.2.4.1.1.3-3 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.4.1.1.3-3: Test Parameters for Dual-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000<br>00111111111111111100000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | TM4 |
| DL Burst transmission pattern for LAA SCell | | | As specified in B.8 |
| The number of subframes set ($S_1$) in a burst | | | {1,3,5,8} |
| Occupied OFDM symbols set in the last subframe | | | {6,9,12,14} |
| Random variable *p* defined in B.8 | | | 0.5 |
| timing error relative of LAA SCell to PCell | | μs | 0 |
| Frequency offset of th *i*-th LAA SCell relative to PCell | | Hz | 200 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers.
Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 3.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.2.4.1.1.3-4: Single carrier performance for PCell for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 3MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 9.5 |
| 10MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.1 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.3 |

**Table 8.2.4.1.1.3-5: Single carrier performance for LAA SCell(s) for multiple CA configurations**

| Band-width | Sub-test (Note 2) | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of nominal maximum throughput (%) (Note 1) | SNR (dB) |
| 20MHz | 1 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 18.7 |
| | 2 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 18.6 |
| | 3 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 18.9 |
| | 4 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 19 |

Note 1: Fraction of nominal maximum throughput is calculated based on random transmission occasions of PDSCH.

Note 2: An UE is required to fulfil only one test of Sub-test 1-4 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE not supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 1; For an UE not supporting endingDwPTS but supporting secondSlotStartingPosition, it is required to fulfil Sub-test 2; For an UE supporting endingDwPTS but not supporting secondSlotStartingPosition, it is required to fulfil Sub-test 3; and For an UE supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 4.

**Table 8.2.4.1.1.3-6: Minimum performance (FRC) based on single carrier performance for CA with LAA SCell(s)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement (Note 2) | UE Category |
|---|---|---|---|---|---|
| | Total | PCell | LAA SCell | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.4.1.1.3-4 and Table 8.2.4.1.1.3-5 | ≥5 |

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3C.

Note 2: Apply a per-CC requirement defined in 8.2.4.1.1.3-4 for PCell and apply a per-CC requirement defined in 8.2.4.1.1.3-5 for LAA SCell.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.4.1.1

### 8.2.4.1.1.4 Test description

#### 8.2.4.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: 2x20MHz, according to Table 8.2.4.1.1.3-6.

CA Capability to be tested: According to Table 8.2.4.1.1.3-6

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.46 as appropriate.
2. The parameter settings for Pcell are set up according to Table 8.2.4.1.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.4.1.1.4.3.

#### 8.2.4.1.1.4.2 Test procedure

1. Configure the LAA SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels. The parameter settings for the LAA SCC are specified in 8.2.4.1.1.3-1 and 8.2.4.1.1.3-2. Additionally, the SS shall configure the PCC and the SCC according to 8.2.4.1.1.3-3.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.4.1.1.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.2.4.1.1.3-4 for PCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.4.1.1.3-2 and 8.2.4.1.1.3-5 for LAA SCC. The SS sends downlink MAC padding bits on the DL RMC. SS transmits PDCCH DCI format 1C for CC_RNTI in the last two subframes of every burst to indicate number of OFDM symbols in the DwPTS of ending partial subframe if required depending on UE capability according to TS 36.213 clause 13A as described in Table 8.2.4.1.1.3-5.

6. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and IM_MCS=29 and N_PRB allocated to be less or equal to 4.

7. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.4.1.1.5-1 and 8.2.4.1.1.5-2 for the PCell and the LAA SCell, respectively.

8. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on both PCC and LAA SCC. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval, for each component carrier and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.4.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.4.1.1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.4.1.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000000011111111111111110000000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.2.4.1.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.2.4.1.1.4.3-4: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | Configure report for PCell and SCell (index = {0,1}) | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.4.1.1.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000000011111111111111110000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| Laa-ScellConfiguration-r13 SEQUENCE { | | | |
| subframeStartPosition | ‘s0’ or ‘s07’ | Depending on UE capability, as described in Table 8.2.4.1.1.3-3 | |
| Laa-SCellSubframeConfig | ‘00000000’ | | |
| } | | | |
| } | | | |

**Table 8.2.4.1.1.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.2.4.1.1.4.3-7: PUCCH-ConfigDedicated-v1020-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-9A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-v1020 ::= SEQUENCE { | | | |
| pucch-Format-r10 CHOICE { | | | |
| format3-r10 SEQUENCE { | | | |
| n3PUCCH-AN-List-r10 SEQUENCE { | 4 | | |
| | 101 | | |
| | 102 | | |
| | 103 | | |
| | 104 | | |
| } | | | |
| twoAntennaPortActivatedPUCCH-Format3-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.4.1.1.4.3-8: RadioResourceConfigCommon-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigCommon-DEFAULT ::= SEQUENCE { | | | |
| tdd-Config | Not present | | |
| } | | | |

**Table 8.2.4.1.1.4.3-9: MeasDS-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasDS-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| dmtc-PeriodOffset-r12 CHOICE { | | | |
| ms80-r12 | 0 | | |
| } | | | |
| ds-OccasionDuration-r12 CHOICE { | | | |
| durationTDD-r12 | 2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.4.1.1.4.3-10: PUSCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.2.4.1.1.5 Test requirement

Table 8.2.4.1.1.5-3 defines the test requirements based on the single carrier performance requirements for the FDD PCell defined in Table 8.2.4.1.1.5-1 and on the single carrier performance requirements for the LAA SCell defined in Table 8.2.4.1.1.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for the FDD PCell and A.8 for the LAA SCell, for the selected throughput test, shall meet or exceed the specified value in Tables 8.2.4.1.1.5-1 and 8.2.4.1.1.5-2, respectively, for the specified SNR including test tolerances and uncertainties.

**Table 8.2.4.1.1.5-1: Single carrier performance for PCell for multiple CA configurations**

| **Band-width** | **Reference channel** | **OCNG pattern** | **Propa-gation condi-tion** | **Correlation matrix and antenna config.** | **Reference value** | |
|---|---|---|---|---|---|---|
| | | | | | **Fraction of maximum throughput (%)** | **SNR (dB)** |
| 1.4MHz | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.3 |
| 3MHz | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 5MHz | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 10.4 |
| 10MHz | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11 |
| 15MHz | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11 |
| 20MHz | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 70 | 11.2 |

**Table 8.2.4.1.1.5-2: Single carrier performance for LAA SCell(s) for multiple CA configurations**

| Band-width | Sub-test (Note 2) | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of nominal maximum throughput (%) (Note 1) | SNR (dB) |
| 20MHz | 1 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 19.6 |
| | 2 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 19.5 |
| | 3 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 19.8 |
| | 4 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 19.9 |

Note 1: Fraction of nominal maximum throughput is calculated based on random transmission occasions of PDSCH.

Note 2: An UE is required to fulfil only one test of Sub-test 1-4 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE not supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 1; For an UE not supporting endingDwPTS but supporting secondSlotStartingPosition, it is required to fulfil Sub-test 2; For an UE supporting endingDwPTS but not supporting secondSlotStartingPosition, it is required to fulfil Sub-test 3; and For an UE supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 4.

**Table 8.2.4.1.1.5-3: Minimum performance (FRC) based on single carrier performance for CA with LAA SCell(s)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement (Note 2) | UE Category |
|---|---|---|---|---|---|
| | Total | PCell | LAA SCell | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.4.1.1.5-1 and Table 8.2.4.1.1.5-2 | ≥5 |

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3C.

Note 2: Apply a per-CC requirement defined in 8.2.4.1.1.5-1 for PCell and apply a per-CC requirement defined in 8.2.4.1.1.5-2 for LAA SCell.

## 8.2.4.1.2 LAA PDSCH CA Closed Loop Spatial Multiplexing Performance with 4 Tx Antenna port and with TDD as Pcell (TDD single carrier)

### 8.2.4.1.2.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with frequency selective precoding for CA with LAA SCell(s).

### 8.2.4.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD Release 13 and forward UEs of category ≥5 that support LAA with E-UTRA TDD as PCell.

### 8.2.4.1.2.3 Minimum conformance requirements

The parameters specified in Table 8.2.4.1.2.3-1 are valid for TDD CC and LAA SCell(s) unless otherwise stated. And the additional parameters specified in Table 8.2.4.1.2.3-2 are valid for LAA SCell(s).

**Table 8.2.4.1.2.3-1: Common Test Parameters (TDD)**

| Parameter | Unit | Value |
|---|---|---|
| Uplink downlink configuration (Note 1) | | 1 |
| Special subframe configuration (Note 2) | | 4 |
| Cyclic prefix | | Normal |
| Cell ID | | 0 |
| Inter-TTI Distance | | 1 |
| Number of HARQ processes per component carrier | Processes | 7 |
| Maximum number of HARQ transmission (Note 3) | | 4 |
| Redundancy version coding sequence | | {0,1,2,3} for QPSK and 16QAM<br>{0,0,1,2} for 64QAM and 256QAM |
| Cross carrier scheduling | | Not configured |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [4].<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [4].<br>Note 3: For retransmission in partial subframes, the TB size should be kept the same as the initial transmission regardless of the initial transmission is performed in full subframes or partial subframes. | | |

**Table 8.2.4.1.2.3-2: Additional Test Parameters for LAA SCell(s)**

| Parameter | Unit | Value |
|---|---|---|
| DMTC Periodicity | ms | 80 |
| dmtc-PeriodOffset-r12 ms80-r12 | | 0 |
| Discovery signal occasion duration | subframe | 1 |
| Power allocation of discovery signal | | Same as power allocation of CRS within a transmission burst in the test |

For CA with LAA SCell(s), the requirements are specified in Table 8.2.4.1.2.3-4, with the addition of the parameters in Table 8.2.4.1.2.3-1, Table 8.2.4.1.2.3-2, Table 8.2.4.1.2.3-3 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.2.4.1.2.3-3: Test Parameters for Dual-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000011111111111111111000000000000000 |
| CSI request field (Note 4) | | | '10' |
| PDSCH transmission mode | | | TM4 |
| DL Burst transmission pattern for LAA SCell | | | As specified in B.8 |
| The number of subframes set ($S_1$) in a burst | | | {1,3,5,8} |
| Occupied OFDM symbols set in the last subframe | | | {6,9,12,14} |
| Random variable *p* defined in B.8 | | | 0.5 |
| timing error relative of LAA SCell to PCell | | μs | 0 |
| Frequency offset of th *i*-th LAA SCell relative to PCell | | Hz | 200 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.
Note 4: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers.
Note 5: ACK/NACK bits are transmitted using PUSCH with PUCCH format 3.
Note 6: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.2.4.1.2.3-4: Single carrier performance for PCell for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.0 |
| 3MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 9.8 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.0 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.5 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.6 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 |

**Table 8.2.4.1.2.3-5: Single carrier performance for LAA SCell for multiple CA configurations**

| Bandwidth | Sub-test (Note 2) | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum throughput (%) (Note 1) | SNR (dB) |
| 20MHz | 1 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 18.7 |
| | 2 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 18.6 |
| | 3 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 18.9 |
| | 4 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 19 |

Note 1: Fraction of nominal maximum throughput is calculated based on random transmission occasions of PDSCH.

Note 2: An UE is required to fulfil only one test of Sub-test 1-4 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE not supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 1; For an UE not supporting endingDwPTS but supporting secondSlotStartingPosition, it is required to fulfil Sub-test 2; For an UE supporting endingDwPTS but not supporting secondSlotStartingPosition, it is required to fulfil Sub-test 3; and For an UE supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 4.

**Table 8.2.4.1.2.3-6: Minimum performance (FRC) based on single carrier performance for CA with LAA SCell(s)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement (Note 2) | UE Category |
|---|---|---|---|---|---|
| | Total | PCell | LAA SCell | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.4.1.2.3-4 and Table 8.2.4.1.2.3-5 | ≥5 |

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3C.

Note 2: Apply a per-CC requirement defined in 8.2.4.1.2.3-4 for PCell and apply a per-CC requirement defined in 8.2.4.1.2.3-5 for LAA SCell.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.4.1.2

### 8.2.4.1.2.4 Test description

#### 8.2.4.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: 2x20MHz, according to Table 8.2.4.1.2.3-6.

CA Capability to be tested: According to Table 8.2.4.1.2.3-6

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.46 as appropriate.
2. The parameter settings for Pcell are set up according to Table 8.2.4.1.2.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.4.1.2.4.3.

#### 8.2.4.1.2.4.2 Test procedure

1. Configure the LAA SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels. The parameter settings for the LAA SCC are specified in 8.2.4.1.2.3-1 and 8.2.4.1.2.3-2. Additionally, the SS shall configure the PCC and the SCC according to 8.2.4.1.2.3-3.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.2.4.1.2.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.2.4.1.2.3-4 for PCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.2.4.1.2.3-2 and 8.2.4.1.2.3-5 for LAA SCC. The SS sends downlink MAC padding bits on the DL RMC. SS transmits PDCCH DCI format 1C for CC_RNTI in the last two subframes of every burst to indicate number of OFDM symbols in the DwPTS of ending partial subframe if required depending on UE capability according to TS 36.213 clause 13A as described in Table 8.2.4.1.2.3-5.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.2.4.1.2.5-1 and 8.2.4.1.2.5-2 for the PCell and the LAA SCell, respectively.

7. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on both PCC and LAA SCC. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval, for each component carrier and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.2.4.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.2.4.1.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.2.4.1.2.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000000011111111111111111000000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.2.4.1.2.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.2.4.1.2.4.3-4: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | Configure report for PCell and SCell (index = {0,1}) | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.4.1.2.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000000011111111111111110000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| Laa-ScellConfiguration-r13 SEQUENCE { | | | |
| subframeStartPosition | ‘s0’ or ‘s07’ | Depending on UE capability, as described in Table 8.2.4.1.1.3-3 | |
| Laa-SCellSubframeConfig | ‘00000000’ | | |
| } | | | |
| } | | | |

**Table 8.2.4.1.2.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.2.4.1.2.4.3-7: PUCCH-ConfigDedicated-v1020-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-9A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-v1020 ::= SEQUENCE { | | | |
| pucch-Format-r10 CHOICE { | | | |
| format3-r10 SEQUENCE { | | | |
| n3PUCCH-AN-List-r10 SEQUENCE { | 4 | | |
| | 101 | | |
| | 102 | | |
| | 103 | | |
| | 104 | | |
| } | | | |
| twoAntennaPortActivatedPUCCH-Format3-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.4.1.2.4.3-8: TDD-Configuration-DEFAULT**

| Derivation Path: 36.508 clause 4.6.4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Configuration-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa1 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

**Table 8.2.4.1.2.4.3-9: MeasDS-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasDS-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| dmtc-PeriodOffset-r12 CHOICE { | | | |
| ms80-r12 | 0 | | |
| } | | | |
| ds-OccasionDuration-r12 CHOICE { | | | |
| durationTDD-r12 | 2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.2.4.1.2.4.3-10: PUSCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

**Table 8.2.4.1.2.4.3-10: *Void***

### 8.2.4.1.2.5 Test requirement

Table 8.2.4.1.2.5-3 defines the test requirements based on the single carrier performance requirements for the TDD PCell defined in Table 8.2.4.1.2.5-1 and on the single carrier performance requirements for the LAA SCell defined in Table 8.2.4.1.2.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for the TDD PCell and A.8 for the LAA SCell, for the selected throughput test, shall meet or exceed the specified value in Tables 8.2.4.1.2.5-1 and 8.2.4.1.2.5-2, respectively, for the specified SNR including test tolerances and uncertainties.

**Table 8.2.4.1.2.5-1: Single carrier performance for PCell for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.9 |
| 3MHz | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.7 |
| 5MHz | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 10.9 |
| 10MHz | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.4 |
| 15MHz | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.5 |
| 20MHz | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 70 | 11.6 |

**Table 8.2.4.1.2.5-2: Single carrier performance for LAA SCell for multiple CA configurations**

| Bandwidth | Sub-test (Note 2) | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum throughput (%) (Note 1) | SNR (dB) |
| 20MHz | 1 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 19.6 |
| | 2 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 19.5 |
| | 3 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 19.8 |
| | 4 | R.1 FS3 | OP.1 FS3 | EVA5 | 4x2 Low | 70 | 19.9 |

Note 1: Fraction of nominal maximum throughput is calculated based on random transmission occasions of PDSCH.

Note 2: An UE is required to fulfil only one test of Sub-test 1-4 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE not supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 1; For an UE not supporting endingDwPTS but supporting secondSlotStartingPosition, it is required to fulfil Sub-test 2; For an UE supporting endingDwPTS but not supporting secondSlotStartingPosition, it is required to fulfil Sub-test 3; and For an UE supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 4.

**Table 8.2.4.1.2.5-3: Minimum performance (FRC) based on single carrier performance for CA with LAA SCell(s)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement (Note 2) | UE Category |
|---|---|---|---|---|---|
| | Total | PCell | LAA SCell | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.2.4.1.2.5-1 and Table 8.2.4.1.2.5-2 | ≥5 |

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3C.

Note 2: Apply a per-CC requirement defined in 8.2.4.1.2.5-1 for PCell and apply a per-CC requirement defined in 8.2.4.1.2.5-2 for LAA SCell.

# 8.3 Demodulation of PDSCH (User-Specific Reference Symbols)

## 8.3.1 FDD

The parameters specified in Table 8.3.1-1 are valid for FDD unless otherwise stated.

**Table 8.3.1-1: Common Test Parameters for User-specific Reference Symbols**

| Parameter | Unit | Value |
|---|---|---|
| Cyclic prefix | | Normal |
| Cell ID | | 0 |
| Inter-TTI Distance | | 1 |
| Number of HARQ processes | Processes | 8 |
| Maximum number of HARQ transmission | | 4 |
| Redundancy version coding sequence | | {0,1,2,3} for QPSK and 16QAM<br>{0,0,1,2} for 64QAM and 256QAM |
| Number of OFDM symbols for PDCCH | OFDM symbols | 2 |
| Precoder update granularity | | Frequency domain: 1 PRG for Transmission mode 9 and 10<br>Time domain: 1 ms |
| Note 1: Void<br>Note 2: Void | | |

## 8.3.1.1 FDD PDSCH Single-layer Spatial Multiplexing Performance (UE-Specific Reference Symbols)

### 8.3.1.1.1_D FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 without a simultaneous transmission for eDL-MIMO

#### 8.3.1.1.1_D.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 without a simultaneous transmission on the other antenna port and multiple CSI reference symbols configurations with non-zero and zero transmission power.

#### 8.3.1.1.1_D.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support eDL-MIMO. Applicability requires support for FGI bit 103.

#### 8.3.1.1.1_D.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.3, with the addition of the relevant parameters in Tables 8.3.1-1, 8.3.1.1.1_D.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.1.1.1_D.3-2 for the specified SNR.

**Table 8.3.1.1.1_D.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple CSI-RS configurations**

| parameter | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 (Note 1) | 0 (Note 1) |
| | $\sigma$ | dB | -3 | -3 | -3 |

| | | | | |
|---|---|---|---|---|
| Beamforming model | | Annex B.4.1 | Annex B.4.1 | Annex B.4.1 |
| Cell-specific reference signals | | Antenna ports 0,1 | | |
| CSI reference signals | | Antenna ports 15,…,18 | Antenna ports 15,…,18 | Antenna ports 15, …, 18 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | Subframes | 5 / 2 | 5 / 2 | 5 / 2 |
| CSI reference signal configuration | | 0 | 3 | 0 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | Subframes / bitmap | 3 / 0001000000000000 | 3 / 0001000000000000 | 3 / 0001000000000000 |
| $N_{oc}$ at antenna port | dBm/15kHz | -98 | -98 | -98 |
| Symbols for unused PRBs | | OCNG (Note 4) | OCNG (Note 4) | OCNG (Note 4) |
| Number of allocated resource blocks (Note 2) | PRB | 50 | 50 | 50 |
| Simultaneous transmission | | No | Yes (Note 3, 5) | No |
| PDSCH transmission mode | | 9 | 9 | 9 |

Note 1: $P_B = 1$.
Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.
Note 3: Modulation symbols of an interference signal is mapped onto the antenna port (7 or 8) not used for the input signal under test.
Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.
Note 5: The two UEs' scrambling identities $n_{\mathrm{SCID}}$ are set to 0 for CDM-multiplexed DM RS with interfering simultaneous transmission test cases.

**Table 8.3.1.1.1_D.3-2: Minimum performance for CDM-multiplexed DM RS without simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category | UE DL Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | | |
| 1 | 10 MHz QPSK 1/3 | R.43 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | -1 | ≥1 | ≥6 |
| 3 | 10MHz 256QAM | R. 66 FDD | OP.1 FDD | EPA5 | 2x2 Low | 70 | 24.3 | 11-12 | ≥11 |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.1.1.

### 8.3.1.1.1_D.4 Test description

#### 8.3.1.1.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Tables 8.3.1-1 and 8.3.1.1.1_D.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.1.1_D.4.3.

### 8.3.1.1.1_D.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.1.1.1_D.3-1, 8.3.1.1.1_D.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.1.1.1_D.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/PDSCH for the test UE are sent on antenna port 7 (or 8) using two Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity specified in Table 8.3.1-1. CSI-RS are sent on antenna ports 15-18 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

### 8.3.1.1.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.1.1.1_D.4.3-1: *Void***

**Table 8.3.1.1.1_D.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.3.1.1.1_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| } | | | |
| release | NULL | | |
| } | | | |

**Table 8.3.1.1.1_D.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 3 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 3 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

8.3.1.1.1_D.5 Test requirement

Table 8.3.1.1.1_D.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3.2 for the throughput test shall meet or exceed the specified value in Table 8.3.1.1.1_D.5-1 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.1.1.1_D.5-1: Test requirement for CDM-multiplexed DM RS without simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz QPSK 1/3 | R.43 FDD | OP.1 FDD | EVA5 | 2x2 Low | 70 | -0.1 | 1-8 |

## 8.3.1.1.1_H FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 without a simultaneous transmission for eDL-MIMO for 256QAM in DL

### 8.3.1.1.1_H.1 Test purpose

Same test purpose as defined in clause 8.3.1.1.1_D.1.

### 8.3.1.1.1_H.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 that support 256QAM in DL. Applicability requires support for FGI bit 103.

### 8.3.1.1.1_H.3 Minimum conformance requirements

Same minimum conformance requirements as defined in clause 8.3.1.1.1_D.3.

### 8.3.1.1.1_H.4 Test description

Same test description as defined in clause 8.3.1.1.1_D.4 with the following exceptions:

- Instead of Table 8.3.1.1.1_D.5-1 → use Table 8.3.1.1.1_H.5-1.

### 8.3.1.1.1_H.5 Test requirement

Same test requirement as defined in clause 8.3.1.1.1_D.5 with the following exceptions:

- Instead of Table 8.3.1.1.1_D.5-1 → use Table 8.3.1.1.1_H.5-1.

**Table 8.3.1.1.1_H.5-1: Test requirement for CDM-multiplexed DM RS without simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category | UE DL Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | | |
| 3 | 10MHz 256QAM | R. 66 FDD | OP.1 FDD | EPA5 | 2x2 Low | 70 | 25.2 | 11-12 | ≥11 |

## 8.3.1.1.2_D FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with a simultaneous transmission for eDL-MIMO

### 8.3.1.1.2_D.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 with a

simultaneous transmission on the other antenna port and multiple CSI reference symbols configurations with non-zero and zero transmission power.

### 8.3.1.1.2_D.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward. Applicability requires support for FGI bit 103.

### 8.3.1.1.2_D.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.3, with the addition of the relevant parameters in Tables 8.3.1-1, 8.3.1.1.2_D.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.1.1.2_D.3-2 for the specified SNR.

**Table 8.3.1.1.2_D.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple CSI-RS configurations**

| parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 (Note 1) |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | |
| CSI reference signals | | | Antenna ports 15,…,18 | Antenna ports 15,…,18 |
| Beamforming model | | | Annex B.4.1 | Annex B.4.1 |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | Subframes | 5 / 2 | 5 / 2 |
| CSI reference signal configuration | | | 0 | 3 |
| Zero-power CSI-RS configuration $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 3 / 0001000000000000 | 3 / 0001000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Symbols for unused PRBs | | | OCNG (Note 4) | OCNG (Note 4) |
| Number of allocated resource blocks (Note 2) | | PRB | 50 | 50 |
| Simultaneous transmission | | | No | Yes (Note 3, 5) |
| PDSCH transmission mode | | | 9 | 9 |

Note 1: $P_B = 1$.

Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.

Note 3: Modulation symbols of an interference signal is mapped onto the antenna port (7 or 8) not used for the input signal under test.

Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 5: The two UEs' scrambling identities $n_{\text{SCID}}$ are set to 0 for CDM-multiplexed DM RS with interfering simultaneous transmission test cases.

**Table 8.3.1.1.2_D.3-2: Minimum performance for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz 64QAM 1/2 | R.50 FDD | OP.1 FDD | EPA5 | 2x2 Low | 70 | 21.9 | 2-8 |
| Note 1: The reference channel applies to both the input signal under test and the interfering signal. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.1.1.

### 8.3.1.1.2_D.4 Test description

#### 8.3.1.1.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Tables 8.3.1-1 and 8.3.1.1.2_D.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.1.2_D.4.3.

#### 8.3.1.1.2_D.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.1.1.2_D.3-1, 8.3.1.1.2_D.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.1.1.2_D.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/PDSCH for the test UE are sent on antenna port 7 (or 8) and another simultaneous transmission of DRS/PDSCH not for the test UE are sent on antenna port 8 (or 7). The DRS/PDSCH transmissions use two Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity specified in Table 8.3.1-1. CSI-RS are sent on antenna ports 15-18 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.3.1.1.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.1.1.2_D.4.3-1: Void**

**Table 8.3.1.1.2_D.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.3.1.1.2_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.1.1.2_D.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 3 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 0001000000000000 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 3 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

8.3.1.1.2_D.5 Test requirement

Table 8.3.1.1.2_D.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3.2 for the throughput test shall meet or exceed the specified value in Table 8.3.1.1.2_D.5-1 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.1.1.2_D.5-1: Test requirement for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz 64QAM 1/2 | R.50 FDD | OP.1 FDD | EPA5 | 2x2 Low | 70 | 22.8 | 2-8 |
| Note 1: The reference channel applies to both the input signal under test and the interfering signal. | | | | | | | | |

### 8.3.1.1.3 FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model - Enhanced Performance Requirement Type A

#### 8.3.1.1.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4.

#### 8.3.1.1.3.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward that support enhanced receiver Type A. Applicability requires support for FGI bit 103.

#### 8.3.1.1.3.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.3, with the addition of the relevant parameters in Tables 8.3.1-1, 8.3.1.1.3.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.1.1.3.3-2 for the specified SNR.

**Table 8.3.1.1.3.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 2 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 126 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 9 | N/A |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |
| Precoder update granularity | | PRB | 50 | 6 |
| PMI delay (Note 5) | | Ms | 8 | N/A |
| Reporting interval | | Ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 0000000000000000 0000000000000000 0000000000000000 1111111111111111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note8) | N/A |
| cqi-pmi-ConfigurationIndex | | | 5 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}$´ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

| | |
|---|---|
| Note 4: | The precoder in clause B.4.3 follows UE recommended PMI. |
| Note 5: | If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). |
| Note 6: | These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. |
| Note 7: | All cells are time-synchronous. |
| Note 8: | To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3. |

**Table 8.3.1.1.3.3-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.48 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 4x2 Low | 70 | -1.1 | 1-8 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | |
| Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.1.1A.

### 8.3.1.1.3.4 Test description

#### 8.3.1.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.49.
2. The parameter settings for the cell are set up according to Tables 8.3.1-1 and 8.3.1.1.3.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.1.3.4.3.

#### 8.3.1.1.3.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.1.1.3.5-1, 8.3.1.1.3.5-2. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink

scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #4 and #9 (Table A.2.2.1.1-1).

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.1.1.3.5-2 as appropriate.
BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/PDSCH for the test UE are sent on antenna port 7 (or 8) using four Tx antennas with beam-forming model as specified in Annex B.4.3 and precoder update granularity specified in Table 8.3.1.1.3.5-1. CSI-RS are sent on antenna ports 15-18 using four Tx antennas with mapping according to beam-forming model as specified in Annex B.4.3.

3. Set the Cell2 –aggressor cell- as defined in Tables 8.3.1.1.3.5-1, 8.3.1.1.3.5-2 and according to Annex B.5.4.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.3.1.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.1.1.3.4.3-1: *Void***

**Table 8.3.1.1.3.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 000000000000000000<br>000000000000000000<br>000000000000111111<br>1111111111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.1.1.3.4.3-3: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.1.1.3.4.3-4: *CQI-ReportPeriodic-r10***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-2AC CQI-ReportPeriodic-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 5 | FDD | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex | 483 | FDD | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |

**Table 8.3.1.1.3.4.3-5: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT using condition CQI_PERIODIC | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 8.3.1.1.3.4.3-6: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

### 8.3.1.1.3.5 Test requirement

Table 8.3.1.1.3.5-1 defines the primary level settings.

**Table 8.3.1.1.3.5-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 2 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.45 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 126 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 9 | N/A |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |
| Precoder update granularity | | PRB | 50 | 6 |
| PMI delay (Note 5) | | Ms | 8 | N/A |
| Reporting interval | | Ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 0000000000000000 0000000000000000 0000000000000000 1111111111111111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note8) | N/A |
| cqi-pmi-ConfigurationIndex | | | 5 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}$´ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

| | |
|---|---|
| Note 4: | The precoder in clause B.4.3 follows UE recommended PMI. |
| Note 5: | If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). |
| Note 6: | These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. |
| Note 7: | All cells are time-synchronous. |
| Note 8: | To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3. |

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3.2 for the throughput test shall meet or exceed the specified value in Table 8.3.1.1.3.5-2 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.1.1.3.5-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.48 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 4x2 Low | 70 | -0.12 | 1-8 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | |
| Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | |

### 8.3.1.1.4 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model – Enhanced Performance Requirement Type B

#### 8.3.1.1.4.1 Test purpose

The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7, 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 9 interference model defined in clause B.6.4.

#### 8.3.1.1.4.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward that support enhanced performance requirement Type B. Applicability requires support for FGI bit 103.

#### 8.3.1.1.4.3 Minimum conformance requirements

The requirements are specified in Table 8.3.1.1.4.3-2, with the addition of the parameters in Table 8.3.1.1.4.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.3.1.1.4.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.3.1.1.4.3-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with TM9 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 | 0 |
| | σ | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols | | | 3 | 3 | 3 |
| CFI indicated in PCFICH | | | 3 | 3 | 3 |
| PDSCH transmission mode | | | 9 | 9 | 9 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI reference signals | | | Antenna ports 15, 16, 17, 18 | Antenna ports 15, 16 | Antenna ports 15, 16 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 10 / 1 | 10 / 1 | 10 / 1 |
| CSI reference signal configuration | | | 5 | 6 | 7 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ /*ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 6 / 1000000000000000 | 6 / 0100000000000000 | 6 / 0010000000000000 |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: CSI-RS configurations are according to TS 36.211 [8] subclause 6.10.5.2.
Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of [5].

**Table 8.3.1.1.4.3-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration | | | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.69 FDD | OP.1 FDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 4x2 Low | 2x2 Low | 2x2 Low | 85 | 18.5 | ≥1 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1.

The normative reference for this requirement is TS 36.101 [2] clause 8.3.1.1C.

#### 8.3.1.1.4.4 Test description

##### 8.3.1.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.3.1.1.4.3-2, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.88.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.3.1.1.4.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.1.4.4.3.

##### 8.3.1.1.4.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.1.1.4.5-1 and 8.3.1.1.4.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 and cell 3 according to table 8.3.1.1.4.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.3.1.1.4.5-2 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 or 8 using four Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity as specified in Table 8.3.1.1.4.5-1. CSI-RS are sent on antenna ports 15-18 using four Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.
5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

##### 8.3.1.1.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m) with the following exceptions.

**Table 8.3.1.1.4.4.3-1: PDSCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.3.1.1.4.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

**Table 8.3.1.1.4.4.3-3: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 5 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 6 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}} - 5$ when CSI-RS SubframeConfig is from 5-14; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 1000000000000000 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 6 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

### 8.3.1.1.4.5 Test requirement

Table 8.3.1.1.4.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.3.1.1.4.5-2 for the specified SNR including test tolerances.

**Table 8.3.1.1.4.5-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with TM9 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 | 0 |
| | σ | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 14.71 | 4.14 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols | | | 3 | 3 | 3 |
| CFI indicated in PCFICH | | | 3 | 3 | 3 |
| PDSCH transmission mode | | | 9 | 9 | 9 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI reference signals | | | Antenna ports 15, 16, 17, 18 | Antenna ports 15, 16 | Antenna ports 15, 16 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 10 / 1 | 10 / 1 | 10 / 1 |
| CSI reference signal configuration | | | 5 | 6 | 7 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ /*ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 6 / 1000000000000000 | 6 / 0100000000000000 | 6 / 0010000000000000 |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: CSI-RS configurations are according to TS 36.211 [8] subclause 6.10.5.2.
Note 4: NeighCellsInfo-r12 is described in subclause TS 36.331 6.3.2 of [5].

**Table 8.3.1.1.4.5-2: Test Requirement for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration | | | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.69 FDD | OP.1 FDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 4x2 Low | 2x2 Low | 2x2 Low | 85 | 20.35 | ≥1 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1.

### 8.3.1.1.5 FDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with CRS Interference Model - Enhanced Performance Requirement Type B

#### 8.3.1.1.5.1 Test purpose

The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by the CRS of the interfering cell, applying the CRS interference model defined in clause B.6.5

#### 8.3.1.1.5.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward UE of Category 2 or higher that support enhanced performance requirement Type B.

#### 8.3.1.1.5.3 Minimum conformance requirements

The requirements are specified in Table 8.3.1.1.5.3-2, with the addition of the parameters in Table 8.3.1.1.5.3-1 and the downlink physical channel setup according to Annex C.3.2. In 8.3.1.1.5.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.3.1.1.5.3-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with CRS interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (NOTE 1) | 0 | 0 |
| | σ | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols | | | 3 | 3 | 3 |
| CFI indicated in PCFICH | | | 3 | 3 | 3 |
| PDSCH transmission mode | | | 8 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.6.5 | As specified in clause B.6.5 |
| Precoding | | | Random wideband precoding per TTI | N/A | N/A |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (NOTE 3) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

NOTE 1: $P_B = 1$
NOTE 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
NOTE 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of [5].

**Table 8.3.1.1.5.3-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with CRS interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (NOTE 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (NOTE 2) | |
| 1 | R.71 FDD | OP.1 FDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 14.3 | ≥2 |
| NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | |
| NOTE 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| NOTE 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. | | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.1.1D.

### 8.3.1.1.5.4 Test description

#### 8.3.1.1.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.3.1.1.4.3-2, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.3.1.1.5.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.1.5.4.3.

#### 8.3.1.1.5.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2B for C_RNTI to transmit the DL RMC according to Tables 8.3.1.1.6.5-1 and 8.3.1.1.6.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 and cell 3 according to table 8.3.1.1.6.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.3.1.1.6.5-2 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 or 8 using two Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity as specified in Table 8.3.1.1.6.5-1.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.

5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

#### 8.3.1.1.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m) with the following exceptions.

**Table 8.3.1.1.5.4.3-1: PDSCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.3.1.1.5.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm8-v920 | | |
| codebookSubsetRestriction-r10 | Not present | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

#### 8.3.1.1.5.5 Test requirement

Table 8.3.1.1.5.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.3.1.1.5.5-2 for the specified SNR including test tolerances.

**Table 8.3.1.1.5.5-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with CRS interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (NOTE 1) | 0 | 0 |
| | σ | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.71 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols | | | 3 | 3 | 3 |
| CFI indicated in PCFICH | | | 3 | 3 | 3 |
| PDSCH transmission mode | | | 8 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.6.5 | As specified in clause B.6.5 |
| Precoding | | | Random wideband precoding per TTI | N/A | N/A |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (NOTE 3) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

NOTE 1: $P_B = 1$
NOTE 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
NOTE 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of [5].

**Table 8.3.1.1.5.5-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with CRS interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (NOTE 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (NOTE 2) | |
| 1 | R.71 FDD | OP.1 FDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 15.2 | ≥2 |

NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
NOTE 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1.
NOTE 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

### 8.3.1.1.6 FDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM3 interference model - Enhanced Performance Requirement Type B

#### 8.3.1.1.6.1 Test purpose

The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving

cell is interfered by PDSCH of two interfering cells applying transmission mode 3 interference model defined in clause B.6.2. In Table 8.3.1.1.6.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells.

### 8.3.1.1.6.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward that support enhanced performance requirement Type B.

### 8.3.1.1.6.3 Minimum conformance requirements

The requirements are specified in Table 8.3.1.1.6.3-2, with the addition of the parameters in Table 8.3.1.1.6.3-1 and the downlink physical channel setup according to Annex C.3.2. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.3.1.1.6.3-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with TM3 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | -3 | -3 |
| | $\rho_B$ | dB | 0 (Note 1) | -3 | -3 |
| | σ | dB | -3 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 3.28 | 0.74 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols | | | 3 | 3 | 3 |
| CFI indicated in PCFICH | | | 3 | Random from {1,2,3} | Random from {1,2,3} |
| PDSCH transmission mode | | | 8 | 3 | 3 |
| Interference model | | | N/A | As specified in clause B.6.2 | As specified in clause B.6.2 |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.2 | As specified in clause B.6.2 |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: CSI-RS configurations are according to TS 36.211 [8] subclause 6.10.5.2.
Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS 36.331 [5].

**Table 8.3.1.1.6.3-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM3 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.70 FDD | OP.1 FDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 11.5 | ≥1 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. | | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.1.1E.

### 8.3.1.1.6.4 Test description

#### 8.3.1.1.6.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.3.1.1.6.3-2, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.3.1.1.6.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.1.6.4.3.

#### 8.3.1.1.6.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2B for C_RNTI to transmit the DL RMC according to Tables 8.3.1.1.6.5-1 and 8.3.1.1.6.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 and cell 3 according to table 8.3.1.1.6.5-1 as appropriate. The CFIs indicated in PCFICH are randomly selected per TTI.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.3.1.1.6.5-2 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 or 8 using two Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity as specified in Table 8.3.1.1.6.5-1.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.

5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

#### 8.3.1.1.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m) with the following exceptions.

**Table 8.3.1.1.6.4.3-1: PDSCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.3.1.1.6.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm8-v920 | | |
| codebookSubsetRestriction-r10 | Not present | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

#### 8.3.1.1.6.5 Test requirement

Table 8.3.1.1.6.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.3.1.1.6.5-2 for the specified SNR including test tolerances.

**Table 8.3.1.1.6.5-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with TM3 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | -3 | -3 |
| | $\rho_B$ | dB | 0 (Note 1) | -3 | -3 |
| | σ | dB | -3 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 4.08 | 1.54 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols | | | 3 | 3 | 3 |
| CFI indicated in PCFICH | | | 3 | Random from {1,2,3} | Random from {1,2,3} |
| PDSCH transmission mode | | | 8 | 3 | 3 |
| Interference model | | | N/A | As specified in clause B.6.2 | As specified in clause B.6.2 |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.2 | As specified in clause B.6.2 |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: CSI-RS configurations are according to TS 36.211 [8] subclause 6.10.5.2.
Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of [5].

**Table 8.3.1.1.6.5-2: Test Requirement for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM3 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.70 FDD | OP.1 FDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 13.04 | ≥1 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1.
Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

### 8.3.1.1.7 FDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM10 serving cell configuration and TM9 interference model - Enhanced Performance Requirement Type B

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- Information in Annex F is TBD

- Test Tolerances are undefined

#### 8.3.1.1.7.1 Test purpose

The purpose of this test is to verify closed loop rank one performance of the UE, on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission configured with TM10 in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 9 interference model defined in clause B.6.4.

#### 8.3.1.1.7.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward that support enhanced performance requirement Type B and PDSCH Transmission mode 10.

#### 8.3.1.1.7.3 Minimum conformance requirements

The requirements are specified in Table 8.3.1.1.7.3-2, with the addition of the parameters in Table 8.3.1.1.7.3-1 and the downlink physical channel setup according to Annex C.3.2.

The NAICS network assistance is provided when the serving cell TM10 is configured with QCL-type A and PCID based DM-RS scrambling. The neighbouring cells have transmission mode TM9 and NeighCellsInfo-r12 for interfering cells indicates presence of TM9. In Table 8.3.1.1.7.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.3.1.1.7.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM10 serving cell configuration and TM9 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 | 0 |
| | σ | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols | | | 3 | 3 | 3 |
| CFI indicated in PCFICH | | | 3 | 3 | 3 |
| PDSCH transmission mode | | | 10 | 9 | 9 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI reference signals | | | Antenna ports 15, 16, 17, 18 | Antenna ports 15, 16 | Antenna ports 15, 16 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 10 / 1 | 10 / 1 | 10 / 1 |
| CSI reference signal configuration | | | 5 | 6 | 7 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ /*ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 6 / 1000000000000000 | 6 / 0100000000000000 | 6 / 0010000000000000 |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: CSI-RS configurations are according to TS 36.211 [8] subclause 6.10.5.2.
Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS 36.331 [5].

**Table 8.3.1.1.7.3-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM10 serving cell configuration and TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration | | | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.69 FDD | OP.1 FDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 4x2 Low | 2x2 Low | 2x2 Low | 85 | 18.2 | ≥1 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | | | |

The normative reference for these requirements is TS 36.101 [2] clause 8.3.1.1F.

### 8.3.1.1.7.4 Test description

#### 8.3.1.1.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.3.1.1.7.3-2, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.88.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.3.1.1.7.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.1.7.4.3.

#### 8.3.1.1.7.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.1.1.7.5-1 and 8.3.1.1.7.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 and cell 3 according to table 8.3.1.1.7.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.3.1.1.7.5-2 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/PDSCH for the test UE are sent on antenna port 7 or 8 using four Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity as specified in Table 8.3.1.1.7.5-1. CSI-RS are sent on antenna ports 15-18 using four Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.

5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

#### 8.3.1.1.7.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m) with the following exceptions.

**Table 8.3.1.1.7.4.3-1: PDSCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.3.1.1.7.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

**Table 8.3.1.1.7.4.3-3: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 5 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 6 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}} - 5$ when CSI-RS SubframeConfig is from 5-14; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 1000000000000000 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 6 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

### 8.3.1.1.7.5 Test requirement

Table 8.3.1.1.7.5-1defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.3.1.1.7.5-2 for the specified SNR including test tolerances.

**Table 8.3.1.1.7.5-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM10 serving cell configuration and TM9 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 | 0 |
| | σ | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91+TT | 3.34+TT |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols | | | 3 | 3 | 3 |
| CFI indicated in PCFICH | | | 3 | 3 | 3 |
| PDSCH transmission mode | | | 10 | 9 | 9 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI reference signals | | | Antenna ports 15, 16, 17, 18 | Antenna ports 15, 16 | Antenna ports 15, 16 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 10 / 1 | 10 / 1 | 10 / 1 |
| CSI reference signal configuration | | | 5 | 6 | 7 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ /*ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 6 / 1000000000000000 | 6 / 0100000000000000 | 6 / 0010000000000000 |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: CSI-RS configurations are according to TS 36.211 [8] subclause 6.10.5.2.
Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS 36.331 [5].

**Table 8.3.1.1.7.5-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM10 serving cell configuration and TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration | | | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.69 FDD | OP.1 FDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 4x2 Low | 2x2 Low | 2x2 Low | 85 | 18.2 + TT | ≥1 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | | | |

## 8.3.1.1.8

## 8.3.1.1.9 FDD PDSCH Single-layer Spatial Multiplexing for FD-MIMO

### 8.3.1.1.9.1 Test purpose

The purpose of this test is to verify rank-1 performance on antenna port 11 with a simultaneous transmission on the antenna port 7, 8 or 13 with DMRS enhancement table and 4 orthogonal DMRS ports.

### 8.3.1.1.9.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 13 and forward. Applicability requires support for FGI bit 103 and dmrs-Enhancements-r13.

### 8.3.1.1.9.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.3.2, with the addition of the relevant parameters in Tables 8.3.1-1, 8.3.1.1.9.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.1.1.9.3-2 for the specified SNR.

**Table 8.3.1.1.9.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations with Enhanced DMRS table**

| parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | -3 |
| Beamforming model | | | Annex B.4.1A |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | Subframes | 5 / 2 |
| CSI reference signal configuration | | | 3 |
| Zero-power CSI-RS configuration $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 3 / 0001000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 4) |
| Number of allocated resource blocks (Note 2) | | PRB | 50 |
| Simultaneous transmission | | | Yes (Note 3, 5) |
| dmrs-Enhancements-r13 | | | Enable |
| PDSCH transmission mode | | | 9 |

Note 1: $P_B = 1$.

Note 2: The modulation symbols of the signal under test are mapped onto antenna port 11.

Note 3: Modulation symbols of an interference signal are random mapped onto one antenna port among antenna port 7, 8 and 13. The update granularity for randomized mapping antenna port is 1 PRG in frequency domain and 1ms in time domain.

Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 5: The two UEs' scrambling identities $n_{\text{SCID}}$ are set to 0 with OCC =4.

**Table 8.3.1.1.9.3-2: Minimum performance for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations with Enhanced DMRS table**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 64QAM 1/2 | R.50 FDD | OP.1 FDD | EPA5 | 2x2 Low | 70 | 21.9 | ≥2 |

Note 1: The reference channel applies to both the input signal under test and the interfering signal.

The normative reference for this requirement is TS 36.101 [2] clause 8.3.1.1H.

#### 8.3.1.1.9.4 Test description

##### 8.3.1.1.9.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Tables 8.3.1-1 and 8.3.1.1.9.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.1.9.4.3.

##### 8.3.1.1.9.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.1.1.9.3-1, 8.3.1.1.9.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.1.1.9.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/PDSCH for the test UE are sent on antenna port 11 and another simultaneous transmission of DRS/PDSCH not for the test UE are sent on antenna port 7, 8 or 13. The DRS/PDSCH transmissions use two Tx antennas with beam-forming model as specified in Annex B.4.1A and precoder update granularity specified in Table 8.3.1-1. CSI-RS are sent on antenna ports 15-18 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1A.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 in Annex G clause G.3.

##### 8.3.1.1.9.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.1.1.9.4.3-1: *Void***

**Table 8.3.1.1.9.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| AntennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| PDSCH-ConfigDedicated-v1310 SEQUENCE { | | | |
| dmrs-ConfigPDSCH-v1310 | DMRS-Config-v1310 | | |
| DMRS-Config-v1310 SEQUENCE { | | | |
| dmrs-tableAlt-r13 | true | | |
| } | | | |
| } | | | |

**Table 8.3.1.1.9.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| } | | | |
| release | NULL | | |
| } | | | |

**Table 8.3.1.1.9.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 3 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 0001000000000000 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 3 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

8.3.1.1.9.5 Test requirement

Table 8.3.1.1.9.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3.2 for the throughput test shall meet or exceed the specified value in Table 8.3.1.1.9.5-1 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.1.1.9.5-1: Minimum performance for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations with Enhanced DMRS table**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 64QAM 1/2 | R.50 FDD | OP.1 FDD | EPA5 | 2x2 Low | 70 | 22.8 | ≥2 |
| Note 1: The reference channel applies to both the input signal under test and the interfering signal. | | | | | | | | |

## 8.3.1.2 FDD PDSCH Dual-layer Spatial Multiplexing Performance (UE-Specific Reference Symbols)

### 8.3.1.2.1_D FDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO

#### 8.3.1.2.1_D.1 Test purpose

To verify the UE's rank-2 performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for dual-layer transmission on antenna ports 7 and 8 using DM-RS with full RB allocation with multiple CSI reference symbol configurations with non-zero and zero transmission power.

#### 8.3.1.2.1_D.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 that support eDL-MIMO. Applicability requires support for FGI bit 103.

#### 8.3.1.2.1_D.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.3, with the addition of the relevant parameters in Tables 8.3.1-1, 8.3.1.2.1_D.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.1.2.1_D.3-2 for the specified SNR.

**Table 8.3.1.2.1_D.3-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations**

| parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | -3 |
| Cell-specific reference signals | | | Antenna ports 0 and 1 |
| CSI reference signals | | | Antenna ports 15,16 |
| Beamforming model | | | Annex B.4.2 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 2 |
| CSI reference signal configuration | | | 8 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 3 / 0010000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Number of allocated resource blocks (Note 2) | | PRB | 50 |
| Simultaneous transmission | | | No |
| PDSCH transmission mode | | | 9 |
| Note 1: $P_B = 1$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |

**Table 8.3.1.2.1_D.3-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.51 FDD | OP.1 FDD | EPA5 | 2x2 Low | 70 | 13.3 | 2-8 |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.1.2.

### 8.3.1.2.1_D.4 Test description

#### 8.3.1.2.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Tables 8.3.1-1 and 8.3.1.2.1_D.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.2.1_D.4.3.

### 8.3.1.2.1_D.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.1.2.1_D.3-1, 8.3.1.2.1_D.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.1.2.1_D.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna ports 7 and 8 using two Tx antennas with beam-forming model as specified in Annex B.4.2 and precoder update granularity specified in Table 8.3.1-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.2.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

### 8.3.1.2.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.1.2.1_D.4.3-1: Void**

**Table 8.3.1.2.1_D.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.3.1.2.1_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.1.2.1_D.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 8 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 3 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

## 8.3.1.2.1_D.5 Test requirement

Table 8.3.1.2.1_D.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3.1 for the throughput test shall meet or exceed the specified value in Table 8.3.1.2.1_D.5-1 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.1.2.1_D.5-1: Test requirement for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.51 FDD | OP.1 FDD | EPA5 | 2x2 Low | 70 | 14.2 | 2-8 |

## 8.3.1.2.1_D_1 FDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO (Release 11 and forward)

### 8.3.1.2.1_D_1.1 Test purpose

To verify the UE's rank-2 performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for dual-layer transmission on antenna ports 7 and 8 using DM-RS with full RB allocation with multiple CSI reference symbol configurations with non-zero and zero transmission power, and to verify that the UE correctly estimate SNR.

### 8.3.1.2.1_D_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward. Applicability requires support for FGI bit 103.

### 8.3.1.2.1_D_1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.3, with the addition of the relevant parameters in Tables 8.3.1-1, 8.3.1.2.1_D_1.3-1 where Cell 1 is the serving cell and Cell 2 is the interfering cell. The downlink physical channel setup is set according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.1.2.1_D_1.3-2 for the specified SNR.

**Table 8.3.1.2.1_D_1.3-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| | | | Cell 1 | Cell 2 |
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| | PDSCH_RA | dB | 4 | NA |
| | PDSCH_RB | dB | 4 | NA |

| | | | |
|---|---|---|---|
| Cell-specific reference signals | | Antenna ports 0 and 1 | Antenna ports 0 and 1 |
| Cell ID | | 0 | 126 |
| CSI reference signals | | Antenna ports 15,16 | NA |
| Beamforming model | | Annex B.4.2 | NA |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | Subframes | 5 / 2 | NA |
| CSI reference signal configuration | | 8 | NA |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | Subframes / bitmap | 3 / 0010000000000000 | NA |
| $N_{oc}$ at antenna port | dBm/15kHz | -98 | -98 |
| $\hat{E}_s / N_{oc}$ | | Reference Value in Table 8.3.1.2-2 | 7.25dB |
| Symbols for unused PRBs | | OCNG (Note 2) | NA |
| Number of allocated resource blocks (Note 2) | PRB | 50 | NA |
| Simultaneous transmission | | No | NA |
| PDSCH transmission mode | | 9 | Blanked |
| Note 1: $P_B = 1$<br>Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |

**Table 8.3.1.2.1_D_1.3-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | | Propagation Condition | | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.51 FDD | OP.1 FDD | N/A | ETU5 | ETU5 | 2x2 Low | 70 | 14.2 | ≥2 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.1.2.

### 8.3.1.2.1_D_1.4 Test description

#### 8.3.1.2.1_D_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40.
2. The parameter settings for the cell are set up according to Tables 8.3.1-1 and 8.3.1.2.1_D_1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.2.1_D_1.4.3.

### 8.3.1.2.1_D_1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.1.2.1_D_1.3-1, 8.3.1.2.1_D_1.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.1.2.1_D_1.5-2 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna ports 7 and 8 using two Tx antennas with beam-forming model as specified in Annex B.4.2 and precoder update granularity specified in Table 8.3.1-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.2.
3. Set Cell 2 as defined in Tables 8.3.1.2.1_D_1.5-1 and 8.3.1.2.1_D_1.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

### 8.3.1.2.1_D_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.1.2.1_D_1.4.3-1: Void**

**Table 8.3.1.2.1_D_1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.3.1.2.1_D_1.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.1.2.1_D_1.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 8 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 3 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

8.3.1.2.1_D_1.5 Test requirement

Table 8.3.1.2.1_D_1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3.1 for the throughput test shall meet or exceed the specified value in Table 8.3.1.2.1_D_1.5-1 and 8.3.1.2.1_D_1.5-2 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.1.2.1_D_1.5-1: Test Requirement for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations**

| parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| | | | Cell 1 | Cell 2 |
| Downlink power allocation | $\rho_A$ | dB | 4 | 0 |
| | $\rho_B$ | dB | 4 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0 and 1 | Antenna ports 0 and 1 |
| Cell ID | | | 0 | 126 |
| CSI reference signals | | | Antenna ports 15,16 | NA |
| Beamforming model | | | Annex B.4.2 | NA |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 2 | NA |
| CSI reference signal configuration | | | 8 | NA |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 3 / 0010000000000000 | NA |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| $\widehat{E}_s / N_{oc}$ | | | Reference Value in Table 8.3.1.2.1_D_1.5-2 | 6.9dB |
| Symbols for unused PRBs | | | OCNG (Note 2) | NA |
| Number of allocated resource blocks (Note 2) | | PRB | 50 | NA |
| Simultaneous transmission | | | No | NA |
| PDSCH transmission mode | | | 9 | Blanked |

Note 1: $P_B = 1$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.3.1.2.1_D_1.5-2: Test requirement for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | | Propagation Condition | | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.51 FDD | OP.1 FDD | N/A | ETU5 | ETU5 | 2x2 Low | 70 | 15.0 | ≥2 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1. | | | | | | | | | | |

## 8.3.1.2.2 FDD PDSCH Dual-layer Spatial Multiplexing – Enhanced Performance Requirement Type C

### 8.3.1.2.2.1 Test purpose

To verify the UE's rank-2 performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for dual-layer transmission on antenna ports 7 and 8 using DM-RS with full RB allocation with multiple CSI reference symbol configurations with non-zero and zero transmission power.

### 8.3.1.2.2.2 Test applicability

This test applies to all types of E-UTRA FDD release 12 and forward UE of Category 2 or higher that support enhanced receiver Type C. Applicability requires support for FGI bit 103.

### 8.3.1.2.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.3, with the addition of the relevant parameters in Tables 8.3.1-1, 8.3.1.2.2.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.1.2.2.3-2 for the specified SNR.

**Table 8.3.1.2.2.3-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations**

| parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | -3 |
| Cell-specific reference signals | | | Antenna ports 0 and 1 |
| CSI reference signals | | | Antenna ports 15,16 |
| Beamforming model | | | Annex B.4.2 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 2 |
| CSI reference signal configuration | | | 8 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 3 / 0010000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Number of allocated resource blocks (Note 2) | | PRB | 50 |
| Simultaneous transmission | | | No |
| PDSCH transmission mode | | | 9 |
| Note 1: $P_B = 1$<br>Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |

**Table 8.3.1.2.2.3-2: Enhanced Performance Requirement Type C for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.51 FDD | OP.1 FDD | EPA5 | 2x2 Medium | 70 | 17.4 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.1.2A.

### 8.3.1.2.2.4 Test description

#### 8.3.1.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Tables 8.3.1-1 and 8.3.1.2.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.2.2.4.3.

#### 8.3.1.2.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.1.2.2.3-1, 8.3.1.2.2.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.1.2.2.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna ports 7 and 8 using two Tx antennas with beam-forming model as specified in Annex B.4.2 and precoder update granularity specified in Table 8.3.1-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.2.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.3.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.1.2.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.3.1.2.2.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

**Table 8.3.1.2.2.4.3-3: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 8 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 3 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

8.3.1.2.2.5 Test requirement

Table 8.3.1.2.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3.1 for the throughput test shall meet or exceed the specified value in Table 8.3.1.2.2.5-1 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.1.2.2.5-1: Test requirement for Enhanced Performance Requirement Type C for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.51 FDD | OP.1 FDD | EPA5 | 2x2 Medium | 70 | 18.3 | ≥2 |

### 8.3.1.3 FDD PDSCH Performance with DCI format 2D and non Quasi Co-located Antenna Ports

#### 8.3.1.3.1_F FDD PDSCH Performance with DCI format 2D, non Quasi Co-located Antenna Ports, Same Cell ID and single NZP CSI-RS resource for CoMP

##### 8.3.1.3.1_F.1 Test purpose

To verify the UE capability of supporting non quasi-collocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission points share the same Cell ID. In particular the test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the timing difference between two transmission points, channel parameters estimation and rate matching behaviour according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling.

##### 8.3.1.3.1_F.2 Test applicability

This test applies to E-UTRA FDD category ≥2 UE release 11 and forward, supporting Maximum CSI processes of One on a component carrier within a band with PDSCH transmission mode 10.

##### 8.3.1.3.1_F.3 Minimum conformance requirements

The requirements are specified in Table 8.3.1.3.1_F.3-3, with the addition of the parameters in Table 8.3.1.3.1_F.3-1 and Table 8.3.1.3.1_F.3-2. In table 8.3.1.3.1_F.3-1 transmission point 1 (TP1) is the serving cell and transmission point 2 (TP2) transmits PDSCH. The downlink physical channel setup for TP1 is according to Table C.3.4-1 and for TP2 according to Table C.3.4-2.

**Table 8.3.1.3.1_F.3-1: Test Parameters for quasi co-location type B: same Cell ID**

| Parameter | | Unit | TP 1 | TP 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | (Note 2) |
| CSI-RS 0 antenna ports | | | NA | Port {15,16} |
| *qcl-CSI-RS-ConfigNZPId-r11,* CSI-RS 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | NA | 5/2 |
| *qcl-CSI-RS-ConfigNZPId-r11,* CSI-RS 0 configuration | | | NA | 8 |
| *csi-RS-ConfigZPId-r11,* Zero-power CSI-RS 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframe | NA | 5/2 |
| *csi-RS-ConfigZPId-r11,* Zero-power CSI-RS 0 configuration $I_{CSI-RS}$ / *ZeroPower CSI-RS* bitmap | | | NA | 2/ 0000010000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| SNR | | dB | Reference point in Table 8.3.1.3.1_F.3-2 | Reference point in Table 8.3.1.3.1_F.3-2 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 0 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | Blanked | 10 |
| Number of allocated PRB | | PRB | NA | 50 |
| *qcl-Operation, '*PDSCH RE Mapping and Quasi-Co-Location Indicator' | | | Type B, '00' | |
| Time offset between TPs | | μs | NA | Reference point in Table 8.3.1.3.1_F.3-2 |
| Frequency error between TPs | | Hz | NA | 0 |
| Beamforming model | | | NA | Port 7 as specified in clause B.4.1 |
| Symbols for unused PRBs | | | NA | OCNG (Note 3) |

Note 1: $P_B = 1$

Note 2: REs for antenna ports 0 and 1 CRSs have zero transmission power.

Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.3.1.3.1_F.3-2: Configurations of PQI and DL transmission hypothesis for each PQI set**

| PQI set index | Parameters in each PQI set | | DL transmission hypothesis for each PQI Set | |
|---|---|---|---|---|
| | NZP CSI-RS Index (For quasi co-location) | ZP CSI-RS configuration | TP 1 | TP 2 |
| PQI set 0 | CSI-RS 0 | ZP CSI-RS 0 | Blanked | PDSCH |

**Table 8.3.1.3.1_F.3-3: Minimum performance for quasi co-location type B: same Cell ID**

| Test Number | Reference Channel | OGCN pattern | | Time offset between TPs (μs) | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | TP1 | TP2 | | TP1 | TP2 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 3) | |
| 1 | R.52 FDD | NA | OP.1 FDD | 2 | EPA5 | EPA5 | 2x2 Low | 70 | 12.1 | ≥2 |
| 2 | R.52 FDD | NA | OP.1 FDD | -0.5 | EPA5 | EPA5 | 2x2 Low | 70 | 12.6 | ≥2 |
| Note 1: The propagation conditions for TP1 and TP2 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for TP1 and TP2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of TP2. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.1.3.1.

### 8.3.1.3.1_F.4 Test description

#### 8.3.1.3.1_F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the TP 1 and TP 2 are set up according to table 8.3.1-1, table 8.3.1.3.1_F.3-1 and 8.3.1.3.1_F.3-2 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.3.1_F.4.3.

#### 8.3.1.3.1_F.4.2 Test procedure

1. SS transmits PDCCH on TP 1. PQI set and PDSCH transmission hypothesis in PDCCH format 2D are configured according to Table 8.3.1.3.1_F.3-2.

2. SS transmits PDSCH on TP 1 and TP 2 via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to Table 8.3.1.3.1_F.3-3. The SS sends downlink MAC padding bits on the DL RMC.

3. Set the parameters of the reference channel, timing offset (TP 2 timing - TP 1 timing), the propagation condition, the correlation matrix and the SNR according to Table 8.3.1.3.1_F.3-3 Test 1 as appropriate.

4. Wait for at least 1 second before measuring throughput.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

6. Repeat steps 1 to 5 for Test 2 in Table 8.3.1.3.1_F.3-3.

### 8.3.1.3.1_F.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.1.3.1_F.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| pdsch-ConfigDedicated | PDSCH-ConfigDedicated-DEFAULT | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-ConfigNZPToAddModList-r11 | CSI-RS-ConfigNZP-r11-DEFAULT | | |
| csi-RS-ConfigZPToAddModList-r11 | CSI-RS-ConfigZP-r11-DEFAULT | | |
| pdsch-ConfigDedicated-v1130 | PDSCH-ConfigDedicated-v1130-DEFAULT | | |
| } | | | |

**Table 8.3.1.3.1_F.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path:36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | 2TX |
| } | | | |

**Table 8.3.1.3.1_F.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.1.3.1_F.4.3-4: CSI-RS-ConfigNZP-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigNZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigNZPId-r11 | 1 | | |
| antennaPortsCount-r11 | an2 | | |
| resourceConfig-r11 | 8 | | |
| subframeConfig-r11 | 2 | | |
| scramblingIdentity-r11 | 0 | | |
| qcl-CRS-Info-r11 SEQUENCE { | | | |
| qcl-ScramblingIdentity-r11 | 0 | | |
| crs-PortsCount-r11 | n2 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| } | | | |
| } | | | |

**Table 8.3.1.3.1_F.4.3-5: *CSI-RS-ConfigZP-r11-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11 | 1 | | |
| resourceConfigList-r11 | 0000010000000000 | | |
| subframeConfig-r11 | 2 | | |
| } | | | |

**Table 8.3.1.3.1_F.4.3-6: PDSCH-ConfigDedicated-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-v1130 ::= SEQUENCE { | | | |
| dmrs-ConfigPDSCH-r11 | DMRS-Config-r11-DEFAULT | | |
| qcl-Operation | typeB | | |
| re-MappingQCLConfigToAddModList-r11 SEQUENCE (SIZE (1..maxRE-MapQCL-r11)) OF SEQUENCE { | 1 entry | | |
| pdsch-RE-MappingQCL-ConfigId-r11[1] | 1 | | |
| optionalSetOfFields-r11[1] SEQUENCE { | | | |
| crs-PortsCount-r11 | n2 | | |
| crs-FreqShift-r11 | 0 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| pdsch-Start-r11 | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 8.3.1.3.1_F.5 Test requirement

Table 8.3.1.3.1_F.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3.2 for the throughput test shall meet or exceed the specified value in Table 8.3.1.3.1_F.5-1 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.1.3.1_F.5-1: Test requirements for quasi co-location type B: same Cell ID**

| Test Number | Reference Channel | OGCN pattern | | Time offset between TPs (Note 4) | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | TP1 | TP2 | | TP1 | TP2 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 3) | |
| 1 | R.52 FDD | NA | OP.1 FDD | 57Ts | EPA5 | EPA5 | 2x2 Low | 70 | 13.0 | ≥2 |
| 2 | R.52 FDD | NA | OP.1 FDD | -11Ts | EPA5 | EPA5 | 2x2 Low | 70 | 13.5 | ≥2 |
| Note 1: The propagation conditions for TP1 and TP2 are statistically independent. | | | | | | | | | | |
| Note 2: The correlation matrix and antenna configuration apply for TP1 and TP2. | | | | | | | | | | |
| Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of TP2. | | | | | | | | | | |
| Note 4: Timing offset in units of Ts: $T_S$ = 1/(15000 x 2048) seconds, the basic timing unit defined in TS 36.211 [8]. | | | | | | | | | | |

## 8.3.1.3.2_F FDD PDSCH Performance with DCI format 2D, non Quasi Co-located Antenna Ports, Same Cell ID and multiple NZP CSI-RS resources for CoMP

### 8.3.1.3.2_F.1 Test purpose

To verify the UE capability of supporting non quasi-collocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission points share the same Cell ID by verifying that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the timing difference between two transmission points, channel parameters estimation and rate matching behaviour according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling.

### 8.3.1.3.2_F.2 Test applicability

This test applies to all types of E-UTRA FDD category ≥2 UE release 11 and forward, supporting Maximum CSI processes of Three or Four on a component carrier within a band with PDSCH transmission mode 10.

### 8.3.1.3.2_F.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.3, with the addition of the relevant parameters in Tables 8.3.1-1, 8.3.1.3.2_F.3-1 and 8.3.1.3.2_F.3-2.

In table 8.3.1.3.2_F.2-1, transmission point 1 (TP 1) is the serving cell transmitting PDCCH, synchronization signals and PBCH, and transmission point 2 (TP 2) has same Cell ID as TP 1. Multiple NZP CSI-RS resources and ZP CSI-RS resources are configured. In each sub-frame, DL PDSCH transmission is dynamically switched between 2 TPs with multiple PDSCH RE Mapping and Quasi-Co-Location Indicator configuration (PQI). Configurations of PDSCH RE Mapping and Quasi-Co-Location Indicator and downlink transmission hypothesis are defined in Table 8.3.1.3.2_F.3-2. The downlink physical channel setup for TP 1 is according to Table C.3.4-1 and for TP 2 according to Table C.3.4-2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.1.3.2_F.3-3 for the specified SNR.

**Table 8.3.1.3.2_F.3-1: Test Parameters for timing offset compensation with DPS transmission**

| Parameter | | Unit | TP 1 | TP 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Beamforming model | | | As specified in clause B.4.1 | As specified in clause B.4.1 |
| Cell-specific reference signals | | | Antenna ports 0,1 | (Note 2) |
| CSI reference signals 0 | | | Antenna ports {15,16} | N/A |
| CSI-RS 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 2 | N/A |
| CSI reference signal 0 configuration | | | 0 | N/A |
| CSI reference signals 1 | | | N/A | Antenna ports {15,16} |
| CSI-RS 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | N/A | 5 / 2 |
| CSI reference signal 1 configuration | | | N/A | 8 |
| Zero-power CSI-RS 0 configuration $I_{CSI-RS}$ / *ZeroPower CSI-RS* bitmap | | Subframes/bitmap | 2/ 0010000000000000 | N/A |
| Zero-power CSI-RS1 configuration $I_{CSI-RS}$ / *ZeroPower CSI-RS* bitmap$_S$ | | Subframes/bitmap | 2/ 0010000000000000 | 2/ 0000010000000000 |
| $\widehat{E}_s / N_{oc}$ | | dB | Reference Value in Table 8.3.1.3.2_F.2-3 | Reference Value in Table 8.3.1.3.2_F.2-3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 0 |
| Number of control OFDM symbols | | | 2 | 2 |
| Timing offset between TPs | | | N/A | Reference Value in Table 8.3.1.3.2_F.3-3 |
| Frequency offset between TPs | | Hz | N/A | 0 |
| Number of allocated resource blocks | | PRB | 50 | 50 |
| PDSCH transmission mode | | | 10 | 10 |
| Probability of occurrence of PDSCH transmission(Note 3) | | % | 30 | 70 |
| Symbols for unused PRBs | | | OCNG (Note 4) | OCNG (Note 4) |

Note 1: $P_B = 1$.

Note 2: REs for antenna ports 0 and 1 CRSs have zero transmission power.

Note 3: PDSCH transmission from TPs shall be randomly determined independently for each subframe. Probabilities of occurrence of PDSCH transmission from TPs are specified.

Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.3.1.3.2_F.3-2: Configurations of PQI and DL transmission hypothesis for each PQI set**

| PQI set index | Parameters in each PQI set | | DL transmission hypothesis for each PQI Set | |
|---|---|---|---|---|
| | NZP CSI-RS Index (For quasi co-location) | ZP CSI-RS configuration | TP 1 | TP 2 |
| PQI set 0 | CSI-RS 0 | ZP CSI-RS 0 | PDSCH | Blanked |
| PQI set 1 | CSI-RS 1 | ZP CSI-RS 1 | Blanked | PDSCH |

**Table 8.3.1.3.2_F.3-3: Minimum Requirements for timing offset compensation with DPS transmission**

| Test Number | Timing offset(us) | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | TP 1 | TP 2 | TP 1 | TP 2 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 3) | |
| 1 | 2 | R.53 FDD | OP.1 FDD | OP.1 FDD | EPA 5 | EPA 5 | 2x2 Low | 70 | 12.2 | ≥2 |
| 2 | -0.5 | R.53 FDD | OP.1 FDD | OP.1 FDD | EPA 5 | EPA 5 | 2x2 Low | 70 | 12.5 | ≥2 |
| Note 1: The propagation conditions for TP 1 and TP 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of TP 1 and TP 2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of both TP 1 and TP 2 as defined in clause 8.1.1. | | | | | | | | | | |

The normative reference for these requirements is TS 36.101 [2] clause 8.3.1.3.2.

### 8.3.1.3.2_F.4 Test description

#### 8.3.1.3.2_F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.2.3.3_C.1.3-2, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the TP 1 and TP 2 are set up according to table 8.3.1-1, 8.3.1.3.2_F.3-1 and 8.3.1.3.2_F.3-2 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.3.2_F.4.3.

#### 8.3.1.3.2_F.4.2 Test procedure

1. SS transmits PDCCH on TP 1. PQI set and PDSCH transmission hypothesis in PDCCH format 2D are configured according to Table 8.3.1.3.2_F.3-2.
2. SS transmits PDSCH on TP 1 and TP 2 via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to Tables 8.3.1.3.2_F.3-1 and 8.3.1.3.2_F.3-2. The SS sends downlink MAC padding bits on the DL RMC. PDSCH transmission from TPs shall be randomly determined independently for each subframe. Probabilities of occurrence of PDSCH transmission from TPs are specified according to Table 8.3.1.3.2_F.3-1. The probability of occurrence of PQI set in each TP is equal.
3. Set the parameters of the reference channel, timing offset (TP 2 timing - TP 1 timing), the propagation condition, the correlation matrix and the SNR according to Table 8.3.1.3.2_F.3-3 Test 1 as appropriate.
4. Wait for at least 1 second before measuring throughput.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

6. Repeat steps 1 to 5 for Test 2 in Table 8.3.1.3.2_F.5-1.

### 8.3.1.3.2_F.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.1.3.2_F.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| pdsch-ConfigDedicated | PDSCH-ConfigDedicated-DEFAULT | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-ConfigNZPToAddModList-r11 | CSI-RS-ConfigNZP-r11-DEFAULT | | |
| csi-RS-ConfigZPToAddModList-r11 | CSI-RS-ConfigZP-r11-DEFAULT | | |
| pdsch-ConfigDedicated-v1130 | PDSCH-ConfigDedicated-v1130-DEFAULT | | |
| } | | | |

**Table 8.3.1.3.2_F.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path:36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | 2TX |
| } | | | |

**Table 8.3.1.3.2_F.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.1.3.2_F.4.3-4: CSI-RS-ConfigNZP-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigNZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigNZPId-r11 | For NZP CSI-RS configuration (CSI reference signals 0 ) = 1 NZP CSI-RS configuration (CSI reference signals 1) = 2 | | |
| antennaPortsCount-r11 | an2 | | |
| resourceConfig-r11 | For NZP CSI-RS configuration (CSI reference signals 0 ) = 0 NZP CSI-RS configuration (CSI reference signals 1) = 8 | | |
| subframeConfig-r11 | 2 | | |
| scramblingIdentity-r11 | 0 | | |
| qcl-CRS-Info-r11 SEQUENCE { | | | |
| qcl-ScramblingIdentity-r11 | 0 | | |
| crs-PortsCount-r11 | n2 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| } | | | |
| } | | | |

**Table 8.3.1.3.2_F.4.3-5: *CSI-RS-ConfigZP-r11-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11 | 1 | | |
| resourceConfigList-r11 | For Zero-power CSI-RS 0 = 0010000000000000 For Zero-power CSI-RS 1 configuration = 0000010000000000 | Parameter: *ZeroPowerCSI-RS* | |
| subframeConfig-r11 | 2 | | |
| } | | | |

**Table 8.3.1.3.2_F.4.3-6: PDSCH-ConfigDedicated-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-v1130 ::= SEQUENCE { | | | |
| dmrs-ConfigPDSCH-r11 | DMRS-Config-r11-DEFAULT | | |
| qcl-Operation | typeB | | |
| re-MappingQCLConfigToAddModList-r11 SEQUENCE (SIZE (1..maxRE-MapQCL-r11)) OF SEQUENCE { | 2 entries | See Table 8.3.1.3.2_F.3-2 | |
| pdsch-RE-MappingQCL-ConfigId-r11[1] | 1 | Entry 1 | |
| optionalSetOfFields-r11[1] SEQUENCE { | | | |
| crs-PortsCount-r11 | n2 | | |
| crs-FreqShift-r11 | 0 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| pdsch-Start-r11 | 2 | | |
| } | | | |
| csi-RS-ConfigZPId-r11[1] | 1 | | |
| qcl-CSI-RS-ConfigNZPId-r11[1] | 1 | | |
| pdsch-RE-MappingQCL-ConfigId-r11[1] | 4 | Entry 2 | |
| optionalSetOfFields-r11[1] SEQUENCE { | | | |
| crs-PortsCount-r11 | n2 | | |
| crs-FreqShift-r11 | 0 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| pdsch-Start-r11 | 2 | | |
| } | | | |
| csi-RS-ConfigZPId-r11[1] | 2 | | |
| qcl-CSI-RS-ConfigNZPId-r11[1] | 2 | | |
| } | | | |
| } | | | |

## 8.3.1.3.2_F.5 Test requirements

Table 8.3.1.3.2_F.2-1 and 8.3.1.3.2_F.2-2 defines the primary level setting.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for each throughput test shall meet or exceed the specified value in Table 8.3.1.3.2_F.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.3.1.3.2_F.5-1: Test Requirements for timing offset compensation with DPS transmission**

| Test Number | Timing offset (Note 4) | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | TP 1 | TP 2 | TP 1 | TP 2 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 3) | |
| 1 | 57Ts | R.53 FDD | OP.1 FDD | OP.1 FDD | EPA5 | EPA5 | 2x2 Low | 70 | 13.1 | ≥2 |
| 2 | 11Ts | R.53 FDD | OP.1 FDD | OP.1 FDD | EPA5 | EPA5 | 2x2 Low | 70 | 13.4 | ≥2 |

Note 1: The propagation conditions for TP 1and TP 2 are statistically independent.
Note 2: Correlation matrix and antenna configuration parameters apply for each of TP 1 and TP 2.
Note 3: SNR corresponds to $\widehat{E}_s / N_{oc}$ of both TP 1 and TP 2 as defined in clause 8.1.1.
Note 4: Timing offset in units of Ts: $T_S$ = 1/(15000 x 2048) seconds, the basic timing unit defined in TS 36.211 [8].

## 8.3.1.3.3_F FDD PDSCH Performance with DCI format 2D, non Quasi Co-located Antenna Ports, Different Cell ID, Colliding CRS and single NZP CSI-RS resource for CoMP

### 8.3.1.3.3_F.1 Test purpose

To verify the UE capability of supporting non quasi-collocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission points have different Cell ID and colliding CRS by verifying that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the frequency difference between two transmission points, channel parameters estimation and rate matching behaviour according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling.

### 8.3.1.3.3_F.2 Test applicability

This test applies to all types of E-UTRA FDD category ≥2 UE release 11 and forward, supporting Maximum CSI processes of One, Three or Four on a component carrier within a band with PDSCH transmission mode 10.

### 8.3.1.3.3_F.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.3, with the addition of the relevant parameters in Tables 8.3.1-1 and 8.3.1.3.3_F.3-1.

In table 8.3.1.3.3_F.3-1, transmission point 1 (TP 1) is the serving cell transmitting PDCCH, synchronization signals and PBCH, and transmission point 2 (TP 2) transmit PDSCH with different Cell ID. The downlink physical channel setup for TP 1 is according to Table C.3.4-1 and for TP 2 according to Table C.3.4-2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.1.3.3_F.3-2 for the specified SNR.

**Table 8.3.1.3.3_F.3-1: Test Parameters for quasi co-location type B with different Cell ID and Colliding CRS**

| parameter | | Unit | TP 1 | TP 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | $\sigma$ | dB | -3 | -3 |

| | | | |
|---|---|---|---|
| Beamforming model | | N/A | As specified in clause B.4.2 |
| Cell-specific reference signals | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals 0 | | N/A | Antenna ports {15,16} |
| CSI-RS 0 periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | Subframes | N/A | 5 / 2 |
| CSI reference signal 0 configuration | | N/A | 0 |
| Zero-power CSI-RS 0 configuration $I_{CSI\text{-}RS}$ / *ZeroPower CSI-RS* bitmap | Subframes /bitmap | N/A | 2/ 0010000000000000 |
| $\hat{E}_s / N_{oc}$ | dB | Reference point in Table 8.3.1.3.3_F.3-2 + 4dB | Reference Value in Table 8.3.1.3.3_F.3-2 |
| $N_{oc}$ at antenna port | dBm/15kHz | -98 | -98 |
| $BW_{Channel}$ | MHz | 10 | 10 |
| Cyclic Prefix | | Normal | Normal |
| Cell Id | | 0 | 126 |
| Number of control OFDM symbols | | 1 | 2 |
| Timing offset between TPs | us | N/A | 0 |
| Frequency offset between TPs | Hz | N/A | 200 |
| *qcl-Operation, '*PDSCH RE Mapping and Quasi-Co-Location Indicator' | | Type B, '00' | |
| PDSCH transmission mode | | Blank | 10 |
| Number of allocated resource block | | N/A | 50 |
| Symbols for unused PRBs | | N/A | OCNG (Note 2) |
| Note 1: $P_B = 1$<br>Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |

**Table 8.3.1.3.3_F.3-2: Performance Requirements for quasi co-location type B with different Cell ID and Colliding CRS**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | TP 1 | TP 2 | TP 1 | TP 2 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 3) | |
| 1 | R.54 FDD | N/A | OP.1 FDD | EPA5 | ETU5 | 2x2 Low | 70 | 14.4 | ≥2 |
| Note 1: The propagation conditions for TP 1 and TP 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of TP 1 and TP 2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of TP 2 as defined in clause 8.1.1. | | | | | | | | | |

The normative reference for these requirements is TS 36.101 [2] clause 8.3.1.3.3.

### 8.3.1.3.3_F.4 Test description

#### 8.3.1.3.3_F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.2.3.3_C.1.3-2, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the TP 1 are set up according to tables 8.3.1-1 and 8.3.1.3.3_F.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.3.3_F.4.3.

#### 8.3.1.3.3_F.4.2 Test procedure

1. SS transmits PDCCH DCI format 2D on TP 1 according to Tables 8.3.1.3.3_F.3-1, 8.3.1.3.3_F.3-2 and Annex C3.4.
2. SS transmits PDSCH on TP 2 via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to Tables 8.3.1.3.3_F.3-1, 8.3.1.3.3_F.3-2 and Annex C3.4. The SS sends downlink MAC padding bits on the DL RMC.
3. Set the parameters of the reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.1.3.3_F.5-1 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.3.1.3.3_F.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.1.3.3_F.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| pdsch-ConfigDedicated | PDSCH-ConfigDedicated-DEFAULT | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-ConfigNZPToAddModList-r11 | CSI-RS-ConfigNZP-r11-DEFAULT | | |
| csi-RS-ConfigZPToAddModList-r11 | CSI-RS-ConfigZP-r11-DEFAULT | | |
| pdsch-ConfigDedicated-v1130 | PDSCH-ConfigDedicated-v1130-DEFAULT | | |
| } | | | |

**Table 8.3.1.3.3_F.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path:36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | 2TX |
| } | | | |

**Table 8.3.1.3.3_F.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.1.3.3_F.4.3-4: CSI-RS-ConfigNZP-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigNZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigNZPId-r11 | 1 | | |
| antennaPortsCount-r11 | an2 | | |
| resourceConfig-r11 | 0 | | |
| subframeConfig-r11 | 2 | | |
| scramblingIdentity-r11 | 126 | | |
| qcl-CRS-Info-r11 SEQUENCE { | | | |
| qcl-ScramblingIdentity-r11 | 0 | | |
| crs-PortsCount-r11 | n2 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| } | | | |
| } | | | |

**Table 8.3.1.3.3_F.4.3-5: *CSI-RS-ConfigZP-r11-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11 | 1 | | |
| resourceConfigList-r11 | 0010000000000000 | | |
| subframeConfig-r11 | 2 | | |
| } | | | |

**Table 8.3.1.3.3_F.4.3-6: PDSCH-ConfigDedicated-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-v1130 ::= SEQUENCE { | | | |
| dmrs-ConfigPDSCH-r11 | DMRS-Config-r11-DEFAULT | | |
| qcl-Operation | typeB | | |
| re-MappingQCLConfigToAddModList-r11 SEQUENCE (SIZE (1..maxRE-MapQCL-r11)) OF SEQUENCE { | 1 entry | | |
| pdsch-RE-MappingQCL-ConfigId-r11[1] | 1 | | |
| optionalSetOfFields-r11[1] SEQUENCE { | | | |
| crs-PortsCount-r11 | n2 | | |
| crs-FreqShift-r11 | 0 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| pdsch-Start-r11 | 2 | | |
| } | | | |
| } | | | |
| } | | | |

8.3.1.3.3_F.5 Test requirements

Table 8.3.1.3.3_F.3-1defines the primary level setting.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for each throughput test shall meet or exceed the specified value in Table 8.3.1.3.3_F.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.3.1.3.3_F.5-1: Test Requirements for quasi co-location type B with different Cell ID and Colliding CRS**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | TP 1 | TP 2 | TP 1 | TP 2 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 3) | |
| 1 | R.54 FDD | N/A | OP.1 FDD | EPA5 | ETU5 | 2x2 Low | 70 | 15.3 | ≥2 |
| Note 1: The propagation conditions for TP 1 and TP 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of TP 1 and TP 2.<br>Note 3: SNR corresponds to $\widehat{E}_s / N_{oc}$ of TP 2 as defined in clause 8.1.1. | | | | | | | | | |

## 8.3.2 TDD

The parameters specified in Table 8.3.2-1 are valid for TDD unless otherwise stated.

**Table 8.3.2-1: Common Test Parameters for User-specific Reference Symbols**

| Parameter | Unit | Value |
|---|---|---|
| Uplink downlink configuration (Note 1) | | 1 |
| Special subframe configuration (Note 2) | | 4 |
| Cyclic prefix | | Normal |
| Cell ID | | 0 |
| Inter-TTI Distance | | 1 |
| Number of HARQ processes. All these HARQ processes are used. | Processes | 7 |
| Maximum number of HARQ transmission | | 4 |
| Redundancy version coding sequence | | {0,1,2,3} for QPSK and 16QAM<br>{0,0,1,2} for 64QAM and 256QAM |
| Number of OFDM symbols for PDCCH | OFDM symbols | 2 |
| Precoder update granularity | | Frequency domain:<br>1 PRB for Transmission mode 7 & 8,<br>1 PRG for Transmission mode 9 and 10<br>Time domain: 1 ms |
| ACK/NACK feedback mode | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8].<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]. | | |

For all test cases, the SNR is defined as:

$$SNR = \frac{\hat{E}_s^{(1)} + \hat{E}_s^{(2)}}{N_{oc}^{(1)} + N_{oc}^{(2)}},$$

where the superscript indicates the receiver antenna connector. The SNR requirement applies for the UE categories given for each test.

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.

## 8.3.2.1 TDD PDSCH Single-layer Spatial Multiplexing Performance (UE-Specific Reference Symbols)

### 8.3.2.1.1 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 8 and forward)

#### 8.3.2.1.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna port 5 using user-specific reference signals with full RB or single RB allocation.

#### 8.3.2.1.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

#### 8.3.2.1.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.3.1, with the addition of the relevant parameters in Tables 8.3.2-1, 8.3.2.1.1.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.3.2.1.1.3-2 for the specified SNR.

**Table 8.3.2.1.1.3-1: Test Parameters for Testing DRS**

| parameter | | Unit | Test 1 | Test 2 | Test 3 | Test 4 |
|---|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 (Note 1) | 0 (Note 1) | 0 (Note 1) |
| | σ | dB | 0 | 0 | 0 | 0 |
| Cell-specific reference signals | | Antenna port 0 | | | | |
| Beamforming model | | Annex B.4.1 | | | | |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 | -98 | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) | OCNG (Note 2) | OCNG (Note 2) | OCNG (Note 2) |
| PDSCH transmission mode | | | 7 | 7 | 7 | 7 |
| Note 1: $P_B = 0$<br>Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | | | | |

**Table 8.3.2.1.1.3-2: Minimum performance DRS (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz QPSK 1/3 | R.25 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | -0.8 | ≥1 |
| 2 | 10 MHz 16QAM 1/2 | R.26 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 7.0 | ≥2 |
| 3 | 10 MHz 64QAM 3/4 | R.27 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 17.0 | ≥2 |
| 4 | 10 MHz 16QAM 1/2 | R.28 TDD | OP.1 TDD | EPA5 | 2x2 Low | 30 | 1.7 | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.

#### 8.3.2.1.1.4 Test description

##### 8.3.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.3.2.1.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.1.1.4.3.

#### 8.3.2.1.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC according to Tables 8.3.2.1.1.3-1, 8.3.2.1.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.1.1.5-1 as appropriate.

   BCH/CRS/PDCCH/PCFICH are sent on antenna port 0 using one Tx antenna, while DRS/Dedicated data for the test UE are sent on antenna port 5 using two Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity specified in Table 8.3.2-1.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
4. Repeat steps from 1 to 3 for each test interval in Tables 8.3.2.1.1.5-1 as appropriate.

#### 8.3.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.3.2.1.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH DRS performance downlink power allocation test point 1 requirement for Test number 1 - 4**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm7 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.3.2.1.1.5 Test requirement

Table 8.3.2.1.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3.1 for each throughput test shall meet or exceed the specified value in Table 8.3.2.1.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.3.2.1.1.5-1: Test requirement DRS**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz QPSK 1/3 | R.25 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 0.1 | ≥1 |
| 2 | 10 MHz 16QAM 1/2 | R.26 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 7.9 | ≥2 |
| 3 | 10 MHz 64QAM 3/4 | R.27 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 17.9 | ≥2 |
| 4 | 10 MHz 16QAM 1/2 | R.28 TDD | OP.1 TDD | EPA5 | 2x2 Low | 30 | 2.6 | ≥1 |

## 8.3.2.1.1_1 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 9 and forward)

### 8.3.2.1.1_1.1 Test purpose

Same test purpose as in clause 8.3.2.1.1.1.

### 8.3.2.1.1_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward of UE category 1.

### 8.3.2.1.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.3.2.1.1.3 with the following exceptions:

- Instead of Table 8.3.2.1.1.3-1 -> use Table 8.3.2.1.1_1.3-1.
- Instead of Table 8.3.2.1.1.3-2 -> use Table 8.3.2.1.1_1.3-2.

**Table 8.3.2.1.1_1.3-1: Test Parameters for Testing DRS (Antenna port 5)**

| Parameter | | Unit | Test 1 (Note 4) | Test 2 | Test 3 | Test 4 (Note 4) |
|---|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | N/A | 0 | 0 | NA |
| | $\rho_B$ | dB | | 0 (Note 1) | 0 (Note 1) | |
| | σ | dB | | 0 | 0 | |
| Cell-specific reference signals | | Antenna port 0 | | | | |
| Beamforming model | | Annex B.4.1 | | | | |
| $N_{oc}$ at antenna port | | dBm/15kHz | N/A | -98 | -98 | NA |
| Symbols for unused PRBs | | | N/A | OCNG (Note 2) | OCNG (Note 2) | N/A |
| PDSCH transmission mode | | | N/A | 7 | 7 | N/A |

Note 1: $P_B = 0$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 3: The modulation symbols of the signal under test are mapped onto antenna port 5.

Note 4: This tests are covered in subclause 8.3.2.1.1

**Table 8.3.2.1.1_1.3-2: Minimum performance DRS (FRC) (Antenna port 5)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 (Note 1) | N/A | | | | | | | |
| 2 | 5MHz 16QAM 1/2 | R.26-1 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 7.0 | 1 |
| 3 | 10 MHz 64QAM 3/4 | R.27-1 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 17.0 | 1 |
| 4 (Note 1) | N/A | | | | | | | |
| Note 1: These tests are covered in subclause 8.3.2.1.1 | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.

### 8.3.2.1.1_1.4 Test description

Same test description as in clause 8.3.2.1.1.4 with the following exceptions:

- Instead of Table 8.3.2.1.1.3-1 -> use Table 8.3.2.1.1_1.3-1.
- Instead of Table 8.3.2.1.1.3-2 -> use Table 8.3.2.1.1_1.3-2.
- Initial conditions - Bandwidths to be tested: Depending on the bandwidth specified per test number in Table 8.3.2.1.1_1.3-2, as defined in TS 36.508 [7] clause 4.3.1.2.
- Instead of Table 8.3.2.1.1.5-1 -> use Table 8.3.2.1.1_1.5-1.

### 8.3.2.1.1_1.5 Test requirement

Same test requirement as in clause 8.3.2.1.1.5 with the following exceptions:

- Instead of Table 8.3.2.1.1.3-1 -> use Table 8.3.2.1.1_1.3-1.
- Instead of Table 8.3.2.1.1.5-1 -> use Table 8.3.2.1.1_1.5-1.

**Table 8.3.2.1.1_1.5-1: Test requirement DRS (FRC) (Antenna port 5)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 (Note 1) | N/A | | | | | | | |
| 2 | 5MHz 16QAM 1/2 | R.26-1 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 7.9 | 1 |
| 3 | 10 MHz 64QAM 3/4 | R.27-1 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 17.9 | 1 |
| 4 (Note 1) | N/A | | | | | | | |
| Note 1: These tests are covered in subclause 8.3.2.1.1 | | | | | | | | |

### 8.3.2.1.2 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without a simultaneous transmission

#### 8.3.2.1.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna port 7 or 8 without a simultaneous transmission on the other antenna port using DM-RS with full RB allocation.

#### 8.3.2.1.2.2 Test applicability

This test applies to Release 9 UEs that support enhanced Dual Layer TDD (TM8) and all types of E-UTRATDD UE release 10 and forward.

#### 8.3.2.1.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.3.2, with the addition of the relevant parameters in Tables 8.3.2-1, 8.3.2.1.2.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.3.2.1.2.3-2 for the specified SNR.

**Table 8.3.2.1.2.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer)**

| parameter | | Unit | Test 1 | Test 2 | Test 3 | Test 4 (Note 3) | Test 5 (Note 3) |
|---|---|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 | N/A | N/A |
| | $\rho_B$ | dB | 0 (Note 1) | 0 (Note 1) | 0 (Note 1) | N/A | N/A |
| | σ | dB | -3 | -3 | -3 | | |
| Cell-specific reference signals | | | Antenna port 0 and antenna port 1 | | | | |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 | -98 | N/A | N/A |
| Symbols for unused PRBs | | | OCNG (Note 4) | OCNG (Note 4) | OCNG (Note 4) | N/A | N/A |
| Simultaneous transmission | | | No | No | No | N/A | N/A |

Note 1: $P_B = 1$
Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.
Note 3: Test 4 and Test 5 are covered in subclause 8.3.2.1.3.
Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.3.2.1.2.3-2: Minimum performance for CDM-multiplexed DM RS without simultaneous transmission (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz QPSK 1/3 | R.31 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | -1.0 | ≥1 |
| 2 | 10 MHz 16QAM 1/2 | R.32 TDD | OP.1 TDD | EPA5 | 2x2 Medium | 70 | 7.7 | ≥2 |
| | 5MHz 16QAM 1/2 | R.32-1 TDD | OP.1 TDD | EPA5 | 2x2 Medium | 70 | 7.7 | 1 |
| 3 | 10 MHz 64QAM 3/4 | R.33 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 17.7 | ≥2 |
| | 10 MHz 64QAM 3/4 | R.33-1 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 17.7 | 1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.

### 8.3.2.1.2.4 Test description

#### 8.3.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: Depending on the bandwidth specified per test number in Table 8.3.2.1.2.3-2, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.3.2.1.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.1.2.4.3.

#### 8.3.2.1.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2B for C_RNTI to transmit the DL RMC according to Tables 8.3.2.1.2.3-1, 8.3.2.1.2.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.1.2.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/Dedicated data for the test UE are sent on antenna port 7 (or 8) using two Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity specified in Table 8.3.2-1.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

4. Repeat steps from 1 to 3 for each test interval in Tables 8.3.2.1.2.5-1 as appropriate.

#### 8.3.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.3.2.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm8-v920 | | |
| } | | | |
| } | | | |
| Extension ::= SEQUENCE { | | | |
| antennaInfo-v920 ::= SEQUENCE{ | | | |
| codebookSubsetRestriction-v920 CHOICE { | | | |
| n2TxAntenna-tm8-r9 | 111111 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.3.2.1.2.5 Test requirement

Table 8.3.2.1.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3.2 for each throughput test shall meet or exceed the specified value in Table 8.3.2.1.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.3.2.1.2.5-1: Test requirement for CDM-multiplexed DM RS without simultaneous transmission (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz QPSK 1/3 | R.31 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | -0.1 | ≥1 |
| 2 | 10 MHz 16QAM 1/2 | R.32 TDD | OP.1 TDD | EPA5 | 2x2 Medium | 70 | 8.6 | ≥2 |
| | 5 MHz 16QAM 1/2 | R.32-1 TDD | OP.1 TDD | EPA5 | 2x2 Medium | 70 | 8.6 | 1 |
| 3 | 10 MHz 64QAM 3/4 | R.33 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 18.6 | ≥2 |
| | 10 MHz 64QAM 3/4 | R.33-1 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 18.6 | 1 |

### 8.3.2.1.2_D TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 without a simultaneous transmission for eDL-MIMO

#### 8.3.2.1.2_D.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 without a

simultaneous transmission on the other antenna port and multiple CSI reference symbol configurations with non-zero and zero transmission power.

### 8.3.2.1.2_D.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit 104.

### 8.3.2.1.2_D.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.3.5, with the addition of the relevant parameters in Tables 8.3.2-1, 8.3.2.1.2_D.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.2.1.2_D.3-2 for the specified SNR.

**Table 8.3.2.1.2_D.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple CSI-RS configurations**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 (Note 1) | 0 (Note 1) |
| | σ | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | | |
| CSI reference signals | | | Antenna ports 15,…,22 | Antenna ports 15,…,18 | Antenna ports 15,…,18 |
| Beamforming model | | | Annex B.4.1 | Annex B.4.1 | Annex B.4.1 |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | Subframes | 5 / 4 | 5 / 4 | 5 / 4 |
| CSI reference signal configuration | | | 1 | 3 | 3 |
| Zero-power CSI-RS configuration $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 4 / 0010000100000000 | 4 / 0010000000000000 | 4/ 0010000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 | -98 |
| Symbols for unused PRBs | | | OCNG (Note 4) | OCNG (Note 4) | OCNG (Note 4) |
| Number of allocated resource blocks (Note 2) | | PRB | 50 | 50 | 100 |
| Simultaneous transmission | | | No | Yes (Note 3, 5) | No |
| PDSCH transmission mode | | | 9 | 9 | 9 |

Note 1: $P_B = 1$.
Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.
Note 3: Modulation symbols of an interference signal is mapped onto the antenna port (7 or 8) not used for the input signal under test.
Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.
Note 5: The two UEs' scrambling identities $n_{\text{SCID}}$ are set to 0 for CDM-multiplexed DM RS with interfering simultaneous transmission test cases.

**Table 8.3.2.1.2_D.3-2: Minimum performance for CDM-multiplexed DM RS without simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category | UE DL Cate-gory |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | | |
| 1 | 10 MHz QPSK 1/3 | R.50 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | -0.6 | ≥1 | ≥6 |
| 3 | 20MHz 256QAM | R. 66 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 24.3 | 11-12 | ≥11 |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.1A.

### 8.3.2.1.2_D.4 Test description

#### 8.3.2.1.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.3.2.1.2_D.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.1.2_D.4.3.

#### 8.3.2.1.2_D.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.2.1.2_D.3-1, 8.3.2.1.2_D.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.1.2_D.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 (or 8) using two Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity specified in Table 8.3.2-1. CSI-RS are sent on antenna ports 15-22 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.3.2.1.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.2.1.2_D.4.3-1: *Void***

**Table 8.3.2.1.2_D.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.3.2.1.2_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.2.1.2_D.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an8 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 1 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -6 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2, 7 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 4 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

8.3.2.1.2_D.5 Test requirement

Table 8.3.2.1.2_D.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3.5 for the throughput test shall meet or exceed the specified value in Table 8.3.2.1.2_D.5-1 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.2.1.2_D.5-1: Test requirement for CDM-multiplexed DM RS without simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz QPSK 1/3 | R.50 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | 0.3 | 1-8 |

## 8.3.2.1.2_H TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 without a simultaneous transmission for eDL-MIMO for 256QAM in DL

### 8.3.2.1.2_H.1 Test purpose

Same test purpose as defined in clause 8.3.2.1.2_D.1.

### 8.3.2.1.2_H.2 Test applicability

This test applies to all types of E-UTRA TDD UEs release 12 and forward that support 256QAM in DL. Applicability requires support for FGI bit 104.

### 8.3.2.1.2_H.3 Minimum conformance requirements

Same minimum conformance requirements as defined in clause 8.3.2.1.2_D.3.

### 8.3.2.1.2_H.4 Test description

#### 8.3.2.1.2_H.4.1 Initial conditions

Same test procedure as defined in clause 8.3.2.1.2_D.4.1 with the following exceptions:

- Instead of Table 8.3.2.1.2_D.4.3-4 → use Table 8.3.2.1.2_H.4.3-1.

#### 8.3.2.1.2_H.4.2 Test procedure

Same test procedure as defined in clause 8.3.2.1.2_D.4.2 with the following exceptions:

- Instead of Table 8.3.2.1.2_D.5-1 → use Table 8.3.2.1.2_H.5-1.
- CSI-RS are sent on antenna ports 15-22 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1 → CSI-RS are sent on antenna ports 15-18 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1 in test step 2.

#### 8.3.2.1.2_H.4.3 Message contents

Same message contents as defined in clause 8.3.2.1.2_D.4.3 with the following exceptions:

**Table 8.3.2.1.2_H.4.3-1: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| } | | | |
| } | | | |
| resourceConfig-r10 | 3 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 4 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

8.3.2.1.2_H.5 Test requirement

Same test requirement as defined in clause 8.3.2.1.2_D.5 with the following exceptions:

- Instead of Table 8.3.2.1.2_D.5-1 → use Table 8.3.2.1.2_H.5-1.

**Table 8.3.2.1.2_H.5-1: Test requirement for CDM-multiplexed DM RS without simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category | UE DL Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | | |
| 3 | 20MHz 256QAM | R. 66 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 25.2 | 11-12 | ≥11 |

### 8.3.2.1.3 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission

#### 8.3.2.1.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna port 7 or 8 with a simultaneous transmission on the other antenna port using DM-RS with full RB allocation.

#### 8.3.2.1.3.2 Test applicability

This test applies to Release9 UEs that support enhanced Dual Layer TDD (TM8) and all types of E-UTRA TDD UE release 10 and forward.

#### 8.3.2.1.3.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.3.2, with the addition of the relevant parameters in Tables 8.3.2-1, 8.3.2.1.3.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.3.2.1.3.3-2 for the specified SNR.

**Table 8.3.2.1.3.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer)**

| parameter | | Unit | Test 1 (Note 6) | Test 2 (Note 6) | Test 3 (Note 6) | Test 4 | Test 5 |
|---|---|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | N/A | N/A | N/A | 0 | 0 |
| | $\rho_B$ | dB | N/A | N/A | N/A | 0 (Note 1) | 0 (Note 1) |
| | σ | dB | N/A | N/A | N/A | -3 | -3 |
| Cell-specific reference signals | | | Antenna port 0 and antenna port 1 | | | | |
| Beamforming model | | | Annex B.4.1 | | | | |
| $N_{oc}$ at antenna port | | dBm/15kHz | N/A | N/A | N/A | -98 | -98 |
| Symbols for unused PRBs | | | N/A | N/A | N/A | OCNG (Note 4) | OCNG (Note 4) |
| Simultaneous transmission | | | N/A | N/A | N/A | Yes (Note 3, 5) | Yes (Note 3, 5) |
| PDSCH transmission mode | | | N/A | N/A | N/A | 8 | 8 |

Note 1: $P_B = 1$
Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.
Note 3: Modulation symbols of an interference signal is mapped onto the antenna port (7 or 8) not used for the input signal under test.
Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.
Note 5: The two UEs' scrambling identities $n_{\mathrm{SCID}}$ are set to 0 for CDM-multiplexed DM RS with interfering simultaneous transmission test cases.
Note 6: Test 1, Test 2 and Test 3 are covered in subclause 8.3.2.1.2.

**Table 8.3.2.1.3.3-2: Minimum performance for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 4 | 10 MHz 16QAM 1/2 | R.32 TDD (Note 1) | OP.1 TDD | EPA5 | 2x2 Medium | 70 | 21.9 | ≥2 |
| 5 | 10 MHz 64QAM 1/2 | R.34 TDD (Note 1) | OP.1 TDD | EPA5 | 2x2 Low | 70 | 22.0 | ≥2 |
| Note 1: The reference channel applies to both the input signal under test and the interfering signal. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.

### 8.3.2.1.3.4 Test description

#### 8.3.2.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.3.2.1.3.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.1.3.4.3.

#### 8.3.2.1.3.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2B for C_RNTI to transmit the DL RMC according to Tables 8.3.2.1.3.3-1, 8.3.2.1.3.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.1.3.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/Dedicated data for the test UE are sent on antenna port 7 (or 8) and another simultaneous transmission of DRS/Dedicated data not for the test UE is sent on antenna port 8 (or 7). The DRS/Dedicated data transmissions use two Tx antennas with different beam-forming model as specified in Annex B.4.1 and precoder update granularity specified in Table 8.3.2-1.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
4. Repeat steps from 1 to 3 for each test interval in Tables 8.3.2.1.3.5-1 as appropriate.

8.3.2.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.3.2.1.3.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm8-v920 | | |
| } | | | |
| } | | | |
| Extension ::= SEQUENCE { | | | |
| antennaInfo-v920 ::= SEQUENCE{ | | | |
| codebookSubsetRestriction-v920 CHOICE { | | | |
| n2TxAntenna-tm8-r9 | 111111 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.3.2.1.3.5 Test requirement

Table 8.3.2.1.3.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3.2 for each throughput test shall meet or exceed the specified value in Table 8.3.2.1.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.3.2.1.3.5-1: Test requirement for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 4 | 10 MHz 16QAM 1/2 | R.32 TDD (Note 1) | OP.1 TDD | EPA5 | 2x2 Medium | 70 | 22.8 | ≥2 |
| 5 | 10 MHz 64QAM 1/2 | R.34 TDD (Note 1) | OP.1 TDD | EPA5 | 2x2 Low | 70 | 22.9 | ≥2 |
| Note 1: The reference channel applies to both the input signal under test and the interfering signal. | | | | | | | | |

## 8.3.2.1.3_D TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with a simultaneous transmission for eDL-MIMO

8.3.2.1.3_D.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 with a simultaneous transmission on the other antenna port and multiple CSI reference symbol configurations with non-zero and zero transmission power.

8.3.2.1.3_D.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit 104.

8.3.2.1.3_D.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.3.5, with the addition of the relevant parameters in Tables 8.3.2-1, 8.3.2.1.3_D.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.2.1.3_D.3-2 for the specified SNR.

**Table 8.3.2.1.3_D.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple CSI-RS configurations**

| Parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 (Note 1) |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | |
| CSI reference signals | | | Antenna ports 15,…,22 | Antenna ports 15,…,18 |
| Beamforming model | | | Annex B.4.1 | Annex B.4.1 |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | Subframes | 5 / 4 | 5 / 4 |
| CSI reference signal configuration | | | 1 | 3 |
| Zero-power CSI-RS configuration $I_{CSI\text{-}RS}$ / ZeroPowerCSI-RS bitmap | | Subframes / bitmap | 4 / 0010000100000000 | 4 / 0010000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Symbols for unused PRBs | | | OCNG (Note 4) | OCNG (Note 4) |
| Number of allocated resource blocks (Note 2) | | PRB | 50 | 50 |
| Simultaneous transmission | | | No | Yes |
| PDSCH transmission mode | | | 9 | 9 |

Note 1: $P_B = 1$.

Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.

Note 3: Modulation symbols of an interference signal is mapped onto the antenna port (7 or 8) not used for the input signal under test.

Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 5: The two UEs' scrambling identities $n_{\mathrm{SCID}}$ are set to 0 for CDM-multiplexed DM RS with interfering simultaneous transmission test cases.

**Table 8.3.2.1.3_D.3-2: Minimum performance for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz 64QAM 1/2 | R.44 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 22.1 | 2-8 |
| Note 1: The reference channel applies to both the input signal under test and the interfering signal. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.1A.

### 8.3.2.1.3_D.4 Test description

#### 8.3.2.1.3_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.3.2.1.3_D.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.1.3_D.4.3.

#### 8.3.2.1.3_D.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.2.1.3_D.3-1, 8.3.2.1.3_D.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.1.3_D.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 (or 8) and another simultaneous transmission of DRS/PDSCH not for the test UE are sent on antenna port 8 (or 7). The DRS/PDSCH transmissions use two Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity specified in Table 8.3.2-1. CSI-RS are sent on antenna ports 15-18 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.3.2.1.3_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.2.1.3_D.4.3-1: Void**

**Table 8.3.2.1.3_D.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.3.2.1.3_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.2.1.3_D.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 3 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 4 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

8.3.2.1.3_D.5 Test requirement

Table 8.3.2.1.3_D.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3.4 for the throughput test shall meet or exceed the specified value in Table 8.3.2.1.3_D.5-1 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.2.1.3_D.5-1: Test requirement for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz 64QAM 1/2 | R.44 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 23 | 2-8 |
| Note 1: The reference channel applies to both the input signal under test and the interfering signal. | | | | | | | | |

### 8.3.2.1.4 TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model - Enhanced Performance Requirement Type A

#### 8.3.2.1.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4.

#### 8.3.2.1.4.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 11 and forward that support enhanced receiver Type A. Applicability requires support for FGI bit 103.

#### 8.3.2.1.4.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.3, with the addition of the relevant parameters in Tables 8.3.2-1, 8.3.2.1.4.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.2.1.4.3-2 for the specified SNR.

**Table 8.3.2.1.4.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 4 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 126 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 9 | N/A |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |
| Precoder update granularity | | PRB | 50 | 6 |
| PMI delay (Note 5) | | ms | 10 or 11 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 0000000000000000 0000000000000000 0000000000000000 1111111111111111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note8) | N/A |
| cqi-pmi-ConfigurationIndex | | | 4 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}$´ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

| | |
|---|---|
| Note 4: | The precoder in clause B.4.3 follows UE recommended PMI. |
| Note 5: | If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). |
| Note 6: | These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. |
| Note 7: | All cells are time-synchronous. |
| Note 8: | To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3. |

**Table 8.3.2.1.4.3-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.48 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 4x2 Low | 70 | -1.0 | 1-8 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | |
| Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.1B.

### 8.3.2.1.4.4 Test description

#### 8.3.2.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.49.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.3.2.1.4.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.1.4.4.3.

#### 8.3.2.1.4.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.2.1.4.5-1, 8.3.2.1.4.5-2. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink

scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #4 and #9 (Table A.2.3.1.1-1).

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.1.4.5-2 as appropriate.
BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/PDSCH for the test UE are sent on antenna port 7 (or 8) using four Tx antennas with beam-forming model as specified in Annex B.4.3 and precoder update granularity specified in Table 8.3.2.1.4.5-1. CSI-RS are sent on antenna ports 15-18 using four Tx antennas with mapping according to beam-forming model as specified in Annex B.4. 3.

3. Set the Cell2 –aggressor cell- as defined in Tables 8.3.2.1.4.5-1, 8.3.2.1.4.5-2 and according to Annex B.5.4.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.3.2.1.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.2.1.4.4.3-1: *Void***

**Table 8.3.2.1.4.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 000000000000000000<br>000000000000000000<br>000000000000111111<br>1111111111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.2.1.4.4.3-3: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.2.1.4.4.3-4: *CQI-ReportPeriodic-r10***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-2AC CQI-ReportPeriodic-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 4 | TDD | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex | 484 | TDD | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |

**Table 8.3.2.1.4.4.3-5: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT using condition CQI_PERIODIC | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 8.3.2.1.4.4.3-6: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

### 8.3.2.1.4.5 Test requirement

Table 8.3.2.1.4.5-1 defines the primary level settings.

**Table 8.3.2.1.4.5-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 4 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.45 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 126 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 9 | N/A |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |
| Precoder update granularity | | PRB | 50 | 6 |
| PMI delay (Note 5) | | ms | 10 or 11 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 0000000000000000 0000000000000000 0000000000000000 1111111111111111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note8) | N/A |
| cqi-pmi-ConfigurationIndex | | | 4 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}$´ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

| | |
|---|---|
| Note 4: | The precoder in clause B.4.3 follows UE recommended PMI. |
| Note 5: | If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). |
| Note 6: | These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. |
| Note 7: | All cells are time-synchronous. |
| Note 8: | To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3. |

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3.4 for the throughput test shall meet or exceed the specified value in Table 8.3.2.1.4.5-2 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.2.1.4.5-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.48 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 4x2 Low | 70 | -0.02 | 1-8 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | |
| Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | |

### 8.3.2.1.5 TDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model - Enhanced Performance Requirement Type B

#### 8.3.2.1.5.1 Test purpose

The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 9 interference model defined in clause B.6.4.

#### 8.3.2.1.5.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward that support enhanced performance requirement Type B. Applicability requires support for FGI bit 103.

#### 8.3.2.1.5.3 Minimum conformance requirements

The requirements are specified in Table 8.3.2.1.5-2, with the addition of the parameters in Table 8.3.2.1.5.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.3.2.1.5.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.3.2.1.5.3-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with TM9 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 | 0 |
| | σ | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | 3 |
| CFI indicated in PCFICH in normal subframes | | | 3 | 3 | 3 |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | 2 |
| CFI indicated in PCFICH in special subframes | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 9 | 9 | 9 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI reference signals | | | Antenna ports 15, 16, 17, 18 | Antenna ports 15, 16 | Antenna ports 15, 16 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 10 / 4 | 10 / 4 | 10 / 4 |
| CSI reference signal configuration | | | 5 | 6 | 7 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ /*ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 9 / 1000000000000000 | 9 / 0100000000000000 | 9 / 0010000000000000 |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: CSI-RS configurations are according to TS 36.211 [8] subclause 6.10.5.2.
Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of [5].

**Table 8.3.2.1.5.3-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration | | | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.69 TDD | OP.1 TDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 4x2 Low | 2x2 Low | 2x2 Low | 85 | 18.0 | ≥1 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.1.D.

### 8.3.2.1.5.4 Test description

#### 8.3.2.1.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.3.2.1.5.3-2, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.88.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.2-1 and 8.3.2.1.5.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.1.5.4.3.

#### 8.3.2.1.5.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.2.1.5.5-1 and 8.3.2.1.5.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 and cell 3 according to table 8.3.2.1.5.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.3.2.1.5.5-2 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 or 8 using four Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity as specified in Table 8.3.2.1.5.5-1. CSI-RS are sent on antenna ports 15-18 using four Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.

5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

#### 8.3.2.1.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m) with the following exceptions.

**Table 8.3.2.1.5.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.3.2.1.5.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

**Table 8.3.2.1.5.4.3-3: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 5 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 10 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}} - 5$ when CSI-RS SubframeConfig is from 5-14; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 1000000000000000 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 9 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

### 8.3.2.1.5.5 Test requirement

Table 8.3.2.1.5.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for throughput test shall meet or exceed the specified value in Table 8.3.2.1.5.5-2 for the specified SNR including test tolerances.

**Table 8.3.2.1.5.5-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with TM9 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 | 0 |
| | $\sigma$ | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 14.71 | 4.14 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | 3 |
| CFI indicated in PCFICH in normal subframes | | | 3 | 3 | 3 |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | 2 |
| CFI indicated in PCFICH in special subframes | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 9 | 9 | 9 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI reference signals | | | Antenna ports 15, 16, 17, 18 | Antenna ports 15, 16 | Antenna ports 15, 16 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 10 / 4 | 10 / 4 | 10 / 4 |
| CSI reference signal configuration | | | 5 | 6 | 7 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ /*ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 9 / 1000000000000000 | 9 / 0100000000000000 | 9 / 0010000000000000 |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: CSI-RS configurations are according to TS 36.211 [8] subclause 6.10.5.2.
Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of [5].

**Table 8.3.2.1.5.5-2: Test Requirement for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration | | | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.69 TDD | OP.1 TDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 4x2 Low | 2x2 Low | 2x2 Low | 85 | 19.85 | ≥1 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | | | |

## 8.3.2.1.6 TDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with CRS Interference Model - Enhanced Performance Requirement Type B

### 8.3.2.1.6.1 Test purpose

The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by the CRS of the interfering cell, applying the CRS interference model defined in clause B.6.5.

### 8.3.2.1.6.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward UE of Category 2 or higher that support enhanced performance requirement Type B.

### 8.3.2.1.6.3 Minimum conformance requirements

The requirements are specified in Table 8.3.2.1.6.3-2, with the addition of the parameters in Table 8.3.2.1.6.3-1 and the downlink physical channel setup according to Annex C.3.2. In 8.3.2.1.6.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.3.2.1.6.3-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with CRS interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (NOTE 1) | 0 | 0 |
| | σ | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s/N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | 3 |
| CFI indicated in PCFICH in normal subframes | | | 3 | 3 | 3 |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | 2 |
| CFI indicated in PCFICH in special subframes | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 8 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.6.5 | As specified in clause B.6.5 |
| Precoding | | | Random wideband precoding per TTI | N/A | N/A |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (NOTE 3) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

NOTE 1: $P_B = 1$
NOTE 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
NOTE 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of [5].

**Table 8.3.2.1.6.3-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with CRS interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (NOTE 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (NOTE 2) | |
| 1 | R.71 TDD | OP.1 TDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 14.0 | ≥2 |

NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
NOTE 2: SNR corresponds to $\hat{E}_s/N_{oc}$ of Cell 1 as defined in clause 8.1.1.
NOTE 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.1.E.

#### 8.3.2.1.6.4 Test description

##### 8.3.2.1.6.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.3.2.1.6.3-2, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.3.2.1.6.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.1.7.4.3.

##### 8.3.2.1.6.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2B for C_RNTI to transmit the DL RMC according to Tables 8.3.2.1.7.5-1 and 8.3.2.1.7.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 and cell 3 according to table 8.3.2.1.6.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.3.2.1.6.5-2 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 or 8 using two Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity as specified in Table 8.3.2.1.6.5-1.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.
5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

##### 8.3.2.1.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m) with the following exceptions.

**Table 8.3.2.1.6.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::=<br>SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.3.2.1.6.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | Tm8-v920 | | |
| codebookSubsetRestriction-r10 | Not present | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

8.3.2.1.6.5 Test requirement

Table 8.3.2.1.6.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for throughput test shall meet or exceed the specified value in Table 8.3.2.1.6.5-2 for the specified SNR including test tolerances.

**Table 8.3.2.1.6.5-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with CRS interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (NOTE 1) | 0 | 0 |
| | σ | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.71 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | 3 |
| CFI indicated in PCFICH in normal subframes | | | 3 | 3 | 3 |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | 2 |
| CFI indicated in PCFICH in special subframes | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 8 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.6.5 | As specified in clause B.6.5 |
| Precoding | | | Random wideband precoding per TTI | N/A | N/A |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (NOTE 3) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

NOTE 1: $P_B = 1$

NOTE 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

NOTE 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of [5].

**Table 8.3.2.1.6.5-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with CRS interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (NOTE 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (NOTE 2) | |
| 1 | R.71 TDD | OP.1 TDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 14.9 | ≥2 |
| NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | |
| NOTE 2: SNR corresponds to $\widehat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| NOTE 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. | | | | | | | | | | | |

## 8.3.2.1.7 TDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM3 Interference Model - Enhanced Performance Requirement Type B

### 8.3.2.1.7.1 Test purpose

The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 3 interference model defined in clause B.6.2. In Table 8.3.2.1.7.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells.

### 8.3.2.1.7.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward that support enhanced performance requirement Type B.

### 8.3.2.1.7.3 Minimum conformance requirements

The requirements are specified in Table 8.3.2.1.7.3-2, with the addition of the parameters in Table 8.3.2.1.7.3-1 and the downlink physical channel setup according to Annex C.3.2. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.3.2.1.7.3-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with TM3 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 | -3 | -3 |
| | $\rho_B$ | dB | 0 (Note 1) | -3 | -3 |
| | $\sigma$ | dB | -3 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 3.28 | 0.74 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | 3 |
| CFI indicated in PCFICH in normal subframes | | | 3 | Random from set {1,2,3} | Random from set {1,2,3} |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | 2 |
| CFI indicated in PCFICH in special subframes | | | 2 | Random from set {1,2} | Random from set {1,2} |
| PDSCH transmission mode | | | 8 | 3 | 3 |
| Interference model | | | N/A | As specified in clause B.6.2 | As specified in clause B.6.2 |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.2 | As specified in clause B.6.2 |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: CSI-RS configurations are according to TS 36.211 [8] subclause 6.10.5.2.
Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of 36.331 [5].

**Table 8.3.2.1.7.3-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM3 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.70 TDD | OP.1 TDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 11.3 | ≥1 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1.
Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.1.F.

#### 8.3.2.1.7.4 Test description

##### 8.3.2.1.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.3.2.1.5.3-2, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.3.2.1.7.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.1.7.4.3.

##### 8.3.2.1.7.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2B for C_RNTI to transmit the DL RMC according to Tables 8.3.2.1.7.5-1 and 8.3.2.1.7.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sets up parameters for cell 2 and cell 3 according to table 8.3.2.1.7.5-1 as appropriate. The CFIs indicated in PCFICH are randomly selected per TTI.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.3.2.1.7.5-2 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 or 8 using two Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity as specified in Table 8.3.2.1.7.5-1.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.
5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

##### 8.3.2.1.7.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m) with the following exceptions.

**Table 8.3.2.1.7.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.3.2.1.7.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | Tm8-v920 | | |
| codebookSubsetRestriction-r10 | Not present | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

### 8.3.2.1.7.5 Test requirement

Table 8.3.2.1.7.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for throughput test shall meet or exceed the specified value in Table 8.3.2.1.7.5-2 for the specified SNR including test tolerances.

**Table 8.3.2.1.7.5-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with TM3 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 | -3 | -3 |
| | $\rho_B$ | dB | 0 (Note 1) | -3 | -3 |
| | $\sigma$ | dB | -3 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 4.08 | 1.54 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | 3 |
| CFI indicated in PCFICH in normal subframes | | | 3 | Random from set {1,2,3} | Random from set {1,2,3} |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | 2 |
| CFI indicated in PCFICH in special subframes | | | | Random from set {1,2} | Random from set {1,2} |
| PDSCH transmission mode | | | 8 | 3 | 3 |
| Interference model | | | N/A | As specified in clause B.6.2 | As specified in clause B.6.2 |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.2 | As specified in clause B.6.2 |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: $P_B = 1$
Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
Note 3: CSI-RS configurations are according to TS 36.211 [8] subclause 6.10.5.2.
Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of 36.331 [5].

**Table 8.3.2.1.7.5-2: Test Requirement for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM3 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.70 TDD | OP.1 TDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 2x2 Low | 85 | 12.84 | ≥1 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1.
Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

### 8.3.2.1.8 TDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM10 serving cell configuration and TM9 interference model - Enhanced Performance Requirement Type B

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- Information in Annex F is TBD

- Test Tolerances are undefined

#### 8.3.2.1.8.1 Test purpose

The purpose of this test is to verify closed loop rank one performance of the UE on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission configured with TM10 in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 9 interference model defined in clause B6.4.

#### 8.3.2.1.8.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward that support enhanced performance requirement Type B and PDSCH Transmission mode 10.

#### 8.3.2.1.8.3 Minimum conformance requirements

The requirements are specified in Table 8.3.2.1.8.3-2, with the addition of the parameters in Table 8.3.2.1.8.3-1 and the downlink physical channel setup according to Annex C.3.2.

The NAICS network assistance is provided when the serving cell TM10 is configured with QCL-type A and PCID based DM-RS scrambling. The neighbouring cells have transmission mode TM9 and NeighCellsInfo-r12 for interfering cell indicates presence of TM9. In Table 8.3.2.1.8.3-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

**Table 8.3.2.1.8.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM10 serving cell configuration and TM9 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 | 0 |
| | σ | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | 3 |
| CFI indicated in PCFICH in normal subframes | | | 3 | 3 | 3 |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | 2 |
| CFI indicated in PCFICH in special subframes | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 10 | 9 | 9 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI reference signals | | | Antenna ports 15, 16, 17, 18 | Antenna ports 15, 16 | Antenna ports 15, 16 |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | Subframes | 10 / 4 | 10 / 4 | 10 / 4 |
| CSI reference signal configuration | | | 5 | 6 | 7 |
| Zero-power CSI-RS configuration $I_{CSI\text{-}RS}$ /*ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 9 / 1000000000000000 | 9 / 0100000000000000 | 9 / 0010000000000000 |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: $P_B = 1$

Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 3: CSI-RS configurations are according to TS 36.211 [8] subclause 6.10.5.2.

Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS 36.331 [5].

**Table 8.3.2.1.8.3-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM10 serving cell configuration and TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration | | | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.69 TDD | OP.1 TDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 4x2 Low | 2x2 Low | 2x2 Low | 85 | 18.0 | ≥1 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | | | |

The normative reference for these requirements is TS 36.101 [2] clause 8.3.2.1G

### 8.3.2.1.8.4 Test description

#### 8.3.2.1.8.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.3.2.1.8.3-2, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.88.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.2-1 and 8.3.2.1.8.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.1.8.4.3.

#### 8.3.2.1.8.4.2 Test procedure

1 SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.2.1.8.5-1 and 8.3.2.1.8.5-2. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sets up parameters for cell 2 and cell 3 according to table 8.3.2.1.8.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.3.2.1.8.5-2 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 or 8 using four Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity as specified in Table 8.3.2.1.8.5-1. CSI-RS are sent on antenna ports 15-18 using four Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.

5. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

#### 8.3.2.1.8.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and clause 5.2A.6.2 with the condition SRB2-DRB_NAICS(n,m) with the following exceptions.

**Table 8.3.2.1.8.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.3.2.1.8.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

**Table 8.3.2.1.8.4.3-3: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 5 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 10 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}} - 5$ when CSI-RS SubframeConfig is from 5-14; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 1000000000000000 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 9 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

8.3.2.1.8.5 Test requirement

Table 8.3.2.1.8.5-1defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.3.2.1.8.5-2 for the specified SNR including test tolerances.

**Table 8.3.2.1.8.5-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM10 serving cell configuration and TM9 interference model**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink Configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 | 0 |
| | σ | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91+TT | 3.34+TT |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Number of control OFDM symbols in normal subframes | | | 3 | 3 | 3 |
| CFI indicated in PCFICH in normal subframes | | | 3 | 3 | 3 |
| Number of control OFDM symbols in special subframes | | | 2 | 2 | 2 |
| CFI indicated in PCFICH in special subframes | | | 2 | 2 | 2 |
| PDSCH transmission mode | | | 10 | 9 | 9 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| Precoding | | | Random wideband precoding per TTI | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI reference signals | | | Antenna ports 15, 16, 17, 18 | Antenna ports 15, 16 | Antenna ports 15, 16 |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | Subframes | 10 / 4 | 10 / 4 | 10 / 4 |
| CSI reference signal configuration | | | 5 | 6 | 7 |
| Zero-power CSI-RS configuration $I_{CSI\text{-}RS}$ /*ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 9 / 1000000000000000 | 9 / 0100000000000000 | 9 / 0010000000000000 |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| MBSFN | | | Not configured | Not configured | Not configured |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: $P_B = 1$

Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 3: CSI-RS configurations are according to TS 36.211 [8] subclause 6.10.5.2.

Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS 36.331 [5].

**Table 8.3.2.1.8.5-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM10 serving cell configuration and TM9 interference model**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions | | | Correlation Matrix and Antenna Configuration | | | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | Fraction of Maximum Throughput (%) | SNR (dB) (Note 2) | |
| 1 | R.69 TDD | OP.1 TDD | N/A | N/A | EPA5 | EPA5 | EPA5 | 4x2 Low | 2x2 Low | 2x2 Low | 85 | 18.0+TT | ≥1 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | | | |

8.3.2.1.9

## 8.3.2.1.10 TDD PDSCH Single-layer Spatial Multiplexing for FD-MIMO

### 8.3.2.1.10.1 Test purpose

The purpose of this test is to verify rank-1 performance on antenna port 11 with a simultaneous transmission on the antenna port 7, 8 or 13 with DMRS enhancement table and 4 orthogonal DMRS ports.

### 8.3.2.1.10.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 13 and forward. Applicability requires support for FGI bit 103 and dmrs-Enhancements-r13.

### 8.3.2.1.10.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.3.4, with the addition of the relevant parameters in Tables 8.3.2-1, 8.3.2.1.10.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.2.1.10.3-2 for the specified SNR.

**Table 8.3.2.1.10.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations with Enhanced DMRS table**

| parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | -3 |
| Beamforming model | | | Annex B.4.1A |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | Subframes | 5 / 4 |
| CSI reference signal configuration | | | 3 |
| Zero-power CSI-RS configuration $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 4 / 0010000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 4) |
| Number of allocated resource blocks (Note 2) | | PRB | 50 |
| Simultaneous transmission | | | Yes (Note 3, 5) |
| dmrs-Enhancements-r13 | | | Enable |
| PDSCH transmission mode | | | 9 |

Note 1: $P_B = 1$.

Note 2: The modulation symbols of the signal under test are mapped onto antenna port 11.

Note 3: Modulation symbols of an interference signal are random mapped onto one antenna port among antenna port 7, 8 and 13. The update granularity for randomized mapping antenna port is 1 PRG in frequency domain and 1ms in time domain.

Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 5: The two UEs' scrambling identities $n_{\text{SCID}}$ are set to 0 with OCC =4.

**Table 8.3.2.1.10.3-2: Minimum performance for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations with Enhanced DMRS table**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 64QAM 1/2 | R.44 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 22.1 | ≥2 |

Note 1: The reference channel applies to both the input signal under test and the interfering signal.

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.1I

#### 8.3.2.1.10.4 Test description

##### 8.3.2.1.10.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.3.2.1.10.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.1.10.4.3.

##### 8.3.2.1.10.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.2.1.10.3-1, 8.3.2.1.10.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.1.10.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/PDSCH for the test UE are sent on antenna port 11 and another simultaneous transmission of DRS/PDSCH not for the test UE are sent on antenna port 7, 8 or 13. The DRS/PDSCH transmissions use two Tx antennas with beam-forming model as specified in Annex B.4.1A and precoder update granularity specified in Table 8.3.2-1. CSI-RS are sent on antenna ports 15-18 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1A.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 in Annex G clause G.3.

##### 8.3.2.1.10.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.2.1.10.4.3-1: *Void***

**Table 8.3.2.1.10.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| AntennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| PDSCH-ConfigDedicated-v1310 SEQUENCE { | | | |
| dmrs-ConfigPDSCH-v1310 | DMRS-Config-v1310 | | |
| DMRS-Config-v1310 SEQUENCE { | | | |
| dmrs-tableAlt-r13 | true | | |
| } | | | |
| } | | | |

**Table 8.3.2.1.10.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| } | | | |
| release | NULL | | |
| } | | | |

**Table 8.3.2.1.10.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 3 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 0010000000000000 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 4 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

8.3.2.1.10.5 Test requirement

Table 8.3.2.1.10.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3.4 for the throughput test shall meet or exceed the specified value in Table 8.3.2.1.10.5-1 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.2.1.10.5-1: Minimum performance for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations with Enhanced DMRS table**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 64QAM 1/2 | R.44 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 23 | ≥2 |
| Note 1: The reference channel applies to both the input signal under test and the interfering signal. | | | | | | | | |

## 8.3.2.2 TDD PDSCH Dual-layer Spatial Multiplexing Performance (UE-Specific Reference Symbols)

### 8.3.2.2.1 TDD PDSCH Dual-layer Spatial Multiplexing

#### 8.3.2.2.1.1 Test purpose

To verify the UE's rank-2 performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for dual-layer transmission on antenna ports 7 and 8 using DM-RS with full RB allocation.

#### 8.3.2.2.1.2 Test applicability

This test applies to Release 9 UEs that support enhanced Dual Layer TDD (TM8) and all types of E-UTRA TDD UE release 10 and forward.

#### 8.3.2.2.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.3.2, with the addition of the relevant parameters in Tables 8.3.2-1, 8.3.2.2.1.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.3.2.2.1.3-2 for the specified SNR.

**Table 8.3.2.2.1.3-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer)**

| Parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 (Note 1) |
| | σ | dB | -3 | -3 |
| Cell-specific reference symbols | | | Antenna port 0 and antenna port 1 | |
| Beamforming model | | | Annex B.4.2 | |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) | OCNG (Note 2) |
| Number of allocated resource blocks | | PRB | 50 | 50 |
| PDSCH transmission mode | | | 8 | 8 |
| Note 1: $P_B = 1$<br>Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | | |

**Table 8.3.2.2.1.3-2: Minimum performance for CDM-multiplexed DM RS (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz QPSK 1/3 | R.31 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | 4.5 | ≥2 |
| 2 | 10 MHz 16QAM 1/2 | R.32 TDD | OP.1 TDD | EPA5 | 2x2 Medium | 70 | 21.7 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.

### 8.3.2.2.1.4 Test description

#### 8.3.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.3.2.2.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.2.1.4.3.

#### 8.3.2.2.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2B for C_RNTI to transmit the DL RMC according to Tables 8.3.2.2.1.3-1, 8.3.2.2.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.2.1.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/Dedicated data for test UE are sent on antenna ports 7 and 8 using two Tx antennas with beam-forming model as specified in Annex B.4.2 and precoder update granularity specified in Table 8.3.2-1.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
4. Repeat steps from 1 to 3 for each test interval in Tables 8.3.2.2.1.5-1 as appropriate.

#### 8.3.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.3.2.2.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm8-v920 | | |
| } | | | |
| } | | | |
| Extension ::= SEQUENCE { | | | |
| antennaInfo-v920 ::= SEQUENCE{ | | | |
| codebookSubsetRestriction-v920 CHOICE { | | | |
| n2TxAntenna-tm8-r9 | 111111 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.3.2.2.1.5 Test requirement

Table 8.3.2.2.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3.2 for each throughput test shall meet or exceed the specified value in Table 8.3.2.2.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.3.2.2.1.5-1: Test requirement for CDM-multiplexed DM RS (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz QPSK 1/3 | R.31 TDD | OP.1 TDD | EVA5 | 2x2 Low | 70 | 5.4 | ≥2 |
| 2 | 10 MHz 16QAM 1/2 | R.32 TDD | OP.1 TDD | EPA5 | 2x2 Medium | 70 | 22.6 | ≥2 |

## 8.3.2.2.1_D TDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO

### 8.3.2.2.1_D.1 Test purpose

To verify the UE's rank-2 performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for dual-layer transmission on antenna ports 7 and 8 using DM-RS with full RB allocation with multiple CSI reference symbol configurations with non-zero and zero transmission power.

### 8.3.2.2.1_D.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10Applicability requires support for FGI bit 103.

### 8.3.2.2.1_D.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.3.2-1, 8.3.2.2.1_D.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.2.2.1_D.3-2 for the specified SNR.

**Table 8.3.2.2.1_D.3-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations**

| parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | -3 |
| Cell-specific reference signals | | | Antenna ports 0 and 1 |
| CSI reference signals | | | Antenna ports 15,16 |
| Beamforming model | | | Annex B.4.2 |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ /$\Delta_{CSI\text{-}RS}$ | | Subframes | 5 / 4 |
| CSI reference signal configuration | | | 8 |
| Zero-power CSI-RS configuration $I_{CSI\text{-}RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 4 / 0010000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Number of allocated resource blocks (Note 2) | | PRB | 50 |
| Simultaneous transmission | | | No |
| PDSCH transmission mode | | | 9 |
| Note 1: $P_B = 1$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |

**Table 8.3.2.2.1_D.3-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.51 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 14.5 | 2-8 |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.3.

### 8.3.2.2.1_D.4 Test description

#### 8.3.2.2.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.3.2.2.1_D.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.2.1_D.4.3.

### 8.3.2.2.1_D.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.2.2.1_D.3-1, 8.3.2.2.1_D.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.2.1_D.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 and 8 using two Tx antennas with beam-forming model as specified in Annex B.4.2 and precoder update granularity specified in Table 8.3.2-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.2.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

### 8.3.2.2.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.2.2.1_D.4.3-1: *Void***

**Table 8.3.2.2.1_D.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.3.2.2.1_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.2.2.1_D.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 8 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 4 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

## 8.3.2.2.1_D.5 Test requirement

Table 8.3.2.2.1_D.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3.3 for the throughput test shall meet or exceed the specified value in Table 8.3.2.2.1_D.5-1 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.2.2.1_D.5-1: Test requirement for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.51 TDD | OP.1 TDD | EPA5 | 2x2 Low | 70 | 15.4 | 2-8 |

## 8.3.2.2.1_D_1 TDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO (Release 11 and forward)

### 8.3.2.2.1_D_1.1 Test purpose

To verify the UE's rank-2 performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for dual-layer transmission on antenna ports 7 and 8 using DM-RS with full RB allocation with multiple CSI reference symbol configurations with non-zero and zero transmission power, and to verify that the UE correctly estimate SNR.

### 8.3.2.2.1_D_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 11 and forward that support eDL-MIMO. Applicability requires support for FGI bit 103.

### 8.3.2.2.1_D_1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.3.2-1, 8.3.2.2.1_D_1.3-1 where Cell 1 is the serving cell and Cell 2 is the interfering cell. The downlink physical channel setup is set according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.2.2.1_D_1.3-2 for the specified SNR.

**Table 8.3.2.2.1_D_1.3-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| | | | Cell 1 | Cell 2 |
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| | PDSCH_RA | dB | 4 | NA |
| | PDSCH_RB | dB | 4 | NA |

| | | | |
|---|---|---|---|
| Cell-specific reference signals | | Antenna ports 0 and 1 | Antenna ports 0 and 1 |
| Cell ID | | 0 | 126 |
| CSI reference signals | | Antenna ports 15,16 | NA |
| Beamforming model | | Annex B.4.2 | NA |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | Subframes | 5 / 4 | NA |
| CSI reference signal configuration | | 8 | NA |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | Subframes / bitmap | 4 / 0010000000000000 | NA |
| $N_{oc}$ at antenna port | dBm/15kHz | -98 | -98 |
| $\hat{E}_s / N_{oc}$ | | Reference Value in Table 8.3.2.3-2 | Test specific, 7.25dB |
| Symbols for unused PRBs | | OCNG (Note 2) | NA |
| Number of allocated resource blocks (Note 2) | PRB | 50 | NA |
| Simultaneous transmission | | No | NA |
| PDSCH transmission mode | | 9 | Blanked |
| Note 1: $P_B = 1$<br>Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |

**Table 8.3.2.2.1_D_1.3-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | | Propagation Condition | | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.51 TDD | OP.1 TDD | N/A | ETU5 | ETU5 | 2x2 Low | 70 | 14.8 | ≥2 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.3.

### 8.3.2.2.1_D_1.4 Test description

#### 8.3.2.2.1_D_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.3.2.2.1_D_1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.2.1_D_1.4.3.

### 8.3.2.2.1_D_1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.3.2.2.1_D_1.3-1, 8.3.2.2.1_D_1.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of Cell 1 for the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.2.1_D.5-2 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 and 8 using two Tx antennas with beam-forming model as specified in Annex B.4.2 and precoder update granularity specified in Table 8.3.2-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.2.
3. Set Cell 2 as defined in Tables 8.3.2.2.1_D_1.5-1 and 8.3.2.2.1_D_1.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

### 8.3.2.2.1_D_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.2.2.1_D_1.4.3-1: *Void***

**Table 8.3.2.2.1_D_1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.3.2.2.1_D_1.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.2.2.1_D_1.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 8 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 4 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

### 8.3.2.2.1_D_1.5 Test requirement

Table 8.3.2.2.1_D_1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3.3 for the throughput test shall meet or exceed the specified value in Table 8.3.2.2.1_D_1.5-1 and 8.3.2.2.1_D_1.5-2 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.2.2.1_D_1.5-1: Test Requirement for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations**

| parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| | | | Cell 1 | Cell 2 |
| Downlink power allocation | $\rho_A$ | dB | 4 | 0 |
| | $\rho_B$ | dB | 4 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0 and 1 | Antenna ports 0 and 1 |
| Cell ID | | | 0 | 126 |
| CSI reference signals | | | Antenna ports 15,16 | NA |
| Beamforming model | | | Annex B.4.2 | NA |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 4 | NA |
| CSI reference signal configuration | | | 8 | NA |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 4 / 0010000000000000 | NA |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| $\widehat{E}_s / N_{oc}$ | | | Reference Value in Table 8.3.2.2.1_D_1.5-2 | 6.9dB |
| Symbols for unused PRBs | | | OCNG (Note 2) | NA |
| Number of allocated resource blocks (Note 2) | | PRB | 50 | NA |
| Simultaneous transmission | | | No | NA |
| PDSCH transmission mode | | | 9 | Blanked |

Note 1: $P_B = 1$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.3.2.2.1_D_1.5-2: Test requirement for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | | Propagation Condition | | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.51 TDD | OP.1 TDD | N/A | ETU5 | ETU5 | 2x2 Low | 70 | 15.6 | ≥2 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.
Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1.

## 8.3.2.2.2 TDD PDSCH Dual-layer Spatial Multiplexing – Enhanced Performance Requirement Type C

### 8.3.2.2.2.1 Test purpose

To verify the UE's rank-2 performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for dual-layer transmission on antenna ports 7 and 8 using DM-RS with full RB allocation.

### 8.3.2.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD release 12 and forward UE of Category 2 or higher that support enhanced receiver Type C

### 8.3.2.2.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.3.2, with the addition of the relevant parameters in Tables 8.3.2-1, 8.3.2.2.2.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.3.2.2.2.3-2 for the specified SNR.

**Table 8.3.2.2.2.3-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | -3 |
| Cell-specific reference symbols | | | Antenna port 0 and antenna port 1 |
| Beamforming model | | | Annex B.4.2 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Number of allocated resource blocks | | PRB | 50 |
| PDSCH transmission mode | | | 8 |
| Note 1: $P_B = 1$. | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |

**Table 8.3.2.2.2.3-2: Enhanced Performance Requirement Type C for CDM-multiplexed DM RS (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.32 TDD | OP.1 TDD | EPA5 | 2x2 Medium | 70 | 17.0 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.2A.

### 8.3.2.2.2.4 Test description

#### 8.3.2.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.3.2.2.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.2.2.4.3.

#### 8.3.2.2.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2B for C_RNTI to transmit the DL RMC according to Tables 8.3.2.2.2.3-1, 8.3.2.2.2.3-2. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.2.2.5-1 as appropriate.
BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/Dedicated data for test UE are sent on antenna ports 7 and 8 using two Tx antennas with beam-forming model as specified in Annex B.4.2 and precoder update granularity specified in Table 8.3.2-1.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

4. Repeat steps from 1 to 3 for each test interval in Tables 8.3.2.2.2.5-1 as appropriate.

#### 8.3.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.3.2.2.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm8-v920 | | |
| } | | | |
| } | | | |
| Extension ::= SEQUENCE { | | | |
| antennaInfo-v920 ::= SEQUENCE{ | | | |
| codebookSubsetRestriction-v920 CHOICE { | | | |
| n2TxAntenna-tm8-r9 | 111111 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.3.2.2.2.5 Test requirement

Table 8.3.2.2.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3.2 for each throughput test shall meet or exceed the specified value in Table 8.3.2.2.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.3.2.2.2.5-1: Test requirement for Enhanced Performance Requirement Type C for CDM-multiplexed DM RS (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.32 TDD | OP.1 TDD | EPA5 | 2x2 Medium | 70 | 17.9 | ≥2 |

## 8.3.2.3 Dual-Layer Spatial Multiplexing (with multiple CSI-RS configurations)

TBD

## 8.3.2.4 TDD PDSCH Performance with DCI format 2D and non Quasi Co-located Antenna Ports

### 8.3.2.4.1_F TDD PDSCH Performance with DCI format 2D, non Quasi Co-located Antenna Ports, Same Cell ID and single NZP CSI-RS resource for CoMP

#### 8.3.2.4.1_F.1 Test purpose

To verify the UE capability of supporting non quasi-collocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission points share the same Cell ID. In particular the test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the timing difference between two transmission points, channel parameters estimation and rate matching behaviour according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling.

#### 8.3.2.4.1_F.2 Test applicability

This test applies to E-UTRA TDD category ≥2 UE release 11 and forward, supporting Maximum CSI processes of One on a component carrier within a band with PDSCH transmission mode 10.

#### 8.3.2.4.1_F.3 Minimum conformance requirements

The requirements are specified in Table 8.3.2.4_F.3-3, with the addition of the parameters in Table 8.3.2.4_F.3-1 and Table 8.3.2.4_F.3-2. In table 8.3.2.4_F.3-1 transmission point 1 (TP1) is the serving cell and transmission point 2 (TP2) transmits PDSCH. The downlink physical channel setup for TP1 is according to Table C.3.4-1 and for TP2 according to Table C.3.4-2.

**Table 8.3.2.4.1_F.3-1: Test Parameters for quasi co-location type B: same Cell ID**

| Parameter | | Unit | TP 1 | TP 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | (Note 2) |
| CSI-RS 0 antenna ports | | | NA | Port {15,16} |
| *qcl-CSI-RS-ConfigNZPId-r11,* CSI-RS 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | NA | 5/4 |
| *qcl-CSI-RS-ConfigNZPId-r11,* CSI-RS 0 configuration | | | NA | 8 |
| *csi-RS-ConfigZPId-r11,* Zero-power CSI-RS 0 configuration $I_{CSI-RS}$ / *ZeroPower CSI-RS* bitmap | | | NA | 4/ 0000010000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| SNR | | dB | Reference point in Table 8.3.2.4_F.3-3 | Reference point in Table 8.3.2.4_F.3-3 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 0 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | Blanked | 10 |
| Number of allocated PRB | | PRB | NA | 50 |
| *qcl-Operation, '*PDSCH RE Mapping and Quasi-Co-Location Indicator' | | | Type B, '00' | |
| Time offset between TPs | | μs | NA | Reference point in Table 8.3.2.4_F.3-2 |
| Frequency error between TPs | | Hz | NA | 0 |
| Beamforming model | | | NA | Port 7 as specified in clause B.4.1 |
| Symbols for unused PRBs | | | NA | OCNG (Note 3) |

Note 1: $P_B = 1$

Note 2: REs for antenna ports 0 and 1 have zero transmission power.

Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.3.2.4.1_F.3-2: Configurations of PQI and DL transmission hypothesis for each PQI set**

| PQI set index | Parameters in each PQI set | | DL transmission hypothesis for each PQI Set | |
|---|---|---|---|---|
| | NZP CSI-RS Index (For quasi co-location) | ZP CSI-RS configuration | TP 1 | TP 2 |
| PQI set 0 | CSI-RS 0 | ZP CSI-RS 0 | Blanked | PDSCH |

**Table 8.3.2.4.1_F.3-3: Minimum performance for quasi co-location type B: same Cell ID**

| Test Number | Reference Channel | OGCN pattern | | Time offset between TPs (μs) | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | TP1 | TP2 | | TP1 | TP2 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 3) | |
| 1 | R.52 TDD | NA | OP.1 TDD | 2 | EPA5 | EPA5 | 2x2 Low | 70 | 12 | ≥2 |
| 2 | R.52 TDD | NA | OP.1 TDD | -0.5 | EPA5 | EPA5 | 2x2 Low | 70 | 12.4 | ≥2 |
| Note 1: The propagation conditions for TP1 and TP2 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for TP1 and TP2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of TP2. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.4.1.

### 8.3.2.4.1_F.4 Test description

#### 8.3.2.4.1_F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the TP 1 and TP 2 are set up according to table 8.3.1-1, table 8.3.2.4.1_F.3-1 and 8.3.2.4.1_F.3-2 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.4.1_F.4.3.

#### 8.3.2.4.1_F.4.2 Test procedure

1. SS transmits PDCCH on TP 1. PQI set and PDSCH transmission hypothesis in PDCCH format 2D are configured according to Table 8.3.2.4.1_F.3-2.
2. SS transmits PDSCH on TP 1 and TP 2 via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to Table 8.3.2.4.1_F.3-3. The SS sends downlink MAC padding bits on the DL RMC.
3. Set the parameters of the reference channel, timing offset (TP 2 timing - TP 1 timing), the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.4.1_F.3-3 Test 1 as appropriate.

4. Wait for at least 1 second before measuring throughput.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

6. Repeat steps 1 to 4 for Test 2 in Table 8.3.2.4.1_F.3-3.

8.3.2.4.1_F.4.3 Message contents

**Table 8.3.2.4.1_F.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| pdsch-ConfigDedicated | PDSCH-ConfigDedicated-DEFAULT | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-ConfigNZPToAddModList-r11 | CSI-RS-ConfigNZP-r11-DEFAULT | | |
| csi-RS-ConfigZPToAddModList-r11 | CSI-RS-ConfigZP-r11-DEFAULT | | |
| pdsch-ConfigDedicated-v1130 | PDSCH-ConfigDedicated-v1130-DEFAULT | | |
| } | | | |

**Table 8.3.2.4.1_F.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path:36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | 2TX |
| } | | | |

**Table 8.3.2.4.1_F.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.2.4.3_F.4.1-4: CSI-RS-ConfigNZP-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigNZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigNZPId-r11 | 1 | | |
| antennaPortsCount-r11 | an2 | | |
| resourceConfig-r11 | 0 | | |
| subframeConfig-r11 | 4 | | |
| scramblingIdentity-r11 | 0 | | |
| qcl-CRS-Info-r11 SEQUENCE { | | | |
| qcl-ScramblingIdentity-r11 | 0 | | |
| crs-PortsCount-r11 | n2 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| } | | | |
| } | | | |

**Table 8.3.2.4.3_F.4.1-5: *CSI-RS-ConfigZP-r11-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11 | 1 | | |
| resourceConfigList-r11 | 0000010000000000 | | |
| subframeConfig-r11 | 4 | | |
| } | | | |

**Table 8.3.2.4.3_F.4.1-6: PDSCH-ConfigDedicated-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-v1130 ::= SEQUENCE { | | | |
| dmrs-ConfigPDSCH-r11 | DMRS-Config-r11-DEFAULT | | |
| qcl-Operation | typeB | | |
| re-MappingQCLConfigToAddModList-r11 SEQUENCE (SIZE (1..maxRE-MapQCL-r11)) OF SEQUENCE { | 1 entry | | |
| pdsch-RE-MappingQCL-ConfigId-r11[1] | 1 | | |
| optionalSetOfFields-r11[1] SEQUENCE { | | | |
| crs-PortsCount-r11 | n2 | | |
| crs-FreqShift-r11 | 0 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| pdsch-Start-r11 | 2 | | |
| } | | | |
| } | | | |
| } | | | |

### 8.3.2.4.1_F.5 Test requirement

Table 8.3.2.4.1_F.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3.2 for the throughput test shall meet or exceed the specified value in Table 8.3.2.4.1_F.5-1 for the specified SNR including test tolerances for the throughput test.

**Table 8.3.2.4.1_F.5-1: Minimum performance for quasi co-location type B: same Cell ID**

| Test Number | Reference Channel | OGCN pattern | | Time offset between TPs (Note 4) | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | TP1 | TP2 | | TP1 | TP2 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 3) | |
| 1 | R.52 TDD | NA | OP.1 TDD | 57Ts | EPA5 | EPA5 | 2x2 Low | 70 | 12.9 | 2-8 |
| 2 | R.52 TDD | NA | OP.1 TDD | -11Ts | EPA5 | EPA5 | 2x2 Low | 70 | 13.3 | 2-8 |

Note 1: The propagation conditions for TP1 and TP2 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for TP1 and TP2.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of TP2.
Note 4: Timing offset in units of Ts: $T_S$ = 1/(15000 x 2048) seconds, the basic timing unit defined in TS 36.211 [8].

## 8.3.2.4.2_F TDD PDSCH Performance with DCI format 2D, non Quasi Co-located Antenna Ports, Same Cell ID and multiple NZP CSI-RS resources for CoMP

### 8.3.2.4.2_F.1 Test purpose

To verify the UE capability of supporting non quasi-collocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission points share the same Cell ID by verifying that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the timing difference between two transmission points, channel parameters estimation and rate matching behaviour according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling.

### 8.3.2.4.2_F.2 Test applicability

This test applies to all types of E-UTRA TDD category ≥2 UE release 11 and forward, supporting Maximum CSI processes of Three or Four on a component carrier within a band with PDSCH transmission mode 10.

### 8.3.2.4.2_F.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.3, with the addition of the relevant parameters in Tables 8.3.2-1, 8.3.2.4.2_F.3-1 and 8.3.2.4.2_F.3-2.

In table 8.3.2.4.2_F.3-1, transmission point 1 (TP 1) is the serving cell transmitting PDCCH, synchronization signals and PBCH, and transmission point 2 (TP 2) has same Cell ID as TP 1. Multiple NZP CSI-RS resources and ZP CSI-RS resources are configured. In each sub-frame, DL PDSCH transmission is dynamically switched between 2 TPs with multiple PDSCH RE Mapping and Quasi-Co-Location Indicator configuration (PQI). Configurations of PDSCH RE Mapping and Quasi-Co-Location Indicator and downlink transmission hypothesis are defined in Table 8.3.2.4.2_F.3-2. The downlink physical channel setup for TP 1 is according to Table C.3.4-1 and for TP 2 according to Table C.3.4-2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.2.4.2_F.3-3 for the specified SNR.

**Table 8.3.2.4.2_F.3-1: Test Parameters for timing offset compensation with DPS transmission**

| parameter | | Unit | TP 1 | TP 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |

| | | | |
|---|---|---|---|
| Beamforming model | | As specified in clause B.4.1 | As specified in clause B.4.1 |
| Cell-specific reference signals | | Antenna ports 0,1 | (Note 2) |
| CSI reference signals 0 | | Antenna ports {15,16} | N/A |
| CSI-RS 0 periodicity and subframe offset TCSI-RS / ΔCSI-RS | Subframes | 5 / 4 | N/A |
| CSI reference signal 0 configuration | | 0 | N/A |
| CSI reference signals 1 | | N/A | Antenna ports {15,16} |
| CSI-RS 1 periodicity and subframe offset TCSI-RS / ΔCSI-RS | Subframes | N/A | 5 / 4 |
| CSI reference signal 1 configuration | | N/A | 8 |
| Zero-power CSI-RS 0 configuration ICSI-RS / ZeroPower CSI-RS bitmap | Subframes /bitmap | 4/ 0010000000000000 | N/A |
| Zero-power CSI-RS1 configuration ICSI-RS / ZeroPower CSI-RS bitmapS | Subframes /bitmap | N/A | 4/ 0000010000000000 |
| $\hat{E}_s / N_{oc}$ | dB | Reference Value in Table 8.3.2.4.2_F.3-3 | Reference Value in Table 8.3.2.4.2_F.3-3 |
| $N_{oc}$ at antenna port | dBm/15kHz | -98 | -98 |
| BWChannel | MHz | 10 | 10 |
| Cyclic Prefix | | Normal | Normal |
| Cell Id | | 0 | 0 |
| Number of control OFDM symbols | | 2 | 2 |
| Timing offset between TPs | | N/A | Reference Value in Table 8.3.2.4.2-3 |
| Frequency offset between TPs | Hz | N/A | 0 |
| Number of allocated resource blocks | PRB | 50 | 50 |
| PDSCH transmission mode | | 10 | 10 |
| Probability of occurrence of PDSCH transmission(Note 3) | % | 30 | 70 |
| Symbols for unused PRBs | | OCNG (Note 4) | OCNG (Note 4) |

Note 1: $P_B = 1$.
Note 2: REs for antenna ports 0 and 1 have zero transmission power.
Note 3: PDSCH transmission from TPs shall be randomly determined independently for each subframe. Probabilities of occurrence of PDSCH transmission from TPs are specified.
Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.3.2.4.2_F.3-2: Configurations of PQI and DL transmission hypothesis for each PQI set**

| PQI set index | Parameters in each PQI set | | DL transmission hypothesis for each PQI Set | |
|---|---|---|---|---|
| | NZP CSI-RS Index (For quasi | ZP CSI-RS configuration | TP 1 | TP 2 |

| | co-location) | | | |
|---|---|---|---|---|
| PQI set 0 | CSI-RS 0 | ZP CSI-RS 0 | PDSCH | Blanked |
| PQI set 1 | CSI-RS 1 | ZP CSI-RS 1 | Blanked | PDSCH |

**Table 8.3.2.4.2_F.3-3: Minimum Requirements for timing offset compensation with DPS transmission**

| Test Number | Timing offset(us) | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | TP 1 | TP 2 | TP 1 | TP 2 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 3) | |
| 1 | 2 | R.53 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EPA5 | 2x2 Low | 70 | 12.3 | ≥2 |
| 2 | -0.5 | R.53 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EPA5 | 2x2 Low | 70 | 12.5 | ≥2 |
| Note 1: The propagation conditions for TP 1and TP 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of TP 1 and TP 2.<br>Note 3: SNR corresponds to $\widehat{E}_s / N_{oc}$ of both TP 1 and TP 2. | | | | | | | | | | |

The normative reference for these requirements is TS 36.101 [2] clause 8.3.2.4.2.

### 8.3.2.4.2_F.4 Test description

#### 8.3.2.4.2_F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the TP 1 and TP 2 are set up according to table 8.3.1-1, 8.3.2.4.2_F.3-1 and 8.3.2.4.2_F.3-2 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.1.3.2_F.4.3.

#### 8.3.2.4.2_F.4.2 Test procedure

1. SS transmits PDCCH on TP 1. PQI set and PDSCH transmission hypothesis in PDCCH format 2D are configured according to Table 8.3.2.4.2_F.3-2.
2. SS transmits PDSCH on TP 1 and TP 2 via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to Tables 8.3.2.4.2_F.3-1 and 8.3.2.4.2_F.3-2. The SS sends downlink MAC padding bits on the DL RMC. PDSCH transmission from TPs shall be randomly determined independently for each subframe. Probabilities of occurrence of PDSCH transmission from TPs are specified according to Table 8.3.2.4.2_F.3-1. The probability of occurrence of PQI set in each TP is equal.

3. Set the parameters of the reference channel, timing offset (TP 2 timing - TP 1 timing), the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.4.2_F.3-3 Test 1 as appropriate.

4. Wait for at least 1 second before measuring throughput.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

6. Repeat steps 1 to 4 for Test 2 in Table 8.3.2.4.2_F.3-3.

### 8.3.2.4.2_F.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.2.4.2_F.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| pdsch-ConfigDedicated | PDSCH-ConfigDedicated-DEFAULT | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-ConfigNZPToAddModList-r11 | CSI-RS-ConfigNZP-r11-DEFAULT | | |
| csi-RS-ConfigZPToAddModList-r11 | CSI-RS-ConfigZP-r11-DEFAULT | | |
| pdsch-ConfigDedicated-v1130 | PDSCH-ConfigDedicated-v1130-DEFAULT | | |
| } | | | |

**Table 8.3.2.4.2_F.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path:36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | 2TX |
| } | | | |

**Table 8.3.2.4.2_F.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.2.4.2_F.4.3-4: CSI-RS-ConfigNZP-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigNZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigNZPId-r11 | For NZP CSI-RS configuration (CSI reference signals 0 ) = 1 NZP CSI-RS configuration (CSI reference signals 1) = 2 | | |
| antennaPortsCount-r11 | an2 | | |
| resourceConfig-r11 | For NZP CSI-RS configuration (CSI reference signals 0 ) = 0 NZP CSI-RS configuration (CSI reference signals 1) = 8 | | |
| subframeConfig-r11 | 4 | | |
| scramblingIdentity-r11 | 0 | | |
| qcl-CRS-Info-r11 SEQUENCE { | | | |
| qcl-ScramblingIdentity-r11 | 0 | | |
| crs-PortsCount-r11 | n2 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| } | | | |
| } | | | |

**Table 8.3.2.4.2_F.4.3-5: *CSI-RS-ConfigZP-r11-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11 | 1 | | |
| resourceConfigList-r11 | For Zero-power CSI-RS 0 = 0010000000000000 For Zero-power CSI-RS 1 configuration = 0000010000000000 | Parameter: *ZeroPowerCSI-RS* | |
| subframeConfig-r11 | 4 | | |
| } | | | |

**Table 8.3.2.4.2_F.4.3-6: PDSCH-ConfigDedicated-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-v1130 ::= SEQUENCE { | | | |
| dmrs-ConfigPDSCH-r11 | DMRS-Config-r11-DEFAULT | | |
| qcl-Operation | typeB | | |
| re-MappingQCLConfigToAddModList-r11 SEQUENCE (SIZE (1..maxRE-MapQCL-r11)) OF SEQUENCE { | 2 entries | See Table 8.3.2.4.2_F.3-2 | |
| pdsch-RE-MappingQCL-ConfigId-r11[1] | 1 | Entry 1 | |
| optionalSetOfFields-r11[1] SEQUENCE { | | | |
| crs-PortsCount-r11 | n2 | | |
| crs-FreqShift-r11 | 0 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| pdsch-Start-r11 | 2 | | |
| } | | | |
| csi-RS-ConfigZPId-r11[1] | 1 | | |
| qcl-CSI-RS-ConfigNZPId-r11[1] | 1 | | |
| pdsch-RE-MappingQCL-ConfigId-r11[1] | 4 | Entry 2 | |
| optionalSetOfFields-r11[1] SEQUENCE { | | | |
| crs-PortsCount-r11 | n2 | | |
| crs-FreqShift-r11 | 0 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| pdsch-Start-r11 | 2 | | |
| } | | | |
| csi-RS-ConfigZPId-r11[1] | 2 | | |
| qcl-CSI-RS-ConfigNZPId-r11[1] | 2 | | |
| } | | | |
| } | | | |

## 8.3.2.4.2_F.5 Test requirements

Table 8.3.2.4.2_F.3-1 and 8.3.2.4.2_F.3-2 defines the primary level setting.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for each throughput test shall meet or exceed the specified value in Table 8.3.2.4.2_F.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.3.2.4.2_F.5-1: Test Requirements for timing offset compensation with DPS transmission**

| Test Number | Timing offset (Note 4) | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | TP 1 | TP 2 | TP 1 | TP 2 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 3) | |
| 1 | 57Ts | R.53 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EPA5 | 2x2 Low | 70 | 13.2 | 2-8 |
| 2 | 11Ts | R.53 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EPA5 | 2x2 Low | 70 | 13.4 | 2-8 |
| Note 1: The propagation conditions for TP1and TP2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of TP1 and TP2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of both TP 1 and TP 2.<br>Note 4: Timing offset in units of Ts: $T_S$ = 1/(15000 x 2048) seconds, the basic timing unit defined in TS 36.211 [8]. | | | | | | | | | | |

## 8.3.2.4.3_F TDD PDSCH Performance with DCI format 2D, non Quasi Co-located Antenna Ports, Different Cell ID, Colliding CRS and single NZP CSI-RS resource for CoMP

### 8.3.2.4.3_F.1 Test purpose

To verify the UE capability of supporting non quasi-collocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission points have different Cell ID and colliding CRS by verifying that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the frequency difference between two transmission points, channel parameters estimation and rate matching behaviour according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling.

### 8.3.2.4.3_F.2 Test applicability

This test applies to all types of E-UTRA TDD category ≥2 UE release 11 and forward, supporting Maximum CSI processes of One, Three or Four on a component carrier within a band with PDSCH transmission mode 10.

### 8.3.2.4.3_F.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.3, with the addition of the relevant parameters in Tables 8.3.2-1 and 8.3.2.4.3_F.3-1.

In table 8.3.2.4.3_F.3-1, transmission point 1 (TP 1) is the serving cell transmitting PDCCH, synchronization signals and PBCH, and transmission point 2 (TP 2) transmit PDSCH with different Cell ID. The downlink physical channel setup for TP 1 is according to Table C.3.4-1 and for TP 2 according to Table C.3.4-2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.2.4.3_F.3-2 for the specified SNR.

**Table 8.3.2.4.3_F.3-1: Test Parameters for quasi co-location type B with different Cell ID and Colliding CRS**

| parameter | | Unit | TP1 | TP2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Beamforming model | | | N/A | As specified in clause B.4.2 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals 0 | | | N/A | Antenna ports {15,16} |
| CSI-RS 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | N/A | 5 / 4 |
| CSI reference signal 0 configuration | | | N/A | 0 |
| Zero-power CSI-RS 0 configuration $I_{CSI-RS}$ / *ZeroPower CSI-RS* bitmap | | Subframes /bitmap | N/A | 4/ 0010000000000000 |
| $\widehat{E}_s / N_{oc}$ | | dB | Reference point in Table 8.3.2.4.3_F.3-2 + 4dB | Reference Value in Table 8.3.2.4.3_F.3-2 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 126 |
| Number of control OFDM symbols | | | 1 | 2 |
| Timing offset between TPs | | us | N/A | 0 |
| Frequency offset between TPs | | Hz | N/A | 200 |
| *qcl-Operation,* 'PDSCH RE Mapping and Quasi-Co-Location Indicator' | | | Type B, '00' | |
| PDSCH transmission mode | | | Blank | 10 |
| Number of allocated resource block | | | N/A | 50 |
| Symbols for unused PRBs | | | N/A | OCNG(Note 2) |

Note 1: $P_B = 1$.
Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.3.2.4.3_F.3-2: Performance Requirements for quasi co-location type B with different Cell ID and Colliding CRS**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | TP 1 | TP 2 | TP 1 | TP 2 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 3) | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | R.54 TDD | N/A | OP.1 TDD | EPA5 | ETU5 | 2x2 Low | 70 | 14.7 | ≥2 |
| Note 1: The propagation conditions for TP 1 and TP 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of TP 1 and TP 2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of TP2. | | | | | | | | | |

The normative reference for these requirements is TS 36.101 [2] clause 8.3.2.4.3.

### 8.3.2.4.3_F.4 Test description

#### 8.3.2.4.3_F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the TP 1 are set up according to tables 8.3.2-1 and 8.3.2.4.3_F.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.2.4.3_F.4.3.

#### 8.3.2.4.3_F.4.2 Test procedure

1. SS transmits PDCCH DCI format 2D on TP 1 according to Tables 8.3.2.4.3_F.3-1, 8.3.2.4.3_F.3-2 and Annex C3.4.
2. SS transmits PDSCH on TP 2 via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to Tables 8.3.2.4.3_F.3-1, 8.3.2.4.3_F.3-2 and Annex C3.4. The SS sends downlink MAC padding bits on the DL RMC.
3. Set the parameters of the reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.4.3_F.3-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.3.2.4.3_F.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.3.2.4.3_F.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| pdsch-ConfigDedicated | PDSCH-ConfigDedicated-DEFAULT | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-ConfigNZPToAddModList-r11 | CSI-RS-ConfigNZP-r11-DEFAULT | | |
| csi-RS-ConfigZPToAddModList-r11 | CSI-RS-ConfigZP-r11-DEFAULT | | |
| pdsch-ConfigDedicated-v1130 | PDSCH-ConfigDedicated-v1130-DEFAULT | | |
| } | | | |

**Table 8.3.2.4.3_F.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path:36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | 2TX |
| } | | | |

**Table 8.3.2.4.3_F.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.3.2.4.3_F.4.3-4: CSI-RS-ConfigNZP-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigNZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigNZPId-r11 | 1 | | |
| antennaPortsCount-r11 | an2 | | |
| resourceConfig-r11 | 0 | | |
| subframeConfig-r11 | 4 | | |
| scramblingIdentity-r11 | 126 | | |
| qcl-CRS-Info-r11 SEQUENCE { | | | |
| qcl-ScramblingIdentity-r11 | 0 | | |
| crs-PortsCount-r11 | n2 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| } | | | |
| } | | | |

**Table 8.3.2.4.3_F.4.3-5: *CSI-RS-ConfigZP-r11-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11 | 1 | | |
| resourceConfigList-r11 | 0010000000000000 | | |
| subframeConfig-r11 | 4 | | |
| } | | | |

**Table 8.3.2.4.3_F.4.3-6: PDSCH-ConfigDedicated-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-v1130 ::= SEQUENCE { | | | |
| dmrs-ConfigPDSCH-r11 | DMRS-Config-r11-DEFAULT | | |
| qcl-Operation | typeB | | |
| re-MappingQCLConfigToAddModList-r11 SEQUENCE (SIZE (1..maxRE-MapQCL-r11)) OF SEQUENCE { | 1 entry | | |
| pdsch-RE-MappingQCL-ConfigId-r11[1] | 1 | | |
| optionalSetOfFields-r11[1] SEQUENCE { | | | |
| crs-PortsCount-r11 | n2 | | |
| crs-FreqShift-r11 | 0 | | |
| mbsfn-SubframeConfigList-r11 | Not present | | |
| pdsch-Start-r11 | 2 | | |
| } | | | |
| } | | | |
| } | | | |

## 8.3.2.4.3_F.5 Test requirements

Table 8.3.2.4.3_F.3-1 defines the primary level setting.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for each throughput test shall meet or exceed the specified value in Table 8.3.2.4.3_F.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.3.2.4.3_F.5-1: Test Requirements for quasi co-location type B with different Cell ID and Colliding CRS**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | TP 1 | TP 2 | TP 1 | TP 2 | | Fraction of Maximum Throughput (%) | SNR (dB) (Note 3) | |
| 1 | R.54 TDD | N/A | OP.1 TDD | EPA5 | ETU5 | 2x2 Low | 70 | 15.6 | 2-8 |
| Note 1: The propagation conditions for TP 1 and TP 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of TP 1 and TP 2.<br>Note 3: SNR corresponds to $\widehat{E}_s / N_{oc}$ of TP2. | | | | | | | | | |

## 8.3.3 LAA

### 8.3.3.1 Dual-Layer Spatial Multiplexing with DM-RS

**Table 8.3.3.1-1: Common Test Parameters**

| Parameter | Unit | Value |
|---|---|---|
| Cyclic prefix | | Normal |
| Cell ID | | 0 |
| Inter-TTI Distance | | 1 |
| Number of HARQ processes | Processes | 8 |
| Maximum number of HARQ transmission (Note 1) | | 4 |
| Redundancy version coding sequence | | {0,1,2,3} for QPSK and 16QAM<br>{0,0,1,2} for 64QAM and 256QAM |
| Precoder update granularity | | Frequency domain: 1 PRG<br>Time domain: 1 ms |
| Note 1: For retransmission in partial subframes, the TB size should be kept the same as the initial transmission regardless of the initial transmission is performed in full subframes or partial subframes.<br>Note 2: Void. | | |

**Table 8.3.3.1-2: Additional Test Parameters for LAA SCell(s)**

| Parameter | Unit | Value |
|---|---|---|
| DMTC Periodicity | ms | 80 |
| dmtc-PeriodOffset-r12 ms80-r12 | | 0 |
| Discovery signal occasion duration | subframe | 1 |
| Power allocation of discovery signal | | Same as power allocation of CRS within a transmission burst in the test |

#### 8.3.3.1.1 LAA Dual-Layer Spatial Multiplexing with DM-RS with FDD as PCell

##### 8.3.3.1.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value and verify the rank-2 performance for full RB allocation for CA with LAA Scell(s).

##### 8.3.3.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD Release 13 and forward UE of categories 5 or higher that support E-UTRA FDD and downlink LAA with FDD as PCell. Applicability requires support for TM9 on LAA cells.

##### 8.3.3.1.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.15.2, with the addition of the relevant parameters in Tables 8.2.3-1 and Tables 8.3.3.1.1.3-1 to 8.3.3.1.1.3-7. The downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.3.1.1.3-7 for the specified SNR. For performance the bandwidths specified in article 5.4.2A are verified.

**Table 8.3.3.1.1.3-1: Common Test Parameters**

| Parameter | Unit | Value |
|---|---|---|
| Cyclic prefix | | Normal |
| Cell ID | | 0 |
| Inter-TTI Distance | | 1 |
| Number of HARQ processes | Processes | 8 |
| Maximum number of HARQ transmission (Note 1) | | 4 |
| Redundancy version coding sequence | | {0,1,2,3} for QPSK and 16QAM<br>{0,0,1,2} for 64QAM and 256QAM |
| Precoder update granularity | | Frequency domain: 1 PRG<br>Time domain: 1 ms |
| Note 1: For retransmission in partial subframes, the TB size should be kept the same as the initial transmission regardless of the initial transmission is performed in full subframes or partial subframes.<br>Note 2: Void. | | |

**Table 8.3.3.1.1.3-2: Additional Test Parameters for LAA SCell(s)**

| Parameter | Unit | Value |
|---|---|---|
| DMTC Periodicity | ms | 80 |
| dmtc-PeriodOffset-r12 ms80-r12 | | 0 |
| Discovery signal occasion duration | subframe | 1 |
| Power allocation of discovery signal | | Same as power allocation of CRS within a transmission burst in the test |

For CA with LAA SCell(s), the requirements for dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C are specified in Table 8.3.3.1.1.3-7, with the addition of the parameters in Table 8.3.3.1.1.3-3, Table 8.3.3.1.1.3-4, Table 8.3.3.1.1.3-5 and Table 8.3.3.1.1.3-6. The downlink physical channel setup is set according to Annex C.3.2. The purpose of these tests is to verify the rank-2 performance for full RB allocation for CA with LAA SCell(s).

**Table 8.3.3.1.1.3-3: Test Parameters for Large Delay CDD (FRC) for PCell**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (NOTE 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | TM3 |
| Subframe configuration | | | Non-MBSFN |
| NOTE 1: $P_B = 1$.<br>NOTE 2: PUCCH format 3 is used to feedback ACK/NACK.<br>NOTE 3: Void | | | |

**Table 8.3.3.1.1.3-4: Test Parameters for CDM-multiplexed DM RS (dual layer) for CA with LAA SCell(s)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | $\sigma$ | dB | -3 |
| Cell-specific reference signals | | | Antenna ports 0 and 1 |
| CSI reference signals | | | Antenna ports 15,16 |
| DMRS ports (dual layer transmission) | | | port 7 and port 8 |
| Beamforming model | | | Annex B.4.2 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5/2 |
| CSI reference signal configuration | | | 8 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 3 / 0010000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| PDSCH transmission mode | | | 9 |
| DL Burst transmission pattern for LAA SCell | | | As specified in B.8 |
| The number of subframes set ($S_1$) in a burst | | | {1,3,5,8} |
| Occupied OFDM symbols set in the last subframe | | | {6,9,12,14} |
| Random variable *p* defined in B.8 | | | 0.5 |
| timing error relative of LAA SCell to PCell | | μs | 0 |
| Frequency offset of the *i*-th LAA SCell relative to PCell | | Hz | 200 |
| Note 1: $P_B = 1$<br>Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |

**Table 8.3.3.1.1.3-5: Single carrier performance Large Delay CDD (FRC) for PCell for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Nominal maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.11-5 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.6 |
| 3MHz | R.11-6 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.3 |
| 5MHz | R.11-2 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.3 |
| 10MHz | R.11 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.9 |
| 15MHz | R.11-7 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 12.9 |

**Table 8.3.3.1.1.3-6: Single carrier performance for CDM-multiplexed DM RS (dual layer) for LAA SCell for multiple CA configurations**

| Band-width | Sub-test (Note 2) | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum throughput (%) (Note 1) | SNR (dB) |
| 20MHz | 1 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 14.1 |
| | 2 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 14 |
| | 3 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 14.2 |
| | 4 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 14.2 |

Note 1: Fraction of nominal maximum throughput is calculated based on random occasions of LAA PDSCH transmission.

Note 2: An UE is required to fulfil only one test of Sub-test 1-4 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE not supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 1; For an UE not supporting endingDwPTS but supporting secondSlotStartingPosition, it is required to fulfil Sub-test 2; For an UE supporting endingDwPTS but not supporting secondSlotStartingPosition, it is required to fulfil Sub-test 3; and For an UE supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 4.

**Table 8.3.3.1.1.3-7: Minimum performance (FRC) based on single carrier performance for CA with LAA SCell(s)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement (Note 2) | UE Category |
|---|---|---|---|---|---|
| | Total | PCell | LAA SCell | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.3.3.1.1.3-5 and Table 8.3.3.1.1.3-6 | ≥5 |

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3C.

Note 2: Apply a per-CC requirement defined in Table 8.3.3.1.1.3-5 for PCell and apply a per-CC requirement defined in Table 8.3.3.1.1.3-6 for LAA SCell.

The normative reference for this requirement is TS 36.101 [2] clause 8.3.3.1.1

### 8.3.3.1.1.4 Test description

#### 8.3.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: 20 MHz + 20 MHz.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.36 as appropriate.
2. The parameter settings for the cell are set up according to Table 8.3.3.1-1, 8.3.3.1-2 and 8.3.3.1.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.3.1.1.4.3.

#### 8.3.3.1.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC, as appropriate and defined in Table 8.3.3.1.1.3-4 as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.3.3.1.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Table 8.3.3.1.1.3-5 for PCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Table 8.3.3.1.1.3-6 for SCC. The SS sends downlink MAC padding bits on the DL RMC. Additionally in the last two subframes of every burst SS transmits PDCCH DCI format 1C for CC_RNTI to indicate number of OFDM symbols in the DwPTS of ending partial subframe if required depending on UE capability according to TS 36.213 clause 13A as described in Table 8.3.3.1.1.3-6.
6. Set the parameters of the reference channel, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 8.3.3.1.1.5-1 and 8.3.3.1.1.5-2 as appropriate.
7. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.3.3.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions

**Table 8.3.3.1.1.4.3-1: MeasDS-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasDS-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| dmtc-PeriodOffset-r12 CHOICE { | | | |
| ms80-r12 | 0 | | |
| } | | | |
| ds-OccasionDuration-r12 CHOICE { | | | |
| durationTDD-r12 | 2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.3.3.1.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | Tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.3.3.1.1.4.3-3: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm9 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| pdsch-ConfigDedicated-r10 | Not present | | |
| } | | | |
| Laa-ScellConfiguration-r13 SEQUENCE { | | | |
| subframeStartPosition | ‘s0’ or ‘s07’ | Depending on UE capability, as described in Table 8.3.3.1.1.3-6 | |
| Laa-SCellSubframeConfig | ‘00000000’ | | |
| } | | | |
| } | | | |

**Table 8.3.3.1.1.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 8 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 3 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.3.3.1.1.4.3-5: PUCCH-ConfigDedicated-v1020-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-9A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-v1020 ::= SEQUENCE { | | | |
| pucch-Format-r10 CHOICE { | | | |
| format3-r10 SEQUENCE { | | | |
| n3PUCCH-AN-List-r10 SEQUENCE { | 4 | | |
| | 101 | | |
| | 102 | | |
| | 103 | | |
| | 104 | | |
| } | | | |
| twoAntennaPortActivatedPUCCH-Format3-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

8.3.3.1.1.5 Test Requirements

Table 8.3.3.1.1.5-1 defines the primary level settings including test tolerances for all throughput tests.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.15.2 and A.3.3.2 for the throughput test shall meet or exceed the specified value in Table 8.3.3.1.1.5-1 and 8.3.3.1.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.3.3.1.1.5-1: Test Parameters for Large Delay CDD (FRC) for PCell for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Nominal maximum throughput (%) | SNR (dB) |
| 20MHz | R.30 FDD | OP.1 FDD | EVA70 | 2x2 Low | 70 | 13.8 |

**Table 8.3.3.1.1.5-2: Test parameters for CDM-multiplexed DM RS (dual layer) for LAA SCell for multiple CA configurations**

| Band-width | Sub-test (Note 2) | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum throughput (%) (Note 1) | SNR (dB) |
| 20MHz | 1 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 15.0 |
| | 2 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 14.9 |
| | 3 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 15.1 |
| | 4 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 15.1 |

Note 1: Fraction of nominal maximum throughput is calculated based on random occasions of LAA PDSCH transmission.

Note 2: An UE is required to fulfil only one test of Sub-test 1-4 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE not supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 1; For an UE not supporting endingDwPTS but supporting secondSlotStartingPosition, it is required to fulfil Sub-test 2; For an UE supporting endingDwPTS but not supporting secondSlotStartingPosition, it is required to fulfil Sub-test 3; and For an UE supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 4.

## 8.3.3.1.2 LAA Dual-Layer Spatial Multiplexing with DM-RS with TDD as PCell

### 8.3.3.1.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value and verify the rank-2 performance for full RB allocation for CA with LAA Scell(s).

### 8.3.3.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD Release 13 and forward UE of categories 5 or higher that support E-UTRA TDD and downlink LAA with TDD as PCell. Applicability requires support for TM9 on LAA cells..

### 8.3.3.1.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A.3.4.2 and Annex A.3.15.2, with the addition of the relevant parameters in Table 8.2.3-1 and Tables 8.3.3.1.2.3-1 to 8.3.3.1.2.3-5. The downlink physical channel setup is set according to Table C.3.2-1 in Annex C.

The parameters specified in Table 8.3.3.1.2.3-1 are valid for TDD CC and LAA SCell(s) unless otherwise stated. And the additional parameters specified in Table 8.3.3.1.2.3-2 are valid for LAA SCell(s).

**Table 8.3.3.1.2.3-1: Common Test Parameters**

| Parameter | Unit | Value |
|---|---|---|
| Uplink downlink configuration (Note 1) | | 1 |
| Special subframe configuration (Note 2) | | 4 |
| Cyclic prefix | | Normal |
| Cell ID | | 0 |
| Inter-TTI Distance | | 1 |
| Number of HARQ processes | Processes | 7 |
| Maximum number of HARQ transmission (Note 3) | | 4 |
| Redundancy version coding sequence | | {0,1,2,3} for QPSK and 16QAM<br>{0,0,1,2} for 64QAM and 256QAM |
| Precoder update granularity | | Frequency domain: 1 PRG for Transmission modes 9<br>Time domain: 1 ms |
| ACK/NACK feedback mode | | Multiplexing |
| Note 1: As specified in Table 4.2-2 in TS 36.211 [4]<br>Note 2: As specified in Table 4.2-1 in TS 36.211 [4]<br>Note 3: For retransmission in partial subframes, the TB size should be kept the same as the initial transmission regardless of the initial transmission is performed in full subframes or partial subframes. | | |

**Table 8.3.3.1.2.3-2: Additional Test Parameters for LAA SCell(s)**

| Parameter | Unit | Value |
|---|---|---|
| DMTC Periodicity | ms | 80 |
| dmtc-PeriodOffset-r12 ms80-r12 | | 0 |
| Discovery signal occasion duration | subframe | 1 |
| Power allocation of discovery signal | | Same as power allocation of CRS within a transmission burst in the test |

For CA with LAA SCell(s), the requirements for dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C are specified in Table 8.3.3.1.2.3-7, with the addition of the parameters in Table 8.3.3.1.2.3-3, Table 8.3.3.1.2.3-4 and Table 8.3.3.1.2.3-5. The purpose of these tests is to verify the rank-2 performance for full RB allocation for CA with LAA SCell(s).

**Table 8.3.3.1.2.3-3: Test Parameters for Large Delay CDD (FRC) for PCell**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (NOTE 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | TM3 |
| Subframe configuration | | | Non-MBSFN |
| NOTE 1: $P_B = 1$.<br>NOTE 2: PUCCH format 3 is used to feedback ACK/NACK.<br>NOTE 3: Void | | | |

**Table 8.3.3.1.2.3-4: Test Parameters for CDM-multiplexed DM RS (dual layer) for LAA SCell(s)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 4 |
| | $\rho_B$ | dB | 4 (Note 1) |
| | σ | dB | -3 |
| Cell-specific reference signals | | | Antenna ports 0 and 1 |
| CSI reference signals | | | Antenna ports 15,16 |
| DMRS ports (dual layer transmission) | | | port 7 and port 8 |
| Beamforming model | | | Annex B.4.2 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5/4 |
| CSI reference signal configuration | | | 8 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 4/ 0010000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| PDSCH transmission mode | | | 9 |
| DL Burst transmission pattern for LAA SCell | | | As specified in B.8 |
| The number of subframes set ($S_1$) in a burst | | | {1,3,5,8} |
| Occupied OFDM symbols set in the last subframe | | | {6,9,12,14} |
| Random variable *p* defined in B.8 | | | 0.5 |
| Timing error relative of LAA SCell to PCell | | μs | 0 |
| Frequency offset of th *i*-th LAA SCell relative to PCell | | Hz | 200 |
| Note 1: $P_B = 1$ | | | |
| Note 2: These physical resource blocks are assigned only within burst transmissions to a LAA UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |

**Table 8.3.3.1.2.3-5: Single carrier performance Large Delay CDD (FRC) for PCell for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 1.4MHz | R.11-5 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.2 |
| 3MHz | R.11-6 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 5MHz | R.11-7 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.6 |
| 10MHz | R.11-8 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.8 |
| 15MHz | R.11-9 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 12.9 |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.0 |

**Table 8.3.3.1.2.3-6: Single carrier performance for CDM-multiplexed DM RS (dual layer) for LAA SCell(s) for multiple CA configurations**

| Band-width | Sub-test (Note2) | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Nominal maximum throughput (%) (Note 1) | SNR (dB) |
| 20MHz | 1 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 14.1 |
| | 2 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 14 |
| | 3 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 14.2 |
| | 4 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 14.2 |

Note 1: Fraction of nominal maximum throughput is calculated based on random occasions of LAA PDSCH transmission.

Note 2: An UE is required to fulfil only one test of Sub-test 1-4 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE not supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 1; For an UE not supporting endingDwPTS but supporting secondSlotStartingPosition, it is required to fulfil Sub-test 2; For an UE supporting endingDwPTS but not supporting secondSlotStartingPosition, it is required to fulfil Sub-test 3; and For an UE supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 4.

**Table 8.3.3.1.2.3-7: Minimum performance (FRC) based on single carrier performance for CA with LAA SCell(s)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement (Note 2) | UE Category |
|---|---|---|---|---|---|
| | Total | PCell | LAA SCell | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.3.3.1.2.3-5 and Table 8.3.3.1.2.3-6 | ≥5 |

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in TS 36.101 [2] clause 8.1.2.3C.

Note 2: Apply a per-CC requirement defined in Table 8.3.3.1.2.3-5 for PCell and apply a per-CC requirement defined in Table 8.3.3.1.2.3-6 for LAA SCell.

Using this configuration, the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.3.3.1.2.3-7 for the specified SNR. For performance, the bandwidths specified in clause 5.4.2A are verified.

The normative reference for this requirement is TS 36.101 [2] clause 8.3.3.1.2.

### 8.3.3.1.2.4 Test description

#### 8.3.3.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: 20 MHz + 20 MHz.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.36 as appropriate.
2. The parameter settings for the cell are set up according to Tables 8.3.3.1.2.3-1 to 8.3.3.1.2.3-3 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.3.3.1.2.4.3.

#### 8.3.3.1.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC, as appropriate and defined in Table 8.3.3.1.2.3-4 as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.3.3.1.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer to TS 36.321 [13], clauses 5.13 and 6.1.3.8). Wait for at least 2 seconds (Refer to TS 36.133 [4], clause 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Table 8.3.3.1.2.3-5 for PCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Table 8.3.3.1.2.3-6 for SCC. The SS sends downlink MAC padding bits on the DL RMC. Additionally, in the last two subframes of every burst, SS transmits PDCCH DCI format 1C for CC_RNTI to indicate number of OFDM symbols in the DwPTS of ending partial subframe if required depending on UE capability according to TS 36.213 [10] clause 13A as described in Table 8.3.3.1.2.3-6.
6. Set the parameters of the reference channel, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 8.3.3.1.2.5-1 and 8.3.3.1.2.5-2 as appropriate.
7. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.3.3.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions.

**Table 8.3.3.1.2.4.3-1: MeasDS-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasDS-Config-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| dmtc-PeriodOffset-r12 CHOICE { | | | |
| ms80-r12 | 0 | | |
| } | | | |
| ds-OccasionDuration-r12 CHOICE { | | | |
| durationTDD-r12 | 2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.3.3.1.2.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.3.3.1.2.4.3-3: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm9 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| pdsch-ConfigDedicated-r10 | Not present | | |
| } | | | |
| Laa-ScellConfiguration-r13 SEQUENCE { | | | |
| subframeStartPosition | ‘s0’ or ‘s07’ | Depending on UE capability, as described in Table 8.3.3.1.1.3-4 | |
| Laa-SCellSubframeConfig | ‘00000000’ | | |
| } | | | |
| } | | | |

**Table 8.3.3.1.2.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 8 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 4 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.3.3.1.2.4.3-5: PUCCH-ConfigDedicated-v1020-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-9A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-v1020 ::= SEQUENCE { | | | |
| pucch-Format-r10 CHOICE { | | | |
| format3-r10 SEQUENCE { | | | |
| n3PUCCH-AN-List-r10 SEQUENCE { | 4 | | |
| | 101 | | |
| | 102 | | |
| | 103 | | |
| | 104 | | |
| } | | | |
| twoAntennaPortActivatedPUCCH-Format3-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

8.3.3.1.2.5 Test Requirements

Table 8.3.3.1.2.5-1 defines the primary level settings including test tolerances for all throughput tests.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A.3.4.2 and Annex A.3.15.2 for the throughput test shall meet or exceed the specified value in Table 8.3.3.1.2.5-1 and 8.3.3.1.2.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.3.3.1.2.5-1: Test Parameters for Large Delay CDD (FRC) for PCell for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of Nominal maximum throughput (%) | SNR (dB) |
| 20MHz | R.30-1 TDD | OP.1 TDD | EVA70 | 2x2 Low | 70 | 13.9 |

**Table 8.3.3.1.2.5-2: Test parameters for CDM-multiplexed DM RS (dual layer) for LAA SCell for multiple CA configurations**

| Band-width | Sub-test (Note 2) | Reference channel | OCNG pattern | Propa-gation condition | Correlation matrix and antenna config. | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum throughput (%) (Note 1) | SNR (dB) |
| 20MHz | 1 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 15.0 |
| | 2 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 14.9 |
| | 3 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 15.1 |
| | 4 | R.2 FS3 | OP.1 FS3 | EVA5 | 2x2 Low | 70 | 15.1 |

Note 1: Fraction of nominal maximum throughput is calculated based on random occasions of LAA PDSCH transmission.

Note 2: An UE is required to fulfil only one test of Sub-test 1-4 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE not supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 1; For an UE not supporting endingDwPTS but supporting secondSlotStartingPosition, it is required to fulfil Sub-test 2; For an UE supporting endingDwPTS but not supporting secondSlotStartingPosition, it is required to fulfil Sub-test 3; and For an UE supporting both endingDwPTS and secondSlotStartingPosition, it is required to fulfil Sub-test 4.

# 8.4 Demodulation of PCFICH/PDCCH

## 8.4.1 FDD

### 8.4.1.1 FDD PCFICH/PDCCH Single-antenna Port Performance

#### 8.4.1.1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for a single-antenna port with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.1 remains below a given reference value.

#### 8.4.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

#### 8.4.1.1.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.1.1.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Single antenna port |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups ($N_g$) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | 0 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note: PHICH power setting refers to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.4.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.1.3-2.

**Table 8.4.1.1.3-2: Minimum performance PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and Correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 8 CCE | R.15 FDD | OP.1 FDD | ETU70 | 1x2 Low | 1 | -1.7 |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.1.

### 8.4.1.1.4 Test description

#### 8.4.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 8.4.1.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.1.1.4.3.

#### 8.4.1.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC according to Table 8.4.1.1.3-2.The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.1.1.5-1 as appropriate.

3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.4.1.1.5-1, pass the UE. Otherwise fail the UE.

#### 8.4.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 8.4.1.1.5 Test requirement

For the parameters specified in Table 8.4.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.1.5-1.

**Table 8.4.1.1.5-1: Test requirement PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 8 CCE | R.15 FDD | OP.1 FDD | ETU70 | 1x2 Low | 1 | -0.9 |

## 8.4.1.2 FDD PCFICH/PDCCH Transmit Diversity Performance

### 8.4.1.2.1 FDD PCFICH/PDCCH Transmit Diversity 2x2

#### 8.4.1.2.1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.1 remains below a given reference value.

#### 8.4.1.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8.

#### 8.4.1.2.1.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.1.2.1.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups ($N_g$) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note: PHICH power setting refers to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.4.1.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.1.3-2.

**Table 8.4.1.2.1.3-2: Minimum performance PDCCH/PCFICH 2 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 1.4 MHz | 2 CCE | R.16 FDD | OP.1 FDD | EPA5 | 2 x 2 Low | 1 | 4.3 |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.1.

### 8.4.1.2.1.4 Test description

#### 8.4.1.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 1.4MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 8.4.1.2.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.1.2.1.4.3.

#### 8.4.1.2.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.1.2.1.3-2.The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity.

2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.1.2.1.5-1.

3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.1.2.1.5-1, pass the UE. Otherwise fail the UE.

#### 8.4.1.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.4.1.2.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.4.1.2.1.5 Test requirement

For the parameters specified in Table 8.4.1.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.1.5-1.

**Table 8.4.1.2.1.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 1.4 MHz | 2 CCE | R.16 FDD | OP.1 FDD | EPA5 | 2 x 2 Low | 1 | 5.3 |

### 8.4.1.2.1_1 FDD PCFICH/PDCCH Transmit Diversity 2x2 (Release 9 and forward)

#### 8.4.1.2.1_1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.1 remains below a given reference value.

8.4.1.2.1_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward.

8.4.1.2.1_1.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.1.2.1_1.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups (Ng) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note: PHICH power setting refers to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.4.1.2.1_1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.1_1.3-2.

**Table 8.4.1.2.1_1.3-2: Minimum performance PDCCH/PCFICH 2 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.16_1 FDD | OP.1 FDD | EVA70 | 2 x 2 Low | 1 | -0.6 |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.1

8.4.1.2.1_1.4 Test description

8.4.1.2.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 8.4.1.2.1_1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.1.2.1_1.4.3.

### 8.4.1.2.1_1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.1.2.1_1.3-2.The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.1.2.1_1.5-1.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.1.2.1_1.5-1, pass the UE. Otherwise fail the UE.

### 8.4.1.2.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.4.1.2.1_1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.4.1.2.1_1.5 Test requirement

For the parameters specified in Table 8.4.1.2.1_1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.1_1.5-1.

**Table 8.4.1.2.1_1.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.16_1 FDD | OP.1 FDD | EVA70 | 2 x 2 Low | 1 | +0.4 |

## 8.4.1.2.2 FDD PCFICH/PDCCH Transmit Diversity 4x2

### 8.4.1.2.2.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.1 remains below a given reference value.

### 8.4.1.2.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8.

### 8.4.1.2.2.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.1.2.2.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups ($N_g$) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note: PHICH power setting refers to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.4.1.2.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.2.3-2.

**Table 8.4.1.2.2.3-2: Minimum performance PDCCH/PCFICH 4 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.17 FDD | OP.1 FDD | EVA5 | 4 x 2 Medium | 1 | 0.9 |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.1.

#### 8.4.1.2.2.4 Test description

##### 8.4.1.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.
2. The parameter settings for the cell are set up according to Table 8.4.1.2.2.3-1.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.1.2.2.4.3.

##### 8.4.1.2.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.1.2.2.3-2. The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.1.2.2.5-1.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.4.1.2.2.5-1, pass the UE. Otherwise fail the UE.

##### 8.4.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.4.1.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 11111111111111111111111111111111111111111111111111111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.1.2.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

### 8.4.1.2.2.5 Test requirement

For the parameters specified in Table 8.4.1.2.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.2.5-1.

**Table 8.4.1.2.2.5-1: Test requirement PDCCH/PCFICH 4 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.17 FDD | OP.1 FDD | EVA5 | 4 x 2 Medium | 1 | 1.9 |

## 8.4.1.2.2_1 FDD PCFICH/PDCCH Transmit Diversity 4x2 (Release 9 and forward)

### 8.4.1.2.2_1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.1 remains below a given reference value.

### 8.4.1.2.2_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward.

### 8.4.1.2.2_1.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.1.2.2_1.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups ($N_g$) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note: PHICH power setting refers to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.4.1.2.2_1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.2_1.3-2.

**Table 8.4.1.2.2_1.3-2: Minimum performance PDCCH/PCFICH 4 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 5 MHz | 2 CCE | R.17_1 FDD | OP.1 FDD | EPA5 | 4 x 2 Medium | 1 | 6.3 |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.1.

### 8.4.1.2.2_1.4 Test description

#### 8.4.1.2.2_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 5MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.

2. The parameter settings for the cell are set up according to Table 8.4.1.2.2_1.3-1.

3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clauses B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.1.2.2_1.4.3.

### 8.4.1.2.2_1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.1.2.2_1.3-2. The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity.

2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.1.2.2_1.5-1.

3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.4.1.2.2_1.5-1, pass the UE. Otherwise fail the UE.

### 8.4.1.2.2_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.4.1.2.2_1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 11111111111111111111111111111111111111111111111111111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.1.2.2_1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

### 8.4.1.2.2_1.5 Test requirement

For the parameters specified in Table 8.4.1.2.2_1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.2_1.5-1.

**Table 8.4.1.2.2_1.5-1: Test requirement PDCCH/PCFICH 4 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 5 MHz | 2 CCE | R.17_1 FDD | OP.1 FDD | EPA5 | 4 x 2 Medium | 1 | +7.3 |

8.4.1.2.3

## 8.4.1.2.3_C FDD PCFICH/PDCCH Transmit Diversity 2x2 for eICIC

## 8.4.1.2.3_C.1 FDD PCFICH/PDCCH Transmit Diversity 2x2 for eICIC (non-MBSFN ABS)

### 8.4.1.2.3_C.1.1 Test purpose

To verify the UE's performance of transmit diversity (SFBC) with 2 transmit antennas if the PCFICH/PDCCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

### 8.4.1.2.3_C.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward. Applicability requires support for FGI bit 115.

### 8.4.1.2.3_C.1.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.1.2.3_C.1.3-1: Void**

For the parameters for non-MBSFN ABS specified in Table 8.4.1.2.3_C.1.3-2, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.3_C.1.3-3. The downlink physical setup is in accordance with Annex C.3.2 and Annex C.3.3. In Table 8.4.1.2.3_C.1.3-2, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

**Table 8.4.1.2.3_C.1.3-2: Test Parameters for PDCCH/PCFICH – Non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -100.5 (Note 1) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -95.3 (Note 3) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.1.2.3_C.1.3-3 | 1.5 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 1 |
| ABS pattern (Note 4) | | | N/A | 00000100<br>00000100<br>00000100<br>01000100<br>00000100 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 00000100<br>00000100<br>00000100<br>01000100<br>00000100 | N/A |
| | $C_{CSI,1}$ | | 11111011<br>11111011<br>11111011<br>10111011<br>11111011 | N/A |
| Number of control OFDM symbols | | | 3 | 3 |
| Number of PHICH groups ($N_g$) | | | 1 | N/A |
| PHICH duration | | | Extended | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. PDCCH/PCFICH other than that associated with SIB1/Paging are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5];
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5];
Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 8: SIB-1 will not be transmitted in Cell2 in the test.

**Table 8.4.1.2.3_C.1.3-3: Minimum performance PDCCH/PCFICH – Non-MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Pm-dsg (%) | SNR (dB) (Note 2) |
| 1 | 8 CCE | R15-1 FDD | OP.1 FDD | OP.1 FDD | EVA5 | EVA5 | 2x2 Low | 1 | -3.9 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1 | | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.1.2.3

### 8.4.1.2.3_C.1.4 Test description

#### 8.4.1.2.3_C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the cell1 are set up according to Tables 8.4.1.2.3_C.1.3-1 and 8.4.1.2.3_C.1.3-2.
3. The downlink signals are initially set up according to Annex C.0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.1.2.3_C.1.4.3.

#### 8.4.1.2.3_C.1.4.2 Test procedure

1. Set the parameters for Cell1 and Cell2 according to Tables 8.4.1.2.3_C.1.5-1, 8.4.1.2.3_C.1.5-2, C.3.3-1 of Annex C.3.3 as appropriate, and SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC in the subframes overlapping with ABS of the aggressor cell. The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2A respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity. Propagation conditions are set according to Annex B clause B.2.
2. Measure the Pm-dsg in the subframes overlapping with ABS of the aggressor cell for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.1.2.3_C.1.5-2, pass the UE. Otherwise fail the UE.

#### 8.4.1.2.3_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.4.1.2.3_C.1.4.3-1: *PHICH-Config-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-4: PHICH-Config-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PHICH-Config-DEFAULT ::= SEQUENCE { | | | |
| phich-Duration | extended | | Cell 1 |
| phich-Resource | one | | |
| } | | | |

**Table 8.4.1.2.3_C.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.4.1.2.3_C.1.4.3-3: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '00000100000001000000 01000000010000000100' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.1.2.3_C.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 CHOICE{ | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '00000100000001000000 01000100010000000100' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '11111011111110111111 10111011101111111011' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.4.1.2.3_C.1.5 Test requirement

For the parameters specified in Table 8.4.1.2.3_C.1.5-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.3_C.1.5-2.

**Table 8.4.1.2.3_C.1.5-1: Test Parameters for PDCCH/PCFICH – Non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -100.6 (Note 1) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -95.4 (Note 3) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.1.2.3_C.1.5-2 | 1.3 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 1 |
| ABS pattern (Note 4) | | | N/A | 00000100<br>00000100<br>00000100<br>01000100<br>00000100 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 00000100<br>00000100<br>00000100<br>01000100<br>00000100 | N/A |
| | $C_{CSI,1}$ | | 11111011<br>11111011<br>11111011<br>10111011<br>11111011 | N/A |
| Number of control OFDM symbols | | | 3 | 3 |
| Number of PHICH groups ($N_g$) | | | 1 | N/A |
| PHICH duration | | | Extended | N/A |
| Unused RE-s and PRB-s | | | OCNG | N/A |
| Cyclic prefix | | | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. PDCCH/PCFICH other than that associated with SIB1/Paging are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5];
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5];
Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 8: SIB-1 will not be transmitted in Cell2 in the test.

**Table 8.4.1.2.3_C.1.5-2: Test Requirement PDCCH/PCFICH – Non-MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Pm-dsg (%) | SNR (dB) (Note 2) |
| 1 | 8 CCE | R15-1 FDD | OP.1 FDD | OP.1 FDD | EVA5 | EVA5 | 2x2 Low | 1 | -3 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1 | | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | | |

## 8.4.1.2.3_C.2 FDD PCFICH/PDCCH Transmit Diversity 2x2 for eICIC (MBSFN ABS)

### 8.4.1.2.3_C.2.1 Test purpose

To verify the UE's performance of transmit diversity (SFBC) with 2 transmit antennas if the PCFICH/PDCCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

### 8.4.1.2.3_C.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward. Applicability requires support for FGI bit 115.

### 8.4.1.2.3_C.2.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.1.2.3_C.2.3-1: Void**

For the parameters for MBSFN ABS specified in Table 8.4.1.2.3_C.2.3-2, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.3_C.2.3-3. The downlink physical setup is in accordance with Annex C.3.2 and Annex C.3.3. In Table 8.4.1.2.3_C.2.3-2, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

**Table 8.4.1.2.3_C.2.3-2: Test Parameters for PDCCH/PCFICH – MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -100.5 (Note 1) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -95.3 (Note 3) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.1.2.3_C.2.3-3 | 1.5 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | MBSFN |
| Time Offset between Cells | | µs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 126 |
| ABS pattern (Note 4) | | | N/A | 0001000000<br>0100000010<br>0000001000<br>0000000000 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 0001000000<br>0100000010<br>0000001000<br>0000000000 | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 0001000000<br>0100000010<br>0000001000<br>0000000000 | N/A |
| | $C_{CSI,1}$ | | 1110111111<br>1011111101<br>1111110111<br>1111111111 | N/A |
| MBSFN Subframe Allocation (Note 9) | | | N/A | 001000<br>100001<br>000100<br>000000 |
| Number of control OFDM symbols | | | 3 | 3 |
| Number of PHICH groups ($N_g$) | | | 1 | N/A |
| PHICH duration | | | extended | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal |

| | |
|---|---|
| Note 1: | This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS. |
| Note 2: | This noise is applied in OFDM symbols #0 of a subframe overlapping with the aggressor ABS. |
| Note 3: | This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS |
| Note 4: | ABS pattern as defined in [14]. The 4th, 12th, 19th and 27th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. |
| Note 5: | Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]. |
| Note 6: | As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5]. |
| Note 7: | Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same. |
| Note 8: | SIB-1 will not be transmitted in Cell2 in this test. |
| Note 9: | MBSFN Subframe Allocation as defined in [5], four frames with 24 bits is chosen for MBSFN subframe allocation. |
| Note 10: | The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel transmission is in a subframe protected by MBSFN ABS in this test. |

**Table 8.4.1.2.3_C.2.3-3: Minimum performance PDCCH/PCFICH – MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Pm-dsg (%) | SNR (dB) (Note 2) |
| 1 | 8 CCE | R15-1 FDD | OP.1 FDD | OP.1 FDD | EVA5 | EVA5 | 2x2 Low | 1 | -4.2 |
| Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent. | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1. | | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.1.2.3

### 8.4.1.2.3_C.2.4 Test description

#### 8.4.1.2.3_C.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.

2. The parameter settings for the cell1 are set up according to Tables 8.4.1.2.3_C.2.3-1 and 8.4.1.2.3_C.2.3-2.

3. The downlink signals are initially set up according to Annex C.0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clauses B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.1.2.3_C.2.4.3.

8.4.1.2.3_C.2.4.2 Test procedure

1. Set the parameters for Cell1 and Cell2 according to Tables 8.4.1.2.3_C.2.5-1, 8.4.1.2.3_C.2.5-2, C.3.3-1 of Annex C.3.3 as appropriate, and SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC in the subframes overlapping with ABS of the aggressor cell. The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2A respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity. Propagation conditions are set according to Annex B clause B.2.

2. Measure the Pm-dsg in the subframes overlapping with ABS of the aggressor cell for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.1.2.3_C.2.5-2, pass the UE. Otherwise fail the UE.

8.4.1.2.3_C.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.4.1.2.3_C.2.4.3-1: *PHICH-Config-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-4: PHICH-Config-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PHICH-Config-DEFAULT ::= SEQUENCE { | | | |
| phich-Duration | extended | | Cell 1 |
| phich-Resource | one | | |
| } | | | |

**Table 8.4.1.2.3_C.2.4.3-2: *SystemInformationBlockType3*: Neighbor cell configuration**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-2: SystemInformationBlockType3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| neighCellConfig | '00'B (Not all neighbour cells have the same MBSFN subframe allocation as serving cell) | | Cell 1 |
| } | | | |

**Table 8.4.1.2.3_C.2.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.4.1.2.3_C.2.4.3-4: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | ‘00010000000100000010 00000010000000000000’ | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.1.2.3_C.2.4.3-5: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 CHOICE{ | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '00010000000100000010 00000010000000000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '11101111111011111101 11111101111111111111' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.4.1.2.3_C.2.5 Test requirement

For the parameters specified in Table 8.4.1.2.3_C.2.5-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.3_C.2.5-2.

**Table 8.4.1.2.3_C.2.5-1: Test Parameters for PDCCH/PCFICH – MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -100.6 (Note 1) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -95.4 (Note 3) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.1.2.3_C.2.5-2 | 1.3 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | MBSFN |
| Time Offset between Cells | | µs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 126 |
| ABS pattern (Note 4) | | | N/A | 0001000000<br>0100000010<br>0000001000<br>0000000000 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 0001000000<br>0100000010<br>0000001000<br>0000000000 | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 0001000000<br>0100000010<br>0000001000<br>0000000000 | N/A |
| | $C_{CSI,1}$ | | 1110111111<br>1011111101<br>1111110111<br>1111111111 | N/A |
| MBSFN Subframe Allocation (Note 9) | | | N/A | 001000<br>100001<br>000100<br>000000 |
| Number of control OFDM symbols | | | 3 | 3 |
| Number of PHICH groups ($N_g$) | | | 1 | N/A |
| PHICH duration | | | extended | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. The 4th, 12th, 19th and 27th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 8: SIB-1 will not be transmitted in Cell2 in this test.
Note 9: MBSFN Subframe Allocation as defined in [5], four frames with 24 bits is chosen for MBSFN subframe allocation.
Note 10: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel transmission is in a subframe protected by MBSFN ABS in this test.

**Table 8.4.1.2.3_C.2.5-2: Test Requirement PDCCH/PCFICH – MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Pm-dsg (%) | SNR (dB) (Note 2) |
| 1 | 8 CCE | R15-1 FDD | OP.1 FDD | OP.1 FDD | EVA5 | EVA5 | 2x2 Low | 1 | -3.3 |
| Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent. | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1 | | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | | |

## 8.4.1.2.3_D

## 8.4.1.2.3_E FDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC

## 8.4.1.2.3_E.1 FDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS)

### 8.4.1.2.3_E.1.1 Test purpose

To verify the UE's performance of transmit diversity (SFBC) with 2 transmit antennas if the PCFICH/PDCCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

### 8.4.1.2.3_E.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE and CRS interference handling – UE Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

### 8.4.1.2.3_E.1.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

For the parameters for non-MBSFN ABS specified in Table 8.4.1.2.3_E.1.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.3_E.1.3-2.

In Tables 8.4.1.2.3_E.1.3-1 and 8.4.1.2.3_E.1.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information TS 36.331 [5] including Cell 2 and Cell 3 is provided.

**Table 8.4.1.2.3_E.1.3-1: Test Parameters for PDCCH/PCFICH – Non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 1) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93 (Note 3) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.1.2.3_E.1.3-2 | 5 | 3 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 4) | | | N/A | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | N/A | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | N/A | N/A |
| | $C_{CSI,1}$ | | 11111011<br>11111011<br>11111011<br>11111011<br>11111011 | N/A | N/A |

| | | | | |
|---|---|---|---|---|
| Number of control OFDM symbols | | 2 | Note 7 | Note 7 |
| Number of PHICH groups ($N_g$) | | 1 | N/A | N/A |
| PHICH duration | | Normal | N/A | N/A |
| Unused RE-s and PRB-s | | OCNG | OCNG | OCNG |
| Cyclic prefix | | Normal | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. PDCCH/PCFICH other than that associated with SIB1/Paging are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 7: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 8: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 9: SIB-1 will not be transmitted in Cell 2 and Cell 3 in the test.

**Table 8.4.1.2.3_E.1.3-2: Minimum performance PDCCH/PCFICH – Non-MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell3 | | Pm-dsg (%) | SNR (dB) (Note 3) |
| 1 | 8 CCE | R.15-2 FDD | OP.1 FDD | OP.1 FDD | OP.1 FDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 1 | -2.2 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1.

The normative reference for this requirement is TS 36.101 [2] clause 8.4.1.2.4.

### 8.4.1.2.3_E.1.4 Test description

#### 8.4.1.2.3_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell1 are set up according to Tables 8.4.1.2.3_E.1.3-1 and 8.4.1.2.3_E.1.3-2.
3. The downlink signals are initially set up according to Annex C.0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 8.4.1.2.3_E.1.4.3.

#### 8.4.1.2.3_E.1.4.2 Test procedure

1. Set the parameters for Cell 1, Cell 2 and Cell 3, according to Tables 8.4.1.2.3_E.1.5-1, 8.4.1.2.3_E.1.5-2, Annex C.3.2 for Cell 1, and Annex C.3.3 for Cell 2 and Cell 3. SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC. The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively.

2. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity. Propagation conditions are set according to Annex B clause B.2.

3. Measure the Pm-dsg in the subframes overlapping with ABS of the aggressor cell for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.1.2.3_E.1.5-2, pass the UE. Otherwise fail the UE.

#### 8.4.1.2.3_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 8.4.1.2.3_E.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '00000100 00000100 00000100 00000100 00000100' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 126 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.1.2.3_E.1.4.3-2: PhysicalConfigDedicated-DEFAULT:**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.4.1.2.3_E.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '00000100 00000100 00000100 00000100 00000100'| BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '11111011 11111011 11111011 11111011 11111011' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.4.1.2.3_E.1.5 Test requirement

For the parameters specified in Table 8.4.1.2.3_E.1.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.3_E.1.5-2.

**Table 8.4.1.2.3_E.1.5-1: Test Parameters for PDCCH/PCFICH – Non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 1) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93.1 (Note 3) | N/A | N/A |

| | | | | | |
|---|---|---|---|---|---|
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.1.2.3_E.1.5-2 | 4.8 | 2.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 4) | | | N/A | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | N/A | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | N/A | N/A |
| | $C_{CSI,1}$ | | 11111011<br>11111011<br>11111011<br>11111011<br>11111011 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 7 | Note 7 |
| Number of PHICH groups ($N_g$) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. PDCCH/PCFICH other than that associated with SIB1/Paging are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 7: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 8: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 9: SIB-1 will not be transmitted in Cell 2 and Cell 3 in the test.

**Table 8.4.1.2.3_E.1.5-2: Test Requirement PDCCH/PCFICH – Non-MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell3 | | Pm-dsg (%) | SNR (dB) (Note 3) |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 8 CCE | R.15-2 FDD | OP.1 FDD | OP.1 FDD | OP.1 FDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 1 | -1.3 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1. | | | | | | | | | | | |

### 8.4.1.2.3_E.2 FDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (MBSFN ABS)

#### 8.4.1.2.3_E.2.1 Test purpose

To verify the UE's performance of transmit diversity (SFBC) with 2 transmit antennas if the PCFICH/PDCCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

#### 8.4.1.2.3_E.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE and CRS interference handling – UE Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

#### 8.4.1.2.3_E.2.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

For the parameters for non-MBSFN ABS specified in Table 8.4.2.2.3_E.2.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.3_E.2.3-2.

In Tables 8.4.1.2.3_E.2.3-1 and 8.4.1.2.3_E.2.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information TS 36.331 [5] including Cell 2 and Cell 3 is provided.

**Table 8.4.1.2.3_E.2.3-1: Test Parameters for PDCCH/PCFICH – MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98(Note 1) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93 (Note 3) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.1.2.3_E.1.3-2 | 5 | 3 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | MBSFN | MBSFN |
| Time Offset between Cells | | µs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 4) | | | N/A | 0001000000<br>0100000010<br>0000001000<br>0000000000 | 0001000000<br>0100000010<br>0000001000<br>0000000000 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 0001000000<br>0100000010<br>0000001000<br>0000000000 | N/A | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 0001000000<br>0100000010<br>0000001000<br>0000000000 | N/A | N/A |
| | $C_{CSI,1}$ | | 1110111111<br>1011111101<br>1111110111<br>1111111111 | N/A | N/A |
| MBSFN Subframe Allocation (Note 7) | | | N/A | 001000<br>100001<br>000100<br>000000 | 001000<br>100001<br>000100<br>000000 |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| Number of PHICH groups ($N_g$) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. The 4th, 12th, 19th and 27th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 7: MBSFN Subframe Allocation as defined in [5], four frames with 24 bits are chosen for MBSFN subframe allocation.
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel transmission is in a subframe protected by MBSFN ABS in this test.
Note 10: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 11: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

**Table 8.4.1.2.3_E.2.3-2: Minimum performance PDCCH/PCFICH – MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 3) |
| 1 | 8 CCE | R.15-2 FDD | OP.1 FDD | OP.1 FDD | OP.1 FDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 1 | -2.0 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\bar{E}_s / N_{oc2}$ of Cell 1.

The normative reference for this requirement is TS 36.101 [2] clause 8.4.1.2.4.

### 8.4.1.2.3_E.2.4 Test description

#### 8.4.1.2.3_E.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.

2. The parameter settings for the cell1 are set up according to Tables 8.4.1.2.3_E.2.3-1 and 8.4.1.2.3_E.2.3-2.

3. The downlink signals are initially set up according to Annex C.0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clauses B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 8.4.1.2.3_E.2.4.3.

### 8.4.1.2.3_E.2.4.2 Test procedure

1. Set the parameters for Cell 1, Cell 2 and Cell3, according to Tables 8.4.1.2.3_E.2.5-1, 8.4.1.2.3_E.2.5-2, Annex C.3.2 for Cell 1, and Annex C.3.3 for Cell 2 and Cell 3. SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC. The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity. Propagation conditions are set according to Annex B clause B.2.

2. Measure the Pm-dsg in the subframes overlapping with ABS of the aggressor cell for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.1.2.3_E.2.5-2, pass the UE. Otherwise fail the UE.

### 8.4.1.2.3_E.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 8.4.1.2.3_E.2.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '00010000001000000100000010000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 126 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n4 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| fourFrames | '00100010000100010000 0000' B | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.1.2.3_E.2.4.3-2: PhysicalConfigDedicated-DEFAULT:**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.4.1.2.3_E.2.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '00010000000100000010 00000010000000000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '11101111111011111101 11111101111111111111' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.1.2.3_E.2.4.3-4: *SystemInformationBlockType3***

| Derivation Path: 36.508 [7] clause 4.6.2, Table 4.4.3.3-2 SystemInformationBlockType3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| neighCellConfig | '00'B (Not all neighbour cells have the same MBSFN subframe allocation as the serving cell) | | Cell 1 |

### 8.4.1.2.3_E.2.5 Test requirement

For the parameters specified in Table 8.4.1.2.3_E.2.5-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.3_E.2.5-2.

**Table 8.4.1.2.3_E.2.5-1: Test Parameters for PDCCH/PCFICH – MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98(Note 1) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93.1 (Note 3) | N/A | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.1.2.3_E.1.5-2 | 4.8 | 2.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | MBSFN | MBSFN |
| Time Offset between Cells | | µs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 4) | | | N/A | 0001000000<br>0100000010<br>0000001000<br>0000000000 | 0001000000<br>0100000010<br>0000001000<br>0000000000 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 0001000000<br>0100000010<br>0000001000<br>0000000000 | N/A | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 0001000000<br>0100000010<br>0000001000<br>0000000000 | N/A | N/A |
| | $C_{CSI,1}$ | | 1110111111<br>1011111101<br>1111110111<br>1111111111 | N/A | N/A |
| MBSFN Subframe Allocation (Note 7) | | | N/A | 001000<br>100001<br>000100<br>000000 | 001000<br>100001<br>000100<br>000000 |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| Number of PHICH groups ($N_g$) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. The 4th, 12th, 19th and 27th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 7: MBSFN Subframe Allocation as defined in [5], four frames with 24 bits are chosen for MBSFN subframe allocation.
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by “0” of ABS pattern.
Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel transmission is in a subframe protected by MBSFN ABS in this test.
Note 10: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 11: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

**Table 8.4.1.2.3_E.2.5-2: Test Requirement PDCCH/PCFICH – MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 3) |
| 1 | 8 CCE | R.15-2 FDD | OP.1 FDD | OP.1 FDD | OP.1 FDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 1 | -1.1 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\bar{E}_s / N_{oc2}$ of Cell 1.

8.4.1.2.4

## 8.4.1.2.5 FDD Enhanced Downlink Control Channel Performance Requirement Type A for PCFICH/PDCCH, 2 Tx Antenna Port under Asynchronous Network

Editor’s Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.4.1.2.5.1 Test purpose

This test verifies the Enhanced downlink control channel performance requirement Type A for PCFICH/PDCCH for 2 transmit diversity under Asynchronous network with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels remains below a given reference value.

### 8.4.1.2.5.2 Test applicability

This test applies to all types of E-UTRA FDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type A. Detailed Test Applicability is specified in clause 8.1.2.7.

8.4.1.2.5.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH. The parameters specified in Table 8.4.1.2.5.3-1 and Table 8.4.1.2.5.3-2.

In Table 8.4.1.2.5.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is not provided.

**Table 8.4.1.2.5.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups (Ng) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note: PHICH power setting refers to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

**Table 8.4.1.2.5.3-2: Additional Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>PDSCH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>PDSCH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of DL control region OFDM symbols | | | 3 | 3 | 3 |
| PHICH Ng (Note 1) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| PDSCH TM | | | 4 | 3 | 3 |
| Interference model | | | N/A | As specified in clause B.5.2 | As specified in clause B.5.2 |
| Probability of occurrence of PDSCH transmission rank in interfering cells | Rank 1 | % | N/A | 80 | 80 |
| | Rank 2 | % | N/A | 20 | 20 |
| Unused RE-s and PRB-s | | | OCNG | OCNG | OCNG |
| Time offset relative to Cell 1 | | ms | N/A | 0.33 | 0.67 |
| Frequency shift relative to Cell 1 | | Hz | N/A | 0 | 0 |
| Note 1: According to Clause 6.9 in TS 36.211 [4]. | | | | | |

For the parameters specified in Table 8.4.1.2.5.3-1 and Table 8.4.1.2.5.3-2 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.5.3-3.

**Table 8.4.1.2.5.3-3: Minimum Performance for PDCCH/PCFICH for Enhanced Downlink Control Channel Performance Requirement Type A**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 2 CCE | R.16-1 FDD | OP.1 FDD | EVA70 | EVA70 | EVA70 | 2x2 Low | 1 | 16.5 |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3.<br>Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.1.5.

#### 8.4.1.2.5.4 Test description

##### 8.4.1.2.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.4.1.2.5.3-1 and Table 8.4.1.2.5.3-2.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.1.2.5.4.3.

##### 8.4.1.2.5.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.1.2.5.3-2.The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be closed loop spatial multiplexing.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.1.2.5.5-1.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.1.2.5.5-1, pass the UE. Otherwise fail the UE.

##### 8.4.1.2.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.4.1.2.5.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.4.1.2.5.5 Test requirement

For the parameters specified in Table 8.4.1.2.5.3-1 and Table 8.4.1.2.5.3-2, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.5.5-1.

**Table 8.4.1.2.5.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 2 CCE | R.16-1 FDD | OP.1 FDD | EVA70 | EVA70 | EVA70 | 2x2 Low | 1 | TBD |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3.<br>Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

## 8.4.1.2.6 FDD Enhanced Downlink Control Channel Performance Requirement Type A for PCFICH/PDCCH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.4.1.2.6.1 Test purpose

This test verifies the enhanced downlink control channel performance requirement Type A for PCFICH/PDCCH for 2 transmit diversity with Non-Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels remains below a given reference value.

### 8.4.1.2.6.2 Test applicability

This test applies to all types of E-UTRA FDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type A. Detailed Test Applicability is specified in clause 8.1.2.7.

8.4.1.2.6.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH. The parameters specified in Table 8.4.1.2.6.3-1 and Table 8.4.1.2.6.3-2.

In Table 8.4.1.2.6.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.4.1.2.6.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups (Ng) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note: PHICH power setting refers to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

**Table 8.4.1.2.6.3-2: Additional Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB PDCCH_RB OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of DL control region OFDM symbols | | | 3 | 3 | 3 |
| CFI indicated in PCFICH | | | 3 | 3 | 3 |
| PHICH Ng (Note 1) | | | 1/6 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| PDSCH TM | | | 4 | N/A | N/A |
| Interference model | | | NA | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time Offset relative to Cell 1 | | μs | N/A | 2 | 3 |
| Frequency shift relative to Cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [4].<br>Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.4.1.2.6.3-1 and Table 8.4.1.2.6.3-2 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.6.3-3.

**Table 8.4.1.2.6.3-3: Minimum Performance for PDCCH/PCFICH for Enhanced Downlink Control Channel Performance Requirement Type A**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 4 CCE | R.16-2 FDD | OP.1 FDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | 12.8 |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3.<br>Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.1.6.

### 8.4.1.2.6.4 Test description

#### 8.4.1.2.6.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.4.1.2.6.3-1 and Table 8.4.1.2.6.3-2.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.1.2.6.4.3.

### 8.4.1.2.6.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.1.2.6.3-2.The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be closed loop spatial multiplexing.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.1.2.6.5-1.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.1.2.6.5-1, pass the UE. Otherwise fail the UE.

### 8.4.1.2.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.4.1.2.6.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.4.1.2.6.5 Test requirement

For the parameters specified in Table 8.4.1.2.6.3-1 and Table 8.4.1.2.6.3-2, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.6.5-1.

**Table 8.4.1.2.6.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 4 CCE | R.16-2 FDD | OP.1 FDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | TBD |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3.<br>Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

## 8.4.1.2.7 FDD Enhanced Downlink Control Channel Performance Requirement Type B for PCFICH/PDCCH, 2 Tx Antenna Port with Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.4.1.2.7.1 Test purpose

This test verifies the enhanced downlink control channel performance requirement Type B for PCFICH/PDCCH for 2 transmit diversity with Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels remains below a given reference value.

### 8.4.1.2.7.2 Test applicability

This test applies to all types of E-UTRA FDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type B. Detailed Test Applicability is specified in clause 8.1.2.7.

### 8.4.1.2.7.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH. The parameters specified in Table 8.4.1.2.7.3-1 and Table 8.4.1.2.7.3-2.

In Table 8.4.1.2.7.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.4.1.2.7.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups (Ng) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note: PHICH power setting refers to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

**Table 8.4.1.2.7.3-2: Additional Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB<br>PDCCH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 6 | 1 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of DL control region OFDM symbols | | | 1 | 1 | 1 |
| CFI indicated in PCFICH | | | 1 | 1 | 1 |
| PHICH Ng (Note 1) | | | 1/6 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| PDSCH TM | | | 4 | N/A | N/A |
| Interference model | | | NA | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time Offset relative to Cell 1 | | µs | N/A | 2 | 3 |
| Frequency shift relative to Cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [4].<br>Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.4.1.2.7.3-1 and Table 8.4.1.2.7.3-2 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.7.3-3.

**Table 8.4.1.2.7.3-3: Minimum Performance for PDCCH/PCFICH for Enhanced Downlink Control Channel Performance Requirement Type B**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 2 CCE | R.16-3 FDD | OP.1 FDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | 12.7 |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3.<br>Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.1.7.

### 8.4.1.2.7.4 Test description

#### 8.4.1.2.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.4.1.2.7.3-1 and Table 8.4.1.2.7.3-2.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.1.2.7.4.3.

#### 8.4.1.2.7.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.1.2.7.3-2.The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be closed loop spatial multiplexing.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.1.2.7.5-1.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.1.2.7.5-1, pass the UE. Otherwise fail the UE.

#### 8.4.1.2.7.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.4.1.2.7.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.4.1.2.7.5 Test requirement

For the parameters specified in Table 8.4.1.2.7.3-1 and Table 8.4.1.2.7.3-2, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.7.5-1.

**Table 8.4.1.2.7.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 2 CCE | R.16-3 FDD | OP.1 FDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | TBD |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3.<br>Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

## 8.4.1.2.8 FDD Enhanced Downlink Control Channel Performance Requirement Type B for PCFICH/PDCCH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.4.1.2.8.1 Test purpose

This test verifies the enhanced downlink control channel performance requirement Type B for PCFICH/PDCCH for 2 transmit diversity with Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels remains below a given reference value.

### 8.4.1.2.8.2 Test applicability

This test applies to all types of E-UTRA FDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type B. Detailed Test Applicability is specified in clause 8.1.2.7.

8.4.1.2.8.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH. The parameters specified in Table 8.4.1.2.8.3-1 and Table 8.4.1.2.8.3-2.

In Table 8.4.1.2.8.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.4.1.2.8.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups (Ng) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note: PHICH power setting refers to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

**Table 8.4.1.2.8.3-2: Additional Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB PDCCH_RB OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of DL control region OFDM symbols | | | 1 | 1 | 1 |
| CFI indicated in PCFICH | | | 1 | 1 | 1 |
| PHICH Ng (Note 1) | | | 1/6 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| PDSCH TM | | | 4 | N/A | N/A |
| Interference model | | | | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time Offset relative to Cell 1 | | μs | N/A | 2 | 3 |
| Frequency shift relative to Cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [4]. Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.4.1.2.8.3-1 and Table 8.4.1.2.8.3-2 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.8.3-3.

**Table 8.4.1.2.8.3-3: Minimum Performance for PDCCH/PCFICH for Enhanced Downlink Control Channel Performance Requirement Type B**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 4 CCE | R.16-4 FDD | OP.1 FDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | 10.3 |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3. Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3. Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.1.8.

### 8.4.1.2.8.4 Test description

#### 8.4.1.2.8.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.4.1.2.8.3-1 and Table 8.4.1.2.8.3-2.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.1.2.8.4.3.

### 8.4.1.2.8.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.1.2.8.3-2.The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be closed loop spatial multiplexing.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.1.2.8.5-1.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.1.2.8.5-1, pass the UE. Otherwise fail the UE.

### 8.4.1.2.8.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.4.1.2.8.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.4.1.2.8.5 Test requirement

For the parameters specified in Table 8.4.1.2.8.3-1 and Table 8.4.1.2.8.3-2, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.8.5-1.

**Table 8.4.1.2.8.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 4 CCE | R.16-4 FDD | OP.1 FDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | TBD |

Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3.
Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 4: SNR corresponds to $\widehat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1.

## 8.4.2 TDD

### 8.4.2.1 TDD PCFICH/PDCCH Single-antenna Port Performance

#### 8.4.2.1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for a single-antenna port with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.2 remains below a given reference value.

#### 8.4.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

#### 8.4.2.1.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.2.1.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Single antenna port |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 0 |
| Special subframe configuration (Note 2) | | | 4 |
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups ($N_g$) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | 0 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: PHICH power setting refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.4.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.1.3-2.

**Table 8.4.2.1.3-2: Minimum performance PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 8 CCE | R.15 TDD | OP.1 TDD | ETU70 | 1x2Low | 1 | -1.6 |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.

### 8.4.2.1.4 Test description

#### 8.4.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.

2. The parameter settings for the cell are set up according to 8.4.2.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.2.1.4.3.

#### 8.4.2.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC according to Table 8.4.2.1.3-2. The details of PDCCH and PDSCH are specified in Table A.3.5.2-1 and Table A.3.5.2-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.4.2.1.5-1 as appropriate.

3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in table 8.4.2.2.1.5-1, pass the UE. Otherwise fail the UE.

#### 8.4.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:.

**Table 8.4.2.1.4.3-1: TDD-Configuration-DEFAULT**

| Derivation Path: 36.508 clause 4.6.4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Configuration-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa0 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

### 8.4.2.1.5 Test requirement

For the parameters specified in Table 8.4.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.1.5-1.

**Table 8.4.2.1.5-1: Test requirement PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 8 CCE | R.15 TDD | OP.1 TDD | ETU70 | 1x2Low | 1 | -0.8 |

## 8.4.2.2 TDD PCFICH/PDCCH Transmit Diversity Performance

### 8.4.2.2.1 TDD PCFICH/PDCCH Transmit Diversity 2x2

#### 8.4.2.2.1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.2 remains below a given reference value.

#### 8.4.2.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8.

#### 8.4.2.2.1.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.2.2.1.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 0 |
| Special subframe configuration (Note 2) | | | 4 |
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups ($N_g$) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: PHICH power setting refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group | | | |

For the parameters specified in Table 8.4.2.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.1.3-2.

**Table 8.4.2.2.1.3-2: Minimum performance PDCCH/PCFICH 2 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 1.4 MHz | 2 CCE | R.16 TDD | OP.1 TDD | EPA5 | 2 x 2 Low | 1 | 4.2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.

#### 8.4.2.2.1.4 Test description

##### 8.4.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 1.4MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to 8.4.2.2.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.2.2.1.4.3.

#### 8.4.2.2.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.2.2.1.3-2. The details of PDCCH and PDSCH are specified in Table A.3.5.2-1 and Table A.3.5.2-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity.
2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.4.2.2.1.5-1 as appropriate.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in table 8.4.2.2.1.5-1, pass the UE. Otherwise fail the UE

#### 8.4.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:.

**Table 8.4.2.2.1.4.3-1: TDD-Configuration-DEFAULT**

| Derivation Path: 36.508 clause 4.6.4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Configuration-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa0 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

**Table 8.4.2.2.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.4.2.2.1.5 Test requirement

For the parameters specified in Table 8.4.2.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.1.5-1.

**Table 8.4.2.2.1.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 1.4 MHz | 2 CCE | R.16 TDD | OP.1 TDD | EPA5 | 2 x 2 Low | 1 | 5.2 |

### 8.4.2.2.1_1 TDD PCFICH/PDCCH Transmit Diversity 2x2 (Release 9 and forward)

#### 8.4.2.2.1_1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.2 remains below a given reference value.

#### 8.4.2.2.1_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward.

#### 8.4.2.2.1_1.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.2.2.1_1.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 0 |
| Special subframe configuration (Note 2) | | | 4 |
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups ($N_g$) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: PHICH power setting refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group | | | |

For the parameters specified in Table 8.4.2.2.1_1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.1_1.3-2.

**Table 8.4.2.2.1_1.3-2: Minimum performance PDCCH/PCFICH 2 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.16_1 TDD | OP.1 TDD | EVA70 | 2 x 2 Low | 1 | 0.1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.

### 8.4.2.2.1_1.4 Test description

#### 8.4.2.2.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to 8.4.2.2.1_1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.2.2.1_1.4.3.

#### 8.4.2.2.1_1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.2.2.1_1.3-2. The details of PDCCH and PDSCH are specified in Table A.3.5.2-1 and Table A.3.5.2-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity.
2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.4.2.2.1_1.5-1 as appropriate.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in table 8.4.2.2.1_1.5-1, pass the UE. Otherwise fail the UE

#### 8.4.2.2.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:.

**Table 8.4.2.2.1_1.4.3-1: TDD-Configuration-DEFAULT**

| Derivation Path: 36.508 clause 4.6.4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Configuration-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa0 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

**Table 8.4.2.2.1_1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.4.2.2.1_1.5 Test requirement

For the parameters specified in Table 8.4.2.2.1_1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.1_1.5-1.

**Table 8.4.2.2.1_1.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.16_1 TDD | OP.1 TDD | EVA70 | 2 x 2 Low | 1 | +1.0 |

8.4.2.2.2 TDD PCFICH/PDCCH Transmit Diversity 4x2

8.4.2.2.2.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.2 remains below a given reference value.

8.4.2.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8.

8.4.2.2.2.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.2.2.2.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 0 |
| Special subframe configuration (Note 2) | | | 4 |
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups ($N_g$) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: PHICH power setting refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.4.2.2.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.2.3-2.

**Table 8.4.2.2.2.3-2: Minimum performance PDCCH/PCFICH 2 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.17 TDD | OP.1 TDD | EVA5 | 4 x 2 Medium | 1 | 1.2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.

### 8.4.2.2.2.4 Test description

#### 8.4.2.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.11.

2. The parameter settings for the cell are set up according to 8.4.2.2.2.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.2.2.2.4.3.

#### 8.4.2.2.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.2.2.2.3-2. The details of PDCCH and PDSCH are specified in Table A.3.5.2-1 and Table A.3.5.2-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity.

2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.4.2.2.2.5-1 as appropriate.

3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in table 8.4.2.2.2.5-1, pass the UE. Otherwise fail the UE

#### 8.4.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:.

**Table 8.4.2.2.2.4.3-1: TDD-Configuration-DEFAULT**

| Derivation Path: 36.508 clause 4.6.4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Configuration-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa0 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

**Table 8.4.2.2.2.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 1111111111111111111111111111111111111111111111111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.2.2.2.4.3-3: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

### 8.4.2.2.2.5 Test requirement

For the parameters specified in Table 8.4.2.2.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.2.5-1.

**Table 8.4.2.2.2.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.17 TDD | OP.1 TDD | EVA5 | 4 x 2 Medium | 1 | 2.2 |

## 8.4.2.2.2_1 TDD PCFICH/PDCCH Transmit Diversity 4x2 (Release 9 and forward)

### 8.4.2.2.2_1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.2 remains below a given reference value.

### 8.4.2.2.2_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward.

### 8.4.2.2.2_1.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.2.2.2_1.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 0 |
| Special subframe configuration (Note 2) | | | 4 |
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups (Ng) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: PHICH power setting refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.4.2.2.2_1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.2_1.3-2.

**Table 8.4.2.2.2_1.3-2: Minimum performance PDCCH/PCFICH 2 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 5 MHz | 2 CCE | R.17_1 TDD | OP.1 TDD | EPA5 | 4 x 2 Medium | 1 | 6.5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.

### 8.4.2.2.2_1.4 Test description

#### 8.4.2.2.2_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 5 MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.11.

2. The parameter settings for the cell are set up according to 8.4.2.2.2_1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.2.2.2_1.4.3.

### 8.4.2.2.2_1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.2.2.2_1.3-2. The details of PDCCH and PDSCH are specified in Table A.3.5.2-1 and Table A.3.5.2-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity.

2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.4.2.2.2_1.5-1 as appropriate.

3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in table 8.4.2.2.2_1.5-1, pass the UE. Otherwise fail the UE

### 8.4.2.2.2_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:.

**Table 8.4.2.2.2_1.4.3-1: TDD-Configuration-DEFAULT**

| Derivation Path: 36.508 clause 4.6.4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Configuration-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa0 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

**Table 8.4.2.2.2_1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 1111111111111111111111111111111111111111111111111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.2.2.2_1.4.3-3: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

### 8.4.2.2.2_1.5 Test requirement

For the parameters specified in Table 8.4.2.2.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.2_1.5-1.

**Table 8.4.2.2.2_1.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 5 MHz | 2 CCE | R.17_1 TDD | OP.1 TDD | EPA5 | 4 x 2 Medium | 1 | +7.5 |

## 8.4.2.2.3_C TDD PCFICH/PDCCH Transmit Diversity 2x2 for eICIC

## 8.4.2.2.3_C.1 TDD PCFICH/PDCCH Transmit Diversity 2x2 for eICIC (non-MBSFN ABS)

### 8.4.2.2.3_C.1.1 Test purpose

To verify the UE's performance of transmit diversity (SFBC) with 2 transmit antennas if the PCFICH/PDCCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

### 8.4.2.2.3_C.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit 115.

### 8.4.2.2.3_C.1.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.2.2.3_C.1.3-1: Void**

For the parameters for non-MBSFN ABS specified in Table 8.4.2.2.3_C.1.3-2, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.3_C.1.3-3. The downlink physical setup is in accordance with Annex C.3.2 and Annex C.3.3. In Table 8.4.2.2.3_C.1.3-2, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

**Table 8.4.2.2.3_C.1.3-2: Test Parameters for PDCCH/PCFICH – Non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 |
| Special subframe configuration | | | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -100.5 (Note 1) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -95.3 (Note 3) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.2.2.3_C.1.3-3 | 1.5 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 1 |
| ABS pattern (Note 4) | | | N/A | 0000010001<br>0000000001 |
| RLM/RRM Measurement Subframe Pattern(Note 5) | | | 0000000001<br>0000000001 | N/A |
| CSI Subframe Sets(Note 6) | $C_{CSI,0}$ | | 0000010001<br>0000000001 | N/A |
| | $C_{CSI,1}$ | | 1100101000<br>1100111000 | N/A |
| Number of control OFDM symbols | | | 3 | 3 |
| ACK/NACK feedback mode | | | Multiplexing | N/A |
| Number of PHICH groups ($N_g$) | | | 1 | N/A |
| PHICH duration | | | extended | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. PDCCH/PCFICH other than that associated with SIB1/Paging are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 8: SIB-1 will not be transmitted in Cell2 in the test.

**Table 8.4.2.2.3_C.1.3-3: Minimum performance PDCCH/PCFICH – Non-MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1 | | Correlation Matrix and Antenna Configuration | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Pm-dsg (%) | SNR (dB) (Note 2) |
| 1 | 8 CCE | R15-1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | 2x2 Low | 1 | -3.9 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1. | | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.2.3

### 8.4.2.2.3_C.1.4 Test description

#### 8.4.2.2.3_C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the cell1 are set up according to Tables 8.4.2.2.3_C.1.3-1 and 8.4.2.2.3_C.1.3-2.
3. The downlink signals are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.2.2.3_C.1.4.3.

#### 8.4.2.2.3_C.1.4.2 Test procedure

1. Set the parameters for Cell1 and Cell2 according to Tables 8.4.2.2.3_C.1.3-2, 8.4.2.2.3_C.1.5-1, C.3.3-1 of Annex C.3.3 as appropriate, and SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC in the subframes overlapping with ABS of the aggressor cell. The details of PDCCH and PDSCH are specified in Table A.3.5.2-1 and Table A.3.5.2-2A respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity. Propagation conditions are set according to Annex B clause B.2.
2. Measure the Pm-dsg in the subframes overlapping with ABS of the aggressor cell for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.2.2.3_C.1.5-2, pass the UE. Otherwise fail the UE.

8.4.2.2.3_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.4.2.2.3_C.1.4.3-1: *PHICH-Config-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-4: PHICH-Config-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PHICH-Config-DEFAULT ::= SEQUENCE { | | | |
| phich-Duration | extended | | Cell 1 |
| phich-Resource | one | | |
| } | | | |

**Table 8.4.2.2.3_C.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.4.2.2.3_C.1.4.3-3: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000000010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.2.2.3_C.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 CHOICE{ | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| | | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000100010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '11001010001100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.4.2.2.3_C.1.5 Test requirement

For the parameters specified in Table 8.4.2.2.3_C.1.5-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.3_C.1.5-2.

**Table 8.4.2.2.3_C.1.5-1: Test Parameters for PDCCH/PCFICH – Non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 |
| Special subframe configuration | | | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -100.6 (Note 1) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -95.4 (Note 3) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.2.2.3_C.1.5-2 | 1.3 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 1 |
| ABS pattern (Note 4) | | | N/A | 0000010001<br>0000000001 |
| RLM/RRM Measurement Subframe Pattern(Note 5) | | | 0000000001<br>0000000001 | N/A |
| CSI Subframe Sets(Note 6) | $C_{CSI,0}$ | | 0000010001<br>0000000001 | N/A |
| | $C_{CSI,1}$ | | 1100101000<br>1100111000 | N/A |
| Number of control OFDM symbols | | | 3 | 3 |
| ACK/NACK feedback mode | | | Multiplexing | N/A |
| Number of PHICH groups ($N_g$) | | | 1 | N/A |
| PHICH duration | | | extended | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. PDCCH/PCFICH other than that associated with SIB1/Paging are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 8: SIB-1 will not be transmitted in Cell2 in the test.

**Table 8.4.2.2.3_C.1.5-2: Test Requirement PDCCH/PCFICH – Non-MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1 | | Correlation Matrix and Antenna Configuration | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Pm-dsg (%) | SNR (dB) (Note 2) |
| 1 | 8 CCE | R15-1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | 2x2 Low | 1 | -3 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1. | | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | | |

## 8.4.2.2.3_C.2 TDD PCFICH/PDCCH Transmit Diversity 2x2 for eICIC (MBSFN ABS)

### 8.4.2.2.3_C.2.1 Test purpose

To verify the UE's performance of transmit diversity (SFBC) with 2 transmit antennas if the PCFICH/PDCCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

### 8.4.2.2.3_C.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit 115.

### 8.4.2.2.3_C.2.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

**Table 8.4.2.2.3_C.2.3-1: Void**

For the parameters for MBSFN ABS specified in Table 8.4.2.2.3_C.2.3-2, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.3_C.2.3-3.

The downlink physical setup is in accordance with Annex C.3.2 and Annex C.3.3. In Table 8.4.2.2.3_C.2.3-2, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

**Table 8.4.2.2.3_C.2.3-2: Minimum performance PDCCH/PCFICH – MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 |
| Special subframe configuration | | | 4 | 4 |
| Downlink power allocation | PDCCH_RA PHICH_RA OCNG_RA | dB | -3 | -3 |
| | PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB | dB | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -100.5 (Note 1) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -95.3 (Note 3) | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.2.2.3_C.2.3-3 | 1.5 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | MBSFN |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 126 |
| ABS pattern (Note 4) | | | N/A | 0000000001 0000000001 |
| RLM/RRM Measurement Subframe Pattern(Note 5) | | | 0000000001 0000000001 | N/A |
| CSI Subframe Sets(Note 6) | $C_{CSI,0}$ | | 0000000001 0000000001 | N/A |
| | $C_{CSI,1}$ | | 1100111000 1100111000 | N/A |
| MBSFN Subframe Allocation (Note 9) | | | N/A | 000010 |
| Number of control OFDM symbols | | | 3 | 3 |
| ACK/NACK feedback mode | | | Multiplexing | N/A |
| Number of PHICH groups ($N_g$) | | | 1 | N/A |
| PHICH duration | | | extended | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. The 10th and 20th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 8: SIB-1 will not be transmitted in Cell2 in this test.
Note 9: MBSFN Subframe Allocation as defined in [5], one frame with 6 bits is chosen for MBSFN subframe allocation.

**Table 8.4.2.2.3_C.2.3-3: Minimum performance PDCCH/PCFICH – MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | Propagation Conditions(Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Pm-dsg (%) | SNR (dB) (Note 2) |
| 1 | 8 CCE | R15-1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | 2x2 Low | 1 | -4.1 |
| Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent. | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1. | | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.2.3

### 8.4.2.2.3_C.2.4 Test description

#### 8.4.2.2.3_C.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2.
2. The parameter settings for the cell1 are set up according to Tables 8.4.2.2.3_C.2.3-1.
3. The downlink signals are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.2.2.3_C.2.4.3.

#### 8.4.2.2.3_C.2.4.2 Test procedure

1. Set the parameters for Cell1 and Cell2 according to Tables 8.4.2.2.3_C.2.3-2, 8.4.2.2.3_C.2.5-1, C.3.3-1 of Annex C.3.3 as appropriate, and SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC in the subframes overlapping with ABS of the aggressor cell. The details of PDCCH and PDSCH are specified in Table A.3.5.2-1 and Table A.3.5.2-2A respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity. Propagation conditions are set according to Annex B clause B.2.
2. Measure the Pm-dsg in the subframes overlapping with ABS of the aggressor cell for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.2.2.3_C.2.5-2, pass the UE. Otherwise fail the UE.

#### 8.4.2.2.3_C.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.4.2.2.3_C.2.4.3-1: *PHICH-Config-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-4: PHICH-Config-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PHICH-Config-DEFAULT ::= SEQUENCE { | | | |
| phich-Duration | extended | | Cell 1 |
| phich-Resource | one | | |
| } | | | |

**Table 8.4.2.2.3_C.2.4.3-2: *SystemInformationBlockType3*: Neighbour cell configuration**

| Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-2: SystemInformationBlockType3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType3 ::= SEQUENCE { | | | |
| neighCellConfig | '00'B (Not all neighbour cells have the same MBSFN subframe allocation as serving cell) | | Cell 1 |
| } | | | |

**Table 8.4.2.2.3_C.2.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.4.2.2.3_C.2.4.3-4: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000000010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.2.2.3_C.2.4.3-5: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 CHOICE{ | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000000010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '11001110001100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.4.2.2.3_C.2.5 Test requirement

For the parameters specified in Table 8.4.2.2.3_C.2.5-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.3_C.2.5-2.

**Table 8.4.2.2.3_C.2.5-1: Minimum performance PDCCH/PCFICH – MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 |
| Special subframe configuration | | | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -100.6 (Note 1) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -95.4 (Note 3) | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.2.2.3_C.2.5-2 | 1.3 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | MBSFN |
| Time Offset between Cells | | Ms | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 126 |
| ABS pattern (Note 4) | | | N/A | 0000000001<br>0000000001 |
| RLM/RRM Measurement Subframe Pattern(Note 5) | | | 0000000001<br>0000000001 | N/A |
| CSI Subframe Sets(Note 6) | $C_{CSI,0}$ | | 0000000001<br>0000000001 | N/A |
| | $C_{CSI,1}$ | | 1100111000<br>1100111000 | N/A |
| MBSFN Subframe Allocation (Note 9) | | | N/A | 000010 |
| Number of control OFDM symbols | | | 3 | 3 |
| ACK/NACK feedback mode | | | Multiplexing | N/A |
| Number of PHICH groups ($N_g$) | | | 1 | N/A |
| PHICH duration | | | extended | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. The 10th and 20th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5].
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5].
Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 8: SIB-1 will not be transmitted in Cell2 in this test.
Note 9: MBSFN Subframe Allocation as defined in [5], one frame with 6 bits is chosen for MBSFN subframe allocation.

**Table 8.4.2.2.3_C.2.5-2: Test Requirement PDCCH/PCFICH – MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | Propagation Conditions(Note 1) | | Correlation Matrix and Antenna Configuration | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Pm-dsg (%) | SNR (dB) (Note 2) |
| 1 | 8 CCE | R15-1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | 2x2 Low | 1 | -3.2 |
| Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent. | | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1. | | | | | | | | | |

## 8.4.2.2.3_D

## 8.4.2.2.3_E TDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC

## 8.4.2.2.3_E.1 TDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS)

### 8.4.2.2.3_E.1.1 Test purpose

To verify the UE's performance of transmit diversity (SFBC) with 2 transmit antennas if the PCFICH/PDCCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

### 8.4.2.2.3_E.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE and CRS interference handling and ss-CCH interference handling – UE Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

### 8.4.2.2.3_E.1.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

For the parameters for non-MBSFN ABS specified in Table 8.4.2.2.3_E.1.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.3_E.1.3-2.

In Tables 8.4.2.2.3_E.1.3-1 and 8.4.2.2.3_E.1.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information TS 36.331 [5] including Cell 2 and Cell 3 is provided.

**Table 8.4.2.2.3_E.1.3-1: Test Parameters for PDCCH/PCFICH – Non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98(Note 1) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93 (Note 3) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.2.2.3_E.1.3-2 | 5 | 3 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 4) | | | N/A | 0000000001<br>0000000001 | 0000000001<br>0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 0000000001<br>0000000001 | N/A | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 0000000001<br>0000000001 | N/A | N/A |
| | $C_{CSI,1}$ | | 1100111000<br>1100111000 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 7 | Note 7 |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| Number of PHICH groups ($N_g$) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. PDCCH/PCFICH other than that associated with SIB1/Paging are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 7: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 8: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 9: SIB-1 will not be transmitted in Cell 2 and Cell 3 in the test.

**Table 8.4.2.2.3_E.1.3-2: Minimum performance PDCCH/PCFICH – Non-MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell3 | | Pm-dsg (%) | SNR (dB) (Note 3) |
| 1 | 8 CCE | R.15-2 TDD | OP.1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 1 | -2.0 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1. | | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.2.4.

### 8.4.2.2.3_E.1.4 Test description

#### 8.4.2.2.3_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell1 are set up according to Tables 8.4.2.2.3_E 1.3-1 and 8.4.2.2.3_E.1.3-2.
3. The downlink signals are initially set up according to Annex C.0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 8.4.2.2.3_E.1.4.3.

#### 8.4.2.2.3_E.1.4.2 Test procedure

1. Set the parameters for Cell 1, Cell 2 and Cell 3, according to Tables 8.4.2.2.3_E.1.5-1, 8.4.2.2.3_E.1.5-2, Annex C.3.2 for Cell 1, and Annex C.3.3 for Cell 2 and Cell 3. SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC. The details of PDCCH and PDSCH are specified in Table A.3.5.2-1 and Table A.3.5.2-2A respectively.
2. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity. Propagation conditions are set according to Annex B clause B.2.
3. Measure the Pm-dsg in the subframes overlapping with ABS of the aggressor cell for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.2.2.3_E.1.5-2, pass the UE. Otherwise fail the UE.

8.4.2.2.3_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 8.4.2.2.3_E.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '0000000001 0000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 126 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.2.2.3_E.1.4.3-2: PhysicalConfigDedicated-DEFAULT:**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.4.2.2.3_E.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '0000000001 0000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '1100111000 1100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.2.2.3_E.1.4.3-2-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 8.4.2.2.3_E.1.4.3-2-5: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | | |
| } | | | |

### 8.4.2.2.3_E.1.5 Test requirement

For the parameters specified in Table 8.4.2.2.3_E.1.5-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.3_E.1.5-2.

**Table 8.4.2.2.3_E.1.5-1: Test Parameters for PDCCH/PCFICH – Non-MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98(Note 1) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93.1 (Note 3) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.2.2.3_E.1.5-2 | 4.8 | 2.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 4) | | | N/A | 0000000001<br>0000000001 | 0000000001<br>0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 0000000001<br>0000000001 | N/A | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 0000000001<br>0000000001 | N/A | N/A |
| | $C_{CSI,1}$ | | 1100111000<br>1100111000 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 7 | Note 7 |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| Number of PHICH groups ($N_g$) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. PDCCH/PCFICH other than that associated with SIB1/Paging are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 7: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 8: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 9: SIB-1 will not be transmitted in Cell 2 and Cell 3 in the test.

**Table 8.4.2.2.3_E.1.5-2: Test Requirement PDCCH/PCFICH – Non-MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell3 | | Pm-dsg (%) | SNR (dB) (Note 3) |
| 1 | 8 CCE | R.15-2 TDD | OP.1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 1 | -1.1 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1. | | | | | | | | | | | |

## 8.4.2.2.3_E.2 TDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (MBSFN ABS)

### 8.4.2.2.3_E.2.1 Test purpose

To verify the UE's performance of transmit diversity (SFBC) with 2 transmit antennas if the PCFICH/PDCCH transmission in the serving cell takes place in subframes that overlap with ABS of the aggressor cell.

### 8.4.2.2.3_E.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE and CRS interference handling and ss-CCH interference handling – UE Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

### 8.4.2.2.3_E.2.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH.

For the parameters for non-MBSFN ABS specified in Table 8.4.2.2.3_E.2.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.3_E.2.3-2.

In Tables 8.4.2.2.3_E.2.3-1 and 8.4.2.2.3_E.2.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information TS 36.331 [5] including Cell 2 and Cell 3 is provided.

**Table 8.4.2.2.3_E.2.3-1: Test Parameters for PDCCH/PCFICH – MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98(Note 1) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93 (Note 3) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.2.2.3_E.2.3-2 | 5 | 3 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | MBSFN | MBSFN |
| Time Offset between Cells | | µs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 4) | | | N/A | 0000000001<br>0000000001 | 0000000001<br>0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 0000000001<br>0000000001 | N/A | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 0000000001<br>0000000001 | N/A | N/A |
| | $C_{CSI,1}$ | | 1100111000<br>1100111000 | N/A | N/A |
| MBSFN Subframe Allocation (Note 7) | | | N/A | 000010 | 000010 |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| Number of PHICH groups ($N_g$) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. The 10th and 20th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 7: MBSFN Subframe Allocation as defined in [7], one frame with 6 bits is chosen for MBSFN subframe allocation.
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by “0” of ABS pattern.
Note 9: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell 1 and Cell 2 is the same.
Note 10: SIB-1 will not be transmitted in Cell 2 in this test.

**Table 8.4.2.2.3_E.2.3-2: Minimum performance PDCCH/PCFICH – MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell3 | | Pm-dsg (%) | SNR (dB) (Note 3) |
| 1 | 8 CCE | R.15-2 TDD | OP.1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 1 | -1.8 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\bar{E}_s / N_{oc2}$ of Cell 1. | | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.2.4.

### 8.4.2.2.3_E.2.4 Test description

#### 8.4.2.2.3_E.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell1 are set up according to Tables 8.4.2.2.3_E.2.3-1 and 8.4.2.2.3_E.2.3-2.
3. The downlink signals are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 8.4.2.2.3_E.2.4.3.

#### 8.4.2.2.3_E.2.4.2 Test procedure

1. Set the parameters for Cell1, Cell2 and Cell3, according to Tables 8.4.2.2.3_E.2.5-1, 8.4.2.2.3_E.2.5-2, Annex C.3.2 for Cell 1, and Annex C.3.3 for Cell 2 and Cell 3. SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC. The details of PDCCH and PDSCH are specified in Table A.3.5.2-1 and Table A.3.5.2-2A respectively.
2. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity. Propagation conditions are set according to Annex B clause B.2.
3. Measure the Pm-dsg in the subframes overlapping with ABS of the aggressor cell for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.2.2.3_E.2.5-2, pass the UE. Otherwise fail the UE.

#### 8.4.2.2.3_E.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 8.4.2.2.3_E.2.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '0000000001000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 126 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000010' B | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.2.2.3_E.1.4.3-2: PhysicalConfigDedicated-DEFAULT:**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.4.2.2.3_E.2.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000000010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '11001110001100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.2.2.3_E.2.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 8.4.2.2.3_E.2.4.3-5: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | | |
| } | | | |

**Table 8.4.2.2.3_E.2.4.3-6: *SystemInformationBlockType3***

| Derivation Path: 36.508 [7] clause 4.6.2, Table 4.4.3.3-2 SystemInformationBlockType3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| neighCellConfig | '00'B (Not all neighbour cells have the same MBSFN subframe allocation as the serving cell) | | Cell 1 |

### 8.4.2.2.3_E.2.5 Test requirement

For the parameters specified in Table 8.4.2.2.3_E.2.5-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.3_E.2.5-2.

**Table 8.4.2.2.3_E.2.5-1: Test Parameters for PDCCH/PCFICH – MBSFN ABS**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98(Note 1) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93.1 (Note 3) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.4.2.2.3_E.2.5-2 | 4.8 | 2.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | MBSFN | MBSFN |
| Time Offset between Cells | | µs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 4) | | | N/A | 0000000001<br>0000000001 | 0000000001<br>0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 0000000001<br>0000000001 | N/A | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 0000000001<br>0000000001 | N/A | N/A |
| | $C_{CSI,1}$ | | 1100111000<br>1100111000 | N/A | N/A |
| MBSFN Subframe Allocation (Note 7) | | | N/A | 000010 | 000010 |
| Number of control OFDM symbols | | | 2 | Note 8 | Note 8 |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| Number of PHICH groups ($N_g$) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 2: This noise is applied in OFDM symbols #0 of a subframe overlapping with the aggressor ABS.
Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. The 10th and 20th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 7: MBSFN Subframe Allocation as defined in [7], one frame with 6 bits is chosen for MBSFN subframe allocation.
Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by “0” of ABS pattern.
Note 9: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell 1 and Cell 2 is the same.
Note 10: SIB-1 will not be transmitted in Cell 2 in this test.

**Table 8.4.2.2.3_E.2.5-2: Test Requirement PDCCH/PCFICH – MBSFN ABS**

| Test Number | Aggregation Level | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Correlation Matrix and Antenna Configuration (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell3 | | Pm-dsg (%) | SNR (dB) (Note 3) |
| 1 | 8 CCE | R.15-2 TDD | OP.1 TDD | OP.1 TDD | OP.1 TDD | EVA5 | EVA5 | EVA5 | 2x2 Low | 1 | -0.9 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\bar{E}_s / N_{oc2}$ of Cell 1. | | | | | | | | | | | |

8.4.2.2.4

## 8.4.2.2.5 TDD Enhanced Downlink Control Channel Performance Requirement Type A for PCFICH/PDCCH, 2 Tx Antenna Port with Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.4.2.2.5.1 Test purpose

This test verifies the enhanced downlink control channel performance requirement Type A for PCFICH/PDCCH for 2 transmit diversity with Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels remains below a given reference value.

### 8.4.2.2.5.2 Test applicability

This test applies to all types of E-UTRA TDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type A. Detailed Test Applicability is specified in clause 8.1.2.7.

### 8.4.2.2.5.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH. The parameters specified in Table 8.4.2.2.5.3-1 and Table 8.4.2.2.5.3-2.

In Table 8.4.2.2.5.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.4.2.2.5.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups (Ng) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note: PHICH power setting refers to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

**Table 8.4.2.2.5.3-2: Additional Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB<br>PDCCH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 6 | 1 |
| UL/DL Configuration | | | 0 | 0 | 0 |
| Special Subframe Configuration | | | 4 | 4 | 4 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of DL control region OFDM symbols | | | 3 for subframes 0 and 5<br>2 for subframes 1 and 6 | | |
| CFI indicated in PCFICH | | | 3 for subframes 0 and 5<br>2 for subframes 1 and 6 | | |
| PHICH Ng (Note 1) | | | 1/6 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| PDSCH TM | | | 4 | N/A | N/A |
| Interference model | | | | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time Offset relative to Cell 1 | | µs | N/A | 2 | 3 |
| Frequency shift relative to Cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [4].<br>Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.4.2.2.5.3-1 and Table 8.4.2.2.5.3-2 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.5.3-3.

**Table 8.4.2.2.5.3-3: Minimum Performance for PDCCH/PCFICH for Enhanced Downlink Control Channel Performance Requirement Type A**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 2 CCE | R.16-1 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | 16.1 |

Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3.
Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1.

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.2.5.

### 8.4.2.2.5.4 Test description

#### 8.4.2.2.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.4.2.2.5.3-1 and Table 8.4.2.2.5.3-2.
3. The downlink signals are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.2.2.5.4.3.

#### 8.4.2.2.5.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.2.2.5.3-2.The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be closed loop spatial multiplexing.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.2.2.5.5-1.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.2.2.5.5-1, pass the UE. Otherwise fail the UE.

#### 8.4.2.2.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.4.2.2.5.4.3-1: TDD-Configuration-DEFAULT**

| Derivation Path: 36.508 clause 4.6.4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Configuration-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa0 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

**Table 8.4.2.2.5.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.4.2.2.5.5 Test requirement

For the parameters specified in Table 8.4.2.2.5.3-1 and Table 8.4.2.2.5.3-2, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.5.5-1.

**Table 8.4.2.2.5.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 2 CCE | R.16-1 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | TBD |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3.<br>Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

## 8.4.2.2.6 TDD Enhanced Downlink Control Channel Performance Requirement Type A for PCFICH/PDCCH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.4.2.2.6.1 Test purpose

This test verifies the enhanced downlink control channel performance requirement Type A for PCFICH/PDCCH for 2 transmit diversity with Non-Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels remains below a given reference value.

#### 8.4.2.2.6.2 Test applicability

This test applies to all types of E-UTRA TDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type A. Detailed Test Applicability is specified in clause 8.1.2.7.

#### 8.4.2.2.6.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH. The parameters specified in Table 8.4.2.2.6.3-1 and Table 8.4.2.2.6.3-2.

In Table 8.4.2.2.6.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.4.2.2.6.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups (Ng) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note: PHICH power setting refers to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

**Table 8.4.2.2.6.3-2: Additional Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB PDCCH_RB OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| UL/DL Configuration | | | 0 | 0 | 0 |
| Special Subframe Configuration | | | 4 | 4 | 4 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of DL control region OFDM symbols | | | 3 for subframes 0 and 5<br>2 for subframes 1 and 6 | | |
| CFI indicated in PCFICH | | | 3 for subframes 0 and 5<br>2 for subframes 1 and 6 | | |
| PHICH Ng (Note 1) | | | 1/6 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| PDSCH TM | | | 4 | N/A | N/A |
| Interference model | | | | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time Offset relative to Cell 1 | | μs | N/A | 2 | 3 |
| Frequency shift relative to Cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [4].<br>Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.4.2.2.6.3-1 and Table 8.4.2.2.6.3-2 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.6.3-3.

**Table 8.4.2.2.6.3-3: Minimum Performance for PDCCH/PCFICH for Enhanced Downlink Control Channel Performance Requirement Type A**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 4 CCE | R.16-2 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | 13.3 |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3.<br>Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.2.6.

### 8.4.2.2.6.4 Test description

#### 8.4.2.2.6.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.4.2.2.6.3-1 and Table 8.4.2.2.6.3-2.
3. The downlink signals are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.2.2.6.4.3.

### 8.4.2.2.6.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.2.2.6.3-2.The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be closed loop spatial multiplexing.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.2.2.6.5-1.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.2.2.6.5-1, pass the UE. Otherwise fail the UE.

### 8.4.2.2.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.4.2.2.6.4.3-1: TDD-Configuration-DEFAULT**

| Derivation Path: 36.508 clause 4.6.4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Configuration-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa0 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

**Table 8.4.2.2.6.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.4.2.2.6.5 Test requirement

For the parameters specified in Table 8.4.2.2.6.3-1 and Table 8.4.2.2.6.3-2, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.6.5-1.

**Table 8.4.2.2.6.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 4 CCE | R.16-2 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | TBD |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3.<br>Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

## 8.4.2.2.7 TDD Enhanced Downlink Control Channel Performance Requirement Type B for PCFICH/PDCCH, 2 Tx Antenna Port with Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.4.2.2.7.1 Test purpose

This test verifies the enhanced downlink control channel performance requirement Type B for PCFICH/PDCCH for 2 transmit diversity with Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels remains below a given reference value.

### 8.4.2.2.7.2 Test applicability

This test applies to all types of E-UTRA TDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type B. Detailed Test Applicability is specified in clause 8.1.2.7.

8.4.2.2.7.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH. The parameters specified in Table 8.4.2.2.7.3-1 and Table 8.4.2.2.7.3-2.

In Table 8.4.2.2.7.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.4.2.2.7.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups (Ng) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note: PHICH power setting refers to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

**Table 8.4.2.2.7.3-2: Additional Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB PDCCH_RB OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 6 | 1 |
| UL/DL Configuration | | | 0 | 0 | 0 |
| Special Subframe Configuration | | | 4 | 4 | 4 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of DL control region OFDM symbols | | | 1 | 1 | 1 |
| CFI indicated in PCFICH | | | 1 | 1 | 1 |
| PHICH Ng (Note 1) | | | 1/6 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| PDSCH TM | | | 4 | N/A | N/A |
| Interference model | | | | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time Offset relative to Cell 1 | | μs | N/A | 2 | 3 |
| Frequency shift relative to Cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [4]. Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.4.2.2.7.3-1 and Table 8.4.2.2.7.3-2 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.7.3-3.

**Table 8.4.2.2.7.3-3: Minimum Performance for PDCCH/PCFICH for Enhanced Downlink Control Channel Performance Requirement Type B**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 2 CCE | R.16-3 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | 13.7 |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3. Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3. Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.2.7.

### 8.4.2.2.7.4 Test description

#### 8.4.2.2.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.4.2.2.7.3-1 and Table 8.4.2.2.7.3-2.
3. The downlink signals are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.2.2.7.4.3.

### 8.4.2.2.7.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.2.2.7.3-2.The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be closed loop spatial multiplexing.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.2.2.7.5-1.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.2.2.7.5-1, pass the UE. Otherwise fail the UE.

### 8.4.2.2.7.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.4.2.2.7.4.3-1: TDD-Configuration-DEFAULT**

| Derivation Path: 36.508 clause 4.6.4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Configuration-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa0 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

**Table 8.4.2.2.7.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.4.2.2.7.5 Test requirement

For the parameters specified in Table 8.4.2.2.7.3-1 and Table 8.4.2.2.7.3-2, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.7.5-1.

**Table 8.4.2.2.7.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 2 CCE | R.16-3 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | TBD |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3.<br>Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

## 8.4.2.2.8 TDD Enhanced Downlink Control Channel Performance Requirement Type B for PCFICH/PDCCH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.4.2.2.8.1 Test purpose

This test verifies the enhanced downlink control channel performance requirement Type B for PCFICH/PDCCH for 2 transmit diversity with Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels remains below a given reference value.

### 8.4.2.2.8.2 Test applicability

This test applies to all types of E-UTRA TDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type B. Detailed Test Applicability is specified in clause 8.1.2.7.

8.4.2.2.8.3 Minimum conformance requirements

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH. The parameters specified in Table 8.4.2.2.8.3-1 and Table 8.4.2.2.8.3-2.

In Table 8.4.2.2.8.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.4.2.2.8.3-1: Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| Number of PHICH groups (Ng) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note: PHICH power setting refers to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

**Table 8.4.2.2.8.3-2: Additional Test Parameters for PDCCH/PCFICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB PDCCH_RB OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell Id | | | 0 | 1 | 6 |
| UL/DL Configuration | | | 0 | 0 | 0 |
| Special Subframe Configuration | | | 4 | 4 | 4 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of DL control region OFDM symbols | | | 1 | 1 | 1 |
| CFI indicated in PCFICH | | | 1 | 1 | 1 |
| PHICH Ng (Note 1) | | | 1/6 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| PDSCH TM | | | 4 | N/A | N/A |
| Interference model | | | | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time Offset relative to Cell 1 | | μs | N/A | 2 | 3 |
| Frequency shift relative to Cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [4]. Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.4.2.2.8.3-1 and Table 8.4.2.2.8.3-2 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.8.3-3.

**Table 8.4.2.2.8.3-3: Minimum Performance for PDCCH/PCFICH for Enhanced Downlink Control Channel Performance Requirement Type B**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 4 CCE | R.16-4 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | 11.2 |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3. Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3. Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.2.8.

### 8.4.2.2.8.4 Test description

#### 8.4.2.2.8.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.4.2.2.8.3-1 and Table 8.4.2.2.8.3-2.
3. The downlink signals are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.2.2.8.4.3.

### 8.4.2.2.8.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.2.2.8.3-2.The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be closed loop spatial multiplexing.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.2.2.8.5-1.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

   If Pm-dsg is less than the value specified in table 8.4.2.2.8.5-1, pass the UE. Otherwise fail the UE.

### 8.4.2.2.8.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.4.2.2.8.4.3-1: TDD-Configuration-DEFAULT**

| Derivation Path: 36.508 clause 4.6.4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Configuration-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa0 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

**Table 8.4.2.2.8.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.4.2.2.8.5 Test requirement

For the parameters specified in Table 8.4.2.2.8.3-1 and Table 8.4.2.2.8.3-2, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.8.5-1.

**Table 8.4.2.2.8.5-1: Test requirement PDCCH/PCFICH 2 Tx Antenna Port**

| Test Number | Aggregation level | Reference Channel | OCNG Pattern (Note 1) | Propagation Conditions (Note 2) | | | Antenna Configuration and Correlation Matrix (Note 3) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Cell 1 | Cell 2 | Cell 3 | | Pm-dsg (%) | SNR (dB) (Note 4) |
| 1 | 4 CCE | R.16-4 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 1 | TBD |
| Note 1: The OCNG pattern applies for Cell 1, Cell 2 and Cell 3.<br>Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 3: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 4: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |

## 8.4.3 LAA

The parameters specified in Table 8.4.3-1 are valid for all LAA PDCCH tests unless otherwise stated.

**Table 8.4.3-1: Common test Parameters for PDCCH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Downlink power allocation (Note 1) | PDCCH_RA PHICH_RA OCNG_RA | dB | -3 |
| | PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB | dB | -3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PHICH Ng (Note 1) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s (Note 2) | | | OCNG |
| Cell ID | | | 0 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: In LAA Scell(s), PCFICH_RB, PHICH_RA, and PHICH_RB are not available.<br>Note 2: OCNG is applied only within LAA burst. | | | |

## 8.4.3.1 Transmit Diversity Performance

### 8.4.3.1.1 LAA PCFICH/PDCCH Transmit Diversity 2x2 with FDD as Pcell

#### 8.4.3.1.1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.2 remains below a given reference value.

#### 8.4.3.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward that support DL LAA with E-UTRA FDD as PCell

#### 8.4.3.1.1.3 Minimum conformance requirements

The average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.3.1.1.3-2 for Pcell and in Table 8.4.3.1.1.3-3 for LAA Scell(s), with the addition of the parameters in Table 8.4.3-1, and Table 8.4.3.1.1.3-1. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.4.3.1.1.3-1: Test Parameters for LAA Scell(s)**

| Parameter | Unit | Value |
|---|---|---|
| DMTC Periodicity | ms | 80 |
| dmtc-PeriodOffset-r12 ms80-r12 | | 0 |
| Downlink Burst transmission pattern for LAA SCell | | As specified in B.8 |
| The number of subframes set ($S_1$) in a burst | | {1,3, 5, 8} |
| Uniform random number ($p$) in the burst model | | 0.5 |
| Occupied OFDM symbols set in the last subframe | | {6, 9, 12,14} |
| timing error relative of LAA SCell to PCell | μs | 15 |
| Frequency offset of th *i*-th LAA SCell relative to PCell | Hz | 200 |
| Note 1: The same PDSCH transmission mode is applied to each component carrier.<br>Note 2: The OCNG shall be applied for the non-scheduled OFDM symbols within the burst, and which OFDM symbols are scheduled within the burst is according to UE capability. | | |

**Table 8.4.3.1.1.3-2: Single carrier performance for CCs which are not LAA Scells for multiple CA configurations**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.16_1 FDD | OP.1 TDD | EVA5 | 2 x 2 Low | 1 | -0.6 |

**Table 8.4.3.1.1.3-3: Single carrier performance for LAA Scell(s) for multiple CA configurations**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 20 MHz | 4 CCE | R.3 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 0.2 |
| 2 | 20 MHz | 4 CCE | R.3 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 0.2 |
| 3 | 20 MHz | 4 CCE | R.3 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 0.3 |
| 4 | 20 MHz | 4 CCE | R.3 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 0.1 |
| Note1: UE is required to fulfil only one test among test 1-4 depending on it's capability for endingDwPTS and secondSlotStartingPosition. For UE don't support endingDwPTS and secondSlotStartingPosition, it is required to fulfil test 1; For UE don't support endingDwPTS and support secondSlotStartingPosition, it is required to fulfil test 2; For UE support endingDwPTS and don't support secondSlotStartingPosition, it is required to fulfil test 3; and For UE support both endingDwPTS and secondSlotStartingPosition, it is required to fulfil test 4. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.3.1.1.1.

### 8.4.3.1.1.4 Test description

#### 8.4.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10+20 MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.36 as appropriate.
2. The parameter settings for the cell are set up according to Table 8.4.3-1.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.3.1.1.4.3.

#### 8.4.3.1.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.4.3.1.1.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4 SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.3.1.1.3-2 for PCC. The details of PDCCH and PDSCH are specified in A.3.5.1. The SS sends downlink MAC padding bits on the DL RMC.

5. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.4.3.1.1.3-1 and 8.4.3.1.1.3-3 for SCC. The details of PDCCH and PDSCH are specified in A.3.5.3. The SS sends downlink MAC padding bits on the DL RMC. SS transmits PDCCH DCI format 1C for CC_RNTI in the last two subframes of every burst to indicate number of OFDM symbols in the DwPTS of ending partial subframe if required depending on UE capability according to TS 36.213 clause 13A as described in Table 8.4.3.1.1.3-3.
6. Set the parameters of the reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.4.3.1.1.5-1 and 8.4.3.1.1.5-2 as appropriate.
7. Measure the Pm-dsg separately for PCC and SCC for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in table 8.4.3.1.1.5-1 for PCC and less than value specified in table 8.4.3.1.1.5-2 for SCC, pass the UE. Otherwise fail the UE.

#### 8.4.3.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 8.4.3.1.1.4.3-1: MeasDS-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasDS-Config-DEFAULT ::= CHOICE { | | | |
| Release | NULL | | |
| setup SEQUENCE { | | | |
| dmtc-PeriodOffset-r12 CHOICE { | | | |
| ms80-r12 | 0 | | |
| } | | | |
| ds-OccasionDuration-r12 CHOICE { | | | |
| durationTDD-r12 | 2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.3.1.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.3.1.1.4.3-3: PhysicalConfigDedicatedSCell-r10-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| Laa-ScellConfiguration-r13 SEQUENCE { | | | |
| subframeStartPosition | ‘s0’ or ‘s07’ | Depending on UE capability, as described in Table 8.4.3.1.1.3-3 | |
| Laa-SCellSubframeConfig | ‘00000000’ | | |
| } | | | |
| } | | | |

#### 8.4.3.1.1.5 Test requirement

For the parameters specified in Table 8.4.3.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.3.1.1.5-1 for PCC and Table 8.4.3.1.1.5-2 for SCC.

**Table 8.4.3.1.1.5-1: Single carrier performance for CCs which are not LAA Scells for multiple CA configurations**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.16_1 FDD | OP.1 TDD | EVA5 | 2 x 2 Low | 1 | 0.3 |

**Table 8.4.3.1.1.5-2: Single carrier performance for LAA Scell(s) for multiple CA configurations**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 20 MHz | 4 CCE | R.3 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 1.1 |
| 2 | 20 MHz | 4 CCE | R.3 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 1.1 |
| 3 | 20 MHz | 4 CCE | R.3 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 1.2 |
| 4 | 20 MHz | 4 CCE | R.3 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 1.0 |
| Note1: UE is required to fulfil only one test among test 1-4 depending on it's capability for endingDwPTS and secondSlotStartingPosition. For UE don't support endingDwPTS and secondSlotStartingPosition, it is required to fulfil test 1; For UE don't support endingDwPTS and support secondSlotStartingPosition, it is required to fulfil test 2; For UE support endingDwPTS and don't support secondSlotStartingPosition, it is required to fulfil test 3; and For UE support both endingDwPTS and secondSlotStartingPosition, it is required to fulfil test 4. | | | | | | | | |

### 8.4.3.1.2 LAA PCFICH/PDCCH Transmit Diversity 2x2 with TDD as Pcell

#### 8.4.3.1.2.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.2 remains below a given reference value.

#### 8.4.3.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 13 and forward that support DL LAA with E-UTRA TDD as PCell

#### 8.4.3.1.2.3 Minimum conformance requirements

The average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.3.1.2.3-2 for Pcell and in Table 8.4.3.1.2.3-3 for LAA Scell(s), with the addition of the parameters in Table 8.4.3-1, and Table 8.4.3.1.2.3-1. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.4.3.1.2.3-1: Test Parameters for LAA Scell(s)**

| Parameter | Unit | Value |
|---|---|---|
| DMTC Periodicity | ms | 80 |
| dmtc-PeriodOffset-r12 ms80-r12 | | 0 |
| Downlink Burst transmission pattern for LAA SCell | | As specified in B.8 |
| The number of subframes set ($S_1$) in a burst | | {1,3, 5, 8} |
| Uniform random number ($p$) in the burst model | | 0.5 |
| subframeStartPosition | | 's07' |
| Occupied OFDM symbols set in the last subframe | | {6, 9, 12,14} |
| timing error relative of LAA SCell to PCell | μs | 15 |
| Frequency offset of th $i$-th LAA SCell relative to PCell | Hz | 200 |
| Note 1: The same PDSCH transmission mode is applied to each component carrier.<br>Note 2: The OCNG shall be applied for the non-scheduled OFDM symbols within the burst, and which OFDM symbols are scheduled within the burst is according to UE capability. | | |

**Table 8.4.3.1.2.3-2: Single carrier performance for CCs which are not LAA Scells for multiple CA configurations**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.16_1 TDD | OP.1 TDD | EVA5 | 2 x 2 Low | 1 | -0.6 |

**Table 8.4.3.1.2.3-3: Single carrier performance for LAA Scell(s) for multiple CA configurations**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 20 MHz | 4 CCE | R.4 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 0.2 |
| 2 | 20 MHz | 4 CCE | R.4 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 0.2 |
| 3 | 20 MHz | 4 CCE | R.4 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 0.3 |
| 4 | 20 MHz | 4 CCE | R.4 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 0.1 |
| Note1 : UE is required to fulfil only one test among test 1-4 depending on it's capability for endingDwPTS and secondSlotStartingPosition. For UE don't support endingDwPTS and secondSlotStartingPosition, it is required to fulfil test 1; For UE don't support endingDwPTS and support secondSlotStartingPosition, it is required to fulfil test 2; For UE support endingDwPTS and don't support secondSlotStartingPosition, it is required to fulfil test 3; and For UE support both endingDwPTS and secondSlotStartingPosition, it is required to fulfil test 4. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.4.3.1.2.

#### 8.4.3.1.2.4 Test description

##### 8.4.3.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10+20 MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.36 as appropriate.
2. The parameter settings for the cell are set up according to Table 8.4.3-1.
3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.4.3.1.2.4.3.

##### 8.4.3.1.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.4.3.1.1.4.3
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4 SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.4.3.1.2.3-2 for PCC. The details of PDCCH and PDSCH are specified in A.3.5.2. The SS sends downlink MAC padding bits on the DL RMC.

5. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.4.3.1.2.3-1 and 8.4.3.1.2.3-3 for SCC. The details of PDCCH and PDSCH are specified in A.3.5.3. The SS sends downlink MAC padding bits on the DL RMC. SS transmits PDCCH DCI format 1C for CC_RNTI in the last two subframes of every burst to indicate number of OFDM symbols in the DwPTS of ending partial subframe if required depending on UE capability according to TS 36.213 clause 13A as described in Table 8.4.3.1.2.3-3.
6. Set the parameters of the reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.4.3.1.2.5-1 and 8.4.3.1.2.5-2 as appropriate.
7. Measure the Pm-dsg separately for PCC and SCC for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in table 8.4.3.1.2.5-1 for PCC and less than value specified in table 8.4.3.1.2.5-2 for SCC, pass the UE. Otherwise fail the UE.

##### 8.4.3.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 8.4.3.1.2.4.3-1: MeasDS-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasDS-Config-DEFAULT ::= CHOICE { | | | |
| Release | NULL | | |
| setup SEQUENCE { | | | |
| dmtc-PeriodOffset-r12 CHOICE { | | | |
| ms80-r12 | 0 | | |
| } | | | |
| ds-OccasionDuration-r12 CHOICE { | | | |
| durationTDD-r12 | 2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.3.1.2.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.4.3.1.2.4.3-3: PhysicalConfigDedicatedSCell-r10-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| Laa-ScellConfiguration-r13 SEQUENCE { | | | |
| subframeStartPosition | ‘s0’ or ‘s07’ | Depending on UE capability, as described in Table 8.4.3.1.2.3-3 | |
| Laa-SCellSubframeConfig | ‘00000000’ | | |
| } | | | |
| } | | | |

#### 8.4.3.1.2.5 Test requirement

For the parameters specified in Table 8.4.3.1.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.3.1.2.5-1 for PCC and Table 8.4.3.1.2.5-2 for SCC.

**Table 8.4.3.1.2.5-1: Single carrier performance for CCs which are not LAA Scells for multiple CA configurations**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.16_1 TDD | OP.1 TDD | EVA5 | 2 x 2 Low | 1 | -0.6 |

**Table 8.4.3.1.2.5-2: Single carrier performance for LAA Scell(s) for multiple CA configurations**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 20 MHz | 4 CCE | R.4 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 1.1 |
| 2 | 20 MHz | 4 CCE | R.4 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 1.1 |
| 3 | 20 MHz | 4 CCE | R.4 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 1.2 |
| 4 | 20 MHz | 4 CCE | R.4 FS3 | OP.1 FS3 | EVA5 | 2 x 2 Low | 1 | 1.0 |
| Note1：UE is required to fulfil only one test among test 1-4 depending on it's capability for endingDwPTS and secondSlotStartingPosition. For UE don't support endingDwPTS and secondSlotStartingPosition, it is required to fulfil test 1; For UE don't support endingDwPTS and support secondSlotStartingPosition, it is required to fulfil test 2; For UE support endingDwPTS and don't support secondSlotStartingPosition, it is required to fulfil test 3; and For UE support both endingDwPTS and secondSlotStartingPosition, it is required to fulfil test 4. | | | | | | | | |

# 8.5 Demodulation of PHICH

## 8.5.1 FDD

### 8.5.1.1 FDD PHICH Single-antenna Port Performance

#### 8.5.1.1.1 Test purpose

This test verifies the demodulation performance of PHICH for a single antenna port with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

#### 8.5.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

#### 8.5.1.1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.1.1.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Single antenna port |
|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | 0 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | 0 |
| PHICH duration | | | Normal |
| Number of PHICH groups (Note 1) | | | Ng = 1 |
| PDCCH Content | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8]<br>Note 2: PHICH power settings refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.5.1.1.3-1 the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.1.1.3-2.

**Table 8.5.1.1.3-2: Minimum performance PHICH**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.18 | OP.1 FDD | ETU70 | 1 x 2 Low | 0.1 | 5.5 |
| 2 | 10 MHz | R.24 | OP.1 FDD | ETU70 | 1 x 2 Low | 0.1 | 0.6 |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.

### 8.5.1.1.4 Test description

#### 8.5.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.

2. The parameter settings for the cell are set up according to Table 8.5.1.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.1.1.4.3.

#### 8.5.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.1.1.5-1 Test 1 as appropriate.

2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.1.1.4.2-1 indicates the transmissions for one cycle.

**Table 8.5.1.1.4.2-1: PHICH test pattern**

| TTI | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 |
|---|---|---|---|---|---|---|
| PDCCH | S | S | - | - | S | S |
| PHICH | - | - | A | A | - | - |
| PUSCH | | T | T | R | R | T |
| UL HARQ Process | 1-4 | 5-8 | 1-4 | 5-8 | 1-4 | 5-8 |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK | | | | | | |

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
If Pm-an is less than the value specified in table 8.5.1.1.5-1, pass the UE. Otherwise fail the UE.

5. Repeat the same procedure (steps 1 to 3 ) with test conditions according to the Table 8.5.1.1.5-1 for Test 2.

#### 8.5.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, with the following exceptions

**Table 8.5.1.1.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

### 8.5.1.1.5 Test requirement

For the parameters specified in Table 8.5.1.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.1.1.5-1.

**Table 8.5.1.1.5-1: Test requirement PHICH**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.18 | OP.1 FDD | ETU70 | 1 x 2 Low | 0.1 | 6.4 |
| 2 | 10 MHz | R.24 | OP.1 FDD | ETU70 | 1 x 2 Low | 0.1 | 1.5 |

## 8.5.1.2 FDD PHICH Transmit Diversity Performance

### 8.5.1.2.1 FDD PHICH Transmit Diversity 2x2

#### 8.5.1.2.1.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

#### 8.5.1.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8.

#### 8.5.1.2.1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.1.2.1.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| PHICH duration | | | Normal |
| Number of PHICH groups (Note 1) | | | Ng = 1 |
| PDCCH Content | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8]<br>Note 2: PHICH power settings refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.5.1.2.1.3-1 the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.1.3-2

**Table 8.5.1.2.1.3-2: Minimum performance PHICH 2 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 1.4 MHz | R.19A | OP.1 FDD | EPA5 | 2 x 2 Low | 0.1 | 5.6 |
| 1A | 5MHz (Note 1) | R.19-1 | OP.1 FDD | EVA 70 | 2x2 Low | 0.1 | 4 |
| Note 1: Test case applicability is defined in 8.1.2.1. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.1.

### 8.5.1.2.1.4 Test description

#### 8.5.1.2.1.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: Depending on the bandwidth specified per test number in Table 8.5.1.2.1.3-2, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 8.5.1.2.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.1.2.1.4.3.

#### 8.5.1.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.1.2.1.5-1.
2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.1.2.1.4.2-1 indicates the transmissions for one cycle.

**Table 8.5.1.2.1.4.2-1: PHICH test pattern**

| TTI | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 |
|---|---|---|---|---|---|---|
| PDCCH | S | S | - | - | S | S |
| PHICH | - | - | A | A | - | - |
| PUSCH | | T | T | R | R | T |
| UL HARQ Process | 1-4 | 5-8 | 1-4 | 5-8 | 1-4 | 5-8 |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK | | | | | | |

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
   If Pm-an is less than the value specified in table 8.5.1.2.1.5-1, pass the UE. Otherwise fail the UE.

### 8.5.1.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions

**Table 8.5.1.2.1.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

### 8.5.1.2.1.5 Test requirement

For the parameters specified in Table 8.5.1.2.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.1.2.1.5-1.

**Table 8.5.1.2.1.5-1: Test requirement PHICH 2 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 1.4 MHz | R.19A | OP.1 FDD | EPA5 | 2 x 2 Low | 0.1 | 6.7 |
| 1A | 5MHz (Note 1) | R.19-1 | OP.1 FDD | EVA 70 | 2x2 Low | 0.1 | 5.1 |
| Note 1: Test case is applicable (according to sub clause 8.1.2.1) to UE's which, from the E-UTRA operating bands defined in Table 5.2-1, support only E-UTRA band 31. | | | | | | | |

### 8.5.1.2.1_1 FDD PHICH Transmit Diversity 2x2 (Release 9 and forward)

#### 8.5.1.2.1_1.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

#### 8.5.1.2.1_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward.

#### 8.5.1.2.1_1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.1.2.1_1.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| PHICH duration | | | Normal |
| Number of PHICH groups (Note 1) | | | Ng = 1 |
| PDCCH Content | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | OCNG | |
| Cell ID | | | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8]<br>Note 2: PHICH power settings refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.5.1.2.1_1.3-1 the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.1_1.3-2

**Table 8.5.1.2.1_1.3-2: Minimum performance PHICH 2 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.19 | OP.1 FDD | EVA70 | 2 x 2 Low | 0.1 | 4.4 |
| 1A | 5MHz (Note 1) | R.19-1 | OP.1 FDD | EVA 70 | 2x2 Low | 0.1 | 4 |
| Note 1: Test case applicability is defined in 8.1.2.1. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.1.

### 8.5.1.2.1_1.4 Test description

#### 8.5.1.2.1_1.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.5.1.2.1_1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 8.5.1.2.1_1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.1.2.1_1.4.3.

#### 8.5.1.2.1_1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.1.2.1_1.5-1.
2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.1.2.1_1.4.2-1 indicates the transmissions for one cycle.

**Table 8.5.1.2.1_1.4.2-1: PHICH test pattern**

| TTI | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 |
|---|---|---|---|---|---|---|
| PDCCH | S | S | - | - | S | S |
| PHICH | - | - | A | A | - | - |
| PUSCH | | T | T | R | R | T |
| UL HARQ Process | 1-4 | 5-8 | 1-4 | 5-8 | 1-4 | 5-8 |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK | | | | | | |

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.
4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
   If Pm-an is less than the value specified in table 8.5.1.2.1_1.5-1, pass the UE. Otherwise fail the UE.

#### 8.5.1.2.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions

**Table 8.5.1.2.1_1.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

### 8.5.1.2.1_1.5 Test requirement

For the parameters specified in Table 8.5.1.2.1_1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.1.2.1_1.5-1.

**Table 8.5.1.2.1_1.5-1: Test requirement PHICH 2 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.19 | OP.1 FDD | EVA70 | 2 x 2 Low | 0.1 | +5.5 |
| 1A | 5MHz (Note 1) | R.19-1 | OP.1 FDD | EVA 70 | 2x2 Low | 0.1 | +5.1 |
| Note 1: Test case is applicable (according to sub clause 8.1.2.1) to UE's which, from the E-UTRA operating bands defined in Table 5.2-1, support only E-UTRA band 31. | | | | | | | |

## 8.5.1.2.2 FDD PHICH Transmit Diversity 4x2

### 8.5.1.2.2.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

### 8.5.1.2.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8.

### 8.5.1.2.2.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.1.2.2.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| PHICH duration | | | Normal |
| Number of PHICH groups (Note 1) | | | Ng = 1 |
| PDCCH Content | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8]<br>Note 2: PHICH power settings refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.5.1.2.2.3-1 the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.2.3-2.

**Table 8.5.1.2.2.3-2: Minimum performance PHICH 4 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.20A | OP.1 FDD | EVA5 | 4 x 2 Medium | 0.1 | 6.0 |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.1.

### 8.5.1.2.2.4 Test description

#### 8.5.1.2.2.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.
2. The parameter settings for the cell are set up according to Table 8.5.1.2.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.1.2.2.4.3.

#### 8.5.1.2.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.1.2.2.5-1.

2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.1.2.2.4.2-1 indicates the transmissions for one cycle.

**Table 8.5.1.2.2.4.2-1: PHICH test pattern**

| TTI | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 |
|---|---|---|---|---|---|---|
| PDCCH | S | S | - | - | S | S |
| PHICH | - | - | A | A | - | - |
| PUSCH | | T | T | R | R | T |
| UL HARQ Process | 1-4 | 5-8 | 1-4 | 5-8 | 1-4 | 5-8 |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK | | | | | | |

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK). If Pm-an is less than the value specified in table 8.5.1.2.2.5-1, pass the UE. Otherwise fail the UE.

#### 8.5.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions

**Table 8.5.1.2.2.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

#### 8.5.1.2.2.5 Test requirement

For the parameters specified in Table 8.5.1.2.2.3-1 the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.1.2.2.5-1.

**Table 8.5.1.2.2.5-1: Test requirement PHICH 4 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.20A | OP.1 FDD | EVA5 | 4 x 2 Medium | 0.1 | 7.0 |

## 8.5.1.2.2_1 FDD PHICH Transmit Diversity 4x2 (Release 9 and forward)

### 8.5.1.2.2_1.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

### 8.5.1.2.2_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward.

### 8.5.1.2.2_1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.1.2.2_1.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| PHICH duration | | | Normal |
| Number of PHICH groups (Note 1) | | | Ng = 1 |
| PDCCH Content | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | OCNG | |
| Cell ID | | | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8]<br>Note 2: PHICH power settings refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.5.1.2.2_1.3-1 the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.2_1.3-2.

**Table 8.5.1.2.2_1.3-2: Minimum performance PHICH 4 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 5 MHz | R.20 | OP.1 FDD | EPA5 | 4 x 2 Medium | 0.1 | 6.1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.1.

### 8.5.1.2.2_1.4 Test description

#### 8.5.1.2.2_1.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 5 MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.
2. The parameter settings for the cell are set up according to Table 8.5.1.2.2_1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.1.2.2_1.4.3.

#### 8.5.1.2.2_1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.1.2.2_1.5-1.
2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.1.2.2_1.4.2-1 indicates the transmissions for one cycle.

**Table 8.5.1.2.2_1.4.2-1: PHICH test pattern**

| TTI | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 |
|---|---|---|---|---|---|---|
| PDCCH | S | S | - | - | S | S |
| PHICH | - | - | A | A | - | - |
| PUSCH | | T | T | R | R | T |
| UL HARQ Process | 1-4 | 5-8 | 1-4 | 5-8 | 1-4 | 5-8 |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK | | | | | | |

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.
4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK). If Pm-an is less than the value specified in table 8.5.1.2.2_1.5-1, pass the UE. Otherwise fail the UE.

#### 8.5.1.2.2_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions

**Table 8.5.1.2.2_1.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

8.5.1.2.2_1.5 Test requirement

For the parameters specified in Table 8.5.1.2.2_1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.1.2.2_1.5-1.

**Table 8.5.1.2.2_1.5-1: Test requirement PHICH 4 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 5 MHz | R.20 | OP.1 FDD | EPA5 | 4 x 2 Medium | 0.1 | +7.1 |

8.5.1.2.3

8.5.1.2.3_A

8.5.1.2.3_B

8.5.1.2.3_C FDD PHICH Transmit Diversity 2x2 for eICIC

8.5.1.2.3_C.1 FDD PHICH Transmit Diversity 2x2 for eICIC (non-MBSFN ABS)

8.5.1.2.3_C.1.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

8.5.1.2.3_C.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward. Applicability requires support for FGI bit 115.

8.5.1.2.3_C.1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.1.2.3_C.1.3-1: Test Parameters for PHICH**

| Parameter | Unit | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -100.5 (Note 1) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -95.3 (Note 3) | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.5.1.2.3_C.1.3-2 | 1.5 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 1 |
| ABS pattern (Note 4) | | | N/A | 00000100<br>00000100<br>00000100<br>01000100<br>00000100 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 00000100<br>00000100<br>00000100<br>01000100<br>00000100 | N/A |
| | $C_{CSI,1}$ | | 11111011<br>11111011<br>11111011<br>10111011<br>11111011 | N/A |
| Number of control OFDM symbols | | | 3 | 3 |
| Number of PHICH groups ($N_g$) | | | 1 | N/A |
| PHICH duration | | | extended | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. PHICH is transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell but not in the 26th subframe indicated by the ABS pattern.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5]
Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 8: SIB-1 will not be transmitted in Cell2 in the test.

For the parameters specified in Table 8.5.1.2.3_C.1.3-1, the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.3_C.1.3-2. In Table 8.5.1.2.3_C.1.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

**Table 8.5.1.2.3_C.1.3-2: Minimum performance PHICH**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Antenna Configuration and Correlation Matrix | Reference Value | |
|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Pm-an (%) | SNR (dB) (Note 2) |
| 1 | R.19 | OP.1 FDD | OP.1 FDD | EPA5 | EPA5 | 2x2 Low | 0.1 | 4.6 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1. | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.1.2.3.

### 8.5.1.2.3_C.1.4 Test description

#### 8.5.1.2.3_C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna transmit diversity 2x2 configuration.
2. The parameter settings for the cell are set up according to Table 8.5.1.2.3_C.1.3-1 and 8.5.1.2.3_C.1.3-2.
3. Downlink signals are initially set up according to Annex C.0, C.1, C.3.2 and C.3.3 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.1.2.3_C.1.4.3.

#### 8.5.1.2.3_C.1.4.2 Test procedure

1. Set the parameters for Cell1 and Cell2 according to Tables 8.5.1.2.3_C.1.5-1, 8.5.1.2.3_C.1.5-2, C.3.3-1 of Annex C.3.3 as appropriate. Propagation conditions are set according to Annex B clause B.2.
2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 via PDCCH DCI format 0 with the new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmission will transmit the associated ACK. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriateTTI-s. Table 8.5.1.2.3_C.1.4.2-1 indicates the transmissions for two cycles.

**Table 8.5.1.2.3_C.1.4.2-1: PHICH test pattern**

| TTI | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 34 | 38 |
|---|---|---|---|---|---|---|---|---|---|
| PDCCH | S | - | - | - | S | - | - | - | S |
| PUSCH | - | T | - | R | - | T | - | R | - |
| PHICH | - | - | A | - | - | - | A | - | - |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK<br>Note 3: In the other TTI-s there are no DCI-0, PHICH and PUSCH transmissions | | | | | | | | | |

3. SS will monitor for uplink retransmissions due to ACK missed-detection. Such re-transmission (if it occurs) will potentially happen in TTI 18 (34 and so on). DTX from the UE side on this TTI is counted as successful ACK receptions while any transmission on this TTI is counted as NACK.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
If Pm-an is less than the value specified in table 8.5.1.2.3_C.1.5-2, pass the UE. Otherwise fail the UE.

### 8.5.1.2.3_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions

**Table 8.5.1.2.3_C.1.4.3-1: PHICH-Config**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PHICH-Config-DEFAULT ::= SEQUENCE { | | | |
| phich-Duration | extended | | Cell 1 |
| phich-Resource | one | | |
| } | | | |

**Table 8.5.1.2.3_C.1.4.3-2: *MAC-MainConfig-RBC***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

**Table 8.5.1.2.3_C.1.4.3-3: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '00000100000001000000 01000000010000000100' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.5.1.2.3_C.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '00000100000001000000 01000100010000000100' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '11111011111110111111 10111011101111111011' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.5.1.2.3_C.1.5 Test requirement

For the parameters specified in Table 8.5.1.2.3_C.1.5-1, the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.1.2.3_C.1.5-2.

**Table 8.5.1.2.3_C.1.5-1: Test Parameters for PHICH**

| Parameter | Unit | Cell 1 | Cell 2 | |
|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -100.6 (Note 1) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -95.4 (Note 3) | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.5.1.2.3_C.1.5-2 | 1.3 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 1 |
| ABS pattern (Note 4) | | | N/A | 00000100<br>00000100<br>00000100<br>01000100<br>00000100 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 00000100<br>00000100<br>00000100<br>01000100<br>00000100 | N/A |
| | $C_{CSI,1}$ | | 11111011<br>11111011<br>11111011<br>10111011<br>11111011 | N/A |
| Number of control OFDM symbols | | | 3 | 3 |
| Number of PHICH groups ($N_g$) | | | 1 | N/A |
| PHICH duration | | | extended | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. PHICH is transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell but not in the 26th subframe indicated by the ABS pattern.
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5]
Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 8: SIB-1 will not be transmitted in Cell2 in the test.

**Table 8.5.1.2.3_C.1.5-2: Test requirement FDD PHICH Transmit Diversity 2x2 for eICIC (non-MBSFN ABS)**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Antenna Configuration and Correlation Matrix | Reference Value | |
|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Pm-an (%) | SNR (dB) (Note 2) |
| 1 | R.19 | OP.1 FDD | OP.1 FDD | EPA5 | EPA5 | 2x2 Low | 0.1 | 5.5 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1. | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | |

## 8.5.1.2.3_D

## 8.5.1.2.3_E FDD PHICH Transmit Diversity 2x2 for feICIC

## 8.5.1.2.3_E.1 FDD PHICH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS)

### 8.5.1.2.3_E.1.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value where PHICH transmission subframes overlap with ABS of the aggressor cell.

### 8.5.1.2.3_E.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE and CRS interference handling – UE Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

### 8.5.1.2.3_E.1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.1.2.3_E.1.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 1) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93 (Note 3) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.5.1.2.3_E.1.3-2 | 5 | 3 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. | N/A | N/A |
| ABS pattern (Note 4) | | | N/A | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | N/A | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | N/A | N/A |
| | $C_{CSI,1}$ | | 11111011<br>11111011<br>11111011<br>11111011<br>11111011 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 7 | Note 7 |
| Number of PHICH groups ($N_g$) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal | Normal |

| | |
|---|---|
| Note 1: | This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS |
| Note 2: | This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS |
| Note 3: | This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS |
| Note 4: | ABS pattern as defined in [9]. PHICH is transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell but not in the 26th subframe indicated by the ABS pattern. |
| Note 5: | Time-domain measurement resource restriction pattern for PCell measurements as defined in [7] |
| Note 6: | As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7] |
| Note 7: | The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by “0” of ABS pattern. |
| Note 8: | The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same. |
| Note 9: | SIB-1 will not be transmitted in Cell 2 and Cell 3 in the test. |

For the parameters specified in Table 8.5.1.2.3_E.1.3-1, the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.3_E.1.3-2. In Table 8.5.1.2.3_E.1.3-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information is provided for Cell 2 and Cell 3.

**Table 8.5.1.2.3_E.1.3-2: Minimum performance PHICH 2 Tx Antenna Port**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EPA5 | EVA5 | EVA5 | 2x2 Low | 0.1 | 5.0 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | |
| Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3. | | | | | | | | | | |
| Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.1.2.4.

### 8.5.1.2.3_E.1.4 Test description

#### 8.5.1.2.3_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna transmit diversity 2x2 configuration.

2. The parameter settings for the cell are set up according to Table 8.5.1.2.3_E.1.3-1 and 8.5.1.2.3_E.1.3-2.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.3.2 and C.3.3 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clauses B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 8.5.1.2.3_E.1.4.3.

8.5.1.2.3_E.1.4.2 Test procedure

1. Set the parameters for Cell1, Cell2 and Cell3 according to Tables 8.5.1.2.3_E.1.3-1, 8.5.1.2.3_E.1.5-1 and C.3.3-2 of Annex C.3.3 as appropriate. Propagation conditions are set according to Annex B clause B.2.

2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 via PDCCH DCI format 0 with the new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmission will transmit the associated ACK. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriateTTI-s. Table 8.5.1.2.3_E.1.4.2-1 indicates the transmissions for two cycles.

**Table 8.5.1.2.3_E.1.4.2-1: PHICH test pattern**

| TTI | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 34 | 38 |
|---|---|---|---|---|---|---|---|---|---|
| PDCCH | S | - | - | - | S | - | - | - | S |
| PUSCH | - | T | - | R | - | T | - | R | - |
| PHICH | - | - | A | - | - | - | A | - | - |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK<br>Note 3: In the other TTI-s there are no DCI-0, PHICH and PUSCH transmissions | | | | | | | | | |

3. SS will monitor for uplink retransmissions due to ACK missed-detection. Such re-transmission (if it occurs) will potentially happen in TTI 18 (34 and so on). DTX from the UE side on this TTI is counted as successful ACK receptions while any transmission on this TTI is counted as NACK.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an in the subframes overlapping with ABS of the aggressor cell. Pm-an is (NACK) / (ACK + NACK).
   If Pm-an is less than the value specified in table 8.5.1.2.3_E.1.5-2, pass the UE. Otherwise fail the UE.

8.5.1.2.3_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions

**Table 8.5.1.2.3_E.1.4.3-1: *MAC-MainConfig-RBC***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

**Table 8.5.1.2.3_E.1.4.3-2: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '00000100000001000000 01000000010000000100' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 126 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.5.1.2.3_E.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '00000100000001000000 01000000010000000100' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '11111011111110111111 10111111101111111011' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.5.1.2.3_E.1.5 Test requirement

For the parameters specified in Table 8.5.1.2.3_E.1.5-1, the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.1.2.3_E.1.5-2.

**Table 8.5.1.2.3_E.1.5-1: Test Parameters for PHICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 1) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93.1 (Note 3) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.5.1.2.3_E.1.5-2 | 4.8 | 2.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. | N/A | N/A |
| ABS pattern (Note 4) | | | N/A | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | N/A | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | N/A | N/A |
| | $C_{CSI,1}$ | | 11111011<br>11111011<br>11111011<br>11111011<br>11111011 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 7 | Note 7 |
| Number of PHICH groups ($N_g$) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal | Normal |

| | |
|---|---|
| Note 1: | This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS |
| Note 2: | This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS |
| Note 3: | This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS |
| Note 4: | ABS pattern as defined in [9]. PHICH is transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell but not in the 26th subframe indicated by the ABS pattern. |
| Note 5: | Time-domain measurement resource restriction pattern for PCell measurements as defined in [7] |
| Note 6: | As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7] |
| Note 7: | The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by “0” of ABS pattern. |
| Note 8: | The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same. |
| Note 9: | SIB-1 will not be transmitted in Cell 2 and Cell 3 in the test. |

**Table 8.5.1.2.3_E.1.5-2: Test requirement FDD PHICH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS)**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EPA5 | EVA5 | EVA5 | 2x2 Low | 0.1 | 5.9 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1. | | | | | | | | | | |

8.5.1.2.4

## 8.5.1.2.5 FDD Enhanced Downlink Control Channel Performance Requirement Type A for PHICH- 2 Tx Antenna Ports under Asynchronous Network

Editor’s Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.5.1.2.5.1 Test purpose

This test verifies the Enhanced downlink control channel performance requirement Type A for PHICH for 2 transmit diversity under Asynchronous network with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

### 8.5.1.2.5.2 Test applicability

This test applies to all types of E-UTRA FDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type A. Detailed Test Applicability is specified in clause 8.1.2.7.

### 8.5.1.2.5.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection). The parameters specified in Table 8.5.1.2.5.3-1 and Table 8.5.1.2.5.3-2.

The purpose of this test is to verify the PHICH performance with 2 transmit antennas when the serving cell PHICH transmission is interfered by two interfering cells and applying interference model defined in clause B.5.2. In Table 8.5.1.2.5.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is not provided.

**Table 8.5.1.2.5.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| PHICH duration | | | Normal |
| Number of PHICH groups (Note 1) | | | Ng = 1 |
| PDCCH Content | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | OCNG | |
| Cell ID | | | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8]<br>Note 2: PHICH power settings refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

**Table 8.5.1.2.5.3-2: Additional Test Parameters for PHICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>PDSCH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PHICH_RB<br>PDCCH_RB<br>PDSCH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of control OFDM symbols | | | 1 | 1 | 1 |
| PHICH Ng (Note 1) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.5.2 | As specified in clause B.5.2 |
| Probability of occurrence of PDSCH transmission rank in interfering cells | Rank 1 | % | N/A | 80 | 80 |
| | Rank 2 | % | N/A | 20 | 20 |
| Unused RE-s and PRB-s | | | OCNG | OCNG | OCNG |
| Time offset relative to Cell 1 | | ms | N/A | 0.33 | 0.67 |
| Frequency offset relative to Cell 1 | | Hz | N/A | 0 | 0 |
| Note 1: According to Clause 6.9 in TS 36.211 [4]. | | | | | |

For the parameters specified in Table 8.5.1.2.5.3-1 and Table 8.5.1.2.5.3-2, the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.5.3-3

**Table 8.5.1.2.5.3-3: Minimum performance PHICH for Enhanced Downlink Control Channel Performance Requirement Type A**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EVA70 | EVA70 | EVA70 | 2x2 Low | 0.1 | 17.9 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.1.2.5.

### 8.5.1.2.5.4 Test description

#### 8.5.1.2.5.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.5.1.2.5.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.5.1.2.5.3-1.
3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.1.2.5.4.3.

#### 8.5.1.2.5.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.1.2.5.5-1.
2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.1.2.5.4.2-1 indicates the transmissions for one cycle.

**Table 8.5.1.2.5.4.2-1: PHICH test pattern**

| TTI | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 |
|---|---|---|---|---|---|---|
| PDCCH | S | S | - | - | S | S |
| PHICH | - | - | A | A | - | - |
| PUSCH | | T | T | R | R | T |
| UL HARQ Process | 1-4 | 5-8 | 1-4 | 5-8 | 1-4 | 5-8 |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK | | | | | | |

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
If Pm-an is less than the value specified in table 8.5.1.2.5.5-1, pass the UE. Otherwise fail the UE.

### 8.5.1.2.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.5.1.2.5.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

### 8.5.1.2.5.5 Test requirement

For the parameters specified in Table 8.5.1.2.5.3-1 and Table 8.5.1.2.5.3-2, the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.1.2.5.5-1.

**Table 8.5.1.2.5.5-1: Test requirement PHICH 2 Tx Antenna Port**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EVA70 | EVA70 | EVA70 | 2x2 Low | 0.1 | TBD |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

## 8.5.1.2.6 FDD Enhanced Downlink Control Channel Performance Requirement Type A for PHICH - 2 Tx Antenna Ports with Non-Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

#### 8.5.1.2.6.1 Test purpose

This test verifies the Enhanced downlink control channel performance requirement Type A for PHICH for 2 transmit diversity with Non-Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

#### 8.5.1.2.6.2 Test applicability

This test applies to all types of E-UTRA FDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type A. Detailed Test Applicability is specified in clause 8.1.2.7.

#### 8.5.1.2.6.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection). The parameters specified in Table 8.5.1.2.6.3-1 and Table 8.5.1.2.6.3-2.

The purpose of this test is to verify the PHICH performance with 2 transmit antennas when the serving cell PHICH transmission is interfered by two interfering cells with the dominant interferer having the non-colliding CRS pattern and applying interference model defined in clause B.7.1. In Table 8.5.1.2.6.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.5.1.2.6.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Single antenna port | Transmit diversity |
|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | 0 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | 0 | -3 |
| PHICH duration | | | Normal | Normal |
| PHICH Ng (Note 1) | | | Ng = 1 | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cell ID | | | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Cyclic prefix | | | Normal | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8] | | | | |

**Table 8.5.1.2.6.3-2: Additional Test Parameters for PHICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB PDCCH_RB OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of control OFDM symbols | | | 1 | 1 | 1 |
| PHICH Ng (Note 1) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [8]. Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.5.1.2.6.3-1 and Table 8.5.1.2.6.3-2, the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.6.3-3.

**Table 8.5.1.2.6.3-3: Minimum performance PHICH for Enhanced Downlink Control Channel Performance Requirement Type A**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | 15.8 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3. Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.1.2.6.5.

### 8.5.1.2.6.4 Test description

#### 8.5.1.2.6.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.5.1.2.6.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.

2. The parameter settings for the cell are set up according to Table 8.5.1.2.6.3-1.

3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clauses B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.1.2.6.4.3.

#### 8.5.1.2.6.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.1.2.6.5-1.

2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.1.2.6.4.2-1 indicates the transmissions for one cycle.

**Table 8.5.1.2.6.4.2-1: PHICH test pattern**

| TTI | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 |
|---|---|---|---|---|---|---|
| PDCCH | S | S | - | - | S | S |
| PHICH | - | - | A | A | - | - |
| PUSCH | | T | T | R | R | T |
| UL HARQ Process | 1-4 | 5-8 | 1-4 | 5-8 | 1-4 | 5-8 |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK | | | | | | |

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
If Pm-an is less than the value specified in table 8.5.1.2.6.5-1, pass the UE. Otherwise fail the UE.

#### 8.5.1.2.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.5.1.2.6.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

#### 8.5.1.2.6.5 Test requirement

For the parameters specified in Table 8.5.1.2.6.3-1 and Table 8.5.1.2.6.3-2, the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.1.2.6.5-1.

**Table 8.5.1.2.6.5-1: Test requirement PHICH 2 Tx Antenna Port**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | TBD |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

### 8.5.1.2.7 FDD Enhanced Downlink Control Channel Performance Requirement Type B for PHICH - 2 Tx Antenna Ports with Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

#### 8.5.1.2.7.1 Test purpose

This test verifies the Enhanced downlink control channel performance requirement Type B for PHICH for 2 transmit diversity with Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

#### 8.5.1.2.7.2 Test applicability

This test applies to all types of E-UTRA FDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type B. Detailed Test Applicability is specified in clause 8.1.2.7.

#### 8.5.1.2.7.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection). The parameters specified in Table 8.5.1.2.7.3-1 and Table 8.5.1.2.7.3-2.

The purpose of this test is to verify the PHICH performance with 2 transmit antennas when the serving cell PHICH transmission is interfered by two interfering cells with the dominant interferer having the colliding CRS pattern and applying interference model defined in clause B.7.1. In Table 8.5.1.2.7.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.5.1.2.7.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Single antenna port | Transmit diversity |
|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | 0 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | 0 | -3 |
| PHICH duration | | | Normal | Normal |
| PHICH Ng (Note 1) | | | Ng = 1 | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cell ID | | | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Cyclic prefix | | | Normal | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8] | | | | |

**Table 8.5.1.2.7.3-2: Additional Test Parameters for PHICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB<br>PDCCH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 6 | 1 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of control OFDM symbols | | | 1 | 1 | 1 |
| PHICH Ng (Note 1) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [8].<br>Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.5.1.2.7.3-1 and Table 8.5.1.2.7.3-2, the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.7.3-3.

**Table 8.5.1.2.7.3-3: Minimum performance PHICH for Enhanced Downlink Control Channel Performance Requirement Type B**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | 13.4 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.1.2.7.5.

### 8.5.1.2.7.4 Test description

#### 8.5.1.2.7.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.5.1.2.7.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.5.1.2.7.3-1.
3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.1.2.7.4.3.

#### 8.5.1.2.7.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.1.2.7.5-1.
2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.1.2.7.4.2-1 indicates the transmissions for one cycle.

**Table 8.5.1.2.7.4.2-1: PHICH test pattern**

| TTI | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 |
|---|---|---|---|---|---|---|
| PDCCH | S | S | - | - | S | S |
| PHICH | - | - | A | A | - | - |
| PUSCH | | T | T | R | R | T |
| UL HARQ Process | 1-4 | 5-8 | 1-4 | 5-8 | 1-4 | 5-8 |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK | | | | | | |

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
If Pm-an is less than the value specified in table 8.5.1.2.7.5-1, pass the UE. Otherwise fail the UE.

### 8.5.1.2.7.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.5.1.2.7.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

### 8.5.1.2.7.5 Test requirement

For the parameters specified in Table 8.5.1.2.7.3-1 and Table 8.5.1.2.7.3-2, the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.1.2.7.5-1.

**Table 8.5.1.2.7.5-1: Test requirement PHICH 2 Tx Antenna Port**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | TBD |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

## 8.5.1.2.8 FDD Enhanced Downlink Control Channel Performance Requirement Type B for PHICH - 2 Tx Antenna Ports with Non-Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

#### 8.5.1.2.8.1 Test purpose

This test verifies the Enhanced downlink control channel performance requirement Type B for PHICH for 2 transmit diversity with Non-Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

#### 8.5.1.2.8.2 Test applicability

This test applies to all types of E-UTRA FDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type B. Detailed Test Applicability is specified in clause 8.1.2.7.

#### 8.5.1.2.8.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection). The parameters specified in Table 8.5.1.2.8.3-1 and Table 8.5.1.2.8.3-2.

The purpose of this test is to verify the PHICH performance with 2 transmit antennas when the serving cell PHICH transmission is interfered by two interfering cells with the dominant interferer having the non-colliding CRS pattern and applying interference model defined in clause B.7.1. In Table 8.5.1.2.8.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.5.1.2.8.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Single antenna port | Transmit diversity |
|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | 0 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | 0 | -3 |
| PHICH duration | | | Normal | Normal |
| PHICH Ng (Note 1) | | | Ng = 1 | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cell ID | | | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Cyclic prefix | | | Normal | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8] | | | | |

**Table 8.5.1.2.8.3-2: Additional Test Parameters for PHICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB PDCCH_RB OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of control OFDM symbols | | | 1 | 1 | 1 |
| PHICH Ng (Note 1) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [8]. Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.5.1.2.8.3-1 and Table 8.5.1.2.8.3-2, the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.8.3-3.

**Table 8.5.1.2.8.3-3: Minimum performance PHICH for Enhanced Downlink Control Channel Performance Requirement Type B**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | 15.0 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3. Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.1.2.8.5.

### 8.5.1.2.8.4 Test description

#### 8.5.1.2.8.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.5.1.2.8.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.

2. The parameter settings for the cell are set up according to Table 8.5.1.2.8.3-1.

3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clauses B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.1.2.8.4.3.

#### 8.5.1.2.8.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.1.2.8.5-1.

2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.1.2.8.4.2-1 indicates the transmissions for one cycle.

**Table 8.5.1.2.8.4.2-1: PHICH test pattern**

| TTI | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 |
|---|---|---|---|---|---|---|
| PDCCH | S | S | - | - | S | S |
| PHICH | - | - | A | A | - | - |
| PUSCH | | T | T | R | R | T |
| UL HARQ Process | 1-4 | 5-8 | 1-4 | 5-8 | 1-4 | 5-8 |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK | | | | | | |

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
If Pm-an is less than the value specified in table 8.5.1.2.8.5-1, pass the UE. Otherwise fail the UE.

#### 8.5.1.2.8.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.5.1.2.8.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

#### 8.5.1.2.8.5 Test requirement

For the parameters specified in Table 8.5.1.2.8.3-1 and Table 8.5.1.2.8.3-2, the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.1.2.8.5-1.

**Table 8.5.1.2.8.5-1: Test requirement PHICH 2 Tx Antenna Port**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 FDD | OP.1 FDD | OP.1 FDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | TBD |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\bar{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

## 8.5.2 TDD

### 8.5.2.1 TDD PHICH Single-antenna Port Performance

#### 8.5.2.1.1 Test purpose

This test verifies the demodulation performance of PHICH for a single antenna port with a given SNR for which a certain Hybrid Indicator detection error rate (i.e. missed detection of "NACK to ACK" and "ACK to NACK") of the specified reference measurement channels is achieved.

#### 8.5.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

#### 8.5.2.1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.2.1.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Single antenna port |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 1 |
| Special subframe configuration (Note 2) | | | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | 0 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | 0 |
| PHICH duration | | | Normal |
| Number of PHICH groups (Note 3) | | | Ng = 1 |
| Cell ID | | | 0 |
| PDCCH Content | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: according to Clause 6.9 in TS 36.211 [8]<br>Note 4: PHICH power settings refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.5.2.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.1.3-2.

**Table 8.5.2.1.3-2: Minimum performance of PHICH**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.18 | OP.1 TDD | ETU70 | 1 x 2 Low | 0.1 | 5.8 |
| 2 | 10 MHz | R.24 | OP.1 TDD | ETU70 | 1 x 2 Low | 0.1 | 1.3 |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.2.

## 8.5.2.1.4 Test description

### 8.5.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1

Bandwidths to be tested: As specified per test number in Tables 8.5.2.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex a, Figure A.9.

2. The parameter settings for the cell are set up according to 8.5.2.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.2.1.4.3.

### 8.5.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.2.1.5-1 Test 1 as appropriate.

2. In Each HARQ process (4 HARQ processes for UL/DL configuration 1); SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions shall transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.2.1.4.2-1 indicates the transmissions for one cycle.

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. DTX from the UE side is counted as successful ACK reception, while any transmission on these subframes is counted as NACKs.

**Table 8.5.2.1.4.2-1: PHICH test pattern**

| **Subframe Index** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PDCCH | | S | | | S | | S | | | S | | | | | | | | | | |
| PHICH | | | | | | | | | | | | A | | | A | | A | | | A |
| PUSCH | | | R? | R? | | | | T | T | | | | T | T | | | | R? | R? | |
| HARQ process | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 |

Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK
Note 3: TDD UL/DL configuration 1 is used here, special subframe is denoted as blue

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).

   If Pm-an is less than the value specified in table 8.5.2.1.5-1, pass the UE. Otherwise fail the UE.

5. Repeat the same procedure (steps 1 to 4 ) with test conditions according to the Table 8.5.2.1.5-1 for Test 2.

### 8.5.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, with the following exceptions

**Table 8.5.1.1.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

### 8.5.2.1.5 Test requirement

For the parameters specified in Table 8.5.2.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.1.5-1.

**Table 8.5.2.1.5-1: Test requirement of PHICH**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.18 | OP.1 TDD | ETU70 | 1 x 2 Low | 0.1 | 6.7 |
| 2 | 10 MHz | R.24 | OP.1 TDD | ETU70 | 1 x 2 Low | 0.1 | 2.2 |

## 8.5.2.2 TDD PHICH Transmit Diversity Performance

### 8.5.2.2.1 TDD PHICH Transmit Diversity 2x2

#### 8.5.2.2.1.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which a certain Hybrid Indicator detection error rate (i.e. missed detection of "NACK to ACK" and "ACK to NACK") of the specified reference measurement channels is achieved.

#### 8.5.2.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8.

#### 8.5.2.2.1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.2.2.1.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 1 |
| Special subframe configuration (Note 2) | | | 4 |
| Downlink power allocation | PDCCH_RA PHICH_RA OCNG_RA | dB | -3 |
| | PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB | dB | -3 |
| PHICH duration | | | Normal |
| Number of PHICH groups (Note 3) | | | Ng = 1 |
| Cell ID | | | 0 |
| PDCCH Content | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: according to Clause 6.9 in TS 36.211 [8]<br>Note 4: PHICH power settings refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.5.2.2.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.1.3-2.

**Table 8.5.2.2.1.3-2: Minimum performance of PHICH 2 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 1.4 MHz | R.19A | OP.1 TDD | EPA5 | 2 x 2 Low | 0.1 | 5.3 |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.2.

### 8.5.2.2.1.4 Test description

#### 8.5.2.2.1.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2

Bandwidths to be tested: 1.4 MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A Figure A.10.
2. The parameter settings for the cell are set up according to Table 8.5.2.2.1.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clause B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.2.2.1.4.3.

### 8.5.2.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.2.2.1.5-1.

2. In Each HARQ process (4 HARQ processes for UL/DL configuration 1), SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions shall transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.2.2.1.4.2-1 indicates the transmissions for one cycle.

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. DTX from the UE side is counted as successful ACK reception, while any transmission on these subframes is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).

   If Pm-an is less than the value specified in table 8.5.2.2.1.5-1, pass the UE. Otherwise fail the UE.

**Table 8.5.2.2.1.4.2-1: PHICH test pattern**

| **Subframe Index** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PDCCH | | S | | | S | | S | | | S | | | | | | | | | | |
| PHICH | | | | | | | | | | | | A | | | A | | A | | | A |
| PUSCH | | | R? | R? | | | | T | T | | | | T | T | | | | R? | R? | |
| HARQ process | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 |

Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK
Note 3: TDD UL/DL configuration 1 is used here, special subframe is denoted as blue

### 8.5.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, with the following exceptions:

**Table 8.5.2.2.1.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |
| … | | | |

#### 8.5.2.2.1.5 Test requirement

For the parameters specified in Table 8.5.2.2.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.1.5-1.

**Table 8.5.2.2.1.5-1: Test requirement of PHICH 2 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 1.4 MHz | R.19A | OP.1 TDD | EPA5 | 2 x 2 Low | 0.1 | 6.4 |

### 8.5.2.2.1_1 TDD PHICH Transmit Diversity 2x2 (Release 9 and forward)

#### 8.5.2.2.1_1.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which a certain Hybrid Indicator detection error rate (i.e. missed detection of "NACK to ACK" and "ACK to NACK") of the specified reference measurement channels is achieved.

#### 8.5.2.2.1_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward.

#### 8.5.2.2.1_1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.2.2.1_1.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 1 |
| Special subframe configuration (Note 2) | | | 4 |
| Downlink power allocation | PDCCH_RA PHICH_RA OCNG_RA | dB | -3 |
| | PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB | dB | -3 |
| PHICH duration | | | Normal |
| Number of PHICH groups (Note 3) | | | Ng = 1 |
| Cell ID | | | 0 |
| PDCCH Content | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | OCNG | |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: according to Clause 6.9 in TS 36.211 [8]<br>Note 4: PHICH power settings refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.5.2.2.1_1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.1_1.3-2.

**Table 8.5.2.2.1_1.3-2: Minimum performance of PHICH 2 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.19 | OP.1 TDD | EVA70 | 2 x 2 Low | 0.1 | 4.2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.2.

### 8.5.2.2.1_1.4 Test description

#### 8.5.2.2.1_1.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2

Bandwidths to be tested: 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A Figure A.10.
2. The parameter settings for the cell are set up according to Table 8.5.2.2.1_1.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clause B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.2.2.1_1.4.3.

### 8.5.2.2.1_1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.2.2.1_1.5-1.

2. In Each HARQ process (4 HARQ processes for UL/DL configuration 1), SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions shall transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.2.2.1_1.4.2-1 indicates the transmissions for one cycle.

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. DTX from the UE side is counted as successful ACK reception, while any transmission on these subframes is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).

   If Pm-an is less than the value specified in table 8.5.2.2.1_1.5-1, pass the UE. Otherwise fail the UE.

**Table 8.5.2.2.1_1.4.2-1: PHICH test pattern**

| **Subframe Index** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PDCCH | | S | | | S | | S | | | S | | | | | | | | | | |
| PHICH | | | | | | | | | | | | A | | | A | | A | | | A |
| PUSCH | | | R? | R? | | | | T | T | | | | T | T | | | | R? | R? | |
| HARQ process | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 |

Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK
Note 3: TDD UL/DL configuration 1 is used here, special subframe is denoted as blue

### 8.5.2.2.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, with the following exceptions:

**Table 8.5.2.2.1_1.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

#### 8.5.2.2.1_1.5 Test requirement

For the parameters specified in Table 8.5.2.2.1_1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.1_1.5-1.

**Table 8.5.2.2.1_1.5-1: Test requirement of PHICH 2 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.19 | OP.1 TDD | EVA70 | 2 x 2 Low | 0.1 | +5.3 |

### 8.5.2.2.2 TDD PHICH Transmit Diversity 4x2

#### 8.5.2.2.2.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which a certain Hybrid Indicator detection error rate (i.e. missed detection of "NACK to ACK" and "ACK to NACK") of the specified reference measurement channels is achieved.

#### 8.5.2.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8.

#### 8.5.2.2.2.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.2.2.2.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 1 |
| Special subframe configuration (Note 2) | | | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| PHICH duration | | | Normal |
| Number of PHICH groups (Note 3) | | | Ng = 1 |
| Cell ID | | | 0 |
| PDCCH Content | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: according to Clause 6.9 in TS 36.211 [8]<br>Note 4: PHICH power settings refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.5.2.2.2.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.2.3-2.

**Table 8.5.2.2.2.3-2: Minimum performance of PHICH 4 Tx Antenna port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.20A | OP.1 TDD | EVA5 | 4 x 2 Medium | 0.1 | 6.1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.2.

### 8.5.2.2.2.4 Test description

#### 8.5.2.2.2.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2

Channel Bandwidths to be tested: 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.

2. The parameter settings for the cell are set up according to Table 8.5.2.2.2.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clause B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.2.2.2.4.3.

### 8.5.2.2.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.2.2.2.5-1.

2. In Each HARQ process (4 HARQ processes for UL/DL configuration 1), SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions shall transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.2.2.2.4.2-1 indicates the transmissions for one cycle.

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. DTX from the UE side is counted as successful ACK reception, while any transmission on these subframes is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).

   If Pm-an is less than the value specified in table 8.5.2.2.2.5-1, pass the UE. Otherwise fail the UE.

**Table 8.5.2.2.2.4.2-1: PHICH test pattern**

| **Subframe Index** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PDCCH | | S | | | S | | S | | | S | | | | | | | | | | |
| PHICH | | | | | | | | | | | | A | | | A | | A | | | A |
| PUSCH | | | R? | R? | | | | T | T | | | | T | T | | | | R? | R? | |
| HARQ process | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 |

Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK
Note 3: TDD UL/DL configuration 1 is used here, special subframe is denoted as blue

### 8.5.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, with the following exceptions:

**Table 8.5.2.2.2.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |
| … | | | |

#### 8.5.2.2.2.5 Test requirement

For the parameters specified in Table 8.5.2.2.2.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.2.5-1.

**Table 8.5.2.2.2.5-1: Test requirement of PHICH 4 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.20A | OP.1 TDD | EVA5 | 4 x 2 Medium | 0.1 | 7.1 |

### 8.5.2.2.2_1 TDD PHICH Transmit Diversity 4x2 (Release 9 and forward)

#### 8.5.2.2.2_1.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which a certain Hybrid Indicator detection error rate (i.e. missed detection of "NACK to ACK" and "ACK to NACK") of the specified reference measurement channels is achieved.

#### 8.5.2.2.2_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward.

#### 8.5.2.2.2_1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.2.2.2_1.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 1 |
| Special subframe configuration (Note 2) | | | 4 |
| Downlink power allocation | PDCCH_RA PHICH_RA OCNG_RA | dB | -3 |
| | PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB | dB | -3 |
| PHICH duration | | | Normal |
| Number of PHICH groups (Note 3) | | | Ng = 1 |
| Cell ID | | | 0 |
| PDCCH Content | | UL Grant should be included with the proper information aligned with A.3.6, other PDCCH resource shall be occupied by non-zero data. | |
| Unused RE-s and PRB-s | | OCNG | |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: according to Clause 6.9 in TS 36.211 [8]<br>Note 4: PHICH power settings refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.5.2.2.2_1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.2_1.3-2.

**Table 8.5.2.2.2_1.3-2: Minimum performance of PHICH 4 Tx Antenna port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 5 MHz | R.20 | OP.1 TDD | EPA5 | 4 x 2 Medium | 0.1 | 6.2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.2.

### 8.5.2.2.2_1.4 Test description

#### 8.5.2.2.2_1.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2

Channel Bandwidths to be tested: 5 MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.
2. The parameter settings for the cell are set up according to Table 8.5.2.2.2_1.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clause B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.2.2.2_1.4.3.

### 8.5.2.2.2_1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.2.2.2_1.5-1.

2. In Each HARQ process (4 HARQ processes for UL/DL configuration 1), SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions shall transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.2.2.2_1.4.2-1 indicates the transmissions for one cycle.

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. DTX from the UE side is counted as successful ACK reception, while any transmission on these subframes is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).

   If Pm-an is less than the value specified in table 8.5.2.2.2_1.5-1, pass the UE. Otherwise fail the UE.

**Table 8.5.2.2.2_1.4.2-1: PHICH test pattern**

| **Subframe Index** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PDCCH | | S | | | S | | S | | | S | | | | | | | | | | |
| PHICH | | | | | | | | | | | | A | | | A | | A | | | A |
| PUSCH | | | R? | R? | | | | T | T | | | | T | T | | | | R? | R? | |
| HARQ process | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 |

Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK
Note 3: TDD UL/DL configuration 1 is used here, special subframe is denoted as blue

### 8.5.2.2.2_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, with the following exceptions:

**Table 8.5.2.2.2_1.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

#### 8.5.2.2.2_1.5 Test requirement

For the parameters specified in Table 8.5.2.2.2_1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.2_1.5-1.

**Table 8.5.2.2.2_1.5-1: Test requirement of PHICH 4 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 5 MHz | R.20 | OP.1 TDD | EPA5 | 4 x 2 Medium | 0.1 | +7.2 |

### 8.5.2.2.3

### 8.5.2.2.3_A

### 8.5.2.2.3_B

### 8.5.2.2.3_C TDD PHICH Transmit Diversity 2x2 for eICIC

### 8.5.2.2.3_C.1 TDD PHICH Transmit Diversity 2x2 for eICIC (non-MBSFN ABS)

#### 8.5.2.2.3_C.1.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which a certain Hybrid Indicator detection error rate (i.e. missed detection of "NACK to ACK" and "ACK to NACK") of the specified reference measurement channels is achieved.

#### 8.5.2.2.3_C.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit 115.

#### 8.5.2.2.3_C.1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.2.2.3_C.1.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 |
| Special subframe configuration | | | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -100.5 (Note 1) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -95.3 (Note 3) | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.5.2.2.3_C.1.3-2 | 1.5 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 1 |
| ABS pattern (Note 4) | | | N/A | 0000010001<br>0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 0000000001<br>0000000001 | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 0000010001<br>0000000001 | N/A |
| | $C_{CSI,1}$ | | 1100101000<br>1100111000 | N/A |
| Number of control OFDM symbols | | | 3 | 3 |
| ACK/NACK feedback mode | | | Multiplexing | N/A |
| Number of PHICH groups ($N_g$) | | | 1 | N/A |
| PHICH duration | | | extended | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. PHICH is transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell but not in subframe 5
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5]
Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 8: SIB-1 will not be transmitted in Cell2 in the test.

For the parameters specified in Table 8.5.2.2.3_C.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.3_C.1.3-2. The downlink physical setup is in accordance with Annex C.3.2 and Annex C.3.3, In Table 8.5.2.2.3_C.1.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

**Table 8.5.2.2.3_C.1.3-2: Minimum performance of PHICH 2 Tx Antenna Port**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions (Note 1) | | Antenna Configuration and Correlation Matrix | Reference Value | |
|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Pm-an (%) | SNR (dB) (Note 2) |
| 1 | R.19 | OP.1 TDD | OP.1 TDD | EPA5 | EPA5 | 2x2 Low | 0.1 | 4.6 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | |
| Note 2: SNR corresponds to $\hat{E}_s / N_{oc2}$ of cell 1. | | | | | | | | |
| Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.2.2.3.

### 8.5.2.2.3_C.1.4 Test description

#### 8.5.2.2.3_C.1.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2

Bandwidths to be tested: 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A Figure A.40 for antenna transmit diversity 2x2 configuration.
2. The parameter settings for the cell are set up according to Table 8.5.2.2.3_C.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.2.2.3_C.1.4.3.

#### 8.5.2.2.3_C.1.4.2 Test procedure

1. Set the parameters for Cell1 and Cell2 according to Tables 8.5.2.2.3_C.1.3-1, 8.5.2.2.3_C.1.5-1, C.3.3-1 of Annex C.3.3 as appropriate. Propagation conditions are set according to Annex B clause B.2.
2. SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with the new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmission shall transmit the associated ACK. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriateTTI-s. Table 8.5.2.2.3_C.1.4.2-1 indicates the transmissions for two cycles.
3. SS will only monitor for uplink retransmissions due to ACK missed-detection. Such re-transmission (if it occurs) will potentially happen in TTI 24 (44 and so on). DTX from the UE side on this TTI is counted as successful ACK reception, while any transmission on this TTI is counted as NACK.
4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).

   If Pm-an is less than the value specified in table 8.5.2.2.3_C.1.5-2, pass the UE. Otherwise fail the UE.

**Table 8.5.2.2.3_C.1.4.2-1: PHICH test pattern**

| TTI | 10 | 14 | 20 | 24 | 30 | 34 | 40 | 44 | 50 |
|---|---|---|---|---|---|---|---|---|---|
| PDCCH | S | - | - | - | S | - | - | - | S |
| PUSCH | - | T | - | R | - | T | - | R | - |
| PHICH | - | - | A | - | - | - | A | - | - |

Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK
Note 3: TDD UL/DL configuration 1 is used here
Note 4: In the other TTI-s there are no DCI-0, PHICH and PUSCH transmissions

8.5.2.2.3_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, with the following exceptions:

**Table 8.5.2.2.3_C.1.4.3-1: PHICH-Config**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-4 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PHICH-Config-DEFAULT ::= SEQUENCE { | | | |
| phich-Duration | extended | | Cell 1 |
| phich-Resource | One | | |
| } | | | |

**Table 8.5.2.2.3_C.1.4.3-2: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |
| … | | | |

**Table 8.5.2.2.3_C.1.4.3-3: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000000010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.5.2.2.3_C.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000100010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '11001010001100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.5.2.2.3_C.1.5 Test requirement

For the parameters specified in Table 8.5.2.2.3_C.1.5-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.3_C.1.5-2.

**Table 8.5.2.2.3_C.1.5-1: Test Parameters for PHICH**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 |
| Special subframe configuration | | | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -100.6 (Note 1) | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A |
| | $N_{oc3}$ | dBm/15kHz | -95.4 (Note 3) | N/A |
| $\widehat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.5.2.2.3_C.1.5-2 | 1.3 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | 2.5 (synchronous cells) | |
| Cell Id | | | 0 | 1 |
| ABS pattern (Note 4) | | | N/A | 0000010001<br>0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 0000000001<br>0000000001 | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 0000010001<br>0000000001 | N/A |
| | $C_{CSI,1}$ | | 1100101000<br>1100111000 | N/A |
| Number of control OFDM symbols | | | 3 | 3 |
| ACK/NACK feedback mode | | | Multiplexing | N/A |
| Number of PHICH groups ($N_g$) | | | 1 | N/A |
| PHICH duration | | | extended | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [14]. PHICH is transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell but not in subframe 5
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5]
Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 8: SIB-1 will not be transmitted in Cell2 in the test.

**Table 8.5.2.2.3_C.1.5-2: Test requirement of PHICH 2 Tx Antenna Port**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.19 | OP.1 TDD | EPA5 | 2 x 2 Low | 0.1 | 5.5 |

8.5.2.2.3_D

## 8.5.2.2.3_E TDD PHICH Transmit Diversity 2x2 for feICIC

### 8.5.2.2.3_E.1 TDD PHICH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS)

#### 8.5.2.2.3_E.1.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which a certain Hybrid Indicator detection error rate (i.e. missed detection of "NACK to ACK" and "ACK to NACK") of the specified reference measurement channels is achieved where PHICH transmission subframes overlap with ABS of the aggressor cell.

#### 8.5.2.2.3_E.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE and CRS interference handling and ss-CCH interference handling – UE Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

#### 8.5.2.2.3_E.1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.5.2.2.3_E.1.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 1) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93 (Note 3) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.5.2.2.3_E.1.3-2 | 5 | 3 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. | N/A | N/A |
| ABS pattern (Note 4) | | | N/A | 0000000001<br>0000000001 | 0000000001<br>0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 0000000001<br>0000000001 | N/A | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 0000000001<br>0000000001 | N/A | N/A |
| | $C_{CSI,1}$ | | 1100111000<br>1100111000 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 7 | Note 7 |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| Number of PHICH groups ($N_g$) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [9]. PHICH is transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell but not in subframe 5
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]
Note 7: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by “0” of ABS pattern.
Note 8: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 9: SIB-1 will not be transmitted in Cell 2 and Cell 3 in the test.

For the parameters specified in Table 8.5.2.2.3_E.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.3_E.1.3-2. The downlink physical setup is in accordance with Annex C.3.2 and Annex C.3.3, In Table 8.5.2.2.3_E.1.3-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information is provided for Cell 2 and Cell 3.

**Table 8.5.2.2.3_E.1.3-2: Minimum performance of PHICH 2 Tx Antenna Port**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EVA5 | EVA5 | 2x2 Low | 0.1 | 5.7 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | |
| Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3. | | | | | | | | | | |
| Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.2.2.4.

### 8.5.2.2.3_E.1.4 Test description

#### 8.5.2.2.3_E.1.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2

Bandwidths to be tested: 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A Figure A.48 for antenna transmit diversity 2x2 configuration.
2. The parameter settings for the cell are set up according to Table 8.5.2.2.3_E.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 8.5.2.2.3_E.1.4.3.

#### 8.5.2.2.3_E.1.4.2 Test procedure

1. Set the parameters for Cell1, Cell2 and Cell3 according to Tables 8.5.2.2.3_E.1.3-1, 8.5.2.2.3_E.1.5-1 and C.3.3-2 of Annex C.3.3 as appropriate. Propagation conditions are set according to Annex B clause B.2.
2. SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with the new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmission shall transmit the associated ACK. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriateTTI-s. Table 8.5.2.2.3_E.1.4.2-1 indicates the transmissions for two cycles.
3. SS will only monitor for uplink retransmissions due to ACK missed-detection. Such re-transmission (if it occurs) will potentially happen in TTI 24 (44 and so on). DTX from the UE side on this TTI is counted as successful ACK reception, while any transmission on this TTI is counted as NACK.
4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an in the subframes overlapping with ABS of the aggressor cell. Pm-an is (NACK) / (ACK + NACK).

   If Pm-an is less than the value specified in table 8.5.2.2.3_E.1.5-2, pass the UE. Otherwise fail the UE.

**Table 8.5.2.2.3_E.1.4.2-1: PHICH test pattern**

| TTI | 10 | 14 | 20 | 24 | 30 | 34 | 40 | 44 | 50 |
|---|---|---|---|---|---|---|---|---|---|
| PDCCH | S | - | - | - | S | - | - | - | S |
| PUSCH | - | T | - | R | - | T | - | R | - |
| PHICH | - | - | A | - | - | - | A | - | - |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK<br>Note 3: TDD UL/DL configuration 1 is used here<br>Note 4: In the other TTI-s there are no DCI-0, PHICH and PUSCH transmissions | | | | | | | | | |

### 8.5.2.2.3_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1, with the following exceptions:

**Table 8.5.2.2.3_E.1.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

**Table 8.5.2.2.3_E.1.4.3-2: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000000010000000 001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 126 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.5.2.2.3_E.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000000010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '11001110001100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.5.2.2.3_E.1.5 Test requirement

For the parameters specified in Table 8.5.2.2.3_E.1.5-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.3_E.1.5-2.

**Table 8.5.2.2.3_E.1.5-1: Test Parameters for PHICH**

| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** | **Cell 3** |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -98 (Note 1) | N/A | N/A |
| | $N_{oc2}$ | dBm/15kHz | -98 (Note 2) | N/A | N/A |
| | $N_{oc3}$ | dBm/15kHz | -93.1 (Note 3) | N/A | N/A |

| | | | | | |
|---|---|---|---|---|---|
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 8.5.2.2.3_E.1.5-2 | 4.8 | 2.8 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | µs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. | N/A | N/A |
| ABS pattern (Note 4) | | | N/A | 0000000001<br>0000000001 | 0000000001<br>0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 5) | | | 0000000001<br>0000000001 | N/A | N/A |
| CSI Subframe Sets (Note 6) | $C_{CSI,0}$ | | 0000000001<br>0000000001 | N/A | N/A |
| | $C_{CSI,1}$ | | 1100111000<br>1100111000 | N/A | N/A |
| Number of control OFDM symbols | | | 2 | Note 7 | Note 7 |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| Number of PHICH groups ($N_g$) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Unused RE-s and PRB-s | | | OCNG | OCNG | OCNG |
| Cyclic prefix | | | Normal | Normal | Normal |

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4: ABS pattern as defined in [9]. PHICH is transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell but not in subframe 5
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]
Note 7: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 8: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 9: SIB-1 will not be transmitted in Cell 2 and Cell 3 in the test.

**Table 8.5.2.2.3_E.1.5-2: Test requirement TDD PHICH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS)**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EVA5 | EVA5 | 2x2 Low | 0.1 | 6.6 |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1.

8.5.2.2.4

## 8.5.2.2.5 TDD Enhanced Downlink Control Channel Performance Requirement Type A for PHICH- 2 Tx Antenna Ports with Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.5.2.2.5.1 Test purpose

This test verifies the Enhanced downlink control channel performance requirement Type A for PHICH for 2 transmit diversity with Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

### 8.5.2.2.5.2 Test applicability

This test applies to all types of E-UTRA TDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type A. Detailed Test Applicability is specified in clause 8.1.2.7.

### 8.5.2.2.5.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection). The parameters specified in Table 8.5.2.2.5.3-1 and Table 8.5.2.2.5.3-2.

The purpose of this test is to verify the PHICH performance with 2 transmit antennas when the serving cell PHICH transmission is interfered by two interfering cells with the dominant interferer having the colliding CRS pattern and applying interference model defined in clause B.7.1. In Table 8.5.2.2.5.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.5.2.2.5.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Single antenna port | Transmit diversity |
|---|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 1 | 1 |
| Special subframe configuration (Note 2) | | | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | 0 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | 0 | -3 |
| PHICH duration | | | Normal | Normal |
| PHICH Ng (Note 3) | | | Ng = 1 | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cell ID | | | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Cyclic prefix | | | Normal | Normal |
| ACK/NACK feedback mode | | | Multiplexing | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: according to Clause 6.9 in TS 36.211 [8] | | | | |

**Table 8.5.2.2.5.3-2: Additional Test Parameters for PHICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB<br>PDCCH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 6 | 1 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of control OFDM symbols | | | 1 | 1 | 1 |
| PHICH Ng (Note 1) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [4].<br>Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.5.2.2.5.3-1 and Table 8.5.2.2.5.3-2, the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.5.3-3.

**Table 8.5.2.2.5.3-3: Minimum performance PHICH for Enhanced Downlink Control Channel Performance Requirement Type A**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | 16.2 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | |
| Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3. | | | | | | | | | | |
| Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.2.2.5.5.

### 8.5.2.2.5.4 Test description

#### 8.5.2.2.5.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.5.2.2.5.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.5.2.2.5.3-1.
3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.2.2.5.4.3.

#### 8.5.2.2.5.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.2.2.5.5-1.
2. In Each HARQ process (4 HARQ processes for UL/DL configuration 1), SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions shall transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.2.2.5.4.2-1 indicates the transmissions for one cycle.
3. SS will only monitor for uplink retransmissions due to ACK missed-detections. DTX from the UE side is counted as successful ACK reception, while any transmission on these subframes is counted as NACKs.
4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).

   If Pm-an is less than the value specified in table 8.5.2.2.5.5-1, pass the UE. Otherwise fail the UE.

**Table 8.5.2.2.5.4.2-1: PHICH test pattern**

| Subframe Index | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PDCCH | | S | | | S | | S | | | S | | | | | | | | | | |
| PHICH | | | | | | | | | | | | A | | | A | | A | | | A |
| PUSCH | | | R? | R? | | | | T | T | | | | T | T | | | | R? | R? | |
| HARQ process | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 |

Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK
Note 3: TDD UL/DL configuration 1 is used here, special subframe is denoted as blue

### 8.5.2.2.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.5.2.2.5.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |
| ... | | | |

### 8.5.2.2.5.5 Test requirement

For the parameters specified in Table 8.5.2.2.5.3-1 and Table 8.5.2.2.5.3-2, the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.2.2.5.5-1.

**Table 8.5.2.2.5.5-1: Test requirement PHICH 2 Tx Antenna Port**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | TBD |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1.

## 8.5.2.2.6 TDD Enhanced Downlink Control Channel Performance Requirement Type A for PHICH - 2 Tx Antenna Ports with Non-Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.5.2.2.6.1 Test purpose

This test verifies the Enhanced downlink control channel performance requirement Type A for PHICH for 2 transmit diversity with Non-Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss

detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

#### 8.5.2.2.6.2 Test applicability

This test applies to all types of E-UTRA TDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type A. Detailed Test Applicability is specified in clause 8.1.2.7.

#### 8.5.2.2.6.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection). The parameters specified in Table 8.5.2.2.6.3-1 and Table 8.5.1.2.6.3-2.

The purpose of this test is to verify the PHICH performance with 2 transmit antennas when the serving cell PHICH transmission is interfered by two interfering cells with the dominant interferer having the non-colliding CRS pattern and applying interference model defined in clause B.7.1. In Table 8.5.2.2.6.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.5.2.2.6.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Single antenna port | Transmit diversity |
|---|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 1 | 1 |
| Special subframe configuration (Note 2) | | | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | 0 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | 0 | -3 |
| PHICH duration | | | Normal | Normal |
| PHICH Ng (Note 3) | | | Ng = 1 | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cell ID | | | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Cyclic prefix | | | Normal | Normal |
| ACK/NACK feedback mode | | | Multiplexing | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: according to Clause 6.9 in TS 36.211 [8] | | | | |

**Table 8.5.2.2.6.3-2: Additional Test Parameters for PHICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB<br>PDCCH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of control OFDM symbols | | | 1 | 1 | 1 |
| PHICH Ng (Note 1) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [8].<br>Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.5.2.2.6.3-1 and Table 8.5.2.2.6.3-2, the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.6.3-3

**Table 8.5.2.2.6.3-3: Minimum performance PHICH for Enhanced Downlink Control Channel Performance Requirement Type A**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | 16.1 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.2.2.6.5.

### 8.5.2.2.6.4 Test description

#### 8.5.2.2.6.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.5.2.2.6.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.

2. The parameter settings for the cell are set up according to Table 8.5.2.2.6.3-1.
3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.2.2.6.4.3.

### 8.5.2.2.6.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.2.2.6.5-1.
2. In Each HARQ process (4 HARQ processes for UL/DL configuration 1), SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions shall transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.2.2.6.4.2-1 indicates the transmissions for one cycle.
3. SS will only monitor for uplink retransmissions due to ACK missed-detections. DTX from the UE side is counted as successful ACK reception, while any transmission on these subframes is counted as NACKs.
4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).

   If Pm-an is less than the value specified in table 8.5.2.2.6.5-1, pass the UE. Otherwise fail the UE.

**Table 8.5.2.2.6.4.2-1: PHICH test pattern**

| **Subframe Index** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PDCCH | | S | | | S | | S | | | S | | | | | | | | | | |
| PHICH | | | | | | | | | | | | A | | | A | | A | | | A |
| PUSCH | | | R? | R? | | | | T | T | | | | T | T | | | | R? | R? | |
| HARQ process | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 |

Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK
Note 3: TDD UL/DL configuration 1 is used here, special subframe is denoted as blue

### 8.5.2.2.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.5.2.2.6.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |
| … | | | |

#### 8.5.2.2.6.5 Test requirement

For the parameters specified in Table 8.5.2.2.6.3-1 and Table 8.5.2.2.6.3-2, the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.2.2.6.5-1.

**Table 8.5.2.2.6.5-1: Test requirement PHICH 2 Tx Antenna Port**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | TBD |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

### 8.5.2.2.7 TDD Enhanced Downlink Control Channel Performance Requirement Type B for PHICH- 2 Tx Antenna Ports with Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

#### 8.5.2.2.7.1 Test purpose

This test verifies the Enhanced downlink control channel performance requirement Type B for PHICH for 2 transmit diversity with Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

#### 8.5.2.2.7.2 Test applicability

This test applies to all types of E-UTRA TDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type B. Detailed Test Applicability is specified in clause 8.1.2.7.

#### 8.5.2.2.7.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection). The parameters specified in Table 8.5.2.2.7.3-1 and Table 8.5.2.2.7.3-2.

The purpose of this test is to verify the PHICH performance with 2 transmit antennas when the serving cell PHICH transmission is interfered by two interfering cells with the dominant interferer having the colliding CRS pattern and applying interference model defined in clause B.7.1. In Table 8.5.2.2.7.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.5.2.2.7.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Single antenna port | Transmit diversity |
|---|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 1 | 1 |
| Special subframe configuration (Note 2) | | | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | 0 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | 0 | -3 |
| PHICH duration | | | Normal | Normal |
| PHICH Ng (Note 3) | | | Ng = 1 | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cell ID | | | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Cyclic prefix | | | Normal | Normal |
| ACK/NACK feedback mode | | | Multiplexing | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: according to Clause 6.9 in TS 36.211 [8] | | | | |

**Table 8.5.2.2.7.3-2: Additional Test Parameters for PHICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB<br>PDCCH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 6 | 1 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of control OFDM symbols | | | 1 | 1 | 1 |
| PHICH Ng (Note 1) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [8].<br>Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.5.2.2.7.3-1 and Table 8.5.2.2.7.3-2, the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.7.3-3.

**Table 8.5.2.2.7.3-3: Minimum performance PHICH for Enhanced Downlink Control Channel Performance Requirement Type B**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | 14.0 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. | | | | | | | | | | |
| Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3. | | | | | | | | | | |
| Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.2.2.7.5.

### 8.5.2.2.7.4 Test description

#### 8.5.2.2.7.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.5.2.2.7.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.5.2.2.7.3-1.
3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.2.2.7.4.3.

#### 8.5.2.2.7.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.2.2.7.5-1.
2. In Each HARQ process (4 HARQ processes for UL/DL configuration 1), SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions shall transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.2.2.7.4.2-1 indicates the transmissions for one cycle.
3. SS will only monitor for uplink retransmissions due to ACK missed-detections. DTX from the UE side is counted as successful ACK reception, while any transmission on these subframes is counted as NACKs.
4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).

   If Pm-an is less than the value specified in table 8.5.2.2.7.5-1, pass the UE. Otherwise fail the UE.

**Table 8.5.2.2.7.4.2-1: PHICH test pattern**

| Subframe Index | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PDCCH | | S | | | S | | S | | | S | | | | | | | | | | |
| PHICH | | | | | | | | | | | | A | | | A | | A | | | A |
| PUSCH | | | R? | R? | | | | T | T | | | | T | T | | | | R? | R? | |
| HARQ process | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 |

Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK
Note 3: TDD UL/DL configuration 1 is used here, special subframe is denoted as blue

### 8.5.2.2.7.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.5.2.2.6.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |
| ... | | | |

### 8.5.2.2.7.5 Test requirement

For the parameters specified in Table 8.5.2.2.7.3-1 and Table 8.5.2.2.7.3-2, the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.2.2.7.5-1.

**Table 8.5.2.2.7.5-1: Test requirement PHICH 2 Tx Antenna Port**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | TBD |

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1.

## 8.5.2.2.8 TDD Enhanced Downlink Control Channel Performance Requirement Type B for PHICH- 2 Tx Antenna Ports with Non-Colliding CRS Dominant Interferer

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.5.2.2.8.1 Test purpose

This test verifies the Enhanced downlink control channel performance requirement Type B for PHICH for 2 transmit diversity with Non-Colliding CRS Dominant Interferer with a given SNR for which the average probability of miss

detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

#### 8.5.2.2.8.2 Test applicability

This test applies to all types of E-UTRA TDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type B. Detailed Test Applicability is specified in clause 8.1.2.7.

#### 8.5.2.2.8.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection). The parameters specified in Table 8.5.2.2.8.3-1 and Table 8.5.2.2.8.3-2.

The purpose of this test is to verify the PHICH performance with 2 transmit antennas when the serving cell PHICH transmission is interfered by two interfering cells with the dominant interferer having the non-colliding CRS pattern and applying interference model defined in clause B.7.1. In Table 8.5.2.2.8.3-2, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.5.2.2.8.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Single antenna port | Transmit diversity |
|---|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 1 | 1 |
| Special subframe configuration (Note 2) | | | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | 0 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | 0 | -3 |
| PHICH duration | | | Normal | Normal |
| PHICH Ng (Note 3) | | | Ng = 1 | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cell ID | | | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Cyclic prefix | | | Normal | Normal |
| ACK/NACK feedback mode | | | Multiplexing | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: according to Clause 6.9 in TS 36.211 [8] | | | | |

**Table 8.5.2.2.8.3-2: Additional Test Parameters for PHICH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | PDCCH_RA<br>OCNG_RA | dB | -3 | -3 | -3 |
| | PHICH_RA | dB | -3 | N/A | N/A |
| | PCFICH_RB<br>PDCCH_RB<br>OCNG_RB | dB | -3 | -3 | -3 |
| | PHICH_RB | dB | -3 | N/A | N/A |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Number of control OFDM symbols | | | 1 | 1 | 1 |
| PHICH Ng (Note 1) | | | 1 | N/A | N/A |
| PHICH duration | | | Normal | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.7.1 | As specified in clause B.7.1 |
| Unused RE-s and PRB-s (Note 2) | | | OCNG | OCNG | OCNG |
| Time offset to cell 1 | | us | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: According to Clause 6.9 in TS 36.211 [8].<br>Note 2: For Cell 2 and Cell 3 unused RE-s and PRB-s do not include control region REs. | | | | | |

For the parameters specified in Table 8.5.2.2.8.3-1 and Table 8.5.2.2.8.3-2, the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.8.3-3.

**Table 8.5.2.2.8.3-3: Minimum performance PHICH for Enhanced Downlink Control Channel Performance Requirement Type B**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | 15.5 |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.2.2.8.5.

### 8.5.2.2.8.4 Test description

#### 8.5.2.2.8.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.5.2.2.8.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.

2. The parameter settings for the cell are set up according to Table 8.5.2.2.8.3-1.
3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.5.2.2.8.4.3.

### 8.5.2.2.8.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.5.2.2.8.5-1.
2. In Each HARQ process (4 HARQ processes for UL/DL configuration 1), SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions shall transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.2.2.8.4.2-1 indicates the transmissions for one cycle.
3. SS will only monitor for uplink retransmissions due to ACK missed-detections. DTX from the UE side is counted as successful ACK reception, while any transmission on these subframes is counted as NACKs.
4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).

   If Pm-an is less than the value specified in table 8.5.2.2.8.5-1, pass the UE. Otherwise fail the UE.

**Table 8.5.2.2.8.4.2-1: PHICH test pattern**

| **Subframe Index** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PDCCH | | S | | | S | | S | | | S | | | | | | | | | | |
| PHICH | | | | | | | | | | | | A | | | A | | A | | | A |
| PUSCH | | | R? | R? | | | | T | T | | | | T | T | | | | R? | R? | |
| HARQ process | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 |

Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK
Note 3: TDD UL/DL configuration 1 is used here, special subframe is denoted as blue

### 8.5.2.2.8.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.5.2.2.8.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |
| … | | | |

#### 8.5.2.2.8.5 Test requirement

For the parameters specified in Table 8.5.2.2.8.3-1 and Table 8.5.2.2.8.3-2, the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.2.2.8.5-1.

**Table 8.5.2.2.8.5-1: Test requirement PHICH 2 Tx Antenna Port**

| Test Number | Reference Channel | OCNG Pattern | | | Propagation Conditions (Note 1) | | | Antenna Configuration and Correlation Matrix (Note 2) | Reference Value | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 3 | Cell 1 | Cell 2 | Cell 3 | | Pm-an (%) | SNR (dB) (Note 3) |
| 1 | R.19 | OP.1 TDD | OP.1 TDD | OP.1 TDD | EPA5 | EPA5 | EPA5 | 2x2 Low | 0.1 | TBD |
| Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.<br>Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.<br>Note 3: SNR corresponds to $\widehat{E}_s / N_{oc2}$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | |

# 8.6 Demodulation of PBCH

RAN4 will specify the PBCH performance requirements and has recommended that these requirements do not need to be tested.

# 8.7 Sustained downlink data rate provided by lower layers

## 8.7.1 FDD

The parameters specified in Table 8.7.1-1 are valid for all FDD tests unless otherwise stated.

**Table 8.7.1-1: Common Test Parameters (FDD)**

| Parameter | Unit | Value |
|---|---|---|
| Cyclic prefix | | Normal |
| Cell ID | | 0 (Note 1) |
| Inter-TTI Distance | | 1 |
| Number of HARQ processes | Processes | Downlink: 8<br>Uplink: 8 |
| Maximum number of HARQ transmission | | Downlink: 4<br>Uplink: 1 |
| Scheduling of retransmissions | | 1. Retransmissions use the same Transport Block Size (TBS) as the initial transmission.<br>2. HARQ processes are scheduled consecutively, independent of the fact, whether retransmissions (for negatively acknowledged HARQ processes) or new transmissions (for positively acknowledged HARQ processes) occur.<br>3. Despite of 1) and 2) the number of RB-s to be allocated in each SF remains firm as specified in the RMC. Thus in case of RMC-s with SF dependent allocation, for retransmissions the TBS and the modulation scheme (MCS) are indicated implicitly ( $29 \le I_{\mathrm{MCS}} \le 31$ ) according to TS 36.213 [10] subclause 7.1.7.2. |
| Redundancy version coding sequence | | {0,0,1,2} for 64QAM and 256QAM |
| Number of OFDM symbols for PDCCH | OFDM symbols | 1 |
| Cross carrier scheduling | | Not configured |
| Propagation condition | | Static propagation condition<br>No external noise sources are applied |
| Note 1: For CA tests, Cell ID = 0 applies to P-Cell, Cell ID = n (where n is 1, 2, 3..) applies to S-Celln (where n is 1, 2, 3..), respectively | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.1.

## 8.7.1.1 FDD sustained data rate performance

### 8.7.1.1.1 Test purpose

The purpose of the test is to verify that the Layer 1 and Layer 2 correctly process in a sustained manner the received packets corresponding to the maximum number of DL-SCH transport block bits received within a TTI for the UE category indicated. The sustained downlink data rate shall be verified in terms of the success rate of delivered PDCP SDU(s) by Layer 2. The test case below specifies the RF conditions and the required success rate of delivered TB by Layer 1 to meet the sustained data rate requirement. The size of the TB per TTI corresponds to the largest possible DL-SCH transport block for each UE category using the maximum number of layers for spatial multiplexing. Transmission modes 1 and 3 are used with radio conditions resembling a scenario where sustained maximum data rates are available. Test case is selected according to table 8.7.1.1.1-1 depending on UE capability for CA and EPDCCH.

**Table 8.7.1.1.1-1: SDR test applicability**

| | Single carrier UE not supporting EPDCCH | CA UE not supporting EPDCCH | Single carrier UE supporting EPDCCH | CA UE supporting EPDCCH |
|---|---|---|---|---|

| FDD | 8.7.1.1, 8.7.1.1_1 | 8.7.1.1_A | 8.7.3.1 | 8.7.1.1_A, 8.7.3.1 |
|---|---|---|---|---|

### 8.7.1.1.2 Test applicability

This test applies to E-UTRA FDD Release 9 and forward UEs of category 1 to 4 and not supporting 256QAM in DL.

### 8.7.1.1.3 Minimum requirements

**Table 8.7.1.1.3-1: Void**

The requirements are specified in Table 8.7.1.1.3-3, with the addition of the parameters in Table 8.7.1.1.3-2 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category as specified in Table 8.7.1.1.3-4. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1.3-2: Test Parameters for sustained downlink data rate (FDD)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 1 | 10 | 1 | 1 x 2 | N/A | 0 | 0 | 0 | -85 | OP.6 FDD |
| 2 | 10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 3, 4, 6 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 3A | 10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 3C, 4B | 15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |

**Table 8.7.1.1.3-3: Minimum Requirement (FDD)**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 1 | 10296 | R.31-1 FDD | 95 |
| 2 | 25456 | R.31-2 FDD | 95 |
| 3 | 51024 | R.31-3 FDD | 95 |
| 3A | 36696 (Note 2) | R.31-3A FDD | 85 |
| 3C | 51024 | R.31-3C FDD | 85 |
| 4 | 75376 (Note 3) | R.31-4 FDD | 85 |
| 4B | 55056 (Note 5) | R.31-4B FDD | 85 |
| 6 | 75376 (Note 3) | R.31-4 FDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: 35160 bits for sub-frame 5.
Note 3: 71112 bits for sub-frame 5.
Note 4: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.
Note 5: 52752 bits for sub-frame 5.

**Table 8.7.1.1.3-4: Test points for sustained data rate (FRC)**

| CA config | Maximum supported Bandwidth (MHz) | Category 1 | Category 2 | Category 3 | Category 4 | Category 6 | Category 7 |
|---|---|---|---|---|---|---|---|
| Single carrier | 10 | 1 | 2 | 3A | 3A | - | - |
| | 15 | - | - | 3C | 4B | - | - |
| | 20 | - | - | 3 | 4 | 6 | 6 |
| Note 1: If UE can be tested for CA configuration, single carrier test is skipped. | | | | | | | |
| Note 2: For non-CA UE, test is selected for maximum supported bandwidth. | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.1

## 8.7.1.1.4 Test description

### 8.7.1.1.4.1 Initial conditions

**Table 8.7.1.1.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | $TB_{size}$ per Codeword | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 1 | R.31-1 FDD | R.1-1 FDD | 10296 | 1 | FLOOR(($TB_{size}$ - 96)/8) | 1275 |
| 2 | R.31-2 FDD | R.1-2 FDD | 25456 | 3 | FLOOR(($TB_{size}$ – 152)/24) | 1054 |
| 3 | R.31-3 FDD | R.1-3 FDD | 51024 | 5 | FLOOR(($TB_{size}$ -– 208)/40) | 1270 |
| 3A | R.31-3A FDD | R.1-3A FDD | 36696 (Note 3) | 4 | FLOOR(($TB_{size}$ – 184)/32) | 1141 |
| 3C | R.31-3C FDD | R.1-4B FDD | 51024 | 5 | FLOOR(($TB_{size}$ -– 208)/40) | 1270 |
| 4 | R.31-4 FDD | R.1-4 FDD | 75376 (Note 4) | 7 | FLOOR(($TB_{size}$ – 264)/56) | 1341 |
| 4B | R.31-4B FDD | R.1-4B FDD | 55056 (Note 5) | 5 | FLOOR(($TB_{size}$ -– 208)/40) | 1371 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).

The PDCP SDU size of each PDCP SDU is:

PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,

where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.

The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 35160 bits for sub-frame 5

Note 4: 71112 bits for sub-frame 5

Note 5: 52752 bits for sub-frame 5.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.1.1.5-2 depending on the UE category according to Table 8.7.1.1.5-3.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.3 for test 1 and Figure A.10 for tests 2-4 (without using faders and AWGN generators).
2. The parameter settings for the cell are set up according to Table 8.7.1.1.5-2 and Table 8.7.1.1.5-1 depending on the UE category according to Table 8.7.1.1.5-3.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.1.1.4.3. PhysicalConfigDedicated-DEFAULT for transmission mode 3 is defined in Table 8.7.1.1.4.3-3.

### 8.7.1.1.4.2 Test procedure

1. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).
2. The SS looks up $TB_{size}$ in Table 8.7.1.1.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.1.1.5-3.
3. SS sets the counters $N_{DL_newtx}N_{DL_retx}$, $N_{UL_PDCP}$, and $N_{DL_PDCP}$ to 0.
4. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.1.1.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.
5. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.
6. Steps 4 to 5 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.
7. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one
8. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.
9. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$
10. The UE passes the test if $A \geq$ "corresponding TB success rates according to Table 8.7.1.1.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.1.1.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.1.1.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.1.1.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.8.2.1.6-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

## 8.7.1.1.5 Test requirement

The requirements are specified in Table 8.7.1.1.5-1 depending on the UE category according to Table 8.7.1.1.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1.5-1: Test requirements per test**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 1 | 10296 | R.31-1 FDD | 95 |
| 2 | 25456 | R.31-2 FDD | 95 |
| 3 | 51024 | R.31-3 FDD | 95 |
| 3A | 36696 (Note 2) | R.31-3A FDD | 85 |
| 3C | 51024 | R.31-3C FDD | 85 |
| 4 | 75376 (Note 3) | R.31-4 FDD | 85 |
| 4B | 55056 (Note 5) | R.31-4B FDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: 35160 bits for sub-frame 5.
Note 3: 71112 bits for sub-frame 5.
Note 4: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.
Note 5: 52752bits for sub-frame 5.

**Table 8.7.1.1.5-2: Test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 1 | 10 | 1 | 1 x 2 | N/A | 0 | 0 | 0 | -85 | OP.6 FDD |
| 2 | 10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 3,4 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 3A | 10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 3C, 4B | 15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |

**Table 8.7.1.1.5-3: Test applicability per UE category**

| CA config | Maximum supported Bandwidth (MHz) | Category 1 | Category 2 | Category 3 | Category 4 | Category 6 | Category 7 |
|---|---|---|---|---|---|---|---|
| Single carrier | 10 | 1 | 2 | 3A | 3A | - | - |
| | 15 | - | - | 3C | 4B | - | - |
| | 20 | - | - | 3 | 4 | - | - |

Note 1: If UE can be tested for CA configuration, single carrier test is skipped.
Note 2: For non-CA UE, test is selected for maximum supported bandwidth.

## 8.7.1.1_1 FDD sustained data rate performance (Rel-10 and forward)

### 8.7.1.1_1.1 Test purpose

Same test purpose as in clause 8.7.1.1.

### 8.7.1.1_1.2 Test applicability

This test case applies to E-UTRA FDD UE release 10 and forward of UE category 6 and 7.

### 8.7.1.1_1.3 Minimum requirements

Same minimum conformance requirements as in clause 8.7.1.1.3.

### 8.7.1.1_1.4 Test description

Same test description as in clause 8.7.1.1.4 with the following exceptions:

- Connection diagram Figure A.10 (without using faders and AWGN generators).
- Instead of Table 8.7.1.1.4.1-1 -> use Table 8.7.1.1_1.4-1.
- Instead of Table 8.7.1.1.5-1 -> use Table 8.7.1.1_1.5-1.
- Instead of Table 8.7.1.1.5-2 -> use Table 8.7.1.1_1.5-2.
- Instead of Table 8.7.1.1.5-3 -> use Table 8.7.1.1_1.5-3.

**Table 8.7.1.1_1.4-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement Channel | $TB_{size}$ per Codeword | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 6 | R.31-4 FDD | R.1-4 FDD | 75376 (Note 3) | 7 | FLOOR(($TB_{size}$ – 264)/56)) | 1341 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).

The PDCP SDU size of each PDCP SDU is:

PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size – Size of Timing Advance - Size of RLC STATUS PDU) / N,

where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 71112 bits for sub-frame 5

### 8.7.1.1_1.5 Test requirement

The requirements are specified in Table 8.7.1.1_1.5-1 depending on the UE category according to Table 8.7.1.1_1.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_1.5-1: Test requirements per test**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 6 | 75376 (Note 2) | R.31-4 FDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: 71112 bits for sub-frame 5.

Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.1.1_1.5-2: Test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 6 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |

**Table 8.7.1.1_1.5-3: Test applicability per UE category**

| CA config | Maximum supported Bandwidth (MHz) | Category 1 | Category 2 | Category 3 | Category 4 | Category 6 | Category 7 |
|---|---|---|---|---|---|---|---|
| Single carrier | 20 | - | - | - | - | 6 | 6 |
| Note 1: If UE can be tested for CA configuration, single carrier test is skipped.<br>Note 2: For non-CA UE, test is selected for maximum supported bandwidth. | | | | | | | |

## 8.7.1.1_2 FDD sustained data rate performance for UE category 1bis

### 8.7.1.1_2.1 Test purpose

Same test purpose as in clause 8.7.1.1.1.

### 8.7.1.1_2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 13 and forward of UE category 1bis..

### 8.7.1.1_2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.7.1.1.3 with the following exceptions:

- Instead of Table 8.7.1.1.3-2 → use Table 8.7.1.1_2.3-1.
- Instead of Table 8.7.1.1.3-3 → use Table 8.7.1.1_2.3-2.

**Table 8.7.1.1_2.3-1: Test parameters for sustained downlink data rate (FDD 64QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 1A | 10 | 1 | 1x1 | N/A | 0 | 0 | 0 | -85 | OP.6 FDD |
| 1B | 20 | 1 | 1x1 | N/A | 0 | 0 | 0 | -85 | OP.6 FDD |

**Table 8.7.1.1_2.3-2: Minimum Requirement (FDD)**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 1A | 10296 | R.31-1 FDD | 95 |
| 1B | 10296 | R.31-1A FDD | 95 |

The normative reference for this requirement is TS 36.101 [2] clause 8.7.1.

### 8.7.1.1_2.4 Test description

Same test description as in clause 8.7.1.1.4 with the following exceptions:

- Instead of Table 8.7.1.1.4.1-1 -> use Table 8.7.1.1_2.4-1.

- Instead of Table 8.7.1.1.5-1 -> use Table 8.7.1.1_2.5-1.
- Instead of Table 8.7.1.1.5-2 -> use Table 8.7.1.1_2.5-2.
- Instead of Table 8.7.1.1.5-3 -> use Table 8.7.1.1_2.5-3.

**Table 8.7.1.1_2.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | $TB_{size}$ per Codeword | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 1A | R.31-1 FDD | R.1-1 FDD | 10296 | 1 | FLOOR(($TB_{size}$ - 96)/8) | 1275 |
| 1B | R.31-1A FDD | R.1-1 FDD | 10296 | 3 | FLOOR(($TB_{size}$ – 96)/8) | 1275 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).

The PDCP SDU size of each PDCP SDU is:

PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,

where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.

The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

### 8.7.1.1_2.5 Test requirement

The requirements are specified in Table 8.7.1.1_2.5-1 depending on the UE category according to Table 8.7.1.1_2.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames

**Table 8.7.1.1_2.5-1: Test Requirements (FDD)**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 1A | 10296 | R.31-1 FDD | 95 |
| 1B | 10296 | R.31-1A FDD | 95 |

**Table 8.7.1.1_2.5-2: Test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 1A | 10 | 1 | 1x1 | N/A | 0 | 0 | 0 | -85 | OP.6 FDD |
| 1B | 20 | 1 | 1x1 | N/A | 0 | 0 | 0 | -85 | OP.6 FDD |

**Table 8.7.1.1_2.5-3: Test applicability per UE category**

| Config | Maximum supported Bandwidth (MHz) | Category 1 | Category 1bis | Category 2 | Category 3 | Category 4 | Category 6 | Category 7 |
|---|---|---|---|---|---|---|---|---|
| Single carrier | 10 | - | 1A | - | - | - | - | - |
| Single carrier | 20 | - | 1B | - | - | - | - | - |
| Note 1: Test is selected for maximum supported bandwidth. | | | | | | | | |

## 8.7.1.1_A FDD sustained data rate performance for CA

### 8.7.1.1_A.1 FDD Sustained data rate performance for CA (2DL CA)

#### 8.7.1.1_A.1.1 Test purpose

Same test purpose as 8.7.1.1

#### 8.7.1.1_A.1.2 Test applicability

This test applies to E-UTRA FDD release 10 and forward UEs of category 3, 4, 6, 7, 9 and 10 which support inter-band OR intra-band contiguous DL CA and not support 256QAM in DL.

This test also applies to E-UTRA FDD release 11 and forward UEs of category 3, 4, 6, 7, 9 and 10 which support intra band non-contiguous DL CA and not support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.7.1.1_A.1.3 Minimum requirements

**Table 8.7.1.1_A.1.3-1: Void**

For UE not supporting 256QAM, the requirements are specified in Table 8.7.1.1_A.1.3-3, with the addition of the parameters in Table 8.7.1.1_A.1.3-2 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category, CA capability and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.1.1_A.1.3-4. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_A.1.3-2: Test Parameters for sustained downlink data rate for CA (FDD)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 3,4 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 3B, 4A | 2x10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6A | 2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6B | 10+15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6C | 10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6D | 15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6E | 2x15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6F | 15+5 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6G | 20+5 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| Note 1: For CA test cases, PUCCH format 1b with channel selection is used to feedback ACK/NACK for Test 1-6E, and PUCCH format 3 is used to feedback ACK/NACK for Test 7-7G. | | | | | | | | | |

**Table 8.7.1.1_A.1.3-3: Minimum requirement for CA (FDD)**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 3 | 51024 | R.31-3 FDD | 95 |
| 3B | 25456 | R.31-2 FDD | 95 |
| 4 | 75376 (Note 3) | R.31-4 FDD | 85 |
| 4A | 36696 (Note 2) | R.31-3A FDD | 85 |
| 6A | 75376 (Note 3) | R.31-4 FDD | 85 |
| 6B | 36696 (Note 2) for 10MHz CC<br>55056 for 15MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-5 FDD for 15MHz CC | 85 |
| 6C | 36696 (Note 2) for 10MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 6D | 55056 for 15MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 6E | 55056 (Note 5) for two 15MHz CCs | R.31-4B FDD for two 15MHz CCs | 85 |
| 6F | 55056 (Note 5) for 15MHz CC<br>18336 (Note 6) for 5MHz CC | R.31-5 FDD for 15MHz CC<br>R.31-6 FDD for 5MHz CC | 85 |
| 6G | 75376 (Note 3) for 20MHz CC<br>18336 (Note 6) for 5MHz CC | R.31-4 FDD for 20MHz CC<br>R.31-6 FDD for 5MHz CC | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: 35160 bits for sub-frame 5.
Note 3: 71112 bits for sub-frame 5.
Note 4: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.
Note 5: 52752bits for sub-frame 5.
Note 6: 15840bits for sub-frame 0.

**Table 8.7.1.1_A.1.3-4: Test points for sustained data rate for CA (FRC)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9,10 |
|---|---|---|---|---|---|---|---|
| CA with 2CCs | 10+10 | - | - | 3B | 4A | 4A | 4A |
| | 10+15 | - | - | 3B | 4A | 6B | 6B |
| | 10+20 | - | - | 3B | 4A | 6C | 6C |
| | 15+15 | | | 3B | 4A | 6E | 6E |
| | 15+20 | - | - | 3B | 4A | 6D | 6D |
| | 20+5 | - | - | 3 | 4 | 6G | 6G |
| | 20+20 | - | - | 3B or 3 (Note 4) | 4A or 4 (Note 4) | 6A | 6A |
| | 15+5 | | | 3B | 4A | 6F | 6F |

Note 1: Void.
Note 2: For non-CA UE, test is selected for maximum supported bandwidth.
Note 3: Void.
Note 4: If the intra-band contiguous CA is the only CA configuration supported by category 3 or 4 UE, the single carrier test is selecte, i.e., Test 3 for UE category 3 and Test 4 for UE category 4. Otherwise, Test 3B applies for category 3 UE and Test 4A applies for category 4 UE.
Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.
Note 6: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.

The normative reference for this requirement is TS 36.101[2] clause 8.7.1

8.7.1.1_A.1.4 Test description

8.7.1.1_A.1.4.1 Initial conditions

**Table 8.7.1.1_A.1.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 3 | R.31-3 FDD | R.1-4 FDD | 51024 | 7 | FLOOR((TBsize – 264)/56) | 1341 |
| 3B | R.31-2 FDD | R.1-2 FDD | 25456 | 3 | FLOOR((TBsize – 152)/24) | 1054 |
| 4 | R.31-4 FDD | R.1-4 FDD | 75376 (Note 4) | 7 | FLOOR((TBsize – 264)/56) | 1341 |
| 4A | R.31-3A FDD | R.1-3A FDD | 36696 (Note 3) | 4 | FLOOR((TBsize – 184)/32) | 1141 |
| 6A | R.31-4 FDD | R.1-4 FDD | 75376 (Note 4) | 7 | FLOOR((TBsize – 264)/56) | 1341 |
| 6B | R.31-3A FDD for 10MHz CC<br>R.31-5 FDD for 15MHz CC | R.1-4B FDD | 36696 (Note 3) for 10MHz CC<br>55056 for 15MHz CC | 4 for 10MHz CC<br>6 for 15 MHz CC | FLOOR(($TB_{size}$ – 184)/32) for 10MHz CC<br>FLOOR((TBsize – 240)/48) for 15 MHz CC | 1141 for 10MHz CC<br>1142 for 15MHz CC |
| 6C | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 36696 (Note 3) for 10MHz CC<br>75376 (Note 4) for 20MHz CC | 4 for 10MHz CC<br>7 for 20 MHz CC | FLOOR(($TB_{size}$ – 184)/32) for 10MHz CC<br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1141 for 10MHz CC<br>1341 for 20MHz CC |
| 6D | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 55056 for 15MHz CC<br>75376 (Note 4) for 20MHz CC | 6 for 15MHz CC<br>7 for 20 MHz CC | FLOOR(($TB_{size}$ – 240)/48) for 15 MHz CC<br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1142 for 15MHz CC<br>1341 for 20MHz CC |
| 6E | R.31-4B FDD for two 15MHz CCs | R.1-4B FDD | 55056 (Note 5) for two 15MHz CCs | 6 for two 15MHz CCs | FLOOR(($TB_{size}$ – 240)/48) for two 15 MHz CCs | 1142 for two 15MHz CCs |
| 6F | R.31-5 FDD for 15MHz CC<br>R.31-6 FDD for 5MHz CC | R.1-4B FDD | 55056 (Note 5) for 15MHz CC<br>18336 (Note 6) for 5MHz CC | 2 for 5MHz CC<br>6 for 15MHz CC | FLOOR(($TB_{size}$ – 128)/16) for 5MHz CC<br>FLOOR(($TB_{size}$ – 240)/48) for 15 MHz CC | 1138 for 5MHz CC<br>1142 for 15MHz CC |
| 6G | R.31-4 FDD for 20MHz CC<br>R.31-6 FDD for 5MHz CC | R.1-4 FDD | 75376 (Note 4) for 20MHz CC<br>18336 (Note 6) for 5MHz CC | 7 for 20 MHz CC<br>2 for 5MHz CC | FLOOR((TBsize – 264)/56) for 20 MHz CC<br>FLOOR(($TB_{size}$ – 128)/16) for 5MHz CC | 1341 for 20MHz CC<br>1138 for 5MHz CC |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:

| | |
|---|---|
| | PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,<br>where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.<br>The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test. |
| Note 3: | 35160 bits for sub-frame 5. |
| Note 4: | 71112 bits for sub-frame 5. |
| Note 5: | 52752 bits for sub-frame 5. |
| Note 6: | 15840bits for sub-frame 0. |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.1.1_A.1.5-2 depending on the UE category according to Table 8.7.1.1_A.1.5-3.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.36 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.1.1_A.1.5-2 and Table 8.7.1.1_A.1.5-1 depending on the UE category according to Table 8.7.1.1_A.1.5-3.

3. Downlink signals for PCC are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.1.1_A.1.4.3.

### 8.7.1.1_A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.1.1_A.1.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.1.1_A.1.4.3-3A.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.1.1_A.1.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.1.1_A.1.5-3.

6. SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.1.1_A.1.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs

to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.1.1_A.1.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.1.1_A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.1.1_A.1.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.1.1_A.1.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.1.1_A.1.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.1.1_A.1.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.7.1.1_A.1.5 Test requirement

The requirements are specified in Table 8.7.1.1_A.1.5-1 depending on the UE category according to Table 8.7.1.1_A.1.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_A.1.5-1: Test requirements per test**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 3 | 51024 | R.31-3 FDD | 95 |
| 3B | 25456 | R.31-2 FDD | 95 |
| 4 | 75376 (Note 3) | R.31-4 FDD | 85 |
| 4A | 36696 (Note 2) | R.31-3A FDD | 85 |
| 6A | 75376 (Note 3) for 20MHz CC | R.31-4 FDD for 20MHz CC | 85 |
| 6B | 36696 (Note 2) for 10MHz CC<br><br>55056 for 15MHz CC | R.31-3A FDD for 10MHz CC<br><br>R.31-5 FDD for 15MHz CC | 85 |
| 6C | 36696 (Note 2) for 10MHz CC<br><br>75376 (Note 3) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 6D | 55056 for 15MHz CC<br><br>75376 (Note 3) for 20MHz CC | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 6E | 55056 (Note 6) for two 15MHz CCs | R.31-4B FDD for two 15MHz CCs | 85 |
| 6F | 55056 (Note 6) for 15MHz CC<br>18336 (Note 8) for 5MHz CC | R.31-5 FDD for 15MHz CC<br>R.31-6 FDD for 5MHz CC | 85 |
| 6G | 75376 (Note 3) for 20MHz CC<br>18336 (Note 8) for 5MHz CC | R.31-4 FDD for 20MHz CC<br>R.31-6 FDD for 5MHz CC | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: 35160 bits for sub-frame 5.
Note 3: 71112 bits for sub-frame 5.
Note 4: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.
Note 5: For category 6 and 7 UE, select one CA configuration among CA configurations corresponding to largest aggregated CA bandwidth signalled by UE.
Note 6: 52752 bits for sub-frame 5.
Note 7: In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.
Note 8: 15840bits for sub-frame 0.

**Table 8.7.1.1_A.1.5-2: Test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 3, 4 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 3B, 4A | 2x10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6A | 2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6B | 10+15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6C | 10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6D | 15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6E | 2x15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6F | 15+5 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6G | 20+5 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |

Note 1: PUCCH format 1b with channel selection is used to feedback ACK/NACK.

**Table 8.7.1.1_A.1.5-3: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9,10 |
|---|---|---|---|---|---|---|---|
| CA with 2CCs | 10+10 | - | - | 3B | 4A | 4A | 4A |
| | 10+15 | - | - | 3B | 4A | 6B | 6B |
| | 10+20 | - | - | 3B | 4A | 6C | 6C |
| | 15+15 | | | 3B | 4A | 6E | 6E |
| | 15+20 | - | - | 3B | 4A | 6D | 6D |
| | 20+5 | - | - | 3 | 4 | 6G | 6G |
| | 20+20 | - | - | 3B or 3 (Note 4) | 4A or 4 (Note 4) | 6A | 6A |
| | 15+5 | | | 3B | 4A | 6F | 6F |
| Note 1: Void.<br>Note 2: For non-CA UE, test is selected for maximum supported bandwidth.<br>Note 3: Void.<br>Note 4: If the intra-band contiguous CA is the only CA configuration supported by category 3 or 4 UE, the single carrier test is selecte, i.e., Test 3 for UE category 3 and Test 4 for UE category 4. Otherwise, Test 3B applies for category 3 UE and Test 4A applies for category 4 UE.<br>Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.<br>Note 6: Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. Only one test point to be tested | | | | | | | |

## 8.7.1.1_A.2 FDD Sustained data rate performance for CA (3DL CA)

### 8.7.1.1_A.2.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.1.1_A.2.2 Test applicability

This test case applies to all types of E-UTRA FDD UE release 10 and forward of UE category 9, 10, 11 and 12 that support 3DL with CA configurations in Table 7.1-2a and not support 256QAM in DL.

This test case applies to all types of E-UTRA FDD UE release 10 and forward of UE category 6 and 7 that support 3DL with CA configurations in Table 7.1-2a and support at most 40MHz aggregated bandwidth and not support 256QAM in DL.

This test case also applies to all types of E-UTRA FDD UE release 11 and forward of UE category 9, 10, 11 and 12 that support 3DL with CA configurations in Table 7.1-2a and not support 256QAM in DL.

This test case also applies to all types of E-UTRA FDD UE release 11 and forward of UE category 6 and 7 that support 3DL with CA configurations in Table 7.1-2a and support at most 40MHz aggregated bandwidth and not support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.1.1_A.2.3 Minimum conformance requirements

For UE not supporting 256QAM, the requirements are specified in Table 8.7.1.1_A.2.3-2, with the addition of the parameters in Table 8.7.1.1_A.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.1.1_A.2.3-3. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_A.2.3-1: test parameters for sustained downlink data rate (FDD 64QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 6A | 2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6D | 15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7 | 3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7A | 15+20+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7B | 10+20+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7C | 15+15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7D | 10+15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7E | 10+10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7F | 10+15+15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7G | 5+10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7H | 5+15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7I | 5+10+10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| Note 1: For CA test cases, PUCCH format 1b with channel selection is used to feedback ACK/NACK for Test 1-6E, and PUCCH format 3 is used to feedback ACK/NACK for Test 7-7G. | | | | | | | | | |

**Table 8.7.1.1_A.2.3-2: Minimum requirement (FDD 64QAM)**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 6A | 75376 (Note 3) | R.31-4 FDD | 85 |
| 6D | 55056 for 15MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7 | 75376 (Note 3) | R.31-4 FDD | 85 |
| 7A | 55056 (Note 5) for 15MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7B | 36696 (Note 2) for 10MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7C | 55056 (Note 5) for 15MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7D | 36696 (Note 2) for 10MHz CC<br>55056 (Note 5) for 15MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7E | 36696 (Note 2) for 10MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7F | 36696 (Note 2) for 10MHz CC<br>55056 (Note 5) for 15MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-5 FDD for 15MHz CC | 85 |
| 7G | 18336 (Note 6) for 5MHz CC<br>36696 (Note 2) for 10MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-6 FDD for 5MHz CC<br>R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7H | 18336 (Note 6) for 5MHz CC<br>55056 (Note 5) for 15MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-6 FDD for 5MHz CC<br>R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7I | 18336 (Note 6) for 5MHz CC<br>36696 (Note 2) for 10MHz CC | R.31-6 FDD for 5MHz CC<br>R.31-3A FDD for 10MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: 35160 bits for sub-frame 5.<br>Note 3: 71112 bits for sub-frame 5.<br>Note 4: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.<br>Note 5: 52752bits for sub-frame 5.<br>Note 6: 15840bits for sub-frame 0. | | | | | | | | |

**Table 8.7.1.1_A.2.3-3: Test points for sustained data rate (FRC 64QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9,10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|
| CA with 3CCs | 3x20 | - | - | - | - | 6A | 7 | 7 |
| | 15+20+20 | - | - | - | - | 6A | 7A | 7A |
| | 10+20+20 | - | - | - | - | 6A | 7B | 7B |
| | 15+15+20 | | | | | 6D | 7C | 7C |
| | 10+15+20 | - | - | - | - | 6D | 7D | 7D |
| | 10+10+20 | - | - | - | - | 7E | 7E | 7E |
| | 10+15+15 | - | - | - | - | 7F | 7F | 7F |
| | 5+10+20 | - | - | - | - | 7G | 7G | 7G |
| | 5+15+20 | - | - | - | - | 7H | 7H | 7H |
| | 5+10+10 | - | - | - | - | 7I | 7I | 7I |

Note 1: Void.
Note 2: For non-CA UE, test is selected for maximum supported bandwidth.
Note 3: Void.
Note 4: If the intra-band contiguous CA is the only CA configuration supported by category 3 or 4 UE, the single carrier test is selecte, i.e., Test 3 for UE category 3 and Test 4 for UE category 4. Otherwise, Test 3B applies for category 3 UE and Test 4A applies for category 4 UE.
Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

The normative reference for this requirement is TS 36.101 [2] clause 8.7.1.

8.7.1.1_A.2.4 Test description

8.7.1.1_A.2.4.1 Initial conditions

**Table 8.7.1.1_A.2.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 6A | R.31-4 FDD for two 20MHz CCs | R.1-4 FDD | 75376 (Note 4) | 7 for two 20MHz CCs | FLOOR((TBsize – 264)/56) | 1341 for two 20MHz CCs |
| 6D | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 55056 for 15MHz CC<br>75376 (Note 4) for 20MHz CC | 6 for 15MHz CC<br>7 for 20 MHz CC | FLOOR(($TB_{size}$ – 240)/48) for 15 MHz CC<br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1142 for 15MHz CC<br>1341 for 20MHz CC |
| 7 | R.31-4 FDD for three 20MHz CCs | R.1-4 FDD | 75376 (Note 4) | 7 for three 20MHz CCs | FLOOR((TBsize – 264)/56) | 1341 for three 20MHz CCs |
| 7A | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 55056 for 15MHz CC<br>75376 (Note 4) for 20MHz CC | 6 for 15MHz CC<br>7 for 20 MHz CC | FLOOR(($TB_{size}$ – 240)/48) for 15 MHz CC<br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1142 for 15MHz CC<br>1341 for 20MHz CC |
| 7B | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 36696 (Note 3) for 10MHz CC<br>75376 (Note 4) for 20MHz CC | 4 for 10MHz CC<br>7 for 20 MHz CC | FLOOR(($TB_{size}$ – 184)/32) for 10MHz CC<br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1141 for 10MHz CC<br>1341 for 20MHz CC |
| 7C | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 55056 for 15MHz CC<br>75376 (Note 4) for 20MHz CC | 6 for 15MHz CC<br>7 for 20 MHz CC | FLOOR(($TB_{size}$ – 240)/48) for 15 MHz CC<br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1142 for 15MHz CC<br>1341 for 20MHz CC |
| 7D | R.31-3A FDD for 10MHz CC<br>R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 36696 (Note 3) for 10MHz CC<br>55056 for 15MHz CC<br>75376 (Note 4) for 20MHz CC | 4 for 10MHz CC<br>6 for 15MHz CC<br>7 for 20 MHz CC | FLOOR(($TB_{size}$ – 184)/32) for 10MHz CC<br>FLOOR(($TB_{size}$ – 240)/48) for 15 MHz CC<br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1141 for 10MHz CC<br>1142 for 15MHz CC<br>1341 for 20MHz CC |
| 7E | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 36696 (Note 3) for 10MHz CC<br>75376 (Note 4) for 20MHz CC | 4 for 10MHz CC<br>7 for 20 MHz CC | FLOOR(($TB_{size}$ – 184)/32) for 10MHz CC<br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1141 for 10MHz CC<br>1341 for 20MHz CC |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7F | R.31-3A FDD for 10MHz CC<br>R.31-5 FDD for 15MHz CC | R.1-4B FDD | 36696 (Note 3) for 10MHz CC<br>55056 for 15MHz CC | 4 for 10MHz CC<br><br>6 for 15MHz CC | FLOOR((TB$_{size}$ – 184)/32) for 10MHz CC<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15 MHz CC | 1141 for 10MHz CC<br><br>1142 for 15MHz CC |
| 7G | R.31-6 FDD for 5MHz CC<br>R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 18336 (Note 6) for 5MHz CC<br>36696 (Note 3) for 10MHz CC<br>75376 (Note 4) for 20MHz CC | 2 for 5MHz CC<br><br>4 for 10MHz CC<br><br>7 for 20 MHz CC | FLOOR((TB$_{size}$ – 128)/16) for 5MHz CC<br><br>FLOOR((TB$_{size}$ – 184)/32) for 10MHz CC<br><br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1138 for 5MHz CC<br><br>1141 for 10MHz CC<br><br>1341 for 20MHz CC |
| 7H | R.31-6 FDD for 5MHz CC<br>R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 18336 (Note 6) for 5MHz CC<br>55056 for 15MHz CC<br>75376 (Note 4) for 20MHz CC | 2 for 5MHz CC<br><br>6 for 15MHz CC<br><br>7 for 20 MHz CC | FLOOR((TB$_{size}$ – 128)/16) for 5MHz CC<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15 MHz CC<br><br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1138 for 5MHz CC<br><br>1142 for 15MHz CC<br><br>1341 for 20MHz CC |
| 7I | R.31-6 FDD for 5MHz CC<br>R.31-3A FDD for 10MHz CC | R.1-1 FDD | 18336 (Note 6) for 5MHz CC<br>36696 (Note 3) for 10MHz CC | 2 for 5MHz CC<br><br>4 for 10MHz CC | FLOOR((TB$_{size}$ – 128)/16) for 5MHz CC<br><br>FLOOR((TB$_{size}$ – 184)/32) for 10MHz CC | 1138 for 5MHz CC<br><br>1141 for 10MHz CC |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits).
This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 35160 bits for sub-frame 5.

Note 4: 71112 bits for sub-frame 5.

Note 5: 52752 bits for sub-frame 5.

Note 6: 15840bits for sub-frame 0.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.1.1_A.2.5-2 depending on the UE category according to Table 8.7.1.1_A.2.5-3.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.60 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.1-1 and Table 8.7.1.1_A.2.5-1 depending on the UE category according to Table 8.7.1.1_A.2.5-3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.1.1_A.2.4.3.

### 8.7.1.1_A.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with two SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.1.1_A.2.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.1.1_A.2.4.3-3A.

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13,6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.1.1_A.2.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.1.1_A.2.5-3.

6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.1.1_A.2.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.1.1_A.2.5-1" and B = 0.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

8.7.1.1_A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.1.1_A.2.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.1.1_A.2.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.1.1_A.2.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.1.1_A.2.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.7.1.1_A.2.5 Test requirement

The requirements are specified in Table 8.7.1.1_A.2.5-1 depending on the UE category according to Table 8.7.1.1_A.2.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_A.2.5-1: Test requirements per test**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 7 | 75376 (Note 3) | R.31-4 FDD | 85 |
| 7A | 55056 (Note 5) for 15MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7B | 36696 (Note 2) for 10MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7C | 55056 (Note 5) for 15MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7D | 36696 (Note 2) for 10MHz CC<br>55056 (Note 5) for 15MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7E | 36696 (Note 2) for 10MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7F | 36696 (Note 2) for 10MHz CC<br>55056 (Note 5) for 15MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-5 FDD for 15MHz CC | 85 |
| 7G | 18336 (Note 6) for 5MHz CC<br>36696 (Note 2) for 10MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-6 FDD for 5MHz CC<br>R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7H | 18336 (Note 6) for 5MHz CC<br>55056 (Note 5) for 15MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-6 FDD for 5MHz CC<br>R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 7I | 18336 (Note 6) for 5MHz CC<br>36696 (Note 2) for 10MHz CC | R.31-6 FDD for 5MHz CC<br>R.31-3A FDD for 10MHz CC | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: 35160 bits for sub-frame 5.
Note 3: 71112 bits for sub-frame 5.
Note 4: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.
Note 5: 52752bits for sub-frame 5.
Note 6: 15840bits for sub-frame 0.

**Table 8.7.1.1_A.2.5-2: test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 7 | 3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7A | 15+20+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7B | 10+20+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7C | 15+15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7D | 10+15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7E | 10+10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7F | 10+15+15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7G | 5+10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7H | 5+15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7I | 5+10+10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| Note 1: PUCCH format 1b with channel selection is used to feedback ACK/NACK for Tests 6A and 6D, and PUCCH format 3 is used to feedback ACK/NACK for Test 7-7G. | | | | | | | | | |

**Table 8.7.1.1_A.2.5-3: Test points per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9,10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|
| CA with 3CCs | 3x20 | - | - | - | - | 6A | 7 | 7 |
| | 15+20+20 | - | - | - | - | 6A | 7A | 7A |
| | 10+20+20 | - | - | - | - | 6A | 7B | 7B |
| | 15+15+20 | | | | | 6D | 7C | 7C |
| | 10+15+20 | - | - | - | - | 6D | 7D | 7D |
| | 10+10+20 | - | - | - | - | 7E | 7E | 7E |
| | 10+15+15 | - | - | - | - | 7F | 7F | 7F |
| | 5+10+20 | - | - | - | - | 7G | 7G | 7G |
| | 5+15+20 | - | - | - | - | 7H | 7H | 7H |
| | 5+10+10 | - | - | - | - | 7I | 7I | 7I |
| Note 1: Void.<br>Note 2: Void.<br>Note 3: Void.<br>Note 4: Void.<br>Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.<br>Note 6: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 7: Test 6A and 6D are tested in 8.7.1.1_A.1 | | | | | | | | |

## 8.7.1.1_A.3 Void

## 8.7.1.1_A.4 FDD Sustained data rate performance for CA (4DL CA)

### 8.7.1.1_A.4.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.1.1_A.4.2 Test applicability

This test case applies to all types of E-UTRA FDD UE release 11 and forward of UE category 11 and 12 that support 4DL with CA configurations in Table 7.1-2b and not support 256QAM in DL.

This test case applies to all types of E-UTRA FDD UE release 11 and forward of UE category 9 and 10 that support 4DL with CA configurations in Table 7.1-2b and support at most 60MHz aggregated bandwidth and not support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.1.1_A.4.3 Minimum conformance requirements

For UE not supporting 256QAM, the requirements are specified in Table 8.7.1.1_A.4.3-2, with the addition of the parameters in Table 8.7.1.1_A.4.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.1.1_A.4.3-3. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_A.4.3-1: test parameters for sustained downlink data rate (FDD 64QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 7 | 3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 8 | 4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 8A | 20+20+20+10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 8B | 20+20+10+10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 8D | 20+10+10+5 | 3 | 2 x2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| Note 1: For CA test cases, PUCCH format 1b with channel selection is used to feedback ACK/NACK for Test 1-6E, and PUCCH format 3 is used to feedback ACK/NACK for Test 7-7G. | | | | | | | | | |

**Table 8.7.1.1_A.4.3-2: Minimum requirement (FDD 64QAM)**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 7 | 75376 (Note 3) | R.31-4 FDD | 85 |
| 8 | 75376 (Note 3) | R.31-4 FDD | 85 |
| 8A | 36696 (Note 2) for 10MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 8B | 36696 (Note 2) for 10MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 8D | 18336 (Note 6) for 5MHz CC<br>36696 (Note 2) for 10MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-6 FDD for 5MHz CC<br>R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: 35160 bits for sub-frame 5.<br>Note 3: 71112 bits for sub-frame 5.<br>Note 4: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.<br>Note 5: 52752bits for sub-frame 5.<br>Note 6: 15840bits for sub-frame 0. | | | |

**Table 8.7.1.1_A.4.3-3: Test points for sustained data rate (FRC 64QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9,10 | Cat 11, 12 / DL Cat. 11,12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|
| CA with 4CCs | 4x20 | - | - | - | - | - | 7 | 8 | 8 |
| | 20+20+20+10 | - | - | - | - | - | 7 | 8A | 8A |
| | 20+20+10+10 | - | - | - | - | - | 8B | 8B | 8B |
| | 20+10+10+5 | - | - | - | - | - | 8D | 8D | 8D |

Note 1: Void.
Note 2: For non-CA UE, test is selected for maximum supported bandwidth.
Note 3: Void.
Note 4: If the intra-band contiguous CA is the only CA configuration supported by category 3 or 4 UE, the single carrier test is selected, i.e. Test 3 for UE category 3 and Test 4 for UE category 4. Otherwise, Test 3B applies for category 3 UE and Test 4A applies for category 4 UE.
Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.
Note 6: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.

The normative reference for this requirement is TS 36.101 [2] clause 8.7.1.

8.7.1.1_A.4.4 Test description

8.7.1.1_A.4.4.1 Initial conditions

**Table 8.7.1.1_A.4.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 7 | R.31-4 FDD for three 20MHz CCs | R.1-4 FDD | 75376 (Note 4) | 7 for three 20MHz CCs | FLOOR((TBsize – 264)/56) | 1341 for three 20MHz CCs |
| 8 | R.31-4 FDD for four 20MHz CCs | R.1-4 FDD | 75376 (Note 4) | 7 for four 20MHz CCs | FLOOR((TBsize – 264)/56) | 1341 for 20MHz CC |
| 8A | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 36696 (Note 3) for 10MHz CC<br>75376 (Note 4) for 20MHz CC | 4 for 10MHz CC<br>7 for 20 MHz CC | FLOOR((TB$_{size}$ – 184)/32) for 10MHz CC<br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1141 for 10MHz CC<br>1341 for 20MHz CC |
| 8B | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 36696 (Note 3) for 10MHz CC<br>75376 (Note 4) for 20MHz CC | 4 for 10MHz CC<br>7 for 20 MHz CC | FLOOR((TB$_{size}$ – 184)/32) for 10MHz CC<br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1141 for 10MHz CC<br>1341 for 20MHz CC |
| 8D | R.31-6 FDD for 5MHz CC<br>R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 18336 (Note 6) for 5MHz CC<br>36696 (Note 3) for 10MHz CC<br>75376 (Note 4) for 20MHz CC | 2 for 5MHz CC<br>4 for 10MHz CC<br>7 for 20 MHz CC | FLOOR((TB$_{size}$ – 128)/16) for 5MHz CC<br>FLOOR((TB$_{size}$ – 184)/32) for 10MHz CC<br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1138 for 5MHz CC<br>1141 for 10MHz CC<br>1341 for 20MHz CC |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size – AMD PDU header size - MAC header size – Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 35160 bits for sub-frame 5.

Note 4: 71112 bits for sub-frame 5.

Note 5: 52752bits for sub-frame 5.

Note 6: 15840bits for sub-frame 0.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.1.1_A.4.5-2 depending on the UE category according to Table 8.7.1.1_A.4.5-3.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.60 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.1-1 and Table 8.7.1.1_A.4.5-1 depending on the UE category according to Table 8.7.1.1_A.4.5-3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.1.1_A.4.4.3.

### 8.7.1.1_A.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with three SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.1.1_A.4.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.1.1_A.4.4.3-3A.

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13,6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.1.1_A.4.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.1.1_A.4.5-3.

6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.1.1_A.4.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} – N_{UL_PDCP}$

13. The UE passes the test if A ≥ "corresponding TB success rate according to Table 8.7.1.1_A.4.5-1" and B = 0.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.1.1_A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.1.1_A.4.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.1.1_A.4.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfigSMC SEQUENCE { | | | |
| securityAlgorithmConfig SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| } | | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.1.1_A.4.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.1.1_A.4.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.7.1.1_A.4.5 Test requirement

The requirements are specified in Table 8.7.1.1_A.4.5-1 depending on the UE category according to Table 8.7.1.1_A.4.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_A.4.5-1: Test requirements per test**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 8 | 75376 (Note 3) | R.31-4 FDD | 85 |
| 8A | 36696 (Note 2) for 10MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 8B | 36696 (Note 2) for 10MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| 8D | 18336 (Note 6) for 5MHz CC<br>36696 (Note 2) for 10MHz CC<br>75376 (Note 3) for 20MHz CC | R.31-6 FDD for 5MHz CC<br>R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: 35160 bits for sub-frame 5.<br>Note 3: 71112 bits for sub-frame 5.<br>Note 4: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.<br>Note 5: 52752bits for sub-frame 5.<br>Note 6: 15840bits for sub-frame 0. | | | |

**Table 8.7.1.1_A.4.5-2: test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 8 | 4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 8A | 20+20+20+10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 8B | 20+20+10+10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 8D | 20+10+10+5 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| Note 1: void | | | | | | | | | |

**Table 8.7.1.1_A.4.5-3: Test points per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9,10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|
| CA with 4CCs | 4x20 | - | - | - | - | - | 7 | 8 |
| | 20+20+20+10 | - | - | - | - | - | 7 | 8A |
| | 20+20+10+10 | - | - | - | - | - | 8B | 8B |
| | 20+10+10+5 | - | - | - | - | - | 8D | 8D |
| Note 1-4: Void.<br>Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.<br>Note 6: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 7: Test 7 is tested in 8.7.1.1_A.2 | | | | | | | | |

## 8.7.1.1_A.5 FDD Sustained data rate performance for CA (5DL CA)

### 8.7.1.1_A.5.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.1.1_A.5.2 Test applicability

This test case applies to all types of E-UTRA FDD UE release 11 and forward UE of DL category 15 that support 5DL with CA configurations in Table 7.1-2c.

This test case also applies to all types of E-UTRA FDD UE release 12 and forward UE of DL category 15 that support 5DL with CA configurations in Table 7.1-2c.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.1.1_A.5.3 Minimum conformance requirements

For UE not supporting 256QAM, the requirements are specified in Table 8.7.1.1_A.5.3-2, with the addition of the parameters in Table 8.7.1.1_A.5.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.1.1_A.5.3-3. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_A.5.3-1: test parameters for sustained downlink data rate (FDD 64QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 8 | 4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 9 | 5x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |

**Table 8.7.1.1_A.5.3-2: Minimum requirement (FDD 64QAM)**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 8 | 75376 (Note 3) | R.31-4 FDD | 85 |
| 9 | 75376 (Note 3) | R.31-4 FDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: Void
Note 3: 71112 bits for sub-frame 5.
Note 4: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.1.1_A.5.3-3: Test points for sustained data rate (FRC 64QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9,10 | Cat 11, 12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DL Cat. 11,12 | |
| CA with 5CCs | 5x20 | - | - | - | - | - | - | 8 | 9 |

Note 1: Void.
Note 2: For non-CA UE, test is selected for maximum supported bandwidth.
Note 3: Void.
Note 4: If the intra-band contiguous CA is the only CA configuration supported by category 3 or 4 UE, the single carrier test is selected, i.e., Test 3 for UE category 3 and Test 4 for UE category 4. Otherwise, Test 3B applies for category 3 UE and Test 4A applies for category 4 UE.
Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.
Note 6: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.

The normative reference for this requirement is TS 36.101 [2] clause 8.7.1.

### 8.7.1.1_A.5.4 Test description

#### 8.7.1.1_A.5.4.1 Initial conditions

**Table 8.7.1.1_A.5.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 8 | R.31-4 FDD for four 20MHz CCs | R.1-4 FDD | 75376 (Note 4) | 7 for four 20MHz CCs | FLOOR((TBsize – 264)/56) | 1341 for 20MHz CC |
| 9 | R.31-4 FDD for five 20MHz CCs | R.1-4 FDD | 75376 (Note 4) | 7 for five 20MHz CCs | FLOOR((TBsize – 264)/56) | 1341 for 20MHz CC |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits).
This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: Void.

Note 4: 71112 bits for sub-frame 5.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.1.1_A.5.5-2 depending on the UE category according to Table 8.7.1.1_A.5.5-3.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.60 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.1-1 and Table 8.7.1.1_A.5.5-1 depending on the UE category according to Table 8.7.1.1_A.5.5-3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.1.1_A.5.4.3.

### 8.7.1.1_A.5.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with four SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.1.1_A.5.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.1.1_A.5.4.3-3A.

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13,6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.1.1_A.5.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.1.1_A.5.5-3.

6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.1.1_A.5.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.1.1_A.5.5-1" and B = 0.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.1.1_A.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.1.1_A.5.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.1.1_A.5.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.1.1_A.5.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.1.1_A.5.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.7.1.1_A.5.5 Test requirement

The requirements are specified in Table 8.7.1.1_A.5.5-1 depending on the UE category according to Table 8.7.1.1_A.5.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_A.5.5-1: Test requirements per test**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 8 | 75376 (Note 3) | R.31-4 FDD | 85 |
| 9 | 75376 (Note 3) | R.31-4 FDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: Void
Note 3: 71112 bits for sub-frame 5.
Note 4: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.1.1_A.5.5-2: test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 8 | 4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 9 | 5x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |

**Table 8.7.1.1_A.5.5-3: Test points per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9,10 | Cat 11, 12 / DL Cat. 11,12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|
| CA with 5CCs | 5x20 | - | - | - | - | - | - | 8 | 9 |

Note 1: Void.
Note 2: Void
Note 3: Void.
Note 4: Void
Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.
Note 6: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.
Note 7: Test 8 is tested in 8.7.1.1_A.4

## 8.7.1.1_H FDD sustained data rate performance for 256QAM in DL

Editor's notes:

- Discussion on DL EVM for 256QAM demodulation test as per R5-155895 is still ongoing

- Whether UL modulation mode QPSK is suitable to use is FFS

## 8.7.1.1_H.1 FDD sustained data rate performance for 256QAM in DL (Single Carrier)

### 8.7.1.1_H.1.1 Test purpose

The purpose of the test is to verify that the Layer 1 and Layer 2 correctly process in a sustained manner the received packets corresponding to the maximum number of DL-SCH transport block bits received within a TTI for the UE category indicated. The sustained downlink data rate shall be verified in terms of the success rate of delivered PDCP SDU(s) by Layer 2. The test case below specifies the RF conditions and the required success rate of delivered TB by Layer 1 to meet the sustained data rate requirement. The size of the TB per TTI corresponds to the largest possible DL-SCH transport block for each UE category using the maximum number of layers for spatial multiplexing. Transmission mode 3 is used with radio conditions resembling a scenario where sustained maximum data rates are available.

### 8.7.1.1_H.1.2 Test applicability

This test applies to E-UTRA FDD UEs Release 12 and forward of UE DL category 13 that support 256QAM in DL.

### 8.7.1.1_H.1.3 Minimum requirements

For UE supporting 256QAM, the requirements are specified in Table 8.7.1.1_H.1.3-2, with the addition of the parameters in Table 8.7.1.1_H.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.1.1_H.1.3-3, the TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.1.1.3-3 is not applicable.

**Table 8.7.1.1_H.1.3-1: test parameters for sustained downlink data rate (FDD 256QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 1 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |

**Table 8.7.1.1_H.1.3-2: Minimum requirement (FDD 256QAM)**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 1 | R.68 FDD | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI. | | |
| Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | |

**Table 8.7.1.1_H.1.3-3: Test points for sustained data rate (FRC 256QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12 / DL Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|
| Single carrier | 20 | - | 1 | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.1

### 8.7.1.1_H.1.4 Test description

Same test description as in clause 8.7.1.1.4 with the following exceptions:

- Connection diagram Figure A.10 (without using faders and AWGN generators).
- Instead of Table 8.7.1.1.4.1-1 -> use Table 8.7.1.1_H.1.4-1.
- Instead of Table 8.7.1.1.5-1 -> use Table 8.7.1.1_H.1.5-1.
- Instead of Table 8.7.1.1.5-2 -> use Table 8.7.1.1_H.1.5-2.
- Instead of Table 8.7.1.1.5-3 -> use Table 8.7.1.1_H.1.5-3.

**Table 8.7.1.1_H.1.4-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | $TB_{size}$ per Codeword | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 1 | R.68 FDD | R.1-4 FDD | 97896 | 10 | FLOOR(($TB_{size}$ - 352)/80) | 1219 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).

The PDCP SDU size of each PDCP SDU is:

PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,

where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.

The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

## 8.7.1.1_H.1.5 Test requirement

The requirements are specified in Table 8.7.1.1_H.1.5-1 depending on the UE category according to Table 8.7.1.1_H.1.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_H.1.5-1: Test requirements per test**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 1 | R.68 FDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.1.1_H.1.5-2: Test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 1 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |

**Table 8.7.1.1_H.1.5-3: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12<br>DL Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|
| Single carrier | 20 | - | 1 | | | | |

## 8.7.1.1_H.2 FDD Sustained data rate performance for CA (2DL CA) for 256QAM in DL

### 8.7.1.1_H.2.1 Test purpose

Same test purpose as 8.7.1.1

### 8.7.1.1_H.2.2 Test applicability

This test applies to E-UTRA FDD UE release 12 and forward of UE DL category 11, 12 and 13 that support 256QAM in DL and 2DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.1.1_H.2.3 Minimum requirements

For UE supporting 256QAM, the requirements are specified in Table 8.7.1.1_H.2.3-2, with the addition of the parameters in Table 8.7.1.1_H.2.3-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.1.1_H.2.3-3, the TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.1.1_A.1.3-3 is not applicable.

**Table 8.7.1.1_H.2.3-1: test parameters for sustained downlink data rate (FDD 256QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 2 | 2x10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 3 | 10+15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 4 | 10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 5 | 2x15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6 | 15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7 | 2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | |

**Table 8.7.1.1_H.2.3-2: Minimum requirement (FDD 256QAM)**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 2 | R.68-2 FDD | 85 |
| 3 | R.68-2 FDD for 10MHz CC<br>R.68-1 FDD for 15MHz CC | 85 |
| 4 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 5 | R.68-1 FDD | 85 |
| 6 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 7 | R.68 FDD | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI. | | |
| Note 2: The TB success rate is defined as TB success rate = $100\%*N_{DL_correct_rx}/ (N_{DL_newtx} + N_{DL_retx})$, where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | |

**Table 8.7.1.1_H.2.3-3: Test points for sustained data rate (FRC 256QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12<br>DL Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|
| CA with 2CCs | 2x10 | 2 | 2 | | | | |
| | 10+15 | 3 | 3 | | | | |
| | 10+20 | 4 | 4 | | | | |
| | 2x15 | 5 | 5 | | | | |
| | 15+20 | 6 | 6 | | | | |
| | 20+20 | 7 | 7 | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.1

### 8.7.1.1_H.2.4 Test description

Same test description as in clause 8.7.1.1_A.1.4 with the following exceptions:

- Instead of Table 8.7.1.1_A.1.4.1-1 -> use Table 8.7.1.1_H.2.4-1.
- Instead of Table 8.7.1.1_A.1.5-1 -> use Table 8.7.1.1_H.2.5-1.
- Instead of Table 8.7.1.1_A.1.5-2 -> use Table 8.7.1.1_H.2.5-2.
- Instead of Table 8.7.1.1_A.1.5-3 -> use Table 8.7.1.1_H.2.5-3.

**Table 8.7.1.1_H.2.4-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 2 | R.68-2 FDD | R.1-2 FDD | 48936(Note 5) | 5 | FLOOR((TBsize – 208)/40) | 1218 |
| 3 | R.68-2 FDD for 10MHz CC<br>R.68-1 FDD for 15MHz CC | R.1-4B FDD | 48936 (Note 5) for 10MHz CC<br>75376 (Note 4) for 15MHz CC | 5 for 10MHz CC<br>7 for 15MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC<br>FLOOR((TBsize – 264)/64) for 15MHz CC | 1218 for 10MHz CC<br>1341 for 15MHz CC |
| 4 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 5 for 10MHz CC<br>10 for 20MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC<br>FLOOR((TB$_{size}$ - 352)/80) for 20MHz CC | 1218 for 10MHz CC<br>1219 for 20MHz CC |
| 5 | R.68-1 FDD | R.1-4B FDD | 75376(Note 4) | 7 | FLOOR((TB$_{size}$ – 264)/64) | 1341 |
| 6 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 75376 (Note 4) for 15MHz CC<br>97896(Note 3) for 20MHz CC | 7 for 15MHz CC<br>10 for 20 MHz CC | FLOOR((TB$_{size}$ – 264)/64) for 15MHz CC<br>FLOOR((TB$_{size}$ - 352)/80) for 20 MHz CC | 1341 for 15MHz CC<br>1219 for 20MHz CC |
| 7 | R.68 FDD | R.1-4 FDD | 97896(Note 3) | 10 | FLOOR((TB$_{size}$ - 352)/80) | 1219 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits).
This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

Note 4: 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5.

Note 5: 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5.

### 8.7.1.1_H.2.5 Test requirement

The requirements are specified in Table 8.7.1.1_H.2.5-1 depending on the UE category according to Table 8.7.1.1_H.2.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_H.2.5-1: Test requirements per test**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 2 | R.68-2 FDD | 85 |
| 3 | R.68-2 FDD for 10MHz CC<br>R.68-1 FDD for 15MHz CC | 85 |
| 4 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 5 | R.68-1 FDD | 85 |
| 6 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 7 | R.68 FDD | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI. | | |
| Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | |

**Table 8.7.1.1_H.2.5-2: Test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 2 | 2x10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 3 | 10+15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 4 | 10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 5 | 2x15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 6 | 15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 7 | 2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | |

**Table 8.7.1.1_H.2.5-3: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12<br>DL Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|
| CA with 2CCs | 2x10 | 2 | 2 | | | | |
| | 10+15 | 3 | 3 | | | | |
| | 10+20 | 4 | 4 | | | | |
| | 2x15 | 5 | 5 | | | | |
| | 15+20 | 6 | 6 | | | | |
| | 20+20 | 7 | 7 | | | | |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | | | |
| Note 2: Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. Only one test point to be tested. | | | | | | | |

## 8.7.1.1_H.3 FDD Sustained data rate performance for CA for 256QAM in DL (3DL CA)

### 8.7.1.1_H.3.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.1.1_H.3.2 Test applicability

This test case applies to all types of E-UTRA FDD UE release 12 and forward of UE DL category 11, 12 and 15 that support 3DL CA and 256QAM in DL.

This test case applies to all types of E-UTRA FDD UE release 12 and forward of UE DL category 13 that support 3DL CA and 256QAM in DL and at most 40MHz aggregated bandwidth.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.1.1_H.3.3 Minimum conformance requirements

For UE supporting 256QAM, the requirements are specified in Table 8.7.1.1_H.3.3-2, with the addition of the parameters in Table 8.7.1.1_H.3.3-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.1.1_H.3.3-3, the TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.1.1_A.2.3-2 is not applicable.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.1.1_H.3.3-1: test parameters for sustained downlink data rate (FDD 256QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 8 | 3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 9 | 15+20+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 10 | 10+20+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 11 | 15+15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 12 | 10+15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 13 | 10+10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 14 | 10+15+15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 15 | 5+10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 15A | 5+15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | |

**Table 8.7.1.1_H.3.3-2: Minimum requirement (FDD 256QAM)**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 8 | R.68 FDD | 85 |
| 9 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 10 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 11 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 12 | R.68-2 FDD for 10MHz CC<br>R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 13 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 14 | R.68-2 FDD for 10MHz CC<br>R.68-1 FDD for 15MHz CC | 85 |
| 15 | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 15A | R.68-3 FDD for 5MHz CC<br>R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI. | | |
| Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | |

**Table 8.7.1.1_H.3.3-3: Test points for sustained data rate (FRC 256QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12<br>DL Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | | | | |
|---|---|---|---|---|---|---|---|---|
| CA with 3CCs | 3x20 | 8 | 7 | 8 | | | | |
| | 15+20+20 | 9 | 7 | 9 | | | | |
| | 10+20+20 | 10 | 7 | 10 | | | | |
| | 15+15+20 | 11 | 6 | 11 | | | | |
| | 10+15+20 | 12 | 6 | 12 | | | | |
| | 10+10+20 | 13 | 13 | 13 | | | | |
| | 10+15+15 | 14 | 14 | 14 | | | | |
| | 5+10+20 | 15 | 15 | 15 | | | | |
| | 5+15+20 | 15A | 15A | 15A | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.7.1.

### 8.7.1.1_H.3.4 Test description

Same test description as in clause 8.7.1.1_A.2.4 with the following exceptions:

- Instead of Table 8.7.1.1_A.2.4.1-1 -> use Table 8.7.1.1_H.3.4-1.
- Instead of Table 8.7.1.1_A.2.5-1 -> use Table 8.7.1.1_H.3.5-1.
- Instead of Table 8.7.1.1_A.2.5-2 -> use Table 8.7.1.1_H.3.5-2.
- Instead of Table 8.7.1.1_A.2.5-3 -> use Table 8.7.1.1_H.3.5-3.

**Table 8.7.1.1_H.3.4-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 8 | R.68 FDD for 20MHz CC | R.1-4 FDD | 97896 (Note 3) for 20MHz CC | 10 for 20MHz CC | FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1219 for 20MHz CC |
| 9 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 75376 (Note 4) for 15MHz CC<br>97896 (Note 3) for 20MHz CC | 7 for 15MHz CC<br>10 for 20MHz CC | FLOOR((TBsize – 264)/56) for 15MHz CC<br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1341 for 15MHz CC<br>1219 for 20MHz CC |
| 10 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 5 for 10MHz CC<br>10 for 20 MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC<br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1218 for 10MHz CC<br>1219 for 20MHz CC |
| 11 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 75376 (Note 4) for 15MHz CC<br>97896 (Note 3) for 20MHz CC | 7 for 15MHz CC<br>10 for 20 MHz CC | FLOOR(($TB_{size}$ – 264)/56) for 15MHz CC<br>FLOOR(($TB_{size}$ - 352)/80) for 20 MHz CC | 1341 for 15MHz CC<br>1219 for 20MHz CC |
| 12 | R.68-2 FDD for 10MHz CC<br>R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 48936 (Note 5) for 10MHz CC<br>75376 (Note 4) for 15MHz CC<br>97896(Note 3) for 20MHz CC | 5 for 10MHz CC<br>7 for 15MHz CC<br>10 for 20 MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC<br>FLOOR((TBsize – 264)/56) for 15MHz CC<br>FLOOR(($TB_{size}$ - 352)/80) for 20 MHz CC | 1218 for 10MHz CC<br>1341 for 15MHz CC<br>1219 for 20MHz CC |
| 13 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 5 for 10MHz CC<br>10 for 20MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC<br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1218 for 10MHz CC<br>1219 for 20MHz CC |
| 14 | R.68-2 FDD for 10MHz CC<br>R.68-1 FDD for 15MHz CC | R.1-4B FDD | 48936 (Note 5) for 10MHz CC<br>75376 (Note 4) for 15MHz CC | 5 for 10MHz CC<br>7 for 15MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC<br>FLOOR((TBsize – 264)/56) for 15MHz CC | 1218 for 10MHz CC<br>1341 for 15MHz CC |
| 15 | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 24496 (Note 6) for 5MHz CC<br>48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 3 for 5MHz CC<br>5 for 10MHz CC<br>10 for 20MHz CC | FLOOR((TBsize – 152)/24) for 10MHz CC<br>FLOOR((TBsize – 208)/40) for 10MHz CC<br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1014 for 5MHz CC<br>1218 for 10MHz CC<br>1219 for 20MHz CC |

| | | | | | | |
|---|---|---|---|---|---|---|
| 15A | R.68-3 FDD for 5MHz CC<br>R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 24496 (Note 6) for 5MHz CC<br>75376 (Note 4) for 15MHz CC<br>97896 (Note 3) for 20MHz CC | 3 for 5MHz CC<br>7 for 15MHz CC<br>10 for 20MHz CC | FLOOR((TBsize – 152)/24) for 10MHz CC<br>FLOOR((TBsize – 264)/56) for 15MHz CC<br>FLOOR((TB$_{size}$ - 352)/80) for 20MHz CC | 1014 for 5MHz CC<br>1341 for 15MHz CC<br>1219 for 20MHz CC |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits).
This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

Note 4: 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5.

Note 5: 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5.

Note 6: 21384 bits for sub-frames 0,1,2,6,7 and 19848 bits for sub-frames 5.

### 8.7.1.1_H.3.5 Test requirement

The requirements are specified in Table 8.7.1.1_H.3.5-1 depending on the UE category according to Table 8.7.1.1_H.3.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_H.3.5-1: Minimum requirement**

| | | **TB success rate [%]** |
|---|---|---|

| | | |
|---|---|---|
| 8 | R.68 FDD | 85 |
| 9 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 10 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 11 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 12 | R.68-2 FDD for 10MHz CC<br>R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 13 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 14 | R.68-2 FDD for 10MHz CC<br>R.68-1 FDD for 15MHz CC | 85 |
| 15 | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 15A | R.68-3 FDD for 5MHz CC<br>R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | |

**Table 8.7.1.1_H.3.5-2: test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 8 | 3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 9 | 15+20+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 10 | 10+20+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 11 | 15+15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 12 | 10+15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 13 | 10+10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 14 | 10+15+15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 15 | 5+10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| 15A | 5+15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 FDD |
| Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | |

**Table 8.7.1.1_H.3.5-3: Test points per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12 / DL Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | | | |
|---|---|---|---|---|---|---|---|
| CA with 3CCs | 3x20 | 8 | 7 | 8 | | | |
| | 15+20+20 | 9 | 7 | 9 | | | |
| | 10+20+20 | 10 | 7 | 10 | | | |
| | 15+15+20 | 11 | 6 | 11 | | | |
| | 10+15+20 | 12 | 6 | 12 | | | |
| | 10+10+20 | 13 | 13 | 13 | | | |
| | 10+15+15 | 14 | 14 | 14 | | | |
| | 5+10+20 | 15 | 15 | 15 | | | |
| | 5+15+20 | 15A | 15A | 15A | | | |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | | | |
| Note 2: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | | | | |
| Note 3: Test 6 and Test 7 are tested in 8.7.1.1_H.2. | | | | | | | |

## 8.7.1.1_H.4 FDD Sustained data rate performance for CA (4DL CA) for 256QAM in DL

### 8.7.1.1_H.4.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.1.1_H.4.2 Test applicability

This test case applies to all types of E-UTRA FDD UE release and forward of UE DL category 11, 12, 15 and 16 that support 4DL with CA configurations in Table 7.1-2b and 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.1.1_H.4.3 Minimum conformance requirements

For UE supporting 256QAM, the requirements are specified in Table 8.7.1.1_H.4.3-2, with the addition of the parameters in Table 8.7.1.1_H.4.3-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.1.1_H.4.3-3, the TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.1.1_A.4.3-2 is not applicable.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.1.1_H.4.3-1: test parameters for sustained downlink data rate (FDD 256QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symb unuse |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 16 | 4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 17 | 20+20+20+10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18 | 20+20+10+10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18A | 20+20+10+5 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18B | 20+10+10+5 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18C | 15+3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18D | 2x15+2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18E | 10+15+2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18F | 3x10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18G | 2x5+2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18H | 2x5+10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18I | 4x10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | |

**Table 8.7.1.1_H.4.3-2: Minimum requirement (FDD 256QAM)**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 16 | R.68 FDD | 85 |
| 17 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18A | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18B | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18C | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18D | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18E | R.68-2 FDD for 10MHz CC<br>R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18F | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18G | R.68-3 FDD for 5MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18H | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18I | R.68-2 FDD for 10MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | |

**Table 8.7.1.1_H.4.3-3: Test points for sustained data rate (FRC 256QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12<br>DL Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | | |
|---|---|---|---|---|---|---|---|
| CA with 4CCs | 4x20 | 8 | - | 16 | 16 | | |
| | 20+20+20+10 | 8 | - | 17 | 17 | | |
| | 20+20+10+10 | 18 | - | 18 | 18 | | |
| | 20+20+10+5 | 18A | - | 18A | 18A | | |
| | 20+10+10+5 | 18B | - | 18B | 18B | | |
| | 15+3x20 | 18C | | 18C | 18C | | |
| | 2x15+2x20 | 18D | | 18D | 18D | | |
| | 10+15+2x20 | 18E | | 18E | 18E | | |
| | 3x10+20 | 18F | | 18F | 18F | | |
| | 2x5+2x20 | 18G | | 18G | 18G | | |
| | 2x5+10+20 | 18H | | 18H | 18H | | |
| | 4x10 | 18I | | 18I | 18I | | |
| NOTE 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.7.1.

### 8.7.1.1_H.4.4 Test description

Same test description as in clause 8.7.1.1_A.4.4 with the following exceptions:

- Instead of Table 8.7.1.1_A.4.4.1-1 -> use Table 8.7.1.1_H.4.4-1.
- Instead of Table 8.7.1.1_A.4.5-1 -> use Table 8.7.1.1_H.4.5-1.
- Instead of Table 8.7.1.1_A.4.5-2 -> use Table 8.7.1.1_H.4.5-2.
- Instead of Table 8.7.1.1_A.4.5-3 -> use Table 8.7.1.1_H.4.5-3.

**Table 8.7.1.1_H.4.4-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 16 | R.68 FDD for 20MHz CC | R.1-4 FDD | 97896 (Note 3) for 20MHz CC | 10 for 20MHz CC | FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1219 for 20MHz CC |
| 17 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 5 for 10MHz CC<br>10 for 20 MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC<br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1218 for 10MHz CC<br>1219 for 20MHz CC |
| 18 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 5 for 10MHz CC<br>10 for 20 MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC<br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1218 for 10MHz CC<br>1219 for 20MHz CC |
| 18A | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 24496 (Note 6) for 5MHz CC<br>48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 3 for 5MHz CC<br>5 for 10MHz CC<br>10 for 20MHz CC | FLOOR((TBsize – 152)/24) for 10MHz CC<br>FLOOR((TBsize – 208)/40) for 10MHz CC<br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1014 for 5MHz CC<br>1218 for 10MHz CC<br>1219 for 20MHz CC |
| 18B | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 24496 (Note 6) for 5MHz CC<br>48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 3 for 5MHz CC<br>5 for 10MHz CC<br>10 for 20MHz CC | FLOOR((TBsize – 152)/24) for 10MHz CC<br>FLOOR((TBsize – 208)/40) for 10MHz CC<br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1014 for 5MHz CC<br>1218 for 10MHz CC<br>1219 for 20MHz CC |
| 18C | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 75376 (Note 4) for 15MHz CC<br>97896 (Note 3) for 20MHz CC | 7 for 15MHz CC<br>10 for 20MHz CC | FLOOR((TBsize – 264)/56) for 15MHz CC<br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1341 for 15MHz CC<br>1219 for 20MHz CC |
| 18D | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 75376 (Note 4) for 15MHz CC<br>97896 (Note 3) for 20MHz CC | 7 for 15MHz CC<br>10 for 20MHz CC | FLOOR((TBsize – 264)/56) for 15MHz CC<br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1341 for 15MHz CC<br>1219 for 20MHz CC |

| | | | | | | |
|---|---|---|---|---|---|---|
| 18E | R.68-2 FDD for 10MHz CC<br>R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 24496 (Note 6) for 5MHz CC<br>75376 (Note 4) for 15MHz CC<br>97896 (Note 3) for 20MHz CC | 3 for 5MHz CC<br>7 for 15MHz CC<br>10 for 20MHz CC | FLOOR((TBsize – 152)/24) for 10MHz CC<br>FLOOR((TBsize – 264)/56) for 15MHz CC<br>FLOOR((TB$_{size}$ - 352)/80) for 20MHz CC | 1014 for 5MHz CC<br>1341 for 15MHz CC<br>1219 for 20MHz CC |
| 18F | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 5 for 10MHz CC<br>10 for 20 MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC<br>FLOOR((TB$_{size}$ - 352)/80) for 20MHz CC | 1218 for 10MHz CC<br>1219 for 20MHz CC |
| 18G | R.68-3 FDD for 5MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 24496 (Note 6) for 5MHz CC<br>97896 (Note 3) for 20MHz CC | 3 for 5MHz CC<br>10 for 20MHz CC | FLOOR((TBsize – 152)/24) for 10MHz CC<br>FLOOR((TB$_{size}$ - 352)/80) for 20MHz CC | 1014 for 5MHz CC<br>1219 for 20MHz CC |
| 18H | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 24496 (Note 6) for 5MHz CC<br>48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 3 for 5MHz CC<br>5 for 10MHz CC<br>10 for 20MHz CC | FLOOR((TBsize – 152)/24) for 10MHz CC<br>FLOOR((TBsize – 208)/40) for 10MHz CC<br>FLOOR((TB$_{size}$ - 352)/80) for 20MHz CC | 1014 for 5MHz CC<br>1218 for 10MHz CC<br>1219 for 20MHz CC |
| 18I | R.68-2 FDD for 10MHz CC | R.1-3a FDD | 48936 (Note 5) for 10MHz CC | 5 for 10MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC | 1218 for 10MHz CC |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives:
PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

Note 4: 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5.

Note 5: 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5.

Note 6: 21384 bits for sub-frames 0,1,2,6,7 and 19848 bits for sub-frames 5.

8.7.1.1_H.4.5 Test requirement

The requirements are specified in Table 8.7.1.1_H.4.5-1 depending on the UE category according to Table 8.7.1.1_H.4.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_H.4.5-1: Minimum requirement**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 16 | R.68 FDD | 85 |
| 17 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18A | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18B | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18C | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18D | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18E | R.68-2 FDD for 10MHz CC<br>R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18F | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18G | R.68-3 FDD for 5MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18H | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 18I | R.68-2 FDD for 10MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | |

**Table 8.7.1.1_H.4.5-2: test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symb unuse |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 16 | 4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 17 | 20+20+20+10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18 | 20+20+10+10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18A | 20+20+10+5 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18B | 20+10+10+5 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18C | 15+3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18D | 2x15+2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18E | 10+15+2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18F | 3x10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18G | 2x5+2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18H | 2x5+10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 18I | 4x10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | |

**Table 8.7.1.1_H.4.5-3: Test points per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12<br>DL Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | | |
|---|---|---|---|---|---|---|---|
| CA with 4CCs | 4x20 | 8 | - | 16 | 16 | | |
| | 20+20+20+10 | 8 | - | 17 | 17 | | |
| | 20+20+10+10 | 18 | - | 18 | 18 | | |
| | 20+20+10+5 | 18A | - | 18A | 18A | | |
| | 20+10+10+5 | 18B | - | 18B | 18B | | |
| | 15+3x20 | 18C | | 18C | 18C | | |
| | 2x15+2x20 | 18D | | 18D | 18D | | |
| | 10+15+2x20 | 18E | | 18E | 18E | | |
| | 3x10+20 | 18F | | 18F | 18F | | |
| | 2x5+2x20 | 18G | | 18G | 18G | | |
| | 2x5+10+20 | 18H | | 18H | 18H | | |
| | 4x10 | 18I | | 18I | 18I | | |
| NOTE 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | |

## 8.7.1.1_H.5 FDD Sustained data rate performance for CA (5DL CA) for 256QAM in DL

Editor's notes: This test case is incomplete. The following items are missing or are incomplete:

### 8.7.1.1_H.5.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.1.1_H.5.2 Test applicability

This test case applies to all types of E-UTRA FDD UE release and forward of UE DL category 15 and 16 that support 5DL with CA configurations in Table 7.1-2c and 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.1.1_H.5.3 Minimum conformance requirements

For UE supporting 256QAM, the requirements are specified in Table 8.7.1.1_H.5.3-2, with the addition of the parameters in Table 8.7.1.1_H.5.3-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.1.1_H.5.3-3, the TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.1.1_A.5.3-2 is not applicable.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.1.1_H.5.3-1: test parameters for sustained downlink data rate (FDD 256QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symb unuse |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 19 | 5x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 20 | 15+4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 21 | 10+4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 22 | 2x10+3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 23 | 5+10+3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 24 | 3x10+2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 25 | 4x10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | |

**Table 8.7.1.1_H.5.3-2: Minimum requirement (FDD 256QAM)**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 19 | R.68 FDD | 85 |
| 20 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 21 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 22 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 23 | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 24 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 25 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | |

**Table 8.7.1.1_H.5.3-3: Test points for sustained data rate (FRC 256QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12<br>DL Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | | |
|---|---|---|---|---|---|---|---|
| CA with 5CCs | 5x20 | - | - | 16 | 19 | | |
| | 15+4x20 | | | | 20 | | |
| | 10+4x20 | | | | 21 | | |
| | 2x10+3x20 | | | | 22 | | |
| | 5+10+3x20 | | | | 23 | | |
| | 3x10+2x20 | | | | 24 | | |
| | 4x10+20 | | | | 25 | | |
| NOTE 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.7.1.

### 8.7.1.1_H.5.4 Test description

Same test description as in clause 8.7.1.1_A.4.4 with the following exceptions:

- Instead of Table 8.7.1.1_A.4.4.1-1 -> use Table 8.7.1.1_H.5.4-1.
- Instead of Table 8.7.1.1_A.4.5-1 -> use Table 8.7.1.1_H.5.5-1.
- Instead of Table 8.7.1.1_A.4.5-2 -> use Table 8.7.1.1_H.5.5-2.
- Instead of Table 8.7.1.1_A.4.5-3 -> use Table 8.7.1.1_H.5.5-3.

**Table 8.7.1.1_H.5.4-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 19 | R.68 FDD for 20MHz CC | R.1-4 FDD | 97896 (Note 3) for 20MHz CC | 10 for 20MHz CC | FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1219 for 20MHz CC |
| 20 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 75376 (Note 4) for 15MHz CC<br><br>97896 (Note 3) for 20MHz CC | 7 for 15MHz CC<br><br>10 for 20MHz CC | FLOOR((TBsize – 264)/56) for 15MHz CC<br><br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1341 for 15MHz CC<br><br>1219 for 20MHz CC |
| 21 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 5 for 10MHz CC<br><br>10 for 20 MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC<br><br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1218 for 10MHz CC<br><br>1219 for 20MHz CC |
| 22 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 5 for 10MHz CC<br><br>10 for 20 MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC<br><br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1218 for 10MHz CC<br><br>1219 for 20MHz CC |
| 23 | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 24496 (Note 6) for 5MHz CC<br>48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 3 for 5MHz CC<br><br>5 for 10MHz CC<br><br>10 for 20MHz CC | FLOOR((TBsize – 152)/24) for 10MHz CC<br><br>FLOOR((TBsize – 208)/40) for 10MHz CC<br><br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1014 for 5MHz CC<br><br>1218 for 10MHz CC<br><br>1219 for 20MHz CC |
| 24 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 5 for 10MHz CC<br><br>10 for 20 MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC<br><br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1218 for 10MHz CC<br><br>1219 for 20MHz CC |
| 25 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | R.1-4 FDD | 48936 (Note 5) for 10MHz CC<br>97896 (Note 3) for 20MHz CC | 5 for 10MHz CC<br><br>10 for 20 MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC<br><br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1218 for 10MHz CC<br><br>1219 for 20MHz CC |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header

| | |
|---|---|
| | size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits. The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test. |
| Note 3: | 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5. |
| Note 4: | 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5. |
| Note 5: | 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5. |
| Note 6: | 21384 bits for sub-frames 0,1,2,6,7 and 19848 bits for sub-frames 5. |

### 8.7.1.1_H.5.5 Test requirement

The requirements are specified in Table 8.7.1.1_H.5.5-1 depending on the UE category according to Table 8.7.1.1_H.5.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_H.5.5-1: Minimum requirement**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 19 | R.68 FDD | 85 |
| 20 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 21 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 22 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 23 | R.68-3 FDD for 5MHz CC<br>R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 24 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| 25 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | |

**Table 8.7.1.1_H.5.5-2: test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symb unuse |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | |
| 19 | 5x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 20 | 15+4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 21 | 10+4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 22 | 2x10+3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 23 | 5+10+3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 24 | 3x10+2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| 25 | 4x10+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | OP.1 |
| Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | |

**Table 8.7.1.1_H.5.5-3: Test points per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12<br>DL Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | | |
|---|---|---|---|---|---|---|---|
| CA with 5CCs | 5x20 | - | - | 16 | 19 | | |
| | 15+4x20 | | | | 20 | | |
| | 10+4x20 | | | | 21 | | |
| | 2x10+3x20 | | | | 22 | | |
| | 5+10+3x20 | | | | 23 | | |
| | 3x10+2x20 | | | | 24 | | |
| | 4x10+20 | | | | 25 | | |
| NOTE 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | |

## 8.7.2 TDD

The parameters specified in Table 8.7.2-1 are valid for all TDD tests unless otherwise stated.

**Table 8.7.2-1: Common Test Parameters (TDD)**

| Parameter | Unit | Value |
|---|---|---|
| Special subframe configuration (Note 1) | | 4 |
| Cyclic prefix | | Normal |
| Cell ID | | 0 (Note 2) |
| Inter-TTI Distance | | 1 |
| Maximum number of HARQ transmission | | Downlink: 4<br>Uplink: 1 |
| Redundancy version coding sequence | | {0,0,1,2} for 64QAM and 256QAM |
| Scheduling of retransmissions | | 1. Retransmissions use the same Transport Block Size (TBS) as the initial transmission.<br>2. HARQ processes are scheduled consecutively, independent of the fact, whether retransmissions (for negatively acknowledged HARQ processes) or new transmissions (for positively acknowledged HARQ processes) occur.<br>3. Despite of 1) and 2) the number of RB-s to be allocated in each SF remains firm as specified in the RMC. Thus in case of RMC-s with SF dependent allocation, for retransmissions the TBS and the modulation scheme (MCS) are indicated implicitly ( $29 \le I_{\text{MCS}} \le 31$ ) according to TS 36.213 [10] subclause 7.1.7.2. |
| Number of OFDM symbols for PDCCH | OFDM symbols | 1 |
| Cross carrier scheduling | | Not configured |
| Propagation conditions | | Static propagation condition<br>No external noise sources are applied |
| Note 1: as specified in Table 4.2-1 in TS 36.211 [4].<br>Note 2: For CA tests, Cell ID = 0 applies to P-Cell, Cell ID = n (where n is 1, 2, 3..) applies to S-Cells ( where n is 1, 2, 3..), respectively. | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.2.

## 8.7.2.1 TDD sustained data rate performance

### 8.7.2.1.1 Test purpose

The purpose of the test is to verify that the Layer 1 and Layer 2 correctly process in a sustained manner the received packets corresponding to the maximum number of DL-SCH transport block bits received within a TTI for the UE category indicated. The sustained downlink data rate shall be verified in terms of the success rate of delivered PDCP SDU(s) by Layer 2. The test case below specifies the RF conditions and the required success rate of delivered TB by Layer 1 to meet the sustained data rate requirement. The size of the TB per TTI corresponds to the largest possible DL-SCH transport block for each UE category using the maximum number of layers for spatial multiplexing. Transmission modes 1 and 3 are used with radio conditions resembling a scenario where sustained maximum data rates are available. Test case is selected according to table 8.7.2.1.1-1 depending on UE capability for CA and EPDCCH.

**Table 8.7.2.1.1-1: SDR test applicability**

| | Single carrier UE not supporting EPDCCH | CA UE not supporting EPDCCH | Single carrier UE supporting EPDCCH | CA UE supporting EPDCCH |
|---|---|---|---|---|
| **TDD** | **8.7.2.1, 8.7.2.1_1** | **8.7.2.1_A** | **8.7.4.1** | **8.7.2.1_A, 8.7.4.1** |

### 8.7.2.1.2 Test applicability

This test applies to E-UTRA TDD UE release 9 and forward UEs of category 1 to 4 and not supporting 256QAM in DL.

### 8.7.2.1.3 Minimum requirements

**Table 8.7.2.1.3-1: Void**

For UE not supporting 256QAM, the requirements are specified in Table 8.7.2.1.3-3, with the addition of the parameters in Table 8.7.2.1.3-2 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category as specified in Table 8.7.2.1.3-4. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1.3-2: Test parameters for sustained downlink data rate (TDD)**

| Test | Band-width (MHz) | Trans-mission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 1 | 10 | 1 | 1 x 2 | N/A | 0 | 0 | 0 | -85 | Bundling | OP.6 TDD |
| 2 | 10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | Bundling | OP.1 TDD |
| 3 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | Bundling | OP.1 TDD |
| 3A | 15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | Multiplexing | OP.2 TDD |
| 4,6 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | Multiplexing | OP.1 TDD |

**Table 8.7.2.1.3-3: Minimum requirement (TDD)**

| Test | Number of bits of a DL-SCH transport block received within a TTI for normal/special sub-frame | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 1 | 10296/0 | R.31-1 TDD | 95 |
| 2 | 25456/0 | R.31-2 TDD | 95 |
| 3 | 51024/0 | R.31-3 TDD | 95 |
| 3A | 51024/0 | R.31-3A TDD | 85 |
| 4 | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| 6 | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: 71112 bits for sub-frame 5.<br>Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | | |

**Table 8.7.2.1.3-4: Test points for sustained data rate (FRC)**

| CA config | Bandwidth (MHz) | Category 1 | Category 2 | Category 3 | Category 4 | Category 6 | Category 7 |
|---|---|---|---|---|---|---|---|
| Single carrier | 10 | 1 | 2 | - | - | - | - |
| | 15 | - | - | 3A | 3A | - | - |
| | 20 | - | - | 3 | 4 | 6 | 6 |
| Note 1: If UE can be tested for CA configuration, single carrier test is skipped.<br>Note 2: For non-CA UE, test is selected for maximum supported bandwidth. | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.2

### 8.7.2.1.4 Test description

#### 8.7.2.1.4.1 Initial conditions

**Table 8.7.2.1.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement Channel | $TB_{size}$ per Codeword | Number of PDCP SDU per Codeword for normal/special sub-frame | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] for normal/special sub-frame |
|---|---|---|---|---|---|---|
| 1 | R.31-1 TDD | R.1-1 TDD | 10296 | 1/0 | FLOOR(($TB_{size}$ - 96)/8) | 1275/0 |
| 2 | R.31-2 TDD | R.1-2 TDD | 25456 | 3/0 | FLOOR(($TB_{size}$ – 152)/24)) | 1054/0 |
| 3 | R.31-3 TDD | R.1-3 TDD | 51024 | 5/0 | FLOOR(($TB_{size}$ – 208)/40)) | 1270/0 |
| 3A | R.31-3B TDD | R.1-3B TDD | 51024 | 5/0 | FLOOR(($TB_{size}$ – 208)/40)) | 1270/0 |
| 4 | R.31-4 TDD | R.1-4 TDD | 75376 (Note 3) | 7/0 | FLOOR(($TB_{size}$ – 264)/56)) | 1341/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).

The PDCP SDU size of each PDCP SDU is:

PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size – Size of Timing Advance - Size of RLC STATUS PDU) / N,

where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 71112 bits for sub-frame 5.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.2.1.5-2 depending on the UE category according to Table 8.7.2.1.5-3.

1. Connect the SS, to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.3 for test 1 and Figure A.10 for tests 2-5 (without using faders and AWGN generators).

2. The parameter settings for the cell are set up according to Table 8.7.2.1.5-2 and Table 8.7.2.1.5-1 depending on the UE category according to Table 8.7.2.1.5-3.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.2.1.4.3. PhysicalConfigDedicated-DEFAULT for transmission mode 3 is defined in Table 8.7.2.1.4.3-3.

### 8.7.2.1.4.2 Test procedure

1. Propagation conditions are set according to Annex B.1. No external noise sources are applied.
2. The SS looks up $TB_{size}$ in Table 8.7.2.1.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.2.1.5-3.
3. SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.
4. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.2.1.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.
5. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.
6. Steps 4 to 5 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.
7. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one.
8. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.
9. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$
10. The UE passes the test if $A \geq$ "corresponding TB success rates according to Table 8.7.2.1.5-1" and $B = 0$.

NOTE 1 In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.2.1.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 101 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1. | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.2.1.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.2.1.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.8.2.1.6-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm1 for Test 1<br>tm3 for other Test 2, 3, 3B and 4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | Not present for Test 1<br>10 for other Test 2, 3, 3B and 4 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

## 8.7.2.1.5 Test requirement

The requirements are specified in Table 8.7.2.1.5-1 depending on the UE category according to Table 8.7.2.1.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1.5-1: Test requirements per test**

| Test | Number of bits of a DL-SCH transport block received within a TTI for normal/special sub-frame | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 1 | 10296/0 | R.31-1 TDD | 95 |
| 2 | 25456/0 | R.31-2 TDD | 95 |
| 3 | 51024/0 | R.31-3 TDD | 95 |
| 3A | 51024/0 | R.31-3A TDD | 85 |
| 4 | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: 71112 bits for sub-frame 5.<br>Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | | |

**Table 8.7.2.1.5-2: Test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 1 | 10 | 1 | 1 x 2 | N/A | 0 | 0 | 0 | -85 | Bundling | OP.6 TDD |
| 2 | 10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | Bundling | OP.1 TDD |
| 3 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | Bundling | OP.1 TDD |
| 3A | 15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | Muliplexing | OP.2 TDD |
| 4 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | Multiplexing | OP.1 TDD |
| Note 1: N/A. | | | | | | | | | | |

**Table 8.7.2.1.5-3: Test applicability per UE category**

| CA config | Bandwidth (MHz) | Category 1 | Category 2 | Category 3 | Category 4 | Category 6 | Category 7 |
|---|---|---|---|---|---|---|---|
| Single carrier | 10 | 1 | 2 | - | - | - | - |
| | 15 | - | - | 3A | 3A | - | - |
| | 20 | - | - | 3 | 4 | - | - |
| Note 1: If UE can be tested for CA configuration, single carrier test is skipped.<br>Note 2: For non-CA UE, test is selected for maximum supported bandwidth. | | | | | | | |

## 8.7.2.1_1 TDD sustained data rate performance (Rel-10 and forward)

### 8.7.2.1_1.1 Test purpose

Same test purpose as in clause 8.7.2.1.

### 8.7.2.1_1.2 Test applicability

This test case applies to E-UTRA TDD release 10 and forward of UEs category 6 and 7.

### 8.7.2.1_1.3 Minimum requirements

**Table 8.7.2.1_1.3-1: Void**

Same minimum conformance requirements as in clause 8.7.2.1.3.

### 8.7.2.1_1.4 Test description

Same test description as in clause 8.7.2.1.4 with the following exceptions:

- Connection diagram Figure A.10 (without using faders and AWGN generators).

- Instead of Table 8.7.2.1.4.1-1 -> use Table 8.7.2.1_1.4-1.
- Instead of Table 8.7.2.1.5-1 -> use Table 8.7.2.1_1.5-1.
- Instead of Table 8.7.2.1.5-2 -> use Table 8.7.2.1_1.5-2.
- Instead of Table 8.7.2.1.5-3 -> use Table 8.7.2.1_1.5-3.

**Table 8.7.2.1_1.4-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement Channel | $TB_{size}$ per Codeword | Number of PDCP SDU per Codeword for normal/special sub-frame | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] for normal/special sub-frame |
|---|---|---|---|---|---|---|
| 6 | R31-4 TDD | R.1-4 TDD | 75376 (Note 3) | 7/0 | FLOOR(($TB_{size}$ – 264)/56) | 1341/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).

The PDCP SDU size of each PDCP SDU is:

PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size – Size of Timing Advance - Size of RLC STATUS PDU) / N,

where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 71112 bits for sub-frame 5.

## 8.7.2.1_1.5 Test requirement

The requirements are specified in Table 8.7.2.1.5-1 depending on the UE category according to Table 8.7.2.1_1.5-3. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1_1.5-1: Test requirements for sustained downlink data rate (TDD)**

| Test | Number of bits of a DL-SCH transport block received within a TTI for normal/special sub-frame | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 6 | 75376/0 (Note 2) | R.31-4 TDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: 71112 bits for sub-frame 5.

Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.2.1_1.5-2: Test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 6 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | Multiplexing | OP.1 TDD |
| Note 1: N/A. | | | | | | | | | | |

**Table 8.7.2.1_1.5-3: Test applicability per UE category**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Category 1 | Category 2 | Category 3 | Category 4 | Category 6 | Category 7 |
|---|---|---|---|---|---|---|---|
| Single carrier | 20 | - | - | - | - | 6 | 6 |
| Note 1: If UE can be tested for CA configuration, single carrier test is skipped.<br>Note 2: For non-CA UE, test is selected for maximum supported bandwidth. | | | | | | | |

## 8.7.2.1_2 TDD sustained data rate performance for UE category 1bis

### 8.7.2.1_2.1 Test purpose

Same test purpose as in clause 8.7.2.1.1.

### 8.7.2.1_2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 13 and forward of UE category 1bis.

### 8.7.2.1_2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.7.2.1.3 with the following exceptions:

- Instead of Table 8.7.2.1.3-2 → use Table 8.7.2.1_2.3-1.
- Instead of Table 8.7.2.1.3-3 → use Table 8.7.2.1_2.3-2.

**Table 8.7.2.1_2.3-1: Test parameters for sustained downlink data rate (TDD 64QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 1A | 10 | 1 | 1x1 | N/A | 0 | 0 | 0 | -85 | Bundling | OP.6 TDD |
| 1B | 20 | 1 | 1x1 | N/A | 0 | 0 | 0 | -85 | Bundling | OP.6 TDD |

**Table 8.7.2.1_2.3-2: Minimum Requirement (FDD)**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 1A | 10296/0 | R.31-1 TDD | 95 |
| 1B | 10296/0 | R.31-1A TDD | 95 |

The normative reference for this requirement is TS 36.101 [2] clause 8.7.2.

### 8.7.2.1_2.4 Test description

Same test description as in clause 8.7.2.1.4 with the following exceptions:

- Instead of Table 8.7.2.1.4.1-1 -> use Table 8.7.2.1_2.4-1.
- Instead of Table 8.7.2.1.5-1 -> use Table 8.7.2.1_2.5-1.
- Instead of Table 8.7.2.1.5-2 -> use Table 8.7.2.1_2.5-2.
- Instead of Table 8.7.2.1.5-3 -> use Table 8.7.2.1_2.5-3.

**Table 8.7.2.1_2.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | $TB_{size}$ per Codeword | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 1A | R.31-1 TDD | R.1-1 TDD | 10296 | 1/0 | FLOOR(($TB_{size}$ - 96)/8) | 1275/0 |
| 1B | R.31-1A FDD | R.1-1 TDD | 10296 | 1/0 | FLOOR(($TB_{size}$ - 96)/8) | 1275/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).

The PDCP SDU size of each PDCP SDU is:

PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,

where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.

The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

### 8.7.2.1_2.5 Test requirement

The requirements are specified in Table 8.7.2.1_2.5-1 depending on the UE category according to Table 8.7.2.1_2.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.1.1_2.5-1: Test Requirements (FDD)**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 1A | 10296 | R.31-1 FDD | 95 |
| 1B | 10296 | R.31-1A FDD | 95 |

**Table 8.7.2.1_2.5-2: Test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 1A | 10 | 1 | 1x1 | N/A | 0 | 0 | 0 | -85 | Bundling | OP.6 TDD |
| 1B | 20 | 1 | 1x1 | N/A | 0 | 0 | 0 | -85 | Bundling | OP.6 TDD |

**Table 8.7.2.1_2.5-3: Test applicability per UE category**

| Config | Maximum supported Bandwidth (MHz) | Category 1 | Category 1bis | Category 2 | Category 3 | Category 4 | Category 6 | Category 7 |
|---|---|---|---|---|---|---|---|---|
| Single carrier | 10 | - | 1A | - | - | - | - | - |
| Single carrier | 20 | - | 1B | - | - | - | - | - |
| Note 1: Test is selected for maximum supported bandwidth. | | | | | | | | |

## 8.7.2.1_A TDD sustained data rate performance for CA

### 8.7.2.1_A.1 TDD sustained data rate performance for CA (2DL CA)

#### 8.7.2.1_A.1.1 Test purpose

Same test purpose as in clause 8.7.2.1.

#### 8.7.2.1_A.1.2 Test applicability

This test applies to E-UTRA TDD release 10 and forward UEs of category 6, 7, 9 and 10 which support inter-band DL CA OR intra-band contiguous DL CA and not support 256QAM in DL.

This test also applies to E-UTRA TDD release 11 and forward UEs of category6, 7, 9 and 10 which support intra band non-contiguous DL CA and not support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.7.2.1_A.1.3 Minimum requirements

For UE not supporting 256QAM, the requirements are specified in Table 8.7.2.1_A.1.3-3, with the addition of the parameters in Table 8.7.2.1_A.1.3-2 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.2.1_A.1.3-4. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1_A.1.3-1: Void**

**Table 8.7.2.1_A.1.3-2: Test parameters for sustained downlink data rate for CA (TDD 64QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 3 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | Bundling | OP.1 TDD |
| 4 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | Multiplexing | OP.1 TDD |
| 6A | 2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | - (Note 1) | OP.1 TDD |
| 6B | 20+15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 1) | OP.1 TDD |
| Note 1: PUCCH format 1b with channel selection is used to feedback ACK/NACK. | | | | | | | | | | |

**Table 8.7.2.1_A.1.3-3: Minimum requirement for CA (TDD 64QAM)**

| Test | Number of bits of a DL-SCH transport block received within a TTI for normal/special sub-frame | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 3 | 51024/0 | R31-3 TDD | 95 |
| 4 | 75376/0 (Note 2) | R31-4 TDD | 85 |
| 6A | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| 6B | 55056/0 for 15MHz CC<br>75376/0 for 20MHz CC (Note 2) | R.31-5 TDD for 15MHz CC<br>R.31-4 TDD for 20MHz CC | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: 71112 bits for sub-frame 5.
Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.2.1_A.1.3-4: Test points for sustained data rate for CA (FRC 64QAM)**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9, 10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|
| CA with 2CCs | 20+20 | - | -- | 3(Note 4) | 4 (Note 4) | 6A | 6A | - |
| | 15+20 | - | - | 3(Note 4) | 4 (Note 4) | 6B | 6B | - |

Note 1: Void.
Note 2: For non-CA UE, test is selected for maximum supported bandwidth.
Note 3: Void.
Note 4: If the intra-band contiguous CA is the only CA configuration supported by category 3 or 4 UE, single carrier test is selected.
Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

The normative reference for this requirement is TS 36.101[2] clause 8.7.2

8.7.2.1_A.1.4 Test description

8.7.2.1_A.1.4.1 Initial conditions

**Table 8.7.2.1_A.1.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | $TB_{size}$ per Codeword per Component Carrier | Number of PDCP SDU per Codeword for normal/special sub-frame | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] for normal/special sub-frame |
|---|---|---|---|---|---|---|
| 6A | R.31-4 TDD | R.1-4 TDD | 75376 (Note 3) | 7/0 | FLOOR(($TB_{size}$ – 264)/56)) | 1341/0 |
| 6B | R.31-5 TDD for 15MHz CC<br>R.31-4 TDD for 20MHz CC | R.1-4 TDD | 55056/0 for 15MHz CC<br>75376/0 for 20MHz CC (Note 3) | 6 for 15MHz CC<br><br>7 for 20 MHz CC | FLOOR(($TB_{size}$ – 240)/48) for 15 MHz CC<br><br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1142 for 15MHz CC<br><br>1341 for 20MHz CC |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).

The PDCP SDU size of each PDCP SDU is:

PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,

where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.

The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 71112 bits for sub-frame 5

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: according to Table 8.7.2.1_A.1.5-2 depending on the UE category according to Table 8.7.2.1_A.1.5-3.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.36 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.2.1_A.1.5-2 and Table 8.7.2.1_A.1.5-1 depending on the UE category according to Table 8.7.2.1_A.1.5-3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3/4.5.4.5. Message contents are defined in clause 8.7.2.1_A.1.4.3.

### 8.7.2.1_A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.2.1_A.1.4.3-1, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.2.1_A.1.4.3-1A.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1. No external noise sources are applied.

5. The SS looks up $TB_{size}$ in Table 8.7.2.1_A.1.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.2.1_A.1.5-3.

6. SS sets the counters $N_{DL_newtx}$,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.2.1_A.1.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

11. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

12. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.2.1_A.1.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.2.1_A.1.4.3 Message contents

Same message contents as in clause 8.7.2.1.4.3 with the following exceptions:

**Table 8.7.2.1_A.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.8.2.1.6-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.2.1_A.1.4.3-1A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.7.2.1_A.1.5 Test requirement

The requirements are specified in Table 8.7.2.1_A.1.5-1 depending on the UE category according to Table 8.7.2.1_A.1.5-3. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1_A.1.5-1: Test requirements per test**

| Test | Number of bits of a DL-SCH transport block received within a TTI for normal/special sub-frame | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 6A | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| 6B | 55056/0 for 15MHz CC<br>75376/0 for 20MHz CC (Note 2) | R.31-5 TDD for 15MHz CC<br>R.31-4 TDD for 20MHz CC | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: 71112 bits for sub-frame 5.
Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.2.1_A.1.5-2: Test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 6A | 2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | - (Note 1) | OP.1 TDD |
| 6B | 20+15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 1) | OP.1 TDD |
| Note 1: PUCCH format 1b with channel selection is used to feedback ACK/NACK. | | | | | | | | | | |

**Table 8.7.2.1_A.1.5-3: Test applicability per UE category**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9, 10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|
| CA with 2CCs | 20+20 | - | -- | 3(Note 4) | 4 (Note 4) | 6A | 6A | - |
| | 15+20 | - | - | 3(Note 4) | 4 (Note 4) | 6B | 6B | - |
| Note 1: Void.<br>Note 2: For non-CA UE, test is selected for maximum supported bandwidth.<br>Note 3: Void.<br>Note 4: If the intra-band contiguous CA is the only CA configuration supported by category 3 or 4 UE, single carrier test is selected.<br>Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.<br>Note 6: Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. Only one test point to be tested. | | | | | | | | |

## 8.7.2.1_A.2 TDD Sustained data rate performance for CA (3DL CA)

### 8.7.2.1_A.2.1 Test purpose

Same test purpose as in clause 8.7.2.1.

### 8.7.2.1_A.2.2 Test applicability

This test case applies to all types of E-UTRA TDD UE release 10 and forward of UE category 9, 10, 11 and 12 that support 3DL with CA configurations in Table 7.1-2a and not support 256QAM in DL.This test case also applies to all types of E-UTRA TDD UE release 11 and forward of UE category 9, 10, 11 and 12 that support 3DL with CA configurations in Table 7.1-2a and not support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.2.1_A.2.3 Minimum conformance requirements

For UE not supporting 256QAM, the requirements are specified in Table 8.7.2.1_A.2.3-2, with the addition of the parameters in Table 8.7.2.1_A.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.2.1_A.2.3-3. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1_A.2.3-1: test parameters for sustained downlink data rate (TDD 64QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 6A | 2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | - (Note 1) | OP.1 TDD |
| 7 | 3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| 7A | 15+20+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| Note 1: PUCCH format 1b with channel selection is used to feedback ACK/NACK.<br>Note 2: PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | | |

**Table 8.7.2.1_A.2.3-2: Minimum requirement (TDD 64QAM)**

| Test | Number of bits of a DL-SCH transport block received within a TTI for normal/special sub-frame | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 6A | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| 7 | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| 7A | 55056/0 for 15MHz CC<br>75376/0 for 20MHz CC (Note 2) | R.31-5 TDD for 15MHz CC<br>R.31-4 TDD for 20MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: 71112 bits for sub-frame 5.<br>Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | | |

**Table 8.7.2.1_A.2.3-3: Test points for sustained data rate (FRC 64QAM)**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9, 10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|
| CA with 3 CCs | 3x20 | - | - | - | - | 6A | 7 | 7 |
| | 15+20+20 | - | - | - | - | 6A | 7A | 7A |
| Note 1: Void.<br>Note 2: For non-CA UE, test is selected for maximum supported bandwidth.<br>Note 3: Void.<br>Note 4: If the intra-band contiguous CA is the only CA configuration supported by category 3 or 4 UE, single carrier test is selected.<br>Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.7.2.

8.7.2.1_A.2.4 Test description

8.7.2.1_A.2.4.1 Initial conditions

**Table 8.7.2.1_A.2.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 6A | R.31-4 TDD for two 20MHz CCs | R.1-4 TDD | 75376 (Note 3) | 7 for two 20MHz CCs | FLOOR((TBsize – 264)/56) | 1341 for two 20MHz CCs |
| 7 | R.31-4 TDD for three 20MHz CCs | R.1-4 TDD | 75376 (Note 3) | 7 for three 20MHz CCs | FLOOR((TBsize – 264)/56) | 1341 for three 20MHz CCs |
| 7A | R.31-5 TDD for 15MHz CC<br>R.31-4 TDD for 20MHz CC | R.1-4 TDD | 55056 for 15MHz CC<br>75376 (Note 3) for 20MHz CC | 6 for 15MHz CC<br>7 for 20 MHz CC | FLOOR((TB$_{size}$ – 240)/48) for 15 MHz CC<br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1142 for 15MHz CC<br>1341 for 20MHz CC |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 71112 bits for sub-frame 5.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: according to Table 8.7.2.1_A.5-2 depending on the UE category according to Table 8.7.2.1_A.2.5-3.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.60 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.2-1 and Table 8.7.2.1_A.2.5-1 depending on the UE category according to Table 8.7.2.1_A.2.5-3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.2.1_A.2.4.3.

### 8.7.2.1_A.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.2 with two SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.2.1_A.2.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.2.1_A.2.4.3-3A.

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.2.1_A.2.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.2.1_A.2.5-3.

6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.2.1_A.2.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.2.1_A.2.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.2.1_A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.2.1_A.2.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.2.1_A.2.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.2.1_A.2.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.2.1_A.2.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.7.2.1_A.2.5 Test requirement

The requirements are specified in Table 8.7.2.1_A.2.5-1 depending on the UE category according to Table 8.7.2.1_A.2.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1_A.2.5-1: Test requirements per test**

| Test | Number of bits of a DL-SCH transport block received within a TTI for normal/special sub-frame | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 7 | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| 7A | 55056/0 for 15MHz CC<br>75376/0 for 20MHz CC (Note 2) | R.31-5 TDD for 15MHz CC<br>R.31-4 TDD for 20MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: 71112 bits for sub-frame 5.<br>Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | | |

**Table 8.7.2.1_A.2.5-2: test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 7 | 3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| 7A | 15+20+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| Note 1: PUCCH format 1b with channel selection is used to feedback ACK/NACK.<br>Note 2: PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | | |

**Table 8.7.2.1_A.2.5-3: Test points per UE category**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9, 10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|
| CA with 3 CCs | 3x20 | - | - | - | - | 6A | 7 | 7 |
| | 15+20+20 | - | - | - | - | 6A | 7A | 7A |
| Note 1: Void.<br>Note 2: For non-CA UE, test is selected for maximum supported bandwidth.<br>Note 3: Void.<br>Note 4: Void.<br>Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.<br>Note 6: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 7: Test 6A is tested in 8.7.2.1_A.1. | | | | | | | | |

## 8.7.2.1_A.3 TDD Sustained data rate performance for CA (4DL CA)

### 8.7.2.1_A.3.1 Test purpose

Same test purpose as 8.7.2.1.

### 8.7.2.1_A.3.2 Test applicability

This test case applies to all types of E-UTRA TDD UE release 11 and forward of UE DL category 11, 12 and 15 that support 4DL with CA configurations in Table 7.1-2b.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.2.1_A.3.3 Minimum conformance requirements

For UE not supporting 256QAM, the requirements are specified in Table 8.7.2.1_A.3.3-2, with the addition of the parameters in Table 8.7.2.1_A.3.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.2.1_A.3.3-3. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1_A.3.3-1: test parameters for sustained downlink data rate (TDD 64QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 7 | 3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| 8 | 4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| 9 | 15+3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| Note 1: PUCCH format 1b with channel selection is used to feedback ACK/NACK.<br>Note 2: PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | | |

**Table 8.7.2.1_A.3.3-2: Minimum requirement (TDD 64QAM)**

| Test | Number of bits of a DL-SCH transport block received within a TTI for normal/special sub-frame | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |

| | | | |
|---|---|---|---|
| 7 | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| 8 | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| 9 | 55056/0 for 15MHz CC<br>75376/0 for 20MHz CC (Note 2) | R.31-5 TDD for 15MHz CC<br>R.31-4 TDD for 20MHz CC | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: 71112 bits for sub-frame 5.
Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.2.1_A.3.3-3: Test points for sustained data rate (FRC 64QAM)**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9, 10 | Cat. 11, 12<br>DL Cat. 11, 12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|
| CA with 4 CCs | 4x20 | - | - | - | - | - | 7 | 8 | 8 |
| | 15+3x20 | - | - | - | - | - | 7 | 9 | 9 |

Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.
Note 2: For non-CA UE, test is selected for maximum supported bandwidth.
Note 3: Void.
Note 4: If the intra-band contiguous CA is the only CA configuration supported by category 3 or 4 UE, single carrier test is selected.
Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

The normative reference for this requirement is TS 36.101 [2] clause 8.7.2.

8.7.2.1_A.3.4 Test description

8.7.2.1_A.3.4.1 Initial conditions

**Table 8.7.2.1_A.3.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 7 | R.31-4 TDD for three 20MHz CCs | R.1-4 TDD | 75376 (Note 3) | 7 for three 20MHz CCs | FLOOR((TBsize – 264)/56) | 1341 for three 20MHz CCs |
| 8 | R.31-4 TDD for four 20MHz CCs | R.1-4 TDD | 75376 (Note 3) | 7 for four 20MHz CCs | FLOOR((TBsize – 264)/56) | 1341 for four 20MHz CCs |
| 9 | R.31-5 TDD for 15MHz CC R.31-4 TDD for three 20MHz CC | R.1-4 TDD | 55056 for 15MHz CC 75376 (Note 3) for 20MHz CC | 6 for 15MHz CC 7 for three 20 MHz CC | FLOOR((TB$_{size}$ – 240)/48) for 15 MHz CC FLOOR((TBsize – 264)/56) for 20 MHz CC | 1142 for 15MHz CC 1341 for three 20MHz CC |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 71112 bits for sub-frame 5.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.2.1_A.3.5-2 depending on the UE category according to Table 8.7.2.1_A.3.5-3.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.60 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.1-1 and Table 8.7.2.1_A.3.5-1 depending on the UE category according to Table 8.7.2.1_A.3.5-3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.2.1_A.3.4.3.

### 8.7.2.1_A.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with five SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.2.1_A.3.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.2.1_A.3.4.3-3A.

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13,6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.2.1_A.3.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.2.1_A.3.5-3.

6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.2.1_A.3.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.2.1_A.3.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.2.1_A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.2.1_A.3.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.2.1_A.3.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.2.1_A.3.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.2.1_A.3.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.7.2.1_A.3.5 Test requirement

The requirements are specified in Table 8.7.2.1_A.3.5-1 depending on the UE category according to Table 8.7.2.1_A.3.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1_A.3.5-1: Test requirements per test**

| Test | Number of bits of a DL-SCH transport block received within a TTI for normal/special sub-frame | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 7 | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| 8 | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| 9 | 55056/0 for 15MHz CC<br>75376/0 for 20MHz CC (Note 2) | R.31-5 TDD for 15MHz CC<br>R.31-4 TDD for 20MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: 71112 bits for sub-frame 5.<br>Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | | |

**Table 8.7.2.1_A.3.5-2: test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 7 | 3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| 8 | 4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| 9 | 15+3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| Note 1: PUCCH format 1b with channel selection is used to feedback ACK/NACK.<br>Note 2: PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | | |

**Table 8.7.2.1_A.3.5-3: Test points per UE category**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DL Cat. 11, 12 | |
| CA with 4 CCs | 4x20 | - | - | - | - | - | 7 | 8 | 8 |
| | 15+3x20 | - | - | - | - | - | 7 | 9 | 9 |

Note 1: Void.
Note 2: For non-CA UE, test is selected for maximum supported bandwidth.
Note 3: Void.
Note 4: Void.
Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.
Note 6: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.
Note 7: Test 7 is tested in 8.7.2.1_A.2.

### 8.7.2.1_A.4 Void

### 8.7.2.1_A.5 TDD Sustained data rate performance for CA (5DL CA)

Editor's notes: This test case is incomplete. The following items are missing or are incomplete:

- UL RMC for 5-DL CA in loopback mode needs to be further investigated

- The test point in the RAN4 minimum requirement is incomplete.

- Test applicability is incomplete because of the absence of the test point

#### 8.7.2.1_A.5.1 Test purpose

Same test purpose as 8.7.2.1.

#### 8.7.2.1_A.5.2 Test applicability

FFS

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.7.2.1_A.5.3 Minimum conformance requirements

For UE not supporting 256QAM, the requirements are specified in Table 8.7.2.1_A.5.3-2, with the addition of the parameters in Table 8.7.2.1_A.5.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.2.1_A.5.3-3. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1_A.5.3-1: Test parameters for sustained downlink data rate (TDD 64QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 10 | 5x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| 11 | 15+4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| Note 1: PUCCH format 1b with channel selection is used to feedback ACK/NACK.<br>Note 2: PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | | |

**Table 8.7.2.1_A.5.3-2: Minimum requirement (TDD 64QAM)**

| Test | Number of bits of a DL-SCH transport block received within a TTI for normal/special sub-frame | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |

| | | | |
|---|---|---|---|
| 10 | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| 11 | 55056/0 for 15MHz CC<br>75376/0 for 20MHz CC (Note 2) | R.31-5 TDD for 15MHz CC<br>R.31-4 TDD for 20MHz CC | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: 71112 bits for sub-frame 5.
Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.2.1_A.5.3-3: Test points for sustained data rate (FRC 64QAM)**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9, 10 | Cat. 11, 12<br>DL Cat. 11, 12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|
| CA with 5 CCs | 5x20 | | | | | | | | |
| | 15+4x20 | | | | | | | | |

Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.
Note 2: For non-CA UE, test is selected for maximum supported bandwidth.
Note 3: Void.
Note 4: If the intra-band contiguous CA is the only CA configuration supported by category 3 or 4 UE, single carrier test is selected.
Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

The normative reference for this requirement is TS 36.101 [2] clause 8.7.2.

8.7.2.1_A.5.4 Test description

8.7.2.1_A.5.4.1 Initial conditions

**Table 8.7.2.1_A.5.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 10 | R.31-4 TDD for five 20MHz CCs | R.1-4 TDD | 75376 (Note 3) | 7 for five 20MHz CCs | FLOOR((TBsize – 264)/56) | 1341 for four 20MHz CCs |
| 11 | R.31-5 TDD for 15MHz CC<br>R.31-4 TDD for four 20MHz CCs | R.1-4 TDD | 55056 for 15MHz CC<br>75376 (Note 3) for 20MHz CC | 6 for 15MHz CC<br><br>7 for four 20 MHz CCs | FLOOR((TB$_{size}$ – 240)/48) for 15 MHz CC<br><br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1142 for 15MHz CC<br><br>1341 for four 20MHz CCs |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits).
This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 71112 bits for sub-frame 5.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.2.1_A.5.5-2 depending on the UE category according to Table 8.7.2.1_A.5.5-3.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.60 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.1-1 and Table 8.7.2.1_A.5.5-1 depending on the UE category according to Table 8.7.2.1_A.5.5-3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.2.1_A.5.4.3.

### 8.7.2.1_A.5.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with four SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.2.1_A.5.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.2.1_A.5.4.3-3A.

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13,6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.2.1_A.5.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.2.1_A.5.5-3.

6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.2.1_A.5.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.2.1_A.5.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.2.1_A.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.2.1_A.5.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A Table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.2.1_A.5.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 Table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.2.1_A.5.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.2.1_A.5.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.7.2.1_A.5.5 Test requirement

The requirements are specified in Table 8.7.2.1_A.5.5-1 depending on the UE category according to Table 8.7.2.1_A.5.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1_A.5.5-1: Test requirements per test**

| Test | Number of bits of a DL-SCH transport block received within a TTI for normal/special sub-frame | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 10 | 75376/0 (Note 2) | R.31-4 TDD | 85 |
| 11 | 55056/0 for 15MHz CC<br>75376/0 for 20MHz CC (Note 2) | R.31-5 TDD for 15MHz CC<br>R.31-4 TDD for 20MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: 71112 bits for sub-frame 5.<br>Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | | |

**Table 8.7.2.1_A.5.5-2: Test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 10 | 5x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| 11 | 15+4x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 2) | OP.1 TDD |
| Note 1: PUCCH format 1b with channel selection is used to feedback ACK/NACK.<br>Note 2: PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | | |

**Table 8.7.2.1_A.5.5-3: Test points per UE category**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6,7 | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DL Cat. 11, 12 | |
| CA with 5 CCs | 5x20 | - | - | - | - | - | | | |
| | 15+4x20 | - | - | - | - | - | | | |

| | |
|---|---|
| Note 1: | Void. |
| Note 2: | For non-CA UE, test is selected for maximum supported bandwidth. |
| Note 3: | Void. |
| Note 4: | Void. |
| Note 5: | The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. |
| Note 6: | Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. |
| Note 7: | Test 7 is tested in 8.7.2.1_A.2. |

## 8.7.2.1_H TDD sustained data rate performance for 256QAM in DL

Editor's notes:

- Discussion on DL EVM for 256QAM demodulation test as per R5-155895 is still ongoing

- Whether UL modulation mode QPSK is suitable to use is FFS

## 8.7.2.1_H.1 TDD sustained data rate performance for 256QAM in DL (Single Carrier)

### 8.7.2.1_H.1.1 Test purpose

The purpose of the test is to verify that the Layer 1 and Layer 2 correctly process in a sustained manner the received packets corresponding to the maximum number of DL-SCH transport block bits received within a TTI for the UE category indicated. The sustained downlink data rate shall be verified in terms of the success rate of delivered PDCP SDU(s) by Layer 2. The test case below specifies the RF conditions and the required success rate of delivered TB by Layer 1 to meet the sustained data rate requirement. The size of the TB per TTI corresponds to the largest possible DL-SCH transport block for each UE category using the maximum number of layers for spatial multiplexing. Transmission mode 3 is used with radio conditions resembling a scenario where sustained maximum data rates are available.

### 8.7.2.1_H.1.2 Test applicability

This test applies to E-UTRA TDD UE release 12 and forward UE DL category 13 that support 256QAM in DL.

### 8.7.2.1_H.1.3 Minimum requirements

For UE supporting 256QAM, the requirements are specified in Table 8.7.2-2, with the addition of the parameters in Table 8.7.2-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.2-3. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.2.1_A.4.3-2 is not applicable.

**Table 8.7.2.1_H.1.3-1: test parameters for sustained downlink data rate (TDD 256QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 1 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | Bundling | OP.1 TDD |
| Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | | |

**Table 8.7.2.1_H.1.3-2: Minimum requirement (TDD 256QAM)**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 1 | R.68 TDD | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI. | | |
| Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | |

**Table 8.7.2.1_H.1.3-3: Test points for sustained data rate (FRC 256QAM)**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12 / DL Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|
| Single carrier | 20 | - | 1 | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.2

## 8.7.2.1_H.1.4 Test description

Same test description as in clause 8.7.2.1.4 with the following exceptions:

- Connection diagram Figure A.10 (without using faders and AWGN generators).
- Instead of Table 8.7.2.1.4.1-1 -> use Table 8.7.2.1_H.1.4-1.
- Instead of Table 8.7.2.1.5-1 -> use Table 8.7.2.1_H.1.5-1.
- Instead of Table 8.7.2.1.5-2 -> use Table 8.7.2.1_H.1.5-2.
- Instead of Table 8.7.2.1.5-3 -> use Table 8.7.2.1_H.1.5-3.

**Table 8.7.2.1_H.1.4-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement Channel | $TB_{size}$ per Codeword | Number of PDCP SDU per Codeword for normal/special sub-frame | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] for normal/special sub-frame |
|---|---|---|---|---|---|---|
| 1 | R.68 TDD | R.1-4 TDD | 97896(Note 3) | 10/0 | FLOOR(($TB_{size}$ - 352)/80) | 1219/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).

The PDCP SDU size of each PDCP SDU is:

PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size – Size of Timing Advance - Size of RLC STATUS PDU) / N,

where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5.

## 8.7.2.1_H.1.5 Test requirement

The requirements are specified in Table 8.7.2.1_H.1.5-1 depending on the UE category according to Table 8.7.2.1_H.1.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1_H.1.5-1: Test requirements per test**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 1 | R.68 TDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.2.1_H.1.5-2: Test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 1 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | Bundling | OP.1 TDD |

Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK.

**Table 8.7.2.1_H.1.5-3: Test applicability per UE category**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12 / DL Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|
| Single carrier | 20 | - | 1 | | | | |

## 8.7.2.1_H.2 TDD sustained data rate performance for CA (2DL CA) for 256QAM in DL

### 8.7.2.1_H.2.1 Test purpose

Same test purpose as in clause 8.7.2.1.

### 8.7.2.1_H.2.2 Test applicability

This test applies to E-UTRA TDD UE release 12 and forward and UE DL category 11, 12 and 13 that support 256QAM in DL and 2DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.2.1_H.2.3 Minimum requirements

For UE supporting 256QAM, the requirements are specified in Table 8.7.2.1_H.2.3-2, with the addition of the parameters in Table 8.7.2.1_H.2.3-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.2.1_H.2.3-3. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.2.1_A.1.3-3 is not applicable.

**Table 8.7.2.1_H.2.3-1: test parameters for sustained downlink data rate (TDD 256QAM)**

| Test | Band width (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 2 | 15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 1) | OP.1 TDD |
| 3 | 2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 1) | OP.1 TDD |
| Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | | |

**Table 8.7.2.1_H.2.3-2: Minimum requirement (TDD 256QAM)**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 2 | R.68-1 TDD for 15MHz CC<br>R.68 TDD for 20MHz CC | 85 |
| 3 | R.68 TDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.2.1_H.2.3-3: Test points for sustained data rate (FRC 256QAM)**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12 / DL Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|
| CA with 2CCs | 15+20 | 2 | 2 | | | | |
| | 2x20 | 3 | 3 | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.2

### 8.7.2.1_H.2.4 Test description

Same test description as in clause 8.7.2.1_A.1.4 with the following exceptions:

- Instead of Table 8.7.2.1_A.1.4.1-1 -> use Table 8.7.2.1_H.2.4-1.
- Instead of Table 8.7.2.1_A.1.5-1 -> use Table 8.7.2.1_H.2.5-1.
- Instead of Table 8.7.2.1_A.1.5-2 -> use Table 8.7.2.1_H.2.5-2.
- Instead of Table 8.7.2.1_A.1.5-3 -> use Table 8.7.2.1_H.2.5-3.

**Table 8.7.2.1_H.2.4-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | $TB_{size}$ per Codeword per Component Carrier | Number of PDCP SDU per Codeword for normal/special sub-frame | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] for normal/special sub-frame |
|---|---|---|---|---|---|---|
| 2 | R.68-1 TDD for 15MHz CC R.68 TDD for 20MHz CC | R.1-4 TDD | 75376 (Note 4) for 15MHz CC<br><br>97896(Note 3) for 20MHz CC | 7/0 for 15MHz CC<br><br>10/0 for 20MHz CC | FLOOR(($TB_{size}$ – 264)/56)) for 15MHz CC<br><br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1341/0 for 15MHz CC<br><br>1219/0 for 20MHz CC |
| 3 | R.68 TDD | R.1-4 TDD | 97896(Note 3) | 10/0 | FLOOR(($TB_{size}$ - 352)/80) | 1219/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).

The PDCP SDU size of each PDCP SDU is:

PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,

where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.

The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5.

Note 4: 63776 bits for sub-frame 0, 4 and 61664 bits for sub-frame 5.

### 8.7.2.1_H.2.5 Test requirement

The requirements are specified in Table 8.7.2.1_H.2.5-1 depending on the UE category according to Table 8.7.2.1_H.2.5-3. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1_H.2.5-1: Test requirements per test**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 2 | R.68-1 TDD for 15MHz CC<br>R.68 TDD for 20MHz CC | 85 |
| 3 | R.68 TDD | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | |

**Table 8.7.2.1_H.2.5-2: Test parameters per test**

| Test | Band width (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 2 | 15+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 1) | OP.1 TDD |
| 3 | 2x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 1) | OP.1 TDD |
| Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | | |

**Table 8.7.2.1_H.2.5-3: Test applicability per UE category**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12<br>DL Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|
| CA with 2CCs | 15+20 | 2 | 2 | | | | |
| | 2x20 | 3 | 3 | | | | |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.<br>Note 2: Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. Only one test point to be tested. | | | | | | | |

## 8.7.2.1_H.3 TDD Sustained data rate performance for CA (3DL CA) for 256QAM in DL

### 8.7.2.1_H.3.1 Test purpose

Same test purpose as in clause 8.7.2.1.

### 8.7.2.1_H.3.2 Test applicability

This test case applies to all types of E-UTRA TDD UE release 12 and forward of UE DL category 11, 12 and 15 that support 256QAM in DL and 3DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.2.1_H.3.3 Minimum conformance requirements

For UE supporting 256QAM, the requirements are specified in Table 8.7.2.1_H.3.3-2, with the addition of the parameters in Table 8.7.2.1_H.3.3-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.2.1_H.3.3-3. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.2.1_A.2.3-2 is not applicable.

**Table 8.7.2.1_H.3.3-1: test parameters for sustained downlink data rate (TDD 256QAM)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 4 | 3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 1) | OP.1 TDD |
| 5 | 15+20+20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 1) | OP.1 TDD |
| Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | | |

**Table 8.7.2.1_H.3.3-2: Minimum requirement (TDD 256QAM)**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 4 | R.68 TDD | 85 |
| 5 | R.68-1 TDD for 15MHz CC<br>R.68 TDD for 20MHz CC | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | |

**Table 8.7.2.1_H.3.3-3: Test points for sustained data rate (FRC 256QAM)**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12<br>DL Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | | | |
|---|---|---|---|---|---|---|---|
| CA with 3 CCs | 3x20 | 4 | 3 | 4 | | | |
| | 15+20+20 | 5 | 3 | 5 | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.7.2.

### 8.7.2.1_H.3.4 Test description

Same test description as in clause 8.7.2.1_A.1.4 with the following exceptions:

- Instead of Table 8.7.2.1_A.2.4.1-1 -> use Table 8.7.2.1_H.3.4-1.
- Instead of Table 8.7.2.1_A.2.5-1 -> use Table 8.7.2.1_H.3.5-1.
- Instead of Table 8.7.2.1_A.2.5-2 -> use Table 8.7.2.1_H.3.5-2.
- Instead of Table 8.7.2.1_A.2.5-3 -> use Table 8.7.2.1_H.3.5-3.

**Table 8.7.2.1_H.3.4-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 4 | R.68 TDD | R.1-4 TDD | 97896(Note 3) | 10/0 | FLOOR(($TB_{size}$ - 352)/80) | 1219/0 |
| 5 | R.68-1 TDD for 15MHz CC<br>R.68 TDD for 20MHz CC | R.1-4 TDD | 75376 (Note 4) for 15MHz CC<br><br>97896(Note 3) for 20MHz CC | 7/0 for 15MHz CC<br><br>10/0 for 20MHz CC | FLOOR(($TB_{size}$ – 264)/56)) for 15MHz CC<br><br>FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC | 1341/0 for 15MHz CC<br><br>1219/0 for 20MHz CC |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits).
This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5.

Note 4: 63776 bits for sub-frame 0, 4 and 61664 bits for sub-frame 5.

### 8.7.2.1_H.3.5 Test requirement

The requirements are specified in Table 8.7.2.1_H.3.5-1 depending on the UE category according to Table 8.7.2.1_H.3.5-3. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.2.1_H.3.5-1: Minimum requirement**

| Test | Measurement channel | Reference value |
|---|---|---|
| | | TB success rate [%] |
| 4 | R.68 TDD | 85 |
| 5 | R.68-1 TDD for 15MHz CC<br>R.68 TDD for 20MHz CC | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.2.1_H.3.5-2: test parameters per test**

| Test | Band width (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | $\hat{E}_s$ at antenna port (dBm/15 kHz) | ACK/NACK feedback mode | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | | | |
| 4 | 3x20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 1) | OP.1 TDD |
| 5 | 15+20 +20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | -85 | (Note 1) | OP.1 TDD |
| Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK. | | | | | | | | | | |

**Table 8.7.2.1_H.3.5-3: Test points per UE category**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Cat. 11, 12 / DL Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | | | |
|---|---|---|---|---|---|---|---|
| CA with 3 CCs | 3x20 | 4 | 3 | 4 | | | |
| | 15+20+20 | 5 | 3 | 5 | | | |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3. | | | | | | | |
| Note 2: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | | | | |
| Note 3: Test 3 is tested in 8.7.2.1_H.2. | | | | | | | |

## 8.7.3 FDD (EPDCCH scheduling)

The parameters specified in Table 8.7.3-1 are valid for all FDD tests unless otherwise stated.

**Table 8.7.3-1: Common test parameters (FDD)**

| Parameter | Unit | Value |
|---|---|---|
| Cyclic prefix | | Normal |
| Cell ID | | 0 |
| Inter-TTI Distance | | 1 |
| Number of HARQ processes per component carrier | Processes | 8 |
| Maximum number of HARQ transmission | | 4 |
| Redundancy version coding sequence | | {0,0,1,2} for 64QAM |
| Number of OFDM symbols for PDCCH per component carrier | OFDM symbols | 1 |
| Cross carrier scheduling | | Not configured |
| Number of EPDCCH sets | | 1 |
| EPDCCH transmission type | | Localized |
| Number of PRB per EPDCCH set and EPDCCH PRB pair allocation | | 2 PRB pairs<br>10MHz BW: Resource blocks $n_{PRB}$ = 48, 49<br>15MHz BW: Resource blocks $n_{PRB}$ = 70, 71<br>20MHz BW: Resource blocks $n_{PRB}$ = 98, 99 |
| EPDCCH Starting Symbol | | Derived from CFI (i.e. default behaviour) |
| ECCE Aggregation Level | | 2 ECCEs |
| Number of EREGs per ECCE | | 4 |
| EPDCCH scheduling | | EPDCCH candidate is randomly assigned in each subframe |
| EPDCCH precoder (Note 1) | | Fixed PMI 0 |
| EPDCCH monitoring SF pattern | | 1111111111 0000000000<br>1111111111 0000000000 |
| Timing advance | μs | 100 |
| Propagation condition | | Static propagation condition<br>No external noise sources are applied |
| Note 1: EPDCCH precoder parameters are defined for tests with 2 x 2 antenna configuration | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.3

## 8.7.3.1 FDD sustained data rate performance for EPDCCH scheduling

### 8.7.3.1.1 Test purpose

Same test purpose as in clause 8.7.1.1.

### 8.7.3.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE Release 11 and forward supporting EPDCCH.

### 8.7.3.1.3 Minimum requirements

**Table 8.7.3.1.3-1: Void**

The requirements are specified in Table 8.7.3.1.3-3, with the addition of the parameters in Table 8.7.3.1.3-2 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category, CA capability and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.3.1.3-4. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.3.1.3-2: Test parameters for SDR test for PDSCH scheduled by EPDCCH (FDD)**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | δ | | |
| 1 | 10 | 1 | 1 x 2 | N/A | 0 | 0 | 0 | 0 | -85 | OP.6 FDD |
| 2 | 10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 FDD |
| 3,4,6 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 FDD |
| 3A | 10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 FDD |
| 3C, 4B | 15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 FDD |

**Table 8.7.3.1.3-3: Minimum requirement (FDD)**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 1 | 10296 | R.31E-1 FDD | 95 |
| 2 | 25456 | R.31E-2 FDD | 95 |
| 3 | 51024 | R.31E-3 FDD | 95 |
| 3A | 36696 (Note 2) | R.31E-3A FDD | 85 |
| 3C | 51024 | R.31E-3C FDD | 85 |
| 4 | 75376 (Note 3) | R.31E-4 FDD | 85 |
| 4B | 55056 (Note 5) | R.31E-4B FDD | 85 |
| 6 | 75376 (Note 3) | R.31E-4 FDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: 35160 bits for sub-frame 5.
Note 3: 71112 bits for sub-frame 5.
Note 4: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.
Note 5: 52752 bits for sub-frame 5.

**Table 8.7.3.1.3-4: Test points for sustained data rate (FRC)**

| CA config | Bandwidth (MHz) | Category 1 | Category 2 | Category 3 | Category 4 | Category 6 | Category 7 |
|---|---|---|---|---|---|---|---|
| Single carrier | 10 | 1 | 2 | 3A | 3A | - | - |
| | 15 | - | - | 3C | 4B | - | - |
| | 20 | - | - | 3 | 4 | 6 | 6 |
| Note 1: The test is selected for maximum supported bandwidth. | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.3

### 8.7.3.1.4 Test description

#### 8.7.3.1.4.1 Initial conditions

**Table 8.7.3.1.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | $TB_{size}$ per Codeword | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 1 | R31E-1 FDD | R.1-1 FDD | 10296 | 1 | FLOOR(($TB_{size}$ - 96)/8) | |
| 2 | R31E-2 FDD | R.1-2 FDD | 25456 | 3 | FLOOR(($TB_{size}$ – 152)/24)) | |
| 3 | R31E-3 FDD | R.1-3 FDD | 51024 | 5 | FLOOR(($TB_{size}$ -– 208)/40)) | |
| 3A | R31E-3A FDD | R.1-3A FDD | 36696 (Note 3) | 4 | FLOOR(($TB_{size}$ – 184)/32))" | |
| 3C | R31E-3C FDD | R.1-3C FDD | 51024 | 5 | FLOOR(($TB_{size}$ -– 208)/40)) | |
| 4 | R31E-4 FDD | R.1-4 FDD | 75376 (Note 4) | 7 | FLOOR(($TB_{size}$ – 264)/56)) | |
| 4B | R31E-4B FDD | R.1-4 FDD | 55056 (Note 5) | 5 | FLOOR(($TB_{size}$ – 208)/40)) | |
| 6 | R31E-4 FDD | R.1-4 FDD | 75376 (Note 4) | 7 | FLOOR(($TB_{size}$ – 264)/56)) | |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 35160 bits for sub-frame 5

Note 4: 71112 bits for sub-frame 5

Note 5: 52752 bits for sub-frame 5.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: According to table 8.7.3.1.3-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.3 for test 1 and Figure A.10 for tests 2-6.

2. The parameter settings for the cell are set up according to Table 8.7.3.1.5-1 and Table 8.7.3.1.5-2.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 (Loopback activated) according to TS 36.508 [7] clause 4.5.4. Message contents are defined in clause 8.7.3.1.4.3.
6. SS sends Timing Advance Command MAC CE with timing advance 100us to UE.

#### 8.7.3.1.4.2 Test procedure

1. Propagation conditions are set according to Annex B.1. No external noise sources are applied.
2. The SS looks up $TB_{size}$ in table 8.7.3.1.4.1-1 according to the UE category under test.
3. SS sets the counters $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $N_{DL_PDCP}$ to 0.
4. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.3.1.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.
5. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.
6. Steps 5 to 6 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.
7. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one
8. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead (NDL_newtx and NDL_retx) in order to validate HARQ feedback received from the UE.
9. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$
10. The UE passes the test if $A \geq$ "corresponding TB success rates according to Table 8.7.3.1.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

#### 8.7.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.3.1.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.3.1.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.3.1.4.3-3: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| EPDCCH-Config-r11 ::= SEQUENCE{ | | | |
| config-r11 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternConfig-r11 | 1111111111 0000000000<br>1111111111 0000000000 | | |
| startSymbol-r11 | Not present | Derived from CFI | |
| setConfigToReleaseList-r11 | Null | | |
| setConfigToAddModList-r11 SEQUENCE { | 1 entry | | |
| setConfigId-r11[1] | 0 | | |
| transmissionType-r11[1] | localized | | |
| resourceBlockAssignment-r11[1] SEQUENCE{ | | | |
| numberPRB-Pairs-r11 | n2 | | |
| resourceBlockAssignment-r11 | 0000<br>or<br>1001 | 0000 for Bandwidth 10MHz and 20MHz;<br>1001 only for Bandwidth 15MHz | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

## 8.7.3.1.5 Test requirement

The requirements are specified in Table 8.7.3.1.5-1. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.3.1.5-1: Test requirements per test**

| Test | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 1 | 10296 | R.31E-1 FDD | 95 |
| 2 | 25456 | R.31E-2 FDD | 95 |
| 3 | 51024 | R.31E-3 FDD | 95 |
| 3A | 36696 (Note 2) | R.31E-3A FDD | 85 |
| 3C | 51024 | R.31E-3C FDD | 85 |
| 4 | 75376 (Note 3) | R.31E-4 FDD | 85 |
| 4B | 55056 (Note 5) | R.31E-4B FDD | 85 |
| 6 | 75376 (Note 3) | R.31E-4 FDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: 35160 bits for sub-frame 5.
Note 3: 71112 bits for sub-frame 5.
Note 4: The TB success rate is defined as TB success rate = $100\%*N_{DL_correct_rx}/ (N_{DL_newtx} + N_{DL_retx})$, where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.
Note 5: 52752 bits for sub-frame 5.

**Table 8.7.3.1.5-2: Test parameters per test**

| Test | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | δ | | |
| 1 | 10 | 1 | 1 x 2 | N/A | 0 | 0 | 0 | 0 | -85 | OP.6 FDD |
| 2 | 10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 FDD |
| 3,4,6 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 FDD |
| 3A | 10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 FDD |
| 3C, 4B | 15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 FDD |

**Table 8.7.3.1.5-3: Test applicability per UE category**

| CA config | Bandwidth (MHz) | Category 1 | Category 2 | Category 3 | Category 4 | Category 6 | Category 7 |
|---|---|---|---|---|---|---|---|
| Single carrier | 10 | 1 | 2 | 3A | 3A | - | - |
| | 15 | - | - | 3C | 4B | - | - |
| | 20 | - | - | 3 | 4 | 6 | 6 |
| Note 1: The test is selected for maximum supported bandwidth. | | | | | | | |

## 8.7.4 TDD (EPDCCH scheduling)

The parameters specified in Table 8.7.4- 1 are valid for all TDD tests unless otherwise stated.

**Table 8.7.4-1: Common test parameters (TDD)**

| Parameter | Unit | Value |
|---|---|---|
| Special subframe configuration (Note 1) | | 4 |
| Cyclic prefix | | Normal |
| Cell ID | | 0 |
| Inter-TTI Distance | | 1 |
| Maximum number of HARQ transmission | | 4 |
| Redundancy version coding sequence | | {0,0,1,2} for 64QAM |
| Number of OFDM symbols for PDCCH per component carrier | OFDM symbols | 1 |
| Cross carrier scheduling | | Not configured |
| Number of EPDCCH sets | | 1 |
| EPDCCH transmission type | | Localized |
| Number of PRB per EPDCCH set and EPDCCH PRB pair allocation | | 2 PRB pairs<br>10MHz BW: Resource blocks $n_{PRB}$ = 48, 49<br>15MHz BW: Resource blocks $n_{PRB}$ = 70, 71<br>20MHz BW: Resource blocks $n_{PRB}$ = 98, 99 |
| EPDCCH Starting Symbol | | Derived from CFI (i.e. default behaviour) |
| ECCE Aggregation Level | | 2 ECCEs |
| Number of EREGs per ECCE | | 4 for normal subframe and for special subframe |
| EPDCCH scheduling | | EPDCCH candidate is randomly assigned in each subframe |
| EPDCCH precoder (Note 2) | | Fixed PMI 0 |
| EPDCCH monitoring SF pattern | | UL-DL configuration 1: 1101111111 0000000000<br>UL-DL configuration 5: 1100111001 0000000000 |
| Timing advance | μs | 100 |
| Propagation condition | | Static propagation condition<br>No external noise sources are applied |
| Note 1: As specified in Table 4.2-1 in TS 36.211 [4].<br>Note 2: EPDCCH precoder parameters are defined for tests with 2 x 2 antenna configuration | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.4.

## 8.7.4.1 TDD sustained data rate performance for EPDCCH scheduling

### 8.7.4.1.1 Test purpose

Same test purpose as in clause 8.7.2.1.

### 8.7.4.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE Release 11 and forward supporting EPDCCH.

### 8.7.4.1.3 Minimum requirements

**Table 8.7.4.1.3-1: Void**

The requirements are specified in Table 8.7.4.1.3-3, with the addition of the parameters in Table 8.7.4.1.3-2 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category, CA capability and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.4.1.3-4. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.4.1.3-2: Test parameters for SDR test for PDSCH scheduled by EPDCCH (TDD)**

| | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs | ACK/NACK feedback mode |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | δ | | | |
| 1 | 10 | 1 | 1 x 2 | N/A | 0 | 0 | 0 | 0 | -85 | OP.6 TDD | Bundling |
| 2 | 10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 TDD | Bundling |
| 3 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 TDD | Bundling |
| 3A | 15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.2 TDD | Multiplexing |
| 4,6 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 TDD | Multiplexing |

**Table 8.7.4.1.3-3: Minimum requirement (TDD)**

| Test | Number of bits of a DL-SCH transport block received within a TTI for normal/special sub-frame | Measurement channel | Reference value |
|---|---|---|---|
| | | | TB success rate [%] |
| 1 | 10296/0 | R.31E-1 TDD | 95 |
| 2 | 25456/0 | R.31E-2 TDD | 95 |
| 3 | 51024/0 | R.31E-3 TDD | 95 |
| 3A | 51024/0 | R.31E-3A TDD | 85 |
| 4 | 75376/0 (Note 2) | R.31E-4 TDD | 85 |
| 6 | 75376/0 (Note 2) | R.31E-4 TDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: 71112 bits for sub-frame 5.
Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.4.1.3-4: Test points for sustained data rate (FRC)**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Category 1 | Category 2 | Category 3 | Category 4 | Category 6 | Category 7 |
|---|---|---|---|---|---|---|---|
| Single carrier | 10 | 1 | 2 | - | - | - | - |
| | 15 | - | - | 3A | 3A | - | - |
| | 20 | - | - | 3 | 4 | 6 | 6 |
| Note 1: The test is selected for maximum supported bandwidth. | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.4

### 8.7.4.1.4 Test description

#### 8.7.4.1.4.1 Initial conditions

**Table 8.7.4.1.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | $TB_{size}$ per Codeword | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 1 | R.31E-1 TDD | R.1-1 TDD | 10296 | 1/0 | FLOOR(($TB_{size}$ - 96)/8) | |
| 2 | R.31E-2 TDD | R.1-2 TDD | 25456 | 3/0 | FLOOR(($TB_{size}$ – 152)/24)) | |
| 3 | R.31E-3 TDD | R.1-3 TDD | 51024 | 5/0 | FLOOR(($TB_{size}$ – 208)/40)) | |
| 3A | R.31E-3A TDD | R.1-3B TDD | 51024 | 4/0 | FLOOR(($TB_{size}$ – 184)/32))" | |
| 4 | R.31E-4 TDD | R.1-4 TDD | 75376 (Note 3) | 7/0 | FLOOR(($TB_{size}$ – 264)/56)) | |
| 6 | R.31E-4 TDD | R.1-4 TDD | 75376 (Note 3) | 7/0 | FLOOR(($TB_{size}$ – 264)/56)) | |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 71112 bits for sub-frame 5.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: According to table 8.7.4.1.3-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.3 for test 1 and Figure A.10 for tests 2-6.
2. The parameter settings for the cell are set up according to Table 8.7.4.1.5-1 and Table 8.7.4.1.5-2.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 (Loopback activated) according to TS 36.508 [7] clause 4.5.4. Message contents are defined in clause 8.7.4.1.4.3.
6. SS sends Timing Advance Command MAC CE with timing advance 100us to UE.

#### 8.7.4.1.4.2 Test procedure

1. Propagation conditions are set according to Annex B.1. No external noise sources are applied.
2. The SS looks up $TB_{size}$ in table 8.7.4.1.4.1-1 according to the UE category under test.
3. SS sets the counters $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $N_{DL_PDCP}$ to 0.
4. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.4.1.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.
5. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.
6. Steps 5 to 6 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.
7. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one
8. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.
9. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$
10. The UE passes the test if $A \geq$ "corresponding TB success rates according to Table 8.7.4.1.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

#### 8.7.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.4.1.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 101 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1. | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.4.1.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.4.1.4.3-3: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| EPDCCH-Config-r11 ::= SEQUENCE{ | | | |
| config-r11 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternConfig-r11 | 1101111111 000000000<br>or<br>1100111001 000000000 | 1101111111 000000000 for UL-DL configuration 1 and 1100111001 000000000 for UL-DL configuration 5 | |
| startSymbol-r11 | Not present | Derived from CFI | |
| setConfigToReleaseList-r11 | Null | | |
| setConfigToAddModList-r11 SEQUENCE { | 1 entry | | |
| setConfigId-r11[1] | 0 | | |
| transmissionType-r11[1] | localized | | |
| resourceBlockAssignment-r11[1] SEQUENCE{ | | | |
| numberPRB-Pairs-r11 | n2 | | |
| resourceBlockAssignment-r11 | 0000<br>or<br>1001 | 0000 for Bandwidth 10MHz and 20MHz;<br>1001 only for Bandwidth 15MHz | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.4.1.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 or sa5 | The two cases will be configured for each test | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

#### 8.7.4.1.5 Test requirement

The requirements are specified in Table 8.7.4.1.5-1. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.4.1.5-1: Test requirements per test**

| Test | Number of bits of a DL-SCH transport block received within a TTI for normal/special sub-frame | Measurement channel | Reference value TB success rate [%] |
|---|---|---|---|
| 1 | 10296/0 | R.31E-1 TDD | 95 |
| 2 | 25456/0 | R.31E-2 TDD | 95 |
| 3 | 51024/0 | R.31E-3 TDD | 95 |
| 3A | 51024/0 | R.31E-3A TDD | 85 |
| 4 | 75376/0 (Note 2) | R.31E-4 TDD | 85 |
| 6 | 75376/0 (Note 2) | R.31E-4 TDD | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.<br>Note 2: 71112 bits for sub-frame 5.<br>Note 3: The TB success rate is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. | | | |

**Table 8.7.4.1.5-2: Test parameters per test**

| | Bandwidth (MHz) | Transmission mode | Antenna configuration | Codebook subset restriction | Downlink power allocation (dB) | | | | $\hat{E}_s$ at antenna port (dBm/15kHz) | Symbols for unused PRBs | ACK/NACK feedback mode |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $\rho_A$ | $\rho_B$ | σ | δ | | | |
| 1 | 10 | 1 | 1 x 2 | N/A | 0 | 0 | 0 | 0 | -85 | OP.6 TDD | Bundling |
| 2 | 10 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 TDD | Bundling |
| 3 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 TDD | Bundling |
| 3A | 15 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.2 TDD | Multiplexing |
| 4,6 | 20 | 3 | 2 x 2 | 10 | -3 | -3 | 0 | 3 | -85 | OP.1 TDD | Multiplexing |

**Table 8.7.4.1.5-3: Test applicability per UE category**

| CA config | Bandwidth/ Bandwidth combination (MHz) | Category 1 | Category 2 | Category 3 | Category 4 | Category 6 | Category 7 |
|---|---|---|---|---|---|---|---|
| Single carrier | 10 | 1 | 2 | - | - | - | - |
| | 15 | - | - | 3A | 3A | - | - |
| | 20 | - | - | 3 | 4 | 6 | 6 |
| Note 1: The test is selected for maximum supported bandwidth. | | | | | | | |

## 8.7.5 TDD FDD CA Sustained data rate performance

The parameters specified in Table 8.7.5-1 are valid for all TDD FDD CA tests unless otherwise stated.

**Table 8.7.5-1: Common Test Parameters (TDD FDD CA)**

| Parameter | | Unit | Value |
|---|---|---|---|
| Uplink downlink configuration (Note 1) for TDD CC | | | 1 |
| Special subframe configuration (Note 2) for TDD CC | | | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | $\sigma$ | dB | 0 |
| Cyclic prefix | | | Normal |
| Cell ID | | | 0 |
| Inter-TTI Distance | | | 1 |
| Maximum number of HARQ processes per component carrier | FDD PCell | Processes | 8 for FDD and TDD CCs |
| | TDD PCell | Processes | 11 for FDD CC; 7 for TDD CC |
| Maximum number of HARQ transmission | | | 4 |
| Scheduling of retransmissions | | | 1. Retransmissions use the same Transport Block Size (TBS) as the initial transmission.<br>2. HARQ processes are scheduled consecutively, independent of the fact, whether retransmissions (for negatively acknowledged HARQ processes) or new transmissions (for positively acknowledged HARQ processes) occur.<br>3. Despite of 1) and 2) the number of RB-s to be allocated in each SF remains firm as specified in the RMC. Thus in case of RMC-s with SF dependent allocation, for retransmissions the TBS and the modulation scheme (MCS) are indicated implicitly ($29 \le I_{\text{MCS}} \le 31$) according to TS 36.213 [10] subclause 7.1.7.2. |
| Redundancy version coding sequence | | | {0,0,1,2} for 64QAM, 256QAM |
| Number of OFDM symbols for PDCCH per component carrier | | OFDM symbols | 1 |
| Cross carrier scheduling | | | Not configured |
| Propagation condition | | | Static propagation condition<br>No external noise sources are applied |
| Transmission mode | | | TM3 |
| Codebook subset restriction | | | 10 |
| Antenna configuration | | | 2 x 2 |
| $\hat{E}_s$ at antenna port (dBm/15kHz) | | | -85 |
| Symbols for unused PRBs | | | OP.1 FDD for FDD CC,<br>OP.1 TDD for TDD CC |
| ACK/NACK feedback mode | | | PUCCH format 3 |
| Downlink HARQ-ACK timing | FDD PCell | | As specified in Clause 7.3.3 in TS36.213 [6] |
| | TDD PCell | | As specified in Clause 7.3.4 in TS36.213 [6] |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [4].<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [4]. | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.

## 8.7.5.1 TDD FDD CA Sustained data rate performance for FDD PCell

### 8.7.5.1.1 TDD FDD CA Sustained data rate performance for FDD PCell (2DL CA)

#### 8.7.5.1.1.1 Test purpose

Same test purpose as in clause 8.7.1.1.

#### 8.7.5.1.1.2 Test applicability

This test applies to all types of UE Release 12 and forward of UE category 3, 4, 6, 7, 9 and 10, and UE DL category 6, 7, 9 and 10 that support E-UTRA FDD and TDD, 2DL TDD-FDD CA with FDD as PCell and not support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.7.5.1.1.3 Minimum requirements

For UE not supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.1.1.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.1.1.3-2. The TB success rate shall be sustained during at least 300 frames.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.1.1.3-1: test parameters for sustained downlink data rate (TDD FDD CA 64QAM)**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 2 | 10+20 | 10 | 20 | 36696 | 75376/0 | R.31-3A FDD | R.31-4 TDD | 85 |
| 2A | 15+20 | 15 | 20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 3 | 10+10 | 10 | 10 | 36696 | 36696/0 | R.31-3A FDD | R.31-6 TDD | 85 |

**Table 8.7.5.1.1.3-2: Test points for sustained data rate (FRC 64QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6,7 | DL Cat. 9, 10 | DL Cat. 11, 12 |
| CA with 2CCs | 2x20 | 20 | 20 | - | - | 3 | 3 | 1 | 1 | - |
| | 10+20 | 10 | 20 | - | - | 3 | 3 | 2 | 2 | - |
| | 15+20 | 15 | 20 | - | - | 3 | 3 | 2A | 2A | - |
| | 10+10 | 10 | 10 | - | - | 3 | 3 | 3 | 3 | - |
| Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | | | | |
| Note 2: Void. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.1

### 8.7.5.1.1.4 Test description

#### 8.7.5.1.1.4.1 Initial conditions

**Table 8.7.5.1.1.4.1-1: Further test parameters per test**

| Test number | | 1 | 2 | 2A | **3** |
|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20 | 10 | 15 | 10 |
| | **TDD CC** | 20 | 20 | 20 | 10 |
| **DL Measurement channel** | **FDD CC** | R.31-4 FDD | R.31-3A FDD | R.31-5 FDD | R.31-3A FDD |
| | **TDD CC** | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-6 TDD |
| **UL channel** | **FDD CC** | R.1-4 FDD | R.1-1 FDD | R.1-4B FDD | R.1-1 FDD |
| | **TDD CC** | NA | NA | NA | NA |
| **TBsize per Codeword** | **FDD CC** | 75376 | 36696 | 55056 | 36696 |
| | **TDD CC** | 75376/0 | 75376/0 | 75376/0 | 36696/0 |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 7 | 4 | 6 | 4 |
| | **TDD CC** | 7 | 7 | 7 | 4 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TB$_{size}$ – 184)/32) | FLOOR((TB$_{size}$ – 240)/48) | FLOOR((TB$_{size}$ – 184)/32) |
| | **TDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TB$_{size}$ – 184)/32) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1341 | 1141 | 1142 | 1141 |
| | **TDD CC** | 1341 | 1341 | 1341 | 1141 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16-8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: According to Table 8.7.5.1.1.5-1 depending on the UE category according to Table 8.7.5.1.1.5-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.36 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.5-1 and Table 8.7.5.1.1.5-1 depending on the UE category according to Table 8.7.5.1.1.5-2.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 4.5.4. Message contents are defined in clause 8.7.5.1.1.4.3.

#### 8.7.5.1.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4 with SCC configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.5.1.1.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.5.1.1.4.3-3A.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13,6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.5.1.1.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.5.1.1.5-2.

6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.5.1.1.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.5.1.1.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

#### 8.7.5.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.5.1.1.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.5.1.1.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.1.1.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.1.1.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.1.1.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

### 8.7.5.1.1.5 Test requirement

The requirements are specified in Table 8.7.5.1.1.5-1 depending on the UE category according to Table 8.7.5.1.1.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.1.1.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 2 | 10+20 | 10 | 20 | 36696 | 75376/0 | R.31-3A FDD | R.31-4 TDD | 85 |
| 2A | 15+20 | 15 | 20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 3 | 10+10 | 10 | 10 | 36696 | 36696/0 | R.31-3A FDD | R.31-6 TDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: The TB success rate is defined as TB success rate = $100\%*N_{DL_correct_rx}/ (N_{DL_newtx} + N_{DL_retx})$, where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

**Table 8.7.5.1.1.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6,7 | DL Cat. 9, 10 | DL Cat. 11, 12 |
| CA with 2CCs | 2x20 | 20 | 20 | - | - | 3 | 3 | 1 | 1 | - |
| | 10+20 | 10 | 20 | - | - | 3 | 3 | 2 | 2 | - |
| | 15+20 | 15 | 20 | - | - | 3 | 3 | 2A | 2A | - |
| | 10+10 | 10 | 10 | - | - | 3 | 3 | 3 | 3 | - |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 2: The test point is selected according to the UE DL Category, or UE Category (only if UE DL Category not available) as appropriate. | | | | | | | | | | |

## 8.7.5.1.2 TDD FDD CA Sustained data rate performance for FDD PCell (3DL CA)

### 8.7.5.1.2.1 Test purpose

Same test purpose as in clause 8.7.1.1.

### 8.7.5.1.2.2 Test applicability

This test applies to all types of UE Release 12 and forward of UE category 9, 10, 11 and 12, and UE DL category 9, 10, 11 and 12 that support E-UTRA FDD and TDD, 3DL TDD-FDD CA with FDD as PCell and not support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.5.1.2.3 Minimum requirements

For UE not supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.1.2.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.1.2.3-2. The TB success rate shall be sustained during at least 300 frames.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.1.2.3-1: test parameters for sustained downlink data rate (TDD FDD CA 64QAM)**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 2 | 10+20 | 10 | 20 | 36696 | 75376/0 | R.31-3A FDD | R.31-4 TDD | 85 |
| 2A | 15+20 | 15 | 20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 4 | 3x20 | 20 | 2x20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 6 | 10+20+20 | 10 | 2x20 | 36696 | 75376/0 | R.31-3A FDD | R.31-4 TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 9 | 20+20+10 | 20+10 | 20 | 75376 for 20MHz CC 36696 for 10MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-3A FDD for 10MHz CC | R.31-4 TDD | 85 |

**Table 8.7.5.1.2.3-2: Test points for sustained data rate (FRC 64QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6,7 | DL Cat. 9, 10 | DL Cat. 11, 12 |
| CA with 3CCs | 3x20 | 20 | 2x20 | - | - | - | - | 1 | 4 | 4 |
| | 15+20+20 | 15 | 2x20 | - | - | - | - | 2A | 5 | 5 |
| | 10+20+20 | 10 | 2x20 | - | - | - | - | 2 | 6 | 6 |
| | 3x20 | 2x20 | 20 | - | - | - | - | 1 | 7 | 7 |
| | 20+20+15 | 20+15 | 20 | - | - | - | - | 1 | 8 | 8 |
| | 20+20+10 | 20+10 | 20 | - | - | - | - | 1 | 9 | 9 |
| Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. Note 2: Void. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.1

### 8.7.5.1.2.4 Test description

#### 8.7.5.1.2.4.1 Initial conditions

**Table 8.7.5.1.2.4.1-1: Further test parameters per test**

| Test number | | 1 | 2 | 2A | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20 | 10 | 15 | 20 | 15 | 20 | 2x20 | 20+15 | 20+10 |
| | **TDD CC** | 20 | 20 | 20 | 2x20 | 2x20 | 2x20 | 20 | 20 | 20 |
| **DL Measurement channel** | **FDD CC** | R.31-4 FDD | R.31-3A FDD | R.31-5 FDD | R.31-4 FDD | R.31-5 FDD | R.31-4 FDD | R.31-4 FDD | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC | R.31-4 FDD for 20MHz CC,<br><br>R.31-3A FDD for 10MHz CC |
| | **TDD CC** | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD |
| **UL channel** | **FDD CC** | R.1-4 FDD | R.1-1 FDD | R.1-4B FDD | R.1-4 FDD | R.1-4B FDD | R.1-4 FDD | R.1-4 FDD | R.1-4 FDD for 20MHz CC,<br><br>R.1-4B FDD for 15MHz CC | R.1-4 FDD for 20MHz CC,<br><br>R.1-1 FDD for 10MHz CC |
| | **TDD CC** | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **TBsize per Codeword** | **FDD CC** | 75376 | 36696 | 55056 | 75376 | 55056 | 75376 | 75376 | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC | 75376 for 20MHz CC,<br><br>36696 for 10MHz CC |
| | **TDD CC** | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 7 | 4 | 6 | 7 | 6 | 7 | 7 | 7 for 20MHz CC,<br><br>6 for 15MHz CC | 7 for 20MHz CC,<br><br>4 for 10MHz CC |
| | **TDD CC** | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR ((TBsize – 264)/56) | FLOOR ((TB$_{size}$ – 184)/32) | FLOOR ((TB$_{size}$ – 240)/48) | FLOOR ((TBsize – 264)/56) | FLOOR ((TB$_{size}$ – 240)/48) | FLOOR ((TBsize – 264)/56) | FLOOR ((TBsize – 264)/56) | FLOOR ((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR ((TB$_{size}$ – 240)/48) for 15MHz CC | FLOOR ((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR ((TB$_{size}$ – 184)/32) for 10MHz CC |
| | **TDD CC** | FLOOR ((TBsize – 264)/56 | FLOOR ((TBsize – 264)/56 | FLOOR ((TBsize – 264)/56 | FLOOR ((TBsize – 264)/56 | FLOOR ((TBsize – 264)/56 | FLOOR ((TBsize – 264)/56 | FLOOR ((TBsize – 264)/56 | FLOOR ((TBsize – 264)/56 | FLOOR ((TBsize – 264)/56 |

| | | ) | ) | ) | ) | ) | ) | ) | ) | ) |
|---|---|---|---|---|---|---|---|---|---|---|
| **PDCP SDU size [Octets]** | **FDD CC** | 1341 | 1141 | 1142 | 1341 | 1142 | 1341 | 1341 | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC | 1341 for 20MHz CC,<br><br>1141 for 10MHz CC |
| | **TDD CC** | 1341 | 1341 | 1341 | 1341 | 1341 | 1341 | 1341 | 1341 | 1341 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives:
PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: According to Table 8.7.5.1.2.5-1 depending on the UE category according to Table 8.7.5.1.2.5-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.60 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.5-1 and Table 8.7.5.1.2.5-1 depending on the UE category according to Table 8.7.5.1.2.5-2.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 4.5.4. Message contents are defined in clause 8.7.5.1.2.4.3.

### 8.7.5.1.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.5.1.2.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.5.1.2.4.3-3A.

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).
5. The SS looks up $TB_{size}$ in Table 8.7.5.1.2.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.5.1.2.5-2.
6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.
7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.5.1.2.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.
8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.
9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.
10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one
11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.
12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$
13. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.5.1.2.5-1" and B = 0.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.5.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.5.1.2.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.5.1.2.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.1.2.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.1.2.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.1.2.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

### 8.7.5.1.2.5 Test requirement

The requirements are specified in Table 8.7.5.1.2.5-1 depending on the UE category according to Table 8.7.5.1.2.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.1.2.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 2 | 10+20 | 10 | 20 | 36696 | 75376/0 | R.31-3A FDD | R.31-4 TDD | 85 |
| 2A | 15+20 | 15 | 20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 4 | 3x20 | 20 | 2x20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 6 | 10+20+20 | 10 | 2x20 | 36696 | 75376/0 | R.31-3A FDD | R.31-4 TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 9 | 20+20+10 | 20+10 | 20 | 75376 for 20MHz CC 36696 for 10MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-3A FDD for 10MHz CC | R.31-4 TDD | 85 |

**Table 8.7.5.1.2.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6,7 | DL Cat. 9, 10 | DL Cat. 11, 12 |
| CA with 3CCs | 3x20 | 20 | 2x20 | - | - | - | - | 1 | 4 | 4 |
| | 15+20+20 | 15 | 2x20 | - | - | - | - | 2A | 5 | 5 |
| | 10+20+20 | 10 | 2x20 | - | - | - | - | 2 | 6 | 6 |
| | 3x20 | 2x20 | 20 | - | - | - | - | 1 | 7 | 7 |
| | 20+20+15 | 20+15 | 20 | - | - | - | - | 1 | 8 | 8 |
| | 20+20+10 | 20+10 | 20 | - | - | - | - | 1 | 9 | 9 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 2: The test point is selected according to the UE DL Category, or UE Category (only if UE DL Category not available) as appropriate.<br>Note 3: Test 1, Test 2 and Test 2A are tested in 8.7.5.1.1. | | | | | | | | | | |

## 8.7.5.1.3 TDD FDD CA Sustained data rate performance for FDD PCell (4DL CA)

### 8.7.5.1.3.1 Test purpose

Same test purpose as in clause 8.7.1.1.

### 8.7.5.1.3.2 Test applicability

This test applies to all types of UE Release 12 and forward of UE category 11 and 12, and UE DL category 11, 12 and 15 that support E-UTRA FDD and TDD, 4DL TDD-FDD CA with FDD as PCell and not support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.5.1.3.3 Minimum requirements

For UE not supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.1.3.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.1.3.3-2. The TB success rate shall be sustained during at least 300 frames.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.1.3.3-1: test parameters for sustained downlink data rate (TDD FDD CA 64QAM)**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 4 | 3x20 | 20 | 2x20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 10 | 4x20 | 20 | 3x20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 11 | 4x20 | 2×20 | 2×20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 12 | 3x20+15 | 20+15 | 2×20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 13 | 2×15+2x20 | 2×15 | 2x20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 14 | 3x20+15 | 2×20+15 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 15 | 2×15+2x20 | 2x15+20 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 15A | 3x20+10 | 2x20+10 | 20 | 75376 for 20MHz CC 36696 for 10MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-3A FDD for 10MHz CC | R.31-4 TDD | 85 |
| 15B | 2x15+2x20 | 2x15+20 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |

**Table 8.7.5.1.3.3-2: Test points for sustained data rate (FRC 64QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6, 7 | DL Cat. 9, 10 | DL Cat. 11, 12 | |
| CA with 4CCs | 4x20 | 20 | 3x20 | - | - | - | - | - | 4 | 10 | 10 |
| | 4x20 | 2×20 | 2×20 | - | - | - | - | - | 4 or 7 | 11 | 11 |
| | 3x20+15 | 20+15 | 2×20 | - | - | - | - | - | 4 | 12 | 12 |
| | 2×15+2x20 | 2×15 | 2x20 | - | - | - | - | - | 5 | 13 | 13 |
| | 3x20+15 | 2×20+15 | 20 | - | - | - | - | - | 7 | 14 | 14 |
| | 2×15+2x20 | 2x15+20 | 20 | - | - | - | - | - | 8 | 15 | 15 |
| | 3x20+10 | 2x20+10 | 20 | - | - | - | - | - | 7 | 15A | 15A |
| | 2x15+2x20 | 2x15+20 | 20 | - | - | - | - | - | 8 | 15B | 15B |

Note 1: Void.
Note 2: Void.
Note 3: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.1

### 8.7.5.1.3.4 Test description

#### 8.7.5.1.3.4.1 Initial conditions

**Table 8.7.5.1.3.4.1-1: Further test parameters per test (Test number #4 - #11)**

| Test number | | 4 | 5 | 7 | 8 | 10 | 11 |
|---|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20 | 15 | 2x20 | 20+15 | 20 | 2x20 |
| | **TDD CC** | 2x20 | 2x20 | 20 | 20 | 3x20 | 2x20 |
| **DL Measurement channel** | **FDD CC** | R.31-4 FDD | R.31-5 FDD | R.31-4 FDD | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC | R.31-4 FDD | R.31-4 FDD |
| | **TDD CC** | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD |
| **UL channel** | **FDD CC** | R.1-4 FDD | R.1-4B FDD | R.1-4 FDD | R.1-4 FDD for 20MHz CC,<br><br>R.1-4B FDD for 15MHz CC | R.1-4 FDD | R.1-4 FDD |
| | **TDD CC** | NA | NA | NA | NA | NA | NA |
| **TBsize per Codeword** | **FDD CC** | 75376 | 55056 | 75376 | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC | 75376 | 75376 |
| | **TDD CC** | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 7 | 6 | 7 | 7 for 20MHz CC,<br><br>6 for 15MHz CC | 7 | 7 |
| | **TDD CC** | 7 | 7 | 7 | 7 | 7 | 7 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TB$_{size}$ – 240)/48) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15MHz CC | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) |
| | **TDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1341 | 1142 | 1341 | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC | 1341 | 1341 |
| | **TDD CC** | 1341 | 1341 | 1341 | 1341 | 1341 | 1341 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS

| | |
|---|---|
| | 24.301 clause 9.9.4.12).<br>The PDCP SDU size of each PDCP SDU is:<br>PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,<br>where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives:<br>PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.<br>The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test. |

**Table 8.7.5.1.3.4.1-2: Further test parameters per test (Test number #12 - #15B)**

| Test number | | 12 | 13 | 14 | 15 | 15A | 15B |
|---|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20+15 | 2x15 | 2x20+15 | 2x15+20 | 2x20+10 | 2x15+20 |
| | **TDD CC** | 2x20 | 2x20 | 20 | 20 | 20 | 20 |
| **DL Measurement channel** | **FDD CC** | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC | R.31-5 FDD | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC | R.31-4 FDD for 20MHz CC,<br><br>R.31-3A FDD for 10MHz CC | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC |
| | **TDD CC** | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD |
| **UL channel** | **FDD CC** | R.1-4 FDD for 20MHz CC,<br><br>R.1-4B FDD for 15MHz CC | R.1-4B FDD | R.1-4 FDD for 20MHz CC,<br><br>R.1-4B FDD for 15MHz CC | R.1-4 FDD for 20MHz CC,<br><br>R.1-4B FDD for 15MHz CC | R.1-4 FDD for 20MHz CC,<br><br>R.1-1 FDD for 10MHz CC | R.1-4 FDD for 20MHz CC,<br><br>R.1-4B FDD for 15MHz CC |
| | **TDD CC** | NA | NA | NA | NA | NA | NA |
| **TBsize per Codeword** | **FDD CC** | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC | 55056 | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC | 75376 for 20MHz CC,<br><br>36696 for 10MHz CC | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC |
| | **TDD CC** | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 7 for 20MHz CC,<br><br>6 for 15MHz CC | 6 | 7 for 20MHz CC,<br><br>6 for 15MHz CC | 7 for 20MHz CC,<br><br>6 for 15MHz CC | 7 for 20MHz CC,<br><br>4 for 10MHz CC | 7 for 20MHz CC,<br><br>6 for 15MHz CC |
| | **TDD CC** | 7 | 7 | 7 | 7 | 7 | 7 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15MHz CC | FLOOR((TB$_{size}$ – 240)/48) | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15MHz CC | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15MHz CC | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 184)/32) for 10MHz CC | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15MHz CC |
| | **TDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC | 1142 | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC | 1341 for 20MHz CC,<br><br>1141 for 10MHz CC | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC |
| | **TDD CC** | 1341 | 1341 | 1341 | 1341 | 1341 | 1341 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is

| |
|---|
| CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.<br>The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test. |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: According to Table 8.7.5.1.3.5-1 depending on the UE category according to Table 8.7.5.1.3.5-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.60 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.5-1 and Table 8.7.5.1.3.5-1 depending on the UE category according to Table 8.7.5.1.3.5-2.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 4.5.4. Message contents are defined in clause 8.7.5.1.3.4.3.

### 8.7.5.1.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.5.1.3.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.5.1.3.4.3-3A.

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.5.1.3.4.1-1 and Table 8.7.5.1.3.4.1-2 for the tests to be performed depending on the UE category according to Table 8.7.5.1.3.5-2.

6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.5.1.3.4.1-1 and Table 8.7.5.1.3.4.1-2 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as A = 100%*$N_{DL_newtx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$). Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as B = $N_{DL_PDCP}$ - $N_{UL_PDCP}$

13. The UE passes the test if A ≥ "corresponding TB success rate according to Table 8.7.5.1.3.5-1" and B = 0.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

#### 8.7.5.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.5.1.3.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.5.1.3.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.1.3.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.1.3.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.1.3.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

### 8.7.5.1.3.5 Test requirement

The requirements are specified in Table 8.7.5.1.3.5-1 depending on the UE category according to Table 8.7.5.1.3.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.1.3.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 4 | 3x20 | 20 | 2x20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 10 | 4x20 | 20 | 3x20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 11 | 4x20 | 2×20 | 2×20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 12 | 3x20+15 | 20+15 | 2×20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 13 | 2×15+2x20 | 2×15 | 2x20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 14 | 3x20+15 | 2×20+15 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 15 | 2×15+2x20 | 2x15+20 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 15A | 3x20+10 | 2x20+10 | 20 | 75376 for 20MHz CC 36696 for 10MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-3A FDD for 10MHz CC | R.31-4 TDD | 85 |
| 15B | 2x15+2x20 | 2x15+20 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |

**Table 8.7.5.1.3.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6, 7 | DL Cat. 9, 10 | DL Cat. 11, 12 | |
| CA with 4CCs | 4x20 | 20 | 3x20 | - | - | - | - | - | 4 | 10 | 10 |
| | 4x20 | 2×20 | 2×20 | - | - | - | - | - | 4 or 7 | 11 | 11 |
| | 3x20+15 | 20+15 | 2×20 | - | - | - | - | - | 4 | 12 | 12 |
| | 2×15+2x20 | 2×15 | 2x20 | - | - | - | - | - | 5 | 13 | 13 |
| | 3x20+15 | 2×20+15 | 20 | - | - | - | - | - | 7 | 14 | 14 |
| | 2×15+2x20 | 2x15+20 | 20 | - | - | - | - | - | 8 | 15 | 15 |
| | 3x20+10 | 2x20+10 | 20 | - | - | - | - | - | 7 | 15A | 15A |
| | 2x15+2x20 | 2x15+20 | 20 | - | - | - | - | - | 8 | 15B | 15B |

Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.
Note 2: The test point is selected according to the UE DL Category, or UE Category (only if UE DL Category not available) as appropriate.
Note 3: Test 4, Test 5, Test 7, and Test 8 are tested in 8.7.5.1.2.

### 8.7.5.1.4 TDD FDD CA Sustained data rate performance for FDD PCell (5DL CA)

#### 8.7.5.1.4.1 Test purpose

Same test purpose as in clause 8.7.1.1.

#### 8.7.5.1.4.2 Test applicability

This test applies to all types of UE Release 12 and forward of UE DL category 15 that support E-UTRA FDD and TDD, 5DL TDD-FDD CA with FDD as PCell and not support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.7.5.1.4.3 Minimum requirements

For UE not supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.1.4.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.1.4.3-2. The TB success rate shall be sustained during at least 300 frames.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.1.4.3-1: test parameters for sustained downlink data rate (TDD FDD CA 64QAM)**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 11 | 4x20 | 2×20 | 2×20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 12 | 3x20+15 | 20+15 | 2×20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 16 | 4x20+15 | 2x20+15 | 2x20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 17 | 2x15+3x20 | 2x15+20 | 2x20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |

**Table 8.7.5.1.4.3-2: Test points for sustained data rate (FRC 64QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6, 7 | DL Cat. 9, 10 | DL Cat. 11, 12 | |
| CA with 5 CCs | 4x20+15 | 2x20+15 | 2x20 | - | - | - | - | - | - | 11 | 16 |
| | 2x15+3x20 | 2x15+20 | 2x20 | - | - | - | - | - | - | 12 | 17 |
| Note 1: Void.<br>Note 2: Void.<br>Note 3: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.1

### 8.7.5.1.4.4 Test description

#### 8.7.5.1.4.4.1 Initial conditions

**Table 8.7.5.1.4.4.1-1: Further test parameters per test**

| Test number | | 11 | 12 | 16 | 17 |
|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 2x20 | 20+15 | 2x20+15 | 2x15+20 |
| | **TDD CC** | 2x20 | 2x20 | 2x20 | 2x20 |
| **DL Measurement channel** | **FDD CC** | R.31-4 FDD | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC |
| | **TDD CC** | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD |
| **UL channel** | **FDD CC** | R.1-4 FDD | R.1-4 FDD for 20MHz CC | R.1-4 FDD for 20MHz CC | R.1-4 FDD for 20MHz CC |
| | **TDD CC** | NA | NA | NA | NA |
| **TBsize per Codeword** | **FDD CC** | 75376 | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC |
| | **TDD CC** | 75376/0 | 75376/0 | 75376/0 | 75376/0 |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 7 | 7 for 20MHz CC,<br><br>6 for 15MHz CC | 7 for 20MHz CC,<br><br>6 for 15MHz CC | 7 for 20MHz CC,<br><br>6 for 15MHz CC |
| | **TDD CC** | 7 | 7 | 7 | 7 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR(($TB_{size}$ – 240)/48) for 15MHz CC | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR(($TB_{size}$ – 240)/48) for 15MHz CC | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR(($TB_{size}$ – 240)/48) for 15MHz CC |
| | **TDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1341 | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC |
| | **TDD CC** | 1341 | 1341 | 1341 | 1341 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: According to Table 8.7.5.1.4.5-1 depending on the UE category according to Table 8.7.5.1.4.5-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.60 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.5-1 and Table 8.7.5.1.4.5-1 depending on the UE category according to Table 8.7.5.1.4.5-2.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 4.5.4. Message contents are defined in clause 8.7.5.1.4.4.3.

#### 8.7.5.1.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.5.1.4.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.5.1.4.4.3-3A.

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.5.1.4.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.5.1.4.5-2.

6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.5.1.4.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.5.1.4.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

8.7.5.1.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.5.1.4.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.5.1.4.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.1.4.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.1.4.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.1.4.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

### 8.7.5.1.4.5 Test requirement

The requirements are specified in Table 8.7.5.1.4.5-1 depending on the UE category according to Table 8.7.5.1.4.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.1.4.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 11 | 4x20 | 2×20 | 2×20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 12 | 3x20+15 | 20+15 | 2×20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 16 | 4x20+15 | 2x20+15 | 2x20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 17 | 2x15+3x20 | 2x15+20 | 2x20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |

**Table 8.7.5.1.4.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6, 7 | DL Cat. 9, 10 | DL Cat. 11, 12 | |
| CA with 5 CCs | 4x20+15 | 2x20+15 | 2x20 | - | - | - | - | - | - | 11 | 16 |
| | 2x15+3x20 | 2x15+20 | 2x20 | - | - | - | - | - | - | 12 | 17 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 2: The test point is selected according to the UE DL Category, or UE Category (only if UE DL Category not available) as appropriate.<br>Note 3: Test 11 and 12 are tested in clause 8.7.5.1.3 | | | | | | | | | | | |

## 8.7.5.1_H TDD FDD CA Sustained data rate performance for FDD PCell for 256QAM in DL

Editor's notes:

- Discussion on DL EVM for 256QAM demodulation test as per R5-155895 is still ongoing

- Whether UL modulation mode QPSK is suitable to use is FFS

## 8.7.5.1_H.1 TDD FDD CA Sustained data rate performance for FDD PCell (2DL CA) for 256QAM in DL

### 8.7.5.1_H.1.1 Test purpose

Same test purpose as in clause 8.7.1.1.

### 8.7.5.1_H.1.2 Test applicability

This test applies to all types of UE Release 12 and forward of UE DL category 11, 12 and 13 that support 256QAM in DL and support E-UTRA FDD and TDD, 2DL TDD-FDD CA with FDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.5.1_H.1.3 Minimum requirements

For UE supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.1_H.1.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category or UE DL category, and bandwidth combination with the maximum aggregated bandwidth as specified in Table 8.7.5.1_H.1.3-2. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.5.1.1.3-1 is not applicable.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.1_H.1.3-1: Minimum requirement (TDD FDD CA 256QAM)**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 2 | 10+20 | 10 | 20 | R.68-2 FDD | R.68 TDD | 85 |
| 3 | 15+20 | 15 | 20 | R.68-1 FDD | R.68 TDD | 85 |

**Table 8.7.5.1_H.1.3-2: Test points for sustained data rate (FRC 256QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 2CCs | 2x20 | 20 | 20 | 1 | 1 | | | | |
| | 10+20 | 10 | 20 | 2 | 2 | | | | |
| | 15+20 | 15 | 20 | 3 | 3 | | | | |
| Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.1

## 8.7.5.1_H.1.4 Test description

Same test description as in clause 8.7.5.1.1.4 with the following exceptions:

- Instead of Table 8.7.5.1.1.4.1-1 -> use Table 8.7.5.1_H.1.4-1.
- Instead of Table 8.7.5.1.1.5-1 -> use Table 8.7.5.1_H.1.5-1.
- Instead of Table 8.7.5.1.1.5-2 -> use Table 8.7.5.1_H.1.5-2.

**Table 8.7.5.1_H.1.4-1: Further test parameters per test**

| Test number | | 1 | 2 | 3 |
|---|---|---|---|---|
| Bandwidth | FDD CC | 20 | 10 | 15 |
| | TDD CC | 20 | 20 | 20 |
| DL Measurement channel | FDD CC | R.68 FDD | R.68-2 FDD | R.68-1 FDD |
| | TDD CC | R.68 FDD | R.68 FDD | R.68 FDD |
| UL channel | FDD CC | R.1-4 FDD | R.1-1 FDD | R.1-4B FDD |
| | TDD CC | NA | NA | NA |
| TBsize per Codeword | FDD CC | 97896(Note 3) | 48936(Note 5) | 75376(Note 4) |
| | TDD CC | 97896/0(Note 6) | 97896/0(Note 6) | 97896/0(Note 6) |
| Number of PDCP SDU per Codeword | FDD CC | 10 | 5 | 7 |
| | TDD CC | 10/0 | 10/0 | 10/0 |
| PDCP SDU size [Octets] Calculation (Note 1) | FDD CC | FLOOR(($TB_{size}$ - 352)/80) | FLOOR((TBsize – 208)/40) | FLOOR((TBsize – 264)/56) |
| | TDD CC | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) |
| PDCP SDU size [Octets] | FDD CC | 1219 | 1218 | 1341 |
| | TDD CC | 1219/0 | 1219/0 | 1219/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16-8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

Note 4: 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5.

Note 5: 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5.

Note 6: 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5.

## 8.7.5.1_H.1.5 Test requirement

The requirements are specified in Table 8.7.5.1_H.1.5-1 depending on the UE category according to Table 8.7.5.1_H.1.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.1_H.1.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 2 | 10+20 | 10 | 20 | R.68-2 FDD | R.68 TDD | 85 |
| 3 | 15+20 | 15 | 20 | R.68-1 FDD | R.68 TDD | [85] |

**Table 8.7.5.1_H.1.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 2CCs | 2x20 | 20 | 20 | 1 | 1 | | | | |
| | 10+20 | 10 | 20 | 2 | 2 | | | | |
| | 15+20 | 15 | 20 | 3 | 3 | | | | |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | | | | | | |
| Note 2: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | | | |

## 8.7.5.1_H.2 TDD FDD CA Sustained data rate performance for FDD PCell (3DL CA) for 256QAM in DL

### 8.7.5.1_H.2.1 Test purpose

Same test purpose as in clause 8.7.1.1.

### 8.7.5.1_H.2.2 Test applicability

This test applies to Release 12 and forward of UE DL category 11, 12 and 15 UE that support 256QAM in DL and E-UTRA FDD and TDD, 3DL TDD-FDD CA with FDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.5.1_H.2.3 Minimum requirements

For UE supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.1_H.2.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category or UE DL category, and bandwidth combination with the maximum aggregated bandwidth as specified in Table 8.7.5.1_H.2.3-2. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.5.1.2.3-1 is not applicable.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.1_H.2.3-1: Minimum requirement (TDD FDD CA 256QAM)**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 2 | 10+20 | 10 | 20 | R.68-2 FDD | R.68 TDD | 85 |
| 3 | 15+20 | 15 | 20 | R.68-1 FDD | R.68 TDD | 85 |
| 4 | 3x20 | 20 | 2x20 | R.68 FDD | R.68 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | R.68-1 FDD | R.68 TDD | 85 |
| 6 | 10+20+20 | 10 | 2x20 | R.68-2 FDD | R.68TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 9 | 20+20+10 | 20+10 | 20 | R.68 FDD for 20MHz CC, R.68-2 FDD for 10MHz CC | R.68 TDD | 85 |
| 9A | 20+10+10 | 2x10 | 20 | R.68-2 FDD | R.68 TDD | 85 |

**Table 8.7.5.1_H.2.3-2: Test points for sustained data rate (FRC 256QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 3CCs | 3x20 | 20 | 2x20 | 4 | 1 | 4 | - | | |
| | 15+20+20 | 15 | 2x20 | 5 | 3 | 5 | - | | |
| | 10+20+20 | 10 | 2x20 | 6 | 2 | 6 | - | | |
| | 3x20 | 2x20 | 20 | 7 | 1 | 7 | - | | |
| | 20+20+15 | 20+15 | 20 | 8 | 1 | 8 | - | | |
| | 20+20+10 | 20+10 | 20 | 9 | 1 | 9 | - | | |
| | 20+10+10 | 2x10 | 20 | 9A | 2 | 9A | | | |
| Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.1

## 8.7.5.1_H.2.4 Test description

Same test description as in clause 8.7.5.1.2.4 with the following exceptions:

- Instead of Table 8.7.5.1.2.4.1-1 -> use Table 8.7.5.1_H.2.4-1 and Table 8.7.5.1_H.2.4-2.
- Instead of Table 8.7.5.1.2.5-1 -> use Table 8.7.5.1_H.2.5-1.
- Instead of Table 8.7.5.1.2.5-2 -> use Table 8.7.5.1_H.2.5-2.

**Table 8.7.5.1_H.2.4-1: Further test parameters per test (Test number #1 - #5)**

| Test number | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20 | 10 | 15 | 20 | 15 |
| | **TDD CC** | 20 | 20 | 20 | 2x20 | 2x20 |
| **DL Measurement channel** | **FDD CC** | R.68 FDD | R.68-2 FDD | R.68-1 FDD | R.68 FDD | R.68-1 FDD |
| | **TDD CC** | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD |
| **UL channel** | **FDD CC** | R.1-4 FDD | R.1-1 FDD | R.1-4B FDD | R.1-4 FDD | R.1-4B FDD |
| | **TDD CC** | NA | NA | NA | NA | NA |
| **TBsize per Codeword** | **FDD CC** | 97896(Note 3) | 48936(Note 5) | 75376(Note 4) | 97896(Note 3) | 75376(Note 4) |
| | **TDD CC** | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 10 | 5 | 7 | 10 | 7 |
| | **TDD CC** | 10/0 | 10/0 | 10/0 | 10/0 | 10/0 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR(($TB_{size}$ - 352)/80) | FLOOR((TBsize – 208)/40) | FLOOR((TBsize – 264)/56) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR((TBsize – 264)/56) |
| | **TDD CC** | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1219 | 1218 | 1341 | 1219 | 1341 |
| | **TDD CC** | 1219/0 | 1219/0 | 1219/0 | 1219/0 | 1219/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

Note 4: 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5.

Note 5: 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5.

Note 6: 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5.

**Table 8.7.5.1_H.2.4-2: Further test parameters per test (Test number #6 - #9A)**

| Test number | | 6 | 7 | 8 | 9 | 9A |
|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 10 | 2x20 | 20+15 | 20+10 | 2x10 |
| | **TDD CC** | 2x20 | 20 | 20 | 20 | 20 |
| **DL Measurement channel** | **FDD CC** | R.68-2 FDD | R.68 FDD | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 FDD for 20MHz CC, R.68-2 FDD for 10MHz CC | R.68-2 FDD |
| | **TDD CC** | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD |
| **UL channel** | **FDD CC** | R.1-1 FDD | R.1-4 FDD | R.1-4 FDD for 20MHz CC, R.1-4B FDD for 15MHz CC | R.1-4 FDD for 20MHz CC, R.1-1 FDD for 10MHz CC | R.1-1 FDD |
| | **TDD CC** | NA | NA | NA | NA | NA |
| **TBsize per Codeword** | **FDD CC** | 48936(Note 5) | 97896(Note 3) | 97896(Note 3) for 20MHz CC, 75376(Note 4) for 15MHz CC | 97896(Note 3) for 20MHz CC, 48936(Note 5) for 10MHz CC | 48936(Note 5) |
| | **TDD CC** | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 5 | 10 | 10 for 20MHz CC, 7 for 15MHz CC | 10 for 20MHz CC, 5 for 10MHz CC | 5 |
| | **TDD CC** | 10/0 | 10/0 | 10/0 | 10/0 | 10/0 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR((TBsize – 208)/40) | FLOOR((TB$_{size}$ - 352)/80) | FLOOR((TB$_{size}$ - 352)/80) for 20MHz CC, FLOOR((TBsize – 264)/56) for 15MHz CC | FLOOR((TB$_{size}$ - 352)/80) for 20MHz CC, FLOOR((TBsize – 208)/40) for 10MHz CC | FLOOR((TBsize – 208)/40) |
| | **TDD CC** | FLOOR((TB$_{size}$ - 352)/80) | FLOOR((TB$_{size}$ - 352)/80) | FLOOR((TB$_{size}$ - 352)/80) | FLOOR((TB$_{size}$ - 352)/80) | FLOOR((TB$_{size}$ - 352)/80) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1218 | 1219 | 1219 for 20MHz CC, 1341 for 15MHz CC | 1219 for 20MHz CC, 1218 for 10MHz CC | 1218 |
| | **TDD CC** | 1219/0 | 1219/0 | 1219/0 | 1219/0 | 1219/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

Note 4: 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5.

Note 5: 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5.

Note 6: 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5.

## 8.7.5.1_H.2.5 Test requirement

The requirements are specified in Table 8.7.5.1_H.2.5-1 depending on the UE category according to Table 8.7.5.1_H.2.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.1_H.2.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 2 | 10+20 | 10 | 20 | R.68-2 FDD | R.68 TDD | 85 |
| 3 | 15+20 | 15 | 20 | R.68-1 FDD | R.68 TDD | 85 |
| 4 | 3x20 | 20 | 2x20 | R.68 FDD | R.68 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | R.68-1 FDD | R.68 TDD | 85 |
| 6 | 10+20+20 | 10 | 2x20 | R.68-2 FDD | R.68TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 9 | 20+20+10 | 20+10 | 20 | R.68 FDD for 20MHz CC, R.68-2 FDD for 10MHz CC | R.68 TDD | 85 |
| 9A | 20+10+10 | 2x10 | 20 | R.68-2 FDD | R.68 TDD | 85 |

**Table 8.7.5.1_H.2.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 3CCs | 3x20 | 20 | 2x20 | 4 | 1 | 4 | - | | |
| | 15+20+20 | 15 | 2x20 | 5 | 3 | 5 | - | | |
| | 10+20+20 | 10 | 2x20 | 6 | 2 | 6 | - | | |
| | 3x20 | 2x20 | 20 | 7 | 1 | 7 | - | | |
| | 20+20+15 | 20+15 | 20 | 8 | 1 | 8 | - | | |
| | 20+20+10 | 20+10 | 20 | 9 | 1 | 9 | - | | |
| | 20+10+10 | 2x10 | 20 | 9A | 2 | 9A | | | |

Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.
Note 2: The test point is selected according to the UE DL Category, or UE Category (only if UE DL Category not available) as appropriate.
Note 3: Test 1, 2, and 3 are tested in 8.7.5.1_H.1.

## 8.7.5.1_H.3 TDD FDD CA Sustained data rate performance for FDD PCell (4DL CA) for 256QAM in DL

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined.

### 8.7.5.1_H.3.1 Test purpose

Same test purpose as in clause 8.7.1.1.

### 8.7.5.1_H.3.2 Test applicability

This test applies to Release 12 and forward of UE DL category 15 and 16 that support 256QAM in DL and E-UTRA FDD and TDD, 4DL TDD-FDD CA with FDD as PCell.

### 8.7.5.1_H.3.3 Minimum requirements

For UE supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.1_H.3.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to

Annex C.3.2. The test points are applied to UE category or UE DL category, and bandwidth combination with the maximum aggregated bandwidth as specified in Table 8.7.5.1_H.3.3-2. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.5.1.3.3-1 is not applicable.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.1_H.3.3-1: Minimum requirement (TDD FDD CA 256QAM)**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 4 | 3x20 | 20 | 2x20 | R.68 FDD | R.68 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | R.68-1 FDD | R.68 TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 10 | 4x20 | 20 | 3x20 | R.68-2 FDD | R.68TDD | 85 |
| 11 | 4x20 | 2×20 | 2×20 | R.68 FDD | R.68 TDD | 85 |
| 12 | 3x20+15 | 20+15 | 2×20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 13 | 2×15+2x20 | 2×15 | 2x20 | R.68-1 FDD | R.68 TDD | 85 |
| 14 | 3x20+15 | 2×20+15 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 15 | 2×15+2x20 | 2x15+20 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 15A | 3x20+10 | 2x20+10 | 20 | R.68 FDD for 20MHz CC, R.68-2 FDD for 10MHz CC | R.68 TDD | 85 |

**Table 8.7.5.1_H.3.3-2: Test points for sustained data rate (FRC 256QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 4CCs | 4x20 | 20 | 3x20 | 4 | - | 10 | 10 | | |
| | 4x20 | 2×20 | 2×20 | 4 or 7 | - | 11 | 11 | | |
| | 3x20+15 | 20+15 | 2×20 | 8 | - | 12 | 12 | | |
| | 2×15+2x20 | 2×15 | 2x20 | 5 | - | 13 | 13 | | |
| | 3x20+15 | 2×20+15 | 20 | 7 | - | 14 | 14 | | |
| | 2×15+2x20 | 2x15+20 | 20 | 8 | - | 15 | 15 | | |
| | 3x20+10 | 2x20+10 | 20 | 7 | - | 15A | 15A | | |
| Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.1

## 8.7.5.1_H.3.4 Test description

Same test description as in clause 8.7.5.1.3.4 with the following exceptions:

- Instead of Table 8.7.5.1.3.4.1-1 -> use Table 8.7.5.1_H.3.4-1 and Table 8.7.5.1_H.3.4-2.

- Instead of Table 8.7.5.1.3.5-1 -> use Table 8.7.5.1_H.3.5-1.
- Instead of Table 8.7.5.1.3.5-2 -> use Table 8.7.5.1_H.3.5-2.

**Table 8.7.5.1_H.3.4-1: Further test parameters per test (Test number #4 - #10)**

| Test number | | 4 | 5 | 7 | 8 | 10 |
|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20 | 15 | 2x20 | 20+15 | 20 |
| | **TDD CC** | 2x20 | 2x20 | 20 | 20 | 3x20 |
| **DL Measurement channel** | **FDD CC** | R.68 FDD | R.68-1 FDD | R.68 FDD | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 FDD |
| | **TDD CC** | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD |
| **UL channel** | **FDD CC** | R.1-4 FDD | R.1-4B FDD | R.1-4 FDD | R.1-4 FDD for 20MHz CC, R.1-4B FDD for 15MHz CC | R.1-4 FDD |
| | **TDD CC** | NA | NA | NA | NA | NA |
| **TBsize per Codeword** | **FDD CC** | 97896(Note 3) | 75376(Note 4) | 97896(Note 3) | 97896(Note 3) for 20MHz CC, 75376(Note 4) for 15MHz CC | 97896(Note 3) |
| | **TDD CC** | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 10 | 7 | 10 | 10 for 20MHz CC, 7 for 15MHz CC | 10 |
| | **TDD CC** | 10/0 | 10/0 | 10/0 | 10/0 | 10/0 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR(($TB_{size}$ - 352)/80) | FLOOR((TBsize – 264)/56) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC, FLOOR((TBsize – 264)/56) for 15MHz CC | FLOOR(($TB_{size}$ - 352)/80) |
| | **TDD CC** | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1219 | 1341 | 1219 | 1219 for 20MHz CC, 1341 for 15MHz CC | 1219 |
| | **TDD CC** | 1219/0 | 1219/0 | 1219/0 | 1219/0 | 1219/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

Note 4: 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5.

Note 5: 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5.

Note 6: 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5.

**Table 8.7.5.1_H.3.4-2: Further test parameters per test (Test number #11 - #15A)**

| Test number | | 11 | 12 | 13 | 14 | 15 | 15A |
|---|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 2x20 | 20+15 | 2x15 | 2x20+15 | 2x15+20 | 2x20+10 |
| | **TDD CC** | 2x20 | 2x20 | 2x20 | 20 | 20 | 20 |
| **DL Measurement channel** | **FDD CC** | R.68 FDD | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68-1 FDD | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 FDD for 20MHz CC, R.68-2 FDD for 10MHz CC |
| | **TDD CC** | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD |
| **UL channel** | **FDD CC** | R.1-4 FDD | R.1-4 FDD for 20MHz CC, R.1-4B FDD for 15MHz CC | R.1-4B FDD | R.1-4 FDD for 20MHz CC, R.1-4B FDD for 15MHz CC | R.1-4 FDD for 20MHz CC, R.1-4B FDD for 15MHz CC | R.1-4 FDD for 20MHz CC, R.1-1 FDD for 10MHz CC |
| | **TDD CC** | NA | NA | NA | NA | NA | NA |
| **TBsize per Codeword** | **FDD CC** | 97896(Note 3) | 97896(Note 3) for 20MHz CC, 75376(Note 4) for 15MHz CC | 75376(Note 4) | 97896(Note 3) for 20MHz CC, 75376(Note 4) for 15MHz CC | 97896(Note 3) for 20MHz CC, 75376(Note 4) for 15MHz CC | 97896(Note 3) for 20MHz CC, 48936(Note 5) for 10MHz CC |
| | **TDD CC** | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 10 | 10 for 20MHz CC, 7 for 15MHz CC | 7 | 10 for 20MHz CC, 7 for 15MHz CC | 10 for 20MHz CC, 7 for 15MHz CC | 10 for 20MHz CC, 5 for 10MHz CC |
| | **TDD CC** | 10/0 | 10/0 | 10/0 | 10/0 | 10/0 | 10/0 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR(($TB_{size}$ – 352)/80) | FLOOR(($TB_{size}$ – 352)/80) for 20MHz CC, FLOOR((Tbsize – 264)/56) for 15MHz CC | FLOOR((Tbsize – 264)/56) | FLOOR(($TB_{size}$ – 352)/80) for 20MHz CC, FLOOR((Tbsize – 264)/56) for 15MHz CC | FLOOR(($TB_{size}$ – 352)/80) for 20MHz CC, FLOOR((Tbsize – 264)/56) for 15MHz CC | FLOOR(($TB_{size}$ – 352)/80) for 20MHz CC, FLOOR((Tbsize – 208)/40) for 10MHz CC |
| | **TDD CC** | FLOOR(($TB_{size}$ – 352)/80) | FLOOR(($TB_{size}$ – 352)/80) | FLOOR(($TB_{size}$ – 352)/80) | FLOOR(($TB_{size}$ – 352)/80) | FLOOR(($TB_{size}$ – 352)/80) | FLOOR(($TB_{size}$ – 352)/80) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1219 | 1219 for 20MHz CC, 1341 for 15MHz CC | 1341 | 1219 for 20MHz CC, 1341 for 15MHz CC | 1219 for 20MHz CC, 1341 for 15MHz CC | 1219 for 20MHz CC, 1218 for 10MHz CC |
| | **TDD CC** | 1219/0 | 1219/0 | 1219/0 | 1219/0 | 1219/0 | 1219/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (Tbsize – N*PDCP header size – AMD PDU header size - MAC header size – Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((Tbsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

Note 4: 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5.

Note 5: 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5.

Note 6: 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5.

### 8.7.5.1_H.3.5 Test requirement

The requirements are specified in Table 8.7.5.1_H.3.5-1 depending on the UE category according to Table 8.7.5.1_H.3.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.1_H.3.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 4 | 3x20 | 20 | 2x20 | R.68 FDD | R.68 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | R.68-1 FDD | R.68 TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 10 | 4x20 | 20 | 3x20 | R.68-2 FDD | R.68TDD | 85 |
| 11 | 4x20 | 2×20 | 2×20 | R.68 FDD | R.68 TDD | 85 |
| 12 | 3x20+15 | 20+15 | 2×20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 13 | 2×15+2x20 | 2×15 | 2x20 | R.68-1 FDD | R.68 TDD | 85 |
| 14 | 3x20+15 | 2×20+15 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 15 | 2×15+2x20 | 2x15+20 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 15A | 3x20+10 | 2×20+10 | 20 | R.68 FDD for 20MHz CC, R.68-2 FDD for 10MHz CC | R.68 TDD | 85 |

**Table 8.7.5.1_H.3.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 4CCs | 4x20 | 20 | 3x20 | 4 | - | 10 | 10 | | |
| | 4x20 | 2×20 | 2×20 | 4 or 7 | - | 11 | 11 | | |
| | 3x20+15 | 20+15 | 2×20 | 8 | - | 12 | 12 | | |
| | 2×15+2x20 | 2×15 | 2x20 | 5 | - | 13 | 13 | | |
| | 3x20+15 | 2×20+15 | 20 | 7 | - | 14 | 14 | | |
| | 2×15+2x20 | 2x15+20 | 20 | 8 | - | 15 | 15 | | |
| | 3x20+10 | 2x20+10 | 20 | 7 | - | 15A | 15A | | |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 2: The test point is selected according to the UE DL Category, or UE Category (only if UE DL Category not available) as appropriate.<br>Note 3: Test 4, 5, 7, and 8 are tested in 8.7.5.1_H.2. | | | | | | | | | |

## 8.7.5.1_H.4 TDD FDD CA Sustained data rate performance for FDD PCell (5DL CA) for 256QAM in DL

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined.

### 8.7.5.1_H.4.1 Test purpose

Same test purpose as in clause 8.7.1.1.

### 8.7.5.1_H.4.2 Test applicability

This test applies to Release 12 and forward of UE DL category 16 that support 256QAM in DL and E-UTRA FDD and TDD, 5DL TDD-FDD CA with FDD as PCell.

### 8.7.5.1_H.4.3 Minimum requirements

For UE supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.1_H.4.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category or UE DL category, and bandwidth combination with the maximum aggregated bandwidth as specified in Table 8.7.5.1_H.4.3-2. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.5.1.4.3-1 is not applicable.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.1_H.4.3-1: Minimum requirement (TDD FDD CA 256QAM)**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 12 | 3x20+15 | 20+15 | 2x20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 14 | 3x20+15 | 2x20+15 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 15 | 2x15+2x20 | 2x15+20 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 16 | 4x20+15 | 2x20+15 | 2x20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 17 | 2x15+3x20 | 2x15+20 | 2x20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |

**Table 8.7.5.1_H.4.3-2: Test points for sustained data rate (FRC 256QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 5CCs | 4x20+15 | 2x20+15 | 2x20 | - | - | 14 or 12 | 16 | | |
| | 2x15+3x20 | 2x15+20 | 2x20 | - | - | 15 or 12 | 17 | | |
| Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.1

### 8.7.5.1_H.4.4 Test description

Same test description as in clause 8.7.5.1.4.4 with the following exceptions:

- Instead of Table 8.7.5.1.4.4.1-1 -> use Table 8.7.5.1_H.4.4-1.
- Instead of Table 8.7.5.1.4.5-1 -> use Table 8.7.5.1_H.4.5-1.
- Instead of Table 8.7.5.1.4.5-2 -> use Table 8.7.5.1_H.4.5-2.

**Table 8.7.5.1_H.4.4-1: Further test parameters per test**

| Test number | | 12 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20+15 | 2x20+15 | 2x15+20 | 2x20+15 | 2x15+20 |
| | **TDD CC** | 2x20 | 20 | 20 | 2x20 | 2x20 |
| **DL Measurement channel** | **FDD CC** | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC |
| | **TDD CC** | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD |
| **UL channel** | **FDD CC** | R.1-4 FDD for 20MHz CC | R.1-4 FDD for 20MHz CC | R.1-4 FDD for 20MHz CC | R.1-4 FDD for 20MHz CC | R.1-4 FDD for 20MHz CC |
| | **TDD CC** | NA | NA | NA | NA | NA |
| **TBsize per Codeword** | **FDD CC** | 97896(Note 3) for 20MHz CC, 75376(Note 4) for 15MHz CC | 97896(Note 3) for 20MHz CC, 75376(Note 4) for 15MHz CC | 97896(Note 3) for 20MHz CC, 75376(Note 4) for 15MHz CC | 97896(Note 3) for 20MHz CC, 75376(Note 4) for 15MHz CC | 97896(Note 3) for 20MHz CC, 75376(Note 4) for 15MHz CC |
| | **TDD CC** | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 10 for 20MHz CC, 7 for 15MHz CC | 10 for 20MHz CC, 7 for 15MHz CC | 10 for 20MHz CC, 7 for 15MHz CC | 10 for 20MHz CC, 7 for 15MHz CC | 10 for 20MHz CC, 7 for 15MHz CC |
| | **TDD CC** | 10/0 | 10/0 | 10/0 | 10/0 | 10/0 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC, FLOOR((TBsize – 264)/56) for 15MHz CC | FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC, FLOOR((TBsize – 264)/56) for 15MHz CC | FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC, FLOOR((TBsize – 264)/56) for 15MHz CC | FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC, FLOOR((TBsize – 264)/56) for 15MHz CC | FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC, FLOOR((TBsize – 264)/56) for 15MHz CC |
| | **TDD CC** | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1219 for 20MHz CC, 1341 for 15MHz CC | 1219 for 20MHz CC, 1341 for 15MHz CC | 1219 for 20MHz CC, 1341 for 15MHz CC | 1219 for 20MHz CC, 1341 for 15MHz CC | 1219 for 20MHz CC, 1341 for 15MHz CC |
| | **TDD CC** | 1219/0 | 1219/0 | 1219/0 | 1219/0 | 1219/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

Note 4: 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5.

Note 5: 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5.

Note 6: 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5.

## 8.7.5.1_H.4.5 Test requirement

The requirements are specified in Table 8.7.5.1_H.4.5-1 depending on the UE category according to Table 8.7.5.1_H.4.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.1_H.4.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 16 | 4x20+15 | 2x20+15 | 2x20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 17 | 2x15+3x20 | 2x15+20 | 2x20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |

**Table 8.7.5.1_H.4.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 5CCs | 4x20+15 | 2x20+15 | 2x20 | - | - | 14 or 12 | 16 | | |
| | 2x15+3x20 | 2x15+20 | 2x20 | - | - | 15 or 12 | 17 | | |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 2: The test point is selected according to the UE DL Category.<br>Note 3: Test 12, 14, and 15 are tested in clause 8.7.5.1_H.3. | | | | | | | | | |

## 8.7.5.2 TDD FDD CA Sustained data rate performance for TDD PCell

### 8.7.5.2.1 TDD FDD CA Sustained data rate performance for TDD PCell (2DL CA)

#### 8.7.5.2.1.1 Test purpose

Same test purpose as in clause 8.7.2.1.

#### 8.7.5.2.1.2 Test applicability

This test applies to all types of UE Release 12 and forward of UE category 3, 4, 6, 7, 9 and 10 and UE DL category 6, 7, 9 and 10 that support E-UTRA FDD and TDD, 2DL TDD-FDD CA with TDD as PCell and not support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 8.7.5.2.1.3 Minimum requirements

For UE not supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.2.1.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.2.1.3-2. The TB success rate shall be sustained during at least 300 frames.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.2.1.3-1: test parameters for sustained downlink data rate (TDD FDD CA 64QAM)**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 2 | 10+20 | 10 | 20 | 36696 | 75376/0 | R.31-3A FDD | R.31-4 TDD | 85 |
| 2A | 15+20 | 15 | 20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 3 | 10+10 | 10 | 10 | 36696 | 36696/0 | R.31-3A FDD | R.31-6 TDD | 85 |

**Table 8.7.5.2.1.3-2: Test points for sustained data rate (FRC 64QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6,7 | DL Cat. 9, 10 | DL Cat. 11, 12 |
| CA with 2CCs | 2x20 | 20 | 20 | - | - | 3 | 3 | 1 | 1 | - |
| | 10+20 | 10 | 20 | - | - | 3 | 3 | 2 | 2 | - |
| | 15+20 | 15 | 20 | - | - | 3 | 3 | 2A | 2A | - |
| Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.<br>Note 2: Void | | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.2

### 8.7.5.2.1.4 Test description

#### 8.7.5.2.1.4.1 Initial conditions

**Table 8.7.5.2.1.4.1-1: Further test parameters per test**

| Test number | | 1 | 2 | 2A | 3 |
|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20 | 10 | 15 | 10 |
| | **TDD CC** | 20 | 20 | 20 | 10 |
| **DL Measurement channel** | **FDD CC** | R.31-4 FDD | R.31-3A FDD | R.31-5 FDD | R.31-3A FDD |
| | **TDD CC** | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-6 TDD |
| **UL channel** | **FDD CC** | NA | NA | NA | NA |
| | **TDD CC** | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-5 TDD |
| **TBsize per Codeword** | **FDD CC** | 75376 | 36696 | 55056 | 36696 |
| | **TDD CC** | 75376/0 | 75376/0 | 75376/0 | 36696/0 |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 7 | 4 | 6 | 4 |
| | **TDD CC** | 7 | 7 | 7 | 4 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TB$_{size}$ – 184)/32) | FLOOR((TB$_{size}$ – 240)/48) | FLOOR((TB$_{size}$ – 184)/32) |
| | **TDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TB$_{size}$ – 184)/32) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1341 | 1141 | 1142 | 1141 |
| | **TDD CC** | 1341 | 1341 | 1341 | 1141 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives:
PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: According to Table 8.7.5.2.1.5-1 depending on the UE category according to Table 8.7.5.2.1.5-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.36 (without using faders and AWGN generators for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

).

2. The parameter settings for the cell are set up according to Table 8.7.5-1 and Table 8.7.5.2.1.5-1 depending on the UE category according to Table 8.7.5.2.1.5-2.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 4.5.4. Message contents are defined in clause 8.7.5.2.1.4.3.

#### 8.7.5.2.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4 with SCC configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.5.2.1.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.5.2.1.4.3-3A.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.5.2.1.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.5.2.1.5-2.

6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.5.2.1.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.5.2.1.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

#### 8.7.5.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.5.2.1.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.5.2.1.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.2.1.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.2.1.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.2.1.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

### 8.7.5.2.1.5 Test requirement

The requirements are specified in Table 8.7.5.2.1.5-1 depending on the UE category according to Table 8.7.5.2.1.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.2.1.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 2 | 10+20 | 10 | 20 | 36696 | 75376/0 | R.31-3A FDD | R.31-4 TDD | 85 |
| 2A | 15+20 | 15 | 20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 3 | 10+10 | 10 | 10 | 36696 | 36696/0 | R.31-3A FDD | R.31-6 TDD | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.
Note 2: The TB success rate is defined as TB success rate = 100%*NDL_correct_rx/ (NDL_newtx + NDL_retx), where NDL_newtx is the number of newly transmitted DL transport blocks, NDL_retx is the number of retransmitted DL transport blocks, and NDL_correct_rx is the number of correctly received DL transport blocks.

**Table 8.7.5.2.1.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DL Cat. 6,7 | DL Cat. 9, 10 | DL Cat. 11, 12 |
| | Total | FDD CC | TDD CC | | | | | | | |
| CA with 2CCs | 2x20 | 20 | 20 | - | - | 3 | 3 | 1 | 1 | - |
| | 10+20 | 10 | 20 | - | - | 3 | 3 | 2 | 2 | - |
| | 15+20 | 15 | 20 | - | - | 3 | 3 | 2A | 2A | - |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 2: The test point is selected according to the UE DL Category, or UE Category (only if UE DL Category not available) as appropriate. | | | | | | | | | | |

## 8.7.5.2.2 TDD FDD CA Sustained data rate performance for TDD PCell (3DL CA)

### 8.7.5.2.2.1 Test purpose

Same test purpose as in clause 8.7.2.1.

### 8.7.5.2.2.2 Test applicability

This test applies to all types of UE Release 12 and forward of UE category 9, 10, 11 and 12, and UE DL category 9, 10,11 and 12 that support E-UTRA FDD and TDD, 3DL TDD-FDD CA with TDD as PCell and not support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.5.2.2.3 Minimum requirements

For UE not supporting 256QAM, the requirements for TDD FDD CA with TDD PCell are specified in Table 8.7.5.2-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.2-2. The TB success rate shall be sustained during at least 300 frames.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.2-1: test parameters for sustained downlink data rate (TDD FDD CA 64QAM)**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 2 | 10+20 | 10 | 20 | 36696 | 75376/0 | R.31-3A FDD | R.31-4 TDD | 85 |
| 2A | 15+20 | 15 | 20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 3 | 10+10 | 10 | 10 | 36696 | 36696/0 | R.31-3A FDD | R.31-6 TDD | 85 |
| 4 | 3x20 | 20 | 2x20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 6 | 10+20+20 | 10 | 2x20 | 36696 | 75376/0 | R.31-3A FDD | R.31-4 TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 9 | 20+20+10 | 20+10 | 20 | 75376 for 20MHz CC 36696 for 10MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-3A FDD for 10MHz CC | R.31-4 TDD | 85 |
| 9A | 20+10+10 | 2x10 | 20 | 36696 | 75376/0 | R.31-3A | R.31-4 TDD | 85 |

**Table 8.7.5.2-2: Test points for sustained data rate (FRC 64QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6,7 | DL Cat. 9, 10 | DL Cat. 11, 12 |
| CA with 3CCs | 3x20 | 20 | 2x20 | - | - | - | - | 1 | 4 | 4 |
| | 15+20+20 | 15 | 2x20 | - | - | - | - | 2A | 5 | 5 |
| | 10+20+20 | 10 | 2x20 | - | - | - | - | 2 | 6 | 6 |
| | 3x20 | 2x20 | 20 | - | - | - | - | 1 | 7 | 7 |
| | 20+20+15 | 20+15 | 20 | - | - | - | - | 1 | 8 | 8 |
| | 20+20+10 | 20+10 | 20 | - | - | - | - | 1 | 9 | 9 |
| | 20+10+10 | 2x10 | 20 | - | - | - | - | 2 | 9A | 9A |
| Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.<br>Note 2: Void. | | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.2

### 8.7.5.2.2.4 Test description

#### 8.7.5.2.2.4.1 Initial conditions

**Table 8.7.5.2.2.4.1-1: Further test parameters per test (Test number #1 - #6)**

| Test number | | 1 | 2 | 2A | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20 | 10 | 15 | 20 | 15 | 10 |
| | **TDD CC** | 20 | 20 | 20 | 2x20 | 2x20 | 2x20 |
| **DL Measurement channel** | **FDD CC** | R.31-4 FDD | R.31-3A FDD | R.31-5 FDD | R.31-4 FDD | R.31-5 FDD | R.31-3A FDD |
| | **TDD CC** | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD |
| **UL channel** | **FDD CC** | NA | NA | NA | NA | NA | NA |
| | **TDD CC** | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD |
| **TBsize per Codeword** | **FDD CC** | 75376 | 36696 | 55056 | 75376 | 55056 | 36696 |
| | **TDD CC** | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 7 | 4 | 6 | 7 | 6 | 4 |
| | **TDD CC** | 7 | 7 | 7 | 7 | 7 | 7 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TB$_{size}$ – 184)/32) | FLOOR((TB$_{size}$ – 240)/48) | FLOOR((TBsize – 264)/56) | FLOOR((TB$_{size}$ – 240)/48) | FLOOR((TB$_{size}$ – 184)/32) |
| | **TDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1341 | 1141 | 1142 | 1341 | 1142 | 1141 |
| | **TDD CC** | 1341 | 1341 | 1341 | 1341 | 1341 | 1341 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives:
PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

**Table 8.7.5.2.2.4.1-2: Further test parameters per test (Test number #7 - #9A)**

| Test number | | 7 | 8 | 9 | 9A |
|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 2x20 | 20+15 | 20+10 | 2x10 |
| | **TDD CC** | 20 | 20 | 20 | 20 |
| **DL Measurement channel** | **FDD CC** | R.31-4 FDD | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 FDD for 20MHz CC, R.31-3A FDD for 10MHz CC | R.31-3A |
| | **TDD CC** | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD |
| **UL channel** | **FDD CC** | NA | NA | NA | NA |
| | **TDD CC** | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD |
| **TBsize per Codeword** | **FDD CC** | 75376 | 75376 for 20MHz CC, 55056 for 15MHz CC | 75376 for 20MHz CC, 36696 for 10MHz CC | 36696 |
| | **TDD CC** | 75376/0 | 75376/0 | 75376/0 | 75376/0 |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 7 | 7 for 20MHz CC, 6 for 15MHz CC | 7 for 20MHz CC, 4 for 10MHz CC | 7 |
| | **TDD CC** | 7 | 7 | 7 | 7 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR(($TB_{size}$ – 264)/56) | FLOOR(($TB_{size}$ – 264)/56) for 20MHz CC, FLOOR(($TB_{size}$ – 240)/48) for 15MHz CC | FLOOR(($TB_{size}$ – 264)/56) for 20MHz CC, FLOOR(($TB_{size}$ – 184)/32) for 10MHz CC | FLOOR(($TB_{size}$ – 184)/32) |
| | **TDD CC** | FLOOR(($TB_{size}$ – 264)/56) | FLOOR(($TB_{size}$ – 264)/56) | FLOOR(($TB_{size}$ – 264)/56) | FLOOR(($TB_{size}$ – 264)/56) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1341 | 1341 for 20MHz CC, 1142 for 15MHz CC | 1341 for 20MHz CC, 1141 for 10MHz CC | 1141 |
| | **TDD CC** | 1341 | 1341 | 1341 | 1341 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits).
This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: According to Table 8.7.5.2.2.5-1 depending on the UE category according to Table 8.7.5.2.2.5-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.60 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.5-1 and Table 8.7.5.2.2.5-1 depending on the UE category according to Table 8.7.5.2.2.5-2.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 4.5.4. Message contents are defined in clause 8.7.5.2.2.4.3.

#### 8.7.5.2.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.5.2.2.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.5.2.2.4.3-3A.

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.5.2.2.4.1-1 and Table 8.7.5.2.2.4.1-2 for the tests to be performed depending on the UE category according to Table 8.7.5.2.2.5-2.

6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.5.2.2.4.1-1 (Note 1) and Table 8.7.5.2.2.4.1-2 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.5.2.2.5-1" and B = 0.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

#### 8.7.5.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.5.2.2.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.5.2.2.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.2.2.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.2.2.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.2.2.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

### 8.7.5.2.2.5 Test requirement

The requirements are specified in Table 8.7.5.2.2.5-1 depending on the UE category according to Table 8.7.5.2.2.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.2.2.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 4 | 3x20 | 20 | 2x20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 6 | 10+20+20 | 10 | 2x20 | 36696 | 75376/0 | R.31-3A FDD | R.31-4 TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 9 | 20+20+10 | 20+10 | 20 | 75376 for 20MHz CC 36696 for 10MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-3A FDD for 10MHz CC | R.31-4 TDD | 85 |
| 9A | 20+10+10 | 2x10 | 20 | 36696 | 75376/0 | R.31-3A | R.31-4 TDD | 85 |

**Table 8.7.5.2.2.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6,7 | DL Cat. 9, 10 | DL Cat. 11, 12 |
| CA with 3CCs | 3x20 | 20 | 2x20 | - | - | - | - | 1 | 4 | 4 |
| | 15+20+20 | 15 | 2x20 | - | - | - | - | 2A | 5 | 5 |
| | 10+20+20 | 10 | 2x20 | - | - | - | - | 2 | 6 | 6 |
| | 3x20 | 2x20 | 20 | - | - | - | - | 1 | 7 | 7 |
| | 20+20+15 | 20+15 | 20 | - | - | - | - | 1 | 8 | 8 |
| | 20+20+10 | 20+10 | 20 | - | - | - | - | 1 | 9 | 9 |
| | 20+10+10 | 2x10 | 20 | - | - | - | - | 2 | 9A | 9A |

Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.
Note 2: The test point is selected according to the UE DL Category, or UE Category (only if UE DL Category not available) as appropriate.
Note 3: Test 1, 2, and 2A are tested in clause 8.7.5.2.1.

## 8.7.5.2.3 TDD FDD CA Sustained data rate performance for TDD PCell (4DL CA)

### 8.7.5.2.3.1 Test purpose

Same test purpose as in clause 8.7.2.1.

### 8.7.5.2.3.2 Test applicability

This test applies to all types of UE Release 13 and forward of UE category 11 and 12, and UE DL category 11, 12 and 15 that support E-UTRA FDD and TDD, 4DL TDD-FDD CA with TDD as PCell and not support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.5.2.3.3 Minimum requirements

For UE not supporting 256QAM, the requirements for TDD FDD CA with TDD PCell are specified in Table 8.7.5.2.3.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.2.3.3-2. The TB success rate shall be sustained during at least 300 frames.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.2.3.3-1: test parameters for sustained downlink data rate (TDD FDD CA 64QAM)**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 4 | 3x20 | 20 | 2x20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 10 | 4x20 | 20 | 3x20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 11 | 4x20 | 2×20 | 2×20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 12 | 3x20+15 | 20+15 | 2×20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 13 | 2×15+2x20 | 2×15 | 2x20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 14 | 3x20+15 | 2×20+15 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 15 | 2×15+2x20 | 2x15+20 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 15A | 3x20+10 | 2x20+10 | 20 | 75376 for 20MHz CC 36696 for 10MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-3A FDD for 10MHz CC | R.31-4 TDD | 85 |
| 15B | 2x15+2x20 | 2x15+20 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |

**Table 8.7.5.2.3.3-2: Test points for sustained data rate (FRC 64QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6, 7 | DL Cat. 9, 10 | DL Cat. 11, 12 | |
| CA with 4CCs | 4x20 | 20 | 3x20 | - | - | - | - | - | 4 | 10 | 10 |
| | 4x20 | 2×20 | 2×20 | - | - | - | - | - | 4 or 7 | 11 | 11 |
| | 3x20+15 | 20+15 | 2×20 | - | - | - | - | - | 4 | 12 | 12 |
| | 2×15+2x20 | 2×15 | 2x20 | - | - | - | - | - | 5 | 13 | 13 |
| | 3x20+15 | 2×20+15 | 20 | - | - | - | - | - | 7 | 14 | 14 |
| | 2×15+2x20 | 2x15+20 | 20 | - | - | - | - | - | 8 | 15 | 15 |
| | 3x20+10 | 2x20+10 | 20 | - | - | - | - | - | 7 | 15A | 15A |
| | 2x15+2x20 | 2x15+20 | 20 | - | - | - | - | - | 8 | 15B | 15B |
| Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.2

### 8.7.5.2.3.4 Test description

#### 8.7.5.2.3.4.1 Initial conditions

**Table 8.7.5.2.3.4.1-1: Further test parameters per test (Test number #4 - #11)**

| Test number | | 4 | 5 | 7 | 8 | 10 | 11 |
|---|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20 | 15 | 2x20 | 20+15 | 20 | 2x20 |
| | **TDD CC** | 2x20 | 2x20 | 20 | 20 | 3x20 | 2x20 |
| **DL Measurement channel** | **FDD CC** | R.31-4 FDD | R.31-5 FDD | R.31-4 FDD | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC | R.31-4 FDD | R.31-4 FDD |
| | **TDD CC** | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD |
| **UL channel** | **FDD CC** | NA | NA | NA | NA | NA | NA |
| | **TDD CC** | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD |
| **TBsize per Codeword** | **FDD CC** | 75376 | 55056 | 75376 | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC | 75376 | 75376 |
| | **TDD CC** | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 7 | 6 | 7 | 7 for 20MHz CC,<br>6 for 15MHz CC | 7 | 7 |
| | **TDD CC** | 7 | 7 | 7 | 7 | 7 | 7 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TB$_{size}$ – 240)/48) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15MHz CC | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) |
| | **TDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1341 | 1142 | 1341 | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC | 1341 | 1341 |
| | **TDD CC** | 1341 | 1341 | 1341 | 1341 | 1341 | 1341 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

**Table 8.7.5.2.3.4.1-2: Further test parameters per test (Test number #12 - #15B)**

| Test number | | 12 | 13 | 14 | 15 | 15A | 15B |
|---|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20+15 | 2x15 | 2x20+15 | 2x15+20 | 2x20+10 | 2x15+20 |
| | **TDD CC** | 2x20 | 2x20 | 20 | 20 | 20 | 20 |
| **DL Measurement channel** | **FDD CC** | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC | R.31-5 FDD | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC | R.31-4 FDD for 20MHz CC,<br><br>R.31-3A FDD for 10MHz CC | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC |
| | **TDD CC** | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD |
| **UL channel** | **FDD CC** | NA | NA | NA | NA | NA | NA |
| | **TDD CC** | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD |
| **TBsize per Codeword** | **FDD CC** | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC | 55056 | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC | 75376 for 20MHz CC,<br><br>36696 for 10MHz CC | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC |
| | **TDD CC** | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 | 75376/0 |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 7 for 20MHz CC,<br><br>6 for 15MHz CC | 6 | 7 for 20MHz CC,<br><br>6 for 15MHz CC | 7 for 20MHz CC,<br><br>6 for 15MHz CC | 7 for 20MHz CC,<br><br>4 for 10MHz CC | 7 for 20MHz CC,<br><br>6 for 15MHz CC |
| | **TDD CC** | 7 | 7 | 7 | 7 | 7 | 7 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15MHz CC | FLOOR((TB$_{size}$ – 240)/48) | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15MHz CC | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15MHz CC | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 184)/32) for 10MHz CC | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15MHz CC |
| | **TDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC | 1142 | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC | 1341 for 20MHz CC,<br><br>1141 for 10MHz CC | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC |
| | **TDD CC** | 1341 | 1341 | 1341 | 1341 | 1341 | 1341 |

| | |
|---|---|
| Note 1: | Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers. |
| Note 2: | Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).<br>The PDCP SDU size of each PDCP SDU is:<br>PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,<br>where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.<br>The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test. |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: According to Table 8.7.5.2.3.5-1 depending on the UE category according to Table 8.7.5.2.3.5-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.60 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.5-1 and Table 8.7.5.2.3.5-1 depending on the UE category according to Table 8.7.5.2.3.5-2.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 4.5.4. Message contents are defined in clause 8.7.5.2.3.4.3.

### 8.7.5.2.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.5.2.3.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.5.2.3.4.3-3A.

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.5.2.3.4.1-1 and Table 8.7.5.2.3.4.1-2 for the tests to be performed depending on the UE category according to Table 8.7.5.2.3.5-2.

6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.5.2.3.4.1-1 and Table 8.7.5.2.3.4.1-2 (Note 1). The SS ciphers the PDCP SDUs, concatenates the

resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.5.2.3.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

#### 8.7.5.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.5.2.3.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.5.2.3.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.2.3.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.2.3.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.2.3.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

### 8.7.5.2.3.5 Test requirement

The requirements are specified in Table 8.7.5.2.3.5-1 depending on the UE category according to Table 8.7.5.2.3.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.2.3.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 10 | 4x20 | 20 | 3x20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 11 | 4x20 | 2×20 | 2×20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 12 | 3x20+15 | 20+15 | 2×20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 13 | 2×15+2x20 | 2×15 | 2x20 | 55056 | 75376/0 | R.31-5 FDD | R.31-4 TDD | 85 |
| 14 | 3x20+15 | 2×20+15 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 15 | 2×15+2x20 | 2x15+20 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 15A | 3x20+10 | 2x20+10 | 20 | 75376 for 20MHz CC 36696 for 10MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-3A FDD for 10MHz CC | R.31-4 TDD | 85 |
| 15B | 2x15+2x20 | 2x15+20 | 20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |

**Table 8.7.5.2.3.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6, 7 | DL Cat. 9, 10 | DL Cat. 11, 12 | |
| CA with 4CCs | 4x20 | 20 | 3x20 | - | - | - | - | - | 4 | 10 | 10 |
| | 4x20 | 2×20 | 2×20 | - | - | - | - | - | 4 or 7 | 11 | 11 |
| | 3x20+15 | 20+15 | 2×20 | - | - | - | - | - | 4 | 12 | 12 |
| | 2×15+2x20 | 2×15 | 2x20 | - | - | - | - | - | 5 | 13 | 13 |
| | 3x20+15 | 2×20+15 | 20 | - | - | - | - | - | 7 | 14 | 14 |
| | 2×15+2x20 | 2x15+20 | 20 | - | - | - | - | - | 8 | 15 | 15 |
| | 3x20+10 | 2x20+10 | 20 | - | - | - | - | - | 7 | 15A | 15A |
| | 2x15+2x20 | 2x15+20 | 20 | - | - | - | - | - | 8 | 15B | 15B |

Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.
Note 2: The test point is selected according to the UE DL Category, or UE Category (only if UE DL Category not available) as appropriate.
Note 3: Test 4, Test 5, Test 7 and Test 8 are tested in clause 8.7.5.2.2.

## 8.7.5.2_H TDD FDD CA Sustained data rate performance for TDD PCell for 256QAM in DL

Editor's notes:

- How to consider 3% Tx EVM for 256QAM demodulation test cases discussed in R5-155895 is FFS

- Whether UL modulation mode QPSK is suitable to use is FFS

## 8.7.5.2_H.1 TDD FDD CA Sustained data rate performance for TDD PCell (2DL CA) for 256QAM in DL

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- Discussion on DL EVM for 256QAM demodulation test as per R5-155895 is still ongoing

### 8.7.5.2_H.1.1 Test purpose

Same test purpose as in clause 8.7.2.1.

### 8.7.5.2_H.1.2 Test applicability

This test applies to all types of UE Release 12 and forward of UE DL category 11, 12 and 13 that support 256QAM in DL and E-UTRA FDD and TDD, 2DL TDD-FDD CA with TDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.5.2_H.1.3 Minimum requirements

For UE supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.2_H.1.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category or UE DL category, and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.2_H.1.3-2. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirements in Table 8.7.5.2.1.3-1 is not applicable.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.2_H.1.3-1-1: Minimum requirement (TDD FDD CA 256QAM)**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 2 | 10+20 | 10 | 20 | R.68-2 FDD | R.68 TDD | 85 |
| 3 | 15+20 | 15 | 20 | R.68-1 FDD | R.68 TDD | 85 |

**Table 8.7.5.2_H.1.3-1-2: Test points for sustained data rate (FRC 256QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 2CCs | 2x20 | 20 | 20 | 1 | 1 | | | | |
| | 10+20 | 10 | 20 | 2 | 2 | | | | |
| | 15+20 | 15 | 20 | 3 | 3 | | | | |
| Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.2

## 8.7.5.2_H.1.4 Test description

Same test description as in clause 8.7.5.2.1.4 with the following exceptions:

- Instead of Table 8.7.5.2.1.4.1-1 -> use Table 8.7.5.2_H.1.4-1.
- Instead of Table 8.7.5.2.1.5-1 -> use Table 8.7.5.2_H.1.5-1.
- Instead of Table 8.7.5.2.1.5-2 -> use Table 8.7.5.2_H.1.5-2.

**Table 8.7.5.2_H.1.4-1: Further test parameters per test**

| Test number | | 1 | 2 | 3 |
|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20 | 10 | 15 |
| | **TDD CC** | 20 | 20 | 20 |
| **DL Measurement channel** | **FDD CC** | R.68 FDD | R.68-2 FDD | R.68-1 FDD |
| | **TDD CC** | R.68 FDD | R.68 FDD | R.68 FDD |
| **UL channel** | **FDD CC** | NA | NA | NA |
| | **TDD CC** | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD |
| **TBsize per Codeword** | **FDD CC** | 97896(Note 3) | 48936(Note 5) | 75376(Note 4) |
| | **TDD CC** | 97896/0(Note 6) | 97896/0(Note 6) | 97896/0(Note 6) |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 10 | 5 | 7 |
| | **TDD CC** | 10/0 | 10/0 | 10/0 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR((TB$_{size}$ - 352)/80) | FLOOR((TBsize – 208)/40) | FLOOR((TBsize – 264)/56) |
| | **TDD CC** | FLOOR((TB$_{size}$ - 352)/80) | FLOOR((TB$_{size}$ - 352)/80) | FLOOR((TB$_{size}$ - 352)/80) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1219 | 1218 | 1341 |
| | **TDD CC** | 1219/0 | 1219/0 | 1219/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16-8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

Note 4: 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5.

Note 5: 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5.

Note 6: 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5.

### 8.7.5.2_H.1.5 Test requirement

The requirements are specified in Table 8.7.5.2_H.1.5-1 depending on the UE category according to Table 8.7.5.2_H.1.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.2_H.1.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 2 | 10+20 | 10 | 20 | R.68-2 FDD | R.68 TDD | 85 |
| 3 | 15+20 | 15 | 20 | R.68-1 FDD | R.68 TDD | 85 |

**Table 8.7.5.2_H.1.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 2CCs | 2x20 | 20 | 20 | 1 | 1 | | | | |
| | 10+20 | 10 | 20 | 2 | 2 | | | | |
| | 15+20 | 15 | 20 | 3 | 3 | | | | |
| Note 1: The test point is selected according to the UE DL Category, or UE Category (only if UE DL Category not available) as appropriate.<br>Note 2: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | | | | | | |

## 8.7.5.2_H.2 TDD FDD CA Sustained data rate performance for TDD PCell (3DL CA) for 256QAM in DL

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- Discussion on DL EVM for 256QAM demodulation test as per R5-155895 is still ongoing

### 8.7.5.2_H.2.1 Test purpose

Same test purpose as in clause 8.7.2.1.

### 8.7.5.2_H.2.2 Test applicability

This test applies to all types of UE Release 12 and forward of UE DL category 11, 12, and15 that support 256QAM in DL and support E-UTRA FDD and TDD, 3DL TDD-FDD CA with TDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.5.2_H.2.3 Minimum requirements

For UE supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.2_H.2.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category or UE DL category, and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.2_H.2.3-2. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirements in Table 8.7.5.2-1 is not applicable.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.2_H.2.3-1: Minimum requirement (TDD FDD CA 256QAM)**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 2 | 10+20 | 10 | 20 | R.68-2 FDD | R.68 TDD | 85 |
| 3 | 15+20 | 15 | 20 | R.68-1 FDD | R.68 TDD | 85 |
| 4 | 3x20 | 20 | 2x20 | R.68 FDD | R.68 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | R.68-1 FDD | R.68 TDD | 85 |
| 6 | 10+20+20 | 10 | 2x20 | R.68-2 FDD | R.68TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 9 | 20+20+10 | 20+10 | 20 | R.68 FDD for 20MHz CC, R.68-2 FDD for 10MHz CC | R.68 TDD | 85 |
| 9A | 20+10+10 | 2x10 | 20 | R.68-2 FDD | R.68 TDD | 85 |

**Table 8.7.5.2_H2.3-2: Test points for sustained data rate (FRC 256QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 3CCs | 3x20 | 20 | 2x20 | 4 | 1 | 4 | | | |
| | 15+20+20 | 15 | 2x20 | 5 | 3 | 5 | | | |
| | 10+20+20 | 10 | 2x20 | 6 | 2 | 6 | | | |
| | 3x20 | 2x20 | 20 | 7 | 1 | 7 | - | | |
| | 20+20+15 | 20+15 | 20 | 8 | 1 | 8 | - | | |
| | 20+20+10 | 20+10 | 20 | 9 | 1 | 9 | - | | |
| | 20+10+10 | 2x10 | 20 | 9A | 2 | 9A | | | |
| Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.2

## 8.7.5.2_H.2.4 Test description

Same test description as in clause 8.7.5.2.2.4 with the following exceptions:

- Instead of Table 8.7.5.2.2.4.1-1 and Table 8.7.5.2.2.4.1-2 -> use Table 8.7.5.2_H.2.4-1 and Table 8.7.5.2_H.2.4-2.
- Instead of Table 8.7.5.2.2.5-1 -> use Table 8.7.5.2_H.2.5-1.
- Instead of Table 8.7.5.2.2.5-2 -> use Table 8.7.5.2_H.2.5-2.

**Table 8.7.5.2_H.2.4-1: Further test parameters per test (Test number #1 - #5)**

| Test number | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20 | 10 | 15 | 20 | 15 |
| | **TDD CC** | 20 | 20 | 20 | 2x20 | 2x20 |
| **DL Measurement channel** | **FDD CC** | R.68 TDD | R.68-2 FDD | R.68-1 FDD | R.68 TDD | R.68-1 FDD |
| | **TDD CC** | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD |
| **UL channel** | **FDD CC** | NA | NA | NA | NA | NA |
| | **TDD CC** | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD |
| **TBsize per Codeword** | **FDD CC** | 97896(Note 3) | 48936(Note 5) | 75376(Note 4) | 97896(Note 3) | 75376(Note 4) |
| | **TDD CC** | 97896/0(Note 6) | 97896/0(Note 6) | 97896/0(Note 6) | 97896/0(Note 6) | 97896/0(Note 6) |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 10 | 5 | 7 | 10 | 7 |
| | **TDD CC** | 10/0 | 10/0 | 10/0 | 10/0 | 10/0 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ – 208)/40) | FLOOR(($TB_{size}$ – 264)/56) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ – 264)/56) |
| | **TDD CC** | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1219 | 1218 | 1341 | 1219 | 1341 |
| | **TDD CC** | 1219/0 | 1219/0 | 1219/0 | 1219/0 | 1219/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives:
PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

Note 4: 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5.

Note 5: 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5.

Note 6: 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5.

**Table 8.7.5.2_H.2.4-2: Further test parameters per test (Test number #6 - #9A)**

| Test number | | 6 | 7 | 8 | 9 | 9A |
|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 10 | 2x20 | 20+15 | 20+10 | 2x10 |
| | **TDD CC** | 2x20 | 20 | 20 | 20 | 20 |
| **DL Measurement channel** | **FDD CC** | R.68-2 FDD | R.68 TDD | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 FDD for 20MHz CC, R.68-2 FDD for 10MHz CC | R.68-2 FDD |
| | **TDD CC** | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD |
| **UL channel** | **FDD CC** | NA | NA | NA | NA | NA |
| | **TDD CC** | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD |
| **TBsize per Codeword** | **FDD CC** | 48936(Note 5) | 97896(Note 3) | 97896(Note 3) for 20MHz CC, 75376(Note 4) for 15MHz CC | 97896(Note 3) for 20MHz CC, 48936(Note 5) for 10MHz CC | 48936(Note 5) |
| | **TDD CC** | 97896/0(Note 6) | 97896/0(Note 6) | 97896/0(Note 6) | 97896/0(Note 6) | 97896/0(Note 6) |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 5 | 10 | 10 for 20MHz CC, 7 for 15MHz CC | 10 for 20MHz CC, 5 for 10MHz CC | 5 |
| | **TDD CC** | 10/0 | 10/0 | 10/0 | 10/0 | 10/0 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR(($TB_{size}$ – 208)/40) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC, FLOOR(($TB_{size}$ – 264)/56) for 15MHz CC | FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC, FLOOR(($TB_{size}$ – 208)/40) for 10MHz CC | FLOOR(($TB_{size}$ – 208)/40) |
| | **TDD CC** | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1218 | 1219 | 1219 for 20MHz CC, 1341 for 15MHz CC | 1219 for 20MHz CC, 1218 for 10MHz CC | 1218 |
| | **TDD CC** | 1219/0 | 1219/0 | 1219/0 | 1219/0 | 1219/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives:
PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

Note 4: 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5.

Note 5: 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5.

Note 6: 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5.

## 8.7.5.2_H.2.5 Test requirement

The requirements are specified in Table 8.7.5.2_H.2.5-1 depending on the UE category according to Table 8.7.5.2_H.2.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.2_H.2.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 1 | 2x20 | 20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 2 | 10+20 | 10 | 20 | R.68-2 FDD | R.68 TDD | 85 |
| 3 | 15+20 | 15 | 20 | R.68-1 FDD | R.68 TDD | 85 |
| 4 | 3x20 | 20 | 2x20 | R.68 FDD | R.68 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | R.68-1 FDD | R.68 TDD | 85 |
| 6 | 10+20+20 | 10 | 2x20 | R.68-2 FDD | R.68TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 9 | 20+20+10 | 20+10 | 20 | R.68 FDD for 20MHz CC, R.68-2 FDD for 10MHz CC | R.68 TDD | 85 |
| 9A | 20+10+10 | 2x10 | 20 | R.68-2 FDD | R.68 TDD | 85 |

**Table 8.7.5.2_H.2.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 3CCs | 3x20 | 20 | 2x20 | 4 | 1 | 4 | | | |
| | 15+20+20 | 15 | 2x20 | 5 | 3 | 5 | | | |
| | 10+20+20 | 10 | 2x20 | 6 | 2 | 6 | | | |
| | 3x20 | 2x20 | 20 | 7 | 1 | 7 | | | |
| | 20+20+15 | 20+15 | 20 | 8 | 1 | 8 | | | |
| | 20+20+10 | 20+10 | 20 | 9 | 1 | 9 | | | |
| | 20+10+10 | 2x10 | 20 | 9A | 2 | 9A | | | |
| Note 1: The test point is selected according to the UE DL Category, or UE Category (only if UE DL Category not available) as appropriate.<br>Note 2: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 3: Test 1, Test 2 and Test 3 are defined in 8.7.5.2.2. | | | | | | | | | |

## 8.7.5.2_H.3 TDD FDD CA Sustained data rate performance for TDD PCell (4DL CA) for 256QAM in DL

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- Discussion on DL EVM for 256QAM demodulation test as per R5-155895 is still ongoing

### 8.7.5.2_H.3.1 Test purpose

Same test purpose as in clause 8.7.2.1.

### 8.7.5.2_H.3.2 Test applicability

This test applies to all types of UE Release 12 and forward of UE DL category 15 and 16 that support 256QAM in DL and support E-UTRA FDD and TDD, 4DL TDD-FDD CA with TDD as PCell.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.5.2_H.3.3 Minimum requirements

For UE supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.2_H.3.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category or UE DL category, and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.2_H.3.3-2. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirements in Table 8.7.5.2-1 is not applicable.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.2_H.3.3-1: Minimum requirement (TDD FDD CA 256QAM)**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 4 | 3x20 | 20 | 2x20 | R.68 FDD | R.68 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | R.68-1 FDD | R.68 TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 10 | 4x20 | 20 | 3x20 | R.68-2 FDD | R.68TDD | 85 |
| 11 | 4x20 | 2×20 | 2×20 | R.68 FDD | R.68 TDD | 85 |
| 12 | 3x20+15 | 20+15 | 2×20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 13 | 2×15+2x20 | 2×15 | 2x20 | R.68-1 FDD | R.68 TDD | 85 |
| 14 | 3x20+15 | 2×20+15 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 15 | 2×15+2x20 | 2x15+20 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 15A | 3x20+10 | 2x20+10 | 20 | R.68 FDD for 20MHz CC, R.68-2 FDD for 10MHz CC | R.68 TDD | 85 |
| 15B | 2x15+2x20 | 2x15+20 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |

**Table 8.7.5.2_H.3.3-2: Test points for sustained data rate (FRC 256QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 4CCs | 4x20 | 20 | 3x20 | 4 | - | 10 | 10 | | |
| | 4x20 | 2×20 | 2×20 | 4 or 7 | - | 11 | 11 | | |
| | 3x20+15 | 20+15 | 2×20 | 8 | - | 12 | 12 | | |
| | 2×15+2x20 | 2×15 | 2x20 | 5 | - | 13 | 13 | | |
| | 3x20+15 | 2×20+15 | 20 | 7 | - | 14 | 14 | | |
| | 2×15+2x20 | 2x15+20 | 20 | 8 | - | 15 | 15 | | |
| | 3x20+10 | 2x20+10 | 20 | 7 | - | 15A | 15A | | |
| | 2x15+2x20 | 2x15+20 | 20 | 8 | - | 15B | 15B | | |
| Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.2

## 8.7.5.2_H.3.4 Test description

Same test description as in clause 8.7.5.2.3.4 with the following exceptions:

- Instead of Table 8.7.5.2.3.4.1-1 and Table 8.7.5.2.2.4.1-2 -> use Table 8.7.5.2_H.3.4-1 and Table 8.7.5.2_H.3.4-2.
- Instead of Table 8.7.5.2.3.5-1 -> use Table 8.7.5.2_H.3.5-1.
- Instead of Table 8.7.5.2.3.5-2 -> use Table 8.7.5.2_H.3.5-2.

**Table 8.7.5.2_H.3.4-1: Further test parameters per test (Test number #4 - #11)**

| Test number | | 4 | 5 | 7 | 8 | 10 | 11 |
|---|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20 | 15 | 2x20 | 20+15 | 20 | 2x20 |
| | **TDD CC** | 2x20 | 2x20 | 20 | 20 | 3x20 | 2x20 |
| **DL Measurement channel** | **FDD CC** | R.68 FDD | R.68-1 FDD | R.68 FDD | R.68 FDD for 20MHz CC,<br><br>R.68-1 FDD for 15MHz CC | R.68-2 FDD | R.68 FDD |
| | **TDD CC** | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD |
| **UL channel** | **FDD CC** | NA | NA | NA | NA | NA | NA |
| | **TDD CC** | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD |
| **TBsize per Codeword** | **FDD CC** | 97896 (Note 3) | 75376 (Note 4) | 97896 (Note 3) | 97896 (Note 3) for 20MHz CC,<br><br>75376 (Note 4) for 15MHz CC | 97896 (Note 3) | 97896 (Note 3) |
| | **TDD CC** | 97896/0 (Note 5) | 97896/0 (Note 5) | 97896/0 (Note 5) | 97896/0 (Note 5) | 97896/0 (Note 5) | 97896/0 (Note 5) |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 10 | 7 | 10 | 10 for 20MHz CC,<br>7 for 15MHz CC | 10 | 10 |
| | **TDD CC** | 10 | 10 | 10 | 10 | 10 | 10 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ – 264)/56) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) for 20MHz CC,<br><br>FLOOR(($TB_{size}$ - 264)/56) for 15MHz CC, | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) |
| | **TDD CC** | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) | FLOOR(($TB_{size}$ - 352)/80) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1219 | 1341 | 1219 | 1219 for 20MHz CC,<br><br>1341 for 15MHz CC | 1219 | 1219 |
| | **TDD CC** | 1219 | 1219 | 1219 | 1219 | 1219 | 1219 |

| | |
|---|---|
| Note 1: | Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers. |
| Note 2: | Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).<br>The PDCP SDU size of each PDCP SDU is:<br>PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,<br>where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.<br>The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test. |
| Note 3: | 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5. |
| Note 4: | 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5. |
| Note 5: | 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5. |

**Table 8.7.5.2_H.3.4-2: Further test parameters per test (Test number #12 - #15B)**

| Test number | | 12 | 13 | 14 | 15 | 15A | 15B |
|---|---|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 20+15 | 2x15 | 2x20+15 | 2x15+20 | 2x20+10 | 2x15+20 |
| | **TDD CC** | 2x20 | 2x20 | 20 | 20 | 20 | 20 |
| **DL Measurement channel** | **FDD CC** | R.68 FDD for 20MHz CC,<br><br>R.68-1 FDD for 15MHz CC | R.68-1 FDD | R.68 FDD for 20MHz CC,<br><br>R.68-1 FDD for 15MHz CC | R.68 FDD for 20MHz CC,<br><br>R.68-1 FDD for 15MHz CC | R.68 FDD for 20MHz CC,<br><br>R.68-2 FDD for 10MHz CC | R.68 FDD for 20MHz CC,<br><br>R.68-1 FDD for 15MHz CC |
| | **TDD CC** | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD | R.68 TDD |
| **UL channel** | **FDD CC** | NA | NA | NA | NA | NA | NA |
| | **TDD CC** | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD |
| **TBsize per Codeword** | **FDD CC** | 97896 (Note 3) for 20MHz CC,<br><br>75376 (Note 4) for 15MHz CC | 75376 (Note 4) | 97896 (Note 3) for 20MHz CC,<br><br>75376 (Note 4) for 15MHz CC | 97896 (Note 3) for 20MHz CC,<br><br>75376 (Note 4) for 15MHz CC | 97896 (Note 3) for 20MHz CC,<br><br>48936 (Note 5) for 10MHz CC | 97896 (Note 3) for 20MHz CC,<br><br>75376 (Note 4) for 15MHz CC |
| | **TDD CC** | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) | 97896/0 (Note 6) |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 10 for 20MHz CC,<br><br>7 for 15MHz CC | 7 | 10 for 20MHz CC,<br><br>7 for 15MHz CC | 10 for 20MHz CC,<br><br>7 for 15MHz CC | 10 for 20MHz CC,<br><br>5 for 10MHz CC | 10 for 20MHz CC,<br><br>7 for 15MHz CC |
| | **TDD CC** | 10 | 10 | 10 | 10 | 10 | 10 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR((TBsize – 352)/80) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 264)/56) for 15MHz CC | FLOOR((TB$_{size}$ – 264)/56) | FLOOR((TBsize – 352)/80) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 264)/56) for 15MHz CC | FLOOR((TBsize – 352)/80) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 264)/56) for 15MHz CC | FLOOR((TBsize – 352)/80) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 208)/40) for 10MHz CC | FLOOR((TBsize – 352)/80) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 264)/56) for 15MHz CC |
| | **TDD CC** | FLOOR((TBsize – 352)/80) | FLOOR((TBsize – 352)/80) | FLOOR((TBsize – 352)/80) | FLOOR((TBsize – 352)/80) | FLOOR((TBsize – 352)/80) | FLOOR((TBsize – 352)/80) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1219 for 20MHz CC,<br><br>1341 for 15MHz CC | 1341 | 1219 for 20MHz CC,<br><br>1341 for 15MHz CC | 1219 for 20MHz CC,<br><br>1341 for 15MHz CC | 1219 for 20MHz CC,<br><br>1218 for 10MHz CC | 1219 for 20MHz CC,<br><br>1341 for 15MHz CC |
| | **TDD CC** | 1219 | 1219 | 1219 | 1219 | 1219 | 1219 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size

| | |
|---|---|
| | of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.<br>The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test. |
| Note 3: | 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5. |
| Note 4: | 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5. |
| Note 5: | 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5. |
| Note 6: | 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5. |

### 8.7.5.2_H.3.5 Test requirement

The requirements are specified in Table 8.7.5.2_H.3.5-1 depending on the UE category according to Table 8.7.5.2_H.3.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.2_H.3.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 4 | 3x20 | 20 | 2x20 | R.68 FDD | R.68 TDD | 85 |
| 5 | 15+20+20 | 15 | 2x20 | R.68-1 FDD | R.68 TDD | 85 |
| 7 | 3x20 | 2x20 | 20 | R.68 FDD | R.68 TDD | 85 |
| 8 | 20+20+15 | 20+15 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 10 | 4x20 | 20 | 3x20 | R.68-2 FDD | R.68TDD | 85 |
| 11 | 4x20 | 2×20 | 2×20 | R.68 FDD | R.68 TDD | 85 |
| 12 | 3x20+15 | 20+15 | 2×20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 13 | 2×15+2x20 | 2×15 | 2x20 | R.68-1 FDD | R.68 TDD | 85 |
| 14 | 3x20+15 | 2×20+15 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 15 | 2×15+2x20 | 2x15+20 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |
| 15A | 3x20+10 | 2x20+10 | 20 | R.68 FDD for 20MHz CC, R.68-2 FDD for 10MHz CC | R.68 TDD | 85 |
| 15B | 2x15+2x20 | 2x15+20 | 20 | R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC | R.68 TDD | 85 |

**Table 8.7.5.2_H.3.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | DL Cat. 11, 12 | | | | | |
| CA with 4CCs | 4x20 | 20 | 3x20 | 4 | - | 10 | 10 | | |
| | 4x20 | 2×20 | 2×20 | 4 or 7 | - | 11 | 11 | | |
| | 3x20+15 | 20+15 | 2×20 | 8 | - | 12 | 12 | | |
| | 2×15+2x20 | 2×15 | 2x20 | 5 | - | 13 | 13 | | |
| | 3x20+15 | 2×20+15 | 20 | 7 | - | 14 | 14 | | |
| | 2×15+2x20 | 2x15+20 | 20 | 8 | - | 15 | 15 | | |
| | 3x20+10 | 2x20+10 | 20 | 7 | - | 15A | 15A | | |
| | 2x15+2x20 | 2x15+20 | 20 | 8 | - | 15B | 15B | | |
| Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.<br>Note 2: Test 4, Test 5, Test 7 and Test 8 are tested in clause 8.7.5.2_H.2. | | | | | | | | | |

## 8.7.5.2.4 TDD FDD CA Sustained data rate performance for TDD PCell (5DL CA)

### 8.7.5.2.4.1 Test purpose

Same test purpose as in clause 8.7.2.1.

### 8.7.5.2.4.2 Test applicability

This test applies to all types of UE Release 12 and forward of UE DL category 15 that support E-UTRA FDD and TDD, 5DL TDD-FDD CA with TDD as PCell and not support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.5.2.4.3 Minimum requirements

For UE not supporting 256QAM, the requirements for TDD FDD CA with TDD PCell are specified in Table 8.7.5.2.4.3-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.2.4.3-2. The TB success rate shall be sustained during at least 300 frames.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.7.5.2.4.3-1: test parameters for sustained downlink data rate (TDD FDD CA 64QAM)**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 11 | 4x20 | 2×20 | 2×20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 12 | 3x20+15 | 20+15 | 2×20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 16 | 4x20+15 | 2x20+15 | 2x20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 17 | 2x15+3x20 | 2x15+20 | 2x20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |

**test parameters for sustained downlink data rate (TDD FDD CA 64QAM)**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 11 | 4x20 | 2×20 | 2×20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 12 | 3x20+15 | 20+15 | 2×20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 16 | 4x20+15 | 2x20+15 | 2x20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 17 | 2x15+3x20 | 2x15+20 | 2x20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |

**Table 8.7.5.2.4.3-2: Test points for sustained data rate (FRC 64QAM)**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6, 7 | DL Cat. 9, 10 | DL Cat. 11, 12 | |
| CA with 5 CCs | 4x20+15 | 2x20+15 | 2x20 | - | - | - | - | - | - | 11 | 16 |
| | 2x15+3x20 | 2x15+20 | 2x20 | - | - | - | - | - | - | 12 | 17 |
| Note 3: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled. | | | | | | | | | | | |

The normative reference for this requirement is TS 36.101[2] clause 8.7.5.2

### 8.7.5.2.4.4 Test description

#### 8.7.5.2.4.4.1 Initial conditions

**Table 8.7.5.2.4.4.1-1: Further test parameters per test**

| Test number | | 11 | 12 | 16 | 17 |
|---|---|---|---|---|---|
| **Bandwidth** | **FDD CC** | 2x20 | 20+15 | 2x20+15 | 2x15+20 |
| | **TDD CC** | 2x20 | 2x20 | 2x20 | 2x20 |
| **DL Measurement channel** | **FDD CC** | R.31-4 FDD | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC | R.31-4 FDD for 20MHz CC,<br><br>R.31-5 FDD for 15MHz CC |
| | **TDD CC** | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD | R.31-4 TDD |
| **UL channel** | **FDD CC** | NA | NA | NA | NA |
| | **TDD CC** | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD | R.1-4 TDD |
| **TBsize per Codeword** | **FDD CC** | 75376 | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC | 75376 for 20MHz CC,<br><br>55056 for 15MHz CC |
| | **TDD CC** | 75376/0 | 75376/0 | 75376/0 | 75376/0 |
| **Number of PDCP SDU per Codeword** | **FDD CC** | 7 | 7 for 20MHz CC,<br><br>6 for 15MHz CC | 7 for 20MHz CC,<br><br>6 for 15MHz CC | 7 for 20MHz CC,<br><br>6 for 15MHz CC |
| | **TDD CC** | 7 | 7 | 7 | 7 |
| **PDCP SDU size [Octets] Calculation (Note 1)** | **FDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15MHz CC | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15MHz CC | FLOOR((TBsize – 264)/56) for 20MHz CC,<br><br>FLOOR((TB$_{size}$ – 240)/48) for 15MHz CC |
| | **TDD CC** | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) | FLOOR((TBsize – 264)/56) |
| **PDCP SDU size [Octets]** | **FDD CC** | 1341 | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC | 1341 for 20MHz CC,<br><br>1142 for 15MHz CC |
| | **TDD CC** | 1341 | 1341 | 1341 | 1341 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: According to Table 8.7.5.2.4.5-1 depending on the UE category according to Table 8.7.5.2.4.5-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.60 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.5-1 and Table 8.7.5.2.4.5-1 depending on the UE category according to Table 8.7.5.2.4.5-2.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 4.5.4. Message contents are defined in clause 8.7.5.2.4.4.3.

### 8.7.5.2.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.5.2.4.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.5.2.4.4.3-3A.

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.5.2.4.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.5.2.4.5-2.

6. The SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.5.2.4.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A \geq$ "corresponding TB success rate according to Table 8.7.5.2.4.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.5.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.5.2.4.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 clause 4.7A table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.5.2.4.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.2.4.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.2.4.4.3-3A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.5.2.4.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

### 8.7.5.2.4.5 Test requirement

The requirements are specified in Table 8.7.5.2.4.5-1 depending on the UE category according to Table 8.7.5.2.4.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.5.2.4.5-1: Test requirements per test**

| Test number | Bandwidth (MHz) | | | Number of bits of a DL-SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5) | | Measurement channel | | Reference value |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | FDD CC | TDD CC | FDD CC | TDD CC | TB success rate [%] |
| 11 | 4x20 | 2×20 | 2×20 | 75376 | 75376/0 | R.31-4 FDD | R.31-4 TDD | 85 |
| 12 | 3x20+15 | 20+15 | 2×20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 16 | 4x20+15 | 2x20+15 | 2x20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |
| 17 | 2x15+3x20 | 2x15+20 | 2x20 | 75376 for 20MHz CC 55056 for 15MHz CC | 75376/0 | R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC | R.31-4 TDD | 85 |

**Table 8.7.5.2.4.5-2: Test applicability per UE category**

| CA config | Maximum supported Bandwidth/ Bandwidth combination (MHz) | | | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9,10 | Cat 11, 12 | DL Cat. 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | DL Cat. 6, 7 | DL Cat. 9, 10 | DL Cat. 11, 12 | |
| CA with 5 CCs | 4x20+15 | 2x20+15 | 2x20 | - | - | - | - | - | - | 11 | 16 |
| | 2x15+3x20 | 2x15+20 | 2x20 | - | - | - | - | - | - | 12 | 17 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities.<br>Note 2: The test point is selected according to the UE DL Category, or UE Category (only if UE DL Category not available) as appropriate.<br>Note 3: Test 11 and 12 are tested in clause 8.7.5.2.3 | | | | | | | | | | | |

## 8.7.6 FDD (Dual Connectivity)

The parameters specified in Table 8.7.6-1 are valid for all FDD DC tests unless otherwise stated.

**Table 8.7.6-1: Common Test Parameters (FDD)**

| Parameter | | Unit | Value |
|---|---|---|---|
| Cyclic prefix | | | Normal |
| Cell ID | | | 0 |
| Inter-TTI Distance | | | 1 |
| Number of HARQ processes per component carrier | | Processes | 8 |
| Maximum number of HARQ transmission | | | 4 |
| Redundancy version coding sequence | | | {0,0,1,2} for 64QAM and 256QAM |
| Number of OFDM symbols for PDCCH per component carrier | | OFDM symbols | 1 |
| Cross carrier scheduling | | | Not configured |
| Propagation condition | | | Static propagation condition<br>No external noise sources are applied |
| Transmission mode | | | TM3 |
| Codebook subset restriction | | | 10 |
| Antenna configuration | | | 2x2 |
| $\hat{E}_s$ at antenna port (dBm/15kHz) | | | -85 |
| Symbols for unused PRBs | | | OP.1 FDD |
| ACK/NACK feedback mode | | | Separate ACK/NACK feedbacks with PUCCH format 3 on the MCG and SCG |
| Time offset between MCG CC and SCG CC | | µs | 0 for UE under test supporting synchronous dual connectivity;<br>500 for UE under test supporting both asynchronous and synchronous dual connectivity (Note 1) |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| Note 1: Asynchronous and synchronous dual connectivity are defined in TS36.300 [18].<br>Note 2: If the UE supports both SCG bearer and Split bearer, the Split bearer is configured. | | | |

## 8.7.6.1 FDD sustained data rate performance for Dual Connectivity 64QAM

### 8.7.6.1.1 Test purpose

Same test purpose as in clause 8.7.1.1.

### 8.7.6.1.2 Test applicability

This test case applies to all types of E-UTRA FDD release 12 and forward UE of category 3, 4, 6, 7, 9, and 10 that support Dual Connectivity and not supporting 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.6.1.3 Minimum conformance requirements

For UE not supporting 256QAM, the requirements are specified in Table 8.7.6.1.3-1, with the addition of the parameters in Table 8.7.6-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.6.1.3-2. The TB success rate across CGs shall be sustained during at least 300 frames.

The applicability of the requirements is specified in Clause 8.1.2.3A.

**Table 8.7.6.1.3-1: Minimum requirement (DC 64QAM)**

| Test number | Bandwidth combination (MHz) | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value TB success rate(%) | | |
|---|---|---|---|---|---|---|
| | | | | DRB type of Split bearer (Note 2) | DRB type of SCG bearer (Note 3) | |
| | | | | | MCG | SCG |
| 1 | 2x10 | 25456 | R.31-2 FDD | 95 | 95 | 95 |
| 2 | 2x10 | 36696 (Note 4) | R.31-3A FDD | 85 | 85 | 85 |
| 3 | 10+20 | 36696 (Note 4) for 10MHz CC<br>75376 (Note 5) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 | 85 | 85 |
| 4 | 2x15 | 55056 (Note 6) | R.31-4B FDD | 85 | 85 | 85 |
| 5 | 15+20 | 55056 for 15MHz CC<br>75376 (Note 5) for 20MHz CC | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | 85 | 85 | 85 |
| 6 | 2x20 | 75376 (Note 5) | R.31-4 FDD | 85 | 85 | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: For the configuration of DRB type of Split bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks , $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks across all the CGs used for DC transmission or reception.

Note 3: For the configuration of DRB type of SCG bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks per CG used for DC transmission or reception, separately.

Note 4: 35160 bits for sub-frame 5.

Note 5: 71112 bits for sub-frame 5.

Note 6: 52752 bits for sub-frame 5.

**Table 8.7.6.1.3-2: Test points for sustained data rate (FRC DC 64QAM)**

| DC config | Maximum supported Bandwidth combination (MHz) | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9, 10 | Cat. 11, 12 | |
|---|---|---|---|---|---|---|---|
| DC with 2CCs | 2x10 | 1 | 2 | 2 | 2 | - | |
| | 10+20 | 1 | 2 | 3 | 3 | - | |
| | 2x15 | 1 | 2 | 4 | 4 | - | |
| | 15+20 | 1 | 2 | 5 | 5 | - | |
| | 2x20 | 1 | 2 | 6 | 6 | - | |

The normative reference for this requirement is TS 36.101 [2] clause 8.7.6.

### 8.7.6.1.4 Test description

#### 8.7.6.1.4.1 Initial conditions

**Table 8.7.6.1.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 1 | R.31-2 FDD | R.1-2 FDD | 25456 | 3 | FLOOR((TBsize – 152)/24) | 1054 |
| 2 | R.31-3A FDD | R.1-3A FDD | 36696 (Note 3) | 4 | FLOOR((TBsize – 184)/32) | 1141 |
| 3 | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 36696 (Note 3) for 10MHz CC<br>75376 (Note 4) for 20MHz CC | 4 for 10MHz CC<br><br>7 for 20 MHz CC | FLOOR(($TB_{size}$ – 184)/32) for 10MHz CC<br><br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1141 for 10MHz CC<br><br>1341 for 20MHz CC |
| 4 | R.31-4B FDD for two 15MHz CCs | R.1-4B FDD | 55056 (Note 5) for two 15MHz CCs | 6 for two 15MHz CCs | FLOOR(($TB_{size}$ – 240)/48) for two 15 MHz CCs | 1142 for two 15MHz CCs |
| 5 | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | R.1-4 FDD | 55056 for 15MHz CC<br>75376 (Note 4) for 20MHz CC | 6 for 15MHz CC<br><br>7 for 20 MHz CC | FLOOR(($TB_{size}$ – 240)/48) for 15 MHz CC<br><br>FLOOR((TBsize – 264)/56) for 20 MHz CC | 1142 for 15MHz CC<br><br>1341 for 20MHz CC |
| 6 | R.31-4 FDD for two 20MHz CCs | R.1-4 FDD | 75376 (Note 4) for two 20MHz CCs | 7 for two 20 MHz CCs | FLOOR((TBsize – 264)/56) for two 20 MHz CCs | 1341 for two 20MHz CCs |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 35160 bits for sub-frame 5.

Note 4: 71112 bits for sub-frame 5.

Note 5: 52752 bits for sub-frame 5.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Tables 8.1.2.3A-1 and 8.7.6.1.5-1 depending on the UE category according to Table 8.7.6.1.5-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.36 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.6-1 and Table 8.7.6.1.5-1 depending on the UE category according to Table 8.7.6.1.5-2.

3. Downlink signals for MCG CC (PCell) and SCG CC (PSCell) are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. If the SCG bearer is only supported, ensure the UE is in State 4A-RF-DC1 according to TS 36.508 [7] clause 5.2A.3A. Otherwise, ensure that the UE is in State 4A-RF-DC2 according to TS 36.508 [7] clause 5.2A.3B. Message contents are defined in clause 8.7.6.1.4.3.

### 8.7.6.1.4.2 Test procedure

1. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

2. The SS looks up $TB_{size}$ in Table 8.7.6.1.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.6.1.5-2.

3. SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$, and $N_{DL_PDCP}$ to 0 on PCell and PSCell respectively.

4. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.6.1.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU on PCell and PSCell respectively.

5. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one on PCell and PSCell respectively.

6. Steps 4 to 5 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

7. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one on PCell and PSCell respectively.

8. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$ on PCell and PSCell respectively. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE on PCell and PSCell respectively. The total TB success rate is calculated as $A_{total}$ = PCell's A + PSCell's A.

9. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$ on PCell and PSCell respectively. The total PDCP SDU loss is calculated as $B_{total}$ = PCell's B + PSCell's B.

10. The UE passes the test if $A_{total} \geq$ "corresponding TB success rates according to Table 8.7.6.1.5-1" and $B_{total} = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.6.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.6.1.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 [7] clause 4.7A Table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.6.1.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 [7] clause 4.6.1 Table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfigSMC SEQUENCE { | | | |
| securityAlgorithmConfig SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| } | | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.6.1.4.3-2A: MobilityControlInfoSCG-r12**

| Derivation Path: TS 36.331 [5] clause 6.3.4 MobilityControlInfoSCG-r12 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MobilityControlInfoSCG-r12 ::= SEQUENCE { | | | |
| t307-r12 | ms2000 | | |
| ue-IdentitySCG-r12 | C-RNTI | PSCell's C-RNTI | |
| rach-ConfigDedicated-r12 | Rach-ConfigDedicated-DEFAULT | | |
| cipheringAlgorithmSCG-r12 | eea2 | | |
| } | | | |

**Table 8.7.6.1.4.3-3: *PhysicalConfigDedicated-DEFAULT (PCell and PSCell)***

| Derivation Path: 36.508 [7] clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

## 8.7.6.1.5 Test requirement

The requirements are specified in Table 8.7.6. 1.5-1 depending on the UE category according to Table 8.7.6.1.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.6.1.5-1: Test requirement (DC 64QAM)**

| Test number | Bandwidth combination (MHz) | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value TB success rate(%) | | |
|---|---|---|---|---|---|---|
| | | | | DRB type of Split bearer (Note 2) | DRB type of SCG bearer (Note 3) | |
| | | | | | MCG | SCG |
| 1 | 2x10 | 25456 | R.31-2 FDD | 95 | 95 | 95 |
| 2 | 2x10 | 36696 (Note 4) | R.31-3A FDD | 85 | 85 | 85 |
| 3 | 10+20 | 36696 (Note 4) for 10MHz CC<br>75376 (Note 5) for 20MHz CC | R.31-3A FDD for 10MHz CC<br>R.31-4 FDD for 20MHz CC | 85 | 85 | 85 |
| 4 | 2x15 | 55056 (Note 6) | R.31-4B FDD | 85 | 85 | 85 |
| 5 | 15+20 | 55056 for 15MHz CC<br>75376 (Note 5) for 20MHz CC | R.31-5 FDD for 15MHz CC<br>R.31-4 FDD for 20MHz CC | 85 | 85 | 85 |
| 6 | 2x20 | 75376 (Note 5) | R.31-4 FDD | 85 | 85 | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: For the configuration of DRB type of Split bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks , $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks across all the CGs used for DC transmission or reception.

Note 3: For the configuration of DRB type of SCG bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks per CG used for DC transmission or reception, separately.

Note 4: 35160 bits for sub-frame 5.

Note 5: 71112 bits for sub-frame 5.

Note 6: 52752 bits for sub-frame 5.

**Table 8.7.6.1.5-2: Test points for sustained data rate (FRC DC 64QAM)**

| DC config | Maximum supported Bandwidth combination (MHz) | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9, 10 | Cat. 11, 12 | |
|---|---|---|---|---|---|---|---|
| DC with 2CCs | 2x10 | 1 | 2 | 2 | 2 | - | |
| | 10+20 | 1 | 2 | 3 | 3 | - | |
| | 2x15 | 1 | 2 | 4 | 4 | - | |
| | 15+20 | 1 | 2 | 5 | 5 | - | |
| | 2x20 | 1 | 2 | 6 | 6 | - | |
| Note 1: The applicability and test rules for different dual connectivity configuration and bandwidth combination set are defined in 8.1.2.3A.<br>Note 2: Only one test point is tested. Select the largest aggregated dual connectivity bandwidth combination supported by the UE among the UE supported dual connectivity capabilities. | | | | | | | |

## 8.7.6.2 FDD sustained data rate performance for Dual Connectivity 256QAM

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- Discussion on DL EVM for 256QAM demodulation test as per R5-155895 is still ongoing

- Check whether MCG/SCG should be mentioned in Annex C.

- Check how to measure the throughput using two uplink component carriers.

### 8.7.6.2.1 Test purpose

Same test purpose as in clause 8.7.1.1.

### 8.7.6.2.2 Test applicability

This test case applies to all types of E-UTRA FDD release 12 and forward UEs that support Dual Connectivity and 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.6.2.3 Minimum conformance requirements

For UE supporting 256QAM, the requirements are specified in Table 8.7.6.2.3-1, with the addition of the parameters in Table 8.7.6 -1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.6.2.3-2. The TB success rate across CGs shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirements in Table 8.7.6.1.3-1 are not applicable.

The applicability of the requirements is specified in Clause 8.1.2.3A.

**Table 8.7.6.2.3-1: Minimum requirement (DC 256QAM)**

| Test number | Bandwidth combination (MHz) | Measurement channel | Reference value TB success rate (%) | | |
|---|---|---|---|---|---|
| | | | DRB type of Split bearer (Note 2) | DRB type of SCG bearer (Note 3) | |
| | | | | MCG | SCG |
| 1 | 2x10 | R.68-2 FDD | 85 | 85 | 85 |
| 2 | 10+20 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 | 85 | 85 |
| 3 | 2x15 | R.68-1 FDD | 85 | 85 | 85 |
| 4 | 15+20 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 | 85 | 85 |
| 5 | 2x20 | R.68 FDD | 85 | 85 | 85 |
| 6 | 15+5 | R.68-1 FDD for 15MHz CC<br>R.68-3 FDD for 5MHz CC | 85 | 85 | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: For the configuration of DRB type of Split bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks across all the CGs used for DC transmission or reception.

Note 3: For the configuration of DRB type of SCG bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks per CG used for DC transmission or reception, separately.

**Table 8.7.6.2.3-2: Test points for sustained data rate (FRC DC 256QAM)**

| DC config | Maximum supported Bandwidth combination (MHz) | Cat. 11, 12<br>DL Cat. 11,12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|
| DC with 2CCs | 2x10 | 1 | 1 | | | | |
| | 10+20 | 2 | 2 | | | | |
| | 2x15 | 3 | 3 | | | | |
| | 15+20 | 4 | 4 | | | | |
| | 2x20 | 5 | 5 | | | | |
| | 15+5 | 6 | 6 | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.7.6.

### 8.7.6.2.4 Test description

#### 8.7.6.2.4.1 Initial conditions

**Table 8.7.6.2.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | TBsize per Codeword per Component Carrier | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|
| 1 | R.68-2 FDD | R.1-2 FDD | 48936(Note 5) | 5 | FLOOR((TBsize – 208)/40) | 1218 |
| 2 | R.68-2 FDD for 10MHz CC R.68 FDD for 20MHz CC | R.1-4 FDD | 48936 (Note 5) for 10MHz CC 97896 (Note 3) for 20MHz CC | 5 for 10MHz CC 10 for 20MHz CC | FLOOR((TBsize – 208)/40) for 10MHz CC FLOOR((TB$_{size}$ - 352)/80) for 20MHz CC | 1218 for 10MHz CC 1219 for 20MHz CC |
| 3 | R.68-1 FDD | R.1-4B FDD | 75376(Note 4) | 7 | FLOOR((TB$_{size}$ – 264)/64) | 1341 |
| 4 | R.68-1 FDD for 15MHz CC R.68 FDD for 20MHz CC | R.1-4 FDD | 75376 (Note 4) for 15MHz CC 97896(Note 3) for 20MHz CC | 7 for 15MHz CC 10 for 20 MHz CC | FLOOR((TB$_{size}$ – 264)/64) for 15MHz CC FLOOR((TB$_{size}$ - 352)/80) for 20 MHz CC | 1341 for 15MHz CC 1219 for 20MHz CC |
| 5 | R.68 FDD | R.1-4 FDD | 97896(Note 3) | 10 | FLOOR((TB$_{size}$ - 352)/80) | 1219 |
| 6 | R.68-1 FDD for 15MHz CC R.68-3 FDD for 5MHz CC | R.1-4B FDD | 75376 (Note 4) for 15MHz CC 24496(Note 6) for 5MHz CC | 7 for 15MHz CC 3 for 5 MHz CC | FLOOR((TB$_{size}$ – 264)/64) for 15MHz CC FLOOR((TB$_{size}$ – 152)/24) for 10MHz CC | 1341 for 15MHz CC 1014 for 5MHz CC |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits).
This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frames 0,1,2,6,7 and 81176 bits for sub-frames 5.

Note 4: 63776 bits for sub-frames 0,1,2,6,7 and 61664 bits for sub-frames 5.

Note 5: 42368 bits for sub-frames 0,1,2,6,7 and 40576 bits for sub-frames 5.

Note 6: 21384 bits for sub-frames 0,1,2,6,7 and 19848 bits for sub-frames 5.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Tables 8.1.2.3A-1 and 8.7.6.2.5-1 depending on the UE category according to Table 8.7.6.2.5-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.36 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.6-1 and Table 8.7.6.2.5-1 depending on the UE category according to Table 8.7.6.2.5-2.

3. Downlink signals for MCG CC and SCG CC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. If the SCG bearer is only supported, ensure the UE is in State 4A-RF-DC1 according to TS 36.508 [7] clause 5.2A.3A. Otherwise, ensure that the UE is in State 4A-RF-DC2 according to TS 36.508 [7] clause 5.2A.3B. Message contents are defined in clause 8.7.6.2.4.3.

### 8.7.6.2.4.2 Test procedure

1. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

2. The SS looks up $TB_{size}$ in Table 8.7.6.2.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.6.2.5-2.

3. SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$, and $N_{DL_PDCP}$ to 0.

4. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.6.2.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

5. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

6. Steps 4 to 5 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

7. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

8. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $_{NDL_retx}$) in order to validate HARQ feedback received from the UE.

9. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

10. The UE passes the test if $A \geq$ "corresponding TB success rates according to Table 8.7.6.2.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.6.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.6.2.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 [7] clause 4.7A Table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.6.2.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 [7] clause 4.6.1 Table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfigSMC SEQUENCE { | | | |
| securityAlgorithmConfig SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| } | | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.6.2.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 [7] clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

## 8.7.6.2.5 Test requirement

The requirements are specified in Table 8.7.6.2.5-1 depending on the UE category according to Table 8.7.6.2.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.6.2.5-1: Test requirement (DC 256QAM)**

| Test number | Bandwidth combination (MHz) | Measurement channel | Reference value TB success rate (%) | | |
|---|---|---|---|---|---|
| | | | DRB type of Split bearer (Note 2) | DRB type of SCG bearer (Note 3) | |
| | | | | MCG | SCG |
| 1 | 2x10 | R.68-2 FDD | 85 | 85 | 85 |
| 2 | 10+20 | R.68-2 FDD for 10MHz CC<br>R.68 FDD for 20MHz CC | 85 | 85 | 85 |
| 3 | 2x15 | R.68-1 FDD | 85 | 85 | 85 |
| 4 | 15+20 | R.68-1 FDD for 15MHz CC<br>R.68 FDD for 20MHz CC | 85 | 85 | 85 |
| 5 | 2x20 | R.68 FDD | 85 | 85 | 85 |
| 6 | 15+5 | R.68-1 FDD for 15MHz CC<br>R.68-3 FDD for 5MHz CC | 85 | 85 | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: For the configuration of DRB type of Split bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks across all the CGs used for DC transmission or reception.

Note 3: For the configuration of DRB type of SCG bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks per CG used for DC transmission or reception, separately.

**Table 8.7.6.2.5-2: Test points for sustained data rate (FRC DC 256QAM)**

| DC config | Maximum supported Bandwidth combination (MHz) | Cat. 11, 12<br>DL Cat. 11,12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|
| DC with 2CCs | 2x10 | 1 | 1 | | | | |
| | 10+20 | 2 | 2 | | | | |
| | 2x15 | 3 | 3 | | | | |
| | 15+20 | 4 | 4 | | | | |
| | 2x20 | 5 | 5 | | | | |
| | 15+5 | 6 | 6 | | | | |

Note 1: The applicability and test rules for different dual connectivity configuration and bandwidth combination set are defined in 8.1.2.3A.

Note 2: Only one test point is tested. Select the largest aggregated dual connectivity bandwidth combination supported by the UE among the UE supported dual connectivity capabilities.

## 8.7.7 TDD (Dual Connectivity)

The parameters specified in Table 8.7.7-1 are valid for all TDD DC tests unless otherwise stated.

**Table 8.7.7-1: Common Test Parameters (TDD)**

| Parameter | Unit | | Value |
|---|---|---|---|
| Uplink downlink configuration | | | 2 (Note 2) |
| Special subframe configuration | | | 4 |
| Cyclic prefix | | | Normal |
| Cell ID | | | 0 |
| Inter-TTI Distance | | | 1 |
| Number of HARQ processes per component carrier | Processes | | 7 |
| Maximum number of HARQ transmission | | | 4 |
| Redundancy version coding sequence | | | {0,0,1,2} for 64QAM and 256QAM |
| Number of OFDM symbols for PDCCH per component carrier | OFDM symbols | | 1 |
| Cross carrier scheduling | | | Not configured |
| Propagation condition | | | Static propagation condition<br>No external noise sources are applied |
| Transmission mode | | | TM3 |
| Codebook subset restriction | | | 10 |
| Antenna configuration | | | 2x2 |
| $\hat{E}_s$ at antenna port (dBm/15kHz) | | | -85 |
| Symbols for unused PRBs | | | OP.1 TDD |
| ACK/NACK feedback mode | | | Separate ACK/NACK feedbacks with PUCCH format 3 on the MCG and SCG |
| Time offset between MCG CC and SCG CC | μs | | 0 for UE under test supporting synchronous dual connectivity;<br>500 for UE under test supporting both asynchronous and synchronous dual connectivity (Note 1) |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| Note 1: Asynchronous and synchronous dual connectivity are defined in TS36.300 [18].<br>Note 2: If the UE supports both SCG bearer and Split bearer, the Split bearer is configured. | | | |

## 8.7.7.1 TDD sustained data rate performance for Dual Connectivity 64QAM

### 8.7.7.1.1 Test purpose

Same test purpose as in clause 8.7.2.1.

### 8.7.7.1.2 Test applicability

This test case applies to all types of E-UTRA TDD release 12 and forward UE of category 6, 7, 9, and 10 that support Dual Connectivity and not supporting 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.7.1.3 Minimum conformance requirements

For UE not supporting 256QAM, the requirements are specified in Table 8.7.7.1.3-12, with the addition of the parameters in Table 8.7.7-1 and the downlink physical channel setup according to Annex C.3.2. The test points are

applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.7.1.3-2. The TB success rate shall be sustained during at least 300 frames.

The applicability of the requirements is specified in Clause 8.1.2.3A.

**Table 8.7.7.1.3-1: Minimum requirement (DC 64QAM)**

| Test number | Bandwidth combination (MHz) | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value TB success rate across CGs(%) | | |
|---|---|---|---|---|---|---|
| | | | | DRB type of Split bearer (Note 2) | DRB type of SCG bearer (Note 3) | |
| | | | | | MCG | SCG |
| 1 | 2x20 | 75376/0 (Note 4) | R.31-4A TDD | 85 | 85 | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: For the configuration of DRB type of Split bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks across all the CGs used for DC transmission or reception.

Note 3: For the configuration of DRB type of SCG bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks per CG used for DC transmission or reception, separately.

Note 4: 71112 bits for sub-frame 5.

**Table 8.7.7.1.3-2: Test points for sustained data rate (FRC DC 64QAM)**

| DC config | Maximum supported Bandwidth combination (MHz) | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9, 10 | Cat. 11, 12 | |
|---|---|---|---|---|---|---|---|
| DC with 2CCs | 2x20 | - | - | 1 | 1 | - | |

The normative reference for this requirement is TS 36.101 [2] clause 8.7.7.

### 8.7.7.1.4 Test description

#### 8.7.7.1.4.1 Initial conditions

**Table 8.7.7.1.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | $TB_{size}$ per Codeword per Component Carrier | Number of PDCP SDU per Codeword for normal/special sub-frame | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] for normal/special sub-frame |
|---|---|---|---|---|---|---|
| 1 | R.31-4A TDD | R.1-4 TDD | 75376 (Note 3) | 7/0 | FLOOR(($TB_{size}$ – 264)/56)) | 1341/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives:
PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.

The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 71112 bits for sub-frame 5

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Tables 8.1.2.3A-1 and 8.7.7.1.5-1 depending on the UE category according to Table 8.7.7.1.5-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure Group A.36 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.7-1 and Table 8.7.7.1.5-1 depending on the UE category according to Table 8.7.7.1.5-2.

3. Downlink signals for MCG CC (PCell) and SCG CC (PSCell) are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. If the SCG bearer is only supported, ensure the UE is in State 4A-RF-DC1 according to TS 36.508 [7] clause 5.2A.3A. Otherwise, ensure that the UE is in State 4A-RF-DC2 according to TS 36.508 [7] clause 5.2A.3B. Message contents are defined in clause 8.7.7.1.4.3.

#### 8.7.7.1.4.2 Test procedure

1. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

2. The SS looks up $TB_{size}$ in Table 8.7.7.1.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.7.1.5-2.

3. SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$, and $N_{DL_PDCP}$ to 0 on PCell and PSCell respectively.

4. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.7.1.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU on PCell and PSCell respectively.

5. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one on PCell and PSCell respectively.

6. Steps 4 to 5 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

7. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one on PCell and PSCell respectively.

8. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$ on PCell and PSCell respectively. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE on PCell and PSCell respectively. The total TB success rate is calculated as $A_{total}$ = PCell's A + PSCell's A.

9. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$ on PCell and PSCell respectively. The total PDCP SDU loss is calculated as $B_{total}$ = PCell's B + PSCell's B.

10. The UE passes the test if $A_{total} \geq$ "corresponding TB success rates according to Table 8.7.7.1.5-1" and $B_{total} = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.7.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.7.1.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 [7] clause 4.7A Table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.7.1.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 [7] clause 4.6.1 Table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfigSMC SEQUENCE { | | | |
| securityAlgorithmConfig SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| } | | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.7.1.4.3-2A: MobilityControlInfoSCG-r12**

| Derivation Path: TS 36.331 [5] clause 6.3.4 MobilityControlInfoSCG-r12 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MobilityControlInfoSCG-r12 ::= SEQUENCE { | | | |
| t307-r12 | ms2000 | | |
| ue-IdentitySCG-r12 | C-RNTI | PSCell's C-RNTI | |
| rach-ConfigDedicated-r12 | Rach-ConfigDedicated-DEFAULT | | |
| cipheringAlgorithmSCG-r12 | eea2 | | |
| } | | | |

**Table 8.7.7.1.4.3-3: *PhysicalConfigDedicated-DEFAULT (PCell and PSCell)***

| Derivation Path: 36.508 [7] clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

## 8.7.7.1.5 Test requirement

The requirements are specified in Table 8.7.7.1.5-1 depending on the UE category according to Table 8.7.7.1.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.7.1.5-1: Test requirement (DC 64QAM)**

| Test number | Bandwidth combination (MHz) | Number of bits of a DL-SCH transport block received within a TTI | Measurement channel | Reference value TB success rate across CGs(%) | | |
|---|---|---|---|---|---|---|
| | | | | DRB type of Split bearer (Note 2) | DRB type of SCG bearer (Note 3) | |
| | | | | | MCG | SCG |
| 1 | 2x20 | 75376/0 (Note 4) | R.31-4A TDD | 85 | 85 | 85 |

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: For the configuration of DRB type of Split bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks across all the CGs used for DC transmission or reception.

Note 3: For the configuration of DRB type of SCG bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks per CG used for DC transmission or reception, separately.

Note 4: 71112 bits for sub-frame 5.

**Table 8.7.7.1.5-2: Test points for sustained data rate (FRC DC 64QAM)**

| DC config | Maximum supported Bandwidth combination (MHz) | Cat. 3 | Cat. 4 | Cat. 6, 7 | Cat. 9, 10 | Cat. 11, 12 | |
|---|---|---|---|---|---|---|---|
| DC with 2CCs | 2x20 | - | - | 1 | 1 | - | |

## 8.7.7.2 TDD sustained data rate performance for Dual Connectivity 256QAM

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- Discussion on DL EVM for 256QAM demodulation test as per R5-155895 is still ongoing

- Check whether MCG/SCG should be mentioned in Annex C.

- Check how to measure the throughput using two uplink component carriers.

### 8.7.7.2.1 Test purpose

Same test purpose as in clause 8.7.2.1.

### 8.7.7.2.2 Test applicability

This test case applies to all types of E-UTRA TDD release 12 and forward UEs that support Dual Connectivity and 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 8.7.7.2.3 Minimum conformance requirements

For UE supporting 256QAM, the requirements are specified in Table 8.7.7.2.3-1, with the addition of the parameters in Table 8.7.7-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.7.2.3-2. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirements in Table 8.7.7.1.3-1 are not applicable.

The applicability of the requirements is specified in Clause 8.1.2.3A.

**Table 8.7.7.2.3-1: Minimum requirement (DC 256QAM)**

| Test number | Bandwidth combination (MHz) | Measurement channel | Reference value TB success rate (%) | | |
|---|---|---|---|---|---|
| | | | DRB type of Split bearer (Note 2) | DRB type of SCG bearer (Note 3) | |
| | | | | MCG | SCG |
| 1 | 2x20 | R.68-3 TDD | 85 | 85 | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI. | | | | | |
| Note 2: For the configuration of DRB type of Split bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks across all the CGs used for DC transmission or reception. | | | | | |
| Note 3: For the configuration of DRB type of SCG bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks per CG used for DC transmission or reception, separately. | | | | | |

**Table 8.7.7.2.3-2: Test points for sustained data rate (FRC DC 256QAM)**

| DC config | Maximum supported Bandwidth combination (MHz) | Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|
| | | DL Cat. 11, 12 | | | | | |
| DC with 2CCs | 2x20 | 1 | 1 | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.7.7.

### 8.7.7.2.4 Test description

#### 8.7.7.2.4.1 Initial conditions

**Table 8.7.7.2.4.1-1: Further test parameters per test**

| Test | DL Measurement channel | UL Measurement channel | $TB_{size}$ per Codeword per Component Carrier | Number of PDCP SDU per Codeword for normal/special sub-frame | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] for normal/special sub-frame |
|---|---|---|---|---|---|---|
| 1 | R.68-3 TDD | R.1-4 TDD | 97896(Note 3) | 10/0 | FLOOR(($TB_{size}$ - 352)/80) | 1219/0 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation. In case of different resulting PDCP SDU sizes among component carriers, the smaller calculated PDCP SDU size is used across all the carriers.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives:
PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 84760 bits for sub-frame 0, 4 and 81176 bits for sub-frame 5.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Tables 8.1.2.3A-1 and 8.7.7.2.5-1 depending on the UE category according to Table 8.7.7.2.5-2.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.36 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.85 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 8.7.7-1 and Table 8.7.7.1.5-1 depending on the UE category according to Table 8.7.7.1.5-2.

3. Downlink signals for MCG CC and SCG CC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. If the SCG bearer is only supported, ensure the UE is in State 4A-RF-DC1 according to TS 36.508 [7] clause 5.2A.3A. Otherwise, ensure that the UE is in State 4A-RF-DC2 according to TS 36.508 [7] clause 5.2A.3B. Message contents are defined in clause 8.7.7.2.4.3.

#### 8.7.7.2.4.2 Test procedure

1. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

2. The SS looks up $TB_{size}$ in Table 8.7.7.2.4.1-1 for the tests to be performed depending on the UE category according to Table 8.7.7.2.5-2.

3. SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$, and $N_{DL_PDCP}$ to 0.

4. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.7.2.4.1-1 (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

5. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

6. Steps 4 to 5 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

7. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

8. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

9. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

10. The UE passes the test if $A \geq$ "corresponding TB success rates according to Table 8.7.7.2.5-1" and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.7.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 4.7A, with the following exceptions:

**Table 8.7.7.2.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.508 [7] clause 4.7A Table 4.7A-3 with condition UE TEST LOOP MODE A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |

**Table 8.7.7.2.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 [7] clause 4.6.1 Table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfigSMC SEQUENCE { | | | |
| securityAlgorithmConfig SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| } | | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.7.2.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 [7] clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | Transmission mode 3 |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

## 8.7.7.2.5 Test requirement

The requirements are specified in Table 8.7.7.2.5-1 depending on the UE category according to Table 8.7.7.2.5-2. The PDCP SDU success rate shall be sustained during at least 300 frames.

**Table 8.7.7.2.5-1: Test requirement (DC 256QAM)**

| Test number | Bandwidth combination (MHz) | Measurement channel | Reference value TB success rate (%) | | |
|---|---|---|---|---|---|
| | | | DRB type of Split bearer (Note 2) | DRB type of SCG bearer (Note 3) | |
| | | | | MCG | SCG |
| 1 | 2x20 | R.68-3 TDD | 85 | 85 | 85 |
| Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI. | | | | | |
| Note 2: For the configuration of DRB type of Split bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks across all the CGs used for DC transmission or reception. | | | | | |
| Note 3: For the configuration of DRB type of SCG bearer, the TB success rate across CGs is defined as TB success rate = 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blocks per CG used for DC transmission or reception, separately. | | | | | |

**Table 8.7.7.2.5-2: Test points for sustained data rate (FRC DC 256QAM)**

| DC config | Maximum supported Bandwidth combination (MHz) | Cat. 11, 12 | DL Cat. 13 | | | | |
|---|---|---|---|---|---|---|---|
| | | DL Cat. 11, 12 | | | | | |
| DC with 2CCs | 2x20 | 1 | 1 | | | | |

# 8.7.8

# 8.7.9 FDD sustained data rate performance (4 layer MIMO)

## 8.7.9.1 Minimum conformance requirements

The parameters specified in Table 8.7.9.1-1 are valid for all FDD tests unless otherwise stated.

**Table 8.7.9.1-1: Common Test Parameters (FDD)**

| Parameter | Unit | Value |
|---|---|---|
| Transmission mode | | 3 |
| Cyclic prefix | | Normal |
| Cell ID | | 0 |
| Inter-TTI Distance | | 1 |
| Number of HARQ processes per component carrier | Processes | 8 |
| Maximum number of HARQ transmission | | 4 |
| Redundancy version coding sequence | | {0,0,1,2} for 64QAM and 256QAM |
| Number of OFDM symbols for PDCCH per component carrier | OFDM symbols | 1 |
| Cross carrier scheduling | | Not configured |
| Propagation condition | | Static propagation condition<br>No external noise sources are applied |
| $\hat{E}_s$ at antenna port | dBm/15kHz | -85 |
| Antenna configuration | 2 layer CC | 2x2 or 2x4 |
| | 4 layer CC | 4x4 |
| Codebook subset restriction | 2 layer CC | 10 |
| | 4 layer CC | 1000 |
| Downlink power allocation | 2 layer CC | $\rho_A$ = -3dB, $\rho_B$ = -3dB, $\sigma$ = 0dB |
| | 4 layer CC | $\rho_A$ = -6dB, $\rho_B$ = -6dB, $\sigma$ = 3dB |
| Symbols for unused PRBs | | OP.1 FDD |

For UE not supporting 256QAM, the TB success rate shall be higher than 85% when PDSCH are scheduled with FRC in Table 8.7.9.1-2 with the downlink physical channel setup according to Annex C.3.2.

For UE supporting 256QAM, the TB success rate shall be higher than 85% when PDSCH are scheduled with FRC in Table 8.7.9.1-3 with the downlink physical channel setup according to Annex C.3.2. For UE supporting 256QAM, the requirement with 64QAM is not applicable.

The TB success rate is defined as $100\%*N_{DL_correct_rx}/ (N_{DL_newtx} + N_{DL_retx})$, where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.9.1-2: Per-CC FRC for SDR test (FDD 64QAM)**

| MIMO layer | Bandwidth | Reference channel |
|---|---|---|
| 2 layer | 5 | R.31-6 FDD |
| | 10 | R.31-3A FDD |
| | 15 | R.31-5 FDD |
| | 20 | R.31-4 FDD |
| 4 layer | 5 | R.31-10 FDD |
| | 10 | R.31-7 FDD |
| | 15 | R.31-8 FDD |
| | 20 | R.31-9 FDD |

**Table 8.7.9.1-3: Per-CC FRC for SDR test (FDD 256QAM)**

| MIMO layer | Bandwidth | Reference channel |
|---|---|---|
| 2 layer | 5 | R.68-3 FDD |
| | 10 | R.68-2 FDD |
| | 15 | R.68-1 FDD |
| | 20 | R.68 FDD |
| 4 layer | 5 | R.68-7 FDD |
| | 10 | R.68-4 FDD |
| | 15 | R.68-5 FDD |
| | 20 | R.68-6 FDD |

CA configuration, bandwidth combination and MIMO layer on each CC is determined by following procedure.

- Select one CA bandwidth combination among all supported CA configurations with bandwidth combination and MIMO layer on each CC that leads to largest equivalent aggregated bandwidth among all CA bandwidth combinations supported by UE. Equivalent aggregated bandwidth is defined as

$$B_{agg} = \sum_{i=0}^{N-1} R_i B_i$$

  where $N$ is number of CCs, $R_i \in \{2,4\}$ and $B_i \in \{5,10,15,20\}$ is MIMO layer and bandwidth of CC $i$.

- When there are multiple sets of {CA configuration, bandwidth combination, MIMO layer} with same largest aggregated bandwidth, select one among sets with largest number of 4 layer CCs.
- The procedure applies also for single carrier using operating band instead of CA configuration, and bandwidth instead of bandwidth combination.

The normative reference for this requirement is TS 36.101 [2] clause 8.7.9.

## 8.7.9.2 FDD sustained data rate performance for 4 layer MIMO (single carrier)

### 8.7.9.2.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.9.2.2 Test applicability

This test applies to E-UTRA FDD release 10 and forward UE of category 6 and 7 and DL category 13 that supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any FDD RF band.

### 8.7.9.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.9.1.

### 8.7.9.2.4 Test description

#### 8.7.9.2.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.9.1-2, with the addition of the parameters in Table 8.7.9.2.4.1-1 and Table 8.7.9.2.4.1-3. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.9.2.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.9.1-3, with the addition of the parameters in Table 8.7.9.2.4.1-1 and Table 8.7.9.2.4.1-5. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.9.2.4.1-4.

**Table 8.7.9.2.4.1-1: Test parameters for sustained downlink data rate (FDD single carrier)**

| Test | Bandwidth (MHz) | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) |
|---|---|---|---|---|
| 1 | 20 | 4 layer | 4x4 | 80 |
| 2 | 15 | 4 layer | 4x4 | 60 |

**Table 8.7.9.2.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 6, 7 | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 |
|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW (MHz) | MIMO layer | | DL Cat. 9, 10 | DL Cat. 11, 12 | |
| 80 | 20 | 4 | 1 | - | - | - |
| 60 | 15 | 4 | 2 | - | - | - |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.9.1. Only one test point to be tested. | | | | | | |

**Table 8.7.9.2.4.1-3: Further test parameters per test (FRC 64QAM)**

| Test | Bandwidth and number of Rx antennas | DL Measurement channel | UL Measurement channel | TBsize per Codeword per CC | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|---|
| 1 | 20MHz 4Rx | R.31-9 FDD | R.1-4 FDD | 128496 (Note 3) | 11 | FLOOR(($TB_{size}$ – 376)/88) | 1455 |
| 2 | 15MHz 4Rx | R.31-8 FDD | R.1-4B FDD | 93800 (Note 4) | 8 | FLOOR(($TB_{size}$ – 296)/64) | 1461 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 124464 bits for sub-frame 5.

Note 4: 90816 bits for sub-frame 5.

**Table 8.7.9.2.4.1-4: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW (MHz) | MIMO layer | DL Cat. 11, 12 | | | | | |
| 80 | 20 | 4 | - | 1 | - | - | - | - |
| 60 | 15 | 4 | - | 2 | - | - | - | - |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.9.1. Only one test point to be tested. | | | | | | | | |

**Table 8.7.9.2.4.1-5: Further test parameters per test (FRC 256QAM)**

| Test | Bandwidth and number of Rx antennas | DL Measurement channel | UL Measurement channel | TBsize per Codeword per CC | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|---|
| 1 | 20MHz 4Rx | R.68-6 FDD | R.1-4 FDD | 169544 (Note 3) | 15 | FLOOR(($TB_{size}$ – 488)/120) | 1408 |
| 2 | 15MHz 4Rx | R.68-5 FDD | R.1-4B FDD | 128496 (Note 4) | 11 | FLOOR(($TB_{size}$ – 376)/88) | 1455 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 161760 bits for sub-frame 5.

Note 4: 124464 bits for sub-frame 5.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.9.2.4.1-1 depending on the UE category according to Table 8.7.9.2.4.1-2 for UE not supporting 256QAM or Table 8.7.9.2.4.1-4 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.74 (without using faders and AWGN generators).

2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.9.1-1, Table 8.7.9.2.4.1-1 and Table 8.7.9.2.4.1-3 depending on the UE category according to Table 8.7.9.2.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.9.1-1, Table 8.7.9.2.4.1-1 and Table 8.7.9.2.4.1-5 depending on the UE category according to Table 8.7.9.2.4.1-4.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.9.2.4.3.

### 8.7.9.2.4.2 Test procedure

1. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

2. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Table 8.7.9.2.4.1-3 for the tests to be performed depending on the UE category according to Table 8.7.9.2.4.1-2. For UE supporting 256QAM the SS looks up $TB_{size}$ in Table 8.7.9.2.4.1-5 for the tests to be performed depending on the UE category according to Table 8.7.9.2.4.1-4.

3. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $N_{DL_PDCP}$ to 0.

4. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.9.2.4.1-3 (Note 1) for UE not supporting 256QAM or in accordance with Table 8.7.9.2.4.1-5 (Note 1) for UE supporting 256QAM. The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

5. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

6. Steps 4 to 5 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

7. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

8. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $_{NDL_retx}$) in order to validate HARQ feedback received from the UE.

9. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

10. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.9.2.4.3 Message contents

**Table 8.7.9.2.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.9.2.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |

| | | | |
|---|---|---|---|
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.9.2.4.3-3: *RRCConnectionReconfiguration***

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| antennaInfoDedicatedPCell-v10i0 SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.9.2.4.3-4: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.8.2.1.6-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm3 | 1000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.7.9.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.9.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.9.3 FDD sustained data rate performance for 4 layer MIMO (2DL CA)

Editor's note: Simplification of test point tables, to reduce future maintenance, needs further investigation.

### 8.7.9.3.1 Test purpose

Same test purpose as 8.7.1.1.

#### 8.7.9.3.2 Test applicability

This test applies to E-UTRA FDD release 10 and forward UE of category 9, 10, 11 and 12 and DL category 9, 10, 11, 12 and 15 that supports inter-band OR intra-band contiguous DL CA and supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any FDD RF band of the DL CA configuration.

This test also applies to E-UTRA FDD release 11 and forward UE of category 9, 10, 11 and 12 and DL category 9, 10, 11, 12 and 15 that supports intra band non-contiguous DL CA and supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any FDD RF band of the DL CA configuration.

#### 8.7.9.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.9.1.

#### 8.7.9.3.4 Test description

##### 8.7.9.3.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.9.1-2, with the addition of the parameters in Table 8.7.9.3.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.9.3.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.9.1-3, with the addition of the parameters in Table 8.7.9.3.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.9.3.4.1-3.

**Table 8.7.9.3.4.1-1: Test parameters for sustained downlink data rate (FDD 2DL CA)**

**Table 8.7.9.3.4.1-1: Test parameters for sustained downlink data rate (FDD 2DL CA)**

| Test | Bandwidth (MHz) | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|
| 1 | 2x20 | 4 layer | 4x4 | 160 | 1455 | 1408 |
| 2 | 15+20 | 4 layer | 4x4 | 140 | 1455 | 1408 |
| 3 | 20 | 2 layer | 2x2 | 120 | 1341 | 1355 |
| | 20 | 4 layer | 4x4 | | | |
| 4 | 15 | 2 layer | 2x2 | 110 | 1371 | 1341 |
| | 20 | 4 layer | 4x4 | | | |
| 5 | 10 | 2 layer | 2x2 | 100 | 1141 | 1218 |
| | 20 | 4 layer | 4x4 | | | |
| 6 | 20 | 2 layer | 2x2 | 100 | 1341 | 1355 |
| | 15 | 4 layer | 4x4 | | | |
| 7 | 15 | 2 layer | 2x2 | 90 | 1371 | 1341 |
| | 15 | 4 layer | 4x4 | | | |
| 8 | 5 | 2 layer | 2x2 | 90 | 1138 | 1014 |
| | 20 | 4 layer | 4x4 | | | |
| 9 | 5+15 | 4 layer | 4x4 | 80 | 1314 | 1318 |
| 10 | 10 | 2 layer | 2x2 | 80 | 1141 | 1218 |
| | 15 | 4 layer | 4x4 | | | |
| 11 | 10 | 2 layer | 2x2 | 60 | 1141 | 1218 |
| | 10 | 4 layer | 4x4 | | | |

Editor's note: Tests in Table 8.7.9.3.4.1-1 are covering maximum aggregated bandwidth for each Bandwidth combination set with 2DL CA which are defined in Table 5.4.2A.1-1, Table 5.4.2A.1-2 or Table 5.4.2A.1-3.

**Table 8.7.9.3.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | MIMO layer | DL Cat. 9, 10 | DL Cat. 11, 12 | | | | | |
| 160 | 2x20 | 4 | 2 | 1 | - | - | - | - | - |
| 140 | 15+20 | 4 | 2 | 2 | - | - | - | - | - |
| 120 | 20 | 2 | 3 | 3 | - | - | - | - | - |
| | 20 | 4 | | | | | | | |
| 110 | 15 | 2 | 4 | 4 | - | - | - | - | - |
| | 20 | 4 | | | | | | | |
| 100 | 10 | 2 | 5 | 5 | - | - | - | - | - |
| | 20 | 4 | | | | | | | |
| 100 | 20 | 2 | 6 | 6 | - | - | - | - | - |
| | 15 | 4 | | | | | | | |
| 90 | 15 | 2 | 7 | 7 | - | - | - | - | - |
| | 15 | 4 | | | | | | | |
| 90 | 5 | 2 | 8 | 8 | - | - | - | - | - |
| | 20 | 4 | | | | | | | |
| 80 | 5+15 | 4 | 9 | 9 | - | - | - | - | - |
| 80 | 10 | 2 | 10 | 10 | - | - | - | - | - |
| | 15 | 4 | | | | | | | |
| 60 | 10 | 2 | 11 | 11 | - | - | - | - | - |
| | 10 | 4 | | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.9.1. Only one test point to be tested. | | | | | | | | | |

**Table 8.7.9.3.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | MIMO layer | DL Cat. 11, 12 | | | | | |
| 160 | 2x20 | 4 | 2 | - | 1 | - | - | - |
| 140 | 15+20 | 4 | 2 | - | 2 | - | - | - |
| 120 | 20 | 2 | 3 | - | 3 | - | - | - |
| | 20 | 4 | | | | | | |
| 110 | 15 | 2 | 4 | - | 4 | - | - | - |
| | 20 | 4 | | | | | | |
| 100 | 10 | 2 | 5 | - | 5 | - | - | - |
| | 20 | 4 | | | | | | |
| 100 | 20 | 2 | 6 | - | 6 | - | - | - |
| | 15 | 4 | | | | | | |
| 90 | 15 | 2 | 7 | - | 7 | - | - | - |
| | 15 | 4 | | | | | | |
| 90 | 5 | 2 | 8 | - | 8 | - | - | - |
| | 20 | 4 | | | | | | |
| 80 | 5+15 | 4 | 9 | - | 9 | - | - | - |
| 80 | 10 | 2 | 10 | - | 10 | - | - | - |
| | 15 | 4 | | | | | | |
| 60 | 10 | 2 | 11 | - | 11 | - | - | - |
| | 10 | 4 | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.9.1. Only one test point to be tested. | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.9.3.4.1-1 depending on the UE category according to Table 8.7.9.3.4.1-2 for UE not supporting 256QAM or Table 8.7.9.3.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.91.

2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.9.1-1, Table 8.7.9.3.4.1-1 depending on the UE category according to Table 8.7.9.3.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.9.1-1, Table 8.7.9.3.4.1-1 depending on the UE category according to Table 8.7.9.3.4.1-3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.9.3.4.3.

#### 8.7.9.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.9.3.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.9.3.4.3-4. Cell ID = 1 applies to S-Cell.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.9.1-2, for the tests to be performed depending on the UE category according to Table 8.7.9.3.4.1-2. For UE supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.9.1-3, for the tests to be performed depending on the UE category according to Table 8.7.9.3.4.1-3.

6. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as B = $N_{DL_PDCP}$ - $N_{UL_PDCP}$

13. The UE passes the test if A > 85% and B = 0.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

#### 8.7.9.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.9.3.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.9.3.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.9.3.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna P-Cell |
| 4TX | 4 SS Tx antenna P-Cell |

**Table 8.7.9.3.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna S-Cell |
| 4TX | 4 SS Tx antenna S-Cell |

### 8.7.9.3.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.9.3.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.9.4 FDD sustained data rate performance for 4 layer MIMO (3DL CA)

Editor's note: Simplification of test point tables, to reduce future maintenance, needs further investigation.

#### 8.7.9.4.1 Test purpose

Same test purpose as 8.7.1.1.

#### 8.7.9.4.2 Test applicability

This test applies to E-UTRA FDD release 10 and forward UE of category 11 and 12 and DL category 11, 12, 15, 16 and 18 that supports 3DL with CA configurations in Table 7.1-2a and supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any FDD RF band of the 3DL CA configuration.

This test applies to E-UTRA FDD release 11 and forward UE of category 11 and 12 and DL category 11, 12, 15, 16 and 18 that supports 3DL with CA configurations in Table 7.1-2a and supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any FDD RF band of the 3DL CA configuration.

#### 8.7.9.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.9.1.

#### 8.7.9.4.4 Test description

##### 8.7.9.4.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.9.1-2, with the addition of the parameters in Table 8.7.9.4.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.9.4.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.9.1-3, with the addition of the parameters in Table 8.7.9.4.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.9.4.4.1-4.

**Table 8.7.9.4.4.1-1: Test parameters for sustained downlink data rate (FDD 3DL CA)**

| Test | Bandwidth (MHz) | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|
| 1 | 3x20 | 4 layer | 4x4 | 240 | 1455 | 1408 |
| 2 | 15+20+20 | 4 layer | 4x4 | 220 | 1455 | 1408 |
| 3 | 20 | 2 layer | 2x2 | 200 | 1341 | 1355 |
| | 2x20 | 4 layer | 4x4 | | | |
| 4 | 10+20+20 | 4 layer | 4x4 | 200 | 1323 | 1319 |
| 5 | 15 | 2 layer | 2x2 | 190 | 1371 | 1341 |
| | 2x20 | 4 layer | 4x4 | | | |
| 6 | 20 | 2 layer | 2x2 | 180 | 1341 | 1355 |
| | 15+20 | 4 layer | 4x4 | | | |
| 7 | 10 | 2 layer | 2x2 | 180 | 1141 | 1218 |
| | 2x20 | 4 layer | 4x4 | | | |
| 8 | 15 | 2 layer | 2x2 | 170 | 1371 | 1341 |
| | 15+20 | 4 layer | 4x4 | | | |
| 9 | 2x20 | 2 layer | 2x2 | 160 | 141 | 1355 |
| | 20 | 4 layer | 4x4 | | | |
| 10 | 20 | 2 layer | 2x2 | 160 | 1323 | 1319 |
| | 10+20 | 4 layer | 4x4 | | | |
| 11 | 10 | 2 layer | 2x2 | 160 | 1141 | 1218 |
| | 15+20 | 4 layer | 4x4 | | | |
| 12 | 5+15+20 | 4 layer | 4x4 | 160 | 1314 | 1318 |
| 13 | 15+20 | 2 layer | 2x2 | 150 | 1341 | 1341 |
| | 20 | 4 layer | 4x4 | | | |
| 14 | 2x20 | 2 layer | 2x2 | 140 | 1341 | 1355 |
| | 15 | 4 layer | 4x4 | | | |
| 15 | 10+20 | 2 layer | 2x2 | 140 | 1141 | 1218 |
| | 20 | 4 layer | 4x4 | | | |
| 16 | 2x15 | 2 layer | 2x2 | 140 | 1371 | 1341 |
| | 20 | 4 layer | 4x4 | | | |
| 17 | 15+20 | 2 layer | 2x2 | 130 | 1341 | 1341 |
| | 15 | 4 layer | 4x4 | | | |
| 18 | 10+15 | 2 layer | 2x2 | 130 | 1141 | 1218 |
| | 20 | 4 layer | 4x4 | | | |
| 19 | 2x20 | 2 layer | 2x2 | 120 | 1323 | 1319 |
| | 10 | 4 layer | 4x4 | | | |
| 20 | 10+20 | 2 layer | 2x2 | 120 | 1141 | 1218 |
| | 15 | 4 layer | 4x4 | | | |
| 21 | 5+15 | 2 layer | 2x2 | 120 | 1138 | 1014 |
| | 20 | 4 layer | 4x4 | | | |
| 22 | 2x10 | 2 layer | 2x2 | 120 | 1141 | 1218 |
| | 20 | 4 layer | 4x4 | | | |
| 23 | 20 | 2 layer | 2x2 | 120 | 1314 | 1318 |
| | 5+15 | 4 layer | 4x4 | | | |
| 24 | 5+10 | 2 layer | 2x2 | 110 | 1138 | 1014 |
| | 20 | 4 layer | 4x4 | | | |
| 25 | 2x5 | 2 layer | 2x2 | 100 | 1138 | 1014 |
| | 20 | 4 layer | 4x4 | | | |

Editor's note: Tests in Table 8.7.9.4.4.1-1 are covering maximum aggregated bandwidth for each Bandwidth combination set with 3DL CA which are defined in Table 5.4.2A.1-2 or Table 5.4.2A.1-2a.

**Table 8.7.9.4.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | Antenna config. | DL Cat. 11, 12 | | | | | |
| 240 | 3x20 | 4x4 | 7 | - | 2 | 1 | - | - |
| 220 | 15+20+20 | 4x4 | 7 | - | 2 | 2 | - | - |
| 200 | 20 | 2x2 | 7 | - | 3 | 3 | - | - |
| | 2x20 | 4x4 | | | | | | |
| 200 | 10+20+20 | 4x4 | 7 | - | 4 | 4 | - | - |
| 190 | 15 | 2x2 | 7 | - | 5 | 5 | - | - |
| | 2x20 | 4x4 | | | | | | |
| 180 | 20 | 2x2 | 6 | - | 6 | 6 | - | - |
| | 15+20 | 4x4 | | | | | | |
| 180 | 10 | 2x2 | 7 | - | 7 | 7 | - | - |
| | 2x20 | 4x4 | | | | | | |
| 170 | 15 | 2x2 | 8 | - | 8 | 8 | - | - |
| | 15+20 | 4x4 | | | | | | |
| 160 | 2x20 | 2x2 | 9 | - | 9 | 9 | - | - |
| | 20 | 4x4 | | | | | | |
| 160 | 20 | 2x2 | 10 | - | 10 | 10 | - | - |
| | 10+20 | 4x4 | | | | | | |
| 160 | 10 | 2x2 | 11 | - | 11 | 11 | - | - |
| | 15+20 | 4x4 | | | | | | |
| 160 | 5+15+20 | 4x4 | 12 | - | 12 | 12 | - | - |
| 150 | 15+20 | 2x2 | 13 | - | 13 | 13 | - | - |
| | 20 | 4x4 | | | | | | |
| 140 | 2x20 | 2x2 | 14 | - | 14 | 14 | - | - |
| | 15 | 4x4 | | | | | | |
| 140 | 10+20 | 2x2 | 15 | - | 15 | 15 | - | - |
| | 20 | 4x4 | | | | | | |
| 140 | 2x15 | 2x2 | 16 | - | 16 | 16 | - | - |
| | 20 | 4x4 | | | | | | |
| 130 | 15+20 | 2x2 | 17 | - | 17 | 17 | - | - |
| | 15 | 4x4 | | | | | | |
| 130 | 10+15 | 2x2 | 18 | - | 18 | 18 | - | - |
| | 20 | 4x4 | | | | | | |
| 120 | 2x20 | 2x2 | 19 | - | 19 | 19 | - | - |
| | 10 | 4x4 | | | | | | |
| 120 | 10+20 | 2x2 | 20 | - | 20 | 20 | - | - |
| | 15 | 4x4 | | | | | | |
| 120 | 5+15 | 2x2 | 21 | - | 21 | 21 | - | - |
| | 20 | 4x4 | | | | | | |
| 120 | 2x10 | 2x2 | 22 | - | 22 | 22 | - | - |
| | 20 | 4x4 | | | | | | |
| 120 | 20 | 2x2 | 23 | - | 23 | 23 | - | - |
| | 5+15 | 4x4 | | | | | | |
| 110 | 5+10 | 2x2 | 24 | - | 24 | 24 | - | - |
| | 20 | 4x4 | | | | | | |
| 100 | 2x5 | 2x2 | 25 | - | 25 | 25 | - | - |
| | 20 | 4x4 | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.9.1. Only one test point to be tested. | | | | | | | | |

**Table 8.7.9.4.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | Antenna config. | DL Cat. 11, 12 | | | | | |
| 240 | 3x20 | 4x4 | - | - | 9 | 2 | 1 | - |
| 220 | 15+20+20 | 4x4 | - | - | 8 | 2 | 2 | - |
| 200 | 20 | 2x2 | - | - | 9 | 3 | 3 | - |
| | 2x20 | 4x4 | | | | | | |
| 200 | 10+20+20 | 4x4 | - | - | 10 | 4 | 4 | - |
| 190 | 15 | 2x2 | - | - | 8 | 5 | 5 | - |
| | 2x20 | 4x4 | | | | | | |
| 180 | 20 | 2x2 | - | - | 8 | 6 | 6 | - |
| | 15+20 | 4x4 | | | | | | |
| 180 | 10 | 2x2 | - | - | 11 | 7 | 7 | - |
| | 2x20 | 4x4 | | | | | | |
| 170 | 15 | 2x2 | - | - | 8 | 8 | 8 | - |
| | 15+20 | 4x4 | | | | | | |
| 160 | 2x20 | 2x2 | - | - | 9 | 9 | 9 | - |
| | 20 | 4x4 | | | | | | |
| 160 | 20 | 2x2 | - | - | 10 | 10 | 10 | - |
| | 10+20 | 4x4 | | | | | | |
| 160 | 10 | 2x2 | - | - | 11 | 11 | 11 | - |
| | 15+20 | 4x4 | | | | | | |
| 160 | 5+15+20 | 4x4 | - | - | 12 | 12 | 12 | - |
| 150 | 15+20 | 2x2 | - | - | 13 | 13 | 13 | - |
| | 20 | 4x4 | | | | | | |
| 140 | 2x20 | 2x2 | - | - | 14 | 14 | 14 | - |
| | 15 | 4x4 | | | | | | |
| 140 | 10+20 | 2x2 | - | - | 15 | 15 | 15 | - |
| | 20 | 4x4 | | | | | | |
| 140 | 2x15 | 2x2 | - | - | 16 | 16 | 16 | - |
| | 20 | 4x4 | | | | | | |
| 130 | 15+20 | 2x2 | - | - | 17 | 17 | 17 | - |
| | 15 | 4x4 | | | | | | |
| 130 | 10+15 | 2x2 | - | - | 18 | 18 | 18 | - |
| | 20 | 4x4 | | | | | | |
| 120 | 2x20 | 2x2 | - | - | 19 | 19 | 19 | - |
| | 10 | 4x4 | | | | | | |
| 120 | 10+20 | 2x2 | - | - | 20 | 20 | 20 | - |
| | 15 | 4x4 | | | | | | |
| 120 | 5+15 | 2x2 | - | - | 21 | 21 | 21 | - |
| | 20 | 4x4 | | | | | | |
| 120 | 2x10 | 2x2 | - | - | 22 | 22 | 22 | - |
| | 20 | 4x4 | | | | | | |
| 120 | 20 | 2x2 | - | - | 23 | 23 | 23 | - |
| | 5+15 | 4x4 | | | | | | |
| 110 | 5+10 | 2x2 | - | - | 24 | 24 | 24 | - |
| | 20 | 4x4 | | | | | | |
| 100 | 2x5 | 2x2 | - | - | 25 | 25 | 25 | - |
| | 20 | 4x4 | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.9.1. Only one test point to be tested. | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.9.4.4.1-1 depending on the UE category according to Table 8.7.9.4.4.1-2 for UE not supporting 256QAM or Table 8.7.9.4.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.91.
2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.9.1-1, Table 8.7.9.4.4.1-1 depending on the UE category according to Table 8.7.9.4.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.9.1-1, Table 8.7.9.4.4.1-1 depending on the UE category according to Table 8.7.9.4.4.1-3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.9.4.4.3.

### 8.7.9.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with two SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.9.4.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.9.4.4.3-4. Cell ID = n (where n is 1, 2) applies to S-Celln (where n is 1, 2).
3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).
5. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.9.1-2, for the tests to be performed depending on the UE category according to Table 8.7.9.4.4.1-2. For UE supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.9.1-3, for the tests to be performed depending on the UE category according to Table 8.7.9.4.4.1-3.
6. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $ND_{DL_PDCP}$ to 0.
7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.
8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.
9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.
10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one
11. The SS calculates the TB success rate as $A = 100\% * N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.
12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$
13. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

8.7.9.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.9.4.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.9.4.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.9.4.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna P-Cell |
| 4TX | 4 SS Tx antenna P-Cell |

**Table 8.7.9.4.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna S-Cell |
| 4TX | 4 SS Tx antenna S-Cell |

### 8.7.9.4.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.9.4.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.9.5 FDD sustained data rate performance for 4 layer MIMO (4DL CA)

Editor's note: Simplification of test point tables, to reduce future maintenance, needs further investigation.

#### 8.7.9.5.1 Test purpose

Same test purpose as 8.7.1.1.

#### 8.7.9.5.2 Test applicability

This test applies to E-UTRA FDD release 11 and forward UE of DL category 15, 16, 18 and 19 that supports 4DL with CA configurations in Table 7.1-2b and supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any FDD RF band of the 4DL CA configuration.

#### 8.7.9.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.9.1.

#### 8.7.9.5.4 Test description

##### 8.7.9.5.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.9.1-2, with the addition of the parameters in Table 8.7.9.5.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.9.5.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.9.1-3, with the addition of the parameters in Table 8.7.9.5.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.9.5.4.1-3.

**Table 8.7.9.5.4.1-1: Test parameters for sustained downlink data rate (FDD 4DL CA)**

| Test | Bandwidth (MHz) | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|
| 1 | 4x20 | 4 layer | 4x4 | 320 | 1455 | 1408 |
| 2 | 20 | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 3x20 | 4 layer | 4x4 | | | |
| 3 | 10 | 2 layer | 2x2 | 260 | 1141 | 1218 |
| | 3x20 | 4 layer | 4x4 | | | |
| 4 | 15 | 2 layer | 2x2 | 250 | 1371 | 1341 |
| | 15+20+20 | 4 layer | 4x4 | | | |
| 5 | 2x20 | 2 layer | 2x2 | 240 | 1341 | 1355 |
| | 2x20 | 4 layer | 4x4 | | | |
| 6 | 10 | 2 layer | 2x2 | 240 | 1141 | 1218 |
| | 15+20+20 | 4 layer | 4x4 | | | |
| 7 | 10+10+20+20 | 4 layer | 4x4 | 240 | 1323 | 1319 |
| 8 | 10+20 | 2 layer | 2x2 | 220 | 1141 | 1218 |
| | 2x20 | 4 layer | 4x4 | | | |
| 9 | 2x15 | 2 layer | 2x2 | 220 | 1371 | 1341 |
| | 2x20 | 4 layer | 4x4 | | | |
| 10 | 10 | 2 layer | 2x2 | 220 | 1141 | 1218 |
| | 10+20+20 | 4 layer | 4x4 | | | |
| 11 | 15+20 | 2 layer | 2x2 | 210 | 1341 | 1341 |
| | 15+20 | 4 layer | 4x4 | | | |
| 12 | 10+15 | 2 layer | 2x2 | 210 | 1141 | 1218 |
| | 2x20 | 4 layer | 4x4 | | | |
| 13 | 3x20 | 2 layer | 2x2 | 200 | 1341 | 1355 |
| | 20 | 4 layer | 4x4 | | | |
| 14 | 15+20 | 2 layer | 2x2 | 200 | 1323 | 1319 |
| | 10+20 | 4 layer | 4x4 | | | |
| 15 | 2x10 | 2 layer | 2x2 | 200 | 1141 | 1218 |
| | 2x20 | 4 layer | 4x4 | | | |
| 16 | 5+10 | 2 layer | 2x2 | 190 | 1138 | 1014 |
| | 2x20 | 4 layer | 4x4 | | | |
| 17 | 10+20+20 | 2 layer | 2x2 | 180 | 1141 | 1218 |
| | 20 | 4 layer | 4x4 | | | |
| 18 | 15+15+20 | 2 layer | 2x2 | 180 | 1341 | 1341 |
| | 20 | 4 layer | 4x4 | | | |
| 19 | 10+20 | 2 layer | 2x2 | 180 | 1141 | 1218 |
| | 10+20 | 4 layer | 4x4 | | | |
| 20 | 2x5 | 2 layer | 2x2 | 180 | 1138 | 1014 |
| | 2x20 | 4 layer | 4x4 | | | |
| 21 | 15+20+20 | 2 layer | 2x2 | 170 | 1341 | 1341 |
| | 15 | 4 layer | 4x4 | | | |
| 22 | 10+15+20 | 2 layer | 2x2 | 170 | 1141 | 1218 |
| | 20 | 4 layer | 4x4 | | | |
| 23 | 10+20+20 | 2 layer | 2x2 | 160 | 1141 | 1218 |
| | 15 | 4 layer | 4x4 | | | |
| 24 | 10+10+20 | 2 layer | 2x2 | 160 | 1141 | 1218 |
| | 20 | 4 layer | 4x4 | | | |
| 25 | 5+10+20 | 2 layer | 2x2 | 150 | 1138 | 1014 |
| | 20 | 4 layer | 4x4 | | | |
| 26 | 5+5+20 | 2 layer | 2x2 | 140 | 1138 | 1014 |
| | 20 | 4 layer | 4x4 | | | |
| 27 | 10+10+10 | 2 layer | 2x2 | 140 | 1141 | 1218 |
| | 20 | 4 layer | 4x4 | | | |
| 28 | 5+10+10 | 2 layer | 2x2 | 130 | 1138 | 1014 |
| | 20 | 4 layer | 4x4 | | | |
| 29 | 5+5+10 | 2 layer | 2x2 | 120 | 1138 | 1014 |
| | 20 | 4 layer | 4x4 | | | |

Editor's note: Tests in Table 8.7.9.5.4.1-1 are covering maximum aggregated bandwidth for each Bandwidth combination set with 4DL CA, which are defined in Table 5.4.2A.1-2, Table 5.4.2A.1-2a or Table 5.4.2A.1-2b.

**Table 8.7.9.5.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | Antenna config. | DL Cat. 11, 12 | | | | | |
| 320 | 4x20 | 4x4 | - | - | 8 | 2 | 1 | - |
| 280 | 20 | 2x2 | - | - | 8 | 2 | 2 | - |
| | 3x20 | 4x4 | | | | | | |
| 260 | 10 | 2x2 | - | - | 8 | 3 | 3 | - |
| | 3x20 | 4x4 | | | | | | |
| 250 | 15 | 2x2 | - | - | 9 | 4 | 4 | - |
| | 15+20+20 | 4x4 | | | | | | |
| 240 | 2x20 | 2x2 | - | - | 8 | 5 | 5 | - |
| | 2x20 | 4x4 | | | | | | |
| 240 | 10 | 2x2 | - | - | 12 | 6 | 6 | - |
| | 15+20+20 | 4x4 | | | | | | |
| 240 | 10+10+20 +20 | 4x4 | - | - | 10 | 7 | 7 | - |
| 220 | 10+20 | 2x2 | - | - | 8 | 8 | 8 | - |
| | 2x20 | 4x4 | | | | | | |
| 220 | 2x15 | 2x2 | - | - | 9 | 9 | 9 | - |
| | 2x20 | 4x4 | | | | | | |
| 220 | 10 | 2x2 | - | - | 10 | 10 | 10 | - |
| | 10+20+20 | 4x4 | | | | | | |
| 210 | 15+20 | 2x2 | - | - | 11 | 11 | 11 | - |
| | 15+20 | 4x4 | | | | | | |
| 210 | 10+15 | 2x2 | - | - | 12 | 12 | 12 | - |
| | 2x20 | 4x4 | | | | | | |
| 200 | 3x20 | 2x2 | - | - | 13 | 13 | 13 | - |
| | 20 | 4x4 | | | | | | |
| 200 | 15+20 | 2x2 | - | - | 14 | 14 | 14 | - |
| | 10+20 | 4x4 | | | | | | |
| 200 | 2x10 | 2x2 | - | - | 15 | 15 | 15 | - |
| | 2x20 | 4x4 | | | | | | |
| 190 | 5+10 | 2x2 | - | - | 16 | 16 | 16 | - |
| | 2x20 | 4x4 | | | | | | |
| 180 | 10+20+20 | 2x2 | - | - | 17 | 17 | 17 | - |
| | 20 | 4x4 | | | | | | |
| 180 | 15+15+20 | 2x2 | - | - | 18 | 18 | 18 | - |
| | 20 | 4x4 | | | | | | |
| 180 | 10+20 | 2x2 | - | - | 19 | 19 | 19 | - |
| | 10+20 | 4x4 | | | | | | |
| 180 | 2x5 | 2x2 | - | - | 20 | 20 | 20 | - |
| | 2x20 | 4x4 | | | | | | |
| 170 | 15+20+20 | 2x2 | - | - | 21 | 21 | 21 | - |
| | 15 | 4x4 | | | | | | |
| 170 | 10+15+20 | 2x2 | - | - | 22 | 22 | 22 | - |
| | 20 | 4x4 | | | | | | |
| 160 | 10+20+20 | 2x2 | - | - | 23 | 23 | 23 | - |
| | 15 | 4x4 | | | | | | |
| 160 | 10+10+20 | 2x2 | - | - | 24 | 24 | 24 | - |
| | 20 | 4x4 | | | | | | |
| 150 | 5+10+20 | 2x2 | - | - | 25 | 25 | 25 | - |
| | 20 | 4x4 | | | | | | |
| 140 | 5+5+20 | 2x2 | - | - | 26 | 26 | 26 | - |
| | 20 | 4x4 | | | | | | |
| 140 | 10+10+10 | 2x2 | - | - | 27 | 27 | 27 | - |
| | 20 | 4x4 | | | | | | |
| 130 | 5+10+10 | 2x2 | - | - | 28 | 28 | 28 | - |
| | 20 | 4x4 | | | | | | |
| 120 | 5+5+10 | 2x2 | - | - | 29 | 29 | 29 | - |
| | 20 | 4x4 | | | | | | |

| | |
|---|---|
| Note 1: | Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.9.1. Only one test point to be tested. |

**Table 8.7.9.5.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | Antenna config. | DL Cat. 11, 12 | | | | | |
| 320 | 4x20 | 4x4 | - | - | - | 8 | 3 | 1 |
| 280 | 20 | 2x2 | - | - | - | 8 | 3 | 2 |
| | 3x20 | 4x4 | | | | | | |
| 260 | 10 | 2x2 | - | - | - | 8 | 3 | 3 |
| | 3x20 | 4x4 | | | | | | |
| 250 | 15 | 2x2 | - | - | - | 11 | 4 | 4 |
| | 15+20+20 | 4x4 | | | | | | |
| 240 | 2x20 | 2x2 | - | - | - | 8 | 5 | 5 |
| | 2x20 | 4x4 | | | | | | |
| 240 | 10 | 2x2 | - | - | - | 12 | 6 | 6 |
| | 15+20+20 | 4x4 | | | | | | |
| 240 | 10+10+20 +20 | 4x4 | - | - | - | 10 | 7 | 7 |
| 220 | 10+20 | 2x2 | - | - | - | 8 | 8 | 8 |
| | 2x20 | 4x4 | | | | | | |
| 220 | 2x15 | 2x2 | - | - | - | 11 | 9 | 9 |
| | 2x20 | 4x4 | | | | | | |
| 220 | 10 | 2x2 | - | - | - | 10 | 10 | 10 |
| | 10+20+20 | 4x4 | | | | | | |
| 210 | 15+20 | 2x2 | - | - | - | 11 | 11 | 11 |
| | 15+20 | 4x4 | | | | | | |
| 210 | 10+15 | 2x2 | - | - | - | 12 | 12 | 12 |
| | 2x20 | 4x4 | | | | | | |
| 200 | 3x20 | 2x2 | - | - | - | 13 | 13 | 13 |
| | 20 | 4x4 | | | | | | |
| 200 | 15+20 | 2x2 | - | - | - | 14 | 14 | 14 |
| | 10+20 | 4x4 | | | | | | |
| 200 | 2x10 | 2x2 | - | - | - | 15 | 15 | 15 |
| | 2x20 | 4x4 | | | | | | |
| 190 | 5+10 | 2x2 | - | - | - | 16 | 16 | 16 |
| | 2x20 | 4x4 | | | | | | |
| 180 | 10+20+20 | 2x2 | - | - | - | 17 | 17 | 17 |
| | 20 | 4x4 | | | | | | |
| 180 | 15+15+20 | 2x2 | - | - | - | 18 | 18 | 18 |
| | 20 | 4x4 | | | | | | |
| 180 | 10+20 | 2x2 | - | - | - | 19 | 19 | 19 |
| | 10+20 | 4x4 | | | | | | |
| 180 | 2x5 | 2x2 | - | - | - | 20 | 20 | 20 |
| | 2x20 | 4x4 | | | | | | |
| 170 | 15+20+20 | 2x2 | - | - | - | 21 | 21 | 21 |
| | 15 | 4x4 | | | | | | |
| 170 | 10+15+20 | 2x2 | - | - | - | 22 | 22 | 22 |
| | 20 | 4x4 | | | | | | |
| 160 | 10+20+20 | 2x2 | - | - | - | 23 | 23 | 23 |
| | 15 | 4x4 | | | | | | |
| 160 | 10+10+20 | 2x2 | - | - | - | 24 | 24 | 24 |
| | 20 | 4x4 | | | | | | |
| 150 | 5+10+20 | 2x2 | - | - | - | 25 | 25 | 25 |
| | 20 | 4x4 | | | | | | |
| 140 | 5+5+20 | 2x2 | - | - | - | 26 | 26 | 26 |
| | 20 | 4x4 | | | | | | |
| 140 | 10+10+10 | 2x2 | - | - | - | 27 | 27 | 27 |
| | 20 | 4x4 | | | | | | |
| 130 | 5+10+10 | 2x2 | - | - | - | 28 | 28 | 28 |
| | 20 | 4x4 | | | | | | |
| 120 | 5+5+10 | 2x2 | - | - | - | 29 | 29 | 29 |
| | 20 | 4x4 | | | | | | |

| Note 1: | Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.9.1. Only one test point to be tested. |
|---|---|

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.9.5.4.1-1 depending on the UE category according to Table 8.7.9.5.4.1-2 for UE not supporting 256QAM or Table 8.7.9.5.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.91.
2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.9.1-1, Table 8.7.9.5.4.1-1 depending on the UE category according to Table 8.7.9.5.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.9.1-1, Table 8.7.9.5.4.1-1 depending on the UE category according to Table 8.7.9.5.4.1-3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.9.5.4.3.

### 8.7.9.5.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with three SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.9.5.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.9.5.4.3-4. Cell ID = n (where n is 1, 2, 3) applies to S-Celln (where n is 1, 2, 3).
3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).
5. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.9.1-2, for the tests to be performed depending on the UE category according to Table 8.7.9.5.4.1-2. For UE supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.9.1-3, for the tests to be performed depending on the UE category according to Table 8.7.9.5.4.1-3.
6. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $ND_{DL_PDCP}$ to 0.
7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.
8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.
9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

#### 8.7.9.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.9.5.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.9.5.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.9.5.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna P-Cell |
| 4TX | 4 SS Tx antenna P-Cell |

**Table 8.7.9.5.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna S-Cell |
| 4TX | 4 SS Tx antenna S-Cell |

### 8.7.9.5.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.9.5.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.9.6 FDD sustained data rate performance for 4 layer MIMO (5DL CA)

Editor's note: Simplification of test point tables, to reduce future maintenance, needs further investigation.

#### 8.7.9.6.1 Test purpose

Same test purpose as 8.7.1.1.

#### 8.7.9.6.2 Test applicability

This test applies to E-UTRA FDD release 11 and forward UE of DL category 15, 16, 18 and 19 that supports 5DL with CA configurations in Table 7.1-2c and supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any FDD RF band of the 5DL CA configuration.

This test applies to E-UTRA FDD release 12 and forward UE of DL category 15, 16, 18 and 19 that supports 5DLwith CA configurations in Table 7.1-2c and supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any FDD RF band of the 5DL CA configuration.

#### 8.7.9.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.9.1.

#### 8.7.9.6.4 Test description

##### 8.7.9.6.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.9.1-2, with the addition of the parameters in Table 8.7.9.6.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.9.6.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.9.1-3, with the addition of the parameters in Table 8.7.9.6.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.9.6.4.1-3.

**Table 8.7.9.6.4.1-1: Test parameters for sustained downlink data rate (FDD 5DL CA)**

| Test | Bandwidth (MHz) | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|
| 1 | 5x20 | 4 layer | 4x4 | 400 | 1455 | 1408 |
| 2 | 20 | 2 layer | 2x2 | 360 | 1341 | 1355 |
| | 4x20 | 4 layer | 4x4 | | | |
| 3 | 10 | 2 layer | 2x2 | 340 | 1141 | 1355 |
| | 4x20 | 4 layer | 4x4 | | | |
| 4 | 2x20 | 2 layer | 2x2 | 320 | 1341 | 1355 |
| | 3x20 | 4 layer | 4x4 | | | |
| 5 | 10+20 | 2 layer | 2x2 | 300 | 1141 | 1218 |
| | 3x20 | 4 layer | 4x4 | | | |
| 6 | 3x20 | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 2x20 | 4 layer | 4x4 | | | |
| 7 | 10+20+20 | 2 layer | 2x2 | 260 | 1141 | 1218 |
| | 2x20 | 4 layer | 4x4 | | | |
| 8 | 10 | 2 layer | 2x2 | 260 | 1141 | 1218 |
| | 10+10+20+20 | 4 layer | 4x4 | | | |
| 9 | 20 | 2 layer | 2x2 | 240 | 1341 | 1355 |
| | 4x20 | 4 layer | 4x4 | | | |
| 10 | 10+10+20 | 2 layer | 2x2 | 240 | 1141 | 1218 |
| | 2x20 | 4 layer | 4x4 | | | |
| 11 | 5+10+20 | 2 layer | 2x2 | 230 | 1138 | 1014 |
| | 2x20 | 4 layer | 4x4 | | | |
| 12 | 10+20+20+20 | 2 layer | 2x2 | 220 | 1141 | 1218 |
| | 20 | 4 layer | 4x4 | | | |
| 13 | 3x10 | 2 layer | 2x2 | 220 | 1141 | 1218 |
| | 2x20 | 4 layer | 4x4 | | | |
| 14 | 10+10+20+20 | 2 layer | 2x2 | 200 | 1141 | 1218 |
| | 20 | 4 layer | 4x4 | | | |
| 15 | 10+10+20 | 2 layer | 2x2 | 200 | 1141 | 1218 |
| | 10+20 | 4 layer | 4x4 | | | |
| 16 | 5+10+20+20 | 2 layer | 2x2 | 190 | 1138 | 1014 |
| | 20 | 4 layer | 4x4 | | | |
| 17 | 10+10+10+20 | 2 layer | 2x2 | 180 | 1141 | 1218 |
| | 20 | 4 layer | 4x4 | | | |
| 18 | 4x10 | 2 layer | 2x2 | 160 | 1141 | 1218 |
| | 20 | 4 layer | 4x4 | | | |

Editor's note: Tests in Table 8.7.9.6.4.1-1 are covering maximum aggregated bandwidth for each Bandwidth combination set with 5DL CA, which are defined in Table 5.4.2A.1-2, Table 5.4.2A.1-2a, Table 5.4.2A.1-2b or Table 5.4.2A.1-2c.

**Table 8.7.9.6.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | Antenna config. | DL Cat. 11, 12 | | | | | |
| 400 | 5x20 | 4x4 | - | - | 13 | 6 | 3 | 1 |
| 360 | 20 | 2x2 | - | - | 13 | 6 | 3 | 2 |
| | 4x20 | 4x4 | | | | | | |
| 340 | 10 | 2x2 | - | - | 13 | 7 | 3 | 3 |
| | 4x20 | 4x4 | | | | | | |
| 320 | 2x20 | 2x2 | - | - | 13 | 6 | 4 | 4 |
| | 3x20 | 4x4 | | | | | | |
| 300 | 10+20 | 2x2 | - | - | 13 | 7 | 5 | 5 |
| | 3x20 | 4x4 | | | | | | |
| 280 | 3x20 | 2x2 | - | - | 13 | 6 | 6 | 6 |
| | 2x20 | 4x4 | | | | | | |
| 260 | 10+20+20 | 2x2 | - | - | 13 | 7 | 7 | 7 |
| | 2x20 | 4x4 | | | | | | |
| 260 | 10 | 2x2 | - | - | 13 | 8 | 8 | 8 |
| | 10+10+20 +20 | 4x4 | | | | | | |
| 240 | 20 | 2x2 | - | - | 14 | 9 | 9 | 9 |
| | 4x20 | 4x4 | | | | | | |
| 240 | 10+10+20 | 2x2 | - | - | 13 | 10 | 10 | 10 |
| | 2x20 | 4x4 | | | | | | |
| 230 | 5+10+20 | 2x2 | - | - | 16 | 11 | 11 | 11 |
| | 2x20 | 4x4 | | | | | | |
| 220 | 10+20+20 +20 | 2x2 | - | - | 14 | 12 | 12 | 12 |
| | 20 | 4x4 | | | | | | |
| 220 | 3x10 | 2x2 | - | - | 13 | 13 | 13 | 13 |
| | 2x20 | 4x4 | | | | | | |
| 200 | 10+10+20 +20 | 2x2 | - | - | 14 | 14 | 14 | 14 |
| | 20 | 4x4 | | | | | | |
| 200 | 10+10+20 | 2x2 | - | - | 15 | 15 | 15 | 15 |
| | 10+20 | 4x4 | | | | | | |
| 190 | 5+10+20+ 20 | 2x2 | - | - | 16 | 16 | 16 | 16 |
| | 20 | 4x4 | | | | | | |
| 180 | 10+10+10 +20 | 2x2 | - | - | 17 | 17 | 17 | 17 |
| | 20 | 4x4 | | | | | | |
| 160 | 4x10 | 2x2 | - | - | 18 | 18 | 18 | 18 |
| | 20 | 4x4 | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.9.1. Only one test point to be tested. | | | | | | | | |

**Table 8.7.9.6.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | Antenna config. | DL Cat. 11, 12 | | | | | |
| 400 | 5x20 | 4x4 | - | - | - | 13 | 7 | 2 |
| 360 | 20 | 2x2 | - | - | - | 13 | 7 | 2 |
| | 4x20 | 4x4 | | | | | | |
| 340 | 10 | 2x2 | - | - | - | 13 | 7 | 3 |
| | 4x20 | 4x4 | | | | | | |
| 320 | 2x20 | 2x2 | - | - | - | 13 | 7 | 4 |
| | 3x20 | 4x4 | | | | | | |
| 300 | 10+20 | 2x2 | - | - | - | 13 | 7 | 5 |
| | 3x20 | 4x4 | | | | | | |
| 280 | 3x20 | 2x2 | - | - | - | 13 | 7 | 6 |
| | 2x20 | 4x4 | | | | | | |
| 260 | 10+20+20 | 2x2 | - | - | - | 13 | 7 | 7 |
| | 2x20 | 4x4 | | | | | | |
| 260 | 10 | 2x2 | - | - | - | 13 | 8 | 8 |
| | 10+10+20 +20 | 4x4 | | | | | | |
| 240 | 20 | 2x2 | - | - | - | 14 | 9 | 9 |
| | 4x20 | 4x4 | | | | | | |
| 240 | 10+10+20 | 2x2 | - | - | - | 13 | 10 | 10 |
| | 2x20 | 4x4 | | | | | | |
| 230 | 5+10+20 | 2x2 | - | - | - | 16 | 11 | 11 |
| | 2x20 | 4x4 | | | | | | |
| 220 | 10+20+20 +20 | 2x2 | - | - | - | 14 | 12 | 12 |
| | 20 | 4x4 | | | | | | |
| 220 | 3x10 | 2x2 | - | - | - | 13 | 13 | 13 |
| | 2x20 | 4x4 | | | | | | |
| 200 | 10+10+20 +20 | 2x2 | - | - | - | 14 | 14 | 14 |
| | 20 | 4x4 | | | | | | |
| 200 | 10+10+20 | 2x2 | - | - | - | 15 | 15 | 15 |
| | 10+20 | 4x4 | | | | | | |
| 190 | 5+10+20+ 20 | 2x2 | - | - | - | 16 | 16 | 16 |
| | 20 | 4x4 | | | | | | |
| 180 | 10+10+10 +20 | 2x2 | - | - | - | 17 | 17 | 17 |
| | 20 | 4x4 | | | | | | |
| 160 | 4x10 | 2x2 | - | - | - | 18 | 18 | 18 |
| | 20 | 4x4 | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.9.1. Only one test point to be tested. | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.9.6.4.1-1 depending on the UE category according to Table 8.7.9.6.4.1-2 for UE not supporting 256QAM or Table 8.7.9.6.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.91.

2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.9.1-1, Table 8.7.9.6.4.1-1 depending on the UE category according to Table 8.7.9.6.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.9.1-1, Table 8.7.9.6.4.1-1 depending on the UE category according to Table 8.7.9.6.4.1-3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.9.6.4.3.

### 8.7.9.6.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with four SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.9.6.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.9.6.4.3-4. Cell ID = n (where n is 1, 2, 3, 4) applies to S-Celln (where n is 1, 2, 3, 4).

3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.9.1-2, for the tests to be performed depending on the UE category according to Table 8.7.9.6.4.1-2. For UE supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.9.1-3, for the tests to be performed depending on the UE category according to Table 8.7.9.6.4.1-3.

6. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.9.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.9.6.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.9.6.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.9.6.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| **Condition** | **Explanation** |
|---|---|

| | |
|---|---|
| 2TX | 2 SS Tx antenna P-Cell |
| 4TX | 4 SS Tx antenna P-Cell |

**Table 8.7.9.6.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna S-Cell |
| 4TX | 4 SS Tx antenna S-Cell |

### 8.7.9.6.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.9.6.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.10 TDD sustained data rate performance (4 layer MIMO)

### 8.7.10.1 Minimum conformance requirements

The parameters specified in Table 8.7.10.1-1 are valid for all TDD tests unless otherwise stated.

**Table 8.7.10.1-1: Common Test Parameters (TDD)**

| Parameter | Unit | Value |
|---|---|---|
| Transmission mode | | 3 |
| Special subframe configuration (Note 1) | | 4 |
| Cyclic prefix | | Normal |
| Cell ID | | 0 |
| Inter-TTI Distance | | 1 |
| Number of HARQ processes per component carrier | Processes | 8 |
| Maximum number of HARQ transmission | | 4 |
| Redundancy version coding sequence | | {0,0,1,2} for 64QAM and 256QAM |
| Number of OFDM symbols for PDCCH per component carrier | OFDM symbols | 1 |
| Cross carrier scheduling | | Not configured |
| Propagation condition | | Static propagation condition<br>No external noise sources are applied |
| $\hat{E}_s$ at antenna port | dBm/15kHz | -85 |
| Symbols for unused PRBs | | OP.1 TDD |
| Antenna configuration | 2 layer CC | 2x2 or 2x4 |
| | 4 layer CC | 4x4 |
| Codebook subset restriction | 2 layer CC | 10 |
| | 4 layer CC | 1000 |
| Downlink power allocation | 2 layer CC | $\rho_A$ = -3dB, $\rho_B$ = -3dB, $\sigma$ = 0dB |
| | 4 layer CC | $\rho_A$ = -6dB, $\rho_B$ = -6dB, $\sigma$ = 3dB |
| Symbols for unused PRBs | | OP.1 TDD |

For UE not supporting 256QAM, the TB success rate shall be higher than 85% when PDSCH are scheduled with FRC in Table 8.7.10.1-2 with the downlink physical channel setup according to Annex C.3.2.

For UE supporting 256QAM, the TB success rate shall be higher than 85% when PDSCH are scheduled with FRC in Table 8.7.10.1-3 with the downlink physical channel setup according to Annex C.3.2. For UE supporting 256QAM, the requirement with 64QAM is not applicable.

The TB success rate is defined as $100\%*N_{DL_correct_rx}/ (N_{DL_newtx} + N_{DL_retx})$, where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.10.1-2: Per-CC FRC for SDR test(TDD 64QAM)**

| MIMO layer | Bandwidth | Reference channel |
|---|---|---|
| 2 layer | 10 | R.31-6 TDD |
| | 15 | R.31-5 TDD |
| | 20 | R.31-4 TDD |
| 4 layer | 10 | R.31-7 TDD |
| | 15 | R.31-8 TDD |
| | 20 | R.31-9 TDD |

**Table 8.7.10.1-3: Per-CC FRC for SDR test (TDD 256QAM)**

| MIMO layer | Bandwidth | Reference channel |
|---|---|---|
| 2 layer | 10 | R.68-2 TDD |
| | 15 | R.68-1 TDD |
| | 20 | R.68 TDD |
| 4 layer | 10 | R.68-5 TDD |
| | 15 | R.68-6 TDD |
| | 20 | R.68-7 TDD |

CA configuration, bandwidth combination and MIMO layer on each CC is determined by following procedure.

- Select one CA bandwidth combination among all supported CA configurations with bandwidth combination and MIMO layer on each CC that leads to largest equivalent aggregated bandwidth among all CA bandwidth combinations supported by UE. Equivalent aggregated bandwidth is defined as

$$B_{agg} = \sum_{i=0}^{N-1} R_i B_i$$

  where $N$ is number of CCs, $R_i \in \{2,4\}$ and $B_i \in \{5,10,15,20\}$ is MIMO layer and bandwidth of CC $i$.

- When there are multiple sets of {CA configuration, bandwidth combination, MIMO layer} with same largest aggregated bandwidth, select one among sets with largest number of 4 layer CCs.
- The procedure applies also for single carrier using operating band instead of CA configuration, and bandwidth instead of bandwidth combination.

The normative reference for this requirement is TS 36.101 [2] clause 8.7.10.

## 8.7.10.2 TDD sustained data rate performance for 4 layer MIMO (single carrier)

### 8.7.10.2.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.10.2.2 Test applicability

This test applies to E-UTRA TDD release 10 and forward UE of category 6 and 7 and DL category 13 that supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any TDD RF band.

### 8.7.10.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.10.1.

### 8.7.10.2.4 Test description

#### 8.7.10.2.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.10.1-2, with the addition of the parameters in Table 8.7.10.2.4.1-1 and Table 8.7.10.2.4.1-3. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.10.2.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.10.1-3, with the addition of the parameters in Table 8.7.10.2.4.1-1 and Table 8.7.10.2.4.1-5. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.10.2.4.1-4.

**Table 8.7.10.2.4.1-1: Test parameters for sustained downlink data rate (TDD single carrier)**

| Test | Bandwidth (MHz) | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) |
|---|---|---|---|---|
| 1 | 20 | 4 layer | 4x4 | 80 |

**Table 8.7.10.2.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 6, 7 | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 |
|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW (MHz) | MIMO layer | | DL Cat. 9, 10 | DL Cat. 11, 12 | |
| 80 | 20 | 4 | 1 | - | - | - |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.10.1. Only one test point to be tested. | | | | | | |

**Table 8.7.10.2.4.1-3: Further test parameters per test (FRC 64QAM)**

| Test | Bandwidth and number of Rx antennas | DL Measurement channel | UL Measurement channel | TBsize per Codeword per CC | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|---|
| 1 | 20MHz 4Rx | R.31-9 TDD | R.1-4 TDD | 128496 (Note 3) | 11 | FLOOR(($TB_{size}$ – 376)/88) | 1455 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 124464 bits for sub-frame 5.

**Table 8.7.10.2.4.1-4: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW (MHz) | MIMO layer | DL Cat. 11, 12 | | | | | |
| 80 | 20 | 4 | - | 1 | - | - | - | - |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.10.1. Only one test point to be tested. | | | | | | | | |

**Table 8.7.10.2.4.1-5: Further test parameters per test (FRC 256QAM)**

| Test | Bandwidth and number of Rx antennas | DL Measurement channel | UL Measurement channel | TBsize per Codeword per CC | Number of PDCP SDU per Codeword | PDCP SDU size [Octets] Calculation (Note 1) | PDCP SDU size [Octets] |
|---|---|---|---|---|---|---|---|
| 1 | 20MHz 4Rx | R.68-7 TDD | R.1-4 TDD | 169544 (Note 3) | 15 | FLOOR(($TB_{size}$ – 488)/120) | 1408 |

Note 1: Transport block size under test according to applicable Fixed Reference Channel for sustained data-rate test in annex A.3.9. In case of varying TBS across SFs of the RMC, only the maximum TBS is used for PDCP SDU size calculation.

Note 2: Each PDCP SDU is limited to 1500 octets (to keep below maximum SDU size of ESM as specified in TS 24.301 clause 9.9.4.12).
The PDCP SDU size of each PDCP SDU is:
PDCP SDU size = (TBsize – N*PDCP header size - AMD PDU header size - MAC header size - Size of RLC STATUS PDU) / N,
where PDCP header size is 16 bits for the RLC AM and 12-bit SN case; AMD PDU header size is CEIL[(16+(N-1)*12)/8] bytes which includes 16 bit standard AM header and (N-1) Length indicators; and MAC header size = R/R/E/LCID/F/L MAC subheader (24 bits for MAC SDU for RLC STATUS PDU with 15 bit LI) + R/R/E/LCID MAC subheader (8 bits for MAC SDU for RLC Data PDU) = 32 bits. The size of RLC STATUS PDU including one ACK_SN field and one NACK_SN field is 32 bits (if no STATUS PDU is sent or if the size of the STATUS PDU is less than 32 bits then padding will be used to fill the 32 bits). This gives: PDCP SDU size = 8*FLOOR((TBsize – N*16- 8*CEIL((16+(N-1)*12)/8) – 64)/(8*N)) bits.
The calculation of PDCP SDU sizes does not consider timing advance MAC CE as timing advance is not transmitted by SS for RF test cases, and the header sizes are informative and may vary during the test.

Note 3: 161760 bits for sub-frame 5.

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.10.2.4.1-1 depending on the UE category according to Table 8.7.10.2.4.1-2 for UE not supporting 256QAM or Table 8.7.10.2.4.1-4 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.74 (without using faders and AWGN generators).

2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.10.1-1, Table 8.7.10.2.4.1-1 and Table 8.7.10.2.4.1-3 depending on the UE category according to Table 8.7.10.2.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.10.1-1, Table 8.7.10.2.4.1-1 and Table 8.7.10.2.4.1-5 depending on the UE category according to Table 8.7.10.2.4.1-4.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.9.2.4.3.

### 8.7.9.2.4.2 Test procedure

1. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

2. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Table 8.7.10.2.4.1-3 for the tests to be performed depending on the UE category according to Table 8.7.10.2.4.1-2. For UE supporting 256QAM the SS looks up $TB_{size}$ in Table 8.7.10.2.4.1-5 for the tests to be performed depending on the UE category according to Table 8.7.10.2.4.1-4.

3. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $N_{DL_PDCP}$ to 0.

4. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.10.2.4.1-3 (Note 1) for UE not supporting 256QAM or in accordance with Table 8.7.10.2.4.1-5 (Note 1) for UE supporting 256QAM. The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

5. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

6. Steps 4 to 5 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

7. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

8. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $_{NDL_retx}$) in order to validate HARQ feedback received from the UE.

9. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

10. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.10.2.4.3 Message contents

**Table 8.7.10.2.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.9.4.2.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |

| | | | |
|---|---|---|---|
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.10.2.4.3-3: *RRCConnectionReconfiguration***

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| antennaInfoDedicatedPCell-v10i0 SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.10.2.4.3-4: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.8.2.1.6-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm3 | 1000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.7.10.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.10.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.10.3 TDD sustained data rate performance for 4 layer MIMO (2DL CA)

Editor's note: Simplification of test point tables, to reduce future maintenance, needs further investigation.

### 8.7.10.3.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.10.3.2 Test applicability

This test applies to E-UTRA TDD release 10 and forward UE of category 9, 10, 11 and 12 and DL category 9, 10, 11, 12 and 15 that supports inter-band OR intra-band contiguous DL CA and supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any TDD RF band of the DL CA configuration.

This test also applies to E-UTRA TDD release 11 and forward UE of category 9, 10, 11 and 12 and DL category 9, 10, 11, 12 and 15 that supports intra band non-contiguous DL CA and supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any TDD RF band of the DL CA configuration.

### 8.7.10.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.10.1.

### 8.7.10.3.4 Test description

#### 8.7.10.3.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.10.1-2, with the addition of the parameters in Table 8.7.10.3.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.10.3.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.10.1-3, with the addition of the parameters in Table 8.7.10.3.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.10.3.4.1-3.

**Table 8.7.10.3.4.1-1: Test parameters for sustained downlink data rate (TDD 2DL CA)**

| Test | Bandwidth (MHz) | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|
| 1 | 2x20 | 4 layer | 4x4 | 160 | 1455 | 1408 |
| 2 | 15+20 | 4 layer | 4x4 | 140 | 1455 | 1408 |
| 3 | 20 | 2 layer | 2x2 | 120 | 1341 | 1355 |
| | 20 | 4 layer | 4x4 | | | |

Editor's note: Tests in Table 8.7.10.3.4.1-1 are covering maximum aggregated bandwidth for each Bandwidth combination set with 2DL CA which are defined in Table 5.4.2A.1-1, Table 5.4.2A.1-2 or Table 5.4.2A.1-3.

**Table 8.7.10.3.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | MIMO layer | DL Cat. 9, 10 | DL Cat. 11, 12 | | | | | |
| 160 | 2x20 | 4 | 2 | 1 | - | - | - | - | - |
| 140 | 15+20 | 4 | 2 | 2 | - | - | - | - | - |
| 120 | 20 | 2 | 3 | 3 | - | - | - | - | - |
| | 20 | 4 | | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.10.1. Only one test point to be tested. | | | | | | | | | |

**Table 8.7.10.3.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | MIMO layer | DL Cat. 11, 12 | | | | | |
| 160 | 2x20 | 4 | 2 | - | 1 | - | - | - |
| 140 | 15+20 | 4 | 2 | - | 2 | - | - | - |
| 120 | 20 | 2 | 3 | - | 3 | - | - | - |
| | 20 | 4 | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.10.1. Only one test point to be tested. | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.10.3.4.1-1 depending on the UE category according to Table 8.7.10.3.4.1-2 for UE not supporting 256QAM or Table 8.7.10.3.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.91.
2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.10.1-1, Table 8.7.10.3.4.1-1 depending on the UE category according to Table 8.7.10.3.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.10.1-1, Table 8.7.10.3.4.1-1 depending on the UE category according to Table 8.7.10.3.4.1-3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.10.3.4.3.

### 8.7.10.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.10.3.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.10.3.4.3-4. Cell ID = 1 applies to S-Cell.
3. The SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).
5. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.10.1-2, for the tests to be performed depending on the UE category according to Table 8.7.10.3.4.1-2. For UE supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.10.1-3, for the tests to be performed depending on the UE category according to Table 8.7.10.3.4.1-3.
6. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $ND_{DL_PDCP}$ to 0.
7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU.

The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

#### 8.7.10.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.10.3.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.10.3.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.10.3.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna P-Cell |
| 4TX | 4 SS Tx antenna P-Cell |

**Table 8.7.10.3.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna S-Cell |
| 4TX | 4 SS Tx antenna S-Cell |

### 8.7.10.3.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.10.3.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.10.4 TDD sustained data rate performance for 4 layer MIMO (3DL CA)

Editor's note: Simplification of test point tables, to reduce future maintenance, needs further investigation.

### 8.7.10.4.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.10.4.2 Test applicability

This test applies to E-UTRA TDD release 10 and forward UE of category 11 and 12 and DL category 11, 12, 15, 16 and 18 that supports 3DL with CA configurations in Table 7.1-2a and supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any TDD RF band of the 3DL CA configuration.

This test applies to E-UTRA TDD release 11 and forward UE of category 11 and 12 and DL category 11, 12, 15, 16 and 18 that supports 3DL with CA configurations in Table 7.1-2a and supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any TDD RF band of the 3DL CA configuration.

### 8.7.10.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.10.1.

### 8.7.10.4.4 Test description

#### 8.7.10.4.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.10.1-2, with the addition of the parameters in Table 8.7.10.4.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.10.4.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.10.1-3, with the addition of the parameters in Table 8.7.10.4.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.10.4.4.1-3.

**Table 8.7.10.4.4.1-1: Test parameters for sustained downlink data rate (TDD 3DL CA)**

| Test | Bandwidth (MHz) | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|
| 1 | 3x20 | 4 layer | 4x4 | 240 | 1455 | 1408 |
| 2 | 15+20+20 | 4 layer | 4x4 | 220 | 1455 | 1408 |
| 3 | 20 | 2 layer | 2x2 | 200 | 1341 | 1355 |
| | 2x20 | 4 layer | 4x4 | | | |
| 4 | 20 | 2 layer | 2x2 | 180 | 1341 | 1355 |
| | 15+20 | 4 layer | 4x4 | | | |
| 5 | 2x20 | 2 layer | 2x2 | 160 | 1341 | 1355 |
| | 20 | 4 layer | 4x4 | | | |
| 6 | 15+20 | 2 layer | 2x2 | 150 | 1341 | 1341 |
| | 20 | 4 layer | 4x4 | | | |

Editor's note: Tests in Table 8.7.10.4.4.1-1 are covering maximum aggregated bandwidth for each Bandwidth combination set with 3DL CA which are defined in Table 5.4.2A.1-1 or Table 5.4.2A.1-2.

**Table 8.7.10.4.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | Antenna config. | DL Cat. 11, 12 | | | | | |
| 240 | 3x20 | 4x4 | 4 | - | 2 | 1 | - | - |
| 220 | 15+20+20 | 4x4 | 4 | - | 2 | 2 | - | - |
| 200 | 20 | 2x2 | 4 | - | 3 | 3 | - | - |
| | 2x20 | 4x4 | | | | | | |
| 180 | 20 | 2x2 | 4 | - | 4 | 4 | - | - |
| | 15+20 | 4x4 | | | | | | |
| 160 | 2x20 | 2x2 | 5 | - | 5 | 5 | - | - |
| | 20 | 4x4 | | | | | | |
| 150 | 15+20 | 2x2 | 6 | - | 6 | 6 | - | - |
| | 20 | 4x4 | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.10.1. Only one test point to be tested. | | | | | | | | |

**Table 8.7.10.4.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | Antenna config. | DL Cat. 11, 12 | | | | | |
| 240 | 3x20 | 4x4 | - | - | 5 | 2 | 1 | - |
| 220 | 15+20+20 | 4x4 | - | - | 6 | 2 | 2 | - |
| 200 | 20 | 2x2 | - | - | 5 | 3 | 3 | - |
| | 2x20 | 4x4 | | | | | | |
| 180 | 20 | 2x2 | - | - | 6 | 4 | 4 | - |
| | 15+20 | 4x4 | | | | | | |
| 160 | 2x20 | 2x2 | - | - | 5 | 5 | 5 | - |
| | 20 | 4x4 | | | | | | |
| 150 | 15+20 | 2x2 | - | - | 6 | 6 | 6 | - |
| | 20 | 4x4 | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.10.1. Only one test point to be tested. | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.10.4.4.1-1 depending on the UE category according to Table 8.7.10.4.4.1-2 for UE not supporting 256QAM or Table 8.7.10.4.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.91.
2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.10.1-1, Table 8.7.10.4.4.1-1 depending on the UE category according to Table 8.7.10.4.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.10.1-1, Table 8.7.10.4.4.1-1 and depending on the UE category according to Table 8.7.10.4.4.1-3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.10.4.4.3.

### 8.7.10.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with two SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.10.4.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.10.4.4.3-4. Cell ID = n (where n is 1, 2) applies to S-Celln (where n is 1, 2).
3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.10.1-2, for the tests to be performed depending on the UE category according to Table 8.7.10.4.4.1-2. For UE supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.10.1-3, for the tests to be performed depending on the UE category according to Table 8.7.10.4.4.1-3.

6. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.10.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.10.4.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.10.4.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.10.4.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna P-Cell |
| 4TX | 4 SS Tx antenna P-Cell |

**Table 8.7.10.4.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna S-Cell |
| 4TX | 4 SS Tx antenna S-Cell |

### 8.7.10.4.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.10.4.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.10.5 TDD sustained data rate performance for 4 layer MIMO (4DL CA)

Editor's note: Simplification of test point tables, to reduce future maintenance, needs further investigation.

### 8.7.10.5.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.10.5.2 Test applicability

This test case applies to all types of E-UTRA TDD UE release 11 and forward of UE DL category 16, 18 and 19 that support 4DL with CA configurations in Table 7.1-2b and supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any TDD RF band of the 4DL CA configuration.

### 8.7.10.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.10.1.

### 8.7.10.5.4 Test description

#### 8.7.10.5.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.10.1-2, with the addition of the parameters in Table 8.7.10.5.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.10.5.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.10.1-3, with the addition of the parameters in Table 8.7.10.5.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.10.5.4.1-4.

**Table 8.7.10.5.4.1-1: Test parameters for sustained downlink data rate (TDD 4DL CA)**

| Test | Bandwidth (MHz) | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|
| 1 | 4x20 | 4 layer | 4x4 | 320 | 1455 | 1408 |
| 2 | 15+20+20+20 | 4 layer | 4x4 | 300 | 1455 | 1408 |
| 3 | 20 | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 3x20 | 4 layer | 4x4 | | | |
| 4 | 2x20 | 2 layer | 2x2 | 240 | 1341 | 1355 |
| | 2x20 | 4 layer | 4x4 | | | |
| 5 | 15+20 | 2 layer | 2x2 | 230 | 1341 | 1341 |
| | 2x20 | 4 layer | 4x4 | | | |
| 6 | 2x20 | 2 layer | 2x2 | 220 | 1341 | 1355 |
| | 15+20 | 4 layer | 4x4 | | | |
| 7 | 3x20 | 2 layer | 2x2 | 200 | 1341 | 1355 |
| | 20 | 4 layer | 4x4 | | | |

Editor's note: Tests in Table 8.7.10.5.4.1-1 are covering maximum aggregated bandwidth for each Bandwidth combination set with 4DL CA which are defined in Table 5.4.2A.1-1 or Table 5.4.2A.1-2.

**Table 8.7.10.5.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | Antenna config. | DL Cat. 11, 12 | | | | | |
| 320 | 4x20 | 4x4 | - | - | - | 2 | 1 | - |
| 300 | 15+20+20 +20 | 4x4 | - | - | - | 2 | 2 | - |
| 280 | 20 | 2x2 | - | - | - | 3 | 3 | - |
| | 3x20 | 4x4 | | | | | | |
| 240 | 2x20 | 2x2 | - | - | - | 4 | 4 | - |
| | 2x20 | 4x4 | | | | | | |
| 230 | 15+20 | 2x2 | - | - | - | 5 | 5 | - |
| | 2x20 | 4x4 | | | | | | |
| 220 | 2x20 | 2x2 | - | - | - | 6 | 6 | - |
| | 15+20 | 4x4 | | | | | | |
| 200 | 3x20 | 2x2 | - | - | - | 7 | 7 | - |
| | 20 | 4x4 | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.10.1. Only one test point to be tested. | | | | | | | | |

**Table 8.7.10.5.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | Antenna config. | DL Cat. 11, 12 | | | | | |
| 320 | 4x20 | 4x4 | - | - | - | - | 4 | 1 |
| 300 | 15+20+20 +20 | 4x4 | - | - | - | - | 5 | 2 |
| 280 | 20 | 2x2 | - | - | - | - | 4 | 3 |
| | 3x20 | 4x4 | | | | | | |
| 240 | 2x20 | 2x2 | - | - | - | - | 4 | 4 |
| | 2x20 | 4x4 | | | | | | |
| 230 | 15+20 | 2x2 | - | - | - | - | 5 | 5 |
| | 2x20 | 4x4 | | | | | | |
| 220 | 2x20 | 2x2 | - | - | - | - | 6 | 6 |
| | 15+20 | 4x4 | | | | | | |
| 200 | 3x20 | 2x2 | - | - | - | - | 7 | 7 |
| | 20 | 4x4 | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.10.1. Only one test point to be tested. | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.10.5.4.1-1 depending on the UE category according to Table 8.7.10.5.4.1-2 for UE not supporting 256QAM or Table 8.7.10.5.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.91.
2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.10.1-1, Table 8.7.10.5.4.1-1 depending on the UE category according to Table 8.7.10.5.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.10.1-1, Table 8.7.10.5.4.1-1 depending on the UE category according to Table 8.7.10.5.4.1-3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.10.5.4.3.

### 8.7.10.5.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with three SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.10.5.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.10.5.4.3-4. Cell ID = n (where n is 1, 2, 3) applies to S-Celln (where n is 1, 2, 3).
3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.10.1-2, for the tests to be performed depending on the UE category according to Table 8.7.10.5.4.1-2. For UE supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.10.1-3, for the tests to be performed depending on the UE category according to Table 8.7.10.5.4.1-3.

6. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.10.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.10.5.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.10.5.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.10.5.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna P-Cell |
| 4TX | 4 SS Tx antenna P-Cell |

**Table 8.7.10.5.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna S-Cell |
| 4TX | 4 SS Tx antenna S-Cell |

### 8.7.10.5.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.10.5.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.10.6 TDD sustained data rate performance for 4 layer MIMO (5DL CA)

Editor's note: Simplification of test point tables, to reduce future maintenance, needs further investigation.

### 8.7.10.6.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.10.6.2 Test applicability

This test applies to E-UTRA TDD release 11 and forward UE of DL category 18 and 19 that supports 5DL with CA configurations in Table 7.1-2c and supports 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any TDD RF band of the 5DL CA configuration.

### 8.7.10.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.10.1.

### 8.7.10.6.4 Test description

#### 8.7.10.6.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.10.1-2, with the addition of the parameters in Table 8.7.10.6.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.10.6.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.10.1-3, with the addition of the parameters in Table 8.7.10.6.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.10.6.4.1-3.

**Table 8.7.10.6.4.1-1: Test parameters for sustained downlink data rate (TDD 5DL CA)**

| Test | Bandwidth (MHz) | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|
| 1 | 5x20 | 4 layer | 4x4 | 400 | 1455 | 1408 |
| 2 | 15+(4x20) | 4 layer | 4x4 | 380 | 1455 | 1408 |
| 3 | 2x20 | 2 layer | 2x2 | 320 | 1341 | 1355 |
| | 3x20 | 4 layer | 4x4 | | | |
| 4 | 15+20 | 2 layer | 2x2 | 310 | 1341 | 1341 |
| | 3x20 | 4 layer | 4x4 | | | |
| 5 | 3x20 | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 2x20 | 4 layer | 4x4 | | | |
| 6 | 3x20 | 2 layer | 2x2 | 260 | 1341 | 1355 |
| | 15+20 | 4 layer | 4x4 | | | |

Editor's note: Tests in Table 8.7.10.6.4.1-1 are covering maximum aggregated bandwidth for each Bandwidth combination set with 5DL CA which are defined in Table 5.4.2A.1-1 and Table 5.4.2A.1-2.

**Table 8.7.10.6.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | Antenna config. | DL Cat. 11, 12 | | | | | |
| 400 | 5x20 | 4x4 | - | - | - | - | 3 | 1 |
| 380 | 15+20+20 +20+20 | 4x4 | - | - | - | - | 4 | 2 |
| 320 | 2x20 | 2x2 | - | - | - | - | 3 | 3 |
| | 3x20 | 4x4 | | | | | | |
| 310 | 15+20 | 2x2 | - | - | - | - | 4 | 4 |
| | 3x20 | 4x4 | | | | | | |
| 280 | 3x20 | 2x2 | - | - | - | - | 5 | 5 |
| | 2x20 | 4x4 | | | | | | |
| 260 | 3x20 | 2x2 | - | - | - | - | 6 | 6 |
| | 15+20 | 4x4 | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.10.1. Only one test point to be tested. | | | | | | | | |

**Table 8.7.10.6.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | Antenna config. | DL Cat. 11, 12 | | | | | |
| 400 | 5x20 | 4x4 | - | - | - | - | - | 3 |
| 380 | 15+20+20 +20+20 | 4x4 | - | - | - | - | - | 4 |
| 320 | 2x20 | 2x2 | - | - | - | - | - | 3 |
| | 3x20 | 4x4 | | | | | | |
| 310 | 15+20 | 2x2 | - | - | - | - | - | 4 |
| | 3x20 | 4x4 | | | | | | |
| 280 | 3x20 | 2x2 | - | - | - | - | - | 5 |
| | 2x20 | 4x4 | | | | | | |
| 260 | 3x20 | 2x2 | - | - | - | - | - | 6 |
| | 15+20 | 4x4 | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.10.1. Only one test point to be tested. | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.10.6.4.1-1 depending on the UE category according to Table 8.7.10.6.4.1-2 for UE not supporting 256QAM or Table 8.7.10.6.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.91.
2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.10.1-1, Table 8.7.10.6.4.1-1 depending on the UE category according to Table 8.7.10.6.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.10.1-1, Table 8.7.10.6.4.1-1 depending on the UE category according to Table 8.7.10.6.4.1-3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.10.6.4.3.

### 8.7.10.6.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4 with four SCCs configured. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.10.6.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.10.6.4.3-4. Cell ID = n (where n is 1, 2, 3, 4) applies to S-Celln (where n is 1, 2, 3, 4).
3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.10.1-2, for the tests to be performed depending on the UE category according to Table 8.7.10.6.4.1-2. For UE supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.10.1-3, for the tests to be performed depending on the UE category according to Table 8.7.10.6.4.1-3.

6. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.10.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.10.6.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.10.6.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.10.6.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna P-Cell |
| 4TX | 4 SS Tx antenna P-Cell |

**Table 8.7.10.6.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna S-Cell |
| 4TX | 4 SS Tx antenna S-Cell |

### 8.7.10.6.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.10.6.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.11 TDD FDD CA Sustained data rate performance (4 layer MIMO)

### 8.7.11.1 Minimum conformance requirements

The parameters specified in Table 8.7.11.1-1 are valid for all TDD FDD CA tests unless otherwise stated.

**Table 8.7.11.1-1: Common Test Parameters (TDD FDD CA)**

| Parameter | Unit | FDD CC | TDD CC |
|---|---|---|---|
| Transmission mode | | 3 | 3 |
| Uplink downlink configuration (Note 1) | | N/A | 1 |
| Special subframe configuration (Note 2) | | N/A | 4 |
| Cyclic prefix | | Normal | Normal |
| Cell ID | | 0 | 0 |
| Inter-TTI Distance | | 1 | 1 |
| Number of HARQ processes per component carrier | Processes | 8 | 8 |
| Maximum number of HARQ transmission | | 4 | 4 |
| Redundancy version coding sequence | | {0,0,1,2} for 64QAM and 256QAM | {0,0,1,2} for 64QAM and 256QAM |
| Number of OFDM symbols for PDCCH per component carrier | OFDM symbols | 1 | 1 |
| Cross carrier scheduling | | Not configured | Not configured |
| Propagation condition | | Static propagation condition<br>No external noise sources are applied | Static propagation condition<br>No external noise sources are applied |
| $\hat{E}_s$ at antenna port | dBm/15kHz | -85 | -85 |
| Antenna configuration | 2 layer CC | 2x2 or 2x4 | 2x2 or 2x4 |
| | 4 layer CC | 4x4 | 4x4 |
| Codebook subset restriction | 2 layer CC | 10 | 10 |
| | 4 layer CC | 1000 | 1000 |
| Downlink power allocation | 2 layer CC | $\rho_A$ = -3dB, $\rho_B$ = -3dB, $\sigma$ = 0dB | $\rho_A$ = -3dB, $\rho_B$ = -3dB, $\sigma$ = 0dB |
| | 4 layer CC | $\rho_A$ = -6dB, $\rho_B$ = -6dB, $\sigma$ = 3dB | $\rho_A$ = -6dB, $\rho_B$ = -6dB, $\sigma$ = 3dB |
| Symbols for unused PRBs | | OP.1 FDD | OP.1 TDD |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [4].<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [4]. | | | |

For UE not supporting 256QAM, the TB success rate shall be higher than 85% when PDSCH are scheduled with FRC in Table 8.7.11.1-2 with the downlink physical channel setup according to Annex C.3.2.

For UE supporting 256QAM, the TB success rate shall be higher than 85% when PDSCH are scheduled with FRC in Table 8.7.11.1-3 with the downlink physical channel setup according to Annex C.3.2. For UE supporting 256QAM, the requirement with 64QAM is not applicable.

The TB success rate is defined as $100\%*N_{DL_correct_rx}/ (N_{DL_newtx} + N_{DL_retx})$, where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.11.1-2: Per-CC FRC for SDR test (TDD-FDD 64QAM)**

| MIMO layer | Bandwidth | FDD Reference channel | TDD Reference channel |
|---|---|---|---|
| 2 layer | 5 | R.31-6 FDD | N/A |
| | 10 | R.31-3A FDD | R.31-6 TDD |
| | 15 | R.31-5 FDD | R.31-5 TDD |
| | 20 | R.31-4 FDD | R.31-4 TDD |
| 4 layer | 5 | R.31-10 FDD | N/A |
| | 10 | R.31-7 FDD | R.31-7 TDD |
| | 15 | R.31-8 FDD | R.31-8 TDD |
| | 20 | R.31-9 FDD | R.31-9 TDD |

**Table 8.7.11.1-3: Per-CC FRC for SDR test (TDD-FDD 256QAM)**

| MIMO layer | Bandwidth | FDD Reference channel | TDD Reference channel |
|---|---|---|---|
| 2 layer | 5 | R.68-3 FDD | N/A |
| | 10 | R.68-2 FDD | R.68-2 TDD |
| | 15 | R.68-1 FDD | R.68-1 TDD |
| | 20 | R.68 FDD | R.68 TDD |
| 4 layer | 5 | R.68-7 FDD | N/A |
| | 10 | R.68-4 FDD | R.68-5 TDD |
| | 15 | R.68-5 FDD | R.68-6 TDD |
| | 20 | R.68-6 FDD | R.68-7 TDD |

CA configuration, bandwidth combination and MIMO layer on each CC is determined by following procedure.

- Select one CA bandwidth combination among all supported CA configurations with bandwidth combination and MIMO layer on each CC that leads to largest equivalent aggregated bandwidth among all CA bandwidth combinations supported by UE. Equivalent aggregated bandwidth is defined as

$$B_{agg} = \sum_{i=0}^{N-1} R_i B_i$$

  where $N$ is number of CCs, $R_i \in \{2,4\}$ and $B_i \in \{5,10,15,20\}$ is MIMO layer and bandwidth of CC $i$.

- When there are multiple sets of {CA configuration, bandwidth combination, MIMO layer} with same largest aggregated bandwidth, select one among sets with largest number of 4 layer CCs.
- When there are multiple sets of {CA configuration, bandwidth combination, MIMO layer} with same largest aggregated bandwidth, select one among sets with largest number of 4 layer CCs.

The normative reference for this requirement is TS 36.101 [2] clause 8.7.11.

## 8.7.11.2 TDD FDD CA sustained data rate performance for 4 layer MIMO (2DL CA)

Editor's note: Simplification of test point tables, to reduce future maintenance, needs further investigation.

### 8.7.11.2.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.11.2.2 Test applicability

This test applies to all types of UE Release 12 and forward of category 9, 10, 11 and 12, and DL category 9, 10, 11, 12 and 15 that support E-UTRA FDD and TDD, 2DL TDD-FDD CA and support 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any RF band of the DL CA configuration.

### 8.7.11.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.11.1.

### 8.7.11.2.4 Test description

#### 8.7.11.2.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.11.1-2, with the addition of the parameters in Table 8.7.11.2.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.11.2.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.11.1-3, with the addition of the parameters in Table 8.7.11.2.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.11.2.4.1-3.

**Table 8.7.11.2.4.1-1: Test parameters for sustained downlink data rate (TDD FDD 2DL CA)**

| Test | Bandwidth (MHz) | | | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | |
| 1 | 2x20 | 20 | 20 | 4 layer | 4x4 | 160 | 1455 | 1408 |
| 2 | 15+20 | 15 | 20 | 4 layer | 4x4 | 140 | 1455 | 1408 |
| 3 | 20 | 20 | - | 2 layer | 2x2 | 120 | 1341 | 1355 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 4 | 20 | - | 20 | 2 layer | 2x2 | 120 | 1341 | 1355 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 5 | 15 | 15 | - | 2 layer | 2x2 | 110 | 1371 | 1341 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 6 | 20 | - | 20 | 2 layer | 2x2 | 100 | 1341 | 1355 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 7 | 10 | 10 | - | 2 layer | 2x2 | 100 | 1141 | 1218 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |

Editor's note: Tests in Table 8.7.11.2.4.1-1 are covering maximum aggregated bandwidth for each Bandwidth combination set with 2DL CA which are defined in Table 5.4.2A.1-2.

**Table 8.7.11.2.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bagg (MHz) | BW combi-nation (MHz) | | MIMO layer | DL Cat. 9, 10 | DL Cat. 11, 12 | | | | | |
| | FDD CC | TDD CC | | | | | | | | |
| 160 | 20 | 20 | 4 | 3 | 1 | - | - | - | - | - |
| 140 | 15 | 20 | 4 | 2 | 2 | - | - | - | - | - |
| 120 | 20 | - | 2 | 3 | 3 | - | - | - | - | - |
| | - | 20 | 4 | | | | | | | |
| 120 | - | 20 | 2 | 4 | 4 | - | - | - | - | - |
| | 20 | - | 4 | | | | | | | |
| 110 | 15 | - | 2 | 5 | 5 | - | - | - | - | - |
| | - | 20 | 4 | | | | | | | |
| 100 | - | 20 | 2 | 6 | 6 | - | - | - | - | - |
| | 15 | - | 4 | | | | | | | |
| 100 | 10 | - | 2 | 7 | 7 | - | - | - | - | - |
| | - | 20 | 4 | | | | | | | |

Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.11.1. Only one test point to be tested.

**Table 8.7.11.2.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combi-nation (MHz) | | MIMO layer | DL Cat. 11, 12 | | | | | |
| | FDD CC | TDD CC | | | | | | | |
| 160 | 20 | 20 | 4 | 3 | 5 | 1 | - | - | - |
| 140 | 15 | 20 | 4 | 2 | 5 | 2 | - | - | - |
| 120 | 20 | - | 2 | 3 | 5 | 3 | - | - | - |
| | - | 20 | 4 | | | | | | |
| 120 | - | 20 | 2 | 4 | 6 | 4 | - | - | - |
| | 20 | - | 4 | | | | | | |
| 110 | 15 | - | 2 | 5 | 5 | 5 | - | - | - |
| | - | 20 | 4 | | | | | | |
| 100 | - | 20 | 2 | 6 | 6 | 6 | - | - | - |
| | 15 | - | 4 | | | | | | |
| 100 | 10 | - | 2 | 7 | 7 | 7 | - | - | - |
| | - | 20 | 4 | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.11.1. Only one test point to be tested. | | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.11.2.4.1-1 depending on the UE category according to Table 8.7.11.2.4.1-2 for UE not supporting 256QAM or Table 8.7.11.2.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.91.
2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.11.1-1, Table 8.7.11.2.4.1-1 depending on the UE category according to Table 8.7.11.2.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.11.1-1, Table 8.7.11.2.4.1-1 depending on the UE category according to Table 8.7.11.2.4.1-3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.11.2.4.3.

### 8.7.11.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.11.2.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.11.2.4.3-4. Cell ID = 1 applies to S-Cell.
3. The SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).
5. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.11.1-2, for the tests to be performed depending on the UE category according to Table 8.7.11.2.4.1-2. For UE

supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.11.1-3, for the tests to be performed depending on the UE category according to Table 8.7.11.2.4.1-3.

6. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.11.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.11.2.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.11.2.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.11.2.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna P-Cell |
| 4TX | 4 SS Tx antenna P-Cell |

**Table 8.7.11.2.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna S-Cell |
| 4TX | 4 SS Tx antenna S-Cell |

### 8.7.11.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.11.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.11.3 TDD FDD CA sustained data rate performance for 4 layer MIMO (3DL CA)

Editor's note: Simplification of test point tables, to reduce future maintenance, needs further investigation.

### 8.7.11.3.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.11.3.2 Test applicability

This test applies to all types of UE Release 12 and forward of category 11 and 12, and DL category 11, 12, 15, 16 and 18 that support E-UTRA FDD and TDD, 3DL TDD-FDD CA and support 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any RF band of the 3DL CA configuration.

### 8.7.11.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.11.1.

### 8.7.11.3.4 Test description

#### 8.7.11.3.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.11.1-2, with the addition of the parameters in Table 8.7.11.3.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.11.3.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.11.1-3, with the addition of the parameters in Table 8.7.11.3.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.11.3.4.1-3.

**Table 8.7.11.3.4.1-1: Test parameters for sustained downlink data rate (TDD FDD 3DL CA)**

| Test | Bandwidth (MHz) | | | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | |
| 1 | 3x20 | 20 | 2x20 | 4 layer | 4x4 | 240 | 1455 | 1408 |
| 2 | 3x20 | 2x20 | 20 | 4 layer | 4x4 | 240 | 1455 | 1408 |
| 3 | 15+20+20 | 15 | 2x20 | 4 layer | 4x4 | 220 | 1455 | 1408 |
| 4 | 15+20+20 | 15+20 | 20 | 4 layer | 4x4 | 220 | 1455 | 1408 |
| 5 | 20 | 20 | - | 2 layer | 2x2 | 200 | 1341 | 1355 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 6 | 20 | - | 20 | 2 layer | 2x2 | 200 | 1341 | 1355 |
| | 2x20 | 20 | 20 | 4 layer | 4x4 | | | |
| 7 | 20 | 20 | - | 2 layer | 2x2 | 200 | 1341 | 1355 |
| | 2x20 | 20 | 20 | 4 layer | 4x4 | | | |
| 8 | 20 | - | 20 | 2 layer | 2x2 | 200 | 1341 | 1355 |
| | 2x20 | 2x20 | - | 4 layer | 4x4 | | | |
| 9 | 10+20+20 | 10 | 2x20 | 4 layer | 4x4 | 200 | 1323 | 1319 |
| 10 | 15 | 15 | - | 2 layer | 2x2 | 190 | 1371 | 1341 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 11 | 15 | 15 | - | 2 layer | 2x2 | 190 | 1371 | 1341 |
| | 2x20 | 20 | 20 | 4 layer | 4x4 | | | |
| 12 | 20 | 20 | - | 2 layer | 2x2 | 180 | 1341 | 1355 |
| | 15+20 | 15 | 20 | 4 layer | 4x4 | | | |
| 13 | 20 | - | 20 | 2 layer | 2x2 | 180 | 1341 | 1355 |
| | 15+20 | 15+20 | - | 4 layer | 4x4 | | | |
| 14 | 10 | 10 | - | 2 layer | 2x2 | 180 | 1141 | 1218 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 15 | 10 | 10 | - | 2 layer | 2x2 | 180 | 1141 | 1218 |
| | 2x20 | 20 | 20 | 4 layer | 4x4 | | | |
| 16 | 15 | 15 | - | 2 layer | 2x2 | 170 | 1371 | 1341 |
| | 15+20 | 15 | 20 | 4 layer | 4x4 | | | |
| 17 | 2x20 | 20 | 20 | 2 layer | 2x2 | 160 | 1341 | 1355 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 18 | 2x20 | - | 2x20 | 2 layer | 2x2 | 160 | 1341 | 1355 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 19 | 2x20 | 2x20 | - | 2 layer | 2x2 | 160 | 1341 | 1355 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 20 | 2x20 | 20 | 20 | 2 layer | 2x2 | 160 | 1341 | 1355 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 21 | 10 | 10 | - | 2 layer | 2x2 | 160 | 1141 | 1218 |
| | 15+20 | - | 15+20 | 4 layer | 4x4 | | | |
| 22 | 10 | 10 | - | 2 layer | 2x2 | 160 | 1141 | 1218 |
| | 15+20 | 15 | 20 | 4 layer | 4x4 | | | |
| 23 | 15+20 | 15+20 | - | 2 layer | 2x2 | 150 | 1341 | 1341 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 24 | 15+20 | 15 | 20 | 2 layer | 2x2 | 150 | 1341 | 1341 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 25 | 2x20 | - | 2x20 | 2 layer | 2x2 | 140 | 1341 | 1355 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 26 | 2x20 | 20 | 20 | 2 layer | 2x2 | 140 | 1341 | 1355 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 27 | 10+20 | 10 | 20 | 2 layer | 2x2 | 140 | 1141 | 1218 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 28 | 10+20 | 10+20 | - | 2 layer | 2x2 | 140 | 1141 | 1218 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 29 | 10+20 | 10 | 20 | 2 layer | 2x2 | 140 | 1141 | 1218 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 30 | 2x15 | 2x15 | - | 2 layer | 2x2 | 140 | 1371 | 1341 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 31 | 10 | 10 | - | 2 layer | 2x2 | 140 | 1141 | 1218 |
| | 10+20 | 10 | 20 | 4 layer | 4x4 | | | |
| 32 | 15+20 | 15 | 20 | 2 layer | 2x2 | 130 | 1341 | 1341 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 33 | 10+15 | 10+15 | - | 2 layer | 2x2 | 130 | 1141 | 1218 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 34 | 2x20 | - | 2x20 | 2 layer | 2x2 | 120 | 1341 | 1319 |
| | 10 | 10 | - | 4 layer | 4x4 | | | |
| 35 | 10+20 | 10 | 20 | 2 layer | 2x2 | 120 | 1141 | 1218 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 36 | 2x10 | 2x10 | - | 2 layer | 2x2 | 120 | 1141 | 1218 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 37 | 10+20 | 10 | 20 | 2 layer | 2x2 | 100 | 1141 | 1218 |
| | 10 | 10 | - | 4 layer | 4x4 | | | |

Editor's note: Tests in Table 8.7.11.3.4.1-1 are covering maximum aggregated bandwidth for each Bandwidth combination set with 3DL CA, which are defined in Table 5.4.2A.1-2 or Table 5.4.2A.1-2a.

**Table 8.7.11.3.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bagg (MHz) | BW combi-nation (MHz) | | MIMO layer | DL Cat. 9, 10 | DL Cat. 11, 12 | | | | | |
| | FDD CC | TDD CC | | | | | | | | |
| 240 | 20 | 2x20 | 4 | - | 14 | - | 3 | 1 | - | - |
| 240 | 2x20 | 20 | 4 | - | 12 | - | 4 | 2 | - | - |
| 220 | 15 | 2x20 | 4 | - | 14 | - | 3 | 3 | - | - |
| 220 | 15+20 | 20 | 4 | - | 12 | - | 4 | 4 | - | - |
| 200 | 20 | - | 2 | - | 14 | - | 5 | 5 | - | - |
| | - | 2x20 | 4 | | | | | | | |
| 200 | - | 20 | 2 | - | 18 | - | 6 | 6 | - | - |
| | 20 | 20 | 4 | | | | | | | |
| 200 | 20 | - | 2 | - | 12 | - | 7 | 7 | - | - |
| | 20 | 20 | 4 | | | | | | | |
| 200 | - | 20 | 2 | - | 13 | - | 8 | 8 | - | - |
| | 2x20 | - | 4 | | | | | | | |
| 200 | 10 | 2x20 | 4 | - | 14 | - | 9 | 9 | - | - |
| 190 | 15 | - | 2 | - | 14 | - | 10 | 10 | - | - |
| | - | 2x20 | 4 | | | | | | | |
| 190 | 15 | - | 2 | - | 15 | - | 11 | 11 | - | - |
| | 20 | 20 | 4 | | | | | | | |
| 180 | 20 | - | 2 | - | 12 | - | 12 | 12 | - | - |
| | 15 | 20 | 4 | | | | | | | |
| 180 | - | 20 | 2 | - | 13 | - | 13 | 13 | - | - |
| | 15+20 | - | 4 | | | | | | | |
| 180 | 10 | - | 2 | - | 14 | - | 14 | 14 | - | - |
| | - | 2x20 | 4 | | | | | | | |
| 180 | 10 | - | 2 | - | 15 | - | 15 | 15 | - | - |
| | 20 | 20 | 4 | | | | | | | |
| 170 | 15 | - | 2 | - | 16 | - | 16 | 16 | - | - |
| | 15 | 20 | 4 | | | | | | | |
| 160 | 20 | 20 | 2 | - | 17 | - | 17 | 17 | - | - |
| | - | 20 | 4 | | | | | | | |
| 160 | - | 2x20 | 2 | - | 18 | - | 18 | 18 | - | - |
| | 20 | - | 4 | | | | | | | |
| 160 | 2x20 | - | 2 | - | 19 | - | 19 | 19 | - | - |
| | - | 20 | 4 | | | | | | | |
| 160 | 20 | 20 | 2 | - | 20 | - | 20 | 20 | - | - |
| | 20 | - | 4 | | | | | | | |
| 160 | 10 | - | 2 | - | 21 | - | 21 | 21 | - | - |
| | - | 15+20 | 4 | | | | | | | |
| 160 | 10 | - | 2 | - | 22 | - | 22 | 22 | - | - |
| | 15 | 20 | 4 | | | | | | | |
| 150 | 15+20 | - | 2 | - | 23 | - | 23 | 23 | - | - |
| | - | 20 | 4 | | | | | | | |
| 150 | 15 | 20 | 2 | - | 24 | - | 24 | 24 | - | - |
| | 20 | - | 4 | | | | | | | |
| 140 | - | 2x20 | 2 | - | 25 | - | 25 | 25 | - | - |
| | 15 | - | 4 | | | | | | | |
| 140 | 20 | 20 | 2 | - | 26 | - | 26 | 26 | - | - |
| | 15 | - | 4 | | | | | | | |
| 140 | 10 | 20 | 2 | - | 27 | - | 27 | 27 | - | - |
| | - | 20 | 4 | | | | | | | |
| 140 | 10+20 | - | 2 | - | 28 | - | 28 | 28 | - | - |
| | - | 20 | 4 | | | | | | | |
| 140 | 10 | 20 | 2 | - | 29 | - | 29 | 29 | - | - |
| | 20 | - | 4 | | | | | | | |
| 140 | 2x15 | - | 2 | - | 30 | - | 30 | 30 | - | - |
| | - | 20 | 4 | | | | | | | |
| 140 | 10 | - | 2 | - | 31 | - | 31 | 31 | - | - |
| | 10 | 20 | 4 | | | | | | | |
| 130 | 15 | 20 | 2 | - | 32 | - | 32 | 32 | - | - |
| | 15 | - | 4 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 130 | 10+15 | - | 2 | - | 33 | - | 33 | 33 | - | - |
| | - | 20 | 4 | | | | | | | |
| 120 | - | 2x20 | 2 | - | 34 | - | 34 | 34 | - | - |
| | 10 | - | 4 | | | | | | | |
| 120 | 10 | 20 | 2 | - | 35 | - | 35 | 35 | - | - |
| | 15 | - | 4 | | | | | | | |
| 120 | 2x10 | - | 2 | - | 36 | - | 36 | 36 | - | - |
| | - | 20 | 4 | | | | | | | |
| 100 | 10 | 20 | 2 | - | 37 | - | 37 | 37 | - | - |
| | 10 | - | 4 | | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.11.1. Only one test point to be tested. | | | | | | | | | | |

**Table 8.7.11.3.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bagg (MHz) | BW combi-nation (MHz) | | MIMO layer | DL Cat. 9, 10 | DL Cat. 11, 12 | | | | | |
| | FDD CC | TDD CC | | | | | | | | |
| 240 | 20 | 2x20 | 4 | - | - | - | 18 | 3 | 1 | - |
| 240 | 2x20 | 20 | 4 | - | - | - | 16 | 4 | 2 | - |
| 220 | 15 | 2x20 | 4 | - | - | - | 21 | 3 | 3 | - |
| 220 | 15+20 | 20 | 4 | - | - | - | 16 | 4 | 4 | - |
| 200 | 20 | - | 2 | - | - | - | 17 | 5 | 5 | - |
| | - | 2x20 | 4 | | | | | | | |
| 200 | - | 20 | 2 | - | - | - | 18 | 6 | 6 | - |
| | 20 | 20 | 4 | | | | | | | |
| 200 | 20 | - | 2 | - | - | - | 19 | 7 | 7 | - |
| | 20 | 20 | 4 | | | | | | | |
| 200 | - | 20 | 2 | - | - | - | 20 | 8 | 8 | - |
| | 2x20 | - | 4 | | | | | | | |
| 200 | 10 | 2x20 | 4 | - | - | - | 21 | 9 | 9 | - |
| 190 | 15 | - | 2 | - | - | - | 21 | 10 | 10 | - |
| | - | 2x20 | 4 | | | | | | | |
| 190 | 15 | - | 2 | - | - | - | 16 | 11 | 11 | - |
| | 20 | 20 | 4 | | | | | | | |
| 180 | 20 | - | 2 | - | - | - | 22 | 12 | 12 | - |
| | 15 | 20 | 4 | | | | | | | |
| 180 | - | 20 | 2 | - | - | - | 24 | 13 | 13 | - |
| | 15+20 | - | 4 | | | | | | | |
| 180 | 10 | - | 2 | - | - | - | 21 | 14 | 14 | - |
| | - | 2x20 | 4 | | | | | | | |
| 180 | 10 | - | 2 | - | - | - | 28 | 15 | 15 | - |
| | 20 | 20 | 4 | | | | | | | |
| 170 | 15 | - | 2 | - | - | - | 16 | 16 | 16 | - |
| | 15 | 20 | 4 | | | | | | | |
| 160 | 20 | 20 | 2 | - | - | - | 17 | 17 | 17 | - |
| | - | 20 | 4 | | | | | | | |
| 160 | - | 2x20 | 2 | - | - | - | 18 | 18 | 18 | - |
| | 20 | - | 4 | | | | | | | |
| 160 | 2x20 | - | 2 | - | - | - | 19 | 19 | 19 | - |
| | - | 20 | 4 | | | | | | | |
| 160 | 20 | 20 | 2 | - | - | - | 20 | 20 | 20 | - |
| | 20 | - | 4 | | | | | | | |
| 160 | 10 | - | 2 | - | - | - | 21 | 21 | 21 | - |
| | - | 15+20 | 4 | | | | | | | |
| 160 | 10 | - | 2 | - | - | - | 22 | 22 | 22 | - |
| | 15 | 20 | 4 | | | | | | | |
| 150 | 15+20 | - | 2 | - | - | - | 23 | 23 | 23 | - |
| | - | 20 | 4 | | | | | | | |
| 150 | 15 | 20 | 2 | - | - | - | 24 | 24 | 24 | - |
| | 20 | - | 4 | | | | | | | |
| 140 | - | 2x20 | 2 | - | - | - | 25 | 25 | 25 | - |
| | 15 | - | 4 | | | | | | | |
| 140 | 20 | 20 | 2 | - | - | - | 26 | 26 | 26 | - |
| | 15 | - | 4 | | | | | | | |
| 140 | 10 | 20 | 2 | - | - | - | 27 | 27 | 27 | - |
| | - | 20 | 4 | | | | | | | |
| 140 | 10+20 | - | 2 | - | - | - | 28 | 28 | 28 | - |
| | - | 20 | 4 | | | | | | | |
| 140 | 10 | 20 | 2 | - | - | - | 29 | 29 | 29 | - |
| | 20 | - | 4 | | | | | | | |
| 140 | 2x15 | - | 2 | - | - | - | 30 | 30 | 30 | - |
| | - | 20 | 4 | | | | | | | |
| 140 | 10 | - | 2 | - | - | - | 31 | 31 | 31 | - |
| | 10 | 20 | 4 | | | | | | | |
| 130 | 15 | 20 | 2 | - | - | - | 32 | 32 | 32 | - |
| | 15 | - | 4 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 130 | 10+15 | - | 2 | - | - | - | 33 | 33 | 33 | - |
| | - | 20 | 4 | | | | | | | |
| 120 | - | 2x20 | 2 | - | - | - | 34 | 34 | 34 | - |
| | 10 | - | 4 | | | | | | | |
| 120 | 10 | 20 | 2 | - | - | - | 35 | 35 | 35 | - |
| | 15 | - | 4 | | | | | | | |
| 120 | 2x10 | - | 2 | - | - | - | 36 | 36 | 36 | - |
| | - | 20 | 4 | | | | | | | |
| 100 | 10 | 20 | 2 | - | - | - | 37 | 37 | 37 | - |
| | 10 | - | 4 | | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.11.1. Only one test point to be tested. | | | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.11.3.4.1-1 depending on the UE category according to Table 8.7.11.3.4.1-2 for UE not supporting 256QAM or Table 8.7.11.3.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.91.
2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.11.1-1, Table 8.7.11.3.4.1-1 depending on the UE category according to Table 8.7.11.3.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.11.1-1, Table 8.7.11.3.4.1-1 depending on the UE category according to Table 8.7.11.3.4.1-3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.11.3.4.3.

### 8.7.11.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.11.3.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.11.3.4.3-4. Cell ID = n (where n is 1, 2) applies to S-Celln (where n is 1, 2).
3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).
5. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.11.1-2, for the tests to be performed depending on the UE category according to Table 8.7.11.3.4.1-2. For UE supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.11.1-3, for the tests to be performed depending on the UE category according to Table 8.7.11.3.4.1-3.
6. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $ND_{DL_PDCP}$ to 0.
7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU.

The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

#### 8.7.11.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.11.3.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.11.3.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.11.3.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna P-Cell |
| 4TX | 4 SS Tx antenna P-Cell |

**Table 8.7.11.3.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna S-Cell |
| 4TX | 4 SS Tx antenna S-Cell |

### 8.7.11.3.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.11.3.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.11.4 TDD FDD CA sustained data rate performance for 4 layer MIMO (4DL CA)

Editor's note: Simplification of test point tables, to reduce future maintenance, needs further investigation.

### 8.7.11.4.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.11.4.2 Test applicability

This test applies to all types of UE Release 12 and forward of DL category 15, 16, 18 and 19 that support E-UTRA FDD and TDD, 4DL TDD-FDD CA and support 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any RF band of the 4DL CA configuration.

### 8.7.11.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.11.1.

### 8.7.11.4.4 Test description

#### 8.7.11.4.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.11.1-2, with the addition of the parameters in Table 8.7.11.4.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.11.4.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.11.1-3, with the addition of the parameters in Table 8.7.11.4.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.11.4.4.1-3.

**Table 8.7.11.4.4.1-1: Test parameters for sustained downlink data rate (TDD FDD 4DL CA)**

| Test | Bandwidth (MHz) | | | MIMO layer | Antenna confi-guration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | |
| 1 | 4x20 | 2x20 | 2x20 | 4 layer | 4x4 | 320 | 1455 | 1408 |
| 2 | 4x20 | 20 | 3x20 | 4 layer | 4x4 | 320 | 1455 | 1408 |
| 3 | 4x20 | 3x20 | 20 | 4 layer | 4x4 | 320 | 1455 | 1408 |
| 4 | 15+20+20+20 | 15+20 | 2x20 | 4 layer | 4x4 | 300 | 1455 | 1408 |
| 5 | 15+20+20+20 | 15+20+20 | 20 | 4 layer | 4x4 | 300 | 1455 | 1408 |
| 6 | 20 | 20 | - | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 3x20 | 20 | 2x20 | 4 layer | 4x4 | | | |
| 7 | 20 | - | 20 | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 3x20 | 20 | 2x20 | 4 layer | 4x4 | | | |
| 8 | 20 | 20 | - | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 3x20 | - | 3x20 | 4 layer | 4x4 | | | |
| 9 | 20 | - | 20 | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 3x20 | 3x20 | - | 4 layer | 4x4 | | | |
| 10 | 20 | 20 | - | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 3x20 | 2x20 | 20 | 4 layer | 4x4 | | | |
| 11 | 15 | 15 | - | 2 layer | 2x2 | 270 | 1371 | 1341 |
| | 3x20 | 20 | 2x20 | 4 layer | 4x4 | | | |
| 12 | 15 | 15 | - | 2 layer | 2x2 | 270 | 1371 | 1341 |
| | 3x20 | 2x20 | 20 | 4 layer | 4x4 | | | |
| 13 | 20 | 20 | - | 2 layer | 2x2 | 260 | 1341 | 1355 |
| | 15+20+20 | 15 | 2x20 | 4 layer | 4x4 | | | |
| 14 | 20 | - | 20 | 2 layer | 2x2 | 260 | 1341 | 1355 |
| | 15+20+20 | 15+20+20 | - | 4 layer | 4x4 | | | |
| 15 | 20 | 20 | - | 2 layer | 2x2 | 260 | 1341 | 1355 |
| | 15+20+20 | 15+20 | 20 | 4 layer | 4x4 | | | |
| 16 | 10 | 10 | - | 2 layer | 2x2 | 260 | 1141 | 1218 |
| | 3x20 | - | 3x20 | 4 layer | 4x4 | | | |
| 17 | 10 | 10 | - | 2 layer | 2x2 | 260 | 1141 | 1218 |
| | 3x20 | 2x20 | 20 | 4 layer | 4x4 | | | |
| 18 | 10 | 10 | - | 2 layer | 2x2 | 260 | 1141 | 1218 |
| | 3x20 | 20 | 2x20 | 4 layer | 4x4 | | | |
| 19 | 15 | 15 | - | 2 layer | 2x2 | 250 | 1371 | 1341 |
| | 15+20+20 | 15 | 2x20 | 4 layer | 4x4 | | | |
| 20 | 15 | 15 | - | 2 layer | 2x2 | 250 | 1371 | 1341 |
| | 15+20+20 | 15+20 | 20 | 4 layer | 4x4 | | | |
| 21 | 2x20 | 2x20 | - | 2 layer | 2x2 | 240 | 1341 | 1355 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 22 | 2x20 | - | 2x20 | 2 layer | 2x2 | 240 | 1341 | 1355 |
| | 2x20 | 2x20 | - | 4 layer | 4x4 | | | |
| 23 | 2x20 | 20 | 20 | 2 layer | 2x2 | 240 | 1341 | 1355 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 24 | 2x20 | - | 2x20 | 2 layer | 2x2 | 240 | 1341 | 1355 |
| | 2x20 | 20 | 20 | 4 layer | 4x4 | | | |
| 25 | 2x20 | 2x20 | - | 2 layer | 2x2 | 240 | 1341 | 1355 |
| | 2x20 | 20 | 20 | 4 layer | 4x4 | | | |
| 26 | 2x20 | 20 | 20 | 2 layer | 2x2 | 240 | 1341 | 1355 |
| | 2x20 | 2x20 | - | 4 layer | 4x4 | | | |
| 27 | 10 | 10 | - | 2 layer | 2x2 | 240 | 1141 | 1218 |
| | 15+20+20 | 15 | 2x20 | 4 layer | 4x4 | | | |
| 28 | 10 | 10 | - | 2 layer | 2x2 | 240 | 1141 | 1218 |
| | 15+20+20 | 15+20 | 20 | 4 layer | 4x4 | | | |
| 29 | 15+20 | 15+20 | - | 2 layer | 2x2 | 230 | 1341 | 1341 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 30 | 15+20 | 15+20 | - | 2 layer | 2x2 | 230 | 1341 | 1341 |
| | 2x20 | 20 | 20 | 4 layer | 4x4 | | | |
| 31 | 15+20 | 15 | 20 | 2 layer | 2x2 | 230 | 1341 | 1341 |
| | 2x20 | 20+20 | - | 4 layer | 4x4 | | | |
| 32 | 2x20 | - | 2x20 | 2 layer | 2x2 | 220 | 1341 | 1355 |
| | 15+20 | 15+20 | - | 4 layer | 4x4 | | | |
| 33 | 2x20 | 2x20 | - | 2 layer | 2x2 | 220 | 1341 | 1355 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 15+20 | 15 | 20 | 4 layer | 4x4 | | | |
| 34 | 2x20 | 20 | 20 | 2 layer | 2x2 | 220 | 1341 | 1355 |
| | 15+20 | 15+20 | - | 4 layer | 4x4 | | | |
| 35 | 2x15 | 2x15 | - | 2 layer | 2x2 | 220 | 1371 | 1341 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 36 | 10+20 | 10 | 20 | 2 layer | 2x2 | 220 | 1141 | 1218 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 37 | 10+20 | 10 | 20 | 2 layer | 2x2 | 220 | 1141 | 1218 |
| | 2x20 | 2x20 | - | 4 layer | 4x4 | | | |
| 38 | 10+20 | 10+20 | - | 2 layer | 2x2 | 220 | 1141 | 1218 |
| | 2x20 | 20 | 20 | 4 layer | 4x4 | | | |
| 39 | 2x15 | 2x15 | - | 2 layer | 2x2 | 220 | 1371 | 1341 |
| | 2x20 | 20 | 20 | 4 layer | 4x4 | | | |
| 40 | 10+20 | 10 | 20 | 2 layer | 2x2 | 220 | 1141 | 1218 |
| | 2x20 | 20 | 20 | 4 layer | 4x4 | | | |
| 41 | 10+20 | 10+20 | - | 2 layer | 2x2 | 220 | 1141 | 1218 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 42 | 15+20 | 15 | 20 | 2 layer | 2x2 | 210 | 1341 | 1341 |
| | 15+20 | 15+20 | - | 4 layer | 4x4 | | | |
| 43 | 15+20 | 15+20 | - | 2 layer | 2x2 | 210 | 1341 | 1341 |
| | 15+20 | 15 | 20 | 4 layer | 4x4 | | | |
| 44 | 10+15 | 10+15 | - | 2 layer | 2x2 | 210 | 1141 | 1218 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 45 | 10+15 | 10+15 | - | 2 layer | 2x2 | 210 | 1141 | 1218 |
| | 2x20 | 20 | 20 | 4 layer | 4x4 | | | |
| 46 | 3x20 | 20 | 2x20 | 2 layer | 2x2 | 200 | 1341 | 1355 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 47 | 3x20 | 20 | 2x20 | 2 layer | 2x2 | 200 | 1341 | 1355 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 48 | 3x20 | - | 3x20 | 2 layer | 2x2 | 200 | 1341 | 1355 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 49 | 3x20 | 3x20 | - | 2 layer | 2x2 | 200 | 1341 | 1355 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 50 | 3x20 | 2x20 | 20 | 2 layer | 2x2 | 200 | 1341 | 1355 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 51 | 10+20 | 10 | 20 | 2 layer | 2x2 | 200 | 1141 | 1218 |
| | 15+20 | 15+20 | - | 4 layer | 4x4 | | | |
| 52 | 10+20 | 10+20 | - | 2 layer | 2x2 | 200 | 1141 | 1218 |
| | 15+20 | 15 | 20 | 4 layer | 4x4 | | | |
| 53 | 2x10 | 2x10 | - | 2 layer | 2x2 | 200 | 1141 | 1218 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 54 | 15+20+20 | 15 | 2x20 | 2 layer | 2x2 | 190 | 1341 | 1341 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 55 | 15+20+20 | 15+20+20 | - | 2 layer | 2x2 | 190 | 1341 | 1341 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 56 | 15+20+20 | 15+20 | 20 | 2 layer | 2x2 | 190 | 1341 | 1341 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 57 | 3x20 | - | 3x20 | 2 layer | 2x2 | 180 | 1341 | 1355 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 58 | 3x20 | 20 | 2x20 | 2 layer | 2x2 | 180 | 1341 | 1355 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 59 | 3x20 | 2x20 | 20 | 2 layer | 2x2 | 180 | 1341 | 1355 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 60 | 10+20+20 | 10 | 2x20 | 2 layer | 2x2 | 180 | 1141 | 1218 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 61 | 10+20+20 | 10+20+20 | - | 2 layer | 2x2 | 180 | 1141 | 1218 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 62 | 10+20+20 | 10+20 | 20 | 2 layer | 2x2 | 180 | 1141 | 1218 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 63 | 15+15+20 | 15+15+20 | - | 2 layer | 2x2 | 180 | 1341 | 1341 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 64 | 15+15+20 | 15+15 | 20 | 2 layer | 2x2 | 180 | 1341 | 1341 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 65 | 10+20+20 | 10+20 | 20 | 2 layer | 2x2 | 180 | 1141 | 1218 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 66 | 10+20+20 | 10 | 2x20 | 2 layer | 2x2 | 180 | 1141 | 1218 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 67 | 2x10 | 2x10 | - | 2 layer | 2x2 | 180 | 1141 | 1218 |
| | 15+20 | - | 15+20 | 4 layer | 4x4 | | | |
| 68 | 15+20+20 | 15 | 2x20 | 2 layer | 2x2 | 170 | 1341 | 1341 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 69 | 15+20+20 | 15+20 | 20 | 2 layer | 2x2 | 170 | 1341 | 1341 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 70 | 10+15+20 | 10+15+20 | - | 2 layer | 2x2 | 170 | 1141 | 1218 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 71 | 10+15+20 | 10+15 | 20 | 2 layer | 2x2 | 170 | 1141 | 1218 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 72 | 10+20+20 | 10 | 2x20 | 2 layer | 2x2 | 160 | 1141 | 1218 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 73 | 10+20+20 | 10+20 | 20 | 2 layer | 2x2 | 160 | 1141 | 1218 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |

Editor's note: Tests in Table 8.7.11.4.4.1-1 are covering maximum aggregated bandwidth for each Bandwidth combination set with 4DL CA, which are defined in Table 5.4.2A.1-2, Table 5.4.2A.1-2a and Table 5.4.2A.1-2b.

**Table 8.7.11.4.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bagg (MHz) | BW combi-nation (MHz) | | MIMO layer | DL Cat. 9, 10 | DL Cat. 11, 12 | | | | | |
| | FDD CC | TDD CC | | | | | | | | |
| 320 | 2x20 | 2x20 | 4 | - | - | - | 32 | 4 | 1 | - |
| 320 | 20 | 3x20 | 4 | - | - | - | 36 | 7 | 2 | - |
| 320 | 3x20 | 20 | 4 | - | - | - | 33 | 5 | 3 | - |
| 300 | 15+20 | 2x20 | 4 | - | - | - | 32 | 4 | 4 | - |
| 300 | 15+20+20 | 20 | 4 | - | - | - | 33 | 5 | 5 | - |
| 280 | 20 | - | 2 | - | - | - | 41 | 6 | 6 | - |
| | 20 | 2x20 | 4 | | | | | | | |
| 280 | - | 20 | 2 | - | - | - | 47 | 7 | 7 | - |
| | 20 | 2x20 | 4 | | | | | | | |
| 280 | 20 | - | 2 | - | - | - | 36 | 8 | 8 | - |
| | - | 3x20 | 4 | | | | | | | |
| 280 | - | 20 | 2 | - | - | - | 34 | 9 | 9 | - |
| | 3x20 | - | 4 | | | | | | | |
| 280 | 20 | - | 2 | - | - | - | 38 | 10 | 10 | - |
| | 2x20 | 20 | 4 | | | | | | | |
| 270 | 15 | - | 2 | - | - | - | 41 | 11 | 11 | - |
| | 20 | 2x20 | 4 | | | | | | | |
| 270 | 15 | - | 2 | - | - | - | 38 | 12 | 12 | - |
| | 2x20 | 20 | 4 | | | | | | | |
| 260 | 20 | - | 2 | - | - | - | 35 | 13 | 13 | - |
| | 15 | 2x20 | 4 | | | | | | | |
| 260 | - | 20 | 2 | - | - | - | 34 | 14 | 14 | - |
| | 15+20+20 | - | 4 | | | | | | | |
| 260 | 20 | - | 2 | - | - | - | 33 | 15 | 15 | - |
| | 15+20 | 20 | 4 | | | | | | | |
| 260 | 10 | - | 2 | - | - | - | 36 | 16 | 16 | - |
| | - | 3x20 | 4 | | | | | | | |
| 260 | 10 | - | 2 | - | - | - | 38 | 17 | 17 | - |
| | 2x20 | 20 | 4 | | | | | | | |
| 260 | 10 | - | 2 | - | - | - | 41 | 18 | 18 | - |
| | 20 | 2x20 | 4 | | | | | | | |
| 250 | 15 | - | 2 | - | - | - | 44 | 19 | 19 | - |
| | 15 | 2x20 | 4 | | | | | | | |
| 250 | 15 | - | 2 | - | - | - | 39 | 20 | 20 | - |
| | 15+20 | 20 | 4 | | | | | | | |
| 240 | 2x20 | - | 2 | - | - | - | 41 | 21 | 21 | - |
| | - | 2x20 | 4 | | | | | | | |
| 240 | - | 2x20 | 2 | - | - | - | 32 | 22 | 22 | - |
| | 2x20 | - | 4 | | | | | | | |
| 240 | 20 | 20 | 2 | - | - | - | 36 | 23 | 23 | - |
| | - | 2x20 | 4 | | | | | | | |
| 240 | - | 2x20 | 2 | - | - | - | 47 | 24 | 24 | - |
| | 20 | 20 | 4 | | | | | | | |
| 240 | 2x20 | - | 2 | - | - | - | 38 | 25 | 25 | - |
| | 20 | 20 | 4 | | | | | | | |
| 240 | 20 | 20 | 2 | - | - | - | 37 | 26 | 26 | - |
| | 2x20 | - | 4 | | | | | | | |
| 240 | 10 | - | 2 | - | - | - | 44 | 27 | 27 | - |
| | 15 | 2x20 | 4 | | | | | | | |
| 240 | 10 | - | 2 | - | - | - | 45 | 28 | 28 | - |
| | 15+20 | 20 | 4 | | | | | | | |
| 230 | 15+20 | - | 2 | - | - | - | 41 | 29 | 29 | - |
| | - | 2x20 | 4 | | | | | | | |
| 230 | 15+20 | - | 2 | - | - | - | 38 | 30 | 30 | - |
| | 20 | 20 | 4 | | | | | | | |
| 230 | 15 | 20 | 2 | - | - | - | 37 | 31 | 31 | - |
| | 20+20 | - | 4 | | | | | | | |
| 220 | - | 2x20 | 2 | - | - | - | 32 | 32 | 32 | - |
| | 15+20 | - | 4 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 220 | 2x20 | - | 2 | - | - | - | 33 | 33 | 33 | - |
| | 15 | 20 | 4 | | | | | | | |
| 220 | 20 | 20 | 2 | - | - | - | 34 | 34 | 34 | - |
| | 15+20 | - | 4 | | | | | | | |
| 220 | 2x15 | - | 2 | - | - | - | 35 | 35 | 35 | - |
| | - | 2x20 | 4 | | | | | | | |
| 220 | 10 | 20 | 2 | - | - | - | 36 | 36 | 36 | - |
| | - | 2x20 | 4 | | | | | | | |
| 220 | 10 | 20 | 2 | - | - | - | 37 | 37 | 37 | - |
| | 2x20 | - | 4 | | | | | | | |
| 220 | 10+20 | - | 2 | - | - | - | 38 | 38 | 38 | - |
| | 20 | 20 | 4 | | | | | | | |
| 220 | 2x15 | - | 2 | - | - | - | 39 | 39 | 39 | - |
| | 20 | 20 | 4 | | | | | | | |
| 220 | 10 | 20 | 2 | - | - | - | 40 | 40 | 40 | - |
| | 20 | 20 | 4 | | | | | | | |
| 220 | 10+20 | - | 2 | - | - | - | 41 | 41 | 41 | - |
| | - | 2x20 | 4 | | | | | | | |
| 210 | 15 | 20 | 2 | - | - | - | 42 | 42 | 42 | - |
| | 15+20 | - | 4 | | | | | | | |
| 210 | 15+20 | - | 2 | - | - | - | 43 | 43 | 43 | - |
| | 15 | 20 | 4 | | | | | | | |
| 210 | 10+15 | - | 2 | - | - | - | 44 | 44 | 44 | - |
| | - | 2x20 | 4 | | | | | | | |
| 210 | 10+15 | - | 2 | - | - | - | 45 | 45 | 45 | - |
| | 20 | 20 | 4 | | | | | | | |
| 200 | 20 | 2x20 | 2 | - | - | - | 46 | 46 | 46 | - |
| | 20 | - | 4 | | | | | | | |
| 200 | 20 | 2x20 | 2 | - | - | - | 47 | 47 | 47 | - |
| | - | 20 | 4 | | | | | | | |
| 200 | - | 3x20 | 2 | - | - | - | 48 | 48 | 48 | - |
| | 20 | - | 4 | | | | | | | |
| 200 | 3x20 | - | 2 | - | - | - | 49 | 49 | 49 | - |
| | - | 20 | 4 | | | | | | | |
| 200 | 2x20 | 20 | 2 | - | - | - | 50 | 50 | 50 | - |
| | 20 | - | 4 | | | | | | | |
| 200 | 10 | 20 | 2 | - | - | - | 51 | 51 | 51 | - |
| | 15+20 | - | 4 | | | | | | | |
| 200 | 10+20 | - | 2 | - | - | - | 52 | 52 | 52 | - |
| | 15 | 20 | 4 | | | | | | | |
| 200 | 2x10 | - | 2 | - | - | - | 53 | 53 | 53 | - |
| | - | 2x20 | 4 | | | | | | | |
| 190 | 15 | 2x20 | 2 | - | - | - | 54 | 54 | 54 | - |
| | 20 | - | 4 | | | | | | | |
| 190 | 15+20+20 | - | 2 | - | - | - | 55 | 55 | 55 | - |
| | - | 20 | 4 | | | | | | | |
| 190 | 15+20 | 20 | 2 | - | - | - | 56 | 56 | 56 | - |
| | 20 | - | 4 | | | | | | | |
| 180 | - | 3x20 | 2 | - | - | - | 57 | 57 | 57 | - |
| | 15 | - | 4 | | | | | | | |
| 180 | 20 | 2x20 | 2 | - | - | - | 58 | 58 | 58 | - |
| | 15 | - | 4 | | | | | | | |
| 180 | 2x20 | 20 | 2 | - | - | - | 59 | 59 | 59 | - |
| | 15 | - | 4 | | | | | | | |
| 180 | 10 | 2x20 | 2 | - | - | - | 60 | 60 | 60 | - |
| | - | 20 | 4 | | | | | | | |
| 180 | 10+20+20 | - | 2 | - | - | - | 61 | 61 | 61 | - |
| | - | 20 | 4 | | | | | | | |
| 180 | 10+20 | 20 | 2 | - | - | - | 62 | 62 | 62 | - |
| | 20 | - | 4 | | | | | | | |
| 180 | 15+15+20 | - | 2 | - | - | - | 63 | 63 | 63 | - |
| | - | 20 | 4 | | | | | | | |
| 180 | 15+15 | 20 | 2 | - | - | - | 64 | 64 | 64 | - |
| | 20 | - | 4 | | | | | | | |
| 180 | 10+20 | 20 | 2 | - | - | - | 65 | 65 | 65 | - |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | - | 20 | 4 | | | | | | | |
| 180 | 10 | 2x20 | 2 | - | - | - | 66 | 66 | 66 | - |
| | 20 | - | 4 | | | | | | | |
| 180 | 2x10 | - | 2 | - | - | - | 67 | 67 | 67 | - |
| | - | 15+20 | 4 | | | | | | | |
| 170 | 15 | 2x20 | 2 | - | - | - | 68 | 68 | 68 | - |
| | 15 | - | 4 | | | | | | | |
| 170 | 15+20 | 20 | 2 | - | - | - | 69 | 69 | 69 | - |
| | 15 | - | 4 | | | | | | | |
| 170 | 10+15+20 | - | 2 | - | - | - | 70 | 70 | 70 | - |
| | - | 20 | 4 | | | | | | | |
| 170 | 10+15 | 20 | 2 | - | - | - | 71 | 71 | 71 | - |
| | 20 | - | 4 | | | | | | | |
| 160 | 10 | 2x20 | 2 | - | - | - | 72 | 72 | 72 | - |
| | 15 | - | 4 | | | | | | | |
| 160 | 10+20 | 20 | 2 | - | - | - | 73 | 73 | 73 | - |
| | 15 | - | 4 | | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.11.1. Only one test point to be tested. | | | | | | | | | | |

**Table 8.7.11.4.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bagg (MHz) | BW combi-nation (MHz) | | MIMO layer | DL Cat. 9, 10 | DL Cat. 11, 12 | | | | | |
| | FDD CC | TDD CC | | | | | | | | |
| 320 | 2x20 | 2x20 | 4 | - | - | - | - | 40 | 11 | 1 |
| 320 | 20 | 3x20 | 4 | - | - | - | - | 36 | 16 | 2 |
| 320 | 3x20 | 20 | 4 | - | - | - | - | 37 | 12 | 3 |
| 300 | 15+20 | 2x20 | 4 | - | - | - | - | 54 | 11 | 4 |
| 300 | 15+20+20 | 20 | 4 | - | - | - | - | 37 | 12 | 5 |
| 280 | 20 | - | 2 | - | - | - | - | 40 | 11 | 6 |
| | 20 | 2x20 | 4 | | | | | | | |
| 280 | - | 20 | 2 | - | - | - | - | 36 | 23 | 7 |
| | 20 | 2x20 | 4 | | | | | | | |
| 280 | 20 | - | 2 | - | - | - | - | 36 | 16 | 8 |
| | - | 3x20 | 4 | | | | | | | |
| 280 | - | 20 | 2 | - | - | - | - | 37 | 14 | 9 |
| | 3x20 | - | 4 | | | | | | | |
| 280 | 20 | - | 2 | - | - | - | - | 37 | 12 | 10 |
| | 2x20 | 20 | 4 | | | | | | | |
| 270 | 15 | - | 2 | - | - | - | - | 41 | 11 | 11 |
| | 20 | 2x20 | 4 | | | | | | | |
| 270 | 15 | - | 2 | - | - | - | - | 37 | 12 | 12 |
| | 2x20 | 20 | 4 | | | | | | | |
| 260 | 20 | - | 2 | - | - | - | - | 41 | 13 | 13 |
| | 15 | 2x20 | 4 | | | | | | | |
| 260 | - | 20 | 2 | - | - | - | - | 37 | 14 | 14 |
| | 15+20+20 | - | 4 | | | | | | | |
| 260 | 20 | - | 2 | - | - | - | - | 38 | 15 | 15 |
| | 15+20 | 20 | 4 | | | | | | | |
| 260 | 10 | - | 2 | - | - | - | - | 36 | 16 | 16 |
| | - | 3x20 | 4 | | | | | | | |
| 260 | 10 | - | 2 | - | - | - | - | 38 | 17 | 17 |
| | 2x20 | 20 | 4 | | | | | | | |
| 260 | 10 | - | 2 | - | - | - | - | 41 | 18 | 18 |
| | 20 | 2x20 | 4 | | | | | | | |
| 250 | 15 | - | 2 | - | - | - | - | 44 | 19 | 19 |
| | 15 | 2x20 | 4 | | | | | | | |
| 250 | 15 | - | 2 | - | - | - | - | 42 | 20 | 20 |
| | 15+20 | 20 | 4 | | | | | | | |
| 240 | 2x20 | - | 2 | - | - | - | - | 44 | 21 | 21 |
| | - | 2x20 | 4 | | | | | | | |
| 240 | - | 2x20 | 2 | - | - | - | - | 46 | 22 | 22 |
| | 2x20 | - | 4 | | | | | | | |
| 240 | 20 | 20 | 2 | - | - | - | - | 36 | 23 | 23 |
| | - | 2x20 | 4 | | | | | | | |
| 240 | - | 2x20 | 2 | - | - | - | - | 47 | 24 | 24 |
| | 20 | 20 | 4 | | | | | | | |
| 240 | 2x20 | - | 2 | - | - | - | - | 38 | 25 | 25 |
| | 20 | 20 | 4 | | | | | | | |
| 240 | 20 | 20 | 2 | - | - | - | - | 37 | 26 | 26 |
| | 2x20 | - | 4 | | | | | | | |
| 240 | 10 | - | 2 | - | - | - | - | 44 | 27 | 27 |
| | 15 | 2x20 | 4 | | | | | | | |
| 240 | 10 | - | 2 | - | - | - | - | 45 | 28 | 28 |
| | 15+20 | 20 | 4 | | | | | | | |
| 230 | 15+20 | - | 2 | - | - | - | - | 44 | 29 | 29 |
| | - | 2x20 | 4 | | | | | | | |
| 230 | 15+20 | - | 2 | - | - | - | - | 38 | 30 | 30 |
| | 20 | 20 | 4 | | | | | | | |
| 230 | 15 | 20 | 2 | - | - | - | - | 37 | 31 | 31 |
| | 20+20 | - | 4 | | | | | | | |
| 220 | - | 2x20 | 2 | - | - | - | - | 54 | 32 | 32 |
| | 15+20 | - | 4 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 220 | 2x20 | - | 2 | - | - | - | - | 55 | 33 | 33 |
| | 15 | 20 | 4 | | | | | | | |
| 220 | 20 | 20 | 2 | - | - | - | - | 56 | 34 | 34 |
| | 15+20 | - | 4 | | | | | | | |
| 220 | 2x15 | - | 2 | - | - | - | - | 44 | 35 | 35 |
| | - | 2x20 | 4 | | | | | | | |
| 220 | 10 | 20 | 2 | - | - | - | - | 36 | 36 | 36 |
| | - | 2x20 | 4 | | | | | | | |
| 220 | 10 | 20 | 2 | - | - | - | - | 37 | 37 | 37 |
| | 2x20 | - | 4 | | | | | | | |
| 220 | 10+20 | - | 2 | - | - | - | - | 38 | 38 | 38 |
| | 20 | 20 | 4 | | | | | | | |
| 220 | 2x15 | - | 2 | - | - | - | - | 45 | 39 | 39 |
| | 20 | 20 | 4 | | | | | | | |
| 220 | 10 | 20 | 2 | - | - | - | - | 40 | 40 | 40 |
| | 20 | 20 | 4 | | | | | | | |
| 220 | 10+20 | - | 2 | - | - | - | - | 41 | 41 | 41 |
| | - | 2x20 | 4 | | | | | | | |
| 210 | 15 | 20 | 2 | - | - | - | - | 42 | 42 | 42 |
| | 15+20 | - | 4 | | | | | | | |
| 210 | 15+20 | - | 2 | - | - | - | - | 43 | 43 | 43 |
| | 15 | 20 | 4 | | | | | | | |
| 210 | 10+15 | - | 2 | - | - | - | - | 44 | 44 | 44 |
| | - | 2x20 | 4 | | | | | | | |
| 210 | 10+15 | - | 2 | - | - | - | - | 45 | 45 | 45 |
| | 20 | 20 | 4 | | | | | | | |
| 200 | 20 | 2x20 | 2 | - | - | - | - | 46 | 46 | 46 |
| | 20 | - | 4 | | | | | | | |
| 200 | 20 | 2x20 | 2 | - | - | - | - | 47 | 47 | 47 |
| | - | 20 | 4 | | | | | | | |
| 200 | - | 3x20 | 2 | - | - | - | - | 48 | 48 | 48 |
| | 20 | - | 4 | | | | | | | |
| 200 | 3x20 | - | 2 | - | - | - | - | 49 | 49 | 49 |
| | - | 20 | 4 | | | | | | | |
| 200 | 2x20 | 20 | 2 | - | - | - | - | 50 | 50 | 50 |
| | 20 | - | 4 | | | | | | | |
| 200 | 10 | 20 | 2 | - | - | - | - | 51 | 51 | 51 |
| | 15+20 | - | 4 | | | | | | | |
| 200 | 10+20 | - | 2 | - | - | - | - | 52 | 52 | 52 |
| | 15 | 20 | 4 | | | | | | | |
| 200 | 2x10 | - | 2 | - | - | - | - | 53 | 53 | 53 |
| | - | 2x20 | 4 | | | | | | | |
| 190 | 15 | 2x20 | 2 | - | - | - | - | 54 | 54 | 54 |
| | 20 | - | 4 | | | | | | | |
| 190 | 15+20+20 | - | 2 | - | - | - | - | 55 | 55 | 55 |
| | - | 20 | 4 | | | | | | | |
| 190 | 15+20 | 20 | 2 | - | - | - | - | 56 | 56 | 56 |
| | 20 | - | 4 | | | | | | | |
| 180 | - | 3x20 | 2 | - | - | - | - | 57 | 57 | 57 |
| | 15 | - | 4 | | | | | | | |
| 180 | 20 | 2x20 | 2 | - | - | - | - | 58 | 58 | 58 |
| | 15 | - | 4 | | | | | | | |
| 180 | 2x20 | 20 | 2 | - | - | - | - | 59 | 59 | 59 |
| | 15 | - | 4 | | | | | | | |
| 180 | 10 | 2x20 | 2 | - | - | - | - | 60 | 60 | 60 |
| | - | 20 | 4 | | | | | | | |
| 180 | 10+20+20 | - | 2 | - | - | - | - | 61 | 61 | 61 |
| | - | 20 | 4 | | | | | | | |
| 180 | 10+20 | 20 | 2 | - | - | - | - | 62 | 62 | 62 |
| | 20 | - | 4 | | | | | | | |
| 180 | 15+15+20 | - | 2 | - | - | - | - | 63 | 63 | 63 |
| | - | 20 | 4 | | | | | | | |
| 180 | 15+15 | 20 | 2 | - | - | - | - | 64 | 64 | 64 |
| | 20 | - | 4 | | | | | | | |
| 180 | 10+20 | 20 | 2 | - | - | - | - | 65 | 65 | 65 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | - | 20 | 4 | | | | | | | |
| 180 | 10 | 2x20 | 2 | - | - | - | - | 66 | 66 | 66 |
| | 20 | - | 4 | | | | | | | |
| 180 | 2x10 | - | 2 | - | - | - | - | 67 | 67 | 67 |
| | - | 15+20 | 4 | | | | | | | |
| 170 | 15 | 2x20 | 2 | - | - | - | - | 68 | 68 | 68 |
| | 15 | - | 4 | | | | | | | |
| 170 | 15+20 | 20 | 2 | - | - | - | - | 69 | 69 | 69 |
| | 15 | - | 4 | | | | | | | |
| 170 | 10+15+20 | - | 2 | - | - | - | - | 70 | 70 | 70 |
| | - | 20 | 4 | | | | | | | |
| 170 | 10+15 | 20 | 2 | - | - | - | - | 71 | 71 | 71 |
| | 20 | - | 4 | | | | | | | |
| 160 | 10 | 2x20 | 2 | - | - | - | - | 72 | 72 | 72 |
| | 15 | - | 4 | | | | | | | |
| 160 | 10+20 | 20 | 2 | - | - | - | - | 73 | 73 | 73 |
| | 15 | - | 4 | | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.11.1. Only one test point to be tested. | | | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.11.4.4.1-1 depending on the UE category according to Table 8.7.11.4.4.1-2 for UE not supporting 256QAM or Table 8.7.11.4.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.91.
2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.11.1-1, Table 8.7.11.4.4.1-1 depending on the UE category according to Table 8.7.11.4.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.11.1-1, Table 8.7.11.4.4.1-1 depending on the UE category according to Table 8.7.11.4.4.1-3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.11.4.4.3.

### 8.7.11.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.11.4.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.11.4.4.3-4. Cell ID = n (where n is 1, 2, 3) applies to S-Celln (where n is 1, 2, 3).
3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).
5. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with Table 8.7.11.1-2, for the tests to be performed depending on the UE category according to Table 8.7.11.4.4.1-2. For UE

supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with Table 8.7.11.1-3, for the tests to be performed depending on the UE category according to Table 8.7.11.4.4.1-3.

6. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB. The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

#### 8.7.11.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.11.4.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.11.4.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.11.4.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna P-Cell |
| 4TX | 4 SS Tx antenna P-Cell |

**Table 8.7.11.4.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna S-Cell |
| 4TX | 4 SS Tx antenna S-Cell |

### 8.7.11.4.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.11.4.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.11.5 TDD FDD CA sustained data rate performance for 4 layer MIMO (5DL CA)

Editor's note: Simplification of test point tables, to reduce future maintenance, needs further investigation.

### 8.7.11.5.1 Test purpose

Same test purpose as 8.7.1.1.

### 8.7.11.5.2 Test applicability

This test applies to all types of UE Release 12 and forward of DL category 16, 18 and 19 that support E-UTRA FDD and TDD, 5DL TDD-FDD CA and support 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 3 in any RF band of the 5DL CA configuration.

### 8.7.11.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.7.11.1.

### 8.7.11.5.4 Test description

#### 8.7.11.5.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.11.1-2, with the addition of the parameters in Table 8.7.11.5.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.11.5.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.11.1-3, with the addition of the parameters in Table 8.7.11.5.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.11.5.4.1-3.

**Table 8.7.11.5.4.1-1: Test parameters for sustained downlink data rate (TDD FDD 5DL CA)**

| Test | Bandwidth (MHz) | | | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | | | | |
| 1 | 5x20 | 2x20 | 3x20 | 4 layer | 4x4 | 400 | 1455 | 1408 |
| 2 | 5x20 | 3x20 | 2x20 | 4 layer | 4x4 | 400 | 1455 | 1408 |
| 3 | 5x20 | 20 | 4x20 | 4 layer | 4x4 | 400 | 1455 | 1408 |
| 4 | 5x20 | 4x20 | 20 | 4 layer | 4x4 | 400 | 1455 | 1408 |
| 5 | 15+(4x20) | 15+20+20 | 2x20 | 4 layer | 4x4 | 380 | 1455 | 1408 |
| 6 | 20 | 20 | - | 2 layer | 2x2 | 360 | 1341 | 1355 |
| | 4x20 | 2x20 | 2x20 | 4 layer | 4x4 | | | |
| 7 | 20 | 20 | - | 2 layer | 2x2 | 360 | 1341 | 1355 |
| | 4x20 | - | 4x20 | 4 layer | 4x4 | | | |
| 8 | 20 | 20 | - | 2 layer | 2x2 | 360 | 1341 | 1355 |
| | 4x20 | 3x20 | 20 | 4 layer | 4x4 | | | |
| 9 | 20 | - | 20 | 2 layer | 2x2 | 360 | 1341 | 1355 |
| | 4x20 | 4x20 | - | 4 layer | 4x4 | | | |
| 10 | 15 | 15 | - | 2 layer | 2x2 | 350 | 1371 | 1341 |
| | 4x20 | 2x20 | 2x20 | 4 layer | 4x4 | | | |
| 11 | 20 | 20 | - | 2 layer | 2x2 | 340 | 1341 | 1355 |
| | 15+(3x20) | 15+20 | 2x20 | 4 layer | 4x4 | | | |
| 12 | 10 | 10 | - | 2 layer | 2x2 | 340 | 1141 | 1218 |
| | 4x20 | - | 4x20 | 4 layer | 4x4 | | | |
| 13 | 10 | 10 | - | 2 layer | 2x2 | 340 | 1141 | 1218 |
| | 4x20 | 2x20 | 2x20 | 4 layer | 4x4 | | | |
| 14 | 10 | 10 | - | 2 layer | 2x2 | 340 | 1141 | 1218 |
| | 4x20 | 20 | 3x20 | 4 layer | 4x4 | | | |
| 15 | 15 | 15 | - | 2 layer | 2x2 | 330 | 1371 | 1341 |
| | 15+(3x20) | 15+20 | 2x20 | 4 layer | 4x4 | | | |
| 16 | 2x20 | 2x20 | - | 2 layer | 2x2 | 320 | 1341 | 1355 |
| | 3x20 | - | 3x20 | 4 layer | 4x4 | | | |
| 17 | 2x20 | 2x20 | - | 2 layer | 2x2 | 320 | 1341 | 1355 |
| | 3x20 | 20 | 2x20 | 4 layer | 4x4 | | | |
| 18 | 2x20 | - | 2x20 | 2 layer | 2x2 | 320 | 1341 | 1355 |
| | 3x20 | 3x20 | - | 4 layer | 4x4 | | | |
| 19 | 2x20 | - | 2x20 | 2 layer | 2x2 | 320 | 1341 | 1355 |
| | 3x20 | 20 | 2x20 | 4 layer | 4x4 | | | |
| 20 | 2x20 | 2x20 | - | 2 layer | 2x2 | 320 | 1341 | 1355 |
| | 3x20 | 2x20 | 20 | 4 layer | 4x4 | | | |
| 21 | 2x20 | 20 | 20 | 2 layer | 2x2 | 320 | 1341 | 1355 |
| | 3x20 | 3x20 | - | 4 layer | 4x4 | | | |
| 22 | 10 | 10 | - | 2 layer | 2x2 | 320 | 1141 | 1218 |
| | 15+(3x20) | 15+20 | 2x20 | 4 layer | 4x4 | | | |
| 23 | 15+20 | 15+20 | - | 2 layer | 2x2 | 310 | 1341 | 1341 |
| | 3x20 | 20 | 2x20 | 4 layer | 4x4 | | | |
| 24 | 2x20 | - | 2x20 | 2 layer | 2x2 | 300 | 1341 | 1355 |
| | 15+20+20 | 15+20+20 | - | 4 layer | 4x4 | | | |
| 25 | 2x20 | 2x20 | - | 2 layer | 2x2 | 300 | 1341 | 1355 |
| | 15+20+20 | 15 | 2x20 | 4 layer | 4x4 | | | |
| 26 | 10+20 | 10+20 | - | 2 layer | 2x2 | 300 | 1141 | 1218 |
| | 3x20 | 20 | 2x20 | 4 layer | 4x4 | | | |
| 27 | 2x15 | 2x15 | - | 2 layer | 2x2 | 300 | 1371 | 1341 |
| | 3x20 | 20 | 2x20 | 4 layer | 4x4 | | | |
| 28 | 10+20 | 10+20 | - | 2 layer | 2x2 | 300 | 1141 | 1218 |
| | 3x20 | - | 3x20 | 4 layer | 4x4 | | | |
| 29 | 10+20 | 10 | 20 | 2 layer | 2x2 | 300 | 1141 | 1218 |
| | 3x20 | 20 | 2x20 | 4 layer | 4x4 | | | |
| 30 | 15+20 | 15+20 | - | 2 layer | 2x2 | 290 | 1341 | 1341 |
| | 15+20+20 | 15 | 2x20 | 4 layer | 4x4 | | | |
| 31 | 10+15 | 10+15 | - | 2 layer | 2x2 | 290 | 1141 | 1218 |
| | 3x20 | 20 | 2x20 | 4 layer | 4x4 | | | |
| 32 | 3x20 | - | 3x20 | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 2x20 | 2x20 | - | 4 layer | 4x4 | | | |
| 33 | 3x20 | 20 | 2x20 | 2 layer | 2x2 | 280 | 1341 | 1355 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2x20 | 2x20 | - | 4 layer | 4x4 | | | |
| 34 | 3x20 | 3x20 | - | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 35 | 3x20 | 20 | 2x20 | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 36 | 3x20 | 3x20 | - | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 2x20 | 20 | 20 | 4 layer | 4x4 | | | |
| 37 | 3x20 | 2x20 | 20 | 2 layer | 2x2 | 280 | 1341 | 1355 |
| | 2x20 | 2x20 | - | 4 layer | 4x4 | | | |
| 38 | 10+20 | 10+20 | - | 2 layer | 2x2 | 280 | 1141 | 1218 |
| | 15+20+20 | 15 | 2x20 | 4 layer | 4x4 | | | |
| 39 | 2x10 | 2x10 | - | 2 layer | 2x2 | 280 | 1141 | 1218 |
| | 3x20 | - | 3x20 | 4 layer | 4x4 | | | |
| 40 | 15+20+20 | 15 | 2x20 | 2 layer | 2x2 | 270 | 1341 | 1341 |
| | 2x20 | 2x20 | - | 4 layer | 4x4 | | | |
| 41 | 15+20+20 | 15+20+20 | - | 2 layer | 2x2 | 270 | 1341 | 1341 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 42 | 3x20 | 20 | 2x20 | 2 layer | 2x2 | 260 | 1341 | 1355 |
| | 15+20 | 15+20 | - | 4 layer | 4x4 | | | |
| 43 | 10+20+20 | 10 | 2x20 | 2 layer | 2x2 | 260 | 1141 | 1218 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 44 | 10+20+20 | 10 | 2x20 | 2 layer | 2x2 | 260 | 1141 | 1218 |
| | 2x20 | 2x20 | - | 4 layer | 4x4 | | | |
| 45 | 10+20+20 | 10+20+20 | - | 2 layer | 2x2 | 260 | 1141 | 1218 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 46 | 15+15+20 | 15+15+20 | - | 2 layer | 2x2 | 260 | 1341 | 1341 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 47 | 10+20+20 | 10 | 2x20 | 2 layer | 2x2 | 260 | 1141 | 1218 |
| | 2x20 | 20 | 20 | 4 layer | 4x4 | | | |
| 48 | 10+20+20 | 10+20 | 20 | 2 layer | 2x2 | 260 | 1141 | 1218 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 49 | 15+20+20 | 15 | 2x20 | 2 layer | 2x2 | 250 | 1341 | 1341 |
| | 15+20 | 15+20 | - | 4 layer | 4x4 | | | |
| 50 | 10+15+20 | 10+15+20 | - | 2 layer | 2x2 | 250 | 1141 | 1218 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 51 | 4x20 | 2x20 | 2x20 | 2 layer | 2x2 | 240 | 1341 | 1355 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 52 | 4x20 | - | 4x20 | 2 layer | 2x2 | 240 | 1341 | 1355 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 53 | 4x20 | 4x20 | - | 2 layer | 2x2 | 240 | 1341 | 1355 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 54 | 4x20 | 3x20 | 20 | 2 layer | 2x2 | 240 | 1341 | 1355 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 55 | 10+20+20 | 10 | 2x20 | 2 layer | 2x2 | 240 | 1141 | 1218 |
| | 15+20 | 15+20 | - | 4 layer | 4x4 | | | |
| 56 | 10+10+20 | 2x10 | 20 | 2 layer | 2x2 | 240 | 1141 | 1218 |
| | 2x20 | - | 2x20 | 4 layer | 4x4 | | | |
| 57 | 15+(3x20) | 15+20 | 2x20 | 2 layer | 2x2 | 230 | 1341 | 1341 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 58 | 4x20 | - | 4x20 | 2 layer | 2x2 | 220 | 1341 | 1355 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 59 | 4x20 | 2x20 | 2x20 | 2 layer | 2x2 | 220 | 1341 | 1355 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 60 | 10+(3x20) | 10+20 | 2x20 | 2 layer | 2x2 | 220 | 1141 | 1218 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 61 | 15+15+20+20 | 2x15 | 2x20 | 2 layer | 2x2 | 220 | 1341 | 1341 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 62 | 10+(3x20) | 10 | 3x20 | 2 layer | 2x2 | 220 | 1141 | 1218 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |
| 63 | 10+(3x20) | 10+20 | 2x20 | 2 layer | 2x2 | 220 | 1141 | 1218 |
| | 20 | - | 20 | 4 layer | 4x4 | | | |
| 64 | 15+(3x20) | 15+20 | 2x20 | 2 layer | 2x2 | 210 | 1341 | 1341 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |
| 65 | 10+15+20+20 | 10+15 | 2x20 | 2 layer | 2x2 | 210 | 1141 | 1218 |
| | 20 | 20 | - | 4 layer | 4x4 | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 66 | 10+(3x20) | 10+20 | 2x20 | 2 layer | 2x2 | 200 | 1141 | 1218 |
| | 15 | 15 | - | 4 layer | 4x4 | | | |

Editor's note: Tests in Table 8.7.11.5.4.1-1 are covering maximum aggregated bandwidth for each Bandwidth combination set with 5DL CA which are defined in Table 5.4.2A.1-2, Table 5.4.2A.1-2a, Table 5.4.2A.1-2b and Table 5.4.2A.1-2c.

**Table 8.7.11.5.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bagg (MHz) | BW combi-nation (MHz) | | MIMO layer | DL Cat. 9, 10 | DL Cat. 11, 12 | | | | | |
| | FDD CC | TDD CC | | | | | | | | |
| 400 | 2x20 | 3x20 | 4 | - | - | - | - | 32 | 16 | 1 |
| 400 | 3x20 | 2x20 | 4 | - | - | - | - | 34 | 17 | 2 |
| 400 | 20 | 4x20 | 4 | - | - | - | - | 35 | 19 | 3 |
| 400 | 4x20 | 20 | 4 | - | - | - | - | 36 | 20 | 4 |
| 380 | 15+20+20 | 2x20 | 4 | - | - | - | - | 41 | 10 | 5 |
| 360 | 20 | - | 2 | - | - | - | - | 34 | 17 | 6 |
| | 2x20 | 2x20 | 4 | | | | | | | |
| 360 | 20 | - | 2 | - | - | - | - | 35 | 35 | 7 |
| | - | 4x20 | 4 | | | | | | | |
| 360 | 20 | - | 2 | - | - | - | - | 36 | 20 | 8 |
| | 3x20 | 20 | 4 | | | | | | | |
| 360 | - | 20 | 2 | - | - | - | - | 37 | 21 | 9 |
| | 4x20 | - | 4 | | | | | | | |
| 350 | 15 | - | 2 | - | - | - | - | 41 | 10 | 10 |
| | 2x20 | 2x20 | 4 | | | | | | | |
| 340 | 20 | - | 2 | - | - | - | - | 41 | 11 | 11 |
| | 15+20 | 2x20 | 4 | | | | | | | |
| 340 | 10 | - | 2 | - | - | - | - | 43 | 12 | 12 |
| | - | 4x20 | 4 | | | | | | | |
| 340 | 10 | - | 2 | - | - | - | - | 45 | 13 | 13 |
| | 2x20 | 2x20 | 4 | | | | | | | |
| 340 | 10 | - | 2 | - | - | - | - | 47 | 14 | 14 |
| | 20 | 3x20 | 4 | | | | | | | |
| 330 | 15 | - | 2 | - | - | - | - | 46 | 15 | 15 |
| | 15+20 | 2x20 | 4 | | | | | | | |
| 320 | 2x20 | - | 2 | - | - | - | - | 39 | 16 | 16 |
| | - | 3x20 | 4 | | | | | | | |
| 320 | 2x20 | - | 2 | - | - | - | - | 34 | 17 | 17 |
| | 20 | 2x20 | 4 | | | | | | | |
| 320 | - | 2x20 | 2 | - | - | - | - | 33 | 18 | 18 |
| | 3x20 | - | 4 | | | | | | | |
| 320 | - | 2x20 | 2 | - | - | - | - | 35 | 19 | 19 |
| | 20 | 2x20 | 4 | | | | | | | |
| 320 | 2x20 | - | 2 | - | - | - | - | 36 | 20 | 20 |
| | 2x20 | 20 | 4 | | | | | | | |
| 320 | 20 | 20 | 2 | - | - | - | - | 37 | 21 | 21 |
| | 3x20 | - | 4 | | | | | | | |
| 320 | 10 | - | 2 | - | - | - | - | 31 | 22 | 22 |
| | 15+20 | 2x20 | 4 | | | | | | | |
| 310 | 15+20 | - | 2 | - | - | - | - | 41 | 23 | 23 |
| | 20 | 2x20 | 4 | | | | | | | |
| 300 | - | 2x20 | 2 | - | - | - | - | 40 | 24 | 24 |
| | 15+20+20 | - | 4 | | | | | | | |
| 300 | 2x20 | - | 2 | - | - | - | - | 41 | 25 | 25 |
| | 15 | 2x20 | 4 | | | | | | | |
| 300 | 10+20 | - | 2 | - | - | - | - | 45 | 26 | 26 |
| | 20 | 2x20 | 4 | | | | | | | |
| 300 | 2x15 | - | 2 | - | - | - | - | 46 | 27 | 27 |
| | 20 | 2x20 | 4 | | | | | | | |
| 300 | 10+20 | - | 2 | - | - | - | - | 48 | 28 | 28 |
| | - | 3x20 | 4 | | | | | | | |
| 300 | 10 | 20 | 2 | - | - | - | - | 47 | 29 | 29 |
| | 20 | 2x20 | 4 | | | | | | | |
| 290 | 15+20 | - | 2 | - | - | - | - | 30 | 30 | 30 |
| | 15 | 2x20 | 4 | | | | | | | |
| 290 | 10+15 | - | 2 | - | - | - | - | 31 | 31 | 31 |
| | 20 | 2x20 | 4 | | | | | | | |
| 280 | - | 3x20 | 2 | - | - | - | - | 32 | 32 | 32 |
| | 2x20 | - | 4 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 280 | 20 | 2x20 | 2 | - | - | - | - | 33 | 33 | 33 |
| | 2x20 | - | 4 | | | | | | | |
| 280 | 3x20 | - | 2 | - | - | - | - | 34 | 34 | 34 |
| | - | 2x20 | 4 | | | | | | | |
| 280 | 20 | 2x20 | 2 | - | - | - | - | 35 | 35 | 35 |
| | - | 2x20 | 4 | | | | | | | |
| 280 | 3x20 | - | 2 | - | - | - | - | 36 | 36 | 36 |
| | 20 | 20 | 4 | | | | | | | |
| 280 | 2x20 | 20 | 2 | - | - | - | - | 37 | 37 | 37 |
| | 2x20 | - | 4 | | | | | | | |
| 280 | 10+20 | - | 2 | - | - | - | - | 38 | 38 | 38 |
| | 15 | 2x20 | 4 | | | | | | | |
| 280 | 2x10 | - | 2 | - | - | - | - | 39 | 39 | 39 |
| | - | 3x20 | 4 | | | | | | | |
| 270 | 15 | 2x20 | 2 | - | - | - | - | 40 | 40 | 40 |
| | 2x20 | - | 4 | | | | | | | |
| 270 | 15+20+20 | - | 2 | - | - | - | - | 41 | 41 | 41 |
| | - | 2x20 | 4 | | | | | | | |
| 260 | 20 | 2x20 | 2 | - | - | - | - | 42 | 42 | 42 |
| | 15+20 | - | 4 | | | | | | | |
| 260 | 10 | 2x20 | 2 | - | - | - | - | 43 | 43 | 43 |
| | - | 2x20 | 4 | | | | | | | |
| 260 | 10 | 2x20 | 2 | - | - | - | - | 44 | 44 | 44 |
| | 2x20 | - | 4 | | | | | | | |
| 260 | 10+20+20 | - | 2 | - | - | - | - | 45 | 45 | 45 |
| | - | 2x20 | 4 | | | | | | | |
| 260 | 15+15+20 | - | 2 | - | - | - | - | 46 | 46 | 46 |
| | - | 2x20 | 4 | | | | | | | |
| 260 | 10 | 2x20 | 2 | - | - | - | - | 47 | 47 | 47 |
| | 20 | 20 | 4 | | | | | | | |
| 260 | 10+20 | 20 | 2 | - | - | - | - | 48 | 48 | 48 |
| | - | 2x20 | 4 | | | | | | | |
| 250 | 15 | 2x20 | 2 | - | - | - | - | 49 | 49 | 49 |
| | 15+20 | - | 4 | | | | | | | |
| 250 | 10+15+20 | - | 2 | - | - | - | - | 50 | 50 | 50 |
| | - | 2x20 | 4 | | | | | | | |
| 240 | 2x20 | 2x20 | 2 | - | - | - | - | 51 | 51 | 51 |
| | 20 | - | 4 | | | | | | | |
| 240 | - | 4x20 | 2 | - | - | - | - | 52 | 52 | 52 |
| | 20 | - | 4 | | | | | | | |
| 240 | 4x20 | - | 2 | - | - | - | - | 53 | 53 | 53 |
| | - | 20 | 4 | | | | | | | |
| 240 | 3x20 | 20 | 2 | - | - | - | - | 54 | 54 | 54 |
| | 20 | - | 4 | | | | | | | |
| 240 | 10 | 2x20 | 2 | - | - | - | - | 55 | 55 | 55 |
| | 15+20 | - | 4 | | | | | | | |
| 240 | 2x10 | 20 | 2 | - | - | - | - | 56 | 56 | 56 |
| | - | 2x20 | 4 | | | | | | | |
| 230 | 15+20 | 2x20 | 2 | - | - | - | - | 57 | 57 | 57 |
| | 20 | - | 4 | | | | | | | |
| 220 | - | 4x20 | 2 | - | - | - | - | 58 | 58 | 58 |
| | 15 | - | 4 | | | | | | | |
| 220 | 2x20 | 2x20 | 2 | - | - | - | - | 59 | 59 | 59 |
| | 15 | - | 4 | | | | | | | |
| 220 | 10+20 | 2x20 | 2 | - | - | - | - | 60 | 60 | 60 |
| | 20 | - | 4 | | | | | | | |
| 220 | 2x15 | 2x20 | 2 | - | - | - | - | 61 | 61 | 61 |
| | 20 | - | 4 | | | | | | | |
| 220 | 10 | 3x20 | 2 | - | - | - | - | 62 | 62 | 62 |
| | 20 | - | 4 | | | | | | | |
| 220 | 10+20 | 2x20 | 2 | - | - | - | - | 63 | 63 | 63 |
| | - | 20 | 4 | | | | | | | |
| 210 | 15+20 | 2x20 | 2 | - | - | - | - | 64 | 64 | 64 |
| | 15 | - | 4 | | | | | | | |
| 210 | 10+15 | 2x20 | 2 | - | - | - | - | 65 | 65 | 65 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 20 | - | 4 | | | | | | | |
| 200 | 10+20 | 2x20 | 2 | - | - | - | - | 66 | 66 | 66 |
| | 15 | - | 4 | | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.11.1. Only one test point to be tested. | | | | | | | | | | |

**Table 8.7.11.5.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bagg (MHz) | BW combi-nation (MHz) | | MIMO layer | DL Cat. 9, 10 | DL Cat. 11, 12 | | | | | |
| | FDD CC | TDD CC | | | | | | | | |
| 400 | 2x20 | 3x20 | 4 | - | - | - | - | - | 47 | 16 |
| 400 | 3x20 | 2x20 | 4 | - | - | - | - | - | 51 | 6 |
| 400 | 20 | 4x20 | 4 | - | - | - | - | - | 52 | 7 |
| 400 | 4x20 | 20 | 4 | - | - | - | - | - | 53 | 8 |
| 380 | 15+20+20 | 2x20 | 4 | - | - | - | - | - | 57 | 10 |
| 360 | 20 | - | 2 | - | - | - | - | - | 51 | 6 |
| | 2x20 | 2x20 | 4 | | | | | | | |
| 360 | 20 | - | 2 | - | - | - | - | - | 43 | 7 |
| | - | 4x20 | 4 | | | | | | | |
| 360 | 20 | - | 2 | - | - | - | - | - | 53 | 8 |
| | 3x20 | 20 | 4 | | | | | | | |
| 360 | - | 20 | 2 | - | - | - | - | - | 54 | 9 |
| | 4x20 | - | 4 | | | | | | | |
| 350 | 15 | - | 2 | - | - | - | - | - | 57 | 10 |
| | 2x20 | 2x20 | 4 | | | | | | | |
| 340 | 20 | - | 2 | - | - | - | - | - | 57 | 11 |
| | 15+20 | 2x20 | 4 | | | | | | | |
| 340 | 10 | - | 2 | - | - | - | - | - | 43 | 12 |
| | - | 4x20 | 4 | | | | | | | |
| 340 | 10 | - | 2 | - | - | - | - | - | 44 | 13 |
| | 2x20 | 2x20 | 4 | | | | | | | |
| 340 | 10 | - | 2 | - | - | - | - | - | 47 | 14 |
| | 20 | 3x20 | 4 | | | | | | | |
| 330 | 15 | - | 2 | - | - | - | - | - | 61 | 15 |
| | 15+20 | 2x20 | 4 | | | | | | | |
| 320 | 2x20 | - | 2 | - | - | - | - | - | 47 | 16 |
| | - | 3x20 | 4 | | | | | | | |
| 320 | 2x20 | - | 2 | - | - | - | - | - | 51 | 17 |
| | 20 | 2x20 | 4 | | | | | | | |
| 320 | - | 2x20 | 2 | - | - | - | - | - | 51 | 18 |
| | 3x20 | - | 4 | | | | | | | |
| 320 | - | 2x20 | 2 | - | - | - | - | - | 52 | 19 |
| | 20 | 2x20 | 4 | | | | | | | |
| 320 | 2x20 | - | 2 | - | - | - | - | - | 53 | 20 |
| | 2x20 | 20 | 4 | | | | | | | |
| 320 | 20 | 20 | 2 | - | - | - | - | - | 54 | 21 |
| | 3x20 | - | 4 | | | | | | | |
| 320 | 10 | - | 2 | - | - | - | - | - | 50 | 22 |
| | 15+20 | 2x20 | 4 | | | | | | | |
| 310 | 15+20 | - | 2 | - | - | - | - | - | 57 | 23 |
| | 20 | 2x20 | 4 | | | | | | | |
| 300 | - | 2x20 | 2 | - | - | - | - | - | 57 | 24 |
| | 15+20+20 | - | 4 | | | | | | | |
| 300 | 2x20 | - | 2 | - | - | - | - | - | 59 | 25 |
| | 15 | 2x20 | 4 | | | | | | | |
| 300 | 10+20 | - | 2 | - | - | - | - | - | 60 | 26 |
| | 20 | 2x20 | 4 | | | | | | | |
| 300 | 2x15 | - | 2 | - | - | - | - | - | 61 | 27 |
| | 20 | 2x20 | 4 | | | | | | | |
| 300 | 10+20 | - | 2 | - | - | - | - | - | 48 | 28 |
| | - | 3x20 | 4 | | | | | | | |
| 300 | 10 | 20 | 2 | - | - | - | - | - | 47 | 29 |
| | 20 | 2x20 | 4 | | | | | | | |
| 290 | 15+20 | - | 2 | - | - | - | - | - | 64 | 30 |
| | 15 | 2x20 | 4 | | | | | | | |
| 290 | 10+15 | - | 2 | - | - | - | - | - | 50 | 31 |
| | 20 | 2x20 | 4 | | | | | | | |
| 280 | - | 3x20 | 2 | - | - | - | - | - | 62 | 32 |
| | 2x20 | - | 4 | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 280 | 20 | 2x20 | 2 | - | - | - | - | - | 51 | 33 |
| | 2x20 | - | 4 | | | | | | | |
| 280 | 3x20 | - | 2 | - | - | - | - | - | 50 | 34 |
| | - | 2x20 | 4 | | | | | | | |
| 280 | 20 | 2x20 | 2 | - | - | - | - | - | 43 | 35 |
| | - | 2x20 | 4 | | | | | | | |
| 280 | 3x20 | - | 2 | - | - | - | - | - | 53 | 36 |
| | 20 | 20 | 4 | | | | | | | |
| 280 | 2x20 | 20 | 2 | - | - | - | - | - | 54 | 37 |
| | 2x20 | - | 4 | | | | | | | |
| 280 | 10+20 | - | 2 | - | - | - | - | - | 50 | 38 |
| | 15 | 2x20 | 4 | | | | | | | |
| 280 | 2x10 | - | 2 | - | - | - | - | - | 56 | 39 |
| | - | 3x20 | 4 | | | | | | | |
| 270 | 15 | 2x20 | 2 | - | - | - | - | - | 57 | 40 |
| | 2x20 | - | 4 | | | | | | | |
| 270 | 15+20+20 | - | 2 | - | - | - | - | - | 50 | 41 |
| | - | 2x20 | 4 | | | | | | | |
| 260 | 20 | 2x20 | 2 | - | - | - | - | - | 57 | 42 |
| | 15+20 | - | 4 | | | | | | | |
| 260 | 10 | 2x20 | 2 | - | - | - | - | - | 43 | 43 |
| | - | 2x20 | 4 | | | | | | | |
| 260 | 10 | 2x20 | 2 | - | - | - | - | - | 44 | 44 |
| | 2x20 | - | 4 | | | | | | | |
| 260 | 10+20+20 | - | 2 | - | - | - | - | - | 45 | 45 |
| | - | 2x20 | 4 | | | | | | | |
| 260 | 15+15+20 | - | 2 | - | - | - | - | - | 46 | 46 |
| | - | 2x20 | 4 | | | | | | | |
| 260 | 10 | 2x20 | 2 | - | - | - | - | - | 47 | 47 |
| | 20 | 20 | 4 | | | | | | | |
| 260 | 10+20 | 20 | 2 | - | - | - | - | - | 48 | 48 |
| | - | 2x20 | 4 | | | | | | | |
| 250 | 15 | 2x20 | 2 | - | - | - | - | - | 49 | 49 |
| | 15+20 | - | 4 | | | | | | | |
| 250 | 10+15+20 | - | 2 | - | - | - | - | - | 50 | 50 |
| | - | 2x20 | 4 | | | | | | | |
| 240 | 2x20 | 2x20 | 2 | - | - | - | - | - | 51 | 51 |
| | 20 | - | 4 | | | | | | | |
| 240 | - | 4x20 | 2 | - | - | - | - | - | 52 | 52 |
| | 20 | - | 4 | | | | | | | |
| 240 | 4x20 | - | 2 | - | - | - | - | - | 53 | 53 |
| | - | 20 | 4 | | | | | | | |
| 240 | 3x20 | 20 | 2 | - | - | - | - | - | 54 | 54 |
| | 20 | - | 4 | | | | | | | |
| 240 | 10 | 2x20 | 2 | - | - | - | - | - | 55 | 55 |
| | 15+20 | - | 4 | | | | | | | |
| 240 | 2x10 | 20 | 2 | - | - | - | - | - | 56 | 56 |
| | - | 2x20 | 4 | | | | | | | |
| 230 | 15+20 | 2x20 | 2 | - | - | - | - | - | 57 | 57 |
| | 20 | - | 4 | | | | | | | |
| 220 | - | 4x20 | 2 | - | - | - | - | - | 58 | 58 |
| | 15 | - | 4 | | | | | | | |
| 220 | 2x20 | 2x20 | 2 | - | - | - | - | - | 59 | 59 |
| | 15 | - | 4 | | | | | | | |
| 220 | 10+20 | 2x20 | 2 | - | - | - | - | - | 60 | 60 |
| | 20 | - | 4 | | | | | | | |
| 220 | 2x15 | 2x20 | 2 | - | - | - | - | - | 61 | 61 |
| | 20 | - | 4 | | | | | | | |
| 220 | 10 | 3x20 | 2 | - | - | - | - | - | 62 | 62 |
| | 20 | - | 4 | | | | | | | |
| 220 | 10+20 | 2x20 | 2 | - | - | - | - | - | 63 | 63 |
| | - | 20 | 4 | | | | | | | |
| 210 | 15+20 | 2x20 | 2 | - | - | - | - | - | 64 | 64 |
| | 15 | - | 4 | | | | | | | |
| 210 | 10+15 | 2x20 | 2 | - | - | - | - | - | 65 | 65 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 20 | - | 4 | | | | | | | |
| 200 | 10+20 | 2x20 | 2 | - | - | - | - | - | 66 | 66 |
| | 15 | - | 4 | | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.11.1. Only one test point to be tested. | | | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: according to Table 8.7.11.5.4.1-1 depending on the UE category according to Table 8.7.11.5.4.1-2 for UE not supporting 256QAM or Table 8.7.11.5.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.91.
2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.11.1-1, Table 8.7.11.5.4.1-1 depending on the UE category according to Table 8.7.11.5.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.11.1-1, Table 8.7.11.5.4.1-1 depending on the UE category according to Table 8.7.11.5.4.1-3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.11.5.4.3.

### 8.7.11.5.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. PhysicalConfigDedicated-DEFAULT is defined in Table 8.7.11.5.4.3-3, PhysicalConfigDedicatedSCell-r10-DEFAULT is defined in Table 8.7.11.5.4.3-4. Cell ID = n (where n is 1, 2, 3, 4) applies to S-Celln (where n is 1, 2, 3, 4).
3. The SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).
5. For UE not supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.11.1-2, for the tests to be performed depending on the UE category according to Table 8.7.11.5.4.1-2. For UE supporting 256QAM the SS looks up $TB_{size}$ in Annex A.3.9 for the RMCs in accordance with table 8.7.11.1-3, for the tests to be performed depending on the UE category according to Table 8.7.11.5.4.1-3.
6. The SS sets the counters $N_{DL_newtx}$, $N_{DL_retx}$, $N_{UL_PDCP}$ and $ND_{DL_PDCP}$ to 0.
7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB (Note 1). The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.
8. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.
9. Steps 7 to 8 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

10. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

11. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx} / (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

12. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

13. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.11.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 and 4.7A, with the following exceptions:

**Table 8.7.11.5.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.11.5.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.11.5.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna P-Cell |
| 4TX | 4 SS Tx antenna P-Cell |

**Table 8.7.11.5.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|---|---|
| 2TX | 2 SS Tx antenna S-Cell |
| 4TX | 4 SS Tx antenna S-Cell |

### 8.7.11.5.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.11.5.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

# 8.7.12 LAA Sustained data rate performance

## 8.7.12.1 FDD CA in unlicensed bands

### 8.7.12.1.1 Minimum conformance requirements (FDD CA in unlicensed bands)

The parameters specified in Table 8.7.12.1.1-1 are valid for all LAA CA SDR tests unless otherwise stated.

**Table 8.7.12.1.1-1: Common Test Parameters**

| Parameter | Unit | FDD CC | LAA CC |
|---|---|---|---|
| Transmission mode | | 3 | |
| Cyclic prefix | | Normal | |
| Cell ID | | 0 | 0 |
| Inter-TTI Distance | | 1 | |
| Number of HARQ processes per component carrier | Processes | 8 | |
| Maximum number of HARQ transmission | | 4 | |
| Redundancy version coding sequence | | {0,0,1,2} for 64QAM and 256QAM | |
| Number of OFDM symbols for PDCCH per component carrier | OFDM symbols | 1 | |
| Cross carrier scheduling | | Not configured | |
| Propagation condition | | Static propagation condition (B.1)<br>No external noise sources are applied | |
| $\hat{E}_s$ at antenna port | dBm/15kHz | -85 | |
| Antenna configuration | 2 layer CC | 2x2 or 2x4 | |
| | 4 layer CC | 4x4 | |
| Codebook subset restriction | 2 layer CC | 10 | |
| | 4 layer CC | 1000 | |
| Downlink power allocation | 2 layer CC | $\rho_A$ = -3dB, $\rho_B$ = -3dB, $\sigma$ = 0dB | |
| | 4 layer CC | $\rho_A$ = -6dB, $\rho_B$ = -6dB, $\sigma$ = 3dB | |
| Symbols for unused PRBs | | OP.1 FDD | TBD |

For UE not supporting 256QAM, the TB success rate shall be higher than 85% when PDSCH are scheduled with FRC in Table 8.7.12.1.1-2 with the downlink physical channel setup according to Annex C.3.2.

For UE supporting 256QAM, the TB success rate shall be higher than 85% when PDSCH are scheduled with FRC in Table 8.7.12.1.1-3 with the downlink physical channel setup according to Annex C.3.2. For UE supporting 256QAM, the requirement with 64QAM is not applicable.

For LAA SCell, per-CC separate FRCs are defined for different UE capability for endingDwPTS and secondSlotStartingPosition.

The TB success rate is defined as $100\%*N_{DL_correct_rx}/ (N_{DL_newtx} + N_{DL_retx})$, where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.12.1.1-2: Per-CC FRC for SDR test (64QAM)**

| MIMO layer | Bandwidth (MHz) | FDD | LAA supporting end partial SF | LAA supporting initial partial SF but not supporting end partial SF | LAA not supporting both initial and end partial SF |
|---|---|---|---|---|---|
| 2 layer | 5 | R.31-6 FDD | N/A | N/A | N/A |
| | 10 | R.31-3A FDD | N/A | N/A | N/A |
| | 15 | R.31-5 FDD | N/A | NA | NA |
| | 20 | R.31-4 FDD | R.6 FS3 | R.7 FS3 | R.5 FS3 |
| 4 layer | 5 | R.31-10 FDD | N/A | N/A | N/A |
| | 10 | R.31-7 FDD | N/A | N/A | N/A |
| | 15 | R.31-8 FDD | N/A | N/A | N/A |
| | 20 | R.31-9 FDD | R.9 FS3 | R.10 FS3 | R.8 FS3 |

**Table 8.7.12.1.1-3: Per-CC FRC for SDR test (256QAM)**

| MIMO layer | Bandwidth (MHz) | FDD | LAA supporting end partial SF | LAA supporting initial partial SF but not supporting end partial SF | LAA not supporting both initial and end partial SF |
|---|---|---|---|---|---|
| 2 layer | 5 | R.68-3 FDD | N/A | N/A | N/A |
| | 10 | R.68-2 FDD | N/A | N/A | N/A |
| | 15 | R.68-1 FDD | N/A | NA | NA |
| | 20 | R.68 FDD | R.12 FS3 | R.13 FS3 | R.11 FS3 |
| 4 layer | 5 | R.68-7 FDD | N/A | N/A | N/A |
| | 10 | R.68-4 FDD | N/A | N/A | N/A |
| | 15 | R.68-5 FDD | N/A | N/A | N/A |
| | 20 | R.68-6 FDD | R.15 FS3 | R.16 FS3 | R.14 FS3 |

CA configuration, bandwidth combination and MIMO layer on each CC is determined by following procedure.

- Select one CA bandwidth combination among all supported CA configurations with bandwidth combination and MIMO layer on each CC following the equation that leads to largest equivalent aggregated bandwidth among all CA bandwidth combinations supported by UE. Equivalent aggregated bandwidth is defined as

$$B_{agg} = \sum_{i=0}^{N-1} R_i B_i$$

where $N$ is number of CCs, $R_i \in \{2,4\}$ and $B_i \in \{5,10,15,20\}$ is MIMO layer and bandwidth of CC $i$.

- When there are multiple sets of {CA configuration, bandwidth combination, MIMO layer} with same largest aggregated bandwidth, select one among sets with largest number of 4 layer CCs

The normative reference for this requirement is TS 36.101[2] clause 8.7.12.1.

### 8.7.12.1.2 LAA sustained data rate performance with FDD as Pcell with 2DL CA

#### 8.7.12.1.2.1 LAA sustained data rate performance with FDD PCell with 2DL CA (2Rx)

##### 8.7.12.1.2.1.1 Test purpose

Same test purpose as in clause 8.7.1.1.

##### 8.7.12.1.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD Release 13 and forward UEs that support LAA with E-UTRA FDD as PCell.

8.7.12.1.2.1.3 Minimum requirements

The minimum conformance requirements are defined in clause 8.7.12.1.1.

8.7.12.1.2.1.4 Test description

8.7.12.1.2.1.4.1 Initial conditions

For UE not supporting 256QAM, the requirements for LAA Sustained data rate performance with FDD PCell are specified in Table 8.7.12.1.1-2 with the additional parameters specified in Table 8.7.12.1.2.1.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.12.1.2.1.4.1-2.

For UE supporting 256QAM, the requirements for LAA Sustained data rate performance with FDD PCell are specified in Table 8.7.12.1.1-3 with the additional parameters specified in Table 8.7.12.1.2.1.4-3.The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.12.1.2.1.4.1-3.

**Table 8.7.12.1.2.1.4.1-1: Test parameters for sustained downlink data rate**

| Test | Bandwidth (MHz) | | | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | LAA CC | | | | | |
| 1 | 40 | 20 | 20 | 2 layer | 2x2 | 80 | 1341 | 1219 |
| 2 | 35 | 15 | 20 | | | 70 | 1142 | 1219 |
| 3 | 30 | 10 | 20 | | | 60 | 1141 | 1218 |
| 4 | 25 | 5 | 20 | | | 50 | 1138 | 1014 |
| Note 1: For 64 QAM, an UE is required to fulfil Sub-test 1-4 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE supporting end partial SF, it is required to fulfil Sub-test 1-4 with R.6 FS3; For an UE supporting initial partial SF but not supporting end partial SF, it is required to fulfil Sub-test 1-4 with R.7 FS3; For an UE not supporting both initial and end partial SF, it is required to fulfil Sub-test 1-4 with R.5 FS3.<br><br>Note 2: For 256 QAM, an UE is required to fulfil Sub-test 1-4 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE supporting end partial SF, it is required to fulfil Sub-test 1-4 with R.12 FS3; For an UE supporting initial partial SF but not supporting end partial SF, it is required to fulfil Sub-test 1-4 with R.13 FS3; For an UE not supporting both initial and end partial SF, it is required to fulfil Sub-test 1-4 with R.11 FS3. | | | | | | | | |

**Table 8.7.12.1.2.1.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | Cat. 6, 7 | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 |
|---|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW Combination (MHz) | | MIMO layer | DL Cat. 9, 10 | DL Cat. 11, 12 | | | | |
| | FDD CC | LAA CC | | | | | | | |
| 80 | 20 | 20 | 2 layer | 1 | 1 | - | - | - | - | - |
| 70 | 15 | 20 | | 2 | 2 | - | - | - | - | - |
| 60 | 10 | 20 | | 3 | 3 | - | - | - | - | - |
| 50 | 5 | 20 | | 4 | 4 | - | - | - | - | - |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.12.1. Only one test point to be tested. | | | | | | | | | | |

**Table 8.7.12.1.2.1.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW Combination (MHz) | | MIMO layer | DL Cat. 11, 12 | | | | | |
| | FDD CC | LAA CC | | | | | | | |
| 80 | 20 | 20 | 2 layer | 1 | 1 | - | - | - | - |
| 70 | 15 | 20 | | 2 | 2 | - | - | - | - |
| 60 | 10 | 20 | | 3 | 3 | - | - | - | - |
| 50 | 5 | 20 | | 4 | 4 | - | - | - | - |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.12.1. Only one test point to be tested. | | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: according to Table 8.7.12.1.2.1.4.1-1 depending on the UE category according to Table 8.7.12.1.2.1.4.1-2 for UE not supporting 256QAM or Table 8.7.12.1.2.1.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.36 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC.
2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.12.1.1-1 and Table 8.7.12.1.2.1.4.1-1 depending on the UE category according to Table 8.7.12.1.2.1.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.12.1.1-1 and Table 8.7.12.1.2.1.4.1-1 depending on the UE category according to Table 8.7.12.1.2.1.4.1-3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.12.1.2.1.4.3.

### 8.7.12.1.2.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.7.12.1.2.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).
5. The SS looks up $TB_{size}$ in Table 8.7.12.1.2.1.4.1-1 for the tests to be performed.
6. SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.
7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.12.1.2.1.4.1-1. The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.
8. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC for SCC. Additionally in the last two subframes of every burst SS transmits PDCCH DCI format 1C for CC_RNTI to indicate number of OFDM symbols in the DwPTS of ending partial subframe if required depending on UE capability according to

TS 36.213 clause 13A as described in Table 8.7.12.1.2.1.4.1-2 for UE not supporting 256QAM and Table 8.7.12.1.2.1.4.1-3 for UE supporting 256QAM.

9. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

10. Steps 7 to 9 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

11. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

12. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

13. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

14. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

#### 8.7.12.1.2.1.4.3 Message contents

**Table 8.7.12.1.2.1.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.12.1.2.1.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.12.1.2.1.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.12.1.2.1.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.7.12.1.2.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.12.1.2.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 8.7.12.1.2.2 LAA sustained data rate performance with FDD PCell for 4 layer MIMO (2DL CA)

#### 8.7.12.1.2.2.1 Test purpose

Same test purpose as in clause 8.7.1.1.

#### 8.7.12.1.2.2.2 Test applicability

This test applies to all types of E-UTRA FDD Release 13 and forward UEs that support LAA with E-UTRA FDD as PCell and supports 4 Rx antenna ports and 4-layer spatial multiplexing.

#### 8.7.12.1.2.2.3 Minimum requirements

The minimum conformance requirements are defined in clause 8.7.12.1.1.

8.7.12.1.2.2.4 Test description

8.7.12.1.2.2.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.12.1-2, with the addition of the parameters in Table 8.7.12.1.2.2.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.12.1.2.2.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.12.1.1-3, with the addition of the parameters in Table 8.7.12.1.2.2.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.12.1.2.2.4.1-3.

**Table 8.7.12.1.2.2.4.1-1: Test parameters for sustained downlink data rate (4 layers MIMO)**

| Test | Bandwidth (MHz) | | | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|---|---|
| | Total | FDD CC | LAA CC | | | | | |
| 1 | 20 | 20 | - | 4 layer | 4X4 | 160 | 1455 | 1408 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 2 | 15 | 15 | - | 4 layer | 4X4 | 140 | 1455 | 1408 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 3 | 10 | 10 | - | 4 layer | 4X4 | 120 | 1455 | 1408 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 4 | 20 | 20 | - | 2 layer | 2x2 | 120 | 1341 | 1355 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 5 | 20 | 20 | - | 4 layer | 4X4 | 120 | 1341 | 1355 |
| | 20 | - | 20 | 2 layer | 2x2 | | | |
| 6 | 15 | 15 | - | 2 layer | 2x2 | 110 | 1142 | 1341 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 7 | 5 | 5 | - | 4 layer | 4X4 | 100 | 1455 | 1408 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 8 | 10 | 10 | - | 2 layer | 2x2 | 100 | 1141 | 1218 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 9 | 15 | 15 | - | 4 layer | 4X4 | 100 | 1341 | 1355 |
| | 20 | - | 20 | 2 layer | 2x2 | | | |
| 10 | 5 | 5 | - | 2 layer | 2x2 | 90 | 1138 | 1014 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 11 | 10 | 10 | - | 4 layer | 4X4 | 80 | 1341 | 1355 |
| | 20 | - | 20 | 2 layer | 2x2 | | | |
| 12 | 5 | 5 | - | 4 layer | 4X4 | 60 | 1341 | 1355 |
| | 20 | - | 20 | 2 layer | 2x2 | | | |

Note 1: For 64 QAM, an UE is required to fulfil Sub-test 1-12 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE supporting end partial SF, it is required to fulfil Sub-test 1-12 with R.9 FS3; For an UE supporting initial partial SF but not supporting end partial SF, it is required to fulfil Sub-test 1-12 with R.10 FS3; For an UE not supporting both initial and end partial SF, it is required to fulfil Sub-test 1-12 with R.8 FS3.

Note 2: For 256 QAM, an UE is required to fulfil Sub-test 1-12 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE supporting end partial SF, it is required to fulfil Sub-test 1-12 with R.15 FS3; For an UE supporting initial partial SF but not supporting end partial SF, it is required to fulfil Sub-test 1-12 with R.16 FS3; For an UE not supporting both initial and end partial SF, it is required to fulfil Sub-test 1-12 with R.14 FS3.

**Table 8.7.12.1.2.2.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combination (MHz) | | MIMO layer | DL Cat. 9, 10 | DL Cat. 11, 12 | | | | | |
| | FDD CC | LAA CC | | | | | | | | |
| 160 | 20 | - | 4 layer | 1 | 1 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 140 | 15 | - | 4 layer | 2 | 2 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 120 | 10 | - | 4 layer | 3 | 3 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 120 | 20 | - | 2 layer | 4 | 4 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 120 | 20 | - | 4 layer | 5 | 5 | - | - | - | - | - |
| | - | 20 | 2 layer | | | | | | | |
| 110 | 15 | - | 2 layer | 6 | 6 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 100 | 5 | - | 4 layer | 7 | 7 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 100 | 15 | - | 4 layer | 8 | 8 | - | - | - | - | - |
| | - | 20 | 2 layer | | | | | | | |
| 100 | 10 | - | 2 layer | 9 | 9 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 90 | 5 | - | 2 layer | 10 | 10 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 80 | 10 | - | 4 layer | 11 | 11 | - | - | - | - | - |
| | - | 20 | 2 layer | | | | | | | |
| 60 | 5 | - | 4 layer | 12 | 12 | - | - | - | - | - |
| | - | 20 | 2 layer | | | | | | | |

Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.12.1. Only one test point to be tested.

**Table 8.7.12.1.2.2.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combination (MHz) | | MIMO layer | DL Cat. 11, 12 | | | | | |
| | FDD CC | LAA CC | | | | | | | |
| 160 | 20 | - | 4 layer | 1 | - | 1 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 140 | 15 | - | 4 layer | 2 | - | 2 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 120 | 10 | - | 4 layer | 3 | - | 3 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 120 | 20 | - | 2 layer | 4 | - | 4 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 120 | 20 | - | 4 layer | 5 | - | 5 | - | - | - |
| | - | 20 | 2 layer | | | | | | |
| 110 | 15 | - | 2 layer | 6 | - | 6 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 100 | 5 | - | 4 layer | 7 | - | 7 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 100 | 15 | - | 4 layer | 8 | - | 8 | - | - | - |
| | - | 20 | 2 layer | | | | | | |
| 100 | 10 | - | 2 layer | 9 | - | 9 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 90 | 5 | - | 2 layer | 10 | - | 10 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 80 | 10 | - | 4 layer | 11 | - | 11 | - | - | - |
| | - | 20 | 2 layer | | | | | | |
| 60 | 5 | - | 4 layer | 12 | - | 12 | - | - | - |
| | - | 20 | 2 layer | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.12.1.1. Only one test point to be tested. | | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: FDD cell bandwidth can be picked up according to Table 8.7.12.1.2.2.4.1-1 and LAA cell bandwidth shall be 20 MHz.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.90.
2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.12.1.1 and Table 8.7.12.1.2.2.4.1-1 depending on the UE category according to Table 8.7.12.1.2.2.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.12.1.1 and Table 8.7.12.1.2.2.4.1-1 depending on the UE category according to Table 8.7.12.1.2.2.4.1-3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0..
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.12.1.2.2.4.3.

### 8.7.12.1.2.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.12.1.2.2.4.1-1 for the tests to be performed.

6. SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.12.1.2.2.4.1-1. The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC for SCC. Additionally in the last two subframes of every burst SS transmits PDCCH DCI format 1C for CC_RNTI to indicate number of OFDM symbols in the DwPTS of ending partial subframe if required depending on UE capability according to TS 36.213 clause 13A as described in Table 8.7.12.1.2.2.4.1-1.

9. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

10. Steps 7 to 9 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

11. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

12. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

13. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

14. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

### 8.7.12.1.2.2.4.3 Message contents

**Table 8.7.12.1.2.2.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.12.1.2.2.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.12.1.2.2.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.12.1.2.2.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

### 8.7.12.1.2.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.12.1.2.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 8.7.12.2 TDD CA in unlicensed bands

### 8.7.12.2.1 Minimum conformance requirements (TDD CA in unlicensed bands)

The parameters specified in Table 8.7.12.2.1-1 are valid for all LAA CA SDR tests unless otherwise stated.

**Table 8.7.12.2.1-1: Common Test Parameters**

| Parameter | Unit | TDD CC | LAA CC |
|---|---|---|---|
| Transmission mode | | 3 | |
| Uplink downlink configuration (Note 1) | | 1 | N/A |
| Special subframe configuration (Note 2) | | 4 | N/A |
| Cyclic prefix | | Normal | |
| Cell ID | | 0 | 0 |
| Inter-TTI Distance | | 1 | |
| Number of HARQ processes per component carrier | Processes | 8 | |
| Maximum number of HARQ transmission | | 4 | |
| Redundancy version coding sequence | | {0,0,1,2} for 64QAM and 256QAM | |
| Number of OFDM symbols for PDCCH per component carrier | OFDM symbols | 1 | |
| Cross carrier scheduling | | Not configured | |
| Propagation condition | | Static propagation condition (B.1)<br>No external noise sources are applied | |
| $\hat{E}_s$ at antenna port | dBm/15kHz | -85 | |
| Antenna configuration | 2 layer CC | 2x2 or 2x4 | |
| | 4 layer CC | 4x4 | |
| Codebook subset restriction | 2 layer CC | 10 | |
| | 4 layer CC | 1000 | |
| Downlink power allocation | 2 layer CC | $\rho_A$ = -3dB, $\rho_B$ = -3dB, $\sigma$ = 0dB | |
| | 4 layer CC | $\rho_A$ = -6dB, $\rho_B$ = -6dB, $\sigma$ = 3dB | |
| Symbols for unused PRBs | | OP.1 TDD | TBD |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [4].<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [4]. | | | |

For UE not supporting 256QAM, the TB success rate shall be higher than 85% when PDSCH are scheduled with FRC in Table 8.7.12.2.1-2 with the downlink physical channel setup according to Annex C.3.2.

For UE supporting 256QAM, the TB success rate shall be higher than 85% when PDSCH are scheduled with FRC in Table 8.7.12.2.1-3 with the downlink physical channel setup according to Annex C.3.2. For UE supporting 256QAM, the requirement with 64QAM is not applicable.

For LAA SCell, per-CC separate FRCs are defined for different UE capability for endingDwPTS and secondSlotStartingPosition.

The TB success rate is defined as 100%*$N_{DL_correct_rx}$/ ($N_{DL_newtx}$ + $N_{DL_retx}$), where $N_{DL_newtx}$ is the number of newly transmitted DL transport blocks, $N_{DL_retx}$ is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks. The TB success rate shall be sustained during at least 300 frames.

**Table 8.7.12.2.1-2: Per-CC FRC for SDR test (64QAM)**

| MIMO layer | Bandwidth (MHz) | TDD | LAA supporting end partial SF | LAA supporting initial partial SF but not supporting end partial SF | LAA not supporting both initial and end partial SF |
|---|---|---|---|---|---|
| 2 layer | 5 | N/A | N/A | N/A | N/A |
| | 10 | R.31-6 TDD | N/A | N/A | N/A |
| | 15 | R.31-5 TDD | N/A | NA | NA |
| | 20 | R.31-4 TDD | R.6 FS3 | R.7 FS3 | R.5 FS3 |
| 4 layer | 5 | N/A | N/A | N/A | N/A |
| | 10 | R.31-7 TDD | N/A | N/A | N/A |
| | 15 | R.31-8 TDD | N/A | N/A | N/A |
| | 20 | R.31-9 TDD | R.9 FS3 | R.10 FS3 | R.8 FS3 |

**Table 8.7.12.2.1-3: Per-CC FRC for SDR test (256QAM)**

| MIMO layer | Bandwidth (MHz) | TDD | LAA supporting end partial SF | LAA supporting initial partial SF but not supporting end partial SF | LAA not supporting both initial and end partial SF |
|---|---|---|---|---|---|
| 2 layer | 5 | N/A | N/A | N/A | N/A |
| | 10 | R.68-2 TDD | N/A | N/A | N/A |
| | 15 | R.68-1 TDD | N/A | NA | NA |
| | 20 | R.68 TDD | R.12 FS3 | R.13 FS3 | R.11 FS3 |
| 4 layer | 5 | N/A | N/A | N/A | N/A |
| | 10 | R.68-4 TDD | N/A | N/A | N/A |
| | 15 | R.68-5 TDD | N/A | N/A | N/A |
| | 20 | R.68-6 TDD | R.15 FS3 | R.16 FS3 | R.14 FS3 |

CA configuration, bandwidth combination and MIMO layer on each CC is determined by following procedure.

- Select one CA bandwidth combination among all supported CA configurations with bandwidth combination and MIMO layer on each CC following the equation that leads to largest equivalent aggregated bandwidth among all CA bandwidth combinations supported by UE. Equivalent aggregated bandwidth is defined as

$$B_{agg} = \sum_{i=0}^{N-1} R_i B_i$$

where $N$ is number of CCs, $R_i \in \{2,4\}$ and $B_i \in \{5,10,15,20\}$ is MIMO layer and bandwidth of CC $i$.

- When there are multiple sets of {CA configuration, bandwidth combination, MIMO layer} with same largest aggregated bandwidth, select one among sets with largest number of 4 layer CCs.

### 8.7.12.2.2 LAA sustained data rate performance with TDD as Pcell with 2DL CA

#### 8.7.12.2.2.1 LAA sustained data rate performance with TDD PCell with 2DL CA (2Rx)

##### 8.7.12.2.2.1.1 Test purpose

Same test purpose as in clause 8.7.2.1.

##### 8.7.12.2.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD Release 13 and forward UEs that support E-UTRA TDD and downlink LAA with TDD as PCell.

#### 8.7.12.2.2.1.3 Minimum requirements

The minimum conformance requirements are defined in clause 8.7.12.2.1.

#### 8.7.12.2.2.1.4 Test description

##### 8.7.12.2.2.1.4.1 Initial conditions

For UE not supporting 256QAM, the requirements for LAA Sustained data rate performance with TDD PCell are specified in Table 8.7.12.2.1-2 with the additional parameters specified in Table 8.7.12.2.2.1.4.1-1. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.12.2.2.1.4.1-2.

For UE supporting 256QAM, the requirements for LAA Sustained data rate performance with TDD PCell are specified in Table 8.7.12.2.1-3 with the additional parameters specified in Table 8.7.12.2.2.1.4.1-1. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.12.2.2.1.4.1-3

**Table 8.7.12.2.2.1.4.1-1: Test parameters for sustained downlink data rate**

| Test | Bandwidth (MHz) | | | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|---|---|
| | Total | TDD CC | LAA CC | | | | | |
| 1 | 40 | 20 | 20 | 2 layer | 2x2 | 80 | 1341 | 1219 |
| 2 | 35 | 15 | 20 | | | 70 | 1142 | 1219 |
| 3 | 30 | 10 | 20 | | | 60 | 1141 | 1218 |
| Note 1: For 64 QAM, an UE is required to fulfil Sub-test 1-3 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE supporting end partial SF, it is required to fulfil Sub-test 1-3 with R.6 FS3; For an UE supporting initial partial SF but not supporting end partial SF, it is required to fulfil Sub-test 1-3 with R.7 FS3; For an UE not supporting both initial and end partial SF, it is required to fulfil Sub-test 1-3 with R.5 FS3.<br><br>Note 2: For 256 QAM, an UE is required to fulfil Sub-test 1-3 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE supporting end partial SF, it is required to fulfil Sub-test 1-3 with R.12 FS3; For an UE supporting initial partial SF but not supporting end partial SF, it is required to fulfil Sub-test 1-3 with R.13 FS3; For an UE not supporting both initial and end partial SF, it is required to fulfil Sub-test 1-3 with R.11 FS3. | | | | | | | | |

**Table 8.7.12.2.2.1.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 6, 7 | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 |
|---|---|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW Combination (MHz) | | MIMO layer | | DL Cat. 9, 10 | DL Cat. 11, 12 | | | | |
| | TDD CC | | | | | | | | | |
| 80 | 20 | 20 | 2 layer | 1 | 1 | - | - | - | - | - |
| 70 | 15 | 20 | | 2 | 2 | - | - | - | - | - |
| 60 | 10 | 20 | | 3 | 3 | - | - | - | - | - |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.12.2. Only one test point to be tested. | | | | | | | | | | |

**Table 8.7.12.2.2.1.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW Combination (MHz) | | MIMO layer | DL Cat. 11, 12 | | | | | |
| | TDD CC | LAA CC | | | | | | | |
| 80 | 20 | 20 | 2 layer | 1 | 1 | - | - | - | - |
| 70 | 15 | 20 | | 2 | 2 | - | - | - | - |
| 60 | 10 | 20 | | 3 | 3 | - | - | - | - |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.12.2. Only one test point to be tested. | | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: according to Table 8.7.12.2.2.1.4.1-1 depending on the UE category according to Table 8.7.12.2.2.1.4.1-2 for UE not supporting 256QAM or Table 8.7.12.2.2.1.4.1-3 for UE supporting 256QAM.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.36 (without using faders and AWGN generators) for UE supporting only 2Rx RF bands on all CC.

2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.12.2.1-1 and Table 8.7.12.2.2.1.4.1-1 depending on the UE category according to Table 8.7.12.2.2.1.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.12.2.1-1and Table 8.7.12.2.2.1.4.1-1 depending on the UE category according to Table 8.7.12.2.2.1.4.1-3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0..

5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.12.2.1.4.3.

### 8.7.12.2.2.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).

5. The SS looks up $TB_{size}$ in Table 8.7.12.2.2.1.4.1-1 for the tests to be performed.

6. SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.

7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.12.2.2.1.4.1-1. The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.

8. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC for SCC. Additionally in the last two subframes of every burst SS transmits PDCCH DCI format 1C for CC_RNTI to indicate number of OFDM symbols in the DwPTS of ending partial subframe if required depending on UE capability according to TS 36.213 clause 13A as described in Table 8.7.12.2.2.1.4.1-2 for UE not supporting 256QAM and Table 8.7.12.2.2.1.4.1-3 for UE supporting 256QAM.

9. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.

10. Steps 7 to 9 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.

11. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one

12. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.

13. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$

14. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

8.7.12.2.2.1.4.3 Message contents

**Table 8.7.12.2.1.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.12.2.1.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.12.2.1.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.12.2.2.1.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.7.12.2.2.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.12.2.2.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 8.7.12.2.2.2 LAA sustained data rate performance with TDD PCell for 4 layer MIMO (2DL CA)

#### 8.7.12.2.2.2.1 Test purpose

Same test purpose as in clause 8.7.2.1.

#### 8.7.12.2.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD Release 13 and forward UEs that support E-UTRA TDD and supports 4 Rx antenna ports and 4-layer spatial multiplexing and downlink LAA with TDD as PCell.

#### 8.7.12.2.2.2.3 Minimum requirements

The minimum conformance requirements are defined in clause 8.7.12.2.1.

8.7.12.2.2.2.4 Test description

8.7.12.2.2.2.4.1 Initial conditions

For UE not supporting 256QAM, the requirements are specified in Table 8.7.12.2.1-2, with the addition of the parameters in Table 8.7.12.2.2.2.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.12.2.2.2.4.1-2.

For UE supporting 256QAM, the requirements are specified in Table 8.7.12.2.1-3, with the addition of the parameters in Table 8.7.12.2.2.2.4.1-1. The test points are applied to UE category and bandwidth combination with maximum equivalent aggregated bandwidth as specified in Table 8.7.12.2.2.2.4.1-3.

**Table 8.7.12.2.2.2.4.1-1: Test parameters for sustained downlink data rate (4 layers MIMO)**

| Test | Bandwidth (MHz) | | | MIMO layer | Antenna configuration | Equivalent aggr. BW (MHz) | PDCP SDU size [Octets] 64QAM | PDCP SDU size [Octets] 256QAM |
|---|---|---|---|---|---|---|---|---|
| | Total | TDD CC | LAA CC | | | | | |
| 1 | 20 | 20 | - | 4 layer | 4X4 | 160 | 1455 | 1408 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 2 | 15 | 15 | - | 4 layer | 4X4 | 140 | 1455 | 1408 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 3 | 10 | 10 | - | 4 layer | 4X4 | 120 | 1455 | 1408 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 4 | 20 | 20 | - | 2 layer | 2x2 | 120 | 1341 | 1355 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 5 | 20 | 20 | - | 4 layer | 4X4 | 120 | 1341 | 1355 |
| | 20 | - | 20 | 2 layer | 2x2 | | | |
| 6 | 15 | 15 | - | 2 layer | 2x2 | 110 | 1142 | 1341 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 7 | 10 | 10 | - | 2 layer | 2x2 | 100 | 1141 | 1218 |
| | 20 | - | 20 | 4 layer | 4X4 | | | |
| 8 | 15 | 15 | - | 4 layer | 4X4 | 100 | 1341 | 1355 |
| | 20 | - | 20 | 2 layer | 2x2 | | | |
| 9 | 10 | 10 | - | 4 layer | 4X4 | 80 | 1341 | 1355 |
| | 20 | - | 20 | 2 layer | 2x2 | | | |

Note 1: For 64 QAM, an UE is required to fulfil Sub-test 1-9 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE supporting end partial SF, it is required to fulfil Sub-test 1-9 with R.9 FS3; For an UE supporting initial partial SF but not supporting end partial SF, it is required to fulfil Sub-test 1-9 with R.10 FS3; For an UE not supporting both initial and end partial SF, it is required to fulfil Sub-test 1-9 with R.8 FS3.

Note 2: For 256 QAM, an UE is required to fulfil Sub-test 1-9 depending on UE capabilities of endingDwPTS and secondSlotStartingPosition. For an UE supporting end partial SF, it is required to fulfil Sub-test 1-9 with R.15 FS3; For an UE supporting initial partial SF but not supporting end partial SF, it is required to fulfil Sub-test 1-9 with R.16 FS3; For an UE not supporting both initial and end partial SF, it is required to fulfil Sub-test 1-9 with R.14 FS3.

**Table 8.7.12.2.2.2.4.1-2: Test points for sustained data rate (FRC 64QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 9, 10 | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combination (MHz) | | MIMO layer | DL Cat. 9, 10 | DL Cat. 11, 12 | | | | | |
| | TDD CC | LAA CC | | | | | | | | |
| 160 | 20 | - | 4 layer | 1 | 1 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 140 | 15 | - | 4 layer | 2 | 2 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 120 | 10 | - | 4 layer | 3 | 3 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 120 | 20 | - | 2 layer | 4 | 4 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 120 | 20 | - | 4 layer | 5 | 5 | - | - | - | - | - |
| | - | 20 | 2 layer | | | | | | | |
| 110 | 15 | - | 2 layer | 6 | 6 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 100 | 15 | - | 4 layer | 7 | 7 | - | - | - | - | - |
| | - | 20 | 2 layer | | | | | | | |
| 100 | 10 | - | 2 layer | 8 | 8 | - | - | - | - | - |
| | - | 20 | 4 layer | | | | | | | |
| 80 | 10 | - | 4 layer | 9 | 9 | - | - | - | - | - |
| | - | 20 | 2 layer | | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.12.2. Only one test point to be tested. | | | | | | | | | | |

**Table 8.7.12.2.2.2.4.1-3: Test points for sustained data rate (FRC 256QAM)**

| Maximum supported equivalent aggr. BW | | | | Cat. 11, 12 | DL Cat. 13 | DL Cat. 15 | DL Cat. 16 | DL Cat. 18 | DL Cat. 19 |
|---|---|---|---|---|---|---|---|---|---|
| $B_{agg}$ (MHz) | BW combination (MHz) | | MIMO layer | DL Cat. 11, 12 | | | | | |
| | TDD CC | LAA CC | | | | | | | |
| 160 | 20 | - | 4 layer | 1 | - | 1 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 140 | 15 | - | 4 layer | 2 | - | 2 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 120 | 10 | - | 4 layer | 3 | - | 3 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 120 | 20 | - | 2 layer | 4 | - | 4 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 120 | 20 | - | 4 layer | 5 | - | 5 | - | - | - |
| | - | 20 | 2 layer | | | | | | |
| 110 | 15 | - | 2 layer | 6 | - | 6 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 100 | 15 | - | 4 layer | 7 | - | 7 | - | - | - |
| | - | 20 | 2 layer | | | | | | |
| 100 | 10 | - | 2 layer | 8 | - | 8 | - | - | - |
| | - | 20 | 4 layer | | | | | | |
| 80 | 10 | - | 4 layer | 9 | - | 9 | - | - | - |
| | - | 20 | 2 layer | | | | | | |
| Note 1: Select the largest equivalent aggregated bandwidth supported by the UE as defined in clause 8.7.12.2.1. Only one test point to be tested. | | | | | | | | | |

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: TDD cell bandwidth can be picked up according to Table 8.7.12.2.2.2.4.1-1 and LAA cell bandwidth shall be 20 MHz.

1. Connect the SS to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.90.
2. For UE not supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.12.2.1 and Table 8.7.12.2.2.2.4.1-1 depending on the UE category according to Table 8.7.12.2.2.2.4.1-2. For UE supporting 256QAM the parameter settings for the cell are set up according to Table 8.7.12.2.1 and Table 8.7.12.2.2.2.4.1-1 depending on the UE category according to Table 8.7.12.2.2.2.4.1-3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0..
5. Ensure the UE is in State 4A-RF according to TS 36.508 [7] clause 5.2A.3. Message contents are defined in clause 8.7.12.2.2.2.4.3.

### 8.7.12.2.2.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Propagation conditions are set according to Annex B.1 (No external noise sources are applied).
5. The SS looks up $TB_{size}$ in Table 8.7.12.2.2.2.4.1-1 for the tests to be performed.
6. SS sets the counters, $N_{DL_newtx}$ ,$N_{DL_retx}$, $N_{UL_PDCP}$, and $ND_{DL_PDCP}$ to 0.
7. For each new DL HARQ transmission the SS generates sufficient PDCP SDUs to fill up the TB in accordance with Table 8.7.12.2.2.2.4.1-1. The SS ciphers the PDCP SDUs, concatenates the resultant PDCP PDUs to form an RLC PDU and then a MAC PDU. The SS transmits the MAC PDU. The SS increments then $N_{DL_newtx}$ by one and $N_{DL_PDCP}$ by the number of new PDCP SDUs (Note 1) included in the sent MAC PDU.
8. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC for SCC. Additionally in the last two subframes of every burst SS transmits PDCCH DCI format 1C for CC_RNTI to indicate number of OFDM symbols in the DwPTS of ending partial subframe if required depending on UE capability according to TS 36.213 clause 13A as described in Table 8.7.12.2.2.2.4.1-1.
9. If PHY requests a DL HARQ retransmission, the SS performs a HARQ retransmission and increments $N_{DL_retx}$ by one.
10. Steps 7 to 9 are repeated at every TTI for at least 300 frames and the SS waits for 300ms to let any HARQ retransmissions and RLC retransmissions to finish.
11. For each PDCP SDU received at the SS, if the content of the data matches that of the truncated version of the original PDCP SDU generated at the SS, the SS increments $N_{UL_PDCP}$ by one
12. The SS calculates the TB success rate as $A = 100\%*N_{DL_newtx}/ (N_{DL_newtx} + N_{DL_retx})$. Measurements are not based on UE feedback but on SS counters instead ($N_{DL_newtx}$ and $N_{DL_retx}$) in order to validate HARQ feedback received from the UE.
13. The SS calculates the PDCP SDU loss as $B = N_{DL_PDCP} - N_{UL_PDCP}$
14. The UE passes the test if $A > 85\%$ and $B = 0$.

NOTE 1: In case of RLC PDU retransmission, the number of new required PDCP SDUs is as many as to fill the rest of TB.

8.7.12.2.2.2.4.3 Message contents

**Table 8.7.12.2.2.2.4.3-1: CLOSE UE TEST LOOP (in the preamble)**

| Derivation Path: 36.509 clause 6.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 0 | UE test loop mode A | |
| UE test loop mode A LB setup | | | |
| Length of UE test loop mode A LB setup list in bytes | 0 0 0 0 0 0 1 1 | Length of one LB setup DRB (3 bytes) | |
| LB setup DRB | 0 0 0 0 0 0 0 0,<br>0 0 1 0 1 0 0 0,<br>0 0 0 Q4 Q3 Q2 Q1 Q0 | UL PDCP SDU size = 40 bits (5 bytes)<br>Q4..Q0 = Data Radio Bearer identity number for the default radio bearer. See 36.509 clause 6.1 | |
| UE test loop mode B LB setup | Not present | | |

**Table 8.7.12.2.2.2.4.3-2: *SecurityModeCommand* (in the preamble)**

| Derivation Path: TS 36.508 clause 4.6.1 table 4.6.1-19 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SecurityModeCommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| securityModeCommand-r8 SEQUENCE { | | | |
| securityConfiguration SEQUENCE { | | | |
| cipheringAlgorithm | eea2 | | |
| nextHopChainingCount | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.12.2.2.2.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 10 | | 2TX |
| n4TxAntenna-tm3 | 1000 | | 4TX |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.7.12.2.2.2.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| transmissionMode-r10 | tm3 | Transmission mode 3 | |
| codebookSubsetRestriction-r10 | 10 | | 2TX |
| codebookSubsetRestriction-r10 | 1000 | | 4TX |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| pdsch-ConfigDedicated-r10 CHOICE { | | | 4TX |
| p-a | dB-6 | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.7.12.2.2.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 8.7.12.2.2.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

# 8.8 Demodulation of EPDCCH

## 8.8.1 Distributed Transmission

### 8.8.1.1 FDD distributed EPDCCH performance

#### 8.8.1.1.1 Test purpose

This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). EPDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of EPDCCH.

#### 8.8.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward supporting EPDCCH.

#### 8.8.1.1.3 Minimum conformance requirements

The parameters specified in Table 8.8.1.1.3-1 are valid for all FDD distributed EPDCCH tests unless otherwise stated.

**Table 8.8.1.1.3-1: Test Parameters for Distributed EPDCCH**

| Parameter | | Unit | Value |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 (Note 1) |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| | δ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Cyclic prefix | | | Normal |
| Subframe Configuration | | | Non-MBSFN |
| Precoder Update Granularity | | PRB | 1 |
| | | ms | 1 |
| Beamforming Pre-Coder | | | Annex B.4.4 |
| Cell Specific Reference Signal | | | Port 0 and 1 |
| Number of EPDCCH Sets Configured | | | 2 (Note 2) |
| Number of PRB per EPDCCH Set | | | 4 (1st Set)<br>8 (2nd Set) |
| EPDCCH Subframe Monitoring | | | NA |
| PDSCH TM | | | TM3 |
| DCI Format | | | 2A |

Note 1: The starting symbol for EPDCCH is derived from the PCFICH. RRC signalling *epdcch-StartSymbol-r11* is not configured.

Note 2: The two sets are distributed EPDCCH sets and non-overlapping with PRB = {3, 17, 31, 45} for the first set and PRB = {0, 7, 14, 21, 28, 35, 42, 49} for the second set. EPDCCH is scheduled in the first set for Test 1 and second set for Test 2, respectively. Both sets are always configured.

For the parameters specified in Table 8.8.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.1.1.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.8.1.1.3-2: Minimum performance Distributed EPDCCH**

| Test number | Band width | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 ECCE | R.55 FDD | OP.7 FDD | EVA5 | 2 x 2 Low | 1 | 2.6 |
| 2 | 10 MHz | 16 ECCE | R.56 FDD | OP.7 FDD | EVA70 | 2 x 2 Low | 1 | -3.2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.8.1.1.

## 8.8.1.1.4 Test description

### 8.8.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 8.8.1.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.8.1.1.4.3.

#### 8.8.1.1.4.2 Test procedure

1. SS transmits PDSCH via EPDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Table 8.8.1.1.3-2.The details of EPDCCH and PDSCH are specified in Table A.3.10.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.8.1.1.5-1 as appropriate.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.8.1.1.5-1, pass the UE. Otherwise fail the UE.

#### 8.8.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 8.8.1.1.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, Condition: FDD |
|---|

### 8.8.1.1.5 Test requirement

For the parameters specified in Table 8.8.1.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.1.1.1.5-1.

**Table 8.8.1.1.1.5-1: Test requirement Distributed EPDCCH**

| Test number | Band width | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 ECCE | R.55 FDD | OP.7 FDD | EVA5 | 2 x 2 Low | 1 | 3.5 |
| 2 | 10 MHz | 16 ECCE | R.56 FDD | OP.7 FDD | EVA70 | 2 x 2 Low | 1 | -2.3 |

## 8.8.1.2 TDD distributed EPDCCH performance

### 8.8.1.2.1 Test purpose

This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). EPDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of EPDCCH.

### 8.8.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 11 and forward supporting EPDCCH.

### 8.8.1.2.3 Minimum conformance requirements

The parameters specified in Table 8.8.1.2.3-1 are valid for all TDD distributed EPDCCH tests unless otherwise stated.

**Table 8.8.1.2.3-1: Test Parameters for Distributed EPDCCH**

| Parameter | | Unit | Value |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 (Note 1) |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| | δ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Cyclic prefix | | | Normal |
| Subframe Configuration | | | Non-MBSFN |
| Precoder Update Granularity | | PRB | 1 |
| | | ms | 1 |
| Beamforming Pre-Coder | | | Annex B.4.4 |
| Cell Specific Reference Signal | | | Port 0 and 1 |
| Number of EPDCCH Sets Configured | | | 2 (Note 2) |
| Number of PRB per EPDCCH Set | | | 4 (1st Set)<br>8 (2nd Set) |
| EPDCCH Subframe Monitoring | | | NA |
| PDSCH TM | | | TM3 |
| DCI Format | | | 2A |
| TDD UL/DL Configuration | | | 0 |
| TDD Special Subframe | | | 1 (Note 3) |

Note 1: The starting symbol for EPDCCH is derived from the PCFICH. RRC signalling *epdcch-StartSymbol-r11* is not configured.

Note 2: The two sets are distributed EPDCCH sets and non-overlapping with PRB = {3, 17, 31, 45} for the first set and PRB = {0, 7, 14, 21, 28, 35, 42, 49} for the second set. EPDCCH is scheduled in the first set for Test 1 and second set for Test 2, respectively. Both sets are always configured.

Note 3: Demodulation performance is averaged over normal and special subframe.

For the parameters specified in Table 8.8.1.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.1.2.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.8.1.2.3-2: Minimum performance Distributed EPDCCH**

| Test number | Band width | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 ECCE | R.55 TDD | OP.7 TDD | EVA5 | 2 x 2 Low | 1 | 2.8 |
| 2 | 10 MHZ | 16 ECCE | R.56 TDD | OP.7 TDD | EVA70 | 2 x 2 Low | 1 | -3.1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.8.1.2

## 8.8.1.2.4 Test description

### 8.8.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to 8.8.1.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.8.1.2.4.3.

### 8.8.1.2.4.2 Test procedure

1. SS transmits PDSCH via EPDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Table 8.8.1.2.3-2.The details of EPDCCH and PDSCH are specified in Table A.3.10.2-1 and Table A.3.5.2-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.8.1.2.5-1 as appropriate.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in table 8.8.1.2.5-1, pass the UE. Otherwise fail the UE.

### 8.8.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 8.8.1.2.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, Condition: TDD |
|---|

**Table 8.8.1.2.4.3-2: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa0 | | |
| specialSubframePatterns | Ssp1 | | |
| } | | | |

### 8.8.1.2.5 Test requirement

For the parameters specified in Table 8.8.1.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.1.2.5-1.

**Table 8.8.1.2.5-1: Test requirement Distributed EPDCCH**

| Test number | Band width | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 ECCE | R.55 TDD | OP.7 TDD | EVA5 | 2 x 2 Low | 1 | 3.7 |
| 2 | 10 MHz | 16 ECCE | R.56 TDD | OP.7 TDD | EVA70 | 2 x 2 Low | 1 | -2.2 |

## 8.8.2 Localized Transmission with TM9

### 8.8.2.1 FDD localized EPDCCH performance with TM9

Editor's notes: The following items are missing or incomplete:

- Test Tolerance

#### 8.8.2.1.1 Test purpose

This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). In this test, EPDCCH and PCFICH are not tested jointly.

#### 8.8.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward supportingEPDCCH and FGI bit 103.

#### 8.8.2.1.3 Minimum conformance requirements

The parameters specified in Table 8.8.2.1.3-1 are valid for all FDD TM9 localized ePDCCH tests unless otherwise stated.

**Table 8.8.2.1.3-1: Test Parameters for Localized EPDCCH**

| Parameter | | Unit | Value |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 1 (Note 1) |
| EPDCCH starting symbol | | symbols | 2 (Note 1) |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | $\sigma$ | dB | -3 |
| | $\delta$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Cyclic prefix | | | Normal |
| Subframe Configuration | | | Non-MBSFN |
| Precoder Update Granularity | | PRB | 1 |
| | | ms | 1 |
| Beamforming Pre-Coder | | | Annex B.4.5 |
| Cell Specific Reference Signal | | | Port 0 and 1 |
| CSI-RS Reference Signal | | | Port 15 and 16 |
| CSI-RS reference signal resource configuration | | | 0 |
| CSI reference signal subframe configuration $I_{CSI-RS}$ | | | 2 |
| ZP-CSI-RS configuration bitmap | | | 0000010000000000 |
| ZP-CSI-RS subframe configuration $I_{ZP-CSI-RS}$ | | | 2 |
| Number of EPDCCH Sets | | | 2 (Note 2) |
| EPDCCH Subframe Monitoring pattern *subframePatternConfig-r11* | | | 1111111110 1111111101 1111111011 1111110111 (Note 3) |
| PDSCH TM | | | TM9 |

Note 1: The starting symbol for EPDCCH is signalled with *epdcch-StartSymbol-r11*. However, CFI is set to 1.

Note 2: The first set is distributed transmission with PRB = {0, 49} and the second set is localized transmission with PRB = {0, 7, 14, 21, 28, 35, 42, 49}. ePDCCH is scheduled in the second set for all tests.

Note 3: EPDCCH is scheduled in every SF. UE is required to monitor ePDCCH for UE-specific search space only in SFs configured by *subframePatternConfig-r11*. Legacy PDCCH is not scheduled.

For the parameters specified in Table 8.8.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.2.1.3-2. EPDCCH subframe monitoring is configured and the subframe monitoring requirement in EPDCCH restricted subframes is statDTX of 99.9%. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.8.2.1.3-2: Minimum performance Localized EPDCCH with TM9**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 2 ECCE | R.57 FDD | OP.7 FDD | EVA5 | 2 x 2 Low | 1 | 12.2 |
| 2 | 10 MHZ | 8 ECCE | R.58 FDD | OP.7 FDD | EVA5 | 2 x 2 Low | 1 | 2.5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.8.2.1.

#### 8.8.2.1.4 Test description

##### 8.8.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 8.8.2.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.8.2.1.4.3.

##### 8.8.2.1.4.2 Test procedure

1. SS transmits PDSCH via EPDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Table 8.8.2.1.3-2.The details of EPDCCH and PDSCH are specified in Table A.3.10.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.8.2.1.5-1 as appropriate.
3. Measure the Pm-dsg on monitoring subframes for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval for monitoring subframes. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). Also, count the number of statDTX on the UL PUCCH for unmonitoring subframes and calculate the ratio of (number of statDTX on the UL PUCCH for unmonitoring subframes)/( the number of configured unmonitoring subframes). If Pm-dsg is less than the value specified in table 8.8.2.1.5-1 and the ratio of statDTX on the UL PUCCH for unmonitoring subframes is no less than 99.9%+TT, pass the UE. Otherwise fail the UE.

##### 8.8.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 8.8.2.1.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, condition: FDD, TM9 |
|---|

**Table 8.8.2.1.4.3-2: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| antennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 111111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.8.2.1.5 Test requirement

For the parameters specified in Table 8.8.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.2.1.5-1. EPDCCH subframe monitoring is configured and the subframe monitoring requirement in EPDCCH restricted subframes is no less than statDTX of 99.9%+TT.

**Table 8.8.2.1.5-1: Test requirement localized EPDCCH with TM9**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 2 ECCE | R.57 FDD | OP.7 FDD | EVA5 | 2 x 2 Low | 1 | 13.1 |
| 2 | 10 MHZ | 8 ECCE | R.58 FDD | OP.7 FDD | EVA5 | 2 x 2 Low | 1 | 3.4 |

## 8.8.2.2 TDD localized EPDCCH performance with TM9

Editor's notes: The following items are missing or incomplete:

- Test Tolerance

### 8.8.2.2.1 Test purpose

This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). In this test, EPDCCH and PCFICH are not tested jointly.

### 8.8.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 11 and forward supportingEPDCCH and FGI bit 103.

### 8.8.2.2.3 Minimum conformance requirements

The parameters specified in Table 8.8.2.2.3-1 are valid for all TDD TM9 localized ePDCCH tests unless otherwise stated.

**Table 8.8.2.2.3-1: Test Parameters for Localized EPDCCH with TM9**

| Parameter | | Unit | Value |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 1 (Note 1) |
| EPDCCH starting symbol | | symbols | 2 (Note 1) |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | $\sigma$ | dB | -3 |
| | $\delta$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Cyclic prefix | | | Normal |
| Subframe Configuration | | | Non-MBSFN |
| Precoder Update Granularity | | PRB | 1 |
| | | ms | 1 |
| Beamforming Pre-Coder | | | Annex B.4.5 |
| Cell Specific Reference Signal | | | Port 0 and 1 |
| CSI-RS Reference Signal | | | Port 15 and 16 |
| CSI-RS reference signal resource configuration | | | 0 |
| CSI reference signal subframe configuration $I_{CSI-RS}$ | | | 0 |
| ZP-CSI-RS configuration bitmap | | | 0000010000000000 |
| ZP-CSI-RS subframe configuration $I_{ZP-CSI-RS}$ | | | 0 |
| Number of EPDCCH Sets | | | 2 (Note 2) |
| EPDCCH Subframe Monitoring pattern *subframePatternConfig-r11* | | | 1100011000 1100010000 1100011000 1100001000 1100011000 1000011000 1100011000 (Note 3) |
| PDSCH TM | | | TM9 |
| TDD UL/DL Configuration | | | 0 |
| TDD Special Subframe | | | 1 (Note 4) |

Note 1: The starting symbol for EPDCCH is signalled with *epdcch-StartSymbol-r11*. However, CFI is set to 1.
Note 2: The first set is distributed transmission with PRB = {0, 49} and the second set is localized transmission with PRB = {0, 7, 14, 21, 28, 35, 42, 49}. ePDCCH is scheduled in the second set for all tests.
Note 3: EPDCCH is scheduled in every SF. UE is required to monitor ePDCCH for UE-specific search space only in SFs configured by *subframePatternConfig-r11*. Legacy PDCCH is not scheduled.
Note 4: Demodulation performance is averaged over normal and special subframe.

For the parameters specified in Table 8.8.2.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.2.2.3-2. EPDCCH subframe monitoring is configured and the subframe monitoring requirement in EPDCCH restricted subframes is statDTX of 99.9%.

The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.8.2.2.3-2: Minimum performance Localized EPDCCH with TM9**

| Test number | Band width | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 2 ECCE | R.57 TDD | OP.7 TDD | EVA5 | 2 x 2 Low | 1 | 12.8 |
| 2 | 10 MHZ | 8 ECCE | R.58 TDD | OP.7 TDD | EVA5 | 2 x 2 Low | 1 | 2.0 |

The normative reference for this requirement is TS 36.101 [2] clause 8.8.2.2.

#### 8.8.2.2.4 Test description

##### 8.8.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to 8.8.2.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.8.2.2.4.3.

##### 8.8.2.2.4.2 Test procedure

1. SS transmits PDSCH via EPDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Table 8.8.2.2.3-2.The details of EPDCCH and PDSCH are specified in Table A.3.10.2-1 and Table A.3.5.2-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.8.2.2.5-1 as appropriate.
3. Measure the Pm-dsg on monitoring subframes for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval for monitoring subframes. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). Also, count the number of statDTX on the UL PUCCH for unmonitoring subframes and calculate the ratio of (number of statDTX on the UL PUCCH for unmonitoring subframes)/( the number of configured unmonitoring subframes). If Pm-dsg is less than the value specified in table 8.8.2.2.5-1 and the ratio of statDTX on the UL PUCCH for unmonitoring subframes is no less than 99.9%+TT, pass the UE. Otherwise fail the UE.

##### 8.8.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:.

**Table 8.8.2.2.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, condition: TDD, TM9 |
|---|

**Table 8.8.2.2.4.3-2: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa0 | | |
| specialSubframePatterns | ssp1 | | |
| } | | | |

**Table 8.8.2.2.4.3-3: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| antennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 111111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.8.2.2.5 Test requirement

For the parameters specified in Table 8.8.2.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.2.2.5-1. EPDCCH subframe monitoring is configured and the subframe monitoring requirement in EPDCCH restricted subframes is no less than statDTX of 99.9%+TT.

**Table 8.8.2.2.5-1: Test requirement Localized EPDCCH with TM9**

| Test number | Band width | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 2 ECCE | R.57 TDD | OP.7 TDD | EVA5 | 2 x 2 Low | 1 | 13.7 |
| 2 | 10 MHZ | 8 ECCE | R.58 TDD | OP.7 TDD | EVA5 | 2 x 2 Low | 1 | 2.9 |

## 8.8.3 Localized transmission with TM10 Type B quasi co-location type

### 8.8.3.1 FDD localized EPDCCH transmission with TM10 Type B quasi co-location type

#### 8.8.3.1.1 Test purpose

This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). In this test, EPDCCH and PCFICH are not tested jointly.

#### 8.8.3.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward supporting EPDCCH with multiple CSI processes on a component carrier within a band with PDSCH transmission mode 10.

#### 8.8.3.1.3 Minimum conformance requirements

For the parameters specified in Table 8.8.3.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.3.1.3-2. In Table 8.8.3.1.3-1, transmission point 1 (TP 1) is the serving cell. The downlink physical setup is accordance with Annex C.3.2.

**Table 8.8.3.1.3-1: Test Parameters for Localized Transmission TM10 Type B quasi co-location type**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | TP 1 | TP 2 | TP 1 | TP 2 |
| PHICH duration | | | Normal | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $\sigma$ | dB | -3 | | | |
| | $\delta$ | dB | 0 | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 0dB power imbalance is considered between TP 1 and TP 2, | Reference value in Table 8.8.3.1.3-2 | Reference value in Table 8.8.3.1.3-2 | Reference value in Table 8.8.3.1.3-2 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | | |
| Bandwidth | | MHz | 10 | 10 | 10 | 10 |
| Number of configured EPDCCH Sets | | | 2 (Note 1) | | 2 (Note 1) | |
| EPDCCH-PRB-Set ID (setConfigId) | | | 0 | 1 | 0 | 1 |
| Transmission type of EPDCCH-PRB-set | | | Localized | Localized | Localized | Localized |
| Number of PRB pair per EPDCCH-PRB-set | | PRB | 8 | 8 | 8 | 8 |
| EPDCCH beamforming model | | | Annex B.4.5 | Annex B.4.5 | Annex B.4.5 | Annex B.4.5 |
| PDSCH transmission mode | | | TM10 | TM10 | TM10 | TM10 |
| PDSCH transmission scheduling | | | Blanked in all the subframes | Transmit in all the subframes | Probability of occurrence of PDSCH transmission is 30% (Note 3) | Probability of occurrence of PDSCH transmission is 70% (Note 3) |
| Non-zero power CSI reference signal (NZPId=1) | CSI reference signal configuration | | N/A | 0 | N/A | 0 |
| | CSI reference signal subframe configuration $I_{CSI-RS}$ | | N/A | 2 | N/A | 2 |
| Non-zero power CSI reference signal (NZPId=2) | CSI reference signal configuration | | N/A | N/A | 10 | N/A |
| | CSI reference signal subframe configuration $I_{CSI-RS}$ | | N/A | N/A | 2 | N/A |
| Zero power CSI reference signal (ZPId=1) | CSI-RS Configuration list (ZeroPowerCSI-RS bitmap) | Bitmap | N/A | 0000010000000000 | N/A | 1000010000000000 |
| | CSI-RS subframe configuration $I_{CSI-RS}$ | | N/A | 2 | N/A | 2 |
| Zero power CSI reference signal (ZPId=2) | CSI-RS Configuration list (ZeroPowerCSI-RS bitmap) | Bitmap | N/A | N/A | 1000010000000000 | N/A |
| | CSI-RS subframe configuration $I_{CSI-RS}$ | | N/A | N/A | 2 | N/A |
| PQI set 0 (Note 4) | Non-Zero power CSI RS Identity (NZPId) | | N/A | 1 | N/A | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Zero power CSI RS Identity (ZPId) | | N/A | 1 | N/A | 1 |
| PQI set 1 (Note 4) | Non-Zero power CSI RS Identity (NZPId) | | N/A | N/A | 2 | N/A |
| | Zero power CSI RS Identity (ZPId) | | N/A | N/A | 2 | N/A |
| Number of PDCCH symbols | | Symbols | 1 (Note 2) | | | |
| EPDCCH starting position | | | pdsch-Start-r11=2 (Note 2) | pdsch-Start-r11=2 (Note 2) | pdsch-Start-r11=2 (Note 2) | pdsch-Start-r11=2 (Note 2) |
| Subframe configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time offset between TPs | | μs | N/A | 2 | N/A | 2 |
| Frequency shift between TPs | | Hz | N/A | 200 | N/A | 200 |
| Cell ID | | | 0 | 126 | 0 | 126 |

Note 1: Resource blocks $n_{PRB}$ =0, 7, 14, 21, 28, 35, 42, 49 are allocated for both the first set and the second set.
Note 2: The starting OFDM symbol for EPDCCH is determined from the higher layer signalling pdsch-Start-r11. And CFI is set to 1.
Note 3: The TP from which PDSCH is transmitted shall be randomly determined independently for each subframe. Probabilities of occurrence of PDSCH transmission from TP 1 and TP 2 are specified.
Note 4: For PQI set 0, PDSCH and EPDCCH are transmitted from TP 2. For PQI set 1, PDSCH and EPDCCH are transmitted from TP1. EPDCCH and PDSCH are transmitted from same TP.

**Table 8.8.3.1.3-2: Minimum Performance**

| Test number | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 2 ECCE | R.59 FDD | OP.7 FDD | EVA5 | 2 x 2 Low | 1 | 13.4 |
| 2 | 2 ECCE | R.59 FDD | OP.7 FDD | EVA5 | 2 x 2 Low | 1 | 13.4 |

The normative reference for this requirement is TS 36.101 [2] clause 8.8.3.1.

## 8.8.3.1.4 Test description

### 8.8.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40.
2. The parameter settings for the cell are set up according to Table 8.8.3.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.8.3.1.4.3.

#### 8.8.3.1.4.2 Test procedure

1. SS transmits PDSCH via EPDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to Table 8.8.3.1.3-2.The details of EPDCCH and PDSCH are specified in Table A.3.10.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.8.3.1.5-1 as appropriate.

3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.8.3.1.5-1, pass the UE. Otherwise fail the UE.

#### 8.8.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 8.8.3.1.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, Condition: FDD, TM10 |
|---|

**Table 8.8.3.1.4.3-2: PDSCH-ConfigDedicated-v1130**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-6AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-v1130 ::= SEQUENCE { | | | |
| dmrs-ConfigPDSCH-r11 | DMRS-Config-r11-DEFAULT | | |
| qcl-Operation | typeB | | |
| re-MappingQCLConfigToReleaseList-r11 | Not present | | |
| re-MappingQCLConfigToAddModList-r11 SEQUENCE (SIZE (1..maxRE-MapQCL-r11)) OF SEQUENCE { | 2 entries | | |
| pdsch-RE-MappingQCL-ConfigId-r11[1] | 0 | | |
| optionalSetOfFields-r11[1] SEQUENCE { | | | |
| crs-PortsCount-r11 | n2 | | |
| crs-FreqShift-r11 | 0 | | |
| mbsfn-SubframeConfigList-r11 CHOICE { | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| subframeConfigList | Not present | | |
| } | | | |
| } | | | |
| pdsch-Start-r11 | n2 | | |
| } | | | |
| csi-RS-ConfigZPId-r11[1] | 1 | | |
| qcl-CSI-RS-ConfigNZPId-r11[1] | 1 | | |
| pdsch-RE-MappingQCL-ConfigId-r11[2] | 2 | | |
| optionalSetOfFields-r11[2] SEQUENCE { | | | |
| crs-PortsCount-r11 | n2 | | |
| crs-FreqShift-r11 | 0 | | |
| mbsfn-SubframeConfigList-r11 CHOICE { | | | |
| release | Null | | |
| setup SEQUENCE { | | | |
| subframeConfigList | Not present | | |
| } | | | |
| } | | | |
| pdsch-Start-r11 | n2 | | |
| } | | | |
| csi-RS-ConfigZPId-r11[2] | 2 | | |
| qcl-CSI-RS-ConfigNZPId-r11[2] | 2 | | |
| } | | | |
| } | | | |

**Table 8.8.3.1.4.3-3: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| antennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| codebookSubsetRestriction-r10 | FFS | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.8.3.1.5 Test requirement

For the parameters specified in Table 8.8.3.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.3.1.5-1.

**Table 8.8.3.1.5-1: Test Performance**

| Test number | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 2 ECCE | R.59 FDD | OP.7 FDD | EVA5 | 2 x 2 Low | 1 | 14.3 |
| 2 | 2 ECCE | R.59 FDD | OP.7 FDD | EVA5 | 2 x 2 Low | 1 | 14.3 |

### 8.8.3.2 TDD localized EPDCCH transmission with TM10 Type B quasi co-location type

#### 8.8.3.2.1 Test purpose

This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). In this test, EPDCCH and PCFICH are not tested jointly.

#### 8.8.3.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 11 and forward supporting EPDCCH with multiple CSI processes on a component carrier within a band with PDSCH transmission mode 10.

#### 8.8.3.2.3 Minimum conformance requirements

For the parameters specified in Table 8.8.3.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.3.2.3-2. In Table 8.8.3.2.3-1, transmission point 1 (TP1) is the serving cell. The downlink physical setup is accordance with Annex C.3.2.

**Table 8.8.3.2.3-1: Test Parameters for Localized Transmission TM10 Type B quasi co-location type**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | TP 1 | TP 2 | TP 1 | TP 2 |
| PHICH duration | | | Normal | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $\sigma$ | dB | -3 | | | |
| | $\delta$ | dB | 0 | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 0dB power imbalance is considered between TP 1 and TP 2, | Reference value in Table 8.8.3.2.3-2 | Reference value in Table 8.8.3.2.3-2 | Reference value in Table 8.8.3.2.3-2 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | | |
| Bandwidth | | MHz | 10 | 10 | 10 | 10 |
| Number of EPDCCH Sets | | | 2 (Note 1) | | 2 (Note 1) | |
| EPDCCH-PRB-Set ID (setConfigId) | | | 0 | 1 | 0 | 1 |
| Transmission type of EPDCCH-PRB-set | | | Localized | Localized | Localized | Localized |
| Number of PRB pair per EPDCCH-PRB-set | | PRB | 8 | 8 | 8 | 8 |
| EPDCCH beamforming model | | | Annex B.4.5 | Annex B.4.5 | Annex B.4.5 | Annex B.4.5 |
| PDSCH transmission mode | | | TM10 | TM10 | TM10 | TM10 |
| PDSCH transmission scheduling | | | Blanked in all the subframes | Transmit in all the subframes | Probability of occurrence of PDSCH transmission is 30% (Note 3) | Probability of occurrence of PDSCH transmission is 70% (Note 3) |
| CSI reference signal configurations | | | Antenna ports 15,16 | Antenna ports 15,16 | Antenna ports 15,16 | Antenna ports 15,16 |
| Non-zero power CSI reference signal (NZPId=1) | CSI reference signal configuration | | N/A | 0 | N/A | 0 |
| | CSI reference signal subframe configuration $I_{CSI-RS}$ | | N/A | 0 | N/A | 0 |
| Non-zero power CSI reference signal (NZPId=2) | CSI reference signal configuration | | N/A | N/A | 10 | N/A |
| | CSI reference signal subframe configuration $I_{CSI-RS}$ | | N/A | N/A | 0 | N/A |
| Zero power CSI reference signal (ZPId=1) | CSI-RS Configuration list (ZeroPowerCSI-RS bitmap) | Bitmap | N/A | 0000010000000000 | N/A | 1000010000000000 |
| | CSI-RS subframe configuration $I_{CSI-RS}$ | | N/A | 0 | N/A | 0 |
| Zero power CSI reference signal (ZPId=2) | CSI-RS Configuration list (ZeroPowerCSI-RS bitmap) | Bitmap | N/A | N/A | 1000010000000000 | N/A |
| | CSI-RS subframe configuration $I_{CSI-RS}$ | | N/A | N/A | 0 | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| PQI set 0 (Note 4) | Non-Zero power CSI RS Identity (NZPId) | | N/A | 1 | N/A | 1 |
| | Zero power CSI RS Identity (ZPId) | | N/A | 1 | N/A | 1 |
| PQI set 1 (Note 4) | Non-Zero power CSI RS Identity (NZPId) | | N/A | N/A | 2 | N/A |
| | Zero power CSI RS Identity (ZPId) | | N/A | N/A | 2 | N/A |
| Number of PDCCH symbols | | Symbols | 1 (Note 2) | | | |
| EPDCCH starting position | | | pdsch-Start-r11=2 (Note 2) | pdsch-Start-r11=2 (Note 2) | pdsch-Start-r11=2 (Note 2) | pdsch-Start-r11=2 (Note 2) |
| Subframe configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time offset between TPs | | μs | N/A | 2 | N/A | 2 |
| Frequency shift between TPs | | Hz | N/A | 200 | N/A | 200 |
| Cell ID | | | 0 | 126 | 0 | 126 |
| TDD UL/DL configuration | | | 0 | | | |
| TDD special subframe | | | 1 | | | |

Note 1: Resource blocks $n_{PRB}$ = 0, 7, 14, 21, 28, 35, 42, 49 are allocated for both the first set and the second set.
Note 2: The starting OFDM symbol for EPDCCH is determined from the higher layer signalling pdsch-Start-r11. And CFI is set to 1.
Note 3: The TP from which PDSCH is transmitted shall be randomly determined independently for each subframe. Probabilities of occurrence of PDSCH transmission from TP 1 and TP 2 are specified.
Note 4: For PQI set 0, PDSCH and EPDCCH are transmitted from TP 2. For PQI set 1, PDSCH and EPDCCH are transmitted from TP1. EPDCCH and PDSCH are transmitted from same TP.

**Table 8.8.3.2.3-2: Minimum Performance**

| Test number | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 2 ECCE | R.59 TDD | OP.7 TDD | EVA5 | 2 x 2 Low | 1 | 13.6 |
| 2 | 2 ECCE | R.59 TDD | OP.7 TDD | EVA5 | 2 x 2 Low | 1 | 13.6 |

The normative reference for this requirement is TS 36.101 [2] clause 8.8.3.2.

## 8.8.3.2.4 Test description

### 8.8.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40.
2. The parameter settings for the cell are set up according to 8.8.3.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.8.3.2.4.3.

#### 8.8.3.2.4.2 Test procedure

1. SS transmits PDSCH via EPDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to Table 8.8.3.2.3-2. The details of EPDCCH and PDSCH are specified in Table A.3.10.2-1 and Table A.3.5.2-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.8.3.2.5-1 as appropriate.

3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in table 8.8.3.2.5-1 pass the UE. Otherwise fail the UE.

#### 8.8.3.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 8.8.3.2.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, Condition: TDD, TM10 |
|---|

**Table 8.8.3.2.4.3-2: PDSCH-ConfigDedicated-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-6AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-v1130 ::= SEQUENCE { | | | |
| dmrs-ConfigPDSCH-r11 | DMRS-Config-r11-DEFAULT | | |
| qcl-Operation | typeB | | |
| re-MappingQCLConfigToReleaseList-r11 | Not present | | |
| re-MappingQCLConfigToAddModList-r11 SEQUENCE (SIZE (1..maxRE-MapQCL-r11)) OF SEQUENCE { | 2 entries | | |
| pdsch-RE-MappingQCL-ConfigId-r11[1] | 0 | | |
| optionalSetOfFields-r11[1] SEQUENCE { | | | |
| crs-PortsCount-r11 | n2 | | |
| crs-FreqShift-r11 | 0 | | |
| mbsfn-SubframeConfigList-r11 CHOICE { | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| subframeConfigList | Not present | | |
| } | | | |
| } | | | |
| pdsch-Start-r11 | n2 | | |
| } | | | |
| csi-RS-ConfigZPId-r11[1] | 1 | | |
| qcl-CSI-RS-ConfigNZPId-r11[1] | 1 | | |
| pdsch-RE-MappingQCL-ConfigId-r11[2] | 2 | | |
| optionalSetOfFields-r11[2] SEQUENCE { | | | |
| crs-PortsCount-r11 | n2 | | |
| crs-FreqShift-r11 | 0 | | |
| mbsfn-SubframeConfigList-r11 CHOICE { | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| subframeConfigList | Not present | | |
| } | | | |
| } | | | |
| pdsch-Start-r11 | n2 | | |
| } | | | |
| csi-RS-ConfigZPId-r11[2] | 2 | | |
| qcl-CSI-RS-ConfigNZPId-r11[2] | 2 | | |
| } | | | |
| } | | | |

**Table 8.8.3.2.4.3-3: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| antennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| codebookSubsetRestriction-r10 | FFS | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.8.3.2.5 Test requirement

For the parameters specified in Table 8.8.3.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.3.2.5-1.

**Table 8.8.3.2.5-1: Test Performance**

| Test number | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 2 ECCE | R.59 TDD | OP.7 TDD | EVA5 | 2 x 2 Low | 1 | 14.5 |
| 2 | 2 ECCE | R.59 TDD | OP.7 TDD | EVA5 | 2 x 2 Low | 1 | 14.5 |

## 8.8.4

### 8.8.4.1 FDD Enhanced Downlink Control Channel Performance Requirement Type A for EDPCCH - Localized Transmission with CRS Interference Model

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

#### 8.8.4.1.1 Test purpose

This test verifies the Enhanced downlink control channel performance requirement Type A for localized EPDCCH transmission with CRS interference model. This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg).

#### 8.8.4.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type A. Detailed Test Applicability is specified in clause 8.1.2.7.

#### 8.8.4.1.3 Minimum conformance requirements

The purpose of this test is to verify the localized EPDCCH performance the EPDCCH transmission in the serving cell is interfered by the CRS of the interfering cells, applying the CRS interference model defined in clause B.6.5. The receiver performance of the distributed EPDCCH is determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). EPDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of EPDCCH. The parameters specified in Table 8.8.4.1.3-1.

In Table 8.8.4.1-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical setup is in accordance with Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.8.4.1.3-1: Test Parameters for EPDCCH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Number of PDCCH symbols | | symbols | 1 (Note 1) | 2 | 2 |
| EPDCCH starting symbol | | symbols | 2 (Note 1) | N/A | N/A |
| PHICH duration | | | Normal | Normal | Normal |
| Unused RE-s and PRB-s | | | OCNG | N/A | N/A |
| Cell ID | | | 0 | 1 | 6 |
| Downlink power allocation | $\rho_A$ | dB | 0 | -3 | -3 |
| | $\rho_B$ | dB | 0 | -3 | -3 |
| | σ | dB | -3 | 0 | 0 |
| | δ | dB | 0 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| EPDCCH Precoder Update Granularity | | PRB | 1 | N/A | N/A |
| | | ms | 1 | N/A | N/A |
| EPDCCH Beamforming Pre-Coder | | | Annex B. 4.5 | N/A | N/A |
| CSI-RS Reference Signal | | | Port 15 and 16 | N/A | N/A |
| CSI-RS reference signal resource configuration | | | 0 | N/A | N/A |
| CSI reference signal subframe configuration $I_{CSI-RS}$ | | | 2 | N/A | N/A |
| ZP-CSI-RS configuration bitmap | | | 0000010000000000 | N/A | N/A |
| ZP-CSI-RS subframe configuration $I_{ZP-CSI-RS}$ | | | 2 | N/A | N/A |
| Number of EPDCCH Sets | | | 1 | N/A | N/A |
| EPDCCH Set type | | | Localized | N/A | N/A |
| Number of PRB per EPDCCH Set | | | 8 | N/A | N/A |
| EPDCCH Set PRBs | | | 0, 7, 14, 21, 28, 35, 42, 49 | N/A | N/A |
| PDSCH TM | | | TM9 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.6.5 | As specified in clause B.6.5 |
| Time offset to cell 1 | | μs | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| Note 1: The starting symbol for EPDCCH is signalled with *epdcch-StartSymbol-r11*. CFI is set to 1.<br>Note 2: EPDCCH is scheduled in every subframe. EPDCCH Subframe Monitoring pattern is not configured. | | | | | |

For the parameters specified in Table 8.8.4.1.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.4.1.3-2.

**Table 8.8.4.1.3-2: Minimum performance for EPDCCH for enhanced downlink control channel performance requirements Type A**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 2 ECCE | R.57 FDD | OP.7 FDD | EPA5 | 2 x 2 Low | 1 | 13.4 |

The normative reference for this requirement is TS 36.101 [2] clause 8.8.4.1.

#### 8.8.4.1.4 Test description

##### 8.8.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.8.4.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.8.4.1.4.3.

##### 8.8.4.1.4.2 Test procedure

1. SS transmits PDSCH via EPDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Table 8.8.4.1.3-2.The details of EPDCCH and PDSCH are specified in Table A.3.10.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.8.4.1.5-1 as appropriate.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.8.4.1.5-1, pass the UE. Otherwise fail the UE.

##### 8.8.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.8.4.1.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, condition: FDD, TM9 |
|---|

**Table 8.8.4.1.4.3-2: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| antennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 111111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.8.4.1.5 Test requirement

For the parameters specified in Table 8.8.4.1.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.4.1.5-1.

**Table 8.8.4.1.5-1: Test requirement for EPDCCH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 2 ECCE | R.57 FDD | OP.7 FDD | EPA5 | 2 x 2 Low | 1 | TBD |

## 8.8.4.2 TDD Enhanced Downlink Control Channel Performance Requirement Type A for EDPCCH - Localized Transmission with CRS Interference Model

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.8.4.2.1 Test purpose

This test verifies the Enhanced downlink control channel performance requirement Type A for localized EPDCCH transmission with CRS interference model. This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg).

### 8.8.4.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type A. Detailed Test Applicability is specified in clause 8.1.2.7.

### 8.8.4.2.3 Minimum conformance requirements

The purpose of this test is to verify the localized EPDCCH performance the EPDCCH transmission in the serving cell is interfered by the CRS of the interfering cells, applying the CRS interference model defined in clause B.6.5. The receiver performance of the distributed EPDCCH is determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). EPDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of EPDCCH. The parameters specified in Table 8.8.4.2.3-1.

In Table 8.8.4.2-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical setup is in accordance with Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.8.4.2.3-1: Test Parameters for EPDCCH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Number of PDCCH symbols | | symbols | 1 (Note 1) | 2 | 2 |
| EPDCCH starting symbol | | symbols | 2 (Note 1) | N/A | N/A |
| PHICH duration | | | Normal | Normal | Normal |
| Unused RE-s and PRB-s | | | OCNG | N/A | N/A |
| Cell ID | | | 0 | 1 | 6 |
| Downlink power allocation | $\rho_A$ | dB | 0 | -3 | -3 |
| | $\rho_B$ | dB | 0 | -3 | -3 |
| | σ | dB | -3 | 0 | 0 |
| | δ | dB | 0 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| EPDCCH Precoder Update Granularity | | PRB | 1 | N/A | N/A |
| | | ms | 1 | N/A | N/A |
| EPDCCH Beamforming Pre-Coder | | | Annex B. 4.5 | N/A | N/A |
| CSI-RS Reference Signal | | | Port 15 and 16 | N/A | N/A |
| CSI-RS reference signal resource configuration | | | 0 | N/A | N/A |
| CSI reference signal subframe configuration $I_{CSI-RS}$ | | | 2 | N/A | N/A |
| ZP-CSI-RS configuration bitmap | | | 0000010000000000 | N/A | N/A |
| ZP-CSI-RS subframe configuration $I_{ZP-CSI-RS}$ | | | 2 | N/A | N/A |
| Number of EPDCCH Sets | | | 1 | N/A | N/A |
| EPDCCH Set type | | | Localized | N/A | N/A |
| Number of PRB per EPDCCH Set | | | 8 | N/A | N/A |
| EPDCCH Set PRBs | | | 0, 7, 14, 21, 28, 35, 42, 49 | N/A | N/A |
| PDSCH TM | | | TM9 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.6.5 | As specified in clause B.6.5 |
| Time offset to cell 1 | | μs | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| TDD UL/DL Configuration | | | 0 | 0 | 0 |
| TDD Special Subframe | | | 1 (Note 4) | 1 | 1 |
| Note 1: The starting symbol for EPDCCH is signalled with *epdcch-StartSymbol-r11*. CFI is set to 1.<br>Note 2: EPDCCH is scheduled in every subframe. EPDCCH Subframe Monitoring pattern is not configured.<br>Note 3: Demodulation performance is averaged over normal and special subframes. | | | | | |

For the parameters specified in Table 8.8.4.2.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.4.2.3-2.

**Table 8.8.4.2.3-2: Minimum performance for EPDCCH for enhanced downlink control channel performance requirements Type A**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 2 ECCE | R.57 TDD | OP.7 TDD | EPA5 | 2 x 2 Low | 1 | 14.2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.8.4.2.

#### 8.8.4.2.4 Test description

##### 8.8.4.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.8.4.2.3-1.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.8.4.2.4.3.

##### 8.8.4.2.4.2 Test procedure

2. SS transmits PDSCH via EPDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Table 8.8.4.2.3-2.The details of EPDCCH and PDSCH are specified in Table A.3.10.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.8.4.2.5-1 as appropriate.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.8.4.2.5-1, pass the UE. Otherwise fail the UE.

##### 8.8.4.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.8.1 with the following exceptions:

**Table 8.8.4.2.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, condition: TDD, TM9 |
|---|

**Table 8.8.4.2.4.3-2: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa0 | | |
| specialSubframePatterns | ssp1 | | |
| } | | | |

**Table 8.8.4.2.4.3-3: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| antennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 111111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.8.4.2.5 Test requirement

For the parameters specified in Table 8.8.4.2.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.4.2.5-1.

**Table 8.8.4.2.5-1: Test requirement for EPDCCH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 2 ECCE | R.57 TDD | OP.7 TDD | EPA5 | 2 x 2 Low | 1 | TBD |

# 8.8.5

## 8.8.5.1 TDD Enhanced Downlink Control Channel Performance Requirement Type A for EDPCCH - Distributed Transmission with TM9 Interference Model

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

### 8.8.5.1.1 Test purpose

This test verifies the Enhanced downlink control channel performance requirement Type A for distributed EPDCCH transmission with TM9 interference model. This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg).

### 8.8.5.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type A. Detailed Test Applicability is specified in clause 8.1.2.7.

### 8.8.5.1.3 Minimum conformance requirements

The purpose of this test is to verify the distributed EPDCCH performance when the EPDCCH transmission in the serving 5.2A.8.1 cell is interfered by two interfering cells and applying TM9 interference model. The receiver performance of the distributed EPDCCH is determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). EPDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of EPDCCH. The parameters specified in Table 8.8.5.1.3-1.

In Table 8.8.5.1-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical setup is in accordance with Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is provided and includes Cell 2 and Cell 3.

**Table 8.8.5.1.3-1: Test Parameters for EPDCCH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 (Note 1) | 2 | 2 |
| PHICH duration | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 6 | 1 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 | -3 | -3 |
| | σ | dB | 0 | 0 | 0 |
| | δ | dB | 3 | 3 | 3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| EPDCCH precoder Update Granularity | | PRB | 1 | N/A | N/A |
| | | ms | 1 | N/A | N/A |
| Beamforming Pre-Coder | | | Annex B. 4.4 | N/A | N/A |
| Number of EPDCCH Sets Configured | | | 1 | N/A | N/A |
| EPDCCH Set type | | | Distributed | N/A | N/A |
| Number of PRB per EPDCCH Set | | | 4 | N/A | N/A |
| EPDCCH Set PRBs | | | 3, 17, 31, 45 | N/A | N/A |
| PDSCH TM | | | TM9 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 | As specified in clause B.5.4 |
| Probability of occurrence of PDSCH transmission rank in interfering cells | Rank 1 | % | N/A | 70 | 70 |
| | Rank 2 | % | N/A | 30 | 30 |
| PDSCH precoder update granularity | | PRB | N/A | 50 | 50 |
| Time offset to cell 1 | | μs | N/A | 2 | 3 |
| Frequency offset to cell 1 | | Hz | N/A | 200 | 300 |
| TDD UL/DL Configuration | | | 0 | 0 | 0 |
| TDD Special Subframe | | | 1 (Note 3) | 1 | 1 |

Note 1: The starting symbol for EPDCCH is derived from the PCFICH. RRC signalling *epdcch-StartSymbol-r11* is not configured.
Note 2: EPDCCH is scheduled in every subframe. EPDCCH Subframe Monitoring pattern is not configured.
Note 3: Demodulation performance is averaged over normal and special subframes.

For the parameters specified in Table 8.8.5.1.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.5.1.3-2.

**Table 8.8.5.1.3-2: Minimum performance for EPDCCH for enhanced downlink control channel performance requirements Type A**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 ECCE | R.55-1 TDD | OP.7 TDD | EPA5 | 2 x 2 Low | 1 | 14.8 |

The normative reference for this requirement is TS 36.101 [2] clause 8.8.5.1.

### 8.8.5.1.4 Test description

#### 8.8.5.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.8.5.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.8.5.1.4.3.

#### 8.8.5.1.4.2 Test procedure

3. SS transmits PDSCH via EPDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Table 8.8.5.1.3-2.The details of EPDCCH and PDSCH are specified in Table A.3.10.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.8.5.1.5-1 as appropriate.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.8.5.1.5-1, pass the UE. Otherwise fail the UE.

#### 8.8.5.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause with the following exceptions:

**Table 8.8.5.1.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, Condition: TDD |
|---|

**Table 8.8.5.1.4.3-2: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa0 | | |
| specialSubframePatterns | Ssp1 | | |
| } | | | |

#### 8.8.5.1.5 Test requirement

For the parameters specified in Table 8.8.5.1.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.5.1.5-1.

**Table 8.8.5.1.5-1: Test requirement for EPDCCH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 ECCE | R.55-1 TDD | OP.7 TDD | EPA5 | 2 x 2 Low | 1 | TBD |

## 8.8.6

### 8.8.6.1 FDD Enhanced Downlink Control Channel Performance Requirement Type A for EDPCCH- Distributed Transmission with TM3 Interference Model

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- Test tolerances are undefined

#### 8.8.6.1.1 Test purpose

This test verifies the Enhanced downlink control channel performance requirement Type A for distributed EPDCCH transmission with TM3 interference model. This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg).

#### 8.8.6.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE Release 13 and forward supporting Enhanced Downlink Control Channel Performance Requirement Type A. Detailed Test Applicability is specified in clause 8.1.2.7.

#### 8.8.6.1.3 Minimum conformance requirements

The purpose of this test is to verify the distributed EPDCCH performance when the serving cell EPDCCH transmission is interfered by two interfering cells applying asynchronous TM3 interference model. The receiver performance of the distributed EPDCCH is determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). EPDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of EPDCCH. The parameters specified in Table 8.8.6.1.3-1.

In Table 8.8.6.1.3-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical setup is in accordance with Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] is not provided.

**Table 8.8.6.1.3-1: Test Parameters for EPDCCH**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 (Note 1) | 2 | 2 |
| PHICH duration | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 | -3 | -3 |
| | σ | dB | 0 | 0 | 0 |
| | δ | dB | 3 | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | | |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 13.91 | 3.34 |
| $BW_{Channel}$ | | MHz | 10 | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| EPDCCH Precoder Update Granularity | | PRB | 1 | N/A | N/A |
| | | ms | 1 | N/A | N/A |
| EPDCCH Beamforming Pre-Coder | | | Annex B.4.4 | N/A | N/A |
| Number of EPDCCH Sets Configured | | | 1 | N/A | N/A |
| EPDCCH Set type | | | Distributed | N/A | N/A |
| Number of PRB per EPDCCH Set | | | 4 | N/A | N/A |
| EPDCCH Set PRBs | | | 3, 17, 31, 45 | N/A | N/A |
| PDSCH TM | | | TM9 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.5.2 | As specified in clause B.5.2 |
| Probability of occurrence of PDSCH transmission rank in interfering cells | Rank 1 | % | N/A | 70 | 70 |
| | Rank 2 | % | N/A | 30 | 30 |
| Time offset to cell 1 | | μs | N/A | 330 | 667 |
| Frequency offset to cell 1 | | Hz | N/A | 0 | 0 |
| Note 1: The starting symbol for EPDCCH is derived from the PCFICH. RRC signalling *epdcch-StartSymbol-r11* is not configured.<br>Note 2: EPDCCH is scheduled in every subframe. EPDCCH Subframe Monitoring pattern is not configured. | | | | | |

For the parameters specified in Table 8.8.6.1.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.6.1.3-2.

**Table 8.8.6.1.3-2: Minimum performance for EPDCCH for enhanced downlink control channel performance requirements Type A**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 ECCE | R.55-1 FDD | OP.7 FDD | EVA70 | 2 x 2 Low | 1 | 15.9 |

The normative reference for this requirement is TS 36.101 [2] clause 8.8.6.1.

### 8.8.6.1.4 Test description

#### 8.8.6.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 8.8.6.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.8.6.1.4.3.

#### 8.8.6.1.4.2 Test procedure

4. SS transmits PDSCH via EPDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Table 8.8.6.1.3-2.The details of EPDCCH and PDSCH are specified in Table A.3.10.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.8.6.1.5-1 as appropriate.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.8.6.1.5-1, pass the UE. Otherwise fail the UE.

#### 8.8.6.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.8.6.1.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, Condition: FDD |
|---|

#### 8.8.6.1.5 Test requirement

For the parameters specified in Table 8.8.6.1.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.6.1.5-1.

**Table 8.8.6.1.5-1: Test requirement for EPDCCH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 ECCE | R.55-1 FDD | OP.7 FDD | EVA70 | 2 x 2 Low | 1 | TBD |

## 8.9 Demodulation (Single receiver antenna)

The SNR definition is given in Clause 8.1.1 where the number of receiver antennas $N_{RX}$ assumed for the minimum performance requirement in this clause is 1.

# 8.9.1 PDSCH

## 8.9.1.1 FDD and half-duplex FDD (Fixed Reference Channel)

The parameters specified in Table 8.9.1.1-1 are valid for FDD and half-duplex FDD tests unless otherwise stated.

**Table 8.9.1.1-1: Common Test Parameters (FDD and half-duplex FDD)**

| Parameter | Unit | Value |
|---|---|---|
| Inter-TTI Distance | | 1 |
| Number of HARQ processes per component carrier | Processes | 8 |
| Maximum number of HARQ transmission | | 4 |
| Redundancy version coding sequence | | {0,1,2,3} for QPSK and 16QAM<br>{0,0,1,2} for 64QAM |
| Number of OFDM symbols for PDCCH per component carrier | OFDM symbols | 4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths,<br>2 for 10 MHz, 15 MHz and 20 MHz bandwidths |
| Cyclic Prefix | | Normal |
| Precoder update granularity | | Frequency domain: 1 PRG<br>Time domain: 1 ms<br>for transmission mode 9 |

The normative reference for this requirement is TS 36.101 [2] clause 8.9.1.

### 8.9.1.1.1 FDD PDSCH Transmit Diversity 2x1 for UE category 0

#### 8.9.1.1.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using transmit diversity.

#### 8.9.1.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward of UE category 0.

#### 8.9.1.1.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause [A.3.3.2], with the addition of the relevant parameters in Tables 8.9.1.1-1 and 8.9.1.2.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.9.1.1.1.3-2 for the specified SNR. For transmit diversity (SFBC) performance with 2 transmitter antennas (SFBC) as specified.

**Table 8.9.1.1.1.3-1: Test Parameters for Transmit diversity Performance (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 2 |
| Note 1: $P_B = 1$. | | | |

**Table 8.9.1.1.1.3-2: Minimum performance Transmit Diversity (FRC)**

| Test number | Band-width and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE downlink category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.62 FDD | OP.1 FDD | EPA5 | 2x1 Low | 70 | 9.0 | 0 |

### 8.9.1.1.1.4 Test description

#### 8.9.1.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.9.1.1.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Tables 8.9.1.1-1 and 8.9.1.1.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.9.1.1.1.4.3.

#### 8.9.1.1.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.9.1.1.1.3-1 and 8.9.1.1.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.9.1.1.1.3-2 as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.9.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

#### 8.9.1.1.1.5 Test requirement

Table 8.9.1.1.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause [A.3.3.2] for each throughput test shall meet or exceed the specified value in Table 8.9.1.1.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.9.1.1.1.5-1: Minimum performance Transmit Diversity (FRC)**

| Test number | Band-width and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE downlink category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.xx FDD | OP.1 FDD | EPA5 | 2x1 Low | 70 | 9.8 | 0 |

### 8.9.1.1.1_1 FDD PDSCH Transmit Diversity 2x1 for UE category 1bis

#### 8.9.1.1.1_1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using transmit diversity.

#### 8.9.1.1.1_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 13 and forward of UE category 1bis

#### 8.9.1.1.1_1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.9.1.1-1 and 8.9.1.1.1_1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.9.1.1.1_1.3-2 for the specified SNR. For transmit diversity (SFBC) performance with 2 transmitter antennas (SFBC) as specified.

**Table 8.9.1.1.1_1.3-1: Test Parameters for Transmit diversity Performance (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 2 |
| Note 1: $P_B = 1$. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.9.1.1.

**Table 8.9.1.1.1_1.3-2: Minimum performance Transmit Diversity (FRC)**

| Test number | Band-width and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.62 FDD | OP.1 FDD | EPA5 | 2x1 Low | 70 | 9.0 | 0 |
| 2 | 10 MHz 16QAM 1/2 | R.84 FDD | OP.1 FDD | EPA5 | 2x1 Low | 70 | 9.3 | 1bis |

### 8.9.1.1.1_1.4 Test description

#### 8.9.1.1.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.9.1.1.1_1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Tables 8.9.1.1-1 and 8.9.1.1.1_1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.9.1.1.1_1.4.3.

#### 8.9.1.1.1_1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.9.1.1.1_1.3-1 and 8.9.1.1.1_1.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.9.1.1.1_1.3-2 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.9.1.1.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

#### 8.9.1.1.1_1.5 Test requirement

Table 8.9.1.1.4.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.9.1.1.1_1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.9.1.1.1_1.5-1: Minimum performance Transmit Diversity (FRC)**

| Test number | Band-width and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz 16QAM 1/2 | R.84 FDD | OP.1 FDD | EPA5 | 2x1 Low | 70 | 10.1 | 1bis |

### 8.9.1.1.2 FDD closed-loop spatial multiplexing performance (Cell-Specific Reference Symbols)

#### 8.9.1.1.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

#### 8.9.1.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward of UE category 0.

#### 8.9.1.1.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.9.1.1-1 and 8.9.1.2.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.9.1.1.2.3-2 for the specified SNR. For Single-Layer Spatial Multiplexing performance with 2 transmitter antennas as specified.

**Table 8.9.1.1.2.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 8 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 001111 |
| PDSCH transmission mode | | | 4 |
| Note 1: $P_B = 1$. | | | |
| Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). | | | |

**Table 8.9.1.1.2.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 64QAM 1/2 | R. 63 FDD | OP.1 FDD | EPA5 | 2x1Low | 70 | 13.2 | 0 |

The normative reference for this requirement is TS 36.101 [2] clause 8.9.1.1.2.

### 8.9.1.1.2.4 Test description

#### 8.9.1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.9.1.1.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Tables 8.9.1.1-1 and 8.9.1.1.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.9.1.1.2.4.3.

#### 8.9.1.1.2.4.2 Test procedure

1. For single-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.9.1.1.2.3-1 and 8.9.1.1.2.3-2.
2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.9.1.1.2.5-1 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
5. Repeat steps from 1 to 4 for each test interval in Tables 8.9.1.1.2.5-1as appropriate.

#### 8.9.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 8.9.1.1.2.5 Test requirement

Table 8.9.1.1.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause [A.3.3.2] for each throughput test shall meet or exceed the specified value in Table 8.9.1.1.2.3-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.9.1.1.2.5-1: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 64QAM 1/2 | R. 63 FDD | OP.1 FDD | EPA5 | 2x1Low | 70 | 14 | 0 |

## 8.9.1.1.2_1 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 4x1 for UE Category 1bis

### 8.9.1.1.2_1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on four Tx antenna ports using closed-loop rank-one spatial multiplexing.

### 8.9.1.1.2_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 13 and forward of UE category 1bis.

### 8.9.1.1.2_1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.9.1.1-1 and 8.9.1.1.2_1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.9.1.1.2_1.3-2 for the specified SNR. For Single-Layer Spatial Multiplexing performance with 4 transmitter antennas as specified.

**Table 8.9.1.1.2_1.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 8 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 000000000000FFFF |
| PDSCH transmission mode | | | 4 |
| Note 1: $P_B = 1$. | | | |
| Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). | | | |

**Table 8.9.1.1.2_1.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 64QAM 1/2 | R.85 FDD | OP.1 FDD | EPA5 | 4x1 Low | 70 | 11.3 | 1bis |

The normative reference for this requirement is TS 36.101 [2] clause 8.9.1.1.2.2.

### 8.9.1.1.2_1.4 Test description

#### 8.9.1.1.2_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.9.1.1.2_1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.11 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Tables 8.9.1.1-1 and 8.9.1.1.2_1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.9.1.1.2_1.4.3.

### 8.9.1.1.2_1.4.2 Test procedure

1. For single-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.9.1.1.2_1.3-1 and 8.9.1.1.2_1.3-2.

2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.

3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.9.1.1.2_1.5-1 as appropriate.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

5. Repeat steps from 1 to 4 for each test interval in Tables 8.9.1.1.2_1.5-1as appropriate.

### 8.9.1.1.2_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.9.1.1.2_1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.9.1.1.2_1.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop single-layer spatial multiplexing performance downlink power**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 000000000000FFFF | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.9.1.1.2_1.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional FDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

### 8.9.1.1.2_1.5 Test requirement

Table 8.9.1.1.2_1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause [A.3.3.2] for each throughput test shall meet or exceed the specified value in Table 8.9.1.1.2_1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.9.1.1.2_1.5-1: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Band-width and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 64QAM 1/2 | R.85 FDD | OP.1 FDD | EPA5 | 4x1 Low | 70 | 12.1 | 1bis |

## 8.9.1.1.3 FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 0

### 8.9.1.1.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 without a simultaneous transmission on the other antenna port and multiple CSI reference symbols configurations with non-zero and zero transmission power.

### 8.9.1.1.3.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 12 and forward of UE category 0. Applicability requires support for FGI bit 103.

### 8.9.1.1.3.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.1, with the addition of the relevant parameters in Tables 8.9.1.1-1 and 8.9.1.1.3.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.9.1.1.3.3-2 for the specified SNR.

**Table 8.9.1.1.3.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple CSI-RS configurations**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | -3 |
| Beamforming model | | | Annex B.4.1 |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | Subframes | 5 / 2 |
| CSI reference signal configuration | | | 0 |
| Zero-power CSI-RS configuration $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 3 / 0001000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 4) |
| Number of allocated resource blocks (Note 2) | | PRB | 6 |
| PDSCH transmission mode | | | 9 |
| Note 1: $P_B = 1$. | | | |
| Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8. | | | |
| Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |

**Table 8.9.1.1.3.3-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz QPSK 1/3 | R.64 FDD | OP.1 FDD | EPA5 | 2x1 Low | 70 | 4.7 | 0 |

The normative reference for this requirement is TS 36.101 [2] clause 8.9.1.1.3.

### 8.9.1.1.3.4 Test description

#### 8.9.1.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.9.1.1.3.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9(using only main UE Tx/Rx antenna).
2. The parameter settings for the cell are set up according to Tables 8.9.1.1-1 and 8.9.1.1.3.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.9.1.1.3.4.3.

#### 8.9.1.1.3.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.9.1.1.3.3-1, 8.9.1.1.3.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.9.1.1.3.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 (or 8) using two Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity specified in Table 8.9.1.1-1. CSI-RS are sent on antenna ports 15-22 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.9.1.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 8.9.1.1.3.5 Test requirement

Table 8.9.1.1.3.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause [A.3.3.1] for each throughput test shall meet or exceed the specified value in Table 8.9.1.1.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.9.1.1.3.5-1: Test requirement for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz QPSK 1/3 | R.64 FDD | OP.1 FDD | EPA5 | 2x1 Low | 70 | 5.5 | 0 |

### 8.9.1.1.3_1 FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 1bis

#### 8.9.1.1.3_1.1 Test purpose

Same test purpose as in clause 8.9.1.1.3.

#### 8.9.1.1.3_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 13 and forward of UE category 1bis. Applicability requires support for FGI bit 103.

#### 8.9.1.1.3_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.9.1.1.3_1.3 with the following exceptions:

- Instead of Table 8.9.1.1.3-1, use Table 8.9.1.1.3_1.3-1.
- Instead of Table 8.9.1.1.3-2, use Table 8.9.1.1.3_1.3-2.

**Table 8.9.1.1.3_1.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple CSI-RS configurations**

| parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 (Note 1) | |
| | $\sigma$ | dB | -3 | |

| | | | |
|---|---|---|---|
| Beamforming model | | Annex B.4.1 | Annex B.4.3 |
| Cell-specific reference signals | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | Antenna ports 15,…,18 | Antenna ports 15,16 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | Subframes | 5 / 2 | 5 / 2 |
| CSI reference signal configuration | | 0 | 0 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | Subframes / bitmap | 3 / 0001000000000000 | 3 / 0001000000000000 |
| $N_{oc}$ at antenna port | dBm/15kHz | -98 | -98 |
| Symbols for unused PRBs | | OCNG (Note 4) | OCNG (Note 3) |
| Reporting mode | | N/A | PUSCH 3-1 |
| Reporting interval | | N/A | 5 |
| PMI delay (Note 4) | | N/A | 8 |
| CodeBookSubsetRestriction bitmap | | N/A | 001111 |
| Number of allocated resource blocks (Note 2) | PRB | 6 | 50 |
| PDSCH transmission mode | | 9 | |
| Note 1: $P_B = 1$. | | | |
| Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8. | | | |
| Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |
| Note 4: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). | | | |

**Table 8.9.1.1.3_1.3-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz QPSK 1/3 | R.86 FDD | OP.1 FDD | EPA5 | 2x1 Low | 70 | 2.5 | 1bis |

The normative reference for this requirement is TS 36.101 [2] clause 8.9.1.1.3.

### 8.9.1.1.3_1.4 Test description

Same test description as in clause 8.9.1.1.3 with the following exceptions:

- Instead of Table 8.9.1.1.3-1, use Table 8.9.1.1.3_1.3-1.
- Instead of Table 8.9.1.1.3-2, use Table 8.9.1.1.3_1.3-2.
- Instead of Table 8.9.1.1.3.5-1, use Table 8.9.1.1.3_1.5-1

#### 8.9.1.1.3_1.5 Test requirement

Same test requirements as in clause 8.9.1.1.3.5 with the following exceptions:

- Instead of Table 8.9.1.1.3.3-1, use Table 8.9.1.1.3_1.3-1.
- Instead of Table 8.9.1.1.3.5-1, use Table 8.9.1.1.3_1.5-1.

**Table 8.9.1.1.3_1.5-1: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz QPSK 1/3 | R.86 FDD | OP.1 FDD | EPA5 | 2x1 Low | 70 | 3.3 | 1bis |

### 8.9.1.2 TDD (Fixed Reference Channel)

The parameters specified in Table 8.9.1.2-1 are valid for all TDD tests unless otherwise stated.

**Table 8.9.1.2-1: Common Test Parameters (TDD)**

| Parameter | Unit | Value |
|---|---|---|
| Uplink downlink configuration (Note 1) | | 1 |
| Special subframe configuration (Note 2) | | 4 |
| Cyclic prefix | | Normal |
| Cell ID | | 0 |
| Inter-TTI Distance | | 1 |
| Number of HARQ processes per component carrier | Processes | 7 |
| Maximum number of HARQ transmission | | 4 |
| Redundancy version coding sequence | | {0,1,2,3} for QPSK and 16QAM<br>{0,0,1,2} for 64QAM |
| Number of OFDM symbols for PDCCH per component carrier | OFDM symbols | 4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths,<br>2 for 10 MHz, 15 MHz and 20 MHz bandwidths |
| Precoder update granularity | | Frequency domain: 1 PRG<br>Time domain: 1 ms for Transmission mode 9 |
| ACK/NACK feedback mode | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [4].<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [4]. | | |

#### 8.9.1.2.1 TDD PDSCH Transmit Diversity for UE category 0

##### 8.9.1.2.1.1 Test purpose

The purpose is to verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using transmit diversity.

#### 8.9.1.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward of UE category 0.

#### 8.9.1.2.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.9.1.2-1 and 8.9.1.2.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.9.1.2.1.3-2 for the specified SNR. For transmit diversity (SFBC) performance with 2 transmitter antennas (SFBC) as specified.

**Table 8.9.1.2.1.3-1: Test Parameters for Transmit diversity Performance (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| ACK/NACK feedback mode | | | Multiplexing |
| PDSCH transmission mode | | | 2 |
| Note 1: $P_B = 1$ | | | |

**Table 8.9.1.2.1.3-2: Minimum performance Transmit Diversity (FRC)**

| Test number | Band width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.62 TDD | OP.1 TDD | EPA5 | 2x1 Low | 70 | 8.8 | 0 |

The normative reference for this requirement is TS 36.101 [2] clause 8.9.1.2.1.

#### 8.9.1.2.1.4 Test description

##### 8.9.1.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.9.1.2.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9(using only main UE Tx/Rx antenna).

2. The parameter settings for the cell are set up according to Tables 8.9.1.2-1 and 8.9.1.2.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.9.1.2.1.4.3.

#### 8.9.1.2.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.9.1.2.1.3-1 and 8.9.1.2.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.9.1.2.1.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.9.1.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 8.9.1.2.1.5 Test requirement

Table 8.9.1.2.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause [A.3.4.2] for each throughput test shall meet or exceed the specified value in Table 8.9.1.2.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.9.1.2.1.5-1: Test requirement Transmit Diversity (FRC)**

| Test number | Band width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.62 TDD | OP.1 TDD | EPA5 | 2x1 Low | 70 | 9.6 | 0 |

## 8.9.1.2.2 TDD closed-loop spatial multiplexing performance (Cell-Specific Reference Symbols)

### 8.9.1.2.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

### 8.9.1.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward of UE category 0.

#### 8.9.1.2.2.3 Minimum conformance requirements

The requirements are specified in Table 8.9.1.2.2.3-2, with the addition of the parameters in Table 8.9.1.2.2.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with frequency selective precoding.

**Table 8.9.1.2.2.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 001111 |
| ACK/NACK feedback mode | | | Multiplexing |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.

**Table 8.9.1.2.2.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 64QAM 1/2 | R. 63 TDD | OP.1 TDD | EPA5 | 2x1 Low | 70 | 13.1 | 0 |

The normative reference for this requirement is TS 36.101 [2] clause 8.9.1.2.2.

#### 8.9.1.2.2.4 Test description

##### 8.9.1.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.9.1.2.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to Tables 8.9.1.2-1 and 8.9.1.2.2.3-1 as appropriate.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.9.1.1.2.4.3.

#### 8.9.1.2.2.4.2 Test procedure

1. For single-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.9.1.2.2.3-1 and 8.9.1.2.2.3-2.The SS sends downlink MAC padding bits on the DL RMC.

2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.

3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.9.1.2.2.5-1 as appropriate.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

5. Repeat steps from 1 to 4 for each test interval in Tables 8.9.1.2.2.5-1 as appropriate.

#### 8.9.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.9.1.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation for Test number 1**

| Derivation Path: 36.508 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 001111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.9.1.2.2.4.3-2: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop single -layer spatial multiplexing performance downlink power allocation for Test number 1**

| Derivation Path: 36.508 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

#### 8.9.1.2.2.5 Test requirement

Table 8.9.1.2.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.9.1.2.2.3-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.9.1.2.2.5-1: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 64QAM 1/2 | R. 63 TDD | OP.1 TDD | EPA5 | 2x1 Low | 70 | 13.9 | 0 |

### 8.9.1.2.2_1 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 4x1 for UE Category 1bis

#### 8.9.1.2.2_1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on four Tx antenna ports using closed-loop rank-one spatial multiplexing.

#### 8.9.1.2.2_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 13 and forward of UE category 1bis.

#### 8.9.1.2.2_1.3 Minimum conformance requirements

The requirements are specified in Table 8.9.1.2.2_1.3-2, with the addition of the parameters in Table 8.9.1.2.2_1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with frequency selective precoding.

**Table 8.9.1.2.2_1.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | $\sigma$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 000000000000FFFF |
| ACK/NACK feedback mode | | | Multiplexing |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.

**Table 8.9.1.2.2_1.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 64QAM 1/2 | R.85 TDD | OP.1 TDD | EPA5 | 4x1 Low | 70 | 11.6 | 1bis |

The normative reference for this requirement is TS 36.101 [2] clause 8.9.1.2.2.2.

### 8.9.1.2.2_1.4 Test description

#### 8.9.1.2.2_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.9.1.2.2_1.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.11 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Tables 8.9.1.2-1 and 8.9.1.2.2_1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.9.1.1.2.4.3.

#### 8.9.1.2.2_1.4.2 Test procedure

1. For single-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.9.1.2.2_1.3-1 and 8.9.1.2.2_1.3-2.The SS sends downlink MAC padding bits on the DL RMC.
2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.9.1.2.2_1.5-1 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
5. Repeat steps from 1 to 4 for each test interval in Tables 8.9.1.2.2_1.5-1 as appropriate.

#### 8.9.1.2.2_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.9.1.2.2_1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.9.1.2.2_1.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 000000000000FFFF | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.9.1.2.2_1.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop single -layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

### 8.9.1.2.2_1.5 Test requirement

Table 8.9.1.2.2_1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.9.1.2.2_1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.9.1.2.2_1.5-1: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 64QAM 1/2 | R.85 TDD | OP.1 TDD | EPA5 | 4x1 Low | 70 | 12.4 | 1bis |

### 8.9.1.2.3 TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 0)

#### 8.9.1.2.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 without a simultaneous transmission on the other antenna port and multiple CSI reference symbols configurations with non-zero and zero transmission power.

#### 8.9.1.2.3.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward of UE category 0. Applicability requires support for FGI bit 103.

#### 8.9.1.2.3.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.1, with the addition of the relevant parameters in Tables 8.9.1.2-1 and 8.9.1.2.3.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.9.1.2.3.3-2 for the specified SNR.

**Table 8.9.1.2.3.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple CSI-RS configurations**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 |
| Beamforming model | | | Annex B.4.1 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 4 |
| CSI reference signal configuration | | | 1 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 4 / 0010000100000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 4) |
| Number of allocated resource blocks (Note 2) | | PRB | 6 |
| Simultaneous transmission | | | No |
| PDSCH transmission mode | | | 9 |
| Note 1: $P_B = 1$. | | | |
| Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8. | | | |
| Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |

**Table 8.9.1.2.3.3-2: Minimum performance for CDM-multiplexed DM RS without simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz QPSK 1/3 | R.64 TDD | OP.1 TDD | EPA5 | 2x1 Low | 70 | 4.5 | 0 |

The normative reference for this requirement is TS 36.101 [2] clause 8.9.1.2.3.

## 8.9.1.2.3_1 TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 1bis

### 8.9.1.2.3_1.1 Test purpose

Same test purpose as in clause 8.9.1.2.3.

### 8.9.1.2.3_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 13 and forward of UE category 1bis. Applicability requires support for FGI bit 103.

### 8.9.1.2.3_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.9.1.2.3_1.3 with the following exceptions:

- Instead of Table 8.9.1.2.3-1, use Table 8.9.1.2.3_1.3-1.
- Instead of Table 8.9.1.2.3-2, use Table 8.9.1.2.3_1.3-2.

**Table 8.9.1.2.3_1.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple CSI-RS configurations**

| Parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 (Note 1) | |
| | $\sigma$ | dB | -3 | |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 | Antenna ports 15,16 |
| Beamforming model | | | Annex B.4.1 | Annex B.4.3 |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | Subframes | 5 / 4 | 5 / 4 |
| CSI reference signal configuration | | | 1 | 1 |
| Zero-power CSI-RS configuration $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 4 / 0010000100000000 | 4 / 0000001000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Symbols for unused PRBs | | | OCNG (Note 4) | OCNG (Note 3) |
| Reporting mode | | | N/A | PUSCH 3-1 |
| Reporting interval | | | N/A | 5 |
| PMI delay (Note 4) | | | N/A | 10 |
| CodeBookSubsetRestriction bitmap | | | N/A | 001111 |
| Number of allocated resource blocks (Note 2) | | PRB | 6 | |
| Simultaneous transmission | | | No | |
| PDSCH transmission mode | | | 9 | |

Note 1: $P_B = 1$.
Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.
Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.
Note 4: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

**Table 8.9.1.2.3_1.3-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz QPSK 1/3 | R.86 TDD | OP.1 TDD | EPA5 | 2x1 Low | 70 | 2.9 | 1bis |

The normative reference for this requirement is TS 36.101 [2] clause 8.9.1.2.3.

### 8.9.1.2.3_1.4 Test description

Same test description as in clause 8.9.1.1.3 with the following exceptions:

- Instead of Table 8.9.1.2.3-1, use Table 8.9.1.2.3_1.3-1.
- Instead of Table 8.9.1.2.3-2, use Table 8.9.1.2.3_1.3-2.
- Instead of Table 8.9.1.2.3.5-1, use Table 8.9.1.2.3_1.5-1

### 8.9.1.2.3_1.5 Test requirement

Same test requirements as in clause 8.9.1.1.3.5 with the following exceptions:

- Instead of Table 8.9.1.2.3.3-1, use Table 8.9.1.2.3_1.3-1.
- Instead of Table 8.9.1.2.3.5-1, use Table 8.9.1.2.3_1.5-1.

**Table 8.9.1.2.3_1.5-1: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 2 | 10 MHz QPSK 1/3 | R.86 TDD | OP.1 TDD | EPA5 | 2x1 Low | 70 | 3.7 | 1bis |

### 8.9.1.2.3.4 Test description

#### 8.9.1.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.9.1.2.3.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9(using only main UE Tx/Rx antenna).

2. The parameter settings for the cell are set up according to Tables 8.9.1.2-1 and 8.9.1.2.3.3-1 as appropriate.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.9.1.2.3.4.3.

#### 8.9.1.2.3.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.9.1.1.3.3-1, 8.9.1.1.3.3-2. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.9.1.1.3.5-1 as appropriate.
BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 (or 8) using two Tx antennas with beam-forming model as specified in Annex B.4.1 and precoder update granularity specified in Table 8.9.1.1-1. CSI-RS are sent on antenna ports 15-22 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.1.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.9.1.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 8.9.1.2.3.5 Test requirement

Table 8.9.1.2.3.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause [A.3.4.1] for each throughput test shall meet or exceed the specified value in Table 8.9.1.2.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.9.1.2.3.5-1: Test requirement for CDM-multiplexed DM RS without simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz QPSK 1/3 | R.64 TDD | OP.1 TDD | EPA5 | 2x1 Low | 70 | 5.3 | 0 |

# 8.9.2 PHICH

## 8.9.2.1 FDD and half-duplex FDD

### 8.9.2.1.1 FDD PHICH Transmit Diversity for UE category 0

#### 8.9.2.1.1.1 Test purpose

To verify the demodulation performance of PHICH for transmit diversity with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

#### 8.9.2.1.1.2 Test applicability

This test applies to all type of E-UTRA FDD UE release 12 and forward of UE category 0.

#### 8.9.2.1.1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.9.2.1.1.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Single antenna port | Transmit diversity |
|---|---|---|---|---|
| Downlink power allocation | PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | 0 | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | 0 | -3 |
| PHICH duration | | | Normal | Normal |
| PHICH Ng (Note 1) | | | Ng = 1 | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG | OCNG |
| Cell ID | | | 0 | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 |
| Cyclic prefix | | | Normal | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [4] | | | | |

For the parameters specified in Table 8.9.2.1.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.9.2.1.1.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.9.2.1.1.3-2: Minimum performance PHICH**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) | |
| 1 | 10 MHz | R.19 | OP.1 FDD | EPA5 | 2 x 1 Low | 0.1 | 8.6 | 0, 1bis |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.1 and 8.9.2.1.1.

### 8.9.2.1.1.4 Test description

#### 8.9.2.1.1.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: Depending on the bandwidth specified per test number in Table 8.9.2.1.1.3-2, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna..
2. The parameter settings for the cell are set up according to Table 8.9.2.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.9.2.1.1.4.3.

#### 8.9.2.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.9.2.1.1.5-1.
2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1a to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex 3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.9.2.1.1.4.2-1 indicates the transmissions for one cycle.

**Table 8.9.2.1.1.4.2-1: PHICH test pattern**

| TTI | 1-3 | 4 | 5-7 | 8 | 9-11 | 12 | 13-15 | 16 | 17-19 | 20 | 21-23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PDCCH | S | | - | | - | | - | | S | | - | |
| PHICH | - | | - | | A | | - | | - | | - | |
| PUSCH | - | | T | | - | | R | | - | | T | |
| UL HARQ Process | - | | 5-7 | | - | | 5-7 | | - | | 5-7 | |

Note 1: This table gives an example test pattern for HARQ process for HD-FDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 15. DTXs on TTI 13 to 15 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.
4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
If Pm-an is less than the value specified in table 8.9.2.1.1.5-1, pass the UE. Otherwise fail the UE.

#### 8.9.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.9.2.1.1.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

### 8.9.2.1.1.5 Test requirement

For the parameters specified in Table 8.9.2.1.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.9.2.1.1.5-1.

**Table 8.9.2.1.1.5-1: Test requirement PHICH**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.19 | OP.1 FDD | EPA5 | 2 x 1 Low | 0.1 | 9.5 |

### 8.9.2.1.1_1 FDD PHICH Transmit Diversity for UE category 1bis

### 8.9.2.1.1_1.1 Test purpose

To verify the demodulation performance of PHICH for transmit diversity with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

### 8.9.2.1.1_1.2 Test applicability

This test applies to all type of E-UTRA FDD UE release 13 and forward of UE category 1bis.

### 8.9.2.1.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.9.2.1.1.3.

The normative reference for this requirement is TS 36.101 [2] clause 8.5.1 and 8.9.2.1.1.

### 8.9.2.1.1_1.4 Test description

#### 8.9.2.1.1_1.4.1 Initial conditions

Same initial conditions as in clause 8.9.2.1.1.4.1.

#### 8.9.2.1.1_1.4.2 Test procedure

Same test procedure as in clause 8.9.2.1.1.4.2.

#### 8.9.2.1.1_1.4.3 Message contents

Same message content in clause 8.9.2.1.1.4.3.

#### 8.9.2.1.1_1.5 Test requirement

For the parameters specified in Table 8.9.2.1.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.9.2.1.1_1.5-1.

**Table 8.9.2.1.1_1.5-1: Test requirement PHICH**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) | |
| 1 | 10 MHz | R.19 | OP.1 FDD | EPA5 | 2 x 1 Low | 0.1 | 9.5 | 1bis |

### 8.9.2.2.1 TDD PHICH Transmit Diversity for UE category 0

#### 8.9.2.2.1.1 Test purpose

To verify the demodulation performance of PHICH for transmit diversity with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

#### 8.9.2.2.1.2 Test applicability

This test applies to all type of E-UTRA FDD UE release 12 and forward of UE category 0.

#### 8.9.2.2.1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold detection).

**Table 8.9.2.2.1.3-1: Test Parameters for PHICH**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 1 |
| Special subframe configuration (Note 2) | | | 4 |
| Downlink power allocation | PCFICH_RA<br>PDCCH_RA<br>PHICH_RA<br>OCNG_RA | dB | -3 |
| | PCFICH_RB<br>PDCCH_RB<br>PHICH_RB<br>OCNG_RB | dB | -3 |
| PHICH duration | | | Normal |
| Number of PHICH groups (Note 3) | | | Ng = 1 |
| Cell ID | | | 0 |
| PDCCH Content | | UL Grant should be included with the proper information aligned with A.3.6. | |
| Unused RE-s and PRB-s | | | OCNG |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8]<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8]<br>Note 3: according to Clause 6.9 in TS 36.211 [8]<br>Note 4: PHICH power settings refer to PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | | |

For the parameters specified in Table 8.9.2.2.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.9.2.2.1.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.9.2.2.1.3-2: Minimum performance PHICH**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.19 | OP.1 TDD | EPA5 | 2 x 1 Low | 0.1 | 8.6 |

The normative reference for this requirement is TS 36.101 [2] clause 8.5.2 and 8.9.2.2.1.

### 8.9.2.2.1.4 Test description

#### 8.9.2.2.1.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: Depending on the bandwidth specified per test number in Table 8.9.2.2.1.3-2, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna..

2. The parameter settings for the cell are set up according to Table 8.9.2.2.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.9.2.2.1.4.3.

### 8.9.2.2.1.4.2 Test procedure

Same test procedure as defined in clause 8.5.2.2.1.4.2 with the following exceptions:

- Instead of Table A.2.3.1.1-1 → use Table A.2.3.1.1-1a.

### 8.9.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.9.2.2.1.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

### 8.9.2.2.1.5 Test requirement

For the parameters specified in Table 8.9.2.2.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.9.2.2.1.5-1.

**Table 8.9.2.2.1.5-1: Test requirement PHICH**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.19 | OP.1 TDD | EPA5 | 2 x 1 Low | 0.1 | 9.5 |

## 8.9.2.2.1_1 TDD PHICH Transmit Diversity for UE category 1bis

### 8.9.2.2.1_1.1 Test purpose

To verify the demodulation performance of PHICH for transmit diversity with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels remains below a specified value.

### 8.9.2.2.1_1.2 Test applicability

This test applies to all type of E-UTRA TDD UE release 13 and forward of UE category 1bis.

### 8.9.2.2.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 8.9.2.2.1.3.

The normative reference for this requirement is TS 36.101 [2] clause 8.5.2 and 8.9.2.2.1.

#### 8.9.2.2.1_1.4 Test description

##### 8.9.2.2.1_1.4.1 Initial conditions

Same initial conditions as in clause 8.9.2.2.1.4.1.

##### 8.9.2.2.1_1.4.2 Test procedure

Same test procedure as in clause 8.9.2.2.1.4.2.

##### 8.9.2.2.1_1.4.3 Message contents

Same message content in clause 8.9.2.2.1.4.3.

#### 8.9.2.2.1_1.5 Test requirement

For the parameters specified in Table 8.9.2.2.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.9.2.2.1_1.5-1.

**Table 8.9.2.2.1_1.5-1: Test requirement PHICH**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | | UE DL category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) | |
| 1 | 10 MHz | R.19 | OP.1 TDD | EPA5 | 2 x 1 Low | 0.1 | 9.5 | 1bis |

# 8.10 Demodulation (4 receiver antenna ports)

The performance requirements specified in this clause are valid for 4Rx capable UEs.

## 8.10.1 PDSCH

### 8.10.1.1 FDD (Fixed Reference Channel)

#### 8.10.1.1.1 FDD PDSCH Transmit Diversity 2x4

##### 8.10.1.1.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using transmit diversity (SFBC).

##### 8.10.1.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward UE of Category 2 or higher that supports 4 Rx antenna ports on any FDD band

##### 8.10.1.1.1.3 Minimum conformance requirements

The requirements are specified in Table 8.10.1.1.1.3-2, with the addition of the parameters in Table 8.10.1.1.1.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.10.1.1.1.3-1: Test Parameters for Transmit diversity Performance (FRC) with 4 RX Antenna Ports**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (NOTE 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 2 |
| NOTE 1: $P_B = 1$. | | | |

**Table 8.10.1.1.1.3-2: Minimum performance Transmit Diversity (FRC) with 4 RX Antenna Ports**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.11 FDD | OP.1 FDD | EVA5 | 2x4 Medium correlation A, ULA | 70 | 3.9 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.1.1.

### 8.10.1.1.1.4 Test description

#### 8.10.1.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.10.1.1.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.76.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.10.1.1.1.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.1.1.4.3.

#### 8.10.1.1.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.10.1.1.1.3-1 and 8.10.1.1.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.10.1.1.1.5-1 as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.10.1.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

### 8.10.1.1.1.5 Test requirement

Table 8.10.1.1.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.10.1.1.1.5-2 for the specified SNR including test tolerances.

**Table 8.10.1.1.1.5-1: Test Parameters for Transmit diversity Performance (FRC) with 4 RX Antenna Ports**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (NOTE 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 2 |
| NOTE 1: $P_B = 1$. | | | |

**Table 8.10.1.1.1.5-2: Minimum performance Transmit Diversity (FRC) with 4 RX Antenna Ports**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.11 FDD | OP.1 FDD | EVA5 | 2x4 Medium correlation A, ULA | 70 | 4.8 | ≥2 |

## 8.10.1.1.2 FDD PDSCH Open Loop Spatial Multiplexing 2x4

### 8.10.1.1.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

### 8.10.1.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward UE of Category 2 or higher that supports 4 Rx antenna ports on any FDD band.

#### 8.10.1.1.2.3 Minimum conformance requirements

The requirements are specified in Table 8.10.1.1.2.3-2, with the addition of the parameters in Table 8.10.1.1.2.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.10.1.1.2.3-1: Test Parameters for Large Delay CDD (FRC) with 4 RX Antenna Ports**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (NOTE 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 3 |
| NOTE 1: $P_B = 1$. | | | |

**Table 8.10.1.1.2.3-2: Minimum performance Large Delay CDD (FRC) with 4 RX Antenna Ports**

| Test num | Bandwidth and MCS | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | UE cate gory |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.11 FDD | OP.1 FDD | EVA70 | 2x4 Low | 70 | 8.0 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.1.2.

#### 8.10.1.1.2.4 Test description

##### 8.10.1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.10.1.1.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.76.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.10.1.1.2.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.1.2.4.3.

##### 8.10.1.1.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.10.1.1.2.3-1 and 8.10.1.1.2.3-2. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.10.1.1.2.5-1 as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.10.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.10.1.1.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.10.1.1.2.5 Test requirement

Table 8.10.1.1.2.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.10.1.1.2.5-2 for the specified SNR including test tolerances.

**Table 8.10.1.1.2.5-1: Test Parameters for Large Delay CDD (FRC) with 4 RX Antenna Ports**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (NOTE 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 3 |
| NOTE 1: $P_B = 1$. | | | |

**Table 8.10.1.1.2.5-2: Minimum performance Large Delay CDD (FRC) with 4 RX Antenna Ports**

| Test num | Bandwidth and MCS | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | UE cate gory |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.11 FDD | OP.1 FDD | EVA70 | 2x4 Low | 70 | 8.9 | ≥2 |

### 8.10.1.1.3 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model – Enhanced Performance Requirement Type A

#### 8.10.1.1.3.1 Test purpose

The purpose of these tests is to verify the closed loop rank one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 4 interference model defined in clause B.5.3.

#### 8.10.1.1.3.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward that supports 4 Rx antenna ports and enhanced receiver Type A

#### 8.10.1.1.3.3 Minimum conformance requirements

The requirements are specified in Table 8.10.1.1.3-2, with the addition of parameters in Table 8.10.1.1.3.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.10.1.1.3.3-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell.

**Table 8.10.1.1.3.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model and 4 RX Antenna Ports**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 1 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 6 | 4 |
| Interference model | | | N/A | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 |
| | Rank 2 | % | N/A | 20 |
| Precoding granularity | | PRB | 50 | 6 |
| PMI delay (Note 4) | | ms | 8 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 1111 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}$´ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2 is the interfering cell.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

**Table 8.10.1.1.3.3-2: Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model and 4 RX Antenna Ports**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.47 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x4 Low | 70 | -2.3 | ≥1 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.1.3.

### 8.10.1.1.3.4 Test description

#### 8.10.1.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.10.1.1.3.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.73.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.10.1.1.3.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.1.3.4.3.

#### 8.10.1.1.3.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to Tables 8.10.1.1.3.5-1 and 8.10.1.1.3.5-2. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1 and #6 (Table A.2.2.1.2-1).
2. SS sets up parameters for cell 2 according to table 8.10.1.1.3.5-1 as appropriate.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SINR according to Tables 8.10.1.1.3.5-2 as appropriate.
4. Measure the average throughput for duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.5.

8.10.1.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.10.1.1.3.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.10.1.1.3.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 2 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 483 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

8.10.1.1.3.5 Test requirement

Table 8.10.1.1.3.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.10.1.1.3.5-2 for the specified SINR including test tolerances.

**Table 8.10.1.1.3.5-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model and 4 RX Antenna Ports**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.45 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 1 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 6 | 4 |
| Interference model | | | N/A | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 |
| | Rank 2 | % | N/A | 20 |
| Precoding granularity | | PRB | 50 | 6 |
| PMI delay (Note 4) | | ms | 8 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 1111 | N/A |

Note 1: $P_B = 1$
Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.
Note 3: Cell 1 is the serving cell. Cell 2 is the interfering cell.
Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 5: All cells are time-synchronous.

**Table 8.10.1.1.3.5-2: Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model and 4 RX Antenna Ports**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.47 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x4 Low | 70 | -1.32 | ≥1 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.
Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1.
Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

### 8.10.1.1.4 FDD PDSCH Closed Loop Spatial Multiplexing 4x4

#### 8.10.1.1.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on four antenna ports using closed-loop spatial multiplexing.

#### 8.10.1.1.4.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward UE of Category 2 or higher that supports 4 Rx antenna ports on any FDD band.

#### 8.10.1.1.4.3 Minimum conformance requirements

For single carrier, the requirements are specified in Table 8.10.1.1.4.3-2, with the addition of the parameters in Table 8.10.1.1.4.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.10.1.1.4.3-1: Test Parameters for Dual-Layer Spatial Multiplexing (FRC) with 4 RX Antenna Ports**

| Parameter | | Unit | Test 1-2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000<br>00001111111111111111100000000000000 |
| PDSCH transmission mode | | | 4 |
| Note 1: $P_B = 1$.<br>Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). | | | |

**Table 8.10.1.1.4.3-2: Minimum performance Dual-Layer Spatial Multiplexing (FRC) with 4 RX Antenna Ports**

| Test num. | Bandwidth and MCS | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | UE cate-gory | DL UE categ ory |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum throughput (%) | SNR (dB) | | |
| 1 | 10 MHz | R.36 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 10.1 | ≥2 | ≥6 |
| 2 | 10 MHz 256 QAM | R.72 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 18.0 | 11-12 | ≥11 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.1.4.

#### 8.10.1.1.1.4 Test description

##### 8.10.1.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.10.1.1.4.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.74.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.10.1.1.4.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.1.4.4.3.

##### 8.10.1.1.4.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.10.1.1.4.5-1 and 8.10.1.1.4.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.10.1.1.4.5-1 and 8.10.1.1.4.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
5. Repeat steps from 1 to 4 for each test interval in Tables 8.10.1.1.4.5-1 and 8.10.1.1.4.5-2 as appropriate.

##### 8.10.1.1.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.10.1.1.4.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.10.1.1.4.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000111111111111111100000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.10.1.1.4.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional FDD PDSCH closed loop single/multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

### 8.10.1.1.4.5 Test requirement

Table 8.10.1.1.4.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.10.1.1.4.5-2 for the specified SNR including test tolerances.

**Table 8.10.1.1.4.5-1: Test Parameters for Dual-Layer Spatial Multiplexing (FRC) with 4 RX Antenna Ports**

| Parameter | | Unit | Test 1-2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000111111111111111111100000000000000000 |
| PDSCH transmission mode | | | 4 |
| Note 1: $P_B = 1$. | | | |
| Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). | | | |

**Table 8.10.1.1.4.5-2: Minimum performance Dual-Layer Spatial Multiplexing (FRC) with 4 RX Antenna Ports**

| Test num. | Bandwidth and MCS | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | Reference value | | UE cate-gory | DL UE categ ory |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of maximum throughput (%) | SNR (dB) | | |
| 1 | 10 MHz | R.36 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 11 | ≥2 | ≥6 |
| 2 | 10 MHz 256 QAM | R.72 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 18.9 | 11-12 | ≥11 |

## 8.10.1.1.5 FDD PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 interference model – Enhanced Performance Requirement Type A

Editor's Note: This test case is incomplete. The following items are missing or are incomplete:

- CQI reporting config IEs under message contents are TBD

### 8.10.1.1.5.1 Test purpose

The purpose of these tests is to verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4.

### 8.10.1.1.5.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward that supports 4 Rx antenna ports and enhanced receiver Type A. Applicability requires support for FGI bit 103.

### 8.10.1.1.5.3 Minimum conformance requirements

The requirements are specified in Table 8.10.1.1.5.3-2, with the addition of the parameters in Table 8.10.1.1.5.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell

applying transmission mode 9 interference model defined in clause B.5.4. In 8.10.1.1.5.3-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

**Table 8.10.1.1.5.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model and 4 RX Antenna Ports**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | Subframes | 5 / 2 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 126 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 9 | N/A |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |
| Precoder update granularity | | PRB | 50 | 6 |
| PMI delay (Note 5) | | Ms | 8 | N/A |
| Reporting interval | | Ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) used for the input signal under test | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}$´ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 6: These physical resource blocks are assigned to an arbitrary number of virtual UEs

| | |
|---|---|
| | with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. |
| Note 7: | All cells are time-synchronous. |

**Table 8.10.1.1.5.3-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model and 4 RX Antenna Ports**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R. 76 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x4 Low | 70 | -3.0 | ≥1 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.1.5.

### 8.10.1.1.5.4 Test description

#### 8.10.1.1.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10 MHz, as specified in Table 8.10.1.1.5.5-1, and as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.73.

2. The parameter settings for the cell 1 are set up according to Tables 8.3.1-1 and 8.10.1.1.5.5-1 as appropriate.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.1.5.4.3.

#### 8.10.1.1.5.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.10.1.1.5.5-1, 8.10.1.1.5.5-2. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #4 and #9 (Table A.2.2.1.1-1).

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.10.1.1.5.5-2 as appropriate.
BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/PDSCH for the test UE are sent on antenna port 7 (or 8) using two Tx antennas with beam-forming model as specified in

Annex B.4.3 and precoder update granularity specified in Table 8.10.1.1.5.5-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.3.

3. Set the Cell2 –aggressor cell– as defined in Tables 8.10.1.1.5.5-1, 8.10.1.1.5.5-2 and according to Annex B.5.4.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

### 8.10.1.1.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.10.1.1.5.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.10.1.1.5.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 001111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.10.1.1.5.4.3-3: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; $T_{\text{CSI-RS}} = 5$; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.10.1.1.5.4.3-4: *CQI-ReportPeriodic-r10***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-2AC CQI-ReportPeriodic-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 5 | FDD | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex | 483 | FDD | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |

**Table 8.10.1.1.5.4.3-5: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT using condition CQI_PERIODIC | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 8.10.1.1.5.4.3-6: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

### 8.10.1.1.5.5 Test requirement

Table 8.10.1.1.5.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3.1 for throughput test shall meet or exceed the specified value in Table 8.10.1.1.5.5-2 for the specified SINR including test tolerances.

**Table 8.10.1.1.5.5-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model and 4 RX Antenna Ports**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | Subframes | 5 / 2 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.45 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 126 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 9 | N/A |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |
| Precoder update granularity | | PRB | 50 | 6 |
| PMI delay (Note 5) | | Ms | 8 | N/A |
| Reporting interval | | Ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) used for the input signal under test | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}$´ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 6: These physical resource blocks are assigned to an arbitrary number of virtual UEs

| | |
|---|---|
| | with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. |
| Note 7: | All cells are time-synchronous. |

**Table 8.10.1.1.5.5-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model and 4 RX Antenna Ports**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R. 76 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x4 Low | 70 | -2.02 | ≥1 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | |

## 8.10.1.1.6 FDD Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols)

### 8.10.1.1.6.1 Test purpose

To verify the UE's rank-2 performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for dual-layer transmission on antenna ports 7 and 8 using DM-RS with full RB allocation with multiple CSI reference symbol configurations with non-zero and zero transmission power, and to verify that the UE correctly estimate SNR.

### 8.10.1.1.6.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward UE of Category 2 or higher that supports 4 Rx antenna ports on any FDD band. Applicability requires support for FGI bit 103.

### 8.10.1.1.6.3 Minimum conformance requirements

For dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.10.1.1.6.3-2, with the addition of the parameters in Table 8.10.1.1.6.3-1 where Cell 1 is the serving cell and Cell 2 is the interfering cell. The downlink physical channel setup is set according to Annex C.3.2. The purpose of these tests is to verify the rank-2 performance for full RB allocation, to verify rate matching with multiple CSI reference symbol configurations with non-zero and zero transmission power, and to verify that the UE correctly estimate SNR.

**Table 8.10.1.1.6.3-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations with 4 RX Antenna Ports**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| | | | Cell 1 | Cell 2 |
| Downlink power allocation | $\rho_A$ | dB | 4 | 0 |
| | $\rho_B$ | dB | 4 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0 and 1 | Antenna ports 0 and 1 |
| Cell ID | | | 0 | 126 |
| CSI reference signals | | | Antenna ports 15,16 | NA |
| Beamforming model | | | Annex B.4.2 | NA |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 2 | NA |
| CSI reference signal configuration | | | 8 | NA |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 3 / 0010000000000000 | NA |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | NA |
| $\hat{E}_s / N_{oc}$ | | | Reference Value in Table 8.10.1.1.6-2 | 7.25dB |
| Symbols for unused PRBs | | | OCNG (Note 2) | NA |
| Number of allocated resource blocks (Note 2) | | PRB | 50 | NA |
| Simultaneous transmission | | | No | NA |
| PDSCH transmission mode | | | 9 | Blanked |

Note 1: $P_B = 1$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.10.1.1.6.3-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations and 4 RX Antenna Ports**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | | Propagation Condition | | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM ½ | R.51 FDD | OP.1 FDD | N/A | ETU5 | ETU5 | 2x4 Low | 70 | 9.2 | ≥2 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1.

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.1.6.

#### 8.10.1.1.6.4 Test description

##### 8.10.1.1.6.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.10.1.1.6.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.73.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.10.1.1.6.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.1.6.4.3.

##### 8.10.1.1.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.10.1.1.6.3-1, 8.10.1.1.6.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.10.1.1.6.5-2 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna ports 7 and 8 using two Tx antennas with beam-forming model as specified in Annex B.4.2 and precoder update granularity specified in Table 8.3.1-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.2.
3. Set Cell 2 as defined in Tables 8.10.1.1.6.5-1 and 8.10.1.1.6.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.10.1.1.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.10.1.1.6.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::=<br>SEQUENCE { | | | |
| p-a | dB4 for Cell 1<br>dB0 for Cell 2 | According to each Cell in test 1 | |
| } | | | |

**Table 8.10.1.1.6.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.10.1.1.6.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.10.1.1.6.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 8 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 4 for Cell 1<br>0 for Cell 2 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 3 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

8.10.1.1.6.5 Test requirement

Table 8.10.1.1.6.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.10.1.1.6.5-2 for the specified SNR including test tolerances.

**Table 8.10.1.1.6.3-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations with 4 RX Antenna Ports**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| | | | Cell 1 | Cell 2 |
| Downlink power allocation | $\rho_A$ | dB | 4 | 0 |
| | $\rho_B$ | dB | 4 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0 and 1 | Antenna ports 0 and 1 |
| Cell ID | | | 0 | 126 |
| CSI reference signals | | | Antenna ports 15,16 | NA |
| Beamforming model | | | Annex B.4.2 | NA |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 2 | NA |
| CSI reference signal configuration | | | 8 | NA |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 3 / 0010000000000000 | NA |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | NA |
| $\hat{E}_s / N_{oc}$ | | | Reference Value in Table 8.10.1.1.6-2 | 6.9dB |
| Symbols for unused PRBs | | | OCNG (Note 2) | NA |
| Number of allocated resource blocks (Note 2) | | PRB | 50 | NA |
| Simultaneous transmission | | | No | NA |
| PDSCH transmission mode | | | 9 | Blanked |
| Note 1: $P_B = 1$<br>Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | | |

**Table 8.10.1.1.6.3-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations and 4 RX Antenna Ports**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | | Propagation Condition | | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM ½ | R.51 FDD | OP.1 FDD | N/A | ETU5 | ETU5 | 2x4 Low | 70 | 10.0 | ≥2 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1. | | | | | | | | | | |

### 8.10.1.1.7 FDD Open-loop spatial multiplexing, 3 Layer Multiplexing with 4 Tx Antenna Ports

#### 8.10.1.1.7.1 Test purpose

The purpose of these tests is to verify the open loop spatial multiplexing performance using 3 Layer multiplexing with 4Tx antenna ports.

#### 8.10.1.1.7.2 Test applicability

This test applies to all types of E-UTRA FDD release 10 and forward UE of category ≥ 5 that support 4Rx Antenna ports and 3-layer spatial multiplexing for PDSCH transmission mode 3.

#### 8.10.1.1.7.3 Minimum conformance requirements

The requirements are specified in Table 8.10.1.1.7.3-2, with the addition of parameters in Table 8.10.1.1.7.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.10.1.1.7.3-1: Test parameters for Open Loop spatial multiplexing, 3 Layers with 4 Tx ports and 4 Rx ports**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1,2,3 |
| $N_{oc}$ at antenna port | | dBm/15k Hz | -98 |
| PDSCH transmission mode | | | 3 |
| PDSCH rank | | | 3 |
| Number of HARQ processes | | | 8 |
| HARQ redundancy version | | | {0,0,1,2} |
| CFI | | | 2 |
| Note 1: $P_B = 1$. | | | |

**Table 8.10.1.1.7.3-2: Minimum performance Open Loop spatial multiplexing, 3 Layers with 4 Tx ports and 4 Rx ports**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.73 FDD | OP.1 FDD | EVA70 | 4x4 Low | 70 | 15.1 | ≥5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.1.7.

#### 8.10.1.1.7.4 Test description

##### 8.10.1.1.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified in Table 8.10.1.1.7.3-2 and as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.74.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.10.1.1. 7.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.1.7.4.3.

### 8.10.1.1.7.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.10.1.1.7.3-1 and 8.10.1.1.7.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SINR according to Table 8.10.1.1.7.5-1 as appropriate.
3. Measure the average throughput for duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.5.

### 8.10.1.1.7.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.10.1.1.7.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.10.1.1.7.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm3 | 0100 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.10.1.1.7.4.3-3: *RRCConnectionReconfiguration***

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | Not present | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.10.1.1.7.5 Test requirement

Table 8.10.1.1. 7.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.10.1.1.7.5-2 for the specified SINR including test tolerances.

**Table 8.10.1.1.7.5-1: Test Config for Open Loop spatial multiplexing, 3 Layers with 4 Tx ports and 4 Rx ports**

| **Parameter** | | **Unit** | **Test 1** |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1,2,3 |
| $N_{oc}$ at antenna port | | dBm/15k Hz | -98 |
| PDSCH transmission mode | | | 3 |
| PDSCH rank | | | 3 |
| Number of HARQ processes | | | 8 |
| HARQ redundancy version | | | {0,0,1,2} |
| CFI | | | 2 |
| Note 1: $P_B = 1$. | | | |

**Table 8.10.1.1.7.5-2: Test Requirements for Open Loop spatial multiplexing, 3 Layers with 4 Tx ports and 4 Rx ports**

| **Test number** | **Band-width** | **Reference Channel** | **OCNG Pattern** | **Propagation Condition** | **Correlation Matrix and Antenna Configuration** | **Reference value** | | **UE Category** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | **Fraction of Maximum Throughput (%)** | **SNR (dB)** | |
| 1 | 10 MHz | R.73 FDD | OP.1 FDD | EVA70 | 4x4 Low | 70 | 16.0 | ≥5 |

8.10.1.1.8 FDD Closed-loop spatial multiplexing performance, 4 Layers spatial multiplexing 4 Tx antennas

8.10.1.1.8.1 Test purpose

To verify the UE's ability with 4Rx capabilities to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink

Reference Measurement Channel (RMC) not falling below a specified value for transmission on four Tx antenna ports using closed-loop spatial multiplexing.

#### 8.10.1.1.8.2 Test applicability

This test applies to E-UTRA FDD release 10 and forward UE of category ≥ 5 which supports 4Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 4.

#### 8.10.1.1.8.3 Minimum conformance requirements

The requirements are specified in Table 8.10.1.1.8.3-2, with the addition of the parameters in Table 8.10.1.1.8.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.10.1.1.8.3-1: Test parameters for Closed Loop spatial multiplexing, 4 Layers spatial multiplexing with 4 Tx ports and 4 Rx ports**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15k Hz | -98 |
| Cell-specific reference signals | | | Antenna Ports 0,1,2,3 |
| PDSCH transmission mode | | | 4 |
| PDSCH rank | | | 4 |
| Number of HARQ processes | | | 8 |
| HARQ redundancy version | | | {0,1,2,3} |
| CFI | | | 2 |
| Precoding granularity | | PRB | 50 |
| PMI delay | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 3-1 |
| CodeBookSubsetRestriction bitmap | | | 0xFFFF000000000000 |
| Note 1: $P_B = 1$. | | | |

**Table 8.10.1.1.8.3-2: Minimum performance for Closed Loop spatial multiplexing, 4 Layers spatial multiplexing with 4 Tx ports and 4 Rx ports**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.74 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 14.9 | ≥5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.1.8

#### 8.10.1.1.8.4 Test description

##### 8.10.1.1.8.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Tables 8.10.1.1.8.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.74.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1, 8.10.1.1.8.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.1.8.4.3.

### 8.10.1.1.8.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.10.1.1.8.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.10.1.1.8.5-1 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Table G.3.5 and G.3.6 in Annex G clause G.3.

### 8.10.1.1.8.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.10.1.1.8.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop 4layer spatial multiplexing performance downlink power allocation for Test numbers 1**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.10.1.1.8.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop 4layer spatial multiplexing performance downlink power allocation Test number 1**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 0xFFFF000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.10.1.1.8.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional FDD PDSCH closed loop 4layer spatial multiplexing performance downlink power allocation Test number 1**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.10.1.1.8.4.3-4: *RRCConnectionReconfiguration:* Additional FDD PDSCH closed loop 4layer spatial multiplexing performance downlink power allocation Test number 1**

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.10.1.1.8.5 Test requirement

Table 8.10.1.1.8.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.10.1.1.8.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.10.1.1.8.5-1: Test requirements for Closed Loop spatial multiplexing, 4 Layers spatial multiplexing with 4 Tx ports and 4 Rx ports**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.74 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 15.8 | ≥5 |

## 8.10.1.1.9 FDD 4 Layer Spatial Multiplexing (User-Specific Reference Symbols)

### 8.10.1.1.9.1 Test purpose

To verify the UE's rank-4 performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for 4layer transmission on antenna ports 7-10 using DM-RS with full RB allocation with multiple CSI reference symbol configurations with non-zero and zero transmission power.

### 8.10.1.1.9.2 Test applicability

This test applies to E-UTRA FDD release 10 and forward UE of category ≥ 5 which supports 4Rx antenna ports. Applicability requires support for FGI bit 103.

### 8.10.1.1.9.3 Minimum conformance requirements

The requirements are specified in Table 8.10.1.1.9.3-2, with the addition of the parameters in Table 8.10.1.1.9.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.10.1.1.9.3-1: Minimum performance for 4 Layer Spatial Multiplexing (User-Specific Reference Symbols)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | -3 |
| Beamforming model | | | 4 layer precoding based on WB PMI feedback |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 |
| Beamforming model | | | Annex B.4.3 |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | Subframes | 5 / 2 |
| CSI reference signal configuration | | | 3 |
| Zero-power CSI-RS configuration $I_{CSI\text{-}RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 3 / 0001000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 3) |
| Number of allocated resource blocks (Note 2) | | PRB | 50 |
| Simultaneous transmission | | | No |
| PDSCH transmission mode | | | 9 |
| Number of HARQ processes | | | 8 |
| HARQ redundancy version | | | {0,1,2,3} |
| CFI | | | 2 |
| Precoding granularity | | | 50 |
| PMI delay | | | 8 |
| Reporting interval | | | 1 |
| Reporting mode | | | PUSCH 3-1 |
| CodeBookSubsetRestriction bitmap | | | 0xFFFF000000000000 |

Note 1: $P_B = 1$.
Note 2: 50 resource blocks are allocated in sub-frames 1,2,3,4,6,7,8,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.
Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.10.1.1.9.3-2: Minimum performance for 4 Layer Spatial Multiplexing (User-Specific Reference Symbols)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.75 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 18.4 | ≥5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.1.9

#### 8.10.1.1.9.4 Test description

##### 8.10.1.1.9.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.74.
2. The parameter settings for the cell are set up according to Tables 8.3.1-1 and 8.10.1.1.9.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.1.9.4.3.

##### 8.10.1.1.9.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.10.1.1.9.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.10.1.1.9.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna ports 7-10 using four Tx antennas with beam-forming model as specified in Annex B.4.3 and precoder update granularity specified in Table 8.10.1.1.9.3-1. CSI-RS are sent on antenna ports 15-18 using four Tx antennas with mapping according to beam-forming model as specified in Annex B.4.3.
3. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.10.1.1.9.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.10.1.1.9.4.3-1: *Void***

**Table 8.10.1.1.9.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 8.10.1.1.9.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0xFFFF000000000000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.10.1.1.9.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | An4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 3 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 3 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 3 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.10.1.1.9.4.3-5: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: TS 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.10.1.1.9.4.3-6: *RRCConnectionReconfiguration***

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | Not present | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.10.1.1.9.5 Test requirement

Table 8.10.1.1.9.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3. 2 for the throughput test shall meet or exceed the specified value in Table 8.10.1.1.9.5-1 for the specified SNR including test tolerances for the throughput test.

**Table 8.10.1.1.9.5-1: Test requirements for 4 Layer Spatial Multiplexing (User-Specific Reference Symbols)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.75 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 19.3 | ≥5 |

## 8.10.1.2 TDD (Fixed Reference Channel)

### 8.10.1.2.1 TDD PDSCH Transmit Diversity 2x4

#### 8.10.1.2.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using transmit diversity (SFBC) with 2 transmitter antennas.

#### 8.10.1.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward of Category 2 or higher that supports 4 Rx antenna ports on any TDD band

#### 8.10.1.2.1.3 Minimum conformance requirements

The requirements are specified in Table 8. 10.1.2.1.3-2, with the addition of the parameters in Table 8. 10.1.2.1.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.10.1.2.1.3-1: Test Parameters for Transmit diversity Performance (FRC) with 4Rx Antenna Ports**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| PDSCH transmission mode | | | 2 |
| Note 1: $P_B = 1$ | | | |

**Table 8.10.1.2.1.3-2: Minimum performance Transmit Diversity (FRC) with 4Rx Antenna Ports**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.11 TDD | OP.1 TDD | EVA5 | 2x4 Medium correlation A, ULA | 70 | 3.9 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.2.1.

### 8.10.1.2.1.4 Test description

#### 8.10.1.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.10.1.2.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.76.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1 and 8.10.1.2.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.2.1.4.3.

#### 8.10.1.2.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Tables 8.10.1.2.1.3-1 and 8.10.1.2.1.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.10.1.2.1.5-1 as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.10.1.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

#### 8.10.1.2.1.5 Test requirement

Table 8.10.1.2.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Table 8.10.1.2.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.10.1.2.1.5-1: Test requirement Transmit Diversity (FRC) with 4Rx Antenna Ports**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.11 TDD | OP.1 TDD | EVA5 | 2x4 Medium correlation A, ULA | 70 | 4.8 | ≥2 |

### 8.10.1.2.2 TDD PDSCH Open Loop Spatial Multiplexing 2x4

#### 8.10.1.2.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

#### 8.10.1.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward UE of Category 2 or higher that supports 4 Rx antenna ports on any TDD band.

#### 8.10.1.2.2.3 Minimum conformance requirements

The requirements are specified in Table 8.10.1.2.2.3-2, with the addition of the parameters in Table 8.10.1.2.2.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.10.1.2.2.3-1: Test Parameters for Large Delay CDD (FRC) with 4Rx Antenna Ports**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| ACK/NACK feedback mode | | | Bundling |
| PDSCH transmission mode | | | 3 |
| Note 1: $P_B = 1$. | | | |

**Table 8.10.1.2.2.3-2: Minimum performance Large Delay CDD (FRC) with 4Rx Antenna Ports**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.11-1 TDD | OP.1 TDD | EVA70 | 2x4 Low | 70 | 7.7 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.2.2.

### 8.10.1.2.2.4 Test description

#### 8.10.1.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.10.1.2.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.76.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1 and 8.10.1.2.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.2.2.4.3.

#### 8.10.1.2.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.10.1.2.2.3-1 and 8.10.1.2.2.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.10.1.2.2.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.10.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.10.1.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation for Test number 1**

| Derivation Path: 36.508 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 11 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.10.1.2.2.5 Test requirement

Table 8.10.1.2.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Table 8.10.1.2.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.10.1.2.2.5-1: Test requirement Large Delay CDD (FRC) with 4Rx Antenna Ports**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.11-1 TDD | OP.1 TDD | EVA70 | 2x4 Low | 70 | 8.6 | ≥2 |

## 8.10.1.2.3 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model – Enhanced Performance Requirement Type A

### 8.10.1.2.3.1 Test purpose

To verify the closed loop rank-one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 4 interference model.

### 8.10.1.2.3.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward that supports 4 Rx antenna ports and enhanced receiver Type A

### 8.10.1.2.3.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1, 8.10.1.2.3.3-1 and 8.10.1.2.3.3-2 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.10.1.2.3.3-2 for the specified SINR. For single-layer spatial multiplexing closed loop

rank-one performance with wideband and frequency selective precoding is specified. For multi-layer spatial multiplexing closed loop rank-two performance with wideband and frequency selective precoding is specified.

**Table 8.10.1.2.3.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model and 4Rx Antenna Ports**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 1 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 4 | N/A |
| Interference model | | | N/A | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 |
| | Rank 2 | % | N/A | 20 |
| Precoding granularity | | PRB | 50 | 6 |
| PMI delay (Note 4) | | ms | 10 or 11 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

**Table 8.10.1.2.3.3-2: Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model and 4Rx Antenna Ports**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.47 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x4 Low | 70 | -1.9 | ≥1 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.

#### 8.10.1.2.3.4 Test description

##### 8.10.1.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Tables 8.10.1.2.3.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.73.
2. The parameter settings for cell1 are set up according to Tables 8.2.2-1, 8.10.1.2.3.5-1 and 8.10.1.2.3.5-2 as appropriate.
3. Downlink signals are initially set up for cell1 according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.2.3.4.3.

##### 8.10.1.2.3.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to Tables 8.10.1.2.3.5-1 and 8.10.1.2.3.5-2. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #4 and #9 (Table A.2.3.1.2-1).
2. SS sets up the parameters for cell 2 and cell 3 according to Tables 8.10.1.2.3.5-1 and Tables 8.10.1.2.3.5-2.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SINR according to Tables 8.10.1.2.3.5-1 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Annex G clause G.3.5.

##### 8.10.1.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.10.1.2.3.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | Tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 001111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.10.1.2.3.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 4 | (see Table 7.2.2-1C in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 483 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

### 8.10.1.2.3.5 Test requirement

Table 8.10.1.2.3.5-1 defines the primary level settings.

**Table 8.10.1.2.3.5-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model and 4Rx Antenna Ports**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.45 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 1 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 6 | N/A |
| Interference model | | | N/A | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 |
| | Rank 2 | % | N/A | 20 |
| Precoding granularity | | PRB | 50 | 6 |
| PMI delay (Note 4) | | ms | 10 or 11 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}$´ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Table 8.10.1.2.3.5-2 for the specified SINR including test tolerances for all throughput tests.

**Table 8.10.1.2.3.5-2: Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model and 4Rx Antenna Ports**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.47 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x4 Low | 70 | -0.92 | ≥1 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to $\hat{E}_s / N_{oc}$´ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

### 8.10.1.2.4 TDD PDSCH Closed Loop Spatial Multiplexing 4x4

#### 8.10.1.2.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on four antenna ports using closed loop spatial multiplexing with wideband and frequency selective precoding.

#### 8.10.1.2.4.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward UE of Category 2 or higher that supports 4 Rx antenna ports on any TDD band.

#### 8.10.1.2.4.3 Minimum conformance requirements

The requirements are specified in Table 8.10.1.2.4.3-2, with the addition of the parameters in Table 8.10.1.2.4.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.10.1.2.4.3-1: Test Parameters for Dual-Layer Spatial Multiplexing (FRC) with 4Rx Antenna Ports**

| Parameter | | Unit | Test 1-2 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| ACK/NACK feedback mode | | | Bundling |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000 00001111111111111111000000000000000 |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.

**Table 8.10.1.2.4.3-2: Minimum performance Dual-Layer Spatial Multiplexing (FRC) with 4Rx Antenna Ports**

| | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category | DL UE category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | | |
| 1 | 10 MHz 64 QAM | R.36 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 10.4 | ≥2 | ≥6 |
| 2 | 10 MHz 256QAM | R.72 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 17.5 | 11-12 | ≥11 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.2.4.

#### 8.10.1.2.4.4 Test description

##### 8.10.1.2.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.10.1.2.4.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.74.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1, 8.10.1.2.4.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.2.2.4.2.4.3.

##### 8.10.1.2.4.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.10.1.2.4.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.
3. Set the parameters of the reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.10.1.2.4.5-1 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
5. Repeat steps from 1 to 4 for each test interval in Tables 8.10.1.2.4.5-1 as appropriate.

##### 8.10.1.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.10.1.2.4.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.10.1.2.4.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 Table 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000111111111111111110000000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.10.1.2.4.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.10.1.2.4.4.3-4: *PUCCH-ConfigDedicated-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| tddAckNackFeedbackMode | bundling | | |
| } | | | |

### 8.10.1.2.4.5 Test requirement

Table 8.10.1.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Table 8.10.1.2.4.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.10.1.2. 4.5-1: Test requirement Dual-Layer Spatial Multiplexing (FRC) with 4Rx Antenna Ports**

| | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category | DL UE category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | | |
| 1 | 10 MHz 64 QAM | R.36 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 11.3 | ≥2 | ≥6 |
| 2 | 10 MHz 256QAM | R.72 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 18.4 | 11-12 | ≥11 |

## 8.10.1.2.5 TDD PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 interference model – Enhanced Performance Requirement Type A

### 8.10.1.2.5.1 Test purpose

The purpose of these tests is to verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4.

### 8.10.1.2.5.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 11 and forward that supports 4 Rx antenna ports and enhanced receiver Type A. Applicability requires support for FGI bit 103.

### 8.10.1.2.5.3 Minimum conformance requirements

The requirements are specified in Table 8.10.1.2.5.3-2, with the addition of the parameters in Table 8.10.1.2.5.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4. In 8.10.1.2.5.3-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

**Table 8.10.1.2.5.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model and 4Rx Antenna Ports**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | Subframes | 5 / 4 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 126 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 9 | N/A |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |
| Precoder update granularity | | PRB | 50 | 6 |
| PMI delay (Note 5) | | ms | 10 or 11 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}$´ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 6: These physical resource blocks are assigned to an arbitrary number of virtual UEs

| | |
|---|---|
| | with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. |
| Note 7: | All cells are time-synchronous. |

**Table 8.10.1.2.5.3-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model and 4Rx Antenna Ports**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.76 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x4 Low | 70 | -3.3 | ≥1 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | |
| Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.2.5.

### 8.10.1.2.5.4 Test description

#### 8.10.1.2.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10 MHz, as specified in Table 8.10.1.2.5.5-1, and as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.73.

2. The parameter settings for the cell 1 are set up according to Tables 8.3.2-1 and 8.10.1.2.5.5-1 as appropriate.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.2.5.4.3.

#### 8.10.1.2.5.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.10.1.2.5.5-1, 8.10.1.2.5.5-2. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #4 and #9 (Table A.2.3.1.1-1).

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.10.1.2.5.5-2 as appropriate.
BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/PDSCH for the test UE are sent on antenna port 7 (or 8) using two Tx antennas with beam-forming model as specified in

Annex B.4.3 and precoder update granularity specified in Table 8.10.1.2.5.5-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.3.

3. Set the Cell2 –aggressor cell– as defined in Tables 8.10.1.2.5.5-1, 8.10.1.2.5.5-2 and according to Annex B.5.4.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.10.1.2.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.10.1.2.5.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.10.1.2.5.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 001111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.10.1.2.5.4.3-3: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; $T_{\text{CSI-RS}} = 5$; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.10.1.2.5.4.3-4: *CQI-ReportPeriodic-r10***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-2AC CQI-ReportPeriodic-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 4 | TDD | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex | 484 | TDD | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |

**Table 8.10.1.2.5.4.3-5: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT using condition CQI_PERIODIC | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 8.10.1.2.5.4.3-6: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

### 8.10.1.2.5.5 Test requirement

Table 8.10.1.2.5.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3.3 for throughput test shall meet or exceed the specified value in Table 8.10.1.2.5.5-2 for the specified SINR including test tolerances.

**Table 8.10.1.2.5.5-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model and 4Rx Antenna Ports**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | Subframes | 5 / 4 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.45 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cyclic Prefix | | | Normal | Normal |
| Cell Id | | | 0 | 126 |
| Number of control OFDM symbols | | | 2 | 2 |
| PDSCH transmission mode | | | 9 | N/A |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |
| Precoder update granularity | | PRB | 50 | 6 |
| PMI delay (Note 5) | | ms | 10 or 11 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 6: These physical resource blocks are assigned to an arbitrary number of virtual UEs

| | |
|---|---|
| | with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. |
| Note 7: | All cells are time-synchronous. |

**Table 8.10.1.2.5.5-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model and 4Rx Antenna Ports**

| Test Number | Reference Channel | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | Reference Value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| 1 | R.76 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x4 Low | 70 | -2.32 | ≥1 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | |

## 8.10.1.2.6 TDD Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols)

### 8.10.1.2.6.1 Test purpose

To verify the rank-2 performance for full RB allocation, to verify rate matching with multiple CSI reference symbol configurations with non-zero and zero transmission power, and to verify that the UE correctly estimate SNR.

### 8.10.1.2.6.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward UE of Category 2 or higher that supports 4 Rx antenna ports on any TDD band. Applicability requires support for FGI bit 103.

### 8.10.1.2.6.3 Minimum conformance requirements

For dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.10.1.2.6.3-2, with the addition of the parameters in Table 8.10.1.2.6.3-1 where Cell 1 is the serving cell and Cell 2 is the interfering cell. The downlink physical channel setup is set according to Annex C.3.2.

**Table 8.10.1.2.6.3-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations and 4Rx Antenna Ports**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| | | | Cell 1 | Cell 2 |
| Downlink power allocation | $\rho_A$ | dB | 4 | 0 |
| | $\rho_B$ | dB | 4 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0 and 1 | Antenna ports 0 and 1 |
| Cell ID | | | 0 | 126 |
| CSI reference signals | | | Antenna ports 15,16 | NA |
| Beamforming model | | | Annex B.4.2 | NA |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | Subframes | 5 / 4 | NA |
| CSI reference signal configuration | | | 8 | NA |
| Zero-power CSI-RS configuration $I_{CSI\text{-}RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 4 / 0010000000000000 | NA |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | NA |
| $\hat{E}_s / N_{oc}$ | | | Reference Value in Table 8.10.1.2.6-2 | 7.25dB |
| Symbols for unused PRBs | | | OCNG (Note 2) | NA |
| Number of allocated resource blocks (Note 2) | | PRB | 50 | NA |
| Simultaneous transmission | | | No | NA |
| PDSCH transmission mode | | | 9 | Blanked |

Note 1: $P_B = 1$.

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.10.1.2.6.3-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | | Propagation Condition | | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.51 TDD | OP.1 TDD | N/A | ETU5 | ETU5 | 2x4 Low | 70 | 9.5 | ≥2 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1.

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.2.6.

#### 8.10.1.2.6.4 Test description

##### 8.10.1.2.6.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.73.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.10.1.2.6.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.2.6.4.3.

##### 8.10.1.2.6.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.10.1.2.6.5-1 and 8.10.1.2.6.5-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of Cell 1 for the reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.10.1.2.6.5-2 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7 and 8 using two Tx antennas with beam-forming model as specified in Annex B.4.2 and precoder update granularity specified in Table 8.3.2-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.2.
3. Set Cell 2 as defined in Tables 8.10.1.2.6.5-1 and 8.10.1.2.6.5-2 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.10.1.2.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.10.1.2.6.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.10.1.2.6.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.10.1.2.6.4.3-3: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 8 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 4 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

### 8.10.1.2.6.5 Test requirement

Table 8.10.1.2.6.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3.3 for the throughput test shall meet or exceed the specified value in 8.10.1.2.6.5-1 and 8.10.1.2.6.5-2 for the specified SNR including test tolerances for the throughput test.

**Table 8.10.1.2.6.5-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations and 4Rx Antenna Ports**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| | | | Cell 1 | Cell 2 |
| Downlink power allocation | $\rho_A$ | dB | 4 | 0 |
| | $\rho_B$ | dB | 4 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0 and 1 | Antenna ports 0 and 1 |
| Cell ID | | | 0 | 126 |
| CSI reference signals | | | Antenna ports 15,16 | NA |
| Beamforming model | | | Annex B.4.2 | NA |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | Subframes | 5 / 4 | NA |
| CSI reference signal configuration | | | 8 | NA |
| Zero-power CSI-RS configuration $I_{CSI\text{-}RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 4 / 0010000000000000 | NA |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | NA |
| $\hat{E}_s / N_{oc}$ | | | Reference Value in Table 8.10.1.2.6-2 | 6.9dB |
| Symbols for unused PRBs | | | OCNG (Note 2) | NA |
| Number of allocated resource blocks (Note 2) | | PRB | 50 | NA |
| Simultaneous transmission | | | No | NA |
| PDSCH transmission mode | | | 9 | Blanked |

Note 1: $P_B = 1$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.10.1.2.6.5-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | | Propagation Condition | | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz 16QAM 1/2 | R.51 TDD | OP.1 TDD | N/A | ETU5 | ETU5 | 2x4 Low | 70 | 10.3 | ≥2 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1.

### 8.10.1.2.7 TDD Open-loop spatial multiplexing, 3 Layer Multiplexing with 4 Tx Antenna Ports

#### 8.10.1.2.7.1 Test purpose

The purpose of these tests is to verify the open loop spatial multiplexing performance using 3 Layer multiplexing with 4Tx antenna ports.

#### 8.10.1.2.7.2 Test applicability

This test applies to all types of E-UTRA TDD release 10 and forward UE of category ≥ 5 that support 4Rx Antenna ports and 3-layer spatial multiplexing for PDSCH transmission mode 3.

#### 8.10.1.2.7.3 Minimum conformance requirements

The requirements are specified in Table 8.10.1.2.7.3-2, with the addition of parameters in Table 8.10.1.2.7.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.10.1.2.7.3-1: Test parameters for Open Loop spatial multiplexing, 3 Layers with 4 Tx ports and 4 Rx ports**

| Parameter | | Unit | |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cell-specific reference signals | | | Antenna Ports 0,1,2,3 |
| PDSCH transmission mode | | | 3 |
| PDSCH rank | | | 3 |
| Number of HARQ processes | | | 7 |
| HARQ redundancy version | | | {0,0,1,2} |
| CFI | | | 2 |
| Uplink-Downlink Configuration | | | 1 |
| Special subframe configuration | | | 4 |
| Note 1: $P_B = 1$. | | | |

**Table 8.10.1.2.7.3-2: Minimum performance Open Loop spatial multiplexing, 3 Layers with 4 Tx ports and 4 Rx ports**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.73 TDD | OP.1 TDD | EVA70 | 4x4 Low | 70 | 14.9 | ≥5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.2.7

#### 8.10.1.2.7.4 Test description

##### 8.10.1.2.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified in Table 8.10.1.2.7-2 and as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.74.
2. The parameter settings for the cell 1 are set up according to Tables 8.2.1-1 and 8.10.1.1.3.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.2.7.4.3.

### 8.10.1.2.7.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Tables 8.10.1.2.7.3-1 and 8.10.1.2.7.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SINR according to Tables 8.10.1.2.7.5-1as appropriate.
3. Measure the average throughput for duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Annex G clause G.3.5.

### 8.10.1.2.7.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.10.1.2.7.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.10.1.2.7.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm3 | 0100 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.10.1.2.7.4.3-3: *RRCConnectionReconfiguration***

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | Not present | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.10.1.2.7.5 Test requirement

Table 8.10.1.2.7.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for throughput test shall meet or exceed the specified value in Table 8.10.1.2.7.5-2 for the specified SINR including test tolerances.

**Table 8.10.1.2.7.5-1: Test Config for Open Loop spatial multiplexing, 3 Layers with 4 Tx ports and 4 Rx ports**

| **Parameter** | | **Unit** | |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cell-specific reference signals | | | Antenna Ports 0,1,2,3 |
| PDSCH transmission mode | | | 3 |
| PDSCH rank | | | 3 |
| Number of HARQ processes | | | 7 |
| HARQ redundancy version | | | {0,0,1,2} |
| CFI | | | 2 |
| Uplink-Downlink Configuration | | | 1 |
| Special subframe configuration | | | 4 |
| Note 1: $P_B = 1$. | | | |

**Table 8.10.1.2.7.5-2: Test Requirements for Open Loop spatial multiplexing, 3 Layers with 4 Tx ports and 4 Rx ports**

| **Test number** | **Band-width** | **Reference Channel** | **OCNG Pattern** | **Propagation Condition** | **Correlation Matrix and Antenna Configuration** | **Reference value** | | **UE Category** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | **Fraction of Maximum Throughput (%)** | **SNR (dB)** | |
| 1 | 10 MHz | R.73 TDD | OP.1 TDD | EVA70 | 4x4 Low | 70 | 15.8 | ≥5 |

## 8.10.1.2.8 TDD Closed-loop spatial multiplexing performance, 4 Layers spatial multiplexing 4 Tx antennas

8.10.1.2.8.1 Test purpose

To verify the UE's ability with 4Rx antenna capabilities to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified

downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on four antenna ports using closed loop spatial multiplexing.

#### 8.10.1.2.8.2 Test applicability

This test applies to E-UTRA TDD release 10 and forward UE of category ≥ 5 which supports 4Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 4.

#### 8.10.1.2.8.3 Minimum conformance requirements

The requirements are specified in Table 8.10.1.2.8.3-2 with the addition of the parameters in Table 8.10.1.2.8.3-1 and the downlink physical channel setup according to Annex C.3.2

**Table 8.10.1.2.8.3-1: Test parameters for Closed Loop spatial multiplexing, 4 Layers spatial multiplexing with 4 Tx ports and 4 Rx ports**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15k Hz | -98 |
| Cell-specific reference signals | | | Antenna ports 0,1,2,3 |
| PDSCH transmission mode | | | 4 |
| PDSCH rank | | | 4 |
| Number of HARQ processes | | | 7 |
| HARQ redundancy version | | | {0,1,2,3} |
| CFI | | | 2 |
| Precoding granularity | | PRB | 50 |
| PMI delay | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 |
| Reporting mode | | | PUSCH 3-1 |
| CodeBookSubsetRestriction bitmap | | | 0x FFFF000000000000 |
| Uplink-Downlink Configuration | | | 1 |
| Special subframe configuration | | | 4 |
| Note 1: $P_B = 1$. | | | |

**Table 8.10.1.2.8.3-2: Minimum performance for Closed Loop spatial multiplexing, 4 Layers spatial multiplexing with 4 Tx ports and 4 Rx ports**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.74 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 14.4 | ≥5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.2.8.

#### 8.10.1.2.8.4 Test description

##### 8.10.1.2.8.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Tables 8.10.1.2.8.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.74.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1, 8.10.1.2.8.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.2.8.4.3.

### 8.10.1.2.8.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.10.1.2.8.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.
3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.10.1.2.8.5-1 as appropriate.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Annex G clause G.3.5.

### 8.10.1.2.8.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.10.1.2.8.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop 4layer spatial multiplexing performance downlink power allocation for Test numbers 1**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.10.1.2.8.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop 4layer spatial multiplexing performance downlink power allocation for Test number 1**

| Derivation Path: 36.508 Table 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 0x FFFF000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.10.1.2.8.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop 4layer spatial multiplexing performance downlink power allocation for Test number 1**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.10.1.2.8.4.3-4: *PUCCH-ConfigDedicated-DEFAULT:* Additional TDD PDSCH closed loop 4layer spatial multiplexing performance downlink power allocation for Test number 1**

| Derivation Path: 36.508 Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| tddAckNackFeedbackMode | bundling | | |
| } | | | |

**Table 8.10.1.2.8.4.3-5: *RRCConnectionReconfiguration:* Additional TDD PDSCH closed loop 4layer spatial multiplexing performance downlink power allocation Test number 1**

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.10.1.2.8.5 Test requirement

Tables 8.10.1.2.8.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Tables 8.10.1.2.8.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.10.1.2.8.5-1: Minimum performance for Closed Loop spatial multiplexing, 4 Layers spatial multiplexing with 4 Tx ports and 4 Rx ports**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.74 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 15.3 | ≥5 |

## 8.10.1.2.9 TDD 4 Layer Spatial Multiplexing (User-Specific Reference Symbols)

### 8.10.1.2.9.1 Test purpose

To verify the UE's rank-4 performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for 4layer transmission on antenna ports 7-10 using DM-RS with full RB allocation with multiple CSI reference symbol configurations with non-zero and zero transmission power.

### 8.10.1.2.9.2 Test applicability

This test applies to E-UTRA TDD release 10 and forward UE of category ≥ 5 which supports 4Rx antenna ports. Applicability requires support for FGI bit 103.

### 8.10.1.2.9.3 Minimum conformance requirements

The requirements are specified in Table 8.10.1.2.9.3-2, with the addition of the parameters in Table 8.10.1.2.9.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.10.1.2.9.3-1: Minimum performance for 4 Layer Spatial Multiplexing (User-Specific Reference Symbols)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | -3 |
| Beamforming model | | | 4 layer precoding based on WB PMI feedback |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 |
| Beamforming model | | | Annex B.4.3 |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | Subframes | 5 / 4 |
| CSI reference signal configuration | | | 3 |
| Zero-power CSI-RS configuration $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 4 / 0010000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 3) |
| Number of allocated resource blocks (Note 2) | | PRB | 50 |
| Simultaneous transmission | | | No |
| PDSCH transmission mode | | | 9 |
| Number of HARQ processes | | | 7 |
| HARQ redundancy version | | | {0,1,2,3} |
| CFI | | | 2 |
| Precoding granularity | | | 50 |
| PMI delay | | | 10 or 11 |
| Reporting interval | | | 1 or 4 |
| Reporting mode | | | PUSCH 3-1 |
| CodeBookSubsetRestriction bitmap | | | 0x FFFF000000000000 |
| Uplink-Downlink Configuration | | | 1 |
| Special subframe configuration | | | 4 |

Note 1: $P_B = 1$.
Note 2: 50 resource blocks are allocated in sub-frames 4, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0,1 and 6.
Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.10.1.2.9.3-2: Minimum performance for 4 Layer Spatial Multiplexing (User-Specific Reference Symbols)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.75 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 19.0 | ≥5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.1.2.9.

#### 8.10.1.2.9.4 Test description

##### 8.10.1.2.9.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.74.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.10.1.2.9.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.1.2.9.4.3.

##### 8.10.1.2.9.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.10.1.2.9.3-2. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.10.1.2.9.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna port 7-10 using four Tx antennas with beam-forming model as specified in Annex B.4.3 and precoder update granularity specified in Table 8.10.1.2.9.3-1. CSI-RS are sent on antenna ports 15 -18 using four Tx antennas with mapping according to beam-forming model as specified in Annex B.4.3.
3. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.10.1.2.9.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.10.1.2.9.4.3-1: *Void***

**Table 8.10.1.2.9.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 8.10.1.2.9.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0xFFFF000000000000 | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.10.1.2.9.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | An4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 3 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 ::= CHOICE{ | | | |
| setup ::= SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r12 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r12 | 4 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.10.1.2.9.4.3-5: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: TS 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 8.10.1.2.9.4.3-6: *RRCConnectionReconfiguration***

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | Not present | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.10.1.2.9.5 Test requirement

Table 8.10.1.2.9.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3.3 for the throughput test shall meet or exceed the specified value in Table 8.10.1.2.9.5-1 for the specified SNR including test tolerances for the throughput test.

**Table 8.10.1.2.9.5-1: Minimum performance for 4 Layer Spatial Multiplexing (User-Specific Reference Symbols)**

| Test number | Band-width | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10 MHz | R.75 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 19.9 | ≥5 |

# 8.10.2 PCFICH/PDCCH

## 8.10.2.1 FDD

### 8.10.2.1.1 FDD PCFICH/PDCCH Single-antenna Port Performance 1x4

#### 8.10.2.1.1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for a single-antenna port with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.1 remains below a given reference value.

#### 8.10.2.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support 4 Rx antenna ports in any FDD RF band.

#### 8.10.2.1.1.3 Minimum conformance requirements

For the parameters specified in Table 8.10.2.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.2.1.1.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.2.1.1.3-1: Test Parameters for PDCCH/PCFICH with 4 Rx Antenna Ports**

| Parameter | | Unit | Single antenna port |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| PHICH Ng (Note 1) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s (Note 2) | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8]<br>Note 2: PDSCH is mapped as OCNG. | | | |

**Table 8.10.2.1.1.3-2: Minimum performance PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 8 CCE | R.15 FDD | OP.1 FDD | ETU70 | 1x4 Low | 1 | -5.4 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.2.

### 8.10.2.1.1.4 Test description

#### 8.10.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.75.
2. The parameter settings for the cell are set up according to Table 8.10.2.1.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.2.1.1.4.3.

#### 8.10.2.1.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC according to Table 8.10.2.1.1.3-2. The details of PDCCH and PDSCH are specified in Tables A.3.5.1-1 and A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.10.2.1.1.5-1 as appropriate.

3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.10.2.1.1.5-1, pass the UE. Otherwise fail the UE.

#### 8.10.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

#### 8.10.2.1.1.5 Test requirement

For the parameters specified in Table 8.10.2.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.2.1.1.5-1.

**Table 8.10.2.1.1.5-1: Test requirement PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 8 CCE | R.15 FDD | OP.1 FDD | ETU70 | 1x4 Low | 1 | -4.6 |

### 8.10.2.1.2 FDD PCFICH/PDCCH Transmit Diversity 2x4

#### 8.10.2.1.2.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity 2x4 with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.1 remains below a given reference value.

#### 8.10.2.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support 4 Rx antenna ports in any FDD RF band.

#### 8.10.2.1.2.3 Minimum conformance requirements

For the parameters specified in Table 8.10.2.1.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.2.1.2-1. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.2.1.2.3-1: Test Parameters for PDCCH/PCFICH with 4 Rx Antenna Ports**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| PHICH Ng (Note 1) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s (Note 2) | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8]<br>Note 2: PDSCH is mapped as OCNG. | | | |

**Table 8.10.2.1.2.3-2: Minimum performance PDCCH/PCFICH with 4 Rx Antenna Ports**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.16_1 FDD | OP.1 FDD | EVA70 | 2x4 Low | 1 | -3.5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.2.

### 8.10.2.1.2.4 Test description

#### 8.10.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.76.
2. The parameter settings for the cell are set up according to Table 8.10.2.1.2.3-1.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.2.1.2.4.3.

#### 8.10.2.1.2.4.2 Test procedure

1. The SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.10.2.1.2.3-2. The details of PDCCH and PDSCH are specified in Table A.3.5.1-1 and Table A.3.5.1-2

respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity.

2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.10.2.1.2.5-1.

3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.10.2.1.2.5-1, pass the UE. Otherwise fail the UE.

#### 8.10.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.10.2.1.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.10.2.1.2.5 Test requirement

For the parameters specified in Table 8.10.2.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.2.1.2.5-1.

**Table 8.10.2.1.2.5-1: Test requirement PDCCH/PCFICH with 4 Rx Antenna Ports**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.16_1 FDD | OP.1 FDD | EVA70 | 2x4 Low | 1 | -2.5 |

### 8.10.2.1.3 FDD PCFICH/PDCCH Transmit Diversity 4x4

#### 8.10.2.1.3.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity 4x4 with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.1 remains below a given reference value.

#### 8.10.2.1.3.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support 4 Rx antenna ports in any FDD RF band.

#### 8.10.2.1.3.3 Minimum conformance requirements

For the parameters specified in Table 8.10.2.1.3.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.2.1.3.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.2.1.3.3-1: Test Parameters for PDCCH/PCFICH with 4 Rx Antenna Ports**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 |
| PHICH Ng (Note 1) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s (Note 2) | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8]<br>Note 2: PDSCH is mapped as OCNG | | | |

**Table 8.10.2.1.3.3-2: Minimum performance PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 5 MHz | 2 CCE | R.17_1 FDD | OP.1 FDD | EPA5 | 4x4 Medium A Xpol | 1 | -0.4 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.2.

#### 8.10.2.1.3.4 Test description

##### 8.10.2.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 5 MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.74.
2. The parameter settings for the cell are set up according to Table 8.10.2.1.3.3-1.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.2.1.3.4.3.

#### 8.10.2.1.3.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.10.2.1.3.3-2. The details of PDCCH and PDSCH are specified in Table A.3.5.1-1A and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity.

2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.10.2.1.3.5-1.

3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.10.2.1.3.5-1, pass the UE. Otherwise fail the UE.

#### 8.10.2.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 8.10.2.1.3.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000000000000 00000000111111111111 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.10.2.1.3.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

#### 8.10.2.1.3.5 Test requirement

For the parameters specified in Table 8.10.2.1.3.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.2.1.3.5-1.

**Table 8.10.2.1.3.5-1: Test Requirement PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 5 MHz | 2 CCE | R.17_1 FDD | OP.1 FDD | EPA5 | 4x4 Medium A Xpol | 1 | 0.6 |

## 8.10.2.2 TDD

### 8.10.2.2.1 TDD PCFICH/PDCCH Single-antenna Port Performance 1x4

#### 8.10.2.2.1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for a single-antenna port with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.2 remains below a given reference value.

#### 8.10.2.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support 4 Rx antenna ports in any TDD RF band.

#### 8.10.2.2.1.3 Minimum conformance requirements

For the parameters specified in Table 8.10.2.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.2.2.1.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.2.2.1.3-1: Test Parameters for PDCCH/PCFICH with 4 Rx Antenna Ports**

| Parameter | | Unit | Single antenna port |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 0 |
| Special subframe configuration (Note 2) | | | 4 |
| Number of PDCCH symbols | | symbols | 2 |
| PHICH Ng (Note 3) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s (Note 4) | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8].<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8].<br>Note 3: according to Clause 6.9 in TS 36.211 [8].<br>Note 4: PDSCH is mapped as OCNG. | | | |

**Table 8.10.2.2.1.3-2: Minimum performance PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 8 CCE | R.15 TDD | OP.1 TDD | ETU70 | 1x4 Low | 1 | -4.7 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.2.

#### 8.10.2.2.1.4 Test description

##### 8.10.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders, and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.75.
2. The parameter settings for the cell are set up according to Table 8.10.2.2.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.2.2.1.4.3.

##### 8.10.2.2.1.4.2 Test procedure

1. The SS transmits PDSCH via PDCCH DCI format 1 for C_RNTI to transmit the DL RMC according to Table 8.10.2.2.1.3-2. The details of PDCCH and PDSCH are specified in Table A.3.5.2-1 and Table A.3.5.2-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.10.2.2.1.5-1 as appropriate.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in table 8.10.2.2.1.5-1, pass the UE. Otherwise fail the UE.

##### 8.10.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 8.10.2.2.1.4.3-1: TDD-Config-DEFAULT**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-23 TDD-Config-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa0 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

#### 8.10.2.2.1.5 Test requirement

For the parameters specified in Table 8.10.2.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.2.2.1.5-1.

**Table 8.10.2.2.1.5-1: Test requirement PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 8 CCE | R.15 TDD | OP.1 TDD | ETU70 | 1x4 Low | 1 | -3.9 |

## 8.10.2.2.2 TDD PCFICH/PDCCH Transmit Diversity 2x4

### 8.10.2.2.2.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity 2x4 with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.2 remains below a given reference value.

### 8.10.2.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support 4 Rx antenna ports in any TDD RF band.

### 8.10.2.2.2.3 Minimum conformance requirements

For the parameters specified in Table 8.10.2.2.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.2.2.2.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.2.2.2.3-1: Test Parameters for PDCCH/PCFICH with 4 Rx Antenna Ports**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 0 |
| Special subframe configuration (Note 2) | | | 4 |
| Number of PDCCH symbols | | symbols | 2 |
| PHICH Ng (Note 3) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s (Note 4) | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8].<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8].<br>Note 3: according to Clause 6.9 in TS 36.211 [8]<br>Note 4: PDSCH is mapped as OCNG. | | | |

**Table 8.10.2.2.2.3-2: Minimum performance PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.16_1 TDD | OP.1 TDD | EVA70 | 2x4 Low | 1 | -3.2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.2.

### 8.10.2.2.2.4 Test description

#### 8.10.2.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders, and AWGN noise sources to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.76.
2. The parameter settings for the cell are set up according to Table 8.10.2.2.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.2.2.2.4.3.

#### 8.10.2.2.2.4.2 Test procedure

1. The SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.10.2.2.2.3-2. The details of PDCCH and PDSCH are specified in Table A.3.5.2-1 and Table A.3.5.2-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity.
2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.10.2.2.2.5-1 as appropriate.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in Table 8.10.2.2.2.5-1, pass the UE. Otherwise fail the UE.

#### 8.10.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 8.10.2.2.2.4.3-1: *TDD-Config-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-23 TDD-Config-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa0 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

**Table 8.10.2.2.2.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.10.2.2.2.5 Test requirement

For the parameters specified in Table 8.10.2.2.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.2.2.2.5-1.

**Table 8.10.2.2.2.5-1: Test requirement PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 CCE | R.16_1 TDD | OP.1 TDD | EVA70 | 2x4 Low | 1 | -2.2 |

8.10.2.2.3 TDD PCFICH/PDCCH Transmit Diversity 4x4

8.10.2.2.3.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity 4x4 with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.2 remains below a given reference value.

8.10.2.2.3.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support 4 Rx antenna ports in any TDD RF band.

8.10.2.2.3.3 Minimum conformance requirements

For the parameters specified in Table 8.10.2.2.3.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.2.2.3.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.2.2.3.3-1: Test Parameters for PDCCH/PCFICH with 4 Rx Antenna Ports**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 0 |
| Special subframe configuration (Note 2) | | | 4 |
| Number of PDCCH symbols | | symbols | 2 |
| PHICH Ng (Note 3) | | | 1 |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s (Note 4) | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8].<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8].<br>Note 3: according to Clause 6.9 in TS 36.211 [8].<br>Note 4: PDSCH is mapped as OCNG. | | | |

**Table 8.10.2.2.3.3-2: Minimum performance PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 5 MHz | 2 CCE | R.17_1 TDD | OP.1 TDD | EPA5 | 4x4 Medium A Xpol | 1 | 0.0 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.2.

### 8.10.2.2.3.4 Test description

#### 8.10.2.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 5 MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders, and AWGN noise sources to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.74.
2. The parameter settings for the cell are set up according to Table 8.10.2.2.3.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.2.2.3.4.3.

8.10.2.2.3.4.2 Test procedure

1. The SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.10.2.2.3.3-2. The details of PDCCH and PDSCH are specified in Table A.3.5.2-1A and Table A.3.5.2-2 respectively. The SS sends downlink MAC padding bits on the DL RMC. Transmission scheme for the PDSCH shall be transmit diversity.

2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.10.2.2.3.5-1 as appropriate.

3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in Table 8.10.2.2.3.5-1, pass the UE. Otherwise fail the UE.

8.10.2.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 8.10.2.2.3.4.3-1: *TDD-Config-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-23 TDD-Config-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa0 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

**Table 8.10.2.2.3.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000000000000 00000000111111111111 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.10.2.2.3.4.3-3: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

#### 8.10.2.2.3.5 Test requirement

For the parameters specified in Table 8.10.2.2.3.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.2.2.3.5-1.

**Table 8.10.2.2.3.5-1: Test requirement PDCCH/PCFICH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 5 MHz | 2 CCE | R.17_1 TDD | OP.1 TDD | EPA5 | 4x4 Medium A Xpol | 1 | 1.0 |

## 8.10.3 PHICH

### 8.10.3.1 FDD

#### 8.10.3.1.1 FDD PHICH Single-antenna Port Performance 1x4

##### 8.10.3.1.1.1 Test purpose

This test verifies the demodulation performance of PHICH for a single-antenna port with a given SNR for which the average probability of miss-detection of Hybrid Indicator ("ACK to NACK") of the special reference measurement channels below a specified value.

##### 8.10.3.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support 4 Rx antenna ports in any FDD RF band.

##### 8.10.3.1.1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold delection).

**Table 8.10.3.1.1.3-1: Test Parameters for PHICH with 4 Rx Antenna Ports**

| Parameter | | Unit | Single antenna port |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | $\sigma$ | dB | 0 |
| PHICH duration | | | Normal |
| PHICH Ng (Note 1) | | | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. |
| Unused RE-s and PRB-s (Note 2) | | | OCNG |
| Cell ID | | | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8]. Note 2: PDSCH is mapped as OCNG. | | | |

For the parameters specified in Table 8.10.3.1.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.1.1.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.3.1.1.3-2: Minimum performance PHICH with 4 Rx Antenna Ports**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.18 | OP.1 FDD | ETU70 | 1 x 4 Low | 0.1 | 1.6 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.3.

### 8.10.3.1.1.4 Test description

#### 8.10.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.75.
2. The parameter settings for the cell are set up according to Table 8.10.3.1.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.3.1.1.4.3.

#### 8.10.3.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.10.3.1.1.5-1 as appropriate.
2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex A.3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.10.3.1.1.4.2-1 indicates the transmissions for one cycle.

**Table 8.10.3.1.1.4.2-1: PHICH test pattern**

| TTI | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 |
|---|---|---|---|---|---|---|
| PDCCH | S | S | - | - | S | S |
| PHICH | - | - | A | A | - | - |
| PUSCH | | T | T | R | R | T |
| UL HARQ Process | 1-4 | 5-8 | 1-4 | 5-8 | 1-4 | 5-8 |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK | | | | | | |

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
If Pm-an is less than the value specified in table 8.10.3.1.1.5-1, pass the UE. Otherwise fail the UE.

#### 8.10.3.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

**Table 8.10.3.1.1.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

#### 8.10.3.1.1.5 Test requirement

For the parameters specified in Table 8.10.3.1.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.1.1.5-1.

**Table 8.10.3.1.1.5-1: Test requirement PHICH with 4 Rx Antenna Ports**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.18 | OP.1 FDD | ETU70 | 1 x 4 Low | 0.1 | 2.5 |

### 8.10.3.1.2 FDD PHICH Transmit Diversity 2x4

#### 8.10.3.1.2.1 Test purpose

This test verifies the demodulation performance of PHICH for a single-antenna port with a given SNR for which the average probability of miss-detection of Hybrid Indicator (“ACK to NACK”) of the special reference measurement channels below a specified value.

#### 8.10.3.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support 4 Rx antenna ports in any FDD RF band.

#### 8.10.3.1.2.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold delection).

**Table 8.10.3.1.2.3-1: Test Parameters for PHICH with 4 Rx Antenna Ports**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| PHICH duration | | | Normal |
| PHICH Ng (Note 1) | | | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. |
| Unused RE-s and PRB-s (Note 2) | | | OCNG |
| Cell ID | | | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8]. Note 2: PDSCH is mapped as OCNG. | | | |

For the parameters specified in Table 8.10.3.1.2.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.1.2.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.3.1.2.3-2: Minimum performance PHICH with 4 Rx Antenna Ports**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.19 | OP.1 FDD | EVA70 | 2 x 4 Low | 0.1 | 0.6 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.3.

#### 8.10.3.1.2.4 Test description

##### 8.10.3.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.76.

2. The parameter settings for the cell are set up according to Table 8.10.3.1.2.3-1.

3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clause B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.3.1.2.4.3.

### 8.10.3.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.10.3.1.2.5-1 as appropriate.

2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex A.3.6 Table A.3.6-1A. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.10.3.1.2.4.2-1 indicates the transmissions for one cycle.

**Table 8.10.3.1.2.4.2-1: PHICH test pattern**

| TTI | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 |
|---|---|---|---|---|---|---|
| PDCCH | S | S | - | - | S | S |
| PHICH | - | - | A | A | - | - |
| PUSCH | | T | T | R | R | T |
| UL HARQ Process | 1-4 | 5-8 | 1-4 | 5-8 | 1-4 | 5-8 |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK | | | | | | |

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
If Pm-an is less than the value specified in table 8.10.3.1.2.5-1, pass the UE. Otherwise fail the UE.

### 8.10.3.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

**Table 8.10.3.1.2.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

#### 8.10.3.1.2.5 Test requirement

For the parameters specified in Table 8.10.3.1.2.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.1.2.5-1.

**Table 8.10.3.1.2.5-1: Test requirement PHICH with 4 Rx Antenna Ports**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.19_1 | OP.1 FDD | EVA70 | 2 x 4 Low | 0.1 | 1.7 |

### 8.10.3.1.3 FDD PHICH Transmit Diversity 4x4

#### 8.10.3.1.3.1 Test purpose

This test verifies the demodulation performance of PHICH for a single-antenna port with a given SNR for which the average probability of miss-detection of Hybrid Indicator ("ACK to NACK") of the special reference measurement channels below a specified value.

#### 8.10.3.1.3.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support 4 Rx antenna ports in any FDD RF band.

#### 8.10.3.1.3.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold delection).

**Table 8.10.3.1.3.3-1: Test Parameters for PHICH with 4 Rx Antenna Ports**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | $\sigma$ | dB | 0 |
| PHICH duration | | | Normal |
| PHICH Ng (Note 1) | | | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. |
| Unused RE-s and PRB-s (Note 2) | | | OCNG |
| Cell ID | | | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| Note 1: according to Clause 6.9 in TS 36.211 [8].<br>Note 2: PDSCH is mapped as OCNG. | | | |

For the parameters specified in Table 8.10.3.1.3.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.1.3.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.3.1.3.3-2: Minimum performance PHICH with 4 Rx Antenna Ports**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 5 MHz | R.20 | OP.1 FDD | EPA5 | 4 x 4 Medium correlation A, Cross polarized | 0.1 | 0.1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.3.

### 8.10.3.1.3.4 Test description

#### 8.10.3.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 5MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.74.
2. The parameter settings for the cell are set up according to Table 8.10.3.1.3.3-1.
3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.3.1.3.4.3.

#### 8.10.3.1.3.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.10.3.1.3.5-1 as appropriate.
2. SS shall schedule PUSCH transmissions according to Annex A.2.2.1.1 Table A.2.2.1.1-1 to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex A.3.6 Table A.3.6-1A. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.10.3.1.3.4.2-1 indicates the transmissions for one cycle.

**Table 8.10.3.1.3.4.2-1: PHICH test pattern**

| TTI | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 |
|---|---|---|---|---|---|---|
| PDCCH | S | S | - | - | S | S |
| PHICH | - | - | A | A | - | - |
| PUSCH | | T | T | R | R | T |
| UL HARQ Process | 1-4 | 5-8 | 1-4 | 5-8 | 1-4 | 5-8 |
| Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK | | | | | | |

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
If Pm-an is less than the value specified in table 8.10.3.1.3.5-1, pass the UE. Otherwise fail the UE.

### 8.10.3.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

**Table 8.10.3.1.3.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

### 8.10.3.1.3.5 Test requirement

For the parameters specified in Table 8.10.3.1.3.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.1.3.5-1.

**Table 8.10.3.1.3.5-1: Test requirement PHICH with 4 Rx Antenna Ports**

| Test number | Band width | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 5 MHz | R.20 | OP.1 FDD | EPA5 | 4 x 4 Medium correlation A, Cross polarized | 0.1 | 1.1 |

## 8.10.3.2 TDD

### 8.10.3.2.1 TDD PHICH Single-antenna Port Performance 1x4

#### 8.10.3.2.1.1 Test purpose

This test verifies the demodulation performance of PHICH for a single-antenna port with a given SNR for which the average probability of miss-detection of Hybrid Indicator ("ACK to NACK") of the special reference measurement channels below a specified value.

#### 8.10.3.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support 4 Rx antenna ports in any TDD RF band.

#### 8.10.3.2.1.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold delection).

**Table 8.10.3.2.1.3-1: Test Parameters for PHICH with 4 Rx Antenna Ports**

| Parameter | | Unit | Single antenna port |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 1 |
| Special subframe configuration (Note 2) | | | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | $\sigma$ | dB | 0 |
| PHICH duration | | | Normal |
| PHICH Ng (Note 1) | | | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. |
| Unused RE-s and PRB-s (Note 4) | | | OCNG |
| Cell ID | | | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8].<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8].<br>Note 3: according to Clause 6.9 in TS 36.211 [8].<br>Note 4: PDSCH is mapped as OCNG. | | | |

For the parameters specified in Table 8.10.3.2.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.2.1.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.3.2.1.3-2: Minimum performance PHICH with 4 Rx Antenna Ports**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.18 | OP.1 TDD | ETU70 | 1 x 4 Low | 0.1 | 1.7 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.3.

#### 8.10.3.2.1.4 Test description

##### 8.10.3.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.75.

2. The parameter settings for the cell are set up according to Table 8.10.3.2.1.3-1.

3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clause B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.3.2.1.4.3.

##### 8.10.3.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.10.3.2.1.5-1 as appropriate.

2. In Each HARQ process (4 HARQ processes for UL/DL configuration 1); SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex A.3.6 Table A.3.6-1. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.10.3.2.1.4.2-1 indicates the transmissions for one cycle.

**Table 8.10.3.2.1.4.2-1: PHICH test pattern**

| **Subframe Index** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PDCCH | | S | | | S | | S | | | S | | | | | | | | | | |
| PHICH | | | | | | | | | | | | A | | | A | | A | | | A |
| PUSCH | | | R? | R? | | | | T | T | | | | T | T | | | | R? | R? | |
| HARQ process | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 |
| Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test<br>Note 2: Following notation is used:<br>S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission<br>A: represents the ACK transmission on PHICH<br>T: represents a scheduled PUSCH transmission<br>R: represents a potential PUSCH re-transmission due to a missed ACK<br>Note 3: TDD UL/DL configuration 1 is used here, special subframe is denoted as blue | | | | | | | | | | | | | | | | | | | | |

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. DTX from the UE siede is counted as successful ACK reception, while any transmission on these subframe is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
If Pm-an is less than the value specified in table 8.10.3.2.1.5-1, pass the UE. Otherwise fail the UE.

#### 8.10.3.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

**Table 8.10.3.2.1.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

### 8.10.3.2.1.5 Test requirement

For the parameters specified in Table 8.10.3.2.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.2.1.5-1.

**Table 8.10.3.2.1.5-1: Test requirement PHICH with 4 Rx Antenna Ports**

| Test number | Band width | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.18 | OP.1 TDD | ETU70 | 1 x 4 Low | 0.1 | 2.6 |

## 8.10.3.2.2 TDD PHICH Transmit Diversity 2x4

### 8.10.3.2.2.1 Test purpose

This test verifies the demodulation performance of PHICH for a single-antenna port with a given SNR for which the average probability of miss-detection of Hybrid Indicator (“ACK to NACK”) of the special reference measurement channels below a specified value.

### 8.10.3.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support 4 Rx antenna ports in any TDD RF band.

### 8.10.3.2.2.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold delection).

**Table 8.10.3.2.2.3-1: Test Parameters for PHICH with 4 Rx Antenna Ports**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 1 |
| Special subframe configuration (Note 2) | | | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| PHICH duration | | | Normal |
| PHICH Ng (Note 1) | | | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. |
| Unused RE-s and PRB-s (Note 4) | | | OCNG |
| Cell ID | | | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8].<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8].<br>Note 3: according to Clause 6.9 in TS 36.211 [8].<br>Note 4: PDSCH is mapped as OCNG. | | | |

For the parameters specified in Table 8.10.3.2.2.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.2.2.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.3.2.2.3-2: Minimum performance PHICH with 4 Rx Antenna Ports**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.19_1 | OP.1 TDD | EVA70 | 2 x 4 Low | 0.1 | 0.9 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.3.

### 8.10.3.2.2.4 Test description

#### 8.10.3.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.76.

2. The parameter settings for the cell are set up according to Table 8.10.3.2.2.3-1.

3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clause B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.3.2.2.4.3.

### 8.10.3.2.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.10.3.2.2.5-1 as appropriate.

2. In Each HARQ process (4 HARQ processes for UL/DL configuration 1); SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex A.3.6 Table A.3.6-1A. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.10.3.2.2.4.2-1 indicates the transmissions for one cycle.

**Table 8.10.3.2.2.4.2-1: PHICH test pattern**

| **Subframe Index** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PDCCH | | S | | | S | | S | | | S | | | | | | | | | | |
| PHICH | | | | | | | | | | | | A | | | A | | A | | | A |
| PUSCH | | | R? | R? | | | | T | T | | | | T | T | | | | R? | R? | |
| HARQ process | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 |

Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK
Note 3: TDD UL/DL configuration 1 is used here, special subframe is denoted as blue

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. DTX from the UE siede is counted as successful ACK reception, while any transmission on these subframe is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
If Pm-an is less than the value specified in table 8.10.3.2.2.5-1, pass the UE. Otherwise fail the UE.

### 8.10.3.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

**Table 8.10.3.2.2.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

### 8.10.3.2.2.5 Test requirement

For the parameters specified in Table 8.10.3.2.2.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.2.2.5-1.

**Table 8.10.3.2.2.5-1: Test requirement PHICH with 4 Rx Antenna Ports**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 10 MHz | R.19_1 | OP.1 TDD | EVA70 | 2 x 4 Low | 0.1 | 2.0 |

## 8.10.3.2.3 TDD PHICH Transmit Diversity 4x4

### 8.10.3.2.3.1 Test purpose

This test verifies the demodulation performance of PHICH for a single-antenna port with a given SNR for which the average probability of miss-detection of Hybrid Indicator ("ACK to NACK") of the special reference measurement channels below a specified value.

### 8.10.3.2.3.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support 4 Rx antenna ports in any TDD RF band.

### 8.10.3.2.3.3 Minimum conformance requirements

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold delection).

**Table 8.10.3.2.3.3-1: Test Parameters for PHICH with 4 Rx Antenna Ports**

| Parameter | | Unit | Transmit diversity |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | | 1 |
| Special subframe configuration (Note 2) | | | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | $\sigma$ | dB | 0 |
| PHICH duration | | | Normal |
| PHICH Ng (Note 1) | | | Ng = 1 |
| PDCCH Content | | | UL Grant should be included with the proper information aligned with A.3.6. |
| Unused RE-s and PRB-s (Note 4) | | | OCNG |
| Cell ID | | | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cyclic prefix | | | Normal |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [8].<br>Note 2: as specified in Table 4.2-1 in TS 36.211 [8].<br>Note 3: according to Clause 6.9 in TS 36.211 [8].<br>Note 4: PDSCH is mapped as OCNG. | | | |

For the parameters specified in Table 8.10.3.2.3.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.2.3.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.3.2.3.3-2: Minimum performance PHICH with 4 Rx Antenna Ports**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 5 MHz | R.20 | OP.1 TDD | EPA5 | 4 x 4 Medium cotrrelation A, Cross polarized | 0.1 | 0.3 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.3.

### 8.10.3.2.3.4 Test description

#### 8.10.3.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 5MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.74.
2. The parameter settings for the cell are set up according to Table 8.10.3.2.3.3-1.
3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.3.2.3.4.3.

#### 8.10.3.2.3.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.10.3.2.3.5-1 as appropriate.
2. In Each HARQ process (4 HARQ processes for UL/DL configuration 1); SS shall schedule PUSCH transmissions according to Annex A.2.3.1.1 Table A.2.3.1.1-1 via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. PHICH is set according to Annex A.3.6 Table A.3.6-1A. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.10.3.2.3.4.2-1 indicates the transmissions for one cycle.

**Table 8.10.3.2.3.4.2-1: PHICH test pattern**

| Subframe Index | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PDCCH | | S | | | S | | S | | | S | | | | | | | | | | |
| PHICH | | | | | | | | | | | | A | | | A | | A | | | A |
| PUSCH | | | R? | R? | | | | T | T | | | | T | T | | | | R? | R? | |
| HARQ process | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 | | 1 | 3 | 4 | 2 | | 3 | 1 | 2 | 4 |

Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK
Note 3: TDD UL/DL configuration 1 is used here, special subframe is denoted as blue

3. SS will only monitor for uplink retransmissions due to ACK missed-detections. DTX from the UE siede is counted as successful ACK reception, while any transmission on these subframe is counted as NACKs.

4. Repeat steps 1 – 3 for a duration sufficient to achieve statistical significance according to Annex G clause G.4 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
If Pm-an is less than the value specified in table 8.10.3.2.3.5-1, pass the UE. Otherwise fail the UE.

### 8.10.3.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6.

**Table 8.10.3.2.3.4.3-1: MAC-MainConfig-RBC**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| dl-SCH-Config SEQUENCE {} | Not present | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n2 | Only one retransmission per UL HARQ | |

### 8.10.3.2.3.5 Test requirement

For the parameters specified in Table 8.10.3.2.3.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.2.3.5-1.

**Table 8.10.3.2.3.5-1: Test requirement PHICH with 4 Rx Antenna Ports**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pm-an (%) | SNR (dB) |
| 1 | 5 MHz | R.20_1 | OP.1 TDD | EPA5 | 4 x 4 Medium cotrrelation A, Cross polarized | 0.1 | 1.3 |

# 8.10.4 ePDCCH

## 8.10.4.1 Distributed Transmission with 4Rx

### 8.10.4.1.1 FDD distributed EPDCCH performance 2x4

#### 8.10.4.1.1.1 Test purpose

This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). EPDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of EPDCCH.

#### 8.10.4.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward supporting EPDCCH with 4 Rx antenna ports.

#### 8.10.4.1.1.3 Minimum conformance requirements

The parameters specified in Table 8.10.4.1.1.3-1 are valid for all FDD distributed EPDCCH test with 4Rx unless otherwise stated.

**Table 8.10.4.1.1.3-1: Test Parameters for Distributed EPDCCH with 4Rx**

| Parameter | | Unit | Value |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 (Note 1) |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| | Δ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Cyclic prefix | | | Normal |
| Subframe Configuration | | | Non-MBSFN |
| Precoder Update Granularity | | PRB | 1 |
| | | ms | 1 |
| Beamforming Pre-Coder | | | Annex B.4.4 |
| Cell Specific Reference Signal | | | Port 0 and 1 |
| Number of EPDCCH Sets Configured | | | 2 (Note 2) |
| Number of PRB per EPDCCH Set | | | 4 (1st Set)<br>8 (2nd Set) |
| EPDCCH Subframe Monitoring | | | NA |
| PDSCH TM | | | TM3 |
| DCI Format | | | 2A |

Note 1: The starting symbol for EPDCCH is derived from the PCFICH. RRC signalling *epdcch-StartSymbol-r11* is not configured.

Note 2: The two sets are distributed EPDCCH sets and non-overlapping with PRB = {3, 17, 31, 45} for the first set and PRB = {0, 7, 14, 21, 28, 35, 42, 49} for the second set. EPDCCH is scheduled in the first set for Test 1 and second set for Test 2, respectively. Both sets are always configured.

For the parameters specified in Table 8.10.4.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.4.1.1.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.4.1.1.3-2: Minimum performance Distributed EPDCCH with 4Rx**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 ECCE | R.55 FDD | OP.7 FDD | EVA5 | 2 x 4 Low | 1 | -0.7 |
| 2 | 10 MHz | 16 ECCE | R.56 FDD | OP.7 FDD | EVA70 | 2 x 4 Low | 1 | -5.8 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.4.1.1.

### 8.10.4.1.1.4 Test description

#### 8.10.4.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.76 for antenna configuration 2x4.
2. The parameter settings for the cell are set up according to Table 8.10.4.1.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.4.1.1.4.3.

#### 8.10.4.1.1.4.2 Test procedure

1. SS transmits PDSCH via EPDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Table 8.10.4.1.1.3-2. The details of EPDCCH and PDSCH are specified in Table A.3.10.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.10.4.1.1.5-1 as appropriate.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.10.4.1.1.5-1, pass the UE. Otherwise fail the UE.

#### 8.10.4.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 8.10.4.1.1.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, Condition: FDD |
|---|

#### 8.10.4.1.1.5 Test requirement

For the parameters specified in Table 8.10.4.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.4.1.1.5-1.

**Table 8.10.4.1.1.5-1: Test requirement Distributed EPDCCH with 4Rx**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 ECCE | R.55 FDD | OP.7 FDD | EVA5 | 2 x 4 Low | 1 | 0.2 |
| 2 | 10 MHz | 16 ECCE | R.56 FDD | OP.7 FDD | EVA70 | 2 x 4 Low | 1 | -4.9 |

### 8.10.4.1.2 TDD distributed EPDCCH performance 2x4

#### 8.10.4.1.2.1 Test purpose

This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). EPDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of EPDCCH.

#### 8.10.4.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward supporting EPDCCH with 4 Rx antenna ports.

#### 8.10.4.1.2.3 Minimum conformance requirements

The parameters specified in Table 8.10.4.1.2.3-1 are valid for all TDD distributed EPDCCH tests with 4Rx unless otherwise stated.

**Table 8.10.4.1.2.3-1: Test Parameters for Distributed EPDCCH with 4Rx**

| Parameter | | Unit | Value |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 2 (Note 1) |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| | δ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Cyclic prefix | | | Normal |
| Subframe Configuration | | | Non-MBSFN |
| Precoder Update Granularity | | PRB | 1 |
| | | ms | 1 |
| Beamforming Pre-Coder | | | Annex B.4.4 |
| Cell Specific Reference Signal | | | Port 0 and 1 |
| Number of EPDCCH Sets Configured | | | 2 (Note 2) |
| Number of PRB per EPDCCH Set | | | 4 (1st Set)<br>8 (2nd Set) |
| EPDCCH Subframe Monitoring | | | NA |
| PDSCH TM | | | TM3 |
| DCI Format | | | 2A |
| TDD UL/DL Configuration | | | 0 |
| TDD Special Subframe | | | 1 (Note 3) |

Note 1: The starting symbol for EPDCCH is derived from the PCFICH. RRC signalling *epdcch-StartSymbol-r11* is not configured.

Note 2: The two sets are distributed EPDCCH sets and non-overlapping with PRB = {3, 17, 31, 45} for the first set and PRB = {0, 7, 14, 21, 28, 35, 42, 49} for the second set. EPDCCH is scheduled in the first set for Test 1 and second set for Test 2, respectively. Both sets are always configured.

Note 3: Demodulation performance is averaged over normal and special subframe.

For the parameters specified in Table 8.10.4.1.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.4.1.2.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.4.1.2.3-2: Minimum performance Distributed EPDCCH with 4Rx**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 ECCE | R.55 TDD | OP.7 TDD | EVA5 | 2 x 4 Low | 1 | -0.7 |
| 2 | 10 MHz | TBD ECCE | R.56 TDD | OP.7 TDD | EVA70 | 2 x 4 Low | 1 | -5.8 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.4.1.2.

### 8.10.4.1.2.4 Test description

#### 8.10.4.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.76 for antenna configuration 2x4.
2. The parameter settings for the cell are set up according to Table 8.10.4.1.2.3-1.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.4.1.2.4.3.

### 8.10.4.1.2.4.2 Test procedure

1. SS transmits PDSCH via EPDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to Table 8.10.4.1.2.3-2. The details of EPDCCH and PDSCH are specified in Table A.3.10.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.10.4.1.2.5-1 as appropriate.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.10.4.1.2.5-1, pass the UE. Otherwise fail the UE.

### 8.10.4.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 8.10.4.1.2.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, Condition: TDD |
|---|

**Table 8.10.4.1.2.4.3-2: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa0 | | |
| specialSubframePatterns | Ssp1 | | |
| } | | | |

### 8.10.4.1.2.5 Test requirement

For the parameters specified in Table 8.10.4.1.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.4.1.2.5-1.

**Table 8.10.4.1.2.5-1: Test requirement Distributed EPDCCH with 4Rx**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 4 ECCE | R.55 TDD | OP.7 TDD | EVA5 | 2 x 4 Low | 1 | 0.2 |
| 2 | 10 MHz | TBD ECCE | R.56 TDD | OP.7 TDD | EVA70 | 2 x 4 Low | 1 | -4.9 |

## 8.10.4.2 Localized Transmission with TM9 2x4

### 8.10.4.2.1 FDD localized EPDCCH performance with TM9 2x4

#### 8.10.4.2.1.1 Test purpose

This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). In this test, EPDCCH and PCFICH are not tested jointly.

#### 8.10.4.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward supporting EPDCCH and FGI bit 103 with 4Rx antenna ports.

#### 8.10.4.2.1.3 Minimum conformance requirements

The parameters specified in Table 8.10.4.2.1.3-1 are valid for all FDD TM9 localized ePDCCH tests with 4Rx unless otherwise stated.

**Table 8.10.4.2.1.3-1: Test Parameters for Localized EPDCCH with TM9 and 4Rx**

| Parameter | | Unit | Value |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 1 (Note 1) |
| EPDCCH starting symbol | | symbols | 2 (Note 1) |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | $\sigma$ | dB | -3 |
| | $\delta$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Cyclic prefix | | | Normal |
| Subframe Configuration | | | Non-MBSFN |
| Precoder Update Granularity | | PRB | 1 |
| | | ms | 1 |
| Beamforming Pre-Coder | | | Annex B.4.5 |
| Cell Specific Reference Signal | | | Port 0 and 1 |
| CSI-RS Reference Signal | | | Port 15 and 16 |
| CSI-RS reference signal resource configuration | | | 0 |
| CSI reference signal subframe configuration $I_{CSI-RS}$ | | | 2 |
| ZP-CSI-RS configuration bitmap | | | 0000010000000000 |
| ZP-CSI-RS subframe configuration $I_{ZP-CSI-RS}$ | | | 2 |
| Number of EPDCCH Sets | | | 2 (Note 2) |
| EPDCCH Subframe Monitoring pattern *subframePatternConfig-r11* | | | 1111111110 1111111101 1111111011 1111110111 (Note 3) |
| PDSCH TM | | | TM9 |

Note 1: The starting symbol for EPDCCH is signalled with *epdcch-StartSymbol-r11*. However, CFI is set to 1.

Note 2: The first set is distributed transmission with PRB = {0, 49} and the second set is localized transmission with PRB = {0, 7, 14, 21, 28, 35, 42, 49}. ePDCCH is scheduled in the second set for all tests.

Note 3: EPDCCH is scheduled in every SF. UE is required to monitor ePDCCH for UE-specific search space only in SFs configured by *subframePatternConfig-r11*. Legacy PDCCH is not scheduled.

For the parameters specified in Table 8.10.4.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.4.2.1.3-2. EPDCCH subframe monitoring is configured and the subframe monitoring requirement in EPDCCH restricted subframes is statDTX of 99.9%.

The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.4.2.1.3-2: Minimum performance Localized EPDCCH with TM9 and 4Rx**

| Test number | Band width | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 2 ECCE | R.57 FDD | OP.7 FDD | EVA5 | 2 x 4 Low | 1 | 6.6 |
| 2 | 10 MHz | 8 ECCE | R.58 FDD | OP.7 FDD | EVA5 | 2 x 4 Low | 1 | -1.5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.4.2.1.

### 8.10.4.2.1.4 Test description

#### 8.10.4.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.76 for antenna configuration 2x4.
2. The parameter settings for the cell are set up according to Table 8.10.4.2.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.4.2.1.4.3.

#### 8.10.4.2.1.4.2 Test procedure

1. SS transmits PDSCH via EPDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Table 8.10.4.2.1.3-2. The details of EPDCCH and PDSCH are specified in Table A.3.10.1-1 and Table A.3.5.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.10.4.2.1.5-1 as appropriate.
3. Measure the Pm-dsg on monitoring subframes for a duration sufficient to achieve statistical significance according to Annex G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval for monitoring subframes. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). Also, count the number of statDTX on the UL PUCCH for unmonitoring subframes and calculate the ratio of (number of statDTX on the UL PUCCH for unmonitoring subframes)/( the number of configured unmonitoring subframes). If Pm-dsg is less than the value specified in table 8.10.4.2.1.5-1 and the ratio of statDTX on the UL PUCCH for unmonitoring subframes is no less than 99.9%+TT, pass the UE. Otherwise fail the UE.

#### 8.10.4.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 8.10.4.2.1.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, condition: FDD, TM9 |
|---|

**Table 8.10.4.2.1.4.3-2: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| antennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 111111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.10.4.2.1.5 Test requirement

For the parameters specified in Table 8.10.4.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.4.2.1.5-1. EPDCCH subframe monitoring is configured and the subframe monitoring requirement in EPDCCH restricted subframes is no less than statDTX of 99.9%+TT.

**Table 8.10.4.2.1.5-1: Test requirement localized EPDCCH with TM9 and 4Rx**

| Test number | Band width | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 2 ECCE | R.57 FDD | OP.7 FDD | EVA5 | 2 x 4 Low | 1 | 7.5 |
| 2 | 10 MHz | 8 ECCE | R.58 FDD | OP.7 FDD | EVA5 | 2 x 4 Low | 1 | -0.6 |

## 8.10.4.2.2 TDD localized EPDCCH performance with TM9 2x4

### 8.10.4.2.2.1 Test purpose

This test verifies the receiver characteristics of the EPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). In this test, EPDCCH and PCFICH are not tested jointly.

### 8.10.4.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward supporting EPDCCH and FGI bit 103 with 4Rx antenna ports.

### 8.10.4.2.2.3 Minimum conformance requirements

The parameters specified in Table 8.10.4.2.2,3-1 are valid for all TDD TM9 localized ePDCCH tests unless otherwise stated.

**Table 8.10.4.2.2.3-1: Test Parameters for Localized EPDCCH with TM9 and 4Rx**

| Parameter | | Unit | Value |
|---|---|---|---|
| Number of PDCCH symbols | | symbols | 1 (Note 1) |
| EPDCCH starting symbol | | symbols | 2 (Note 1) |
| PHICH duration | | | Normal |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | $\sigma$ | dB | -3 |
| | $\delta$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Cyclic prefix | | | Normal |
| Subframe Configuration | | | Non-MBSFN |
| Precoder Update Granularity | | PRB | 1 |
| | | ms | 1 |
| Beamforming Pre-Coder | | | Annex B.4.5 |
| Cell Specific Reference Signal | | | Port 0 and 1 |
| CSI-RS Reference Signal | | | Port 15 and 16 |
| CSI-RS reference signal resource configuration | | | 0 |
| CSI reference signal subframe configuration $I_{CSI-RS}$ | | | 0 |
| ZP-CSI-RS configuration bitmap | | | 0000010000000000 |
| ZP-CSI-RS subframe configuration $I_{ZP-CSI-RS}$ | | | 0 |
| Number of EPDCCH Sets | | | 2 (Note 2) |
| EPDCCH Subframe Monitoring pattern *subframePatternConfig-r11* | | | 1100011000 1100010000 1100011000 1100001000 1100011000 1000011000 1100011000 (Note 3) |
| PDSCH TM | | | TM9 |
| TDD UL/DL Configuration | | | 0 |
| TDD Special Subframe | | | 1 (Note 4) |

Note 1: The starting symbol for EPDCCH is signalled with *epdcch-StartSymbol-r11*. However, CFI is set to 1.
Note 2: The first set is distributed transmission with PRB = {0, 49} and the second set is localized transmission with PRB = {0, 7, 14, 21, 28, 35, 42, 49}. ePDCCH is scheduled in the second set for all tests.
Note 3: EPDCCH is scheduled in every SF. UE is required to monitor ePDCCH for UE-specific search space only in SFs configured by *subframePatternConfig-r11*. Legacy PDCCH is not scheduled.
Note 4: Demodulation performance is averaged over normal and special subframe.

For the parameters specified in Table 8.10.4.2.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.4.2.2.3-2. EPDCCH subframe monitoring is configured and the subframe monitoring requirement in EPDCCH restricted subframes is statDTX of 99.9%.

The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.10.4.2.2.3-2: Minimum performance Localized EPDCCH with TM9 and 4Rx**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 2 ECCE | R.57 TDD | OP.7 TDD | EVA5 | 2 x 4 Low | 1 | 6.0 |
| 2 | 10 MHz | 8 ECCE | R.58 TDD | OP.7 TDD | EVA5 | 2 x 4 Low | 1 | -2.1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.10.4.2.2.

#### 8.10.4.2.2.4 Test description

##### 8.10.4.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and EPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.76 for antenna configuration 2x4.
2. The parameter settings for the cell are set up according to 8.10.4.2.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.10.4.2.2.4.3.

##### 8.10.4.2.2.4.2 Test procedure

1. SS transmits PDSCH via EPDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Table 8.10.4.2.2.3-2.The details of EPDCCH and PDSCH are specified in Table A.3.10.2-1 and Table A.3.5.2-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.10.4.2.2.5-1 as appropriate.
3. Measure the Pm-dsg on monitoring subframes for a duration sufficient to achieve statistical significance according to Annex G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval for monitoring subframes. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). Also, count the number of statDTX on the UL PUCCH for unmonitoring subframes and calculate the ratio of (number of statDTX on the UL PUCCH for unmonitoring subframes)/( the number of configured unmonitoring subframes). If Pm-dsg is less than the value specified in table 8.10.4.2.2.5-1 and the ratio of statDTX on the UL PUCCH for unmonitoring subframes is no less than 99.9%+TT, pass the UE. Otherwise fail the UE.

##### 8.10.4.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:.

**Table 8.10.4.2.2.4.3-1: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2B, condition: TDD, TM9 |
|---|

**Table 8.10.4.2.2.4.3-2: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa0 | | |
| specialSubframePatterns | ssp1 | | |
| } | | | |

**Table 8.10.4.2.2.4.3-3: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| antennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 111111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 8.10.4.2.2.5 Test requirement

For the parameters specified in Table 8.10.4.2.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.10.4.2.2.5-1. EPDCCH subframe monitoring is configured and the subframe monitoring requirement in EPDCCH restricted subframes is no less than statDTX of 99.9%+TT.

**Table 8.10.4.2.2.5-1: Test requirement Localized EPDCCH with TM9 and 4Rx**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | 10 MHz | 2 ECCE | R.57 TDD | OP.7 TDD | EVA5 | 2 x 4 Low | 1 | 6.9 |
| 2 | 10 MHz | 8 ECCE | R.58 TDD | OP.7 TDD | EVA5 | 2 x 4 Low | 1 | -1.2 |

# 8.11 Demodulation (UE supporting coverage enhancement)

The requirements in this sub-clause are defined based on the simulation results with UE DL Category M1 unless otherwise stated.

The requirements for UE DL Category M2 in this sub-clause are defined based on the simulation results with UE DL Category M2 unless otherwise stated.

The requirements of UE DL Category M1 in this sub-clause are applicable for UE DL Category M2, UE DL Category 1bis and Category 0.

## 8.11.1 PDSCH

### 8.11.1.1 FDD and half-duplex FDD (Fixed Reference Channel)

The parameters specified in Table 8.11.1.1-1 are valid for FDD and half-duplex FDD tests unless otherwise stated.

**Table 8.11.1.1-1: Common Test Parameters (FDD and half-duplex FDD)**

| Parameter | Unit | CE Mode A | CE Mode B |
|---|---|---|---|
| Number of HARQ processes per component carrier | Processes | 8 or 10 (Note 2) | 2 |
| Maximum number of HARQ transmission | | 4 | 4 |
| Redundancy version coding sequence | | {0, 2, 3,1} for QPSK and 16QAM | {0,0,0,0,2,2,2,2,3,3,3,3,1,1,1,1 …} for QPSK |
| Number of OFDM symbols for PDCCH per component carrier | OFDM symbols | 4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths, 2 for 10 MHz, 15 MHz and 20 MHz bandwidths | 4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths, 2 for 10 MHz, 15 MHz and 20 MHz bandwidths |
| Cyclic Prefix | | Normal | Normal |
| Beamforming Precoder for MPDCCH | | Annex B.4.4 | Annex B.4.4 |
| Precoder update granularity for MPDCCH | | Frequency domain: 1 PRB Time domain: identical during the hopping period (interval-FDD for CE Mode A) | Frequency domain: 1 PRB Time domain: identical during the hopping period (interval-FDD for CE Mode B) |
| BL/CE DL subframe comfiguration (fdd-DownlinkOrTddSubframeBitmapBR) | | 1111111111 | 1111111111 |
| Note 1: rvidx is defined in TS 36.213 [6] Table 7.1.7.1-2.<br>Note 2: For UE supporting ce-pdsch-tenProcesses-r13, the number of HARQ processese are set to 10, otherwise, it is set to 8. | | | |

## 8.11.1.1.1 FDD and half-duplex FDD Closed-loop spatial multiplexing performance for UE supporting CE

### 8.11.1.1.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

### 8.11.1.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 13 and forward of UE category M1 that supports TM6 in CE mode A.

This test applies to all types of E-UTRA FDD UE release 14 and forward of UE category M2 that supports TM6 in CE mode A.

### 8.11.1.1.1.3 Minimum conformance requirements

The requirements are specified in Table 8.11.1.1.1.3-2, with the addition of the parameters in Table 8.11.1.1.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with frequency selective precoding.

**Table 8.11.1.1.1.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| | δ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 |
| PMI delay (Note 2) | | ms | 10 |
| Reporting interval | | ms | 10 |
| Reporting mode | | | PUCCH 1-1 |
| Physical channel for CQI reporting | | | PUSCH(Note4) |
| cqi-pmi-ConfigIndex | | | 12 |
| CodeBookSubsetRestriction bitmap | | | 001111 |
| PDSCH transmission mode | | | 6 |
| Coverage enhancement mode | | | CE Mode A |
| OFDM starting symbol (startSymbolBR) | | | 2 |
| Maximum number of repetitions (mpdcch-NumRepetition) | | | 1 |
| Frequency hopping (mpdcch-pdsch-HoppingConfig) | | | Disabled |
| MPDCCH transmission duration | | ms | 1 |
| Starting subframe configuration for MPDCCH (mpdcch_startSF_UESS) | | | 1 |
| Narrowband for MPDCCH (mpdcch_Narrowband) | | | 1 |

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), This reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: For each test, DC subcarrier puncturing shall be considered.

Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 6-0A shall be transmitted in downlink SF#1 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5.

Note 5: If not otherwise stated, the values in this table refer to parameters in TS 36.211 [8] or/and TS 36.213 [10] as appropriate.

**Table 8.11.1.1.1.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1 | 10MHz 16QAM 1/2 | R.79 FDD | OP.2 FDD | EPA5 | 2x1 Low | 70% | 8.6 |

The normative reference for this requirement is TS 36.101 [2] clause 8.11.1.1.1.

#### 8.11.1.1.1.4 Test description

##### 8.11.1.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.11.1.1.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Tables 8.11.1.1-1 and 8.11.1.1.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 8.11.1.1.1.4.3.

##### 8.11.1.1.1.4.2 Test procedure

1. SS transmits PDSCH via MPDCCH DCI format 6-1A with narrowband index $n_{RB}$ = 1 for C_RNTI to transmit the DL RMC according to Tables 8.11.1.1.1.3-1 and 8.11.1.1.1.3-2.

SS sends uplink scheduling information via MPDCCH DCI format 6-0A with CQI request bit set to 0 to schedule UL RMC in subframe #1( Table A.2.2.1.1-1b).2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.11.1.1.1.5-1 as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.11.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with condition CEModeA and the following exceptions.

**Table 8.11.1.1.1.4.3-1: SystemInformationBlockType1-BR-r13**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType1-BR-r13 ::= SEQUENCE { | | | |
| startSymbolBR-r13 | 2 | | |
| } | | | |

**Table 8.11.1.1.1.4.3-2: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| EPDCCH-Config-r11 ::= SEQUENCE{ | | | |
| mpdcch-config-r13 CHOICE[1] { | | | |
| setup SEQUENCE { | | | |
| csi-NumRepetitionCE-r13 | sf1 | | |
| mpdcch-pdsch-HoppingConfig-r13 | off | | |
| mpdcch-StartSF-UESS-r13 CHOICE { | | | |
| fdd-r13 | v1 | | |
| } | | | |
| mpdcch-NumRepetition-r13 | r1 | | |
| mpdcch-Narrowband-r13 | 2 | Narrowband index 1 | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.11.1.1.1.4.3-3: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.11.1.1.1.4.3-4: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 12 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.11.1.1.1.5 Test requirement

Table 8.11.1.1.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.11.1.1.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.11.1.1.1.5-1: Test requirement for Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1 | 10MHz 16QAM 1/2 | R.79 FDD | OP.2 FDD | EPA5 | 2x1 Low | 70% | 9.5 |

### 8.11.1.1.2 FDD and half-duplex FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE supporting CE

#### 8.11.1.1.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

#### 8.11.1.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 13 and forward of UE category M1 and supports TM9 in CE Mode A.This test also applies to all types of E-UTRA FDD UE release 14 and forward of UE category M2 and supports TM9 in CE Mode A.

#### 8.11.1.1.2.3 Minimum conformance requirements

For single-layer transmission on antenna ports 7 or 8 upon detection of a MPDCCH with DCI format 6-1A, the requirements are specified in Table 8.11.1.1.2.3-2 with the addition of the parameters in Table 8.11.1.1.2.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify rank-1 performance on one of the antenna ports 7 or 8.

**Table 8.11.1.1.2.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer)**

| parameter | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 (Note 1) | 0 (Note 1) |
| | σ | dB | -3 | -3 | -3 |
| | δ | dB | 0 | 0 | 0 |
| Beamforming model | | | Annex B.4.1 | Annex B.4.1 | Annex B.4.1 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 (Note 6) | -98 (Note 6) | -98 (Note 6) |
| Symbols for unused PRBs | | | OCNG (Note 3) | OCNG (Note 3) | OCNG (Note 3) |
| Number of allocated resource blocks (Note 2) | | PRB | 6 | 6 | 6 |
| Simultaneous transmission | | | No | No | No |
| PDSCH transmission mode | | | 9 | 9 | 9 |
| Coverage enhancement mode | | | CE Mode A | CE Mode A | CE Mode A |
| OFDM starting symbol (startSymbolBR) | | | 2 | 2 | 2 |
| Maximum number of repetitions for PDSCH (*pdsch-maxNumRepetitionCEmodeA*) | | | 16 | 16 | Not configured |
| PDSCH repetition number | | | 8 | 4 | 2 |
| Frequency hopping (mpdcch-pdsch-HoppingConfig) | | | Enabled | Enabled | Enabled |
| Frequency hopping offset (mpdcch-pdsch-HoppingOffset) | | | 1 | 1 | 1 |
| Frequency hopping interval (interval-FDD) | | ms | 8 | 2 | 1 |
| MPDCCH transmission duration (mPDCCH-NumRepetition) | | ms | 8 | 2 | 1 |
| MPDCCH repetition number | | | 8 | 2 | 1 |
| Number of narrowbands for frequency hopping (mpdcch-pdsch-HoppingNB) | | | 2 | 2 | 2 |
| Starting subframe configuration for MPDCCH (mpdcch_startSF_UESS) | | | 4 | 8 | 10 |
| Narrowband for MPDCCH (mpdcch_Narrowband) | | | 7 | 7 | 7 |
| MPDCCH aggregation level | | | 24 | 24 | 24 |

Note 1: $P_B = 1$.

Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.

Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 4: For each test, DC subcarrier puncturing shall be considered.

Note 5: If not otherwise stated, the values in this table refer to parameters in TS 36.211 [4] or/and TS 36.213 [6] as appropriate.

**Table 8.11.1.1.2.3-2: Minimum performance for CDM-multiplexed DM RS (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10MHz QPSK 1/3 | R.80 FDD | OP.2 FDD | EPA5 | 2x1 Low | 70 | -2.0 | M1 |
| 2 | 10MHz QPSK 1/3 | R.80-1 FDD | OP.2 FDD | EPA5 | 2x2 Low | 70 | -4.0 | ≥1 |
| 3 | 10MHz QPSK 1/3 | R.80-2 FDD | OP.2 FDD | EPA5 | 2x4 Low | 70 | -4.0 | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.11.1.1.2.

### 8.11.1.1.2.4 Test description

#### 8.11.1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.11.1.1.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for UE supporting 1Rx using only main UE Tx/Rx antenna. Annex A, Figure A.10 for UE supporting 2Rx. Annex A, Figure A.10 for UE supporting 2Rx. Annex A, Figure A.10a for UE supporting 4Rx.
2. The parameter settings for the cell are set up according to Tables 8.11.1.1-1 and 8.11.1.1.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 8.11.1.1.2.4.3.

#### 8.11.1.1.2.4.2 Test procedure

1. SS transmits PDSCH via M-PDCCH DCI format 6-1A with narrowband index $n_{RB}$ = 7 for C_RNTI to transmit the DL RMC according to Tables 8.11.1.1.2.3-1 and 8.11.1.1.2.3-2.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.11.1.1.2.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.11.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with condition CEModeA and the following exceptions

**Table 8.11.1.1.2.4.3-1: EPDCCH-Config-r11-DEFAULT configuration for test numer 1**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| | | | |
| mpdcch-config-r13 CHOICE { | | | |
| mpdcch-pdsch-HoppingConfig-r13 | on | | |
| mpdcch-StartSF-UESS-r13 CHOICE { | | | |
| fdd-r13 | v4 | | |
| } | | | |
| mpdcch-NumRepetition-r13 | r8 | | |
| mpdcch-Narrowband-r13 | 8 | Narrowband index 7 | |
| } | | | |

**Table 8.11.1.1.2.4.3-2: EPDCCH-Config-r11-DEFAULT configuration for test number 2**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| | | | |
| mpdcch-config-r13 CHOICE { | | | |
| mpdcch-pdsch-HoppingConfig-r13 | on | | |
| mpdcch-StartSF-UESS-r13 CHOICE { | | | |
| fdd-r13 | v8 | | |
| } | | | |
| mpdcch-NumRepetition-r13 | r2 | | |
| mpdcch-Narrowband-r13 | 8 | Narrowband index 7 | |
| } | | | |

**Table 8.11.1.1.2.4.3-3: EPDCCH-Config-r11-DEFAULT configuration for test number 3**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| | | | |
| mpdcch-config-r13 CHOICE { | | | |
| mpdcch-pdsch-HoppingConfig-r13 | on | | |
| mpdcch-StartSF-UESS-r13 CHOICE { | | | |
| fdd-r13 | v10 | | |
| } | | | |
| mpdcch-NumRepetition-r13 | r1 | | |
| mpdcch-Narrowband-r13 | 8 | Narrowband index 7 | |
| } | | | |

**Table 8.11.1.1.2.4.3-4: FreqHoppingParameters-r13-DEFAULT configuration for test number 1**

| Derivation Path: 36.508 Table 4.4.3.2-3A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType1-BR-r13 ::= SEQUENCE { | | | |
| freqHoppingParametersDL-r13 SEQUENCE { | | | |
| mpdcch-pdsch-HoppingNB-r13 | nb2 | | |
| interval-DLHoppingConfigCommonModeA-r13 CHOICE { | | | |
| interval-FDD-r13 | int8 | | |
| } | | | |
| mpdcch-pdsch-HoppingOffset-r13 | 1 | | |
| } | | | |
| } | | | |

**Table 8.11.1.1.2.4.3-5: FreqHoppingParameters-r13-DEFAULT configuration for test number 2**

| Derivation Path: 36.508 Table 4.4.3.2-3A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType1-BR-r13 ::= SEQUENCE { | | | |
| freqHoppingParametersDL-r13 SEQUENCE { | | | |
| mpdcch-pdsch-HoppingNB-r13 | nb2 | | |
| interval-DLHoppingConfigCommonModeA-r13 CHOICE { | | | |
| interval-FDD-r13 | Int2 | | |
| } | | | |
| mpdcch-pdsch-HoppingOffset-r13 | 1 | | |
| } | | | |
| } | | | |

**Table 8.11.1.1.2.4.3-6: FreqHoppingParameters-r13-DEFAULT configuration for test number 3**

| Derivation Path: 36.508 Table 4.4.3.2-3A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType1-BR-r13 ::= SEQUENCE { | | | |
| freqHoppingParametersDL-r13 SEQUENCE { | | | |
| mpdcch-pdsch-HoppingNB-r13 | nb2 | | |
| interval-DLHoppingConfigCommonModeA-r13 CHOICE { | | | |
| interval-FDD-r13 | Int1 | | |
| } | | | |
| mpdcch-pdsch-HoppingOffset-r13 | 1 | | |
| } | | | |
| } | | | |

**Table 8.11.1.1.2.4.3-7: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: TS 36.508 Table 4.8.2.1.6-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| } | | | |

**Table 8.11.1.1.2.4.3-8: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

**Table 8.11.1.1.2.4.3-9: PDSCH-ConfigCommon-v1310-DEFAULT for test number 1, 2**

| Derivation Path: 36.508 Table 4.6.3-5A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon-v1310-DEFAULT ::= SEQUENCE { | | | |
| pdsch-maxNumRepetitionCEmodeA-r13 | r16 | | |
| } | | | |

**Table 8.11.1.1.2.4.3-10: PDSCH-ConfigCommon-v1310-DEFAULT for test number 3**

| Derivation Path: 36.508 Table 4.6.3-5A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon-v1310-DEFAULT ::= SEQUENCE { | | | |
| pdsch-maxNumRepetitionCEmodeA-r13 | Not present | | |
| } | | | |

#### 8.11.1.1.2.5 Test requirement

Table 8.11.1.1.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.11.1.1.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.11.1.1.2.5-1: Test requirement for CDM-multiplexed DM RS (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10MHz QPSK 1/3 | R.80 FDD | OP.2 FDD | EPA5 | 2x1 Low | 70 | -1.1 | M1, M2 |
| 2 | 10MHz QPSK 1/3 | R.80-1 FDD | OP.2 FDD | EPA5 | 2x2 Low | 70 | -3.1 | ≥1 |
| 3 | 10MHz QPSK 1/3 | R.80-2 FDD | OP.2 FDD | EPA5 | 2x4 Low | 70 | -3.1 | ≥1 |

### 8.11.1.1.3 Transmit diversity performance (Cell-Specific Reference Symbols)

### 8.11.1.1.3.1 FDD and half-duplex FDD PDSCH Transmit Diversity 2x1 for UE category M1

#### 8.11.1.1.3.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using transmit diversity.

#### 8.11.1.1.3.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 13 and forward of UE category M1.

#### 8.11.1.1.3.1.3 Minimum conformance requirements

The requirements are specified in Table 8.11.1.1.3.1.3-2, with the addition of the parameters in Table 8.11.1.1.3.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas.

**Table 8.11.1.1.3.1.3-1: Test Parameters for Transmit diversity performance (FRC)**

| Parameter | | Unit | Test 1 (Note 3) | Test 2 (Note 3) | Test 3 (Note 3) | Test 4 (Note 3) |
|---|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | 0 | 0 | 0 |
| | δ | dB | 3 | 3 | 3 | 3 |
| | MPDCCH_RA | dB | $\rho_A$ + δ + 3 | $\rho_A$ + δ | $\rho_A$ + δ + 3 | $\rho_A$ + δ + 3 |
| | MPDCCH_RB | dB | $\rho_B$ + δ + 3 | $\rho_B$ + δ | $\rho_B$ + δ + 3 | $\rho_B$ + δ + 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 | -98 | -98 |
| Coverage enhancement mode | | | CE Mode B | CE Mode A | CE Mode B | CE Mode B |
| PDSCH transmission mode | | | 2 | 2 | 2 | 2 |
| OFDM starting symbol (startSymbolBR) | | | 2 | 2 | 2 | 2 |
| Maximum number of repetitions (mpdcch-NumRepetition) | | | 64 | 1 | [32] | [16] |
| Frequency hopping (mpdcch-pdsch-HoppingConfig) | | | Enabled | Disabled | Enabled | Enabled |
| Frequency hopping offset (mpdcch-pdsch-HoppingOffset) | | | 1 | N/A | 1 | 1 |
| Frequency hopping interval (interval-FDD) | | ms | 16 | N/A | 16 | [8] |
| MPDCCH transmission duration | | ms | 64 | 1 | [64] | [64] |
| Number of narrowbands for frequency hopping (mpdcch-pdsch-HoppingNB) | | | 4 | N/A | 4 | 4 |
| Starting subframe configuration for MPDCCH (mpdcch_startSF_UESS) | | | 2.5 | 1 | [2.5] | [2.5] |
| Narrowband for MPDCCH (mpdcch_Narrowband) | | | 7 | 0 | 7 | 7 |
| MPDCCH aggregation level | | | 24 | 8 | 24 | 24 |

Note 1: $P_B = 1$.
Note 2: For each test, DC subcarrier puncturing shall be considered.
Note 3: Test 1, test 3 and test 4 are applicable for UE supporting CE Mode B. Test 2 is applicable for UE not supporting CE Mode B.
Note 4: If not otherwise stated, the values in this table refer to parameters in TS 36.211 [8] or/and TS 36.213 [10] as appropriate.

**Table 8.11.1.1.3.1.3-2: Minimum performance Transmit Diversity (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10MHz QPSK 1/10 | R.81 FDD | OP.2 FDD | ETU1 | 2x1 Low | 70 | -13.5 | M1 |
| 2 | 10MHz 16QAM 1/2 | R.79 FDD | OP.2 FDD | EPA5 | 2x1 Low | 70 | 9.4 | M1 |
| 3 | 10MHz QPSK 1/10 | [R.81 FDD] | OP.2 FDD | ETU1 | 2x2 Low | 70 | [TBD] | ≥1 |
| 4 | 10MHz QPSK 1/10 | [R.81 FDD] | OP.2 FDD | ETU1 | 2x4 Low | 70 | [TBD] | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.11.1.1.3.1.

#### 8.11.1.1.3.1.4 Test description

##### 8.11.1.1.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified in Table 8.11.1.1.3.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Tables 8.11.1.1-1 and 8.11.1.1.3.1.3-1 (test 2) as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 8.11.1.1.3.1.4.3.

##### 8.11.1.1.3.1.4.2 Test procedure

1. SS transmits PDSCH via M-PDCCH DCI format 6-1A (test2) with narrowband index $n_{RB}$ = 0 for C_RNTI to transmit the DL RMC according to Tables 8.11.1.1.3.1.3-1 and 8.11.1.1.3.1.3-2.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.11.1.1.3.1.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.11.1.1.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with condition CEModeA and for Test 2 with the following exception.

**Table 8.11.1.1.3.1.4.3-1: EPDCCH-Config-r11-DEFAULT configuration for Test 2**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| setConfigToAddModList-r11 SEQUENCE { | 1 entry | | |
| setConfigId-r11[1] | 0 | | |
| transmissionType-r11[1] | distributed | | |
| resourceBlockAssignment-r11[1] SEQUENCE{ | | | |
| numberPRB-Pairs-r11 | n2 | | |
| resourceBlockAssignment-r11 | 1110 | | |
| } | | | |
| dmrs-ScramblingSequenceInt-r11[1] | 0 | | |
| pucch-ResourceStartOffset-r11[1] | 0 | | |
| re-MappingQCL-ConfigListId-r11[1] | Not present | | |
| numberPRB-Pairs-v1310 CHOICE[1] { | Not present | | |
| } | | | |
| mpdcch-config-r13 CHOICE { | | | |
| mpdcch-Narrowband-r13 | 1 | Narrowband index 0 | |
| } | | | |
| } | | | |

### 8.11.1.1.3.1.5 Test requirement

Table 8.11.1.1.3.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.11.1.1.3.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.11.1.1.3.1.5-1: Test requirement for Transmit diversity performance (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 2 | 10MHz 16QAM 1/2 | R.79 FDD | OP.2 FDD | EPA5 | 2x1 Low | 70 | 10.3 |

## 8.11.1.1.3.1_1 FDD and half-duplex FDD PDSCH Transmit Diversity 2x1 for UE category M1 (CEmodeB)

### 8.11.1.1.3.1_1.1 Test purpose

Same as in sub-clause 8.11.1.1.3.1.1.

### 8.11.1.1.3.1_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 13 and forward of UE category M1 that support operating in CEModeB.

### 8.11.1.1.3.1_1.3 Minimum conformance requirements

Same as in sub-clause 8.11.1.1.3.1.3.

### 8.11.1.1.3.1_1.4 Test description

#### 8.11.1.1.3.1_1.4.1 Initial conditions

Same as in sub-clause 8.11.1.1.3.1.4.1 except for step 2, where the parameter settings for the cell are set up according to Tables 8.11.1.1-1 and 8.11.1.1.3.1.3-1 (test 1).

#### 8.11.1.1.3.1_1.4.2 Test procedure

1. SS transmits PDSCH via M-PDCCH DCI format 6-1B (test 1) with narrowband index $n_{RB}$ = 7 for C_RNTI to transmit the DL RMC according to Tables 8.11.1.1.3.1.3-1 and 8.11.1.1.3.1.3-2.

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.11.1.1.3.1_1.5-1 as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.11.1.1.3.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with condition CEModeB and the following exceptions

**Table 8.11.1.1.3.1_1.4.3-1: EPDCCH-Config-r11-DEFAULT configuration**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| | | | |
| mpdcch-config-r13 CHOICE { | | | |
| mpdcch-pdsch-HoppingConfig-r13 | on | | |
| mpdcch-Narrowband-r13 | 8 | Narrowband index 7 | |
| } | | | |

**Table 8.11.1.1.3.1_1.4.3-2: FreqHoppingParameters-r13-DEFAULT configuration**

| Derivation Path: 36.508 Table 4.6.3-2D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FreqHoppingParameters-r13-DEFAULT::= SEQUENCE { | | | |
| mpdcch-pdsch-HoppingNB-r13 | nb4 | | |
| interval-DLHoppingConfigCommonModeB-r13 CHOICE { | | | |
| interval-FDD-r13 | int16 | | |
| } | | | |
| mpdcch-pdsch-HoppingOffset-r13 | 1 | | |
| } | | | |

### 8.11.1.1.3.1_1.5 Test requirement

Table 8.11.1.1.3.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.11.1.1.3.1_1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.11.1.1.3.1_1.5-1: Test requirement for Transmit diversity performance (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1 | 10MHz QPSK 1/10 | R.81 FDD | OP.2 FDD | ETU1 | 2x1 Low | 70 | -12.6 |

## 8.11.1.1.3.2 FDD and half-duplex FDD PDSCH Transmit Diversity 2x1 for UE category M2

Editor's notes: The following items are missing or incomplete:

- Some values still within brackets (36.101 dependent)
- Reference measurement channel is missing (36.101 dependent)
- TBDs in Annex G

### 8.11.1.1.3.2.1 Test purpose

Same as in sub-clause 8.11.1.1.3.1.1.

### 8.11.1.1.3.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 14 and forward of UE category M2.

### 8.11.1.1.3.2.3 Minimum conformance requirements

The requirements are specified in Table 8.11.1.1.3.2.3-2, with the addition of the parameters in Table 8.11.1.1.3.2.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas

**Table 8.11.1.1.3.2.3-1: Test Parameters for Transmit diversity performance (FRC)**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 | Test 4 |
|---|---|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | 0 | 0 | 0 |
| | δ | dB | 3 | 3 | 3 | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 | -98 | -98 |
| Coverage enhancement mode | | | CE Mode A | CE Mode B | CE Mode A | CE Mode A |
| PDSCH transmission mode | | | 2 | 2 | 2 | 2 |
| OFDM starting symbol (startSymbolBR) | | | 2 | 2 | 2 | 2 |
| Maximum number of repetitions for PDSCH (pdsch-maxNumRepetitionCEmodeA/ pdsch-maxNumRepetitionCEmodeB) | | | Not configured | Not configured | Not configured | Not configured |
| PDSCH repetition number level | | | 8 | 32 | [4] | [2] |
| Frequency hopping (mpdcch-pdsch-HoppingConfig) | | | Enabled | Enabled | Disabled | Disabled |
| Frequency hopping offset (mpdcch-pdsch-HoppingOffset) | | | [5] | [5] | N/A | N/A |
| Frequency hopping interval (interval-FDD) | | ms | [4] | [16] | [1] | [1] |
| Maximum number of MPDCCH repetitions (mpdcch-NumRepetition) | | | [16] | [64] | [8] | [2] |
| MPDCCH transmission duration | | ms | [16] | [64] | [8] | [2] |
| Number of narrowbands for frequency hopping (mpdcch-pdsch-HoppingNB) | | | 2 | 2 | N/A | N/A |
| Starting subframe configuration for MPDCCH (mpdcch_startSF_UESS) | | | [2] | [2] | [2.5] | [5] |
| Narrowband for MPDCCH (mpdcch_Narrowband) | | | 0 | 0 | 0 | 0 |
| MPDCCH aggregation level | | | 24 | 24 | 24 | 24 |

Note 1: $P_B = 1$.
Note 2: For each test, DC subcarrier puncturing shall be considered.
Note 3: If not otherwise stated, the values in this table refer to parameters in TS 36.211 [8] or/and TS 36.213 [10] as appropriate.

**Table 8.11.1.1.3.2.3-2: Minimum performance Transmit Diversity (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10MHz QPSK 1/3 | R.xx FDD | OP.2 FDD | EPA5 | 2x1 Low | 70 | [-5.4] | M2 |
| 2 | 10MHz QPSK 1/10 | R.yy FDD | OP.2 FDD | ETU1 | 2x1 Low | 70 | [-13.1] | M2 |
| 3 | 10MHz QPSK [1/2] | R.zz-1 FDD | OP.2 FDD | EPA5 | 2x2 Low | 70 | [-4.8] | ≥1 |
| 4 | 10MHz QPSK [1/2] | R.zz-2 FDD | OP.2 FDD | EPA5 | 2x4 Low | 70 | [-4.9] | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.11.1.1.3.2.

#### 8.11.1.1.3.2.4 Test description

##### 8.11.1.1.3.2.4.1 Initial conditions

Same as in sub-clause 8.11.1.1.3.1.4.1 with the following exceptions:

- Channel Bandwidths to be tested: As specified in Table 8.11.1.1.3.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.
- For step 2, the parameter settings for the cell are set up according to Tables 8.11.1.1-1 and 8.11.1.1.3.2.3-1 (test 1).

##### 8.11.1.1.3.2.4.2 Test procedure

1. SS transmits PDSCH via M-PDCCH DCI format 6-1A (test 1) with narrowband index $n_{RB}$ = 0 for C_RNTI to transmit the DL RMC according to Tables8.11.1.1.3.2.3-1 and 8.11.1.1.3.2.3-2.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.11.1.1.3.2.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.11.1.1.3.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with condition CEModeA and for Test 1 with the following exception.

**Table 8.11.1.1.3.2.4.3-1: EPDCCH-Config-r11-DEFAULT configuration**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| | | | |
| mpdcch-config-r13 CHOICE { | | | |
| mpdcch-pdsch-HoppingConfig-r13 | on | | |
| mpdcch-Narrowband-r13 | 1 | Narrowband index 0 | |
| } | | | |

**Table 8.11.1.1.3.2.4.3-2: FreqHoppingParameters-r13-DEFAULT configuration**

| Derivation Path: 36.508 Table 4.6.3-2D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FreqHoppingParameters-r13-DEFAULT::= SEQUENCE { | | | |
| mpdcch-pdsch-HoppingNB-r13 | nb2 | | |
| interval-DLHoppingConfigCommonModeB-r13 CHOICE { | | | |
| interval-FDD-r13 | [int1] | | |
| } | | | |
| mpdcch-pdsch-HoppingOffset-r13 | [5] | | |
| } | | | |

#### 8.11.1.1.3.2.5 Test requirement

Table 8.11.1.1.3.2.3-2 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.11.1.1.3.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.11.1.1.3.2.5-1: Test requirement for Transmit diversity performance (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10MHz QPSK 1/3 | R.xx FDD | OP.2 FDD | EPA5 | 2x1 Low | 70 | [-4.5] | M2 |

## 8.11.1.2 TDD (Fixed Reference Channel)

The parameters specified in Table 8.11.1.2-1 are valid for all TDD tests unless otherwise stated.

**Table 8.11.1.2-1: Common Test Parameters (TDD)**

| Parameter | Unit | CE Mode A | CE Mode B |
|---|---|---|---|
| Uplink downlink configuration (Note 1) | | 1 | 1 |
| Special subframe configuration (Note 2) | | 4 | 4 |
| Cyclic prefix | | Normal | Normal |
| Cell ID | | 0 | 0 |
| Number of HARQ processes per component carrier | Processes | 7 | 2 |
| Maximum number of HARQ transmission | | 4 | 4 |
| Redundancy version coding sequence | | {0,1,2,3} for QPSK and 16QAM | {0,0,0,0,0,0,0,0,0,0,1,1,1,1,1,1,1,1,1,1,2,2,2,2,2,2,2,2,2,2,3,3,3,3,3,3,3,3,3,3} for QPSK |
| Number of OFDM symbols for PDCCH per component carrier | OFDM symbols | 4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths, 2 for 10 MHz, 15 MHz and 20 MHz bandwidths | 4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths, 2 for 10 MHz, 15 MHz and 20 MHz bandwidths |
| ACK/NACK feedback mode | | Multiplexing | Multiplexing |
| Beamforming Precoder for MPDCCH | | Annex B.4.4 | Annex B.4.4 |
| Precoder update granularity for MPDCCH | | Frequency domain: 1 PRB Time domain: identical during the hopping period (interval-TDD for CE Mode A) | Frequency domain: 1 PRB Time domain: identical during the hopping period (interval-TDD for CE Mode B) |
| BL/CE DL subframe configuration (fdd-DownlinkOrTddSubframeBitmapBR) | | 1011110111 | 1011110111 |
| Note 1: as specified in Table 4.2-2 in TS 36.211 [4]. Note 2: as specified in Table 4.2-1 in TS 36.211 [4]. | | | |

### 8.11.1.2.1 TDD Closed-loop spatial multiplexing performance for UE category M1 (Cell-Specific Reference Symbols)

#### 8.11.1.2.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

#### 8.11.1.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 13 and forward of UE category M1 that supports TM6 in CE mode A.

#### 8.11.1.2.1.3 Minimum conformance requirements

The requirements are specified in Table 8.11.1.2.1.3-2, with the addition of the parameters in Table 8.11.1.2.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with frequency selective precoding

**Table 8.11.1.2.1.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| | δ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 6 |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 5 |
| Reporting mode | | | PUCCH 1-1 |
| cqi-pmi-ConfigIndex | | | 4 |
| CodeBookSubsetRestriction bitmap | | | 001111 |
| ACK/NACK feedback mode | | | Multiplexing |
| Physical channel for CQI reporting | | | PUSCH (Note 3) |
| PDSCH transmission mode | | | 6 |
| Coverage enhancement mode | | | CE Mode A |
| OFDM starting symbol (startSymbolLC) | | | 2 |
| Maximum number of repetitions | | | 1 |
| Frequency hopping (mpdcch-pdsch-HoppingConfig) | | | Disabled |
| MPDCCH transmission duration (mpdcch-NumRepetition) | | ms | 1 |
| Starting subframe configuration for MPDCCH (mpdcch_startSF_UESS) | | | 1 |
| Narrowband for MPDCCH (mpdcch_Narrowband) | | | 1 |

| | |
|---|---|
| Note 1: | $P_B = 1$. |
| Note 2: | If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). |
| Note 3: | To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. MPDCCH DCI format 6-0A shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3. |
| Note 4: | For each test,DC subcarrier puncturing shall be considered. |
| Note 5: | If not otherwise stated, the values in this table refer to parameters in TS 36.211 [8] or/and TS 36.213 [10] as appropriate. |

**Table 8.11.1.2.1.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1 | 10MHz 16QAM 1/2 | R.79 TDD | OP.2 TDD | EPA5 | 2x1 Low | 70% | 11.4 |

The normative reference for this requirement is TS 36.101 [2] clause 8.11.1.2.1.

### 8.11.1.2.1.4 Test description

#### 8.11.1.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.11.1.2.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Tables 8.11.1.2-1 and 8.11.1.2.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 8.11.1.2.1.4.3.

#### 8.11.1.2.1.4.2 Test procedure

1. SS transmits PDSCH via M-PDCCH DCI format 6-1A with narrowband index $n_{RB}$ = 1 for C_RNTI to transmit the DL RMC according to Tables 8.11.1.2.1.3-1 and 8.11.1.2.1.3-2.

2. SS schedules the UL transmission to carry the PUSCH CQI feedback via MPDCCH DCI format 6-0A with narrowband index $n_{RB}$ = 1 and with CSI request bit set to 0 to schedule UL RMC in subframe #4 and #9(Table A.2.3.1.1-1b ).

3. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.11.1.2.1.5-1 as appropriate.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.11.1.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with condition CEModeA and the following exceptions

**Table 8.11.1.2.1.4.3-1: EPDCCH-Config-r11-DEFAULT configuration**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| mpdcch-NumRepetition-r13 | r1 | | |
| mpdcch-Narrowband-r13 | 2 | Narrowband index 1 | |

**Table 8.11.1.2.1.4.3-2: CQI-ReportConfig-DEFAULT**

| Derivation Path: 36.508 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-pmi-ConfigIndex | 4 | | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

#### 8.11.1.2.1.5 Test requirement

Table 8.11.1.2.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.11.1.2.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.11.1.2.1.5-1: Test requirement Single-Layer Spatial Multiplexing (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1 | 10MHz 16QAM 1/2 | R.79 TDD | OP.2 TDD | EPA5 | 2x1 Low | 70% | 12.3 |

### 8.11.1.2.2 TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category M1

#### 8.11.1.2.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 without a simultaneous transmission on the other antenna port and multiple CSI reference symbols configurations with non-zero and zero transmission power.

#### 8.11.1.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 13 and forward of UE category M1 and supports TM9 in CE Mode A.

#### 8.11.1.2.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.1, with the addition of the relevant parameters in Tables 8.11.1.2-1 and 8.11.1.2.2.3-1 and the downlink physical channel setup according to Annex C.3.2.

Using this configuration, the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.11.1.2.2.3-2 for the specified SNR.

**Table 8.11.1.2.2.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 (Note 1) |
| | σ | dB | 0 |
| | δ | dB | 3 |
| | MPDCCH_RA | dB | $\rho_A$ + δ + 3 |
| | MPDCCH_RB | dB | $\rho_B$ + δ + 3 |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| Beamforming model | | | Annex B.4.1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Symbols for unused PRBs | | | OCNG (Note 3) |
| Number of allocated resource blocks (Note 2) | | PRB | 6 |
| Simultaneous transmission | | | No |
| PDSCH transmission mode | | | 9 |
| Coverage enhancement mode | | | CE Mode A |
| OFDM starting symbol (startSymbolBR) | | | 2 |
| Maximum number of repetitions | | | 8 |
| Frequency hopping (mpdcch-pdsch-HoppingConfig) | | | Enabled |
| Frequency hopping offset (mpdcch-pdsch-HoppingOffset) | | | 1 |
| Frequency hopping interval (interval-TDD) | | ms | 10 |

| | | |
|---|---|---|
| MPDCCH transmission duration (mpdcch-NumRepetition) | ms | 8 |
| Number of narrowbands for frequency hopping (mpdcch-pdsch-HoppingNB) | | 2 |
| Starting subframe configuration for MPDCCH (mpdcch_startSF_UESS) | | 1 |
| Narrowband for MPDCCH (mpdcch_Narrowband) | | 7 |
| MPDCCH aggregation level | | 24 |
| Note 1: $P_B = 1$. | | |
| Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8. | | |
| Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | |
| Note 4: For each test, DC subcarrier puncturing shall be considered. | | |
| Note 5: If not otherwise stated, the values in this table refer to parameters in TS 36.211 [8] or/and TS 36.213 [10] as appropriate. | | |

**Table 8.11.1.2.2.3-2: Minimum performance for CDM-multiplexed DM RS without simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1 | 10MHz QPSK 1/3 | R.80 TDD | OP.2 TDD | EPA5 | 2x1 Low | 70 | -2.5 |

The normative reference for this requirement is TS 36.101 [2] clause 8.11.1.2.2.

### 8.11.1.2.2.4 Test description

#### 8.11.1.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.11.1.2.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9 (using only main UE Tx/Rx antenna).

2. The parameter settings for the cell are set up according to Tables 8.11.1.2-1 and 8.11.1.2.2.3-1 as appropriate.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 8.11.1.2.2.4.3.

#### 8.11.1.2.2.4.2 Test procedure

1. SS transmits PDSCH via M-PDCCH DCI format 6-1A with narrowband index $n_{RB}$ = 7 for C_RNTI to transmit the DL RMC according to Tables 8.11.1.2.2.3-1 and 8.11.1.2.2.3-2.

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.11.1.2.2.5-1 as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.11.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with condition CEModeA and the following exceptions

**Table 8.11.1.2.2.4.3-1: EPDCCH-Config-r11-DEFAULT configuration**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| mpdcch-NumRepetition-r13 | r8 | | |
| mpdcch-Narrowband-r13 | 8 | Narrowband index 7 | |

#### 8.11.1.2.2.5 Test requirement

Table 8.11.1.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause [A.3.4.1] for each throughput test shall meet or exceed the specified value in Table 8.11.1.2.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.11.1.2.2.5-1: Test requirement for CDM-multiplexed DM RS without simultaneous transmission (FRC) with multiple CSI-RS configurations**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1 | 10MHz QPSK 1/3 | R.80 TDD | OP.2 TDD | EPA5 | 2x1 Low | 70 | -1.6 |

### 8.11.1.2.3 Transmit diversity performance (Cell-Specific Reference Symbols)

#### 8.11.1.2.3.1 TDD PDSCH Transmit Diversity for UE category M1

#### 8.11.1.2.3.1.1 Test purpose

The purpose is to verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using transmit diversity.

#### 8.11.1.2.3.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 13 and forward of UE category M1.

#### 8.11.1.2.3.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.11.1.2-1 and 8.11.1.2.3.1.3-1 and the downlink physical channel setup according to Annex C.3.2.

Using this configuration, the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.11.1.2.3.1.3-2 for the specified SNR. For transmit diversity (SFBC) performance with 2 transmitter antennas (SFBC) as specified.

**Table 8.11.1.2.3.1.3-1: Test Parameters for Transmit diversity performance (FRC)**

| Parameter | | Unit | Test 1 (Note 3) | Test 2 (Note 3) | Test 3 (Note 3) | Test 4 (Note 3 |
|---|---|---|---|---|---|---|
| **Downlink power allocation** | $\rho_A$ | dB | -3 | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) | -3 (Note 1) |
| | σ | dB | 0 | 0 | 0 | 0 |
| | δ | dB | -3 | -3 | -3 | -3 |
| | MPDCCH_RA | dB | $\rho_A$ + δ + 3 | $\rho_A$ + δ | $\rho_A$ + δ + 3 | $\rho_A$ + δ + 3 |
| | MPDCCH_RB | dB | $\rho_B$ + δ + 3 | $\rho_B$ + δ | $\rho_B$ + δ + 3 | $\rho_B$ + δ + 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | -98 | -98 | -98 |
| CK/NACK feedback mode | | | Multiplexing | Multiplexing | Multiplexing | Multiplexing |
| DSCH transmission mode | | | 2 | 2 | 2 | 2 |
| overage enhancement mode | | | CE Mode B | CE Mode A | CE Mode B | CE Mode B |
| DSCH transmission mode | | | 2 | 2 | 2 | 2 |
| FDM starting symbol (startSymbolBR) | | | 2 | 2 | 2 | 2 |
| laximum number of repetitions npdcch-NumRepetition) | | | 64 | 1 | [32] | [16] |
| requency hopping npdcch-pdsch-HoppingConfig) | | | Enabled | Disabled | Enabled | Enabled |
| requency hopping offset npdcch-pdsch-HoppingOffset) | | | 1 | N/A | 1 | 1 |
| requency hopping interval nterval-TDD) | | ms | 20 | N/A | 20 | [10] |
| PDCCH transmission duration | | ms | 64 | 1 | [64] | [64] |
| umber of narrowbands for frequency hopping npdcch-pdsch-HoppingNB) | | | 4 | N/A | 4 | 4 |
| tarting subframe configuration for MPDCCH npdcch-startSF-UESS) | | | 1 | 1 | [1] | [1] |
| arrowband for MPDCCH npdcch_Narrowband) | | | 7 | 0 | 7 | 7 |
| PDCCH aggregation level | | | 24 | 8 | 24 | 24 |

ote 1: $P_B = 1$.
ote 2: For each test,DC subcarrier puncturing shall be considered.
ote 3: Test 1, test 3 and test 4 are applicable for UE supporting CE Mode B. Test 2 is applicable for UE not supporting CE Mode B.
ote 4: If not otherwise stated, the values in this table refer to parameters in TS 36.211 [8] or/and TS 36.213 [10] as appropriate.

**Table 8.11.1.2.3.1.3-2: Minimum performance Transmit Diversity (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 10MHz QPSK 1/10 | R.81 TDD | OP.2 TDD | ETU1 | 2x1 Low | 70 | -14.0 | M1 |
| 2 | 10MHz 16QAM 1/2 | R.79 TDD | OP.2 TDD | EPA5 | 2x1 Low | 70 | 9.6 | M1 |
| 3 | 10MHz QPSK 1/10 | [R.81 TDD] | OP.2 TDD | ETU1 | 2x2 Low | 70 | [TBD] | ≥1 |
| 4 | 10MHz QPSK 1/10 | [R.81 TDD] | OP.2 TDD | ETU1 | 2x4 Low | 70 | [TBD] | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 8.11.1.2.3.1.

#### 8.11.1.2.3.1.4 Test description

##### 8.11.1.2.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: As specified per test number in Table 8.11.1.2.3.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9 (using only main UE Tx/Rx antenna).
2. The parameter settings for the cell are set up according to Tables 8.11.1.2-1 and 8.11.1.2.3.1.3-1 (test 2) as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 8.11.1.2.3.1.4.3.

##### 8.11.1.2.3.1.4.2 Test procedure

1. SS transmits PDSCH via M-PDCCH DCI format 6-1A with narrowband index $n_{RB}$ = 0 for C_RNTI to transmit the DL RMC according to Tables 8.11.1.2.3.1.3-1 and 8.11.1.2.3.1.3-2.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.11.1.2.3.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.11.1.2.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with condition CEModeA and the following exceptions

**Table 8.11.1.2.3.1.4.3-1: EPDCCH-Config-r11-DEFAULT configuration**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| mpdcch-NumRepetition-r13 | r1 | | |
| mpdcch-Narrowband-r13 | 1 | Narrowband index 0 | |

#### 8.11.1.2.3.1.5 Test requirement

Table 8.11.1.2.3.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause [A.3.4.2] for each throughput test shall meet or exceed the specified value in Table 8.11.1.2.3.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.11.1.2.3.1.5-1: Test requirement Transmit Diversity (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 2 | 10MHz 16QAM 1/2 | R.79 TDD | OP.2 TDD | EPA5 | 2x1 Low | 70 | 10.5 |

### 8.11.1.2.3.1_1 TDD PDSCH Transmit Diversity for UE category M1 (CEModeB)

#### 8.11.1.2.3.1_1.1 Test purpose

Same as sub-clause 8.11.1.2.3.1.1.

#### 8.11.1.2.3.1_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 13 and forward of UE category M1 that support operating in CEModeB.

#### 8.11.1.2.3.1_1.3 Minimum conformance requirements

Same as sub-clause 8.11.1.2.3.1.3.

#### 8.11.1.2.3.1_1.4 Test description

##### 8.11.1.2.3.1_1.4.1 Initial conditions

Same as in sub-clause 8.11.1.2.3.1.4.1 except for step 2, where the parameter settings for the cell are set up according to Tables 8.11.1.1-1 and 8.11.1.2.3.1.3-1 (test 1).

##### 8.11.1.2.3.1_1.4.2 Test procedure

1. SS transmits PDSCH via M-PDCCH DCI format 6-1B with narrowband index $n_{RB}$ = 7 for C_RNTI to transmit the DL RMC according to Tables 8.11.1.2.3.1_1.3-1 and 8.11.1.2.3.1_1.3-2.

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.11.1.2.3.1_1.5-1 as appropriate.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.11.1.2.3.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with condition CEModeB and the following exceptions

**Table 8.11.1.2.3.1_1.4.3-1: EPDCCH-Config-r11-DEFAULT configuration**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| mpdcch-NumRepetition-r13 | r64 | | |
| mpdcch-Narrowband-r13 | 8 | Narrowband index 7 | |

#### 8.11.1.2.3.1_1.5 Test requirement

Table 8.11.1.2.3.1_1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause [A.3.4.2] for each throughput test shall meet or exceed the specified value in Table 8.11.1.2.3.1_1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.11.1.2.3.1_1.5-1: Test requirement Transmit Diversity (FRC)**

| Test number | Bandwidth and MCS | Reference Channel | OCNG Pattern | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | |
|---|---|---|---|---|---|---|---|
| | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1 | 10MHz QPSK 1/10 | R.81 TDD | OP.2 TDD | ETU1 | 2x1 Low | 70 | -13.1 |

## 8.11.2 MPDCCH

The receiver characteristics of the MPDCCH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg).

### 8.11.2.1 FDD and HD-FDD

#### 8.11.2.1.1 FDD and HD-FDD demodulation of MPDCCH in CE Mode A

##### 8.11.2.1.1.1 Test purpose

This test verifies the receiver characteristics of the MPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg).

##### 8.11.2.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 13 and forward of UE category M1.

This test applies to all types of E-UTRA FDD UE release 14 and forward of UE category M2.

##### 8.11.2.1.1.3 Minimum conformance requirements

For the parameters specified in Table 8.11.2.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.11.2.1.1.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.11.2.1.1.3-1: Test Parameters for MPDCCH (Category M1/M2)**

| Parameter | | Unit | CE Mode A (Test 1) |
|---|---|---|---|
| OFDM starting symbol (startSymbolLC) | | symbols | 2 |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| | δ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Cyclic prefix | | | Normal |
| Subframe Configuration | | | Non-MBSFN |
| Precoder Update Granularity | | PRB | 1 |
| | | ms | 4(Note 2) |
| Beamforming Pre-Coder | | | Annex B.4.4 |
| Cell Specific Reference Signal | | | Port 0 and 1 |
| Number of PRB per MPDCCH Set | | | 4 |
| Transmission type | | | Distributed |
| Frequency hopping | | | Disabled |
| Number of frequency hopping narrowbands | | | N/A |
| Frequency hopping offset | | | N/A |
| Frequency hopping interval | | ms | 4 |
| MPDCCH start subframe (*mpdcch-startSF-UESS*) | | | 1.5 |
| Maximum number of repetitions (*mPDCCH-NumRepetition*) | | | 32 |
| MPDCCH repetition number | | | 32 |
| MPDCCH narrowband (*mpdcch-Narrowband*) | | | 1 |
| PDSCH TM | | | TM2 |
| DCI Format | | | 6-1A |
| fdd-DownlinkOrTddSubframeBitmapBR | | | 1111111111 |
| Note1: For each test, DC subcarrier puncturing shall be considered.<br>Note2: Same precoding matrix is used for a PRB across subframes during the frequency hopping interval.<br>Note 3: For MPDCCH UE-specific search space the formula for the start subframe k0 is given in TS 36.213 [10] clause 9.1.5.<br>Note 4: If not otherwise stated, the values in this table refer to parameters in TS 36.211 [8] or/and TS 36.213 [10] as appropriate. | | | |

**Table 8.11.2.1.1.3-2: Minimum performance CE Mode A MPDCCH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) | |
| 1 | 10 MHz | 16 ECCE | R.82 FDD | OP.2 FDD | EPA5 | 2 x 1 Low | 1 | -4.8 | M1/M2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.11.2.1 and 8.11.2.1.1.

### 8.11.2.1.1.4 Test description

#### 8.11.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Table 8.11.2.1.1.3-1 for category M1 category M2.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.2.
5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2A.A. Message contents are defined in clause 8.11.2.1.1.4.3.

### 8.11.2.1.1.4.2 Test procedure

1. SS transmits PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 8.11.2.1.1.3-2.The details of MPDCCH and PDSCH are specified in Table A.3.11.1-1 and Table A.3.11.1-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.11.2.1.1.5-1 as appropriate.
3. Measure the Pm-dsg on monitoring subframes for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval for monitoring subframes. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.11.2.1.1.5-1, pass the UE. Otherwise fail the UE.

### 8.11.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with condition CEModeA and the following exceptions.

**Table 8.11.2.1.1.4-1: MPDCCH-Config-r13-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3.-1AA and 4.6.3.-1AB, Condition: FDD |
|---|

**Table 8.11.2.1.1.4-2: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| EPDCCH-Config-r11 ::= SEQUENCE{ | | | |
| numberPRB-Pairs-v1310 CHOICE[1] { | Not present | | |
| } | | | |
| mpdcch-config-r13 CHOICE[1] { | | | |
| setup SEQUENCE { | | | |
| csi-NumRepetitionCE-r13 | sf1 | | |
| mpdcch-pdsch-HoppingConfig-r13 | off | | |
| mpdcch-StartSF-UESS-r13 CHOICE { | | | |
| fdd-r13 | v1dot5 | | |
| } | | | |
| mpdcch-NumRepetition-r13 | r32 | | |
| mpdcch-Narrowband-r13 | 2 | Narrowband index 1 | |
| } | | | |
| } | | | |
| } | | | |

#### 8.11.2.1.1.5 Test requirement

For the parameters specified in Table 8.11.2.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.11.2.1.1.5-1.

**Table 8.11.2.1.1.5-1: Test requirement CE Mode A MPDCCH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) | |
| 1 | 10 MHz | 16 ECCE | R.82 FDD | OP.2 FDD | EPA5 | 2 x 1 Low | 1 | -3.9 | M1/M2 |

### 8.11.2.1.2 FDD and half-duplex FDD demodulation of MPDCCH in CE Mode B

#### 8.11.2.1.2.1 Test purpose

Same as in sub-clause 8.11.2.1.1.1.

#### 8.11.2.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 13 and forward of UE category M1 that support operating in CEModeB.

This test applies to all types of E-UTRA FDD UE release 14 and forward of UE category M2 that support operating in CEModeB.

#### 8.11.2.1.2.3 Minimum conformance requirements

For the parameters specified in Table 8.11.2.1.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.11.2.1.2.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.11.2.1.2.3-1: Test Parameters for MPDCCH (Category M1/M2)**

| Parameter | | Unit | CE Mode B (Test 1) |
|---|---|---|---|
| OFDM starting symbol (startSymbolLC) | | symbols | 2 |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | σ | dB | -3 |
| | δ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Cyclic prefix | | | Normal |
| Subframe Configuration | | | Non-MBSFN |
| Precoder Update Granularity | | PRB | 1 |
| | | ms | 16 (Note 2) |
| Beamforming Pre-Coder | | | Annex B.4.4 |
| Cell Specific Reference Signal | | | Port 0 and 1 |
| Number of PRB per MPDCCH Set | | | 2+4 |
| Transmission type | | | Localized |
| Frequency hopping | | | Enabled |
| Number of frequency hopping narrowbands | | | 4 |
| Frequency hopping offset | | | 1 |
| Frequency hopping interval | | ms | 16 |
| Value of G in MPDCCH start subframe (*mpdcch-startSF-UESS*) Note 3 | | | 1.5 |
| Maximum number of repetitions (*mPDCCH-NumRepetition*) | | | 64 |
| MPDCCH repetition number | | | 64 |
| MPDCCH narrowband (*mpdcch-Narrowband*) | | | 7 |
| PDSCH TM | | | TM2 |
| DCI Format | | | 6-1B |
| fdd-DownlinkOrTddSubframeBitmapBR | | | 1111111111 |
| Note 1: For each test, DC subcarrier puncturing shall be considered.<br>Note 2: Same precoding matrix is used for a PRB across subframes during the frequency hopping interval.<br>Note 3: For MPDCCH UE-specific search space the formula for the start subframe k0 is given in TS 36.213 [10] clause 9.1.5.<br>Note 4: If not otherwise stated, the values in this table refer to parameters in TS 36.211 [8] or/and TS 36.213 [10] as appropriate. | | | |

**Table 8.11.2.1.2.3-2: Minimum performance CE Mode B MPDCCH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) | |
| 1 | 10 MHz | 24 ECCE | R.83 FDD | OP.2 FDD | ETU1 | 2 x 1 Low | 1 | -12 | M1/M2 |

The normative reference for this requirement is TS 36.101 [2] clauses 8.11.2.1 and 8.11.2.1.2.

### 8.11.2.1.2.4 Test description

#### 8.11.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Table 8.11.2.1.2.3-1 for category M1 and category M2.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.2.
5. Ensure the UE is in State 3A-RF-CE with the condition CEModeB according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 8.11.2.1.2.4.3.

### 8.11.2.1.2.4.2 Test procedure

1. SS transmits PDSCH via MPDCCH DCI format 6-1B for C_RNTI to transmit the DL RMC according to Table 8.11.2.1.2.3-2. The details of MPDCCH and PDSCH are specified in Table A.3.11.1-1 and Table A.3.11.1-3 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.11.2.1.2.5-1 as appropriate.
3. Measure the Pm-dsg on monitoring subframes for a duration sufficient to achieve statistical significance according to Annex G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval for monitoring subframes. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.11.2.1.2.5-1, pass the UE. Otherwise fail the UE.

### 8.11.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with condition CEModeB and with the message exceptions as in sub-clause 8.11.2.1.1.4.3 unless superceded by the following exceptions.

**Table 8.11.2.1.2.4.3-1: EPDCCH-Config-r11-DEFAULT configuration**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| | | | |
| setConfigToAddModList-r11 SEQUENCE { | 1 entry | | |
| transmissionType-r11[1] | localised | | |
| } | | | |
| mpdcch-config-r13 CHOICE[1] { | | | |
| setup SEQUENCE { | | | |
| mpdcch-pdsch-HoppingConfig-r13 | on | | |
| mpdcch-StartSF-UESS-r13 CHOICE { | | | |
| fdd-r13 | v1dot5 | | |
| } | | | |
| mpdcch-NumRepetition-r13 | r64 | | |
| mpdcch-Narrowband-r13 | 8 | Narrowband index 7 | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.11.2.1.2.4.3-2: FreqHoppingParameters-r13-DEFAULT configuration**

| Derivation Path: 36.508 Table 4.6.3-2D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FreqHoppingParameters-r13-DEFAULT::= SEQUENCE { | | | |
| mpdcch-pdsch-HoppingNB-r13 | nb4 | | |
| interval-DLHoppingConfigCommonModeB-r13 CHOICE { | | | |
| interval-FDD-r13 | 16 | | |
| } | | | |
| mpdcch-pdsch-HoppingOffset-r13 | 1 | | |
| } | | | |

**Table 8.11.2.1.2.4.3-3: PDSCH-ConfigCommon-v1310-DEFAULT**

| Derivation Path: 36.508 Table 4.6.3-5A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon-v1310-DEFAULT ::= SEQUENCE { | | | |
| pdsch-maxNumRepetitionCEmodeB-r13 | r256 | | |
| } | | | |

#### 8.11.2.1.2.5 Test requirement

For the parameters specified in Table 8.11.2.1.2.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.11.2.1.2.5-1.

**Table 8.11.2.1.2.5-1: Test requirement CE Mode B MPDCCH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) | |
| 1 | 10 MHz | 24 ECCE | R.83 FDD | OP.2 FDD | ETU1 | 2 x 1 Low | 1 | -11.1 | M1/M2 |

## 8.11.2.2 TDD

### 8.11.2.2.1 TDD demodulation of MPDCCH in CE Mode A

#### 8.11.2.2.1.1 Test purpose

This test verifies the receiver characteristics of the MPDCCH which are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg).

#### 8.11.2.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 13 and forward of UE category M1.

This test applies to all types of E-UTRA TDD UE release 14 and forward of UE category M2.

#### 8.11.2.2.1.3 Minimum conformance requirements

For the parameters specified in Table 8.11.2.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.11.2.2.1.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.11.2.2.1.3-1: Test Parameters for MPDCCH (Category M1/M2)**

| Parameter | | Unit | CE Mode A (Test 1) |
|---|---|---|---|
| OFDM starting symbol (startSymbolLC) | | symbols | 2 |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| | δ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Cyclic prefix | | | Normal |
| Subframe Configuration | | | Non-MBSFN |
| Precoder Update Granularity | | PRB | 1 |
| | | ms | 5 (Note 2) |
| Beamforming Pre-Coder | | | Annex B.4.4 |
| Cell Specific Reference Signal | | | Port 0 and 1 |
| Number of PRB per MPDCCH Set | | | 4 |
| Transmission type | | | Distributed |
| Frequency hopping | | | Disabled |
| Number of frequency hopping narrowbands | | | N/A |
| Frequency hopping offset | | | N/A |
| Frequency hopping interval | | ms | 5 |
| Value of G in MPDCCH start subframe (*mpdcch-startSF-UESS*) Note 4 | | | 5 |
| Maximum number of repetitions (*mPDCCH-NumRepetition*) | | | 16 |
| MPDCCH repetition number | | | 16 |
| MPDCCH narrowband (*mpdcch-Narrowband*) | | | 1 |
| PDSCH TM | | | TM2 |
| Reference channel for PDSCH transmission | | | R.81 TDD |
| DCI Format | | | 6-1A |
| TDD UL/DL Configuration | | | 0 |
| TDD Special Subframe | | | 1 |
| fdd-DownlinkOrTddSubframeBitmapBR | | | 1000010000 |

Note 1: For each test, DC subcarrier puncturing shall be considered.
Note 2: Same precoding matrix is used for a PRB across subframes where MPDCCH is repeated.
Note 3: The special subframes are not supported by MPDCCH, and are assumed as non- BL/CE DL subframes.
Note 4: For MPDCCH UE-specific search space the formula for the start subframe k0 is given in TS 36.213 [10] clause 9.1.5.
Note 5: If not otherwise stated, the values in this table refer to parameters in TS 36.211 [8] or/and TS 36.213 [10] as appropriate.

**Table 8.11.2.2.1.3-2: Minimum performance CE Mode A MPDCCH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) | |
| 1 | 10 MHz | 16 ECCE | R.82 TDD | OP.2 TDD | EPA5 | 2 x 1 Low | 1 | -5.3 | M1/M2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.11.2.2 and 8.11.2.2.1.

#### 8.11.2.2.1.4 Test description

##### 8.11.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Table 8.11.2.2.1.3-1 for category M1 and category M2.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.2.
5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2A.A. Message contents are defined in clause 8.11.2.2.1.4.3.

##### 8.11.2.2.1.4.2 Test procedure

1. SS transmits PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to Table 8.11.2.2.1.3-2.The details of MPDCCH and PDSCH are specified in Table A.3.11.2-1 and Table A.3.11.2-2 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.11.2.2.1.5-1 as appropriate.
3. Measure the Pm-dsg on monitoring subframes for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval for monitoring subframes. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.11.2.2.1.5-1, pass the UE. Otherwise fail the UE.

##### 8.11.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with condition CEModeA

**Table 8.11.2.2.1.4-1: MPDCCH-Config-r13-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3.-1AA and 4.6.3.-1AB, Condition: TDD |
|---|

**Table 8.11.2.2.1.4-2: *SystemInformationBlockType1-BR-r13***

| Derivation Path: 36.508 clause 4.4.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| bandwidthReducedAccessRelatedInfo-r13 SEQUENCE { | | | |
| fdd-DownlinkOrTddSubframeBitmapBR-r13 CHOICE { | | | |
| subframePattern10-r13 | 1000010000 | | |
| } | | | |
| } | | | |

**Table 8.11.2.2.1.4-3: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| EPDCCH-Config-r11 ::= SEQUENCE{ | | | |
| numberPRB-Pairs-v1310 CHOICE[1] { | Not present | | |
| } | | | |
| mpdcch-config-r13 CHOICE[1] { | | | |
| setup SEQUENCE { | | | |
| csi-NumRepetitionCE-r13 | sf1 | | |
| mpdcch-pdsch-HoppingConfig-r13 | off | | |
| mpdcch-StartSF-UESS-r13 CHOICE { | | | |
| tdd-r13 | v5 | | |
| } | | | |
| mpdcch-NumRepetition-r13 | r16 | | |
| mpdcch-Narrowband-r13 | 2 | Narrowband index 1 | |
| } | | | |
| } | | | |
| } | | | |

#### 8.11.2.2.1.5 Test requirement

For the parameters specified in Table 8.11.2.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.11.2.2.1.5-1.

**Table 8.11.2.2.1.5-1: Test requirement CE Mode A MPDCCH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) | |
| 1 | 10 MHz | 16 ECCE | R.82 TDD | OP.2 TDD | EPA5 | 2 x 1 Low | 1 | -4.4 | M1/M2 |

### 8.11.2.2.2 TDD demodulation of MPDCCH in CE Mode B

#### 8.11.2.2.2.1 Test purpose

Same as in sub-clause 8.11.2.2.1.1.

#### 8.11.2.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 13 and forward of UE category M1 that support operating in CEModeB.

This test applies to all types of E-UTRA TDD UE release 14 and forward of UE category M2 that support operating in CEModeB.

#### 8.11.2.2.2.3 Minimum conformance requirements

For the parameters specified in Table 8.11.2.2.2.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.11.2.2.2.3-2. The downlink physical setup is in accordance with Annex C.3.2.

**Table 8.11.2.2.2.3-1: Test Parameters for MPDCCH (Category M1/M2)**

| Parameter | | Unit | CE Mode B (Test 1) |
|---|---|---|---|
| OFDM starting symbol (startSymbolLC) | | symbols | 2 |
| Unused RE-s and PRB-s | | | OCNG |
| Cell ID | | | 0 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | σ | dB | -3 |
| | δ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Cyclic prefix | | | Normal |
| Subframe Configuration | | | Non-MBSFN |
| Precoder Update Granularity | | PRB | 1 |
| | | ms | 20 (Note 2) |
| Beamforming Pre-Coder | | | Annex B.4.4 |
| Cell Specific Reference Signal | | | Port 0 and 1 |
| Number of PRB per MPDCCH Set | | | 2+4 |
| Transmission type | | | Localized |
| Frequency hopping | | | Enabled |
| Number of frequency hopping narrowbands | | | 4 |
| Frequency hopping offset | | | 1 |
| Frequency hopping interval | | ms | 20 |
| Value of G in MPDCCH start subframe (*mpdcch-startSF-UESS*) Note 4 | | | 5 |
| Maximum number of repetitions (*mPDCCH-NumRepetition*) | | | 32 |
| MPDCCH repetition number | | | 32 |
| MPDCCH narrowband (*mpdcch-Narrowband*) | | | 7 |
| PDSCH TM | | | TM2 |
| DCI Format | | | 6-1B |
| TDD UL/DL Configuration | | | 0 |
| TDD Special Subframe | | | 1 |
| fdd-DownlinkOrTddSubframeBitmapBR | | | 1000010000 |

Note 1: For each test, DC subcarrier puncturing shall be considered.
Note 2: Same precoding matrix is used for a PRB across subframes where MPDCCH is repeated.
Note 3: The special subframes are not supported by MPDCCH, and are assumed as non- BL/CE DL subframes.
Note 4: For MPDCCH UE-specific search space the formula for the start subframe k0 is given in TS 36.213 [10] clause 9.1.5.
Note 5: If not otherwise stated, the values in this table refer to parameters in TS 36.211 [8] or/and TS 36.213 [10] as appropriate.

**Table 8.11.2.2.2.3-2: Minimum performance CE Mode B MPDCCH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) | |
| 1 | 10 MHz | 24 ECCE | R.83 TDD | OP.2 TDD | ETU1 | 2 x 1 Low | 1 | -10.1 | M1/M2 |

The normative reference for this requirement is TS 36.101 [2] clauses 8.11.2.2 and 8.11.2.2.2.

#### 8.11.2.2.2.4 Test description

##### 8.11.2.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Table 8.11.2.2.2.3-1 for category M1 and category M2.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.2.
5. Ensure the UE is in State 3A-RF-CE with the condition CEModeB according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 8.11.2.2.2.4.3.

##### 8.11.2.2.2.4.2 Test procedure

1. SS transmits PDSCH via MPDCCH DCI format 6-1B for C_RNTI to transmit the DL RMC according to Table 8.11.2.2.2.3-2. The details of MPDCCH and PDSCH are specified in Table A.3.11.2-1 and Table A.3.11.2-3 respectively. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.11.2.2.2.5-1 as appropriate.
3. Measure the Pm-dsg on monitoring subframes for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval for monitoring subframes. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX). If Pm-dsg is less than the value specified in table 8.11.2.2.2.5-1, pass the UE. Otherwise fail the UE.

##### 8.11.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with condition CEModeB with the message exceptions as in sub-clause 8.11.2.2.1.4.3 unless superseded by the following exceptions.

**Table 8.11.2.2.2.4.3-1: EPDCCH-Config-r11-DEFAULT configuration**

| Derivation Path: 36.508 Table 4.6.3-2B | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| setConfigToAddModList-r11 SEQUENCE { | 1 entry | | |
| transmissionType-r11[1] | localised | | |
| } | | | |
| mpdcch-config-r13 CHOICE[1] { | | | |
| setup SEQUENCE { | | | |
| mpdcch-pdsch-HoppingConfig-r13 | on | | |
| mpdcch-StartSF-UESS-r13 CHOICE { | | | |
| tdd-r13 | v2 | | |
| } | | | |
| mpdcch-NumRepetition-r13 | r32 | | |
| mpdcch-Narrowband-r13 | 8 | Narrowband index 7 | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.11.2.2.2.4.3-2: FreqHoppingParameters-r13-DEFAULT configuration**

| Derivation Path: 36.508 Table 4.6.3-2D | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| FreqHoppingParameters-r13-DEFAULT::= SEQUENCE { | | | |
| mpdcch-pdsch-HoppingNB-r13 | nb4 | | |
| interval-DLHoppingConfigCommonModeB-r13 CHOICE { | | | |
| interval-TDD-r13 | 20 | | |
| } | | | |
| mpdcch-pdsch-HoppingOffset-r13 | 1 | | |
| } | | | |

**Table 8.11.2.2.2.4.3-3: PDSCH-ConfigCommon-v1310-DEFAULT**

| Derivation Path: 36.508 Table 4.6.3-5A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigCommon-v1310-DEFAULT ::= SEQUENCE { | | | |
| pdsch-maxNumRepetitionCEmodeB-r13 | r192 | | |
| } | | | |

### 8.11.2.2.2.5 Test requirement

For the parameters specified in Table 8.11.2.2.2.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.11.2.2.2.5-1.

**Table 8.11.2.2.2.5-1: Test requirement CE Mode B MPDCCH**

| Test number | Bandwidth | Aggregation level | Reference Channel | OCNG Pattern | Propagation Condition | Antenna configuration and correlation Matrix | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) | |
| 1 | 10 MHz | 24 ECCE | R.83 TDD | OP.2 TDD | ETU1 | 2 x 1 Low | 1 | -9.2 | M1/M2 |

### 8.11.3 Demodulation of PBCH (enhanced coverage)

TS 36.101 [2] specifies the PBCH performance requirements but there is no way of measuring them because PBCH is a broadcast channel with no feedback information in uplink.

## 8.12 Demodulation of Narrowband IoT

### 8.12.1 NPDSCH

#### 8.12.1.1 Half-duplex FDD

**Table 8.12.1.1-1: Common Test Parameters**

| Parameter | Unit | Value |
|---|---|---|
| Number of HARQ processes per component carrier (Note 2) | **Processes** | 1 or 2 |
| Maximum number of HARQ transmission | | 4 |
| Cyclic Prefix | | Normal |
| eutraControlRegionSize-r13 | | 3 for In-band and N/A for Standalone/Guard-band unless otherwise stated |
| downlinkBitmap-r13 and dl-Gap-r13 | | Not configured |
| dl-GapNonAnchor-r13 and downlinkBitmapNonAnchor-r13 | | Not configured |
| Unused REs or RB (Note 1) | | OCNG |
| OCNG pattern | | NB.OP.1 |
| Note 1: For in-band mode, the REs for transmission of LTE signals including PDCCH, CRS should be filled by OCNG.<br>Note 2: 1 is applicable for both UE Category NB1 and NB2; 2 is only applicable for UE Category NB2 if UE supports it. | | |

**Table 8.12.1.1-2: Test Parameters of related NPDCCH and NPUSCH format 2 configurations**

| Parameter | Unit | Value |
|---|---|---|
| DCI format | | DCI format N1 |
| scheduling delay field ( $I_{\text{Delay}}$ ) | | 1 for the first HARQ process; 2 for the second HARQ process if configured |
| $N_{\text{Rep}}^{AN}$ (*ack-NACK-NumRepetitions*) | | 1 |
| ACK/NACK resource field | | 0 |
| Reference channel for NPDCCH | | R.NB.3 for one NRS antenna port; R.NB.4 for two NRS antenna ports |
| $\alpha_{offset}$ (*npdcch-Offset-USS-r13*) | | 0 |

### 8.12.1.1.1 Demodulation of NPDSCH (Cell-Specific Reference Symbols) in In-band mode for category NB1 and NB2

#### 8.12.1.1.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports.

#### 8.12.1.1.1.2 Test applicability

This test applies to all types of UE release 13 and forward of category NB1.

This test applies to all types of UE release 14 and forward of category NB2.

#### 8.12.1.1.1.3 Minimum conformance requirements

The requirements are specified in Table 8.12.1.1.1.3-2, with the addition of the parameters in Table 8.12.1.1.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the performance.

**Table 8.12.1.1.1.3-1: Test Parameters for NPDSCH under In-band**

| Parameter | | Unit | Test 1, 2, 3 |
|---|---|---|---|
| Downlink power allocation of LTE signal | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3(Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -93 (Note 2) |
| | $N_{oc2}$ | dBm/15kHz | -99 (Note 3) |
| LTE CRS port number (eutra-NumCRS-Ports-r13) | | | 4 |
| NPDCCH repetition number | | subframe | 8 for Test 1; 16 for Test 2; 128 for Test 3. |
| $R_{\max}$ (*npdcch-NumRepetitions-r13*) | | subframe | 8 for Test 1; 16 for Test 2; 128 for Test 3. |
| $G$ (*nPDCCH-startSF-USS-r13*) | | | 4 for Test 1; 2 for Test 2; 1.5 for Test 3 |

Note 1: $P_B = 1$.
Note 2: This noise is applied to all subframes from the end of the NPDCCH to the end of the following NPDSCH transmission;
Note 3: This noise is applied to all subframes from the end of the NPDSCH to the end of the following NPDCCH transmission.

**Table 8.12.1.1.1.3-2: Minimum performance under In-band with 2 NRS ports**

| Test number | Bandwidth | Carrier Type | Reference Channel | Repetition number | Propagation Condition | Correlation Matrix and Antenna Configuration | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 200kHz | Anchor | R.NB.5 FDD | 1 | EPA5 | 2x1 Low | 70% | 6.9 | NB1, NB2 |
| 2 | 200kHz | Anchor | R.NB.5 FDD | 32 | EPA5 | 2x1 Low | 70% | -4.8 | NB1, NB2 |
| 3 | 200kHz | Non-anchor | R.NB.5-1 FDD | 256 | ETU1 | 2x1 Low | 70% | -9.8 | NB1, NB2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.12.1.1.1.

#### 8.12.1.1.1.4 Test description

##### 8.12.1.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: K.2.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.12.1.1.1.3-2.

EUTRA Bandwidth is 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.1, except for band 31 where 5 MHz bandwidth is used.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Tables 8.12.1.1-1 and 8.12.1.1.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.0.1, H.1.1, H.2.1 and Annex H.4.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 8.12.1.1.1.4.3.

##### 8.12.1.1.1.4.2 Test procedure

1. SS transmits NPDSCH via NPDCCH DCI format N1 for C_RNTI to transmit the DL RMC according to Tables 8.12.1.1.1.3-1 and 8.12.1.1.1.3-2.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.12.1.1.1.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
4. Repeat steps from 1 to 3 for each test interval in Tables 8.12.1.1.1.5-1 as appropriate.

##### 8.12.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 and clause 8.1.4.3 using condition "Inband_Different" with the following exceptions:

**Table 8.12.1.1.1.4.3-1: *MasterInformationBlock-NB***

| Derivation Path: 36.508 Table 8.1.4.3.2-1: MasterInformationBlock-NB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MasterInformationBlock-NB ::= SEQUENCE { | | | |
| systemFrameNumber-MSB-r13 | A valid value as defined in TS 36.331 [17] | | |
| hyperSFN-LSB-r13 | A valid value as defined in TS 36.331 [17] | | |
| schedulingInfoSIB1-r13 | 2 | TBS = 208 bits, 16 repetitions | |
| systemInfoValueTag-r13 | 0 | | |
| ab-Enabled-r13 | FALSE | | |
| operationModeInfo-r13 CHOICE { | | | |
| inband-DifferentPCI-r13 SEQUENCE { | | | Inband_Different |
| eutra-NumCRS-Ports-r13 | four | | |
| rasterOffset-r13 | khz-2dot5 | | |
| spare | '00'B | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.12.1.1.1.4.3-2: Configure Non-anchor carrier in subtest 3**

| Derivation Path: 36.508 Table 8.1.8.2.1.6-1 PhysicalConfigDedicated-NB-DEFAULT | | | |
|---|---|---|---|
| Information Element | Value/remark | Comment | Condition |
| PhysicalConfigDedicated-NB-DEFAULT ::= SEQUENCE { | | | |
| carrierConfigDedicated-NB-r13 ::= SEQUENCE { | | Non-anchor carrier | |
| dl-CarrierConfig-r13::= SEQUENCE { | | | |
| dl-CarrierFreq-r13 | Note 1 | | |
| downlinkBitmapNonAnchor-r13 | NULL | | |
| dl-GapNonAnchor-r13 | NULL | | |
| } | | | |
| ul-CarrierConfig-r13 ::= SEQUENCE { | | | |
| ul-CarrierFreq-r13 | Note 1 | | |
| } | | | |
| } | | | |
| npdcch-ConfigDedicated-r13 | NPDCCH-ConfigDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| npusch-ConfigDedicated-r13 | NPUSCH-ConfigDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| uplinkPowerControlDedicated-r13 | UplinkPowerControlDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| } | | | |
| Note 1: The frequency of the non-anchor carrier is 180KHz higher than the centre of the anchor carrier. | | | |

8.12.1.1.1.5 Test requirement

Table 8.12.1.1.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause FFS for each throughput test shall meet or exceed the specified value in Table 8.12.1.1.1.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.12.1.1.1.5-1: Test Parameters under In-band with 2 NRS ports**

| Test number | Bandwidth | Carrier Type | Reference Channel | Repetition number | Propagation Condition | Correlation Matrix and Antenna | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of Maximum | SNR (dB) |

| | | | | | | Configuration | Throughput (%) | |
|---|---|---|---|---|---|---|---|---|
| 1 | 200kHz | Anchor | R.NB.5 FDD | 1 | EPA5 | 2x1 Low | 70% | 7.8 |
| 2 | 200kHz | Anchor | R.NB.5 FDD | 32 | EPA5 | 2x1 Low | 70% | -3.9 |
| 3 | 200kHz | Non-anchor | R.NB.5-1 FDD | 256 | ETU1 | 2x1 Low | 70% | -8.9 |

### 8.12.1.1.2 Demodulation of NPDSCH (Cell-Specific Reference Symbols) in standalone and Guard-band mode for category NB1 and NB2

#### 8.12.1.1.2.1 Test purpose

Same test purpose as in clause 8.12.1.1.1.

#### 8.12.1.1.2.2 Test applicability

This test applies to all types of UE release 13 and forward of category NB1.

This test applies to all types of UE release 14 and forward of category NB2.

#### 8.12.1.1.2.3 Minimum conformance requirements

The requirements are specified in Table 8.12.1.1.2.3-2, with the addition of the parameters in Table 8.12.1.1.2.3-1 and the downlink physical channel setup according to Annex C.3.2. Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.12.1.1.2.3-2 for the specified SNR.

**Table 8.12.1.1.2.3-1: Test Parameters for NPDSCH under standalone/Guard-band**

| Parameter | Unit | | Test 1, 2 |
|---|---|---|---|
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -93 (Note 1) |
| | $N_{oc2}$ | dBm/15kHz | -99 (Note 2) |
| NPDCCH repetition number | | subframe | 32 for Test 1; 256 for Test 2. |
| $R_{\max}$ (*npdcch-NumRepetitions-r13*) | | subframe | 64 for Test 1; 512 for Test 2. |
| $G$ (*nPDCCH-startSF-USS-r13*) | | | 1.5 |
| Note 1: This noise is applied to all subframes from the end of the NPDCCH to the end of the following NPDSCH transmission;<br>Note 2: This noise is applied to all subframes from the end of the NPDSCH to the end of the following NPDCCH transmission. | | | |

**Table 8.12.1.1.2.3-2: Minimum performance under standalone/Guard-band with 1 NRS ports**

| Test number | Band width | Carrier Type | Reference Channel | Repetition number | Propagation condition | Number of NRS ports | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 200kHz | Anchor | R.NB.6 FDD | 32 | EPA5 | 1 | 70% | -3.4 | NB1, NB2 |
| 2 | 200kHz | Non-anchor | R.NB.6-1 FDD | 256 | ETU1 | 1 | 70% | -10.2 | NB1, NB2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.12.1.1.2.

#### 8.12.1.1.2.4 Test description

##### 8.12.1.1.2.4.1 Initial conditions

Same initial conditions as in clause 8.12.1.1.1.4.1 with the following exceptions.

- Operation mode: Standalone.
- Instead of Figure A.10→ use Figure A.9.

##### 8.12.1.1.2.4.2 Test procedure

1. SS transmits NPDSCH via NPDCCH DCI format N1 for C_RNTI to transmit the DL RMC according to Tables 8.12.1.1.2.3-1 and 8.12.1.1.2.3-2.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.12.1.1.2.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
4. Repeat steps from 1 to 3 for each subtest in Table 8.12.1.1.2.5-1 as appropriate.

##### 8.12.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 with the following exceptions:

**Table 8.12.1.1.2.4.3-1: Configure Non-anchor carrier in subtest 2**

| Derivation Path: 36.508 Table 8.1.8.2.1.6-1 PhysicalConfigDedicated-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-NB-DEFAULT ::= SEQUENCE { | | | |
| carrierConfigDedicated-NB-r13 ::= SEQUENCE { | | Non-anchor carrier | |
| dl-CarrierConfig-r13::= SEQUENCE { | | | |
| dl-CarrierFreq-r13 | Note 1 | | |
| downlinkBitmapNonAnchor-r13 | NULL | | |
| dl-GapNonAnchor-r13 | NULL | | |
| } | | | |
| ul-CarrierConfig-r13 ::= SEQUENCE { | | | |
| ul-CarrierFreq-r13 | Note 1 | | |
| } | | | |
| } | | | |
| npdcch-ConfigDedicated-r13 | NPDCCH-ConfigDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| npusch-ConfigDedicated-r13 | NPUSCH-ConfigDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| uplinkPowerControlDedicated-r13 | UplinkPowerControlDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| } | | | |
| Note 1: The frequency of Non-anchor carrier is located at 180KHz higher from the centre of the anchor carrier. | | | |

#### 8.12.1.1.2.5 Test requirement

Table 8.12.1.1.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.12.2.1 for each throughput test shall meet or exceed the specified value in Table 8.12.1.1.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.12.1.1.2.5-1: Test requirements under standalone with 1 NRS ports**

| Test number | Bandwidth | Carrier Type | Reference Channel | Repetition number | Propagation condition | Number of NRS ports | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) |
| 1 | 200kHz | Anchor | R.NB.6 FDD | 32 | EPA5 | 1 | 70% | -2.6 |
| 2 | 200kHz | Non-anchor | R.NB.6-1 FDD | 256 | ETU1 | 1 | 70% | -9.4 |

## 8.12.1.1.3 Demodulation of NPDSCH (Cell-Specific Reference Symbols) in standalone for NB2

### 8.12.1.1.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on one antenna port.

### 8.12.1.1.3.2 Test applicability

This test applies to all types of UE release 14 and forward of category NB2.

### 8.12.1.1.3.3 Minimum conformance requirements

The requirements are specified in Table 8.12.1.1.3.3-2, with the addition of the parameters in Table 8.12.1.1.3.3-1 and the downlink physical channel setup according to Annex C.3.2. Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.12.1.1.3.3-2 for the specified SNR.

**Table 8.12.1.1.3.3-1: Test Parameters for NPDSCH under Standalone**

| Parameter | Unit | | Test 1 |
|---|---|---|---|
| $N_{oc}$ at antenna port | $N_{oc1}$ | dBm/15kHz | -93 (Note 1) |
| | $N_{oc2}$ | dBm/15kHz | -96 (Note 2) |
| NPDCCH repetition number | | subframe | 4 for Test 1 |
| $R_{\max}$ (*npdcch-NumRepetitions-r13*) | | subframe | 8 for Test 1 |
| $G$ (*nPDCCH-startSF-USS-r13*) | | | 1.5 |
| Note 1: This noise is applied to all subframes from the end of the NPDCCH to the end of the following NPDSCH transmission;<br>Note 2: This noise is applied to all subframes from the end of the NPDSCH to the end of the following NPDCCH transmission. | | | |

**Table 8.12.1.1.3.3-2: Minimum performance for NPDSCH under Standalone with 1 NRS port**

| Test number | Bandwidth | Carrier Type | Reference Channel | Repetition number | Propagation condition | Number of NRS ports | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 200kHz | Non-anchor | R.NB.7 FDD | 1 | EPA5 | 1 | 70% | 9.4 | NB2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.12.1.1.3.

#### 8.12.1.1.3.4 Test description

##### 8.12.1.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: K.2.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.12.1.1.3.3-2.

EUTRA Bandwidth is 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.1, except for band 31 where 5 MHz bandwidth is used.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Tables 8.12.1.1-1 and 8.12.1.1.3.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.0.1, H.1.1, H.2.1 and Annex H.4.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 8.12.1.1.3.4.3.

##### 8.12.1.1.3.4.2 Test procedure

1. SS transmits NPDSCH via NPDCCH DCI format N1 for C_RNTI to transmit the DL RMC according to Tables 8.12.1.1.3.3-1 and 8.12.1.1.3.3-2.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.12.1.1.3.5-1 as appropriate.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.12.1.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 with the following exceptions:

**Table 8.12.1.1.3.4.3-1: Configure Non-anchor carrier in subtest 1**

| Derivation Path: 36.508 Table 8.1.8.2.1.6-1 PhysicalConfigDedicated-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-NB-DEFAULT ::= SEQUENCE { | | | |
| carrierConfigDedicated-NB-r13 ::= SEQUENCE { | | Non-anchor carrier | |
| dl-CarrierConfig-r13::= SEQUENCE { | | | |
| dl-CarrierFreq-r13 | Note 1 | | |
| downlinkBitmapNonAnchor-r13 | NULL | | |
| dl-GapNonAnchor-r13 | NULL | | |
| } | | | |
| ul-CarrierConfig-r13 ::= SEQUENCE { | | | |
| ul-CarrierFreq-r13 | Note 1 | | |
| } | | | |
| } | | | |
| npdcch-ConfigDedicated-r13 | NPDCCH-ConfigDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| npusch-ConfigDedicated-r13 | NPUSCH-ConfigDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| uplinkPowerControlDedicated-r13 | UplinkPowerControlDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| } | | | |
| Note 1: The frequency of Non-anchor carrier is located at 200KHz higher from the centre of the anchor carrier. | | | |

#### 8.12.1.1.3.5 Test requirement

Table 8.12.1.1.3.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.12.2.1 for each throughput test shall meet or exceed the specified value in Table 8.12.1.1.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.12.1.1.3.5-1: Test requirements under standalone with 1 NRS ports**

| Test number | Bandwidth | Carrier Type | Reference Channel | Repetition number | Propagation condition | Number of NRS ports | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of Maximum Throughput (%) | SNR (dB) | |
| 1 | 200kHz | Non-anchor | R.NB.7 FDD | 1 | EPA5 | 1 | 70% | 10.2 | NB2 |

## 8.12.2 NPDCCH

### 8.12.2.1 Half-duplex FDD

The parameters specified in Table 8.12.2.1-1 are valid for all half-duplex FDD tests unless otherwise stated.

**Table 8.12.2.1-1: Test Parameters for NPDCCH**

| Parameter | Unit | Single antenna port | Transmit diversity |
|---|---|---|---|
| Narrowband physical layer Cell ID | | 0 | 0 |
| $N_{oc}$ at antenna port | dBm/15kHz | -98 | -98 |
| Cyclic prefix | | Normal | Normal |
| Number of CRS ports for in-band deployment mode | | 4 | 4 |
| NPDCCH starting position (*eutraControlRegionSize-r13*) (Note 1) | | 3 | 3 |
| Maximum number of repetitions $R_{\max}$ (*npdcch-NumRepetitions-r13*) | | 128 for Test 1; 1024 for Test 2. | 64 for Test 1; 512 for Test 2. |
| NPDCCH start subframe $G$ (*npdcch-startSF-USS-r13*) | | 2 for test1, 1.5 for test2 | 2 for test1, 1.5 for test2 |
| NPDCCH fractional period offset of starting subframe $\alpha_{offset}$ (*npdcch-Offset-USS-r13*) | | 0 | 0 |
| NB-IoT downlink subframe bitmap for anchor carrier *(downlinkBitmap-r13)* | | Not configured | Not configured |
| NB-IoT downlink subframe bitmap for non-anchor carrier *(downlinkBitmapNonAnchor-r13)* | | Not configured | Not configured |
| Downlink gap configuration for anchor carrier *(dl-Gap-r13)* | | Not configured | Not configured |
| Downlink gap configuration for non-anchor carrier *(dl-GapNonAnchor-r13)* | | Not configured | Not configured |
| Unused REs or RBs (Note 1) | | OCNG | OCNG |
| OCNG pattern | | NB.OP.1 | NB.OP.1 |
| NOTE 1: Applicable only for in-band deployment mode. | | | |

**Table 8.12.2.1-2: Test Parameters of related NPDSCH and NPUSCH format 2 configurations**

| Parameter | Unit | Value |
|---|---|---|
| Scheduling delay field ($I_{\text{Delay}}$) | | 0 |
| NPDSCH Repetition number | | 1 |
| $N_{oc}$ at antenna port for NPDSCH | dBm/15kHz | -98 |
| $N_{\text{Rep}}^{AN}$ (*ack-NACK-NumRepetitions-r13*) | | 1 |
| ACK/NACK resource field | | 0 |
| Reference channel for NPDSCH | | R.NB.6 and R.NB.6-1 for one NRS antenna port; R.NB.5 and R.NB.5-1 for two NRS antenna ports |

### 8.12.2.1.1 Demodulation of NPDCCH single-antenna performance for category NB1 and NB2

#### 8.12.2.1.1.1 Test purpose

This test verifies the demodulation performance of NPDCCH for single-antenna scenario with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, remains below a given reference value.

#### 8.12.2.1.1.2 Test applicability

This test applies to all types of UE release 13 and forward of category NB1.

This test applies to all types of UE release 13 and forward of category NB2.

#### 8.12.2.1.1.3 Minimum conformance requirements

The purpose of these tests is to verify the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). The requirements are specified in Table 8.12.2.1.1.3-1, with the parameters in Table 8.12.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the performance.

**Table 8.12.2.1.1.3-1: Minimum performance NPDCCH**

| Test number | Deployment mode | Repetition number (R) | Carrier Type | Reference Channel | Propagation Condition | Number of NRS ports | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) | |
| 1 | Stand-alone/Guard-band | 128 | Anchor | R.NB.3 FDD | EPA5 | 1 | 1 | -4.9 | NB1, NB2 |
| 2 | Stand-alone/Guard-band | 1024 | Non-anchor | R.NB.3 FDD | ETU1 | 1 | 1 | -11.4 | NB1, NB2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.12.2.1.1.

#### 8.12.2.1.1.4 Test description

##### 8.12.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of NPDSCH and NPDCCH before measurement are specified in TBD.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Operation mode: Standalone.

Frequencies to be tested: K.2.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.12.2.1.1.3-2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Tables 8.12.2.1-1 and 8.12.2.1.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.0.1, H.1.1, H.2.1 and Annex H.4.2.
4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 8.12.2.1.1.4.3.

#### 8.12.2.1.1.4.2 Test procedure

1. SS transmits NPDSCH via NPDCCH DCI format N1 for C_RNTI to transmit the DL RMC according to Tables 8.12.2.1-1, 8.12.2.1-2 and 8.12.2.1.1.3-1. The details of NPDCCH are specified in Table A.3.13.1. The SS sends downlink MAC padding bits on the DL RMC.

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition and the SNR according to Tables 8.12.2.1.1.5-1 as appropriate.

3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL NPUSCH during each subtest. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in table 8.12.2.1.1.5-1, UE pass the subtest. Otherwise fail the UE.

4. SS release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Configure the Non-anchor carrier according to table 8.12.2.1.1.4.3-1.

5. Repeat steps from 1 to 3 for subtest 2 in Table 8.12.2.1.1.5-1 as appropriate.

#### 8.12.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 with the following exceptions:

**Table 8.12.2.1.1.4.3-1: Configure Non-anchor carrier in subtest 2**

| Derivation Path: 36.508 Table 8.1.8.2.1.6-1 PhysicalConfigDedicated-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-NB-DEFAULT ::= SEQUENCE { | | | |
| carrierConfigDedicated-NB-r13 ::= SEQUENCE { | | Non-anchor carrier | |
| dl-CarrierConfig-r13::= SEQUENCE { | | | |
| dl-CarrierFreq-r13 | Note 1 | | |
| downlinkBitmapNonAnchor-r13 | NULL | | |
| dl-GapNonAnchor-r13 | NULL | | |
| } | | | |
| ul-CarrierConfig-r13 ::= SEQUENCE { | | | |
| ul-CarrierFreq-r13 | Note 1 | | |
| } | | | |
| } | | | |
| npdcch-ConfigDedicated-r13 | NPDCCH-ConfigDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| npusch-ConfigDedicated-r13 | NPUSCH-ConfigDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| uplinkPowerControlDedicated-r13 | UplinkPowerControlDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| } | | | |
| Note 1: The frequency of Non-anchor carrier is located at 200KHz higher from the centre of the anchor carrier. | | | |

#### 8.12.2.1.1.5 Test requirement

For the parameters specified in Tables 8.12.2.1-1 and 8.12.2.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.12.2.1.1.5-1.

**Table 8.12.2.1.1.5-1: Test Parameters for NPDCCH performance**

| Test number | Deployment mode | Repetition number ($R_{max}$) | Operated carrier | Reference Channel | Propagation Condition | Number of NRS ports | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | Stand-alone | 128 | Anchor | R.NB.3 FDD | EPA5 | 1 | 1 | -4.1 |
| 2 | Stand-alone | 1024 | Non-anchor | R.NB.3 FDD | ETU1 | 1 | 1 | -10.6 |

## 8.12.2.1.2 Demodulation of NPDCCH Transmit diversity performance for category NB1 and NB2

### 8.12.2.1.2.1 Test purpose

This test verifies the demodulation performance of NPDCCH for the transmit diversity scenario with a given SNR for which the average probability of misdetection of the Downlink Scheduling Grant, remains below a given reference value.

### 8.12.2.1.2.2 Test applicability

This test applies to all types of UE release 13 and forward of category NB1.

This test applies to all types of UE release 14 and forward of category NB2.

### 8.12.2.1.2.3 Minimum conformance requirements

The requirements are specified in Table 8.12.2.1.2.3-1, with the addition of the parameters in Tables 8.12.2.1-1, 8.12.2.1-2 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the performance.

**Table 8.12.2.1.2.3-1: Minimum performance NPDCCH**

| Test number | Deployment mode | Repetition number (R) | Carrier Type | Reference Channel | Propagation Condition | Number of NRS ports | Reference value | | UE Category |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) | |
| 1 | In-band | 64 | Anchor | R.NB.4 FDD | EPA5 | 2 | 1 | -3.9 | NB1, NB2 |
| 2 | In-band | 512 | Non-anchor | R.NB.4 FDD | ETU1 | 2 | 1 | -10.0 | NB1, NB2 |

The normative reference for this requirement is TS 36.101 [2] clause 8.12.2.1.2.

### 8.12.2.1.2.4 Test description

#### 8.12.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of NPDSCH and NPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: K.2.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.12.2.1.2.3-1.

EUTRA Bandwidth is 10 MHz, as defined in TS 36.508 [7] clause 4.3.1.1 except for band 31 where 5 MHz bandwidth is used.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Tables 8.12.2.1-1, 8.12.2.1-2 and 8.12.2.1.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.0.1, H.1.1, H.2.1 and Annex H.4.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Message contents are defined in clause 8.12.2.1.2.4.3.

#### 8.12.2.1.2.4.2 Test procedure

1. SS transmits NPDSCH via NPDCCH DCI format N1 for C_RNTI to transmit the DL RMC according to Tables 8.12.2.1-1, 8.12.2.1-2 and 8.12.2.1.2.3-1. The details of NPDCCH are specified in Table A.3.13.1. The SS sends downlink MAC padding bits on the DL RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition and the SNR according to Tables 8.12.2.1.2.5-1 as appropriate.
3. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.4. Count the number of NACKs, ACKs and statDTXs on the UL NPUCCH during each subtest. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX). If Pm-dsg is less than the value specified in table 8.12.2.1.2.5-1, UE pass the subtest. Otherwise fail the UE.
4. SS release the connection through State 3A-NB and finally ensure the UE is in State 2A-NB with CP CIoT Optimisation according to TS 36.508 [7] clause 8.1.5. Configure the Non-anchor carrier according to table 8.12.2.1.2.4.3-2.
5. Repeat steps from 1 to 3 for subtest 2 in Table 8.12.2.1.2.5-1 as appropriate.

#### 8.12.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 8.1.6 and clause 8.1.4.3 using condition "Inband_Different" with the following exceptions:

**Table 8.12.2.1.2.4.3-1: *MasterInformationBlock-NB***

| Derivation Path: 36.508 Table 8.1.4.3.2-1: MasterInformationBlock-NB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MasterInformationBlock-NB ::= SEQUENCE { | | | |
| systemFrameNumber-MSB-r13 | A valid value as defined in TS 36.331 [17] | | |
| hyperSFN-LSB-r13 | A valid value as defined in TS 36.331 [17] | | |
| schedulingInfoSIB1-r13 | 2 | TBS = 208 bits, 16 repetitions | |
| systemInfoValueTag-r13 | 0 | | |
| ab-Enabled-r13 | FALSE | | |
| operationModeInfo-r13 CHOICE { | | | |
| inband-DifferentPCI-r13 SEQUENCE { | | | Inband_Different |
| eutra-NumCRS-Ports-r13 | four | | |
| rasterOffset-r13 | khz-2dot5 | | |
| spare | '00'B | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.12.2.1.2.4.3-2: Configure Non-anchor carrier in subtest 2**

| Derivation Path: 36.508 Table 8.1.8.2.1.6-1 PhysicalConfigDedicated-NB-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-NB-DEFAULT ::= SEQUENCE { | | | |
| carrierConfigDedicated-NB-r13 ::= SEQUENCE { | | Non-anchor carrier | |
| dl-CarrierConfig-r13::= SEQUENCE { | | | |
| dl-CarrierFreq-r13 | Note 1 | | |
| downlinkBitmapNonAnchor-r13 | NULL | | |
| dl-GapNonAnchor-r13 | NULL | | |
| } | | | |
| ul-CarrierConfig-r13 ::= SEQUENCE { | | | |
| ul-CarrierFreq-r13 | Note 1 | | |
| } | | | |
| } | | | |
| npdcch-ConfigDedicated-r13 | NPDCCH-ConfigDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| npusch-ConfigDedicated-r13 | NPUSCH-ConfigDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| uplinkPowerControlDedicated-r13 | UplinkPowerControlDedicated-NB-DEFAULT | See subclause 8.1.6.3 in 36.508 | |
| } | | | |
| Note 1: The frequency of the non-anchor carrier is 180KHz higher than the centre of the anchor carrier. | | | |

8.12.2.1.2.5 Test requirement

For the parameters specified in Tables 8.12.2.1-1, 8.12.2.1-2 and 8.12.2.1.2.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.12.2.1.2.5-1.

**Table 8.12.2.1.2.5-1: Test Parameters for NPDCCH performance**

| Test number | Deployment mode | Repetition number ($R_{max}$) | Operated carrier | Reference Channel | Propagation Condition | Number of NRS ports | Reference value | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pm-dsg (%) | SNR (dB) |
| 1 | In-band | 64 | Anchor | R.NB.4 FDD | EPA5 | 2 | 1 | -3.0 |
| 2 | In-band | 512 | Non-anchor | R.NB.4 FDD | ETU1 | 2 | 1 | -9.1 |

# 8.13 Demodulation of PDSCH CA and DC (4 receiver antenna ports)

## 8.13.1 FDD (CA and DC)

### 8.13.1.1 Closed Loop Multi Layer Spatial Multiplexing

#### 8.13.1.1.1 Closed Loop Multi Layer Spatial Multiplexing 4x4 for CA

##### 8.13.1.1.1.1 Minimum Requirement

The purpose of these tests is to verify the closed loop rank-two performance with frequency selective precoding.

For CA with 2 DL CCs, the requirements are specified in Table 8.13.1.1.1.1-3, based on single carrier requirement specified in Table 8.13.1.1.1.1-2, with the addition of the parameters in Table 8.13.1.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 3 DL CCs, the requirements are specified in Table 8.13.1.1.1.1-4, based on single carrier requirement specified in Table 8.13.1.1.1.1-2, with the addition of the parameters in Table 8.13.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 4 DL CCs, the requirements are specified in Table 8.13.1.1.1.1-5, based on single carrier requirement specified in Table 8.13.1.1.1.1-2, with the addition of the parameters in Table 8.13.1.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 5 DL CCs, the requirements are specified in Table 8.13.1.1.1.1-6, based on single carrier requirement specified in Table 8.13.1.1.1.1-2, with the addition of the parameters in Table 8.13.1.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.1.1.1.1-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000<br>00111111111111111110000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers.

Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for Tests in Table 8.13.1.1.1.1-3, and with PUCCH format 3 for Tests in Table 8.13.1.1.1.1-4, Table 8.13.1.1.1.1-5 and Table 8.13.1.1.1.1-6.

Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.13.1.1.1.1-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 7.5 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 9.5 | 5.1 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 9.5 | 5.2 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.1 | 5.7 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.1 | 5.6 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.3 | 5.6 |

**Table 8.13.1.1.1.1-3: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x10 MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 2x20 MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 2x5 MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 15MHz+5MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 10MHz+5MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

**Table 8.13.1.1.1.1-4: Minimum performance (FRC) based on single carrier performance for CA with 3 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 20MHz+20MHz+10MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 20MHz+15MHz+15MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 20MHz+15MHz+10MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 6 | 20MHz+10MHz+10MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 7 | 15MHz+15MHz+10MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 8 | 20MHz+10MHz+5MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 9 | 20MHz+15MHz+5MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 10 | 10MHz+10MHz+5MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 11 | 5MHz+5MHz+20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 12 | 3x10MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 13 | 5MHz+5MHz+10MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

**Table 8.13.1.1.1.1-5: Minimum performance (FRC) based on single carrier performance for CA with 4 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 2 | 10MHz+20MHz+20MHz+20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 3 | 10MHz+10MHz+20MHz+20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 4 | 5MHz+10MHz+20MHz+20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 5 | 5MHz+10MHz+10MHz+20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 6 | 15+3x20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 7 | 2x15+2x20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 8 | 10+15+2x20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 9 | 3x10+20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 10 | 2x5+2x20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 11 | 2x5+10+20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 12 | 4x10MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

**Table 8.13.1.1.1.1-6: Minimum performance (FRC) based on single carrier performance for CA with 5 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 2 | 15MHz+4x20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 3 | 10MHz+4x20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 4 | 2x10MHz+3x20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 5 | 5MHz+10MHz+3x20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 6 | 3x10MHz+2x20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 7 | 4x10MHz+20MHz | As specified in Table 8.13.1.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.1.1.1.

### 8.13.1.1.1.2 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 (2DL CA)

#### 8.13.1.1.1.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement

Channel (RMC) not falling below a specified value for transmission on four antenna ports using closed-loop spatial multiplexing.

#### 8.13.1.1.1.2.2 Test applicability

This test applies to E-UTRA FDD release10 and forward UE of category ≥ 5 which supports inter-band OR intra-band contiguous DL CA and 4 Rx antenna ports.

This test also applies to E-UTRA FDD release 11 and forward UE of category ≥ 5 that supports intra-band non-contiguous DL CA and 4 Rx antenna ports.

#### 8.13.1.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.1.1.1.1.

#### 8.13.1.1.1.2.4 Test description

##### 8.13.1.1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1, 8.13.1.1.1.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.1.1.2.4.3.

##### 8.13.1.1.1.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *PDSCH-ConfigDedicated-DEFAULT* is defined in Table 8.13.1.1.1.2.4.3-1, *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.13.1.1.1.2.4.3-2, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.13.1.1.1.2.4.3-2A, *CQI-ReportConfig-r10-DEFAULT* is defined in Table 8.13.1.1.1.2.4.3-4, *CQI-ReportAperiodic-r10-DEFAULT* is defined in Table 8.13.1.1.1.2.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 8.13.1.1.1.2.4.3-6, *PUSCH-ConfigDedicated-DEFAULT* is defined in Table 8.13.1.1.1.2.4.3-7.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.13.1.1.1.2.5-2. The SS sends downlink MAC padding bits on the DL RMC.

5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.1.1.1.2.5-1 as appropriate.

7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.13.1.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.13.1.1.1.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.1.1.1.2.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000000011111111111111111000000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.1.1.1.2.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000000011111111111111110000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.1.1.1.2.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | RBC |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.1.1.1.2.4.3-4: *CQI-ReportConfig-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.1.1.1.2.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.1.1.1.2.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.1.1.1.2.4.3-7: PUSCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.13.1.1.1.2.5 Test requirement

Table 8.13.1.1.1.1-1 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.1.1.1.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.1.1.1.2.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.3 | 8.4 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.0 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.1 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.6 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.5 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.2 | 6.5 |

**Table 8.13.1.1.1.2.5-2: Test requirements (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x10 MHz | As specified in Table 8.13.1.1.1.2.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 2x20 MHz | As specified in Table 8.13.1.1.1.2.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 2x5 MHz | As specified in Table 8.13.1.1.1.2.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 15MHz+5MHz | As specified in Table 8.13.1.1.1.2.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 10MHz+5MHz | As specified in Table 8.13.1.1.1.2.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.1.1.1.3 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 (3DL CA)

#### 8.13.1.1.1.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

#### 8.13.1.1.1.3.2 Test applicability

This test case applies to all types of E-UTRA FDD release 10 and forward UE of category ≥ 5 that support 3DL with CA configurations in Table 7.1-2a and 4 Rx antenna ports.

This test case also applies to all types of E-UTRA FDD release 11 and forward UE of category ≥ 5 that support 3DL with CA configurations in Table 7.1-2a and 4 Rx antenna ports.

#### 8.13.1.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.1.1.1.1.

#### 8.13.1.1.1.3.4 Test description

##### 8.13.1.1.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for the cell are set up according to Table 8.2.1-1 and 8.13.1.1.1.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.1.1.3.4.3.

##### 8.13.1.1.1.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.1.1.1.3.4.3.
3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.
4. The SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table8.13.1.1.1.3.5-2. The SS sends downlink MAC padding bits on the DL RMC.
5. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Table 8.13.1.1.1.3.5-1 as appropriate.
7. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

##### 8.13.1.1.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 8.13.1.1.1.3.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.1.1.1.3.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000111111111111111100000000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.1.1.1.3.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000111111111111111100000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.1.1.1.3.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | RBC |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.1.1.1.3.4.3-4: *CQI-ReportConfig-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.1.1.1.3.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11100000 | P-Cell, S-Cells report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.1.1.1.3.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.1.1.1.3.4.3-7: PUSCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

8.13.1.1.1.3.5 Test requirement

Table 8.13.1.1.1.1-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.1.1.1.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.1.1.1.3.5-1: Single carrier performance for multiple CA configurations**

| **Band-width** | **Reference channel** | | **OCNG pattern** | **Propa-gation condi-tion** | **Correlation matrix and antenna config.** | | **Reference value** | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **Fraction of maximum throughput (%)** | **SNR (dB)** | |
| | **2Rx CC** | **4Rx CC** | | | **2Rx CC** | **4Rx CC** | | **2Rx CC** | **4Rx CC** |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.3 | 8.4 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.0 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.1 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.6 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.5 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.2 | 6.5 |

**Table 8.13.1.1.1.3.5-2: Minimum performance (FRC) based on single carrier performance for CA with 3 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.13.1.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.13.1.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 20MHz+20MHz+10MHz | As specified in Table 8.13.1.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 20MHz+15MHz+15MHz | As specified in Table 8.13.1.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 20MHz+15MHz+10MHz | As specified in Table 8.13.1.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 6 | 20MHz+10MHz+10MHz | As specified in Table 8.13.1.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 7 | 15MHz+15MHz+10MHz | As specified in Table 8.13.1.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 8 | 20MHz+10MHz+5MHz | As specified in Table 8.13.1.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 9 | 20MHz+15MHz+5MHz | As specified in Table 8.13.1.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 10 | 10MHz+10MHz+5MHz | As specified in Table 8.13.1.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 11 | 5MHz+5MHz+20MHz | As specified in Table 8.13.1.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 12 | 3x10MHz | As specified in Table 8.13.1.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 13 | 5MHz+5MHz+10MHz | As specified in Table 8.13.1.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.1.1.1.4 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 (4DL CA)

#### 8.13.1.1.1.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

#### 8.13.1.1.1.4.2 Test applicability

This test case applies to all types of E-UTRA FDD release 11 and forward UE of category ≥ 8 that support 4DL with CA configurations in Table 7.1-2b or 4DL with Intra-band non-contiguous and Intra-band non-contiguous CA and 4 Rx antenna ports.

#### 8.13.1.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.1.1.1.1.

#### 8.13.1.1.1.4.4 Test description

##### 8.13.1.1.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for the cell are set up according to Table 8.2.1-1 and 8.13.1.1.1.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.1.1.4.4.3.

### 8.13.1.1.1.4.4.2 Test procedure

Same test procedure as in clause 8.13.1.1.1.2.4.2 with the following exceptions:

- Instead of Table 8.13.1.1.1.2.5-1 → use Table 8.13.1.1.1.4.5-1

### 8.13.1.1.1.4.4.3 Message contents

Same message contents as in clause 8.13.1.1.1.2.4.3 with the following exceptions:

**Table 8.13.1.1.1.4.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11110000 | P-Cell, S-Cells report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

### 8.13.1.1.1.4.5 Test requirement

Table 8.13.1.1.1.1-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.1.1.1.4.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.1.1.1.4.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.3 | 8.4 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.0 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.1 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.6 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.5 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.2 | 6.5 |

**Table 8.13.1.1.1.4.5-2: Test requirements (FRC) based on single carrier performance for CA with 4 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.13.1.1.1.4.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 2 | 10MHz+20MHz+20MHz+20MHz | As specified in Table 8.13.1.1.1.4.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 3 | 10MHz+10MHz+20MHz+20MHz | As specified in Table 8.13.1.1.1.4.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 4 | 5MHz+10MHz+20MHz+20MHz | As specified in Table 8.13.1.1.1.4.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 5 | 5MHz+10MHz+10MHz+20MHz | As specified in Table 8.13.1.1.1.4.5-1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 6 | 15+3x20MHz | As specified in Table 8.13.1.1.1.4.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 7 | 2x15+2x20MHz | As specified in Table 8.13.1.1.1.4.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 8 | 10+15+2x20MHz | As specified in Table 8.13.1.1.1.4.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 9 | 3x10+20MHz | As specified in Table 8.13.1.1.1.4.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 10 | 2x5+2x20MHz | As specified in Table 8.13.1.1.1.4.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 11 | 2x5+10+20MHz | As specified in Table 8.13.1.1.1.4.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 12 | 4x10MHz | As specified in Table 8.13.1.1.1.4.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.1.1.1.5 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 (5DL CA)

### 8.13.1.1.1.5.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by th9.e SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

#### 8.13.1.1.1.5.2 Test applicability

This test case applies to all types of E-UTRA FDD release 11 and forward UE of category 8, 11 or higher that support 5DL with CA configurations in Table 7.1-2c and 4 Rx antenna ports
This test case also applies to all types of E-UTRA FDD release 12 and forward UE of category 8, 11 or higher that support 5DL with CA configurations in Table 7.1-2c and 4 Rx antenna ports.

#### 8.13.1.1.1.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.1.1.1.1.

#### 8.13.1.1.1.5.4 Test description

##### 8.13.1.1.1.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95
2. The parameter settings for the cell are set up according to Table 8.2.1-1 and 8.13.1.1.1.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.1.1.5.4.3.

##### 8.13.1.1.1.5.4.2 Test procedure

Same test procedure as in clause 8.13.1.1.1.2.4.2 with the following exceptions:

- Instead of Table 8.13.1.1.1.2.5-1 → use Table 8.13.1.1.1.5.5-1

##### 8.13.1.1.1.5.4.3 Message contents

Same message contents as in clause 8.13.1.1.1.2.4.3 with the following exceptions:

**Table 8.13.1.1.1.5.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT:* Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11111000 | P-Cell, S-Cells report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

8.13.1.1.1.5.5 Test requirement

Table 8.13.1.1.1.1-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.1.1.1.5.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.1.1.1.5.5-1: Single carrier performance for multiple CA configurations**

| **Band-width** | **Reference channel** | | **OCNG pattern** | **Propa-gation condi-tion** | **Correlation matrix and antenna config.** | | **Reference value** | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **Fraction of maximum throughput (%)** | **SNR (dB)** | |
| | **2Rx CC** | **4Rx CC** | | | **2Rx CC** | **4Rx CC** | | **2Rx CC** | **4Rx CC** |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.3 | 8.4 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.0 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.1 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.6 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.5 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.2 | 6.5 |

**Table 8.13.1.1.1.5.5-2: Test requirements (FRC) based on single carrier performance for CA with 5 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.13.1.1.1.5.5-1 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 2 | 15MHz+4x20MHz | As specified in Table 8.13.1.1.1.5.5-1 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 3 | 10MHz+4x20MHz | As specified in Table 8.13.1.1.1.5.5-1 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 4 | 2x10MHz+3x20MHz | As specified in Table 8.13.1.1.1.5.5-1 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 5 | 5MHz+10MHz+3x20MHz | As specified in Table 8.13.1.1.1.5.5-1 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 6 | 3x10MHz+2x20MHz | As specified in Table 8.13.1.1.1.5.5-1 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 7 | 4x10MHz+20MHz | As specified in Table 8.13.1.1.1.5.5-1 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.1.1.2

## 8.13.1.1.3 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 with 256QAM (2DL CA)

### 8.13.1.1.3.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with frequency selective precoding with 256QAM under CA.

### 8.13.1.1.3.2 Test applicability

This test applies to E-UTRA FDD release10 and forward UE of category ≥ 5 which supports inter-band OR intra-band contiguous DL CA and 4 Rx antenna ports and 256QAM in DL.

This test also applies to E-UTRA FDD release 11 and forward UE of category ≥ 5 that supports intra-band non-contiguous DL CA and 4 Rx antenna ports and 256QAM in DL.

### 8.13.1.1.3.3 Minimum conformance requirements

For CA with 2 DL CCs, the requirements are specified in Table 8.13.1.1.3.3-3, based on single carrier requirement specified in Table 8.13.1.1.3.3-2, with the addition of the parameters in Table 8.13.1.1.3.3-1 and the downlink physical channel setup according to Annex C.3.2. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.1.1.3.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000011111111111111111000000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | 4 |
| Note 1: $P_B = 1$. | | | |
| Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). | | | |
| Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers. | | | |
| Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for Tests in Table 8.13.1.1.3-3. | | | |
| Note 5: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.13.1.1.3.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.72-1 FDD | R.72-1 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 23.4 | 19.3 |
| 10 MHz | R.72 FDD | R.72 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.6 | 18.0 |
| 15MHz | R.72-2 FDD | R.72-2 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.7 | 17.4 |
| 20MHz | R.72-3 FDD | R.72-3 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.8 | 17.5 |

**Table 8.13.1.1.3.3-3: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x10 MHz | As specified in Table 8.13.1.1.3-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 2x20 MHz | As specified in Table 8.13.1.1.3-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 2x5 MHz | As specified in Table 8.13.1.1.3-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 20MHz+15MHz | As specified in Table 8.13.1.1.3-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 10MHz+5MHz | As specified in Table 8.13.1.1.3-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.1.1.3.

#### 8.13.1.1.3.4 Test description

##### 8.13.1.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for the cell are set up according to Table 8.13.1.1.3.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.1.3.4.3.

##### 8.13.1.1.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.1.2.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.13.1.1.3.3-2 and 8.13.1.1.3.3-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.1.1.3.5-1 as appropriate.
7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3A.5 and G.3A.6 in Annex G clause G.3.

##### 8.13.1.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 5.5 with the following exceptions.

**Table 8.13.1.1.3.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.1.1.3.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| cqi-ReportConfigPCell-v1250 | CQI-ReportConfig-v1250-DEFAULT | | DL 256QAM |
| } | | | |

**Table 8.13.1.1.3.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| cqi-ReportConfigSCell-v1250 | CQI-ReportConfig-v1250-DEFAULT | | DL 256QAM |
| } | | | |

**Table 8.13.1.1.3.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.1.1.3.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.1.1.3.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.1.1.3.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.1.1.3.4.3-7: *CQI-ReportConfig-v1250-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1250 ::= SEQUENCE { | | | |
| csi-SubframePatternConfig-r12 CHOICE { | | | |
| release | NULL | | |
| } | | | |
| cqiCQI-ReportBoth-v1250 | Not present | | |
| cqi-ReportAperiodic-v1250 | Not present | | |
| altCQI-Table-r12 | allSubframes | | DL 256QAM |
| } | | | |

**Table 8.13.1.1.3.4.3-8: PUSCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

8.13.1.1.3.5 Test requirement

Table 8.13.1.1.3.3-1 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Tables 8.13.1.1.3.5-1 and 8.13.1.1.3.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.1.1.3.5-1: Test requirement single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.72-1 FDD | R.72-1 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 24.3 | 20.2 |
| 10 MHz | R.72 FDD | R.72 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.5 | 18.9 |
| 15MHz | R.72-2 FDD | R.72-2 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.6 | 18.3 |
| 20MHz | R.72-3 FDD | R.72-3 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.7 | 18.4 |

**Table 8.13.1.1.3.5-2: Test requirement (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x10 MHz | As specified in Table 8.13.1.1.3.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 2x20 MHz | As specified in Table 8.13.1.1.3.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 2x5 MHz | As specified in Table 8.13.1.1.3.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 20MHz+15MHz | As specified in Table 8.13.1.1.3.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 10MHz+5MHz | As specified in Table 8.13.1.1.3.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.1.1.4 FDD PDSCH Closed Loop Four-Layer Spatial Multiplexing for CA (2DL CA)

#### 8.13.1.1.4.1 Test purpose

To verify the UE's rank-four performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for four-layer transmission on 4Tx and 4Rx under CA.

#### 8.13.1.1.4.2 Test applicability

This test applies to all types of E-UTRA FDD release11 and forward UE of categories 5 or higher that support 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 4 and E-UTRA FDD 2DL CA.

#### 8.13.1.1.4.3 Minimum conformance requirements

For CA with 2 DL CCs, the requirements are specified in Table 8.13.1.1.4.3-3, based on single carrier requirement specified in Table 8.13.1.1.4.3-2, with the addition of the parameters in Table 8.13.1.1.4.3-1 and the downlink physical channel setup according to Annex C.3.2. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.1.1.4.3-1: Test Parameters for Four-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | $\sigma$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cell-specific reference signals | | | Antenna Ports 0,1,2,3 |
| Precoding granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs |
| PMI delay (Note 2) | | ms | 8 |
| Reporting interval | | ms | 1 |
| Reporting mode | | | PUSCH 3-1 |
| CodeBookSubsetRestriction bitmap | | | 0xFFFF000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | 4 |
| PDSCH rank | | | 4 |
| Note 1: $P_B = 1$. | | | |
| Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). | | | |
| Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers. | | | |
| Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection | | | |
| Note 5: The same PDSCH transmission mode is applied to each component carrier. | | | |

**Table 8.13.1.1.4.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 5MHz | R.74-1 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 14.1 |
| 10MHz | R.74 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 14.9 |
| 15MHz | R.74-2 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 14.3 |
| 20MHz | R.74-3 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 14.4 |

**Table 8.13.1.1.4.3-3: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x10 MHz | As specified in Table 8.13.1.1.4-2 per CC | ≥5 |
| 2 | 2x20 MHz | As specified in Table 8.13.1.1.4-2 per CC | ≥5 |
| 3 | 2x5 MHz | As specified in Table 8.13.1.1.4-2 per CC | ≥5 |
| 4 | 15MHz+5MHz | As specified in Table 8.13.1.1.4-2 per CC | ≥5 |
| 5 | 10MHz+5MHz | As specified in Table 8.13.1.1.4-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.1.1.4.

#### 8.13.1.1.4.4 Test description

##### 8.13.1.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for the cell are set up according to Table 8.13.1.1.4.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.1.3.4.3.

##### 8.13.1.1.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.1.2.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.13.1.1.4.3-2 and 8.13.1.1.4.3-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.1.1.4.5-1 as appropriate.
7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3A.5 and G.3A.6 in Annex G clause G.3.

##### 8.13.1.1.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 4.6 and 5.5 with the following exceptions.

**Table 8.13.1.1.4.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.1.1.4.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 0xFFFF000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.1.1.4.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 0xFFFF000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.1.1.4.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.1.1.4.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.1.1.4.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.1.1.4.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.1.1.4.4.3-7: *RRCConnectionReconfiguration***

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | Not present | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.1.1.4.4.3-8: PUSCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.13.1.1.4.5 Test requirement

Table 8.13.1.1.4.3-1 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Tables 8.13.1.1.3.5-1 and 8.13.1.1.3.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.1.1.4.5-1: Test requirement single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 5MHz | R.74-1 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 15.0 |
| 10MHz | R.74 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 15.8 |
| 15MHz | R.74-2 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 15.2 |
| 20MHz | R.74-3 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 15.3 |

**Table 8.13.1.1.4.5-2: Test requirement (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x10 MHz | As specified in Table 8.13.1.1.4.5-2 per CC | ≥5 |
| 2 | 2x20 MHz | As specified in Table 8.13.1.1.4.5-2 per CC | ≥5 |
| 3 | 2x5 MHz | As specified in Table 8.13.1.1.4.5-2 per CC | ≥5 |
| 4 | 15MHz+5MHz | As specified in Table 8.13.1.1.4.5-2 per CC | ≥5 |
| 5 | 10MHz+5MHz | As specified in Table 8.13.1.1.4.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.1.2 Dual-Layer Spatial Multiplexing (User-Specific Reference Symbols)

### 8.13.1.2.1 Minimum Requirement

For CA with 2 DL CCs, for dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.13.1.2.1-3, based on single carrier requirement specified in Table 8.13.1.2.1-2, with the addition of the parameters in Table 8.13.1.2.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 3 DL CCs, for dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.13.1.2.1-4, based on single carrier requirement specified in Table

8.13.1.2.1-2, with the addition of the parameters in Table 8.13.1.2.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 4 DL CCs, for dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.13.1.2.1-5, based on single carrier requirement specified in Table 8.13.1.2.1-2, with the addition of the parameters in Table 8.13.1.2.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 5 DL CCs, for dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.13.1.2.1-6, based on single carrier requirement specified in Table 8.13.1.2.1-2, with the addition of the parameters in Table 8.13.1.2.1-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.1.2.1-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Values |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | -3 |
| Cell-specific reference signals | | | Antenna ports 0 and 1 |
| Cell ID | | | 0 |
| CSI reference signals | | | Antenna ports 15,16 |
| Beamforming model | | | Annex B.4.2 |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | Subframes | 5 / 2 |
| CSI reference signal configuration | | | 8 |
| Zero-power CSI-RS configuration $I_{CSI\text{-}RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 3 / 0010000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| $\widehat{E}_s / N_{oc}$ | | | Reference Value in Table 8.13.1.2.1-2 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Number of allocated resource blocks (Note 2) | | PRB | 50 |
| Simultaneous transmission | | | No |
| PDSCH transmission mode | | | 9 |

Note 1: $P_B = 1$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

**Table 8.13.1.2.1-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.51-2 FDD | R.51-2 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.2 | 9.0 |
| 10 MHz | R.51 FDD | R.51 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 13.7 | 8.8 |
| 15MHz | R.51-3 FDD | R.51-3 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 13.6 | 8.7 |
| 20MHz | R.51-4 FDD | R.51-4 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.3 | 8.8 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.
Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1.

**Table 8.13.1.2.1-3: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x10 MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 2x20 MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 2x5 MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 20MHz+5MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 10MHz+5MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6.

**Table 8.13.1.2.1-4: Minimum performance (FRC) based on single carrier performance for CA with 3 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 20MHz+20MHz+10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 20MHz+15MHz+15MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 20MHz+15MHz+10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 6 | 20MHz+10MHz+10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 7 | 15MHz+15MHz+10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 8 | 20MHz+10MHz+5MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 9 | 20MHz+15MHz+5MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 10 | 10MHz+10MHz+5MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 11 | 5MHz+5MHz+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 12 | 3x10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 13 | 5MHz+5MHz+10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

**Table 8.13.1.2.1-5: Minimum performance (FRC) based on single carrier performance for CA with 4 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 2 | 10MHz+20MHz+20MHz+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 3 | 10MHz+10MHz+20MHz+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 4 | 5MHz+10MHz+20MHz+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 5 | 5MHz+10MHz+10MHz+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 6 | 15+3x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 7 | 2x15+2x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 8 | 10+15+2x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 9 | 3x10+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 10 | 2x5+2x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 11 | 2x5+10+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 12 | 4x10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

**Table 8.13.1.2.1-6: Minimum performance (FRC) based on single carrier performance for CA with 5 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 2 | 15MHz+4x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 3 | 10MHz+4x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 4 | 2x10MHz+3x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 5 | 5MHz+10MHz+3x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 6 | 3x10MHz+2x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 7 | 4x10MHz+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.1.2.1.

### 8.13.1.2.2 FDD Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols) (2DL CA)

#### 8.13.1.2.2.1 Test purpose

To verify the UE's rank-2 performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink

Reference Measurement Channel (RMC) not falling below a specified value for dual-layer transmission on antenna ports 7 and 8 using DM-RS with full RB allocation with multiple CSI reference symbol configurations with non-zero and zero transmission power.

#### 8.13.1.2.2.2 Test applicability

This test applies to E-UTRA FDD release10 and forward UE of category ≥ 5 which supports inter-band OR intra-band contiguous DL CA and 4 Rx antenna ports.

This test also applies to E-UTRA FDD release 11 and forward UE of category ≥ 5 that supports intra-band non-contiguous DL CA and 4 Rx antenna ports.

#### 8.13.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.1.2.1.

#### 8.13.1.2.2.4 Test description

##### 8.13.1.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.94.
2. The parameter settings for the cell are set up according to Table 8.13.1.2.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.2.2.4.3.

##### 8.13.1.2.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.1.2.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.13.1.2.1-2 and 8.13.1.2.1-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.13.1.2.2.5-1 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna ports 7 and 8 using two Tx antennas with beam-forming model as specified in Annex B.4.2 and precoder update granularity specified in Table 8.3.1-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.2.

6. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.13.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.13.1.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.13.1.2.2.4.3-2: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.13.1.2.2.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |

**Table 8.13.1.2.2.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 8 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 3 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

### 8.13.1.2.2.5 Test requirement

Table 8.13.1.2.1-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.1.2.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.1.2.2.5-1: Test requirement single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.51-2 FDD | R.51-2 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 15.1 | 9.9 |
| 10 MHz | R.51 FDD | R.51 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.6 | 9.7 |
| 15MHz | R.51-3 FDD | R.51-3 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.5 | 9.6 |
| 20MHz | R.51-4 FDD | R.51-4 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 15.2 | 9.7 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1. | | | | | | | | | |

**Table 8.13.1.2.2.5-2: Test requirement (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x10 MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 2x20 MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 2x5 MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 20MHz+5MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 10MHz+5MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.1.2.3 FDD Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols) (3DL CA)

### 8.13.1.2.3.1 Test purpose

Same test purpose as 8.13.1.2.2.1

### 8.13.1.2.3.2 Test applicability

This test case applies to all types of E-UTRA FDD release 10 and forward UE of category ≥ 5 that support 3DL with CA configurations in Table 7.1-2a and 4 Rx antenna ports

This test case also applies to all types of E-UTRA FDD release 11 and forward UE of category ≥ 5 that support 3DL with CA configurations in Table 7.1-2a and 4 Rx antenna ports.

### 8.13.1.2.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.1.2.1.

#### 8.13.1.2.3.4 Test description

##### 8.13.1.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.94.
2. The parameter settings for the cell are set up according to Table 8.13.1.2.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.2.3.4.3.

##### 8.13.1.2.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.1.2.3.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.13.1.2.1-2 and 8.13.1.2.1-3 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.13.1.2.3.5-1 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna ports 7 and 8 using two Tx antennas with beam-forming model as specified in Annex B.4.2 and precoder update granularity specified in Table 8.3.1-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.2.
6. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

##### 8.13.1.2.3.4.3 Message contents

Same message contents as 8.13.1.2.2.4.3

#### 8.13.1.2.3.5 Test requirement

Table 8.13.1.2.1-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.1.2.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.1.2.3.5-1: Test requirement single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.51-2 FDD | R.51-2 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 15.1 | 9.9 |
| 10 MHz | R.51 FDD | R.51 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.6 | 9.7 |
| 15MHz | R.51-3 FDD | R.51-3 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.5 | 9.6 |
| 20MHz | R.51-4 FDD | R.51-4 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 15.2 | 9.7 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1. | | | | | | | | | |

**Table 8.13.1.2.3.5-2: Test requirement (FRC) based on single carrier performance for CA with 3 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 20MHz+20MHz+10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 20MHz+15MHz+15MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 20MHz+15MHz+10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 6 | 20MHz+10MHz+10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 7 | 15MHz+15MHz+10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 8 | 20MHz+10MHz+5MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 9 | 20MHz+15MHz+5MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 10 | 10MHz+10MHz+5MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 11 | 5MHz+5MHz+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 12 | 3x10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 13 | 5MHz+5MHz+10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.1.2.4 FDD Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols) (4DL CA)

#### 8.13.1.2.4.1 Test purpose

Same test purpose as 8.13.1.2.2.1

#### 8.13.1.2.4.2 Test applicability

This test case applies to all types of E-UTRA FDD release 11 and forward UE of category ≥ 5 that support 4DL with CA configurations in Table 7.1-2b or 4DL with Intra-band non-contiguous and Intra-band non-contiguous CA and 4 Rx antenna ports.

#### 8.13.1.2.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.1.2.1.

#### 8.13.1.2.4.4 Test description

##### 8.13.1.2.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.94.
2. The parameter settings for the cell are set up according to Table 8.13.1.2.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.2.4.4.3.

##### 8.13.1.2.4.4.2 Test procedure

Same test procedure as in clause 8.13.1.2.3.4.2 with the following exceptions:

- Instead of Table 8.13.1.2.3.5-1 → use Table 8.13.1.2.4.5-1

##### 8.13.1.2.4.4.3 Message contents

Same message contents as 8.13.1.2.2.4.3

#### 8.13.1.2.4.5 Test requirement

Table 8.13.1.2.1-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.1.2.4.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.1.2.4.5-1: Test requirement single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.51-2 FDD | R.51-2 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 15.1 | 9.9 |
| 10 MHz | R.51 FDD | R.51 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.6 | 9.7 |
| 15MHz | R.51-3 FDD | R.51-3 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.5 | 9.6 |
| 20MHz | R.51-4 FDD | R.51-4 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 15.2 | 9.7 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1. | | | | | | | | | |

**Table 8.13.1.2.4.5-2: Test requirement (FRC) based on single carrier performance for CA with 4 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 2 | 10MHz+20MHz+20MHz+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 3 | 10MHz+10MHz+20MHz+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 4 | 5MHz+10MHz+20MHz+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 5 | 5MHz+10MHz+10MHz+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 6 | 15+3x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 7 | 2x15+2x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 8 | 10+15+2x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 9 | 3x10+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 10 | 2x5+2x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 11 | 2x5+10+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 12 | 4x10MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.1.2.5 FDD Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols) (5DL CA)

#### 8.13.1.2.5.1 Test purpose

Same test purpose as 8.13.1.2.2.1

#### 8.13.1.2.5.2 Test applicability

This test case applies to all types of E-UTRA FDD release 11 and forward UE of category 8, 11 or higher that support 5DL with CA configurations in Table 7.1-2c and 4 Rx antenna ports.
This test case also applies to all types of E-UTRA FDD release 12 and forward UE of category 8, 11 or higher that support 5DL with CA configurations in Table 7.1-2c and 4 Rx antenna ports.

#### 8.13.1.2.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.1.2.1.

#### 8.13.1.2.5.4 Test description

##### 8.13.1.2.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.94.
2. The parameter settings for the cell are set up according to Table 8.13.1.2.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.2.5.4.3.

##### 8.13.1.2.5.4.2 Test procedure

Same test procedure as in clause 8.13.1.2.3.4.2 with the following exceptions:

- Instead of Table 8.13.1.2.3.5-1 → use Table 8.13.1.2.5.5-1

##### 8.13.1.2.5.4.3 Message contents

Same message contents as 8.13.1.2.2.4.3

8.13.1.2.5.5 Test requirement

Table 8.13.1.2.1-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.1.2.5.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.1.2.5.5-1: Test requirement single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.51-2 FDD | R.51-2 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 15.1 | 9.9 |
| 10 MHz | R.51 FDD | R.51 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.6 | 9.7 |
| 15MHz | R.51-3 FDD | R.51-3 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.5 | 9.6 |
| 20MHz | R.51-4 FDD | R.51-4 FDD | OP.1 FDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 15.2 | 9.7 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.<br>Note 3: SNR corresponds to $\hat{E}_s/N_{oc}$ of Cell 1. | | | | | | | | | |

**Table 8.13.1.2.5.5-2: Test requirement (FRC) based on single carrier performance for CA with 5 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 2 | 15MHz+4x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 3 | 10MHz+4x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 4 | 2x10MHz+3x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 5 | 5MHz+10MHz+3x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 6 | 3x10MHz+2x20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 7 | 4x10MHz+20MHz | As specified in Table 8.13.1.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.1.3 Enhanced Performance Requirements Type A Closed-loop spatial multiplexing

### 8.13.1.3.1 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model – Enhanced Performance Requirement Type A (2DL CA)

#### 8.13.1.3.1.1 Test purpose

The purpose of these tests is to verify the closed loop rank one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 4 interference model defined in clause B.5.3.

#### 8.13.1.3.1.2 Test applicability

This test applies to all types of E-UTRA FDD release11 and forward UE of categories 5 or higher that support 4 Rx antenna ports and enhanced receiver Type A and E-UTRA FDD 2DL CA.

#### 8.13.1.3.1.3 Minimum conformance requirements

For CA with 2 DL CCs, the requirements are specified in Table 8.13.1.3.1.3-3, based on single carrier requirement specified in Table 8.13.1.3.1.3-2, with the addition of the parameters in Table 8.13.1.3.1.3-1 and the downlink physical channel setup according to Annex C.3.2. In Table 8.13.1.3.1.3-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell.

**Table 8.13.1.3.1.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model for CA**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| Cell Id | | | 0 | 1 |
| PDSCH transmission mode | | | 6 | 4 |
| Interference model | | | N/A | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 |
| | Rank 2 | % | N/A | 20 |

| | | | | |
|---|---|---|---|---|
| Precoding granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs | 4 for 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 4) | | ms | 8 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 1111 | N/A |
| Physical channel for CQI reporting | | | PUSCH (Note 7) | N/A |
| cqi-pmi-ConfigurationIndex | FDD PCC | | 2 | N/A |
| | FDD SCC | | 3 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2 is the interfering cell.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Note 6: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

Note 7: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, SF#2, SF#6 and #7 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5 SF#6 SF#0 and SF#1.

**Table 8.13.1.3.1.3-2: Single carrier performance for multiple CA configurations Enhanced Performance Requirement Type A**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| | | | | | | | | | | 2Rx CC | 4Rx CC |
| 5MHz | R.47-1 FDD | R.47-1 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.8 | -3.0 |
| 10 MHz | R.47 FDD | R.47 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.0 | -2.7 |
| 15MHz | R.47-2 FDD | R.47-2 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.8 | -2.9 |
| 20MHz | R.47-3 FDD | R.47-3 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.1 | -2.8 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

**Table 8.13.1.3.1.3-3: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x10 MHz | As specified in Table 8.13.1.3.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 2x20 MHz | As specified in Table 8.13.1.3.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 2x5 MHz | As specified in Table 8.13.1.3.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 15MHz+5MHz | As specified in Table 8.13.1.3.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 10MHz+5MHz | As specified in Table 8.13.1.3.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.1.3.1.

### 8.13.1.3.1.4 Test description

#### 8.13.1.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.94.
2. The parameter settings for the cell 1 are set up according to Table 8.13.1.3.1.5-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.3.1.4.3.

#### 8.13.1.3.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.1.3.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to Tables 8.13.1.3.1.5-1 and 8.13.1.1.3.5-2 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL

RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0, #1, #5 and #6 (Table A.2.2.1.2-1).

5. SS sets up parameters for interfering cells (cell 2 for PCC and SCC) according to table 8.13.1.3.1.5-1 as appropriate.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SINR according to Tables 8.13.1.3.1.5-2 and 8.13.1.3.1.5-3 as appropriate.

7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3A.5 and G.3A.6 in Annex G clause G.3.

#### 8.13.1.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 5.5 with the following exceptions.

**Table 8.13.1.3.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.1.3.1.4.3-2: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm6 | | |
| codebookSubsetRestriction-r10 | 1111 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.1.3.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 2 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.1.3.1.4.3-4: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.1.3.1.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 3 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

### 8.13.1.3.1.5 Test requirement

Table 8.13.1.3.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.1 for throughput test shall meet or exceed the specified value in Tables 8.13.1.3.1.5-2 and 8.13.1.3.1.5-3 for the specified SINR including test tolerances.

**Table 8.13.1.3.1.5-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model for CA**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | $\sigma$ | dB | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| Cell Id | | | 0 | 1 |
| PDSCH transmission mode | | | 6 | 4 |
| Interference model | | | N/A | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 |
| | Rank 2 | % | N/A | 20 |
| Precoding granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs | 4 for 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 4) | | ms | 8 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 1111 | N/A |
| Physical channel for CQI reporting | | | PUSCH (Note 7) | N/A |
| cqi-pmi-ConfigurationIndex | FDD PCC | | 2 | N/A |
| | FDD SCC | | 3 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}$´ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2 is the interfering cell.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Note 6: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

Note 7: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, SF#2, SF#6 and #7 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5 SF#6 SF#0 and SF#1.

**Table 8.13.1.3.1.5-2: Test requirement Single carrier performance for multiple CA configurations Enhanced Performance Requirement Type A**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| | | | | | | | | | | 2Rx CC | 4Rx CC |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5MHz | R.47-1 FDD | R.47-1 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.8+ TT | -3.0+TT |
| 10 MHz | R.47 FDD | R.47 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.0+ TT | -2.7+TT |
| 15MHz | R.47-2 FDD | R.47-2 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.8+ TT | -2.9+TT |
| 20MHz | R.47-3 FDD | R.47-3 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.1+ TT | -2.8+TT |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.1.3.1.5-3: Test requirement (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x10 MHz | As specified in Table 8.13.1.3.1.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 2x20 MHz | As specified in Table 8.13.1.3.1.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 2x5 MHz | As specified in Table 8.13.1.3.1.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 15MHz+5MHz | As specified in Table 8.13.1.3.1.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 10MHz+5MHz | As specified in Table 8.13.1.3.1.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.1.4 Enhanced Performance Requirement Type A - Single-layer Spatial Multiplexing (User-Specific Reference Symbols)

### 8.13.1.4.1 FDD PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 Interference Model - Enhanced Performance Requirement Type A (2DL CA)

#### 8.13.1.4.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SINR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4.

#### 8.13.1.4.1.2 Test applicability

This test applies to all types of E-UTRA FDD release11 and forward UE of categories 5 or higher that support 4 Rx antenna ports and enhanced receiver Type A and E-UTRA FDD 2DL CA. Applicability requires support for FGI bit 103.

#### 8.13.1.4.1.3 Minimum conformance requirements

The requirements are specified in Table 8.13.1.4.1.3-2, with the addition of the parameters in Table 8.13.1.4.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4. In 8.13.1.4.1.3-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

**Table 8.13.1.4.1.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model for CA**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 2 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cell Id | | | 0 | 126 |
| PDSCH transmission mode | | | 9 | 9 |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |
| Precoder update granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs | 4 for 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 5) | | Ms | 8 | N/A |
| Reporting interval | | Ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) used for the input signal under test | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note 8) | N/A |
| cqi-pmi-ConfigurationIndex | FDD PCC | | 4 | N/A |
| | FDD SCC | | 5 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subframe SF#n based on

| | |
|---|---|
| | PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). |
| Note 6: | These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. |
| Note 7: | All cells are time-synchronous. |
| Note 8: | To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3, SF#4, SF#8 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7,SF#8, SF#2 and #3. |
| Note 9: | ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs. |

**Table 8.13.1.4.1.3-2: Single carrier performance for multiple CA configurations Enhanced Performance Requirement Type A, CDM-multiplexed DM RS**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| | | | | | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.76-1 FDD | R.76-4 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.4 | -2.0 |
| 10 MHz | R.76 FDD | R.76-5 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.1 | -1.8 |
| 15MHz | R.76-2 FDD | R.76-6 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.2 | -1.9 |
| 20MHz | R.76-3 FDD | R.76-7 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.4 | -1.7 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.1.4.1.3-3: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x10 MHz | As specified in Table 8.13.1.4.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 2x20 MHz | As specified in Table 8.13.1.4.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 2x5 MHz | As specified in Table 8.13.1.4.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 15MHz+5MHz | As specified in Table 8.13.1.4.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 10MHz+5MHz | As specified in Table 8.13.1.4.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.1.4.1.

### 8.13.1.4.1.4 Test description

#### 8.13.1.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.94.
2. The parameter settings for the cell 1 are set up according to Table 8.13.1.4.1.5-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.4.1.4.3.

#### 8.13.1.4.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.1.4.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.13.1.4.1.5-2, 8.13.1.4.1.5-3. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2, #3, #7 and #8 (Table A.2.2.1.1-1).
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.13.1.4.1.5-1 as appropriate.
   BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/PDSCH for the test UE are sent on antenna port 7 (or 8) using two Tx antennas with beam-forming model as specified in Annex B.4.3 and precoder update granularity specified in Table 8.13.1.4.1.5-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.3.
6. Set the interfering cells (cell 2 for PCC and SCC) –aggressor cell– as defined in Tables 8.13.1.4.1.5-1, 8.13.1.4.1.5-2 and according to Annex B.5.4.
7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5A.5 and G.3.6A.6 in Annex G clause G.3.

#### 8.13.1.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 5.5 with the following exceptions:

**Table 8.13.1.4.1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.13.1.4.1.4.3-2: *AntennaInfoDedicated-r10-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 001111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.13.1.4.1.4.3-3: *CSI-RS-Config-r10-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; $T_{\text{CSI-RS}} = 5$; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.13.1.4.1.4.3-4: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-2AC CQI-ReportPeriodic-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 4 | FDD | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex | 483 | FDD | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |

**Table 8.13.1.4.1.4.3-5: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT using condition CQI_PERIODIC | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 8.13.1.4.1.4.3-6: CQI-ReportConfigSCell-r10-DEFAULT**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-2AB CQI-ReportConfigSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| cqi-ReportPeriodicSCell-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 5 | FDD | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex | 483 | FDD | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |

**Table 8.13.1.4.1.4.3-7: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.13.1.4.1.4.3-8: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 8.13.1.4.1.4.3-9: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| pmi-RI-Report-r10 | setup | | |
| } | | | |

### 8.13.1.4.1.5 Test requirement

Table 8.13.1.4.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.3.1 for throughput test shall meet or exceed the specified value in Tables 8.13.1.4.1.5-2 and 8.13.1.4.1.5-3 for the specified SINR including test tolerances.

**Table 8.13.1.4.1.5-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model for CA**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 2 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cell Id | | | 0 | 126 |
| PDSCH transmission mode | | | 9 | 9 |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |
| Precoder update granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs | 4 for 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 5) | | Ms | 8 | N/A |
| Reporting interval | | Ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) used for the input signal under test | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note 8) | N/A |
| cqi-pmi-ConfigurationIndex | FDD PCC | | 4 | N/A |
| | FDD SCC | | 5 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subframe SF#n based on

| | |
|---|---|
| | PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). |
| Note 6: | These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. |
| Note 7: | All cells are time-synchronous. |
| Note 8: | To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3, SF#4, SF#8 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7, SF#8, SF#2 and #3. |
| Note 9: | ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs. |

**Table 8.13.1.4.1.5-2: Test requirement single carrier performance for multiple CA configurations Enhanced Performance Requirement Type A, CDM-multiplexed DM RS**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | | | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| | | | | | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.76-1 FDD | R.76-4 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.4+TT | -2.0+TT |
| 10 MHz | R.76 FDD | R.76-5 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.1+TT | -1.8+TT |
| 15MHz | R.76-2 FDD | R.76-6 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.2+TT | -1.9+TT |
| 20MHz | R.76-3 FDD | R.76-7 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.4+TT | -1.7+TT |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.1.4.1.5-3: Test requirement (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x10 MHz | As specified in Table 8.13.1.4.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 2x20 MHz | As specified in Table 8.13.1.4.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 3 | 2x5 MHz | As specified in Table 8.13.1.4.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 4 | 15MHz+5MHz | As specified in Table 8.13.1.4.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 5 | 10MHz+5MHz | As specified in Table 8.13.1.4.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.2 TDD (CA and DC)

### 8.13.2.1 Closed Loop Multi Layer Spatial Multiplexing

#### 8.13.2.1.1 Closed Loop Multi Layer Spatial Multiplexing 4x4 for CA

##### 8.13.2.1.1.1 Minimum Requirement

For CA with 2 DL CCs, the requirements are specified in Table 8.13.2.1.1.1-2A, based on single carrier requirement specified in Table 8.13.2.1.1.1-2, with the addition of the parameters in Table 8.13.2.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 3 DL CCs, the requirements are specified in Table 8.13.2.1.1.1-3, based on single carrier requirement specified in Table 8.13.2.1.1.1-2, with the addition of the parameters in Table 8.13.2.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 4 DL CCs, the requirements are specified in Table 8.13.2.1.1.1-4, based on single carrier requirement specified in Table 8.13.2.1.1.1-2, with the addition of the parameters in Table 8.13.2.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 5 DL CCs, the requirements are specified in Table 8.13.2.1.1.1-5, based on single carrier requirement specified in Table 8.13.2.1.1.1-2, with the addition of the parameters in Table 8.13.2.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.2.1.1.1-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 8 |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| ACK/NACK feedback mode | | | PUCCH format 1b with channel selection for Tests with 2CCs; PUCCH format 3 for Tests with more than 2 CCs |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000111111111111111111000000000000000 |
| CSI request field (Note 4) | | | '10' |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.
Note 4: Multiple CC-s under test are configured as the 1st set of serving cells by high layers.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.13.2.1.1.1-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 8.1 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 9.8 | 5.4 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.0 | 5.9 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.5 | 6.3 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.6 | 6.2 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.4 |

**Table 8.13.2.1.1.1-2A: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20MHz | As specified in Table 8.13.2.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+15MHz | As specified in Table 8.13.2.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

**Table 8.13.2.1.1.1-3: Minimum performance (FRC) based on single carrier performance for CA with 3 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.13.2.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.13.2.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

**Table 8.13.2.1.1.1-4: Minimum performance (FRC) based on single carrier performance for CA with 4 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.13.2.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 2 | 20MHz+20MHz+20MHz+15MHz | As specified in Table 8.13.2.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

**Table 8.13.2.1.1.1-5: Minimum performance (FRC) based on single carrier performance for CA with 5 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.13.2.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 2 | 15MHz+4x20MHz | As specified in Table 8.13.2.1.1.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6 | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.2.1.1.

### 8.13.2.1.1.2 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 for CA (2DL CA)

#### 8.13.2.1.1.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on four antenna ports using closed-loop spatial multiplexing.

#### 8.13.2.1.1.2.2 Test applicability

E-UTRA TDD release 10 and forward UE of category 5 or higher that supports inter-band OR intra-band contiguous DL CA and 4 Rx antenna ports.

This test also applies to E-UTRA TDD release 11 and forward UE of category 5 or higher that supports intra-band non-contiguous DL CA and 4 Rx antenna ports.

#### 8.13.2.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.2.1.1.1.

#### 8.13.2.1.1.2.4 Test description

##### 8.13.2.1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for the cell are set up according to Tables 8.2.2 -1, 8.13.2.1.1.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.2.1.1.2.4.3.

8.13.2.1.1.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *PDSCH-ConfigDedicated-DEFAULT* is defined in Table 8.13.2.1.1.2.4.3-1, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 8.13.2.1.1.2.4.3-2A , *PhysicalConfigDedicated-DEFAULT* is defined in Table 8.13.2.1.1.2.4.3-2, *CQI-ReportConfigSCell-DEFAULT* is defined in Table 8.13.2.1.1.2.4.3-4, *CQI-ReportAperiodic-r10-DEFAULT* is defined in Table 8.13.2.1.1.2.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 8.13.2.1.1.2.4.3-6.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.13.2.1.1.2.5-2. The SS sends downlink MAC padding bits on the DL RMC.

5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.13.2.1.1.2.5-1 as appropriate.

7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3A.5 and G.3A.6 in Annex G clause G.3.

8.13.2.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.13.2.1.1.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.2.1.1.2.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000111111111111111100000000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.2.1.1.2.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000000011111111111111111000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |

**Table 8.13.2.1.1.2.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.2.1.1.2.4.3-4: *CQI-ReportConfig-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.2.1.1.2.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.2.1.1.2.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.2.1.1.2.4.3-7: *PUSCH-ConfigDedicated-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.13.2.1.1.2.5 Test requirement

Table 8.13.2.1.1.1-1 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.2.1.1.2.5-1 or 8.13.2.1.1.2.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.2.1.1.2.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.9 | 9.0 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.3 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.9 | 6.8 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.4 | 7.2 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.5 | 7.1 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.6 | 7.3 |

**Table 8.13.2.1.1.2.5-2: Test requirements (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20MHz | As specified in Table 8.13.2.1.1.2.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+15MHz | As specified in Table 8.13.2.1.1.2.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.2.1.1.3 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 for CA (3DL CA)

#### 8.13.2.1.1.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on four antenna ports using closed-loop spatial multiplexing.

#### 8.13.2.1.1.3.2 Test applicability

This test case applies to all types of E-UTRA TDD release 10 and forward UE of category 5 or higher that support 3DL with CA configurations in Table 7.1-2a and 4 Rx antenna ports.

This test case also applies to all types of E-UTRA TDD release 11 and forward UE of category 5 or higher that support 3DL with CA configurations in Table 7.1-2a and 4 Rx antenna ports.

#### 8.13.2.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.2.1.1.1.

#### 8.13.2.1.1.3.4 Test description

##### 8.13.2.1.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for the cell are set up according to Table 8.2.2-1 and 8.13.2.1.1.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.2.1.1.3.4.3.

#### 8.13.2.1.1.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.2.1.1.3.4.3.
3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.
4. The SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.13.2.1.1.3.5-2. The SS sends downlink MAC padding bits on the DL RMC.
5. The SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Tables 8.13.2.1.1.3.5-1 as appropriate.
7. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.13.2.1.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 8.13.2.1.1.3.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.2.1.1.3.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000111111111111111100000000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.2.1.1.3.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000111111111111111100000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.2.1.1.3.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | RBC |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.2.1.1.3.4.3-4: *CQI-ReportConfig-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.2.1.1.3.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11100000 | P-Cell, S-Cells report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.2.1.1.3.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.2.1.1.3.4.3-7: *PUSCH-ConfigDedicated-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.13.2.1.1.3.5 Test requirement

Table 8.13.2.1.1.3.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.2.1.1.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.2.1.1.3.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.9 | 9.0 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.3 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.9 | 6.8 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.4 | 7.2 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.5 | 7.1 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.6 | 7.3 |

**Table 8.13.2.1.1.3.5-2: Test requirements (FRC) based on single carrier performance for CA with 3 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.13.2.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.13.2.1.1.3.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.2.1.1.4 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 for CA (4DL CA)

#### 8.13.2.1.1.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on four antenna ports using closed-loop spatial multiplexing.

#### 8.13.2.1.1.4.2 Test applicability

This test case applies to all types of E-UTRA TDD release 11 and forward UE of category 8 or higher that support 4DL with CA configurations in Table 7.1-2b and 4 Rx antenna ports.

#### 8.13.2.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.2.1.1.1.

#### 8.13.2.1.1.4.4 Test description

##### 8.13.2.1.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for the cell are set up according to Table 8.2.2-1 and 8.13.2.1.1.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.2.1.1.4.4.3.

#### 8.13.2.1.1.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.2.1.1.4.4.3.
3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.
4. The SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.13.2.1.1.4.5-2. The SS sends downlink MAC padding bits on the DL RMC.
5. The SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Table 8.13.2.1.1.4.5-1 as appropriate.
7. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

#### 8.13.2.1.1.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 8.13.2.1.1.4.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.2.1.1.4.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000111111111111111100000000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.2.1.1.4.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000111111111111111100000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.2.1.1.4.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | RBC |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.2.1.1.4.4.3-4: *CQI-ReportConfig-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.2.1.1.4.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11110000 | P-Cell, S-Cells report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.2.1.1.4.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.2.1.1.4.4.3-7: *PUSCH-ConfigDedicated-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.13.2.1.1.4.5 Test requirement

Table 8.13.2.1.1.4.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.2.1.1.4.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.2.1.1.4.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.9 | 9.0 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.3 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.9 | 6.8 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.4 | 7.2 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.5 | 7.1 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.6 | 7.3 |

**Table 8.13.2.1.1.4.5-2: Test requirements (FRC) based on single carrier performance for CA with 4 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.13.2.1.1.4.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 2 | 20MHz+20MHz+20MHz+15MHz | As specified in Table 8.13.2.1.1.4.5-1 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.2.1.1.5 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 for CA (5DL CA)

#### 8.13.2.1.1.5.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on four antenna ports using closed-loop spatial multiplexing.

#### 8.13.2.1.1.5.2 Test applicability

This test case applies to all types of E-UTRA TDD release 11 and forward UE of category 8, 11 or higher that support 5DL with CA configurations in Table 7.1-2c and 4 Rx antenna ports

This test case also applies to all types of E-UTRA TDD release 12 and forward UE of category 8, 11 or higher that support 5DL with CA configurations in Table 7.1-2c and 4 Rx antenna ports.

#### 8.13.2.1.1.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.2.1.1.1.

#### 8.13.2.1.1.5.4 Test description

##### 8.13.2.1.1.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for the cell are set up according to Table 8.2.2-1 and 8.13.2.1.1.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.2.1.1.5.4.3.

##### 8.13.2.1.1.5.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.2.1.1.5.4.3.
3. The SS activates SCCs by sending the MAC-CE according to TS 36.321 [13] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [4] clause 8.3.3.2.
4. The SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Table 8.13.2.1.1.5.5-2. The SS sends downlink MAC padding bits on the DL RMC.
5. The SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR on each of the component carriers according to Table 8.13.2.1.1.5.5-1 as appropriate.
7. Measure the average throughput per component carrier for duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on each of the component carriers.

##### 8.13.2.1.1.5.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

**Table 8.13.2.1.1.5.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.2.1.1.5.4.3-2: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 5.5.1.2, Table 5.5.1.2-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.2.1.1.5.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.2.1.1.5.4.3-3: *CQI-ReportConfig-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | RBC |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.2.1.1.5.4.3-4: *CQI-ReportConfig-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.2.1.1.5.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11111000 | P-Cell, S-Cells report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.2.1.1.5.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.2.1.1.5.4.3-7: *PUSCH-ConfigDedicated-DEFAULT:* Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.13.2.1.1.5.5 Test requirement

Table 8.13.2.1.1.1-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.2.1.1.5.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.2.1.1.5.5-1: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.9 | 9.0 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.3 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.9 | 6.8 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.4 | 7.2 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.5 | 7.1 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.6 | 7.3 |

**Table 8.13.2.1.1.5.5-2: Test requirements (FRC) based on single carrier performance for CA with 5 DL CCs**

| | | | |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.13.2.1.1.5.5-1 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 2 | 15MHz+4x20MHz | As specified in Table 8.13.2.1.1.5.5-1 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6 | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.2.1.3 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 with 256QAM (2DL CA)

### 8.13.2.1.3.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with frequency selective precoding with 256QAM under CA.

#### 8.13.2.1.3.2 Test applicability

This test applies to E-UTRA TDD release10 and forward UE of category ≥ 5 which supports inter-band OR intra-band contiguous DL CA and 4 Rx antenna ports and 256QAM in DL.

This test also applies to E-UTRA TDD release 11 and forward UE of category ≥ 5 that supports intra-band non-contiguous DL CA and 4 Rx antenna ports and 256QAM in DL.

#### 8.13.2.1.3.3 Minimum conformance requirements

For CA with 2 DL CCs, the requirements are specified in Table 8.13.2.1.3.3-3, based on single carrier requirement specified in Table 8.13.2.1.3.3-2, with the addition of the parameters in Table 8.13.2.1.3.3-1 and the downlink physical channel setup according to Annex C.3.2. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.2.1.3.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| ACK/NACK feedback mode | | | PUCCH format 1b with channel selection for Tests with 2CCs |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000111111111111111111000000000000000 |
| CSI request field (Note 4) | | | '10' |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.
Note 4: Multiple CC-s under test are configured as the 1st set of serving cells by high layers.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.13.2.1.3.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.72-1 TDD | R.72-1 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.4 | 18.0 |
| 10 MHz | R.72 TDD | R.72 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.4 | 17.5 |
| 15MHz | R.72-2 TDD | R.72-2 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.5 | 17.1 |
| 20MHz | R.72-3 TDD | R.72-3 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.6 | 17.2 |

**Table 8.13.2.1.3.3-3: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20MHz | As specified in Table 8.13.2.1.3-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+15MHz | As specified in Table 8.13.2.1.3-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.2.1.3.

### 8.13.2.1.3.4 Test description

#### 8.13.2.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for the cell are set up according to Table 8.13.2.1.3.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.2.1.3.4.3.

#### 8.13.2.1.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.2.1.3.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.13.2.1.3.3-2 and 8.13.2.1.3.3-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.2.1.3.5-1 as appropriate.

7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3A.5 and G.3A.6 in Annex G clause G.3.

#### 8.13.2.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and 5.5 with the following exceptions.

**Table 8.13.2.1.3.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.2.1.3.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000000011111111111111110000000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| cqi-ReportConfigPCell-v1250 | CQI-ReportConfig-v1250-DEFAULT | | DL 256QAM |
| } | | | |

**Table 8.13.2.1.3.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000000011111111111111110000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| cqi-ReportConfigSCell-v1250 | CQI-ReportConfig-v1250-DEFAULT | | DL 256QAM |
| } | | | |

**Table 8.13.2.1.3.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.2.1.3.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.2.1.3.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.2.1.3.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.2.1.3.4.3-7: *CQI-ReportConfig-v1250-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1250 ::= SEQUENCE { | | | |
| csi-SubframePatternConfig-r12 CHOICE { | | | |
| release | NULL | | |
| } | | | |
| cqiCQI-ReportBoth-v1250 | Not present | | |
| cqi-ReportAperiodic-v1250 | Not present | | |
| altCQI-Table-r12 | allSubframes | | DL 256QAM |
| } | | | |

**Table 8.13.2.1.3.4.3-8: *PUSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.13.2.1.3.5 Test requirement

Table 8.13.2.1.3.3-1 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Tables 8.13.2.1.3.5-1 and 8.13.2.1.3.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.2.1.3.5-1: Test requirement single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.72-1 TDD | R.72-1 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 23.3 | 18.9 |
| 10 MHz | R.72 TDD | R.72 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.3 | 18.4 |
| 15MHz | R.72-2 TDD | R.72-2 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.4 | 18.0 |
| 20MHz | R.72-3 TDD | R.72-3 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.5 | 18.1 |

**Table 8.13.2.1.3.5-2: Test requirement (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20MHz | As specified in Table 8.13.2.1.3.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+15MHz | As specified in Table 8.13.2.1.3.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.2.1.4 TDD PDSCH Closed Loop Four-Layer Spatial Multiplexing for CA (2DL CA)

### 8.13.2.1.4.1 Test purpose

To verify the UE's rank-four performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for four-layer transmission on 4Tx and 4Rx under CA.

#### 8.13.2.1.4.2 Test applicability

This test applies to all types of E-UTRA TDD release11 and forward UE of categories 5 or higher that support 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 4 and E-UTRA TDD 2DL CA.

#### 8.13.2.1.4.3 Minimum conformance requirements

For CA with 2 DL CCs, the requirements are specified in Table 8.13.2.1.4.3-3, based on single carrier requirement specified in Table 8.13.2.1.4.3-2, with the addition of the parameters in Table 8.13.2.1.4.3-1 and the downlink physical channel setup according to Annex C.3.2. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.2.1.4.3-1: Test Parameters for Four-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cell-specific reference signals | | | Antenna ports 0,1,2,3 |
| PDSCH transmission mode | | | 4 |
| PDSCH rank | | | 4 |
| Precoding granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs |
| PMI delay | | ms | 10 or 11 |
| Reporting interval | | ms | 1 or 4 |
| Reporting mode | | | PUSCH 3-1 |
| CodeBookSubsetRestriction bitmap | | | 0xFFFF000000000000 |
| ACK/NACK feedback mode | | | PUCCH format 1b with channel selection for Tests with 2CCs |
| CSI request field (Note 4) | | | '10' |
| PDSCH transmission mode | | | 4 |
| Uplink-Downlink Configuration | | | 1 |
| Special subframe configuration | | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.
Note 4: Multiple CC-s under test are configured as the 1st set of serving cells by high layers.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.13.2.1.4.3-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 5MHz | R.74-1 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 14.5 |
| 10MHz | R.74 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 14.4 |
| 15MHz | R.74-2 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 14.6 |
| 20MHz | R.74-3 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 14.8 |

**Table 8.13.2.1.4.3-3: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20MHz | As specified in Table 8.13.2.1.4-2 per CC | ≥5 |
| 2 | 20MHz+15MHz | As specified in Table 8.13.2.1.4-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.2.1.4.

### 8.13.2.1.4.4 Test description

#### 8.13.2.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for the cell are set up according to Table 8.13.2.1.4.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.1.3.4.3.

#### 8.13.2.1.4.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.1.2.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.13.2.1.4.3-2 and 8.13.2.1.4.3-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.2.1.4.5-1 as appropriate.

7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3A.5 and G.3A.6 in Annex G clause G.3.

#### 8.13.2.1.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 4.6 and 5.5 with the following exceptions.

**Table 8.13.2.1.4.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.2.1.4.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 0xFFFF000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.2.1.4.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 0xFFFF000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.2.1.4.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.2.1.4.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.2.1.4.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.2.1.4.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.2.1.4.4.3-7: *RRCConnectionReconfiguration***

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | Not present | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.2.1.4.4.3-8: *PUSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

8.13.2.1.4.5 Test requirement

Table 8.13.2.1.4.3-1 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Tables 8.13.2.1.4.5-1 and 8.13.2.1.4.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.2.1.4.5-1: Test requirement single carrier performance for multiple CA configurations**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 5MHz | R.74-1 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 15.4 |
| 10MHz | R.74 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 15.3 |
| 15MHz | R.74-2 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 15.5 |
| 20MHz | R.74-3 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 15.7 |

**Table 8.13.2.1.4.5-2: Test requirement (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20MHz | As specified in Table 8.13.2.1.4.5-1 per CC | ≥5 |
| 2 | 20MHz+15MHz | As specified in Table 8.13.2.1.4.5-1 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.2.2 Dual-Layer Spatial Multiplexing (User-Specific Reference Symbols)

### 8.13.2.2.1 Minimum Requirement

For CA with 2 DL CCs, for dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.13.2.2.1-2A, based on single carrier requirement specified in Table 8.13.2.2.1-2, with the addition of the parameters in Table 8.13.2.2.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 3 DL CCs, for dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.13.2.2.1-3, based on single carrier requirement specified in Table 8.13.2.2.1-2, with the addition of the parameters in Table 8.13.2.2.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 4 DL CCs, for dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.13.2.2.1-4, based on single carrier requirement specified in Table 8.13.2.2.1-2, with the addition of the parameters in Table 8.13.2.2.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 5 DL CCs, for dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.13.2.2.1-5, based on single carrier requirement specified in Table 8.13.2.2.1-2, with the addition of the parameters in Table 8.13.2.2.1-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.2.2.1-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Values |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | -3 |
| Cell-specific reference signals | | | Antenna ports 0 and 1 |
| Cell ID | | | 0 |
| CSI reference signals | | | Antenna ports 15,16 |
| Beamforming model | | | Annex B.4.2 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 4 |
| CSI reference signal configuration | | | 8 |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | 4 / 0010000000000000 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| $\hat{E}_s / N_{oc}$ | | | Reference Value in Table 8.13.2.2.1-2 |
| Symbols for unused PRBs | | | OCNG (Note 2) |
| Number of allocated resource blocks (Note 2) | | PRB | 50 |
| Simultaneous transmission | | | No |
| PDSCH transmission mode | | | 9 |
| Note 1: $P_B = 1$ | | | |
| Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. | | | |

**Table 8.13.2.2.1-2: Single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.51-2 TDD | R.51-2 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.0 | 9.0 |
| 10 MHz | R.51 TDD | R.51 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 13.9 | 9.1 |
| 15MHz | R.51-3 TDD | R.51-3 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 13.9 | 9.2 |
| 20MHz | R.51-4 TDD | R.51-4 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.1 | 9.3 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.<br>Note 3: SNR corresponds to $\hat{E}_s/N_{oc}$ of Cell 1. | | | | | | | | | |

**Table 8.13.2.2.1-2A: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+15MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

**Table 8.13.2.2.1-3: Minimum performance (FRC) based on single carrier performance for CA with 3 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

**Table 8.13.2.2.1-4: Minimum performance (FRC) based on single carrier performance for CA with 4 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 2 | 20MHz+20MHz+20MHz+15MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

**Table 8.13.2.1.1-5: Minimum performance (FRC) based on single carrier performance for CA with 5 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 2 | 15MHz+4x20MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6 | | | |

### 8.13.2.2.2 TDD Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols) (2DL CA)

#### 8.13.1.2.2.1 Test purpose

To verify the UE's rank-2 performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for dual-layer transmission on antenna ports 7 and 8 using DM-RS with full RB allocation with multiple CSI reference symbol configurations with non-zero and zero transmission power.

#### 8.13.2.2.2.2 Test applicability

This test applies to E-UTRA TDD release10 and forward UE of category ≥ 5 which supports inter-band OR intra-band contiguous DL CA and 4 Rx antenna ports.

This test also applies to E-UTRA TDD release 11 and forward UE of category ≥ 5 that supports intra-band non-contiguous DL CA and 4 Rx antenna ports.

#### 8.13.2.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.2.2.1.

#### 8.13.2.2.2.4 Test description

##### 8.13.2.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.94.
2. The parameter settings for the cell are set up according to Table 8.13.1.2.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.2.2.2.4.3.

#### 8.13.2.2.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.2.2.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.13.1.2.1-2 and 8.13.1.2.1-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.13.2.2.2.5-1 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna ports 7 and 8 using two Tx antennas with beam-forming model as specified in Annex B.4.2 and precoder update granularity specified in Table 8.3.1-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.2.
6. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.13.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.13.2.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.13.2.2.2.4.3-2: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.13.2.2.2.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | If the UE is configured with *transmissionMode* tm9, E-UTRAN only configures the field *codebookSubsetRestriction* if PMI/RI reporting is configured | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |

**Table 8.13.2.2.2.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 8 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 2 | Parameter: *ZeroPowerCSI-RS* | |
| zeroTxPowerSubframeConfig-r10 | 4 | Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |
| } | | | |
| } | | | |

8.13.2.2.2.5 Test requirement

Table 8.13.1.2.1-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.2.2.2.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.2.2.2.5-1: Test requirement single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.51-2 TDD | R.51-2 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.9 | 9.9 |
| 10 MHz | R.51 TDD | R.51 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.8 | 10.0 |
| 15MHz | R.51-3 TDD | R.51-3 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.8 | 10.1 |
| 20MHz | R.51-4 TDD | R.51-4 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 15.0 | 10.2 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1. | | | | | | | | | |

**Table 8.13.2.2.2.5-2: Test requirement (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+15MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.2.2.3 TDD Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols) (3DL CA)

#### 8.13.2.2.3.1 Test purpose

Same test purpose as 8.13.2.2.2.1

#### 8.13.2.2.3.2 Test applicability

This test case applies to all types of E-UTRA TDD release 10 and forward UE of category ≥ 5 that support 3DL with CA configurations in Table 7.1-2a and 4 Rx antenna ports

This test case also applies to all types of E-UTRA TDD release 11 and forward UE of category ≥ 5 that support 3DL with CA configurations in Table 7.1-2a and 4 Rx antenna ports.

#### 8.13.2.2.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.2.2.1.

#### 8.13.2.2.3.4 Test description

##### 8.13.2.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.94.
2. The parameter settings for the cell are set up according to Table 8.13.2.2.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.2.2.3.4.3.

#### 8.13.2.2.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.2.2.3.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.13.2.2.1-2 and 8.13.2.2.1-3 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.13.2.2.3.5-1 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/ PDSCH for the test UE are sent on antenna ports 7 and 8 using two Tx antennas with beam-forming model as specified in Annex B.4.2 and precoder update granularity specified in Table 8.3.1-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.2.
6. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.13.2.2.3.4.3 Message contents

Same message contents as 8.13.2.2.2.4.3

### 8.13.2.2.3.5 Test requirement

Table 8.13.2.2.1-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.2.2.3.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.2.2.3.5-1: Test requirement single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propagation condition | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.51-2 TDD | R.51-2 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.9 | 9.9 |
| 10 MHz | R.51 TDD | R.51 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.8 | 10.0 |
| 15MHz | R.51-3 TDD | R.51-3 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.8 | 10.1 |
| 20MHz | R.51-4 TDD | R.51-4 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 15.0 | 10.2 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.<br>Note 3: SNR corresponds to $\hat{E}_s/N_{oc}$ of Cell 1. | | | | | | | | | |

**Table 8.13.2.2.3.5-2: Test requirement (FRC) based on single carrier performance for CA with 3 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 3x20MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+20MHz+15MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.2.2.4 TDD Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols) (4DL CA)

#### 8.13.2.2.4.1 Test purpose

Same test purpose as 8.13.2.2.2.1

#### 8.13.2.2.4.2 Test applicability

This test case applies to all types of E-UTRA TDD release 11 and forward UE of category ≥ 5 that support 4DL with CA configurations in Table 7.1-2b and 4 Rx antenna ports.

#### 8.13.2.2.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.2.2.1.

#### 8.13.2.2.4.4 Test description

##### 8.13.2.2.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.94.
2. The parameter settings for the cell are set up according to Table 8.13.2.2.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.2.2.4.4.3.

#### 8.13.2.2.4.4.2 Test procedure

Same test procedure as in clause 8.13.2.2.3.4.2 with the following exceptions:

- Instead of Table 8.13.2.2.3.5-1 → use Table 8.13.2.2.4.5-1

#### 8.13.2.2.4.4.3 Message contents

Same message contents as 8.13.2.2.2.4.3

#### 8.13.2.2.4.5 Test requirement

Table 8.13.2.2.1-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.2.2.4.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.2.2.4.5-1: Test requirement single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.51-2 TDD | R.51-2 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.9 | 9.9 |
| 10 MHz | R.51 TDD | R.51 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.8 | 10.0 |
| 15MHz | R.51-3 TDD | R.51-3 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.8 | 10.1 |
| 20MHz | R.51-4 TDD | R.51-4 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 15.0 | 10.2 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.
Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.
Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1.

**Table 8.13.2.2.4.5-2: Test requirement (FRC) based on single carrier performance for CA with 4 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 4x20MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| 2 | 20MHz+20MHz+20MHz+15MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.2.2.5 TDD Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols) (5DL CA)

### 8.13.2.2.5.1 Test purpose

Same test purpose as 8.13.2.2.2.1

### 8.13.2.2.5.2 Test applicability

This test case applies to all types of E-UTRA TDD release 11 and forward UE of category 8, 11 or higher that support 5DL with CA configurations in Table 7.1-2c and 4 Rx antenna ports.

This test case also applies to all types of E-UTRA TDD release 12 and forward UE of category 8, 11 or higher that support 5DL with CA configurations in Table 7.1-2c and 4 Rx antenna ports.

### 8.13.2.2.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.2.2.1.

### 8.13.2.2.5.4 Test description

#### 8.13.2.2.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.94.
2. The parameter settings for the cell are set up according to Table 8.13.2.2.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.2.2.5.4.3.

### 8.13.2.2.5.4.2 Test procedure

Same test procedure as in clause 8.13.2.2.3.4.2 with the following exceptions:

- Instead of Table 8.13.2.2.3.5-1 → use Table 8.13.2.2.5.5-1

### 8.13.2.2.5.4.3 Message contents

Same message contents as 8.13.2.2.2.4.3

### 8.13.2.2.5.5 Test requirement

Table 8.13.2.2.1-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Table 8.13.2.2.5.5-1 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.2.2.5.5-1: Test requirement single carrier performance for multiple CA configurations**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.51-2 TDD | R.51-2 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.9 | 9.9 |
| 10 MHz | R.51 TDD | R.51 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.8 | 10.0 |
| 15MHz | R.51-3 TDD | R.51-3 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 14.8 | 10.1 |
| 20MHz | R.51-4 TDD | R.51-4 TDD | OP.1 TDD | ETU5 | 2x2 Low | 2x4 Low | 70 | 15.0 | 10.2 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.<br>Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.<br>Note 3: SNR corresponds to $\hat{E}_s / N_{oc}$ of Cell 1. | | | | | | | | | |

**Table 8.13.2.2.5.5-2: Test requirement (FRC) based on single carrier performance for CA with 5 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 5x20MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| 2 | 15MHz+4x20MHz | As specified in Table 8.13.2.2.1-2 per CC depending on either 2Rx CC or 4Rx CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6 | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.2.3 Enhanced Performance Requirements Type A Closed-loop spatial multiplexing

### 8.13.2.3.1 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model – Enhanced Performance Requirement Type A (2DL CA)

#### 8.13.2.3.1.1 Test purpose

To verify the closed loop rank-one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 4 interference model.

#### 8.13.2.3.1.2 Test applicability

This test applies to all types of E-UTRA TDD release11 and forward UE of categories 5 or higher that support 4 Rx antenna ports and enhanced receiver Type A and E-UTRA TDD 2DL CA.

#### 8.13.2.3.1.3 Minimum conformance requirements

The purpose of these tests is to verify the closed loop rank-one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 4 interference model defined in clause B.5.3. In Table 8.13.2.3.1.3-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

For CA with 2 DL CCs, the requirements are specified in Table 8.13.2.3.1.3-3, based on single carrier requirement specified in Table 8.13.2.3.1.3-2, with the addition of the parameters in Table 8.13.2.3.1.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.13.2.3.1.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model for CA**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cell Id | | | 0 | 1 |
| PDSCH transmission mode | | | 6 | N/A |
| Interference model | | | N/A | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 |
| | Rank 2 | % | N/A | 20 |

| | | | | |
|---|---|---|---|---|
| Precoding granularity | | PRB | 50 | 6 |
| PMI delay (Note 4) | | ms | 10 or 11 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 1111 | N/A |
| Physical channel for CQI reporting | | | PUSCH (Note 7) | N/A |
| cqi-pmi-ConfigurationIndex | TDD PCC | | 3 | N/A |
| | TDD SCC | | 4 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Note 6: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

Note 7: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, SF#4, SF#6 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 SF#8 SF#2 and SF#3.

**Table 8.13.2.3.1.3-2: Single carrier performance for multiple CA configurations Enhanced Performance Requirement Type A**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) 2Rx CC | SINR (dB) (Note 2) 4Rx CC |
| 5MHz | R.47-1 TDD | R.47-1 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.8 | -2.8 |
| 10 MHz | R.47 TDD | R.47 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.3 | -2.5 |
| 15MHz | R.47-2 TDD | R.47-2 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.0 | -2.7 |
| 20MHz | R.47-3 TDD | R.47-3 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.3 | -2.3 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

**Table 8.13.2.3.1.3-3: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20MHz | As specified in Table 8.13.2.3.1.3-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+15MHz | As specified in Table 8.13.2.3.1.3-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6.

The normative reference for this requirement is TS 36.101 [2] clause 8.13.2.3.

#### 8.13.2.3.1.4 Test description

##### 8.13.2.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.94.
2. The parameter settings for cell 1 are set up according to Tables 8.13.2.3.1.5-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.2.3.1.4.3.

##### 8.13.2.3.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.2.3.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to Tables 8.13.2.3.1.5-1 and 8.13.2.3.1.5-2 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2, #3, #7 and #8 (Table A.2.3.1.2-1).
5. SS sets up parameters for interfering cells (cell 2 for PCC and SCC) according to table 8.13.2.3.1.5-1 as appropriate.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SINR according to Tables 8.13.2.3.1.5-2 and 8.13.2.3.1.5-3 as appropriate.
7. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.10.1.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.13.2.3.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.2.3.1.4.3-2: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm6 | | |
| codebookSubsetRestriction-r10 | 1111 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.2.3.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | (see Table7.2.2-1C in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.2.3.1.4.3-4: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.2.3.1.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 4 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

8.13.2.3.1.5 Test requirement

Table 8.13.2.3.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2.1 for throughput test shall meet or exceed the specified value in Tables 8.13.2.3.1.5-2 and 8.13.2.3.1.5-3 for the specified SINR including test tolerances.

**Table 8.13.2.3.1.5-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model for CA**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cell Id | | | 0 | 1 |
| PDSCH transmission mode | | | 6 | N/A |
| Interference model | | | N/A | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 |
| | Rank 2 | % | N/A | 20 |
| Precoding granularity | | PRB | 50 | 6 |
| PMI delay (Note 4) | | ms | 10 or 11 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 1111 | N/A |
| Physical channel for CQI reporting | | | PUSCH (Note 7) | N/A |
| cqi-pmi-ConfigurationIndex | TDD PCC | | 3 | N/A |
| | TDD SCC | | 4 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}$´ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Note 6: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

Note 7: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, SF#4, SF#6 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 SF#8 SF#2 and SF#3.

**Table 8.13.2.3.1.5-2: Single carrier performance for multiple CA configurations Enhanced Performance Requirement Type A**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| | | | | | | | | | | 2Rx CC | 4Rx CC |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5MHz | R.47-1 TDD | R.47-1 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.8+TT | 2.8+TT |
| 10 MHz | R.47 TDD | R.47 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.3+TT | 2.5+TT |
| 15MHz | R.47-2 TDD | R.47-2 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.0+TT | 2.7+TT |
| 20MHz | R.47-3 TDD | R.47-3 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.3+TT | 2.3+TT |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.2.3.1.5-3: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20MHz | As specified in Table 8.13.2.3.1.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+15MHz | As specified in Table 8.13.2.3.1.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.2.4 Enhanced Performance Requirement Type A - Single-layer Spatial Multiplexing (User-Specific Reference Symbols)

### 8.13.2.4.1 TDD PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 Interference Model - Enhanced Performance Requirement Type A (2DL CA)

#### 8.13.2.4.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4.

#### 8.13.2.4.1.2 Test applicability

This test applies to all types of E-UTRA TDD release11 and forward UE of categories 5 or higher that support 4 Rx antenna ports and enhanced receiver Type A and E-UTRA TDD 2DL CA. Applicability requires support for FGI bit 103.

#### 8.13.2.4.1.3 Minimum conformance requirements

The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4. In 8.13.2.4.1.3-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

For CA with 2 DL CCs, the requirements are specified in Table 8.13.2.4.1.3-3, based on single carrier requirement specified in Table 8.13.2.4.1.3-2, with the addition of the parameters in Table 8.13.2.4.1.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.13.2.4.1.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model for CA**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | Subframes | 5 / 4 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cell Id | | | 0 | 126 |
| PDSCH transmission mode | | | 9 | 9 |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |

| | | | | |
|---|---|---|---|---|
| Precoder update granularity | | PRB | 50 | 6 |
| PMI delay (Note 5) | | ms | 10 or 11 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note 8) | N/A |
| cqi-pmi-ConfigurationIndex | TDD PCC | | 3 | N/A |
| | TDD SCC | | 4 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 6: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 7: All cells are time-synchronous.

Note 8: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, SF#4, SF#6 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7, SF#8, SF#2 and #3.

Note 9: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

**Table 8.13.2.4.1.3-2: Single carrier performance for multiple CA configurations Enhanced Performance Requirement Type A, CDM-multiplexed DM RS**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) 2Rx CC | SINR (dB) (Note 2) 4Rx CC |
| 5MHz | R.76-1 TDD | R.76-4 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.6 | -2.4 |
| 10 MHz | R.76 TDD | R.76-5 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.1 | -2.1 |
| 15MHz | R.76-2 TDD | R.76-6 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.2 | -2.1 |
| 20MHz | R.76-3 TDD | R.76-7 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.4 | -2.1 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

**Table 8.13.2.4.1.3-3: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20MHz | As specified in Table 8.13.2.4.1.3-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+15MHz | As specified in Table 8.13.2.4.1.3-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.2.4.

### 8.13.2.4.1.4 Test description

#### 8.13.2.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.94.
2. The parameter settings for the cell are set up according to Table 8.13.2.4.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.2.4.1.4.3.

#### 8.13.2.4.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.2.4.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.13.2.4.1.3-1, 8.13.2.4.1.3-2 and 8.13.2.4.1.3-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe#2, #3, #7 and #8 (Table A.2.2.1.2-1).
5. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.2.4.1.5-2 and 8.13.2.4.1.5-3 as appropriate. BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/PDSCH for

the test UE are sent on antenna port 7 (or 8) using two Tx antennas with beam-forming model as specified in Annex B.4.3 and precoder update granularity specified in Table 8.13.2.4.1.5-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.3.

6. Set the interfering cells (cell 2 for PCC and SCC) –aggressor cell– as defined in Tables 8.13.2.4.1.5-1, 8.13.2.4.1.5-2 and according to Annex B.5.4.

7. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.13.2.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.13.2.4.1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.13.2.4.1.4.3-2: *AntennaInfoDedicated-r10-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 001111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.13.2.4.1.4.3-3: *CSI-RS-Config-r10-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; $T_{\text{CSI-RS}} = 5$; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.13.2.4.1.4.3-4: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-2AC CQI-ReportPeriodic-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 3 | TDD | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex | 483 | TDD | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |

**Table 8.13.2.4.1.4.3-5: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.6 Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT using condition CQI_PERIODIC | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 8.13.2.4.1.4.3-6: CQI-ReportConfigSCell-r10-DEFAULT**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-2AB CQI-ReportConfigSCell-r10-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| cqi-ReportPeriodicSCell-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 4 | TDD | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex | 483 | TDD | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |

**Table 8.13.2.4.1.4.3-7: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.13.2.4.1.4.3-8: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 8.13.2.4.1.4.3-9: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| pmi-RI-Report-r10 | setup | | |
| } | | | |

### 8.13.2.4.1.5 Test requirement

Table 8.13.2.4.1.5-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3.3 for throughput test shall meet or exceed the specified value in Tables 8.13.2.4.1.5-2 and 8.13.2.4.1.5-3 for the specified SINR including test tolerances.

**Table 8.13.2.4.1.5-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model for CA**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | Subframes | 5 / 4 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| $BW_{Channel}$ | | MHz | 10 | 10 |
| Cell Id | | | 0 | 126 |
| PDSCH transmission mode | | | 9 | 9 |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |

| | | | | |
|---|---|---|---|---|
| Precoder update granularity | | PRB | 50 | 6 |
| PMI delay (Note 5) | | ms | 10 or 11 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note 8) | N/A |
| cqi-pmi-ConfigurationIndex | TDD PCC | | 3 | N/A |
| | TDD SCC | | 4 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 6: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 7: All cells are time-synchronous.

Note 8: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, SF#4, SF#6 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7, SF#8, SF#2 and #3.

Note 9: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

**Table 8.13.2.4.1.5-2: Single carrier performance for multiple CA configurations Enhanced Performance Requirement Type A, CDM-multiplexed DM RS**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| | | | | | | | | | | 2Rx CC | 4Rx CC |
| 5MHz | R.76-1 TDD | R.76-4 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.6+TT | 2.4+TT |
| 10 MHz | R.76 TDD | R.76-5 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.1+TT | 2.1+TT |
| 15MHz | R.76-2 TDD | R.76-6 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.2+TT | 2.1+TT |
| 20MHz | R.76-3 TDD | R.76-7 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.4+TT | 2.1+TT |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

**Table 8.13.2.4.1.5-3: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test num. | CA Band-width combination | Requirement | UE category |
|---|---|---|---|
| 1 | 2x20MHz | As specified in Table 8.13.2.4.1.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| 2 | 20MHz+15MHz | As specified in Table 8.13.2.4.1.5-2 per CC depending on either 2Rx CC or 4Rx CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.3 TDD-FDD (CA and DC)

### 8.13.3.1 Closed Loop Multi Layer Spatial Multiplexing

#### 8.13.3.1.1 Closed Loop Multi Layer Spatial Multiplexing 4x4 for FDD PCell

##### 8.13.3.1.1.1 Minimum Requirement

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.1.1.1-4 based on single carrier requirement specified in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3, with the addition of the parameters in Table 8.13.3.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For TDD FDD CA with FDD PCell and 3DL CCs, the requirements are specified in Table 8.13.3.1.1.1-5 based on single carrier requirement specified in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3, with the addition of the parameters in Table 8.13.3.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For TDD FDD CA with FDD PCell and 4DL CCs, the requirements are specified in Table 8.13.3.1.1.1-6 based on single carrier requirement specified in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3, with the addition of the parameters in Table 8.13.3.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For TDD FDD CA with FDD PCell and 5DL CCs, the requirements are specified in Table 8.13.3.1.1.1-7 based on single carrier requirement specified in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3, with the addition of the parameters in Table 8.13.3.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.3.1.1.1-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | Wideband precoding for 1.4MHz, 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | FDD CC | ms | 8 |
| | TDD CC | ms | 10 or 11 |
| Reporting interval | FDD CC | ms | 1 |
| | TDD CC | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000111111111111111111000000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers.
Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 3.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.13.3.1.1.1-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 7.5 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 9.5 | 5.1 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 9.5 | 5.2 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.1 | 5.7 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.1 | 5.6 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.3 | 5.6 |

**Table 8.13.3.1.1.1-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 8.1 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 9.8 | 5.4 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.0 | 5.9 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.5 | 6.3 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.6 | 6.2 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.4 |

**Table 8.13.3.1.1.1-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

**Table 8.13.3.1.1.1-5: Minimum performance for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥5 |
| 4 | 3x20 | 2x20 | 20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥5 |
| 5 | 20+20+15 | 20+15 | 20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥5 |
| 6 | 20+20+10 | 20+10 | 20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥5 |
| 7 | 20+10+10 | 2x10 | 20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥5 |
| 8 | 10+15+20 | 10 | 15+20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥5 |
| 9 | 10+15+20 | 10+15 | 20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

**Table 8.13.3.1.1.1-6: Minimum performance for multiple CA configurations with 4DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.13.3.1.1.1-2 and Table 8.13.3.1.1.1-3 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | ≥8 |
| 4 | 2×15+2x20 | 2×15 | 2x20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | ≥8 |
| 5 | 3x20+15 | 2×20+15 | 20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | ≥8 |
| 6 | 2×15+2x20 | 2x15+20 | 20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | ≥8 |
| 8 | 4x20 | 3x20 | 20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | ≥8 |
| 9 | 10+3x20 | 10 | 3x20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | ≥8 |
| 10 | 2x10+2x20 | 2x10 | 2x20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | ≥8 |
| 11 | 2x10+20+15 | 2x10 | 20+15 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | ≥8 |
| 12 | 10+3x20 | 10+20 | 2x20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | ≥8 |
| 13 | 10+15+2x20 | 10+15 | 2x20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | ≥8 |
| 14 | 10+15+2x20 | 10+15+20 | 20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

**Table 8.13.3.1.1.2-7: Minimum performance for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | 8, ≥11 |
| 3 | 4x20+20 | 4x20 | 20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | 8, ≥11 |
| 4 | 3x20+2x20 | 3x20 | 2x20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | 8, ≥11 |
| 5 | 2x20+3x20 | 2x20 | 3X20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | 8, ≥11 |
| 6 | 20+4x20 | 20 | 4x20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | 8, ≥11 |
| 7 | 10+4x20 | 10 | 4x20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | 8, ≥11 |
| 8 | 10+20+3x20 | 10+20 | 3x20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | 8, ≥11 |
| 9 | 2x10+3x20 | 2x10 | 3x20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | 8, ≥11 |
| 10 | 10+2×20+2×20 | 10+2x20 | 2x20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | 8, ≥11 |
| 11 | 10+15+20+2x20 | 10+15+20 | 2x20 | As defined in Table 8.13.3.1.1.2-2 and Table 8.13.3.1.1.2-3 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

### 8.13.3.1.1.2 TDD-FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 for FDD PCell (2DL CA)

#### 8.13.3.1.1.2.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

#### 8.13.3.1.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support E-UTRA FDD and TDD and 2DL CA with FDD as PCell and 4 Rx antenna ports.

#### 8.13.3.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.3.1.1.1.

#### 8.13.3.1.1.2.4 Test description

##### 8.13.3.1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.13.3.1.1.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.1.1.2.4.3.

#### 8.13.3.1.1.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.3.1.1.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).
4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.13.3.1.1.1-1 and 8.13.3.1.1.1-2 or 8.13.3.1.1.1-3. The SS sends downlink MAC padding bits on the DL RMC.
5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.3.1.1.2.5-1 or 8.13.3.1.1.2.5-2 as appropriate.
7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.13.3.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.13.3.1.1.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.3.1.1.2.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000011111111111111110000000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.3.1.1.2.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000011111111111111110000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.3.1.1.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.3.1.1.2.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.3.1.1.2.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.3.1.1.2.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.3.1.1.2.4.3-7: *PUSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.13.3.1.1.2.5 Test requirement

Table 8.13.3.1.1.1-1 define the primary level settings.

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.1.1.2.5-3 based on single carrier requirement specified in Table 8.13.3.1.1.2.5-1 and Table 8.13.3.1.1.2.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.1.1.2.5-1 or 8.13.3.1.1.2.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.1.1.2.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.3 | 8.4 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.0 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.1 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.6 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.5 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.2 | 6.5 |

**Table 8.13.3.1.1.2.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.9 | 9.0 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.3 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.9 | 6.8 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.4 | 7.4 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.5 | 7.1 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.6 | 7.3 |

**Table 8.13.3.1.1.2.5-3: Test requirement for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.1.1.2.5-1 and Table 8.13.3.1.1.2.5-2 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.1.1.2.5-1 and Table 8.13.3.1.1.2.5-2 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.1.1.2.5-1 and Table 8.13.3.1.1.2.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

#### 8.13.3.1.1.3 TDD-FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 for FDD PCell (3DL CA)

##### 8.13.3.1.1.3.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

##### 8.13.3.1.1.3.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support E-UTRA FDD and TDD and 3DL CA with FDD as PCell and 4 Rx antenna ports.

##### 8.13.3.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.3.1.1.1.

##### 8.13.3.1.1.3.4 Test description

###### 8.13.3.1.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.13.3.1.1.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.1.1.3.4.3.

###### 8.13.3.1.1.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.3.1.1.3.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).
4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.13.3.1.1.1-1 and 8.13.3.1.1.1-2 or 8.13.3.1.1.1-3. The SS sends downlink MAC padding bits on the DL RMC.

5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.3.1.1.3.5-1 or 8.13.3.1.1.3.5-2 as appropriate.

7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

#### 8.13.3.1.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.13.3.1.1.3.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.3.1.1.3.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.3.1.1.3.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000000011111111111111111000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.3.1.1.3.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.3.1.1.3.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.3.1.1.3.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11100000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.3.1.1.3.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.3.1.1.3.4.3-7: *PUSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.13.3.1.1.3.5 Test requirement

Table 8.13.3.1.1.1-1 define the primary level settings.

For TDD FDD CA with FDD PCell and 3DL CCs, the requirements are specified in Table 8.13.3.1.1.3.5-3 based on single carrier requirement specified in Table 8.13.3.1.1.3.5-1 and Table 8.13.3.1.1.3.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.1.1.3.5-1 or 8.13.3.1.1.3.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.1.1.3.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| **Band-width** | **Reference channel** | | **OCNG pattern** | **Propa-gation condi-tion** | **Correlation matrix and antenna config.** | | **Reference value** | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **Fraction of maximum throughput (%)** | **SNR (dB)** | |
| | **2Rx CC** | **4Rx CC** | | | **2Rx CC** | **4Rx CC** | | **2Rx CC** | **4Rx CC** |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.3 | 8.4 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.0 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.1 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.6 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.5 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.2 | 6.5 |

**Table 8.13.3.1.1.3.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.9 | 9.0 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.3 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.9 | 6.8 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.4 | 7.4 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.5 | 7.1 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.6 | 7.3 |

**Table 8.13.3.1.1.3.5-3: Test requirement for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.13.3.1.1.3.5-1 and Table 8.13.3.1.1.3.5-2 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.13.3.1.1.3.5-1 and Table 8.13.3.1.1.3.5-2 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.13.3.1.1.3.5-1 and Table 8.13.3.1.1.3.5-2 per CC | ≥5 |
| 4 | 3x20 | 2x20 | 20 | As defined in Table 8.13.3.1.1.3.5-1 and Table 8.13.3.1.1.3.5-2 per CC | ≥5 |
| 5 | 20+20+15 | 20+15 | 20 | As defined in Table 8.13.3.1.1.3.5-1 and Table 8.13.3.1.1.3.5-2 per CC | ≥5 |
| 6 | 20+20+10 | 20+10 | 20 | As defined in Table 8.13.3.1.1.3.5-1 and Table 8.13.3.1.1.3.5-2 per CC | ≥5 |
| 7 | 20+10+10 | 2x10 | 20 | As defined in Table 8.13.3.1.1.3.5-1 and Table 8.13.3.1.1.3.5-2 per CC | ≥5 |
| 8 | 10+15+20 | 10 | 15+20 | As defined in Table 8.13.3.1.1.3.5-1 and Table 8.13.3.1.1.3.5-2 per CC | ≥5 |
| 9 | 10+15+20 | 10+15 | 20 | As defined in Table 8.13.3.1.1.3.5-1 and Table 8.13.3.1.1.3.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.3.1.1.4 TDD-FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 for FDD PCell (4DL CA)

#### 8.13.3.1.1.4.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

#### 8.13.3.1.1.4.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8 or higher that support E-UTRA FDD and TDD and 4DL CA with FDD as PCell and 4 Rx antenna ports.

#### 8.13.3.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.3.1.1.1.

#### 8.13.3.1.1.4.4 Test description

##### 8.13.3.1.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.13.3.1.1.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.1.1.4.4.3.

##### 8.13.3.1.1.4.4.2 Test procedure

Same test procedure as in clause 8.13.3.1.1.3.4.2 with the following exceptions:

- Instead of Table 8.13.3.1.1.3.5-1 → use Table 8.13.3.1.1.4.5-1

##### 8.13.3.1.1.4.4.3 Message contents

Same message contents as in clause 8.13.3.1.1.2.4.3 with the following exceptions:

**Table 8.13.3.1.1.4.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11110000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

8.13.3.1.1.4.5 Test requirement

Table 8.13.3.1.1.1-1 define the primary level settings.

For TDD FDD CA with FDD PCell and 4DL CCs, the requirements are specified in Table 8.13.3.1.1.4.5-3 based on single carrier requirement specified in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.1.1.4.5-1 or 8.13.3.1.1.4.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.1.1.4.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.3 | 8.4 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.0 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.1 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.6 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.5 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.2 | 6.5 |

**Table 8.13.3.1.1.4.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.9 | 9.0 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.3 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.9 | 6.8 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.4 | 7.4 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.5 | 7.1 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.6 | 7.3 |

**Table 8.13.3.1.1.4.5-3: Test requirement for multiple CA configurations with 4DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| 4 | 2×15+2x20 | 2×15 | 2x20 | As defined in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| 5 | 3x20+15 | 2×20+15 | 20 | As defined in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| 6 | 2×15+2x20 | 2x15+20 | 20 | As defined in Table 8.13.3.1.1.4.5.1-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| 8 | 4x20 | 3x20 | 20 | As defined in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| 9 | 10+3x20 | 10 | 3x20 | As defined in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| 10 | 2x10+2x20 | 2x10 | 2x20 | As defined in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| 11 | 2x10+20+15 | 2x10 | 20+15 | As defined in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| 12 | 10+3x20 | 10+20 | 2x20 | As defined in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| 13 | 10+15+2x20 | 10+15 | 2x20 | As defined in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| 14 | 10+15+2x20 | 10+15+20 | 20 | As defined in Table 8.13.3.1.1.4.5-1 and Table 8.13.3.1.1.4.5-2 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.3.1.1.5 TDD-FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 for FDD PCell (5DL CA)

#### 8.13.3.1.1.5.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

#### 8.13.3.1.1.5.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8, 11 or higher that support E-UTRA FDD and TDD and 5DL CA with FDD as PCell and 4 Rx antenna ports.

#### 8.13.3.1.1.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.3.1.1.1.

#### 8.13.3.1.1.5.4 Test description

##### 8.13.3.1.1.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.13.3.1.1.1-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.1.1.5.4.3.

#### 8.13.3.1.1.5.4.2 Test procedure

Same test procedure as in clause 8.13.3.1.1.3.4.2 with the following exceptions:

- Instead of Table 8.13.3.1.1.3.5-1 → use Table 8.13.3.1.1.5.5-1

#### 8.13.3.1.1.5.4.3 Message contents

Same message contents as in clause 8.13.3.1.1.2.4.3 with the following exceptions:

**Table 8.13.3.1.1.5.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11111000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

#### 8.13.3.1.1.5.5 Test requirement

Table 8.13.3.1.1.1-1 define the primary level settings.

For TDD FDD CA with FDD PCell and 5DL CCs, the requirements are specified in Table 8.13.3.1.1.5.5-3 based on single carrier requirement specified in Table 8.13.3.1.1.5.5-1 and Table 8.13.3.1.1.5.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.1.1.5.5-1 or 8.13.3.1.1.5.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.1.1.5.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.3 | 8.4 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.0 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.1 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.6 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.5 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.2 | 6.5 |

**Table 8.13.3.1.1.5.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.9 | 9.0 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.3 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.9 | 6.8 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.4 | 7.4 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.5 | 7.1 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.6 | 7.3 |

**Table 8.13.3.1.1.5.5-3: Test requirement for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.13.3.1.1.5.5-1 and Table 8.13.3.1.1.5.5-2 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.13.3.1.1.5.5-1 and Table 8.13.3.1.1.5.5-2 per CC | 8, ≥11 |
| 3 | 4x20+20 | 4x20 | 20 | As defined in Table 8.13.3.1.1.5.5-1 and Table 8.13.3.1.1.5.5-2 per CC | 8, ≥11 |
| 4 | 3x20+2x20 | 3x20 | 2x20 | As defined in Table 8.13.3.1.1.5.5-1 and Table 8.13.3.1.1.5.5-2 per CC | 8, ≥11 |
| 5 | 2x20+3x20 | 2x20 | 3X20 | As defined in Table 8.13.3.1.1.5.5-1 and Table 8.13.3.1.1.5.5-2 per CC | 8, ≥11 |
| 6 | 20+4x20 | 20 | 4x20 | As defined in Table 8.13.3.1.1.5.5-1 and Table 8.13.3.1.1.5.5-2 per CC | 8, ≥11 |
| 7 | 10+4x20 | 10 | 4x20 | As defined in Table 8.13.3.1.1.5.5-1 and Table 8.13.3.1.1.5.5-2 per CC | 8, ≥11 |
| 8 | 10+20+3x20 | 10+20 | 3x20 | As defined in Table 8.13.3.1.1.5.5-1 and Table 8.13.3.1.1.5.5-2 per CC | 8, ≥11 |
| 9 | 2x10+3x20 | 2x10 | 3x20 | As defined in Table 8.13.3.1.1.5.5-1 and Table 8.13.3.1.1.5.5-2 per CC | 8, ≥11 |
| 10 | 10+2×20+2×20 | 10+2x20 | 2x20 | As defined in Table 8.13.3.1.1.5.5-1 and Table 8.13.3.1.1.5.5-2 per CC | 8, ≥11 |
| 11 | 10+15+20+2x20 | 10+15+20 | 2x20 | As defined in Table 8.13.3.1.1.5.5-1 and Table 8.13.3.1.1.5.5-2 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.3.1.2 Closed Loop Multi Layer Spatial Multiplexing 4x4 for TDD PCell

### 8.13.3.1.2.1 Minimum Requirement

For TDD FDD CA with TDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.1.2.1-4 based on single carrier requirement specified in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3, with the addition of the parameters in Table 8.13.3.1.2.1-1 and the downlink physical channel setup according to Annex C.3.2.

For TDD FDD CA with TDD PCell and 3DL CCs, the requirements are specified in Table 8.13.3.1.2.1-5 based on single carrier requirement specified in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3, with the addition of the parameters in Table 8.13.3.1.2.1-1 and the downlink physical channel setup according to Annex C.3.2.

For TDD FDD CA with TDD PCell and 4DL CCs, the requirements are specified in Table 8.13.3.1.2.1-6 based on single carrier requirement specified in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3, with the addition of the parameters in Table 8.13.3.1.2.1-1 and the downlink physical channel setup according to Annex C.3.2.

For TDD FDD CA with TDD PCell and 5DL CCs, the requirements are specified in Table 8.13.3.1.2.1-7 based on single carrier requirement specified in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3, with the addition of the parameters in Table 8.13.3.1.2.1-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.3.1.2.1-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | Wideband pre-coding for 1.4MHz, 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | FDD CC | ms | 8 |
| | TDD CC | ms | 10 or 11 |
| Reporting interval | FDD CC | ms | 1 |
| | TDD CC | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000111111111111111111000000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | TM4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers.
Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 3.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.13.3.1.2.1-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 7.5 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 9.5 | 5.1 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 9.5 | 5.2 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.1 | 5.7 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.1 | 5.6 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.3 | 5.6 |

**Table 8.13.3.1.2.1-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 8.1 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 9.8 | 5.4 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.0 | 5.9 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.5 | 6.3 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.6 | 6.2 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.4 |

**Table 8.13.3.1.2.1-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.1.1-2 and Table 8.13.3.1.1-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

**Table 8.13.3.1.2.1-5: Minimum performance for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 4 | 3x20 | 2x20 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 5 | 20+20+15 | 20+15 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 6 | 20+20+10 | 20+10 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 7 | 20+10+10 | 2x10 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 8 | 10+15+20 | 10 | 15+20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 9 | 10+15+20 | 10+15 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

**Table 8.13.3.1.2.1-6: Minimum performance for multiple CA configurations with 4DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| 4 | 2×15+2x20 | 2×15 | 2x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| 5 | 3x20+15 | 2×20+15 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| 6 | 2×15+2x20 | 2x15+20 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| 8 | 4x20 | 3x20 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| 9 | 10+3x20 | 10 | 3x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| 10 | 2x10+2x20 | 2x10 | 2x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| 11 | 2x10+20+15 | 2x10 | 20+15 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| 12 | 10+3x20 | 10+20 | 2x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| 13 | 10+15+2x20 | 10+15 | 2x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| 14 | 10+15+2x20 | 10+15+20 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

**Table 8.13.3.1.2.1-7: Minimum performance for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | 8, ≥11 |
| 3 | 4x20+20 | 4x20 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | 8, ≥11 |
| 4 | 3x20+2x20 | 3x20 | 2x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | 8, ≥11 |
| 5 | 2x20+3x20 | 2x20 | 3X20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | 8, ≥11 |
| 6 | 20+4x20 | 20 | 4x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | 8, ≥11 |
| 7 | 10+4x20 | 10 | 4x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | 8, ≥11 |
| 8 | 10+20+3x20 | 10+20 | 3x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | 8, ≥11 |
| 9 | 2x10+3x20 | 2x10 | 3x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | 8, ≥11 |
| 10 | 10+2×20+2×20 | 10+2x20 | 2x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | 8, ≥11 |
| 11 | 10+15+20+2x20 | 10+15+20 | 2x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

#### 8.13.3.1.2.2 TDD-FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 for TDD PCell (2DL CA)

##### 8.13.3.1.2.2.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

##### 8.13.3.1.2.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support E-UTRA FDD and TDD and 2DL CA with TDD as PCell and 4 Rx antenna ports.

##### 8.13.3.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.3.1.2.1.

##### 8.13.3.1.2.2.4 Test description

###### 8.13.3.1.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.13.3.2.1.1-1as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.1.2.2.4.3.

###### 8.13.3.1.2.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.3.1.2.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.13.3.1.2.2.3-1 and 8.13.3.1.2.2.3-2 or 8.13.3.1.2.2.3-3. The SS sends downlink MAC padding bits on the DL RMC.

5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.3.1.2.2.5-1 or 8.13.3.1.2.2.5-2 as appropriate.

7. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.13.3.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.13.3.1.2.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.3.1.2.2.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.3.1.2.2.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000000011111111111111110000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |

**Table 8.13.3.1.2.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.3.1.2.2.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.3.1.2.2.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.3.1.2.2.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.3.1.2.2.4.3-7: *PUSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.13.3.1.2.2.5 Test requirement

Table 8.13.3.1.2.1-1 define the primary level settings.

For TDD FDD CA with TDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.1.2.2.5-3 based on single carrier requirement specified in Table 8.13.3.1.2.2.5-1 and Table 8.13.3.1.2.2.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.1.2.2.5-1 or 8.13.3.1.2.2.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.1.2.2.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| **Band-width** | **Reference channel** | | **OCNG pattern** | **Propa-gation condi-tion** | **Correlation matrix and antenna config.** | | **Reference value** | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **Fraction of maximum throughput (%)** | **SNR (dB)** | |
| | **2Rx CC** | **4Rx CC** | | | **2Rx CC** | **4Rx CC** | | **2Rx CC** | **4Rx CC** |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.3 | 8.4 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.0 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.1 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.6 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.5 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.2 | 6.5 |

**Table 8.13.3.1.2.2.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.9 | 9.0 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.3 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.9 | 6.8 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.4 | 7.2 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.5 | 7.1 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.6 | 7.3 |

**Table 8.13.3.1.2.2.5-3: Test requirement for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.1.2.2.5-1 and Table 8.13.3.1.2.2.5-2 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.1.2.2.5-1 and Table 8.13.3.1.2.2.5-2 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.1.2.2.5-1 and Table 8.13.3.1.2.2.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.3.1.2.3 TDD-FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 for TDD PCell (3DL CA)

#### 8.13.3.1.2.3.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

#### 8.13.3.1.2.3.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support E-UTRA FDD and TDD and 3DL CA with TDD as PCell and 4 Rx antenna ports.

#### 8.13.3.1.2.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.3.1.2.1.

#### 8.13.3.1.2.3.4 Test description

##### 8.13.3.1.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.13.3.2.1.1-1as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.1.2.3.4.3.

#### 8.13.3.1.2.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.3.1.2.3.4.3.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.13.3.1.2.3.3-1 and 8.13.3.1.2.3.3-2 or 8.13.3.1.2.3.3-3. The SS sends downlink MAC padding bits on the DL RMC.
5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.3.1.2.3.5-1 or 8.13.3.1.2.3.5-2 as appropriate.
7. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5 on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.13.3.1.2.3.4.3 Message contents

Same message contents as in clause 8.13.3.1.2.2.4.3 with the following exceptions:

**Table 8.13.3.1.2.3.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11100000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

8.13.3.1.2.3.5 Test requirement

Table 8.13.3.1.2.1-1 define the primary level settings.

For TDD FDD CA with TDD PCell and 3DL CCs, the requirements are specified in Table 8.13.3.1.2.3.5-3 based on single carrier requirement specified in Table 8.13.3.1.2.3.5-1 and Table 8.13.3.1.2.3.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.1.2.3.5-1 or 8.13.3.1.2.3.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.1.2.3.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| **Band-width** | **Reference channel** | | **OCNG pattern** | **Propa-gation condi-tion** | **Correlation matrix and antenna config.** | | **Reference value** | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **Fraction of maximum throughput (%)** | **SNR (dB)** | |
| | **2Rx CC** | **4Rx CC** | | | **2Rx CC** | **4Rx CC** | | **2Rx CC** | **4Rx CC** |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.3 | 8.4 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.0 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.1 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.6 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.5 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.2 | 6.5 |

**Table 8.13.3.1.2.3.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.9 | 9.0 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.3 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.9 | 6.8 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.4 | 7.2 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.5 | 7.1 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.6 | 7.3 |

**Table 8.13.3.1.2.3.5-3: Test requirement for multiple CA configurations with 3DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 3x20 | 20 | 2x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 2 | 20+20+15 | 15 | 2x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 3 | 20+20+10 | 10 | 2x20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 4 | 3x20 | 2x20 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 5 | 20+20+15 | 20+15 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 6 | 20+20+10 | 20+10 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 7 | 20+10+10 | 2x10 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 8 | 10+15+20 | 10 | 15+20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| 9 | 10+15+20 | 10+15 | 20 | As defined in Table 8.13.3.1.2.1-2 and Table 8.13.3.1.2.1-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.3.1.2.4 TDD-FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 for TDD PCell (4DL CA)

#### 8.13.3.1.2.4.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

#### 8.13.3.1.2.4.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8 or higher that support E-UTRA FDD and TDD and 4DL CA with TDD as PCell and 4 Rx antenna ports.

#### 8.13.3.1.2.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.3.1.2.1.

#### 8.13.3.1.2.4.4 Test description

##### 8.13.3.1.2.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.13.3.2.1.1-1as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.1.2.4.4.3.

##### 8.13.3.1.2.4.4.2 Test procedure

Same test procedure as in clause 8.13.3.1.2.3.4.2 with the following exceptions:

- Instead of Table 8.13.3.1.2.3.5-1 → use Table 8.13.3.1.2.4.5-1

##### 8.13.3.1.2.4.4.3 Message contents

Same message contents as in clause 8.13.3.1.2.2.4.3 with the following exceptions:

**Table 8.13.3.1.2.4.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11110000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

8.13.3.1.2.4.5 Test requirement

Table 8.13.3.1.2.1-1 define the primary level settings.

For TDD FDD CA with TDD PCell and 4DL CCs, the requirements are specified in Table 8.13.3.1.2.4.5-3 based on single carrier requirement specified in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.1.2.4.5-1 or 8.13.3.1.2.4.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.1.2.4.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.3 | 8.4 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.0 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.1 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.6 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.5 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.2 | 6.5 |

**Table 8.13.3.1.2.4.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.9 | 9.0 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.3 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.9 | 6.8 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.4 | 7.2 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.5 | 7.1 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.6 | 7.3 |

**Table 8.13.3.1.2.4.5-3: Test requirement for multiple CA configurations with 4DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 4x20 | 20 | 3x20 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| 2 | 4x20 | 2×20 | 2×20 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| 3 | 3x20+15 | 20+15 | 2×20 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| 4 | 2×15+2x20 | 2×15 | 2x20 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| 5 | 3x20+15 | 2×20+15 | 20 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| 6 | 2×15+2x20 | 2x15+20 | 20 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| 7 | 3x20+10 | 2x20+10 | 20 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| 8 | 4x20 | 3x20 | 20 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| 9 | 10+3x20 | 10 | 3x20 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| 10 | 2x10+2x20 | 2x10 | 2x20 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| 11 | 2x10+20+15 | 2x10 | 20+15 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| 12 | 10+3x20 | 10+20 | 2x20 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| 13 | 10+15+2x20 | 10+15 | 2x20 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| 14 | 10+15+2x20 | 10+15+20 | 20 | As defined in Table 8.13.3.1.2.4.5-1 and Table 8.13.3.1.2.4.5-2 per CC | ≥8 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.3.1.2.5 TDD-FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 for TDD PCell (5DL CA)

#### 8.13.3.1.2.5.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

#### 8.13.3.1.2.5.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 8, 11 or higher that support E-UTRA FDD and TDD and 5DL CA with TDD as PCell and 4 Rx antenna ports.

#### 8.13.3.1.2.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 8.13.3.1.2.1.

#### 8.13.3.1.2.5.4 Test description

##### 8.13.3.1.2.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for Pcell are set up according to Tables 8.2.3-1, 8.13.3.2.1.1-1as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.1.2.5.4.3.

#### 8.13.3.1.2.5.4.2 Test procedure

Same test procedure as in clause 8.13.3.1.2.3.4.2 with the following exceptions:

- Instead of Table 8.13.3.1.2.3.5-1 → use Table 8.13.3.1.2.5.5-1

#### 8.13.3.1.2.5.4.3 Message contents

Same message contents as in clause 8.13.3.1.2.2.4.3 with the following exceptions:

**Table 8.13.3.1.2.5.4.3-1: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11111000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

#### 8.13.3.1.2.5.5 Test requirement

Table 8.13.3.1.2.1-1 define the primary level settings.

For TDD FDD CA with TDD PCell and 5DL CCs, the requirements are specified in Table 8.13.3.1.2.5.5-3 based on single carrier requirement specified in Table 8.13.3.1.2.5.5-1 and Table 8.13.3.1.2.5.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.1.2.5.5-1 or 8.13.3.1.2.5.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.1.2.5.5-1: Single carrier test requirement with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.14-4 FDD | R.14-4 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.3 | 8.4 |
| 3MHz | R.14-5 FDD | R.14-5 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.0 |
| 5MHz | R.14-6 FDD | R.14-6 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.4 | 6.1 |
| 10 MHz | R.14 FDD | R.14 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.6 |
| 15MHz | R.14-7 FDD | R.14-7 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.0 | 6.5 |
| 20MHz | R.14-3 FDD | R.14-3 FDD | OP.1 FDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.2 | 6.5 |

**Table 8.13.3.1.2.5.5-2: Single carrier test requirement with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 1.4MHz | R.43-1 TDD | R.43-1 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.9 | 9.0 |
| 3MHz | R.43-2 TDD | R.43-2 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.7 | 6.3 |
| 5MHz | R.43-3 TDD | R.43-3 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 10.9 | 6.8 |
| 10 MHz | R.43-4 TDD | R.43-4 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.4 | 7.2 |
| 15MHz | R.43-5 TDD | R.43-5 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.5 | 7.1 |
| 20MHz | R.43 TDD | R.43 TDD | OP.1 TDD | EVA5 | 4x2 Low | 4x4 Low | 70 | 11.6 | 7.3 |

**Table 8.13.3.1.2.5.5-3: Test requirement for multiple CA configurations with 5DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 15+4×20 | 15+2×20 | 2×20 | As defined in Table 8.13.3.1.2.5.5-1 and 8.13.3.1.2.5.5-2 per CC | 8, ≥11 |
| 2 | 2×15+3×20 | 2×15+20 | 2×20 | As defined in Table 8.13.3.1.2.5.5-1 and 8.13.3.1.2.5.5-2 per CC | 8, ≥11 |
| 3 | 4x20+20 | 4x20 | 20 | As defined in Table 8.13.3.1.2.5.5-1 and 8.13.3.1.2.5.5-2 per CC | 8, ≥11 |
| 4 | 3x20+2x20 | 3x20 | 2x20 | As defined in Table 8.13.3.1.2.5.5-1 and 8.13.3.1.2.5.5-2 per CC | 8, ≥11 |
| 5 | 2x20+3x20 | 2x20 | 3X20 | As defined in Table 8.13.3.1.2.5.5-1 and 8.13.3.1.2.5.5-2 per CC | 8, ≥11 |
| 6 | 20+4x20 | 20 | 4x20 | As defined in Table 8.13.3.1.2.5.5-1 and 8.13.3.1.2.5.5-2 per CC | 8, ≥11 |
| 7 | 10+4x20 | 10 | 4x20 | As defined in Table 8.13.3.1.2.5.5-1 and 8.13.3.1.2.5.5-2 per CC | 8, ≥11 |
| 8 | 10+20+3x20 | 10+20 | 3x20 | As defined in Table 8.13.3.1.2.5.5-1 and 8.13.3.1.2.5.5-2 per CC | 8, ≥11 |
| 9 | 2x10+3x20 | 2x10 | 3x20 | As defined in Table 8.13.3.1.2.5.5-1 and 8.13.3.1.2.5.5-2 per CC | 8, ≥11 |
| 10 | 10+2×20+2×20 | 10+2x20 | 2x20 | As defined in Table 8.13.3.1.2.5.5-1 and 8.13.3.1.2.5.5-2 per CC | 8, ≥11 |
| 11 | 10+15+20+2x20 | 10+15+20 | 2x20 | As defined in Table 8.13.3.1.2.5.5-1 and 8.13.3.1.2.5.5-2 per CC | 8, ≥11 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.3.2

## 8.13.3.3 Enhanced Performance Requirements Type A Closed-loop spatial multiplexing

### 8.13.3.3.1 TDD-FDD CA PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model-Enhanced Performance Requirement Type A for FDD Pcell (2DL CA)

#### 8.13.3.3.1.1 Test purpose

To verify the closed loop rank-one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 4 interference model defined in clause B.5.3.

#### 8.13.3.3.1.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support 4 Rx antenna ports and enhanced receiver Type A and E-UTRA FDD and TDD and 2DL CA with FDD as PCELL in any FDD or TDD RF band.

#### 8.13.3.3.1.3 Minimum conformance requirements

In Table 8.13.3.3.1.3-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

For TDD FDD CA with FDD PCell and with 2 DL CCs, the requirements are specified in Table 8.13.3.3.1.3-4, based on single carrier requirement specified in Table 8.13.3.3.1.3-2 and Table 8.13.3.3.1.3-3, with the addition of the parameters in Table 8.13.3.3.1.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.13.3.3.1.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model for CA**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| Cell Id | | | 0 | 1 |
| PDSCH transmission mode | | | 6 | 4 |
| Interference model | | | N/A | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 |
| | Rank 2 | % | N/A | 20 |
| Precoding granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs | 4 for 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 4) | FDD CC | ms | 8 | N/A |
| | TDD CC | ms | 10 or 11 | N/A |

| | | | | |
|---|---|---|---|---|
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 1111 | N/A |
| Physical channel for CQI reporting | | | PUSCH (Note 7) | N/A |
| cqi-pmi-ConfigurationIndex | FDD PCC | | 4 | N/A |
| | TDD SCC | | 5 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2 is the interfering cell.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Note 6: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

Note 7: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3 for TDD CCs, and PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2 for FDD CCs.

**Table 8.13.3.3.1.3-2: Single carrier performance for Enhanced Performance Requirement Type A for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| | | | | | | | | | | 2Rx CC | 4Rx CC |
| 5MHz | R.47-1 FDD | R.47-1 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.8 | -3.0 |
| 10 MHz | R.47 FDD | R.47 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.0 | -2.7 |
| 15MHz | R.47-2 FDD | R.47-2 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.8 | -2.9 |
| 20MHz | R.47-3 FDD | R.47-3 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.1 | -2.8 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

**Table 8.13.3.3.1.3-3: Single carrier performance for Enhanced Performance Requirement Type A for TDD SCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) 2Rx CC | SINR (dB) (Note 2) 4Rx CC |
| 5MHz | R.47-1 TDD | R.47-1 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.8 | -2.8 |
| 10 MHz | R.47 TDD | R.47 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.3 | -2.5 |
| 15MHz | R.47-2 TDD | R.47-2 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.0 | -2.7 |
| 20MHz | R.47-3 TDD | R.47-3 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.3 | -2.3 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

**Table 8.13.3.3.1.3-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.3.1.3-2 and Table 8.13.3.3.1.3-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.3.1.3-2 and Table 8.13.3.3.1.3-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.3.1.3-2 and Table 8.13.3.3.1.3-3 per CC | ≥5 |

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6.

The normative reference for this requirement is TS 36.101 [2] clause 8.13.3.3.

### 8.13.3.3.1.4 Test description

#### 8.13.3.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.13.3.3.1.4.1-1.

CA Capability to be tested: Select one according to Table 8.13.3.3.1.4.1-1.

**Table 8.13.3.3.1.4.1-1: Test point selection for TM4 TDD FDD 2DL CA for FDD PCell**

| CA Capability | Bandwidth Combination | | |
|---|---|---|---|
| | 20+20 | 10+20 | 15+20 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 | Test 2 | Test3 |

| | |
|---|---|
| Note 1: | One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.94.
2. The parameter settings for the cell are set up according to Table 8.2.3-1 and 8.13.3.3.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.3.1.4.3.

#### 8.13.3.3.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.3.3.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4 SS transmits PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to Tables 8.13.3.3.1.3-1, 8.13.3.3.1.3-2 and 8.13.3.3.1.3-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2, #3, #7 and #8 (Table A.2.2.1.2-1).

5. Set the parameters of the reference channel, MCS, the propagation condition, the correlation matrix and the SNR according to Tables 8.13.3.3.1.5-2 and 8.13.3.3.1.5-3 as appropriate.
6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.13.3.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.13.3.3.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.3.3.1.4.3-2: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm6 | | |
| codebookSubsetRestriction-r10 | 1111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.3.3.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.3.3.1.4.3-4: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 4 | | Pcell |
| | 5 | | Scell |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | | Pcell, Scell |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

8.13.3.3.1.5 Test requirement

Tables 8.13.3.3.1.5-2 and 8.13.3.3.1.5-3 define the primary level settings.

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.3.1.5-4 based on single carrier requirement specified in Table 8.13.3.3.1.5-2 and Table 8.13.3.3.1.5-3.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.3.1.5-2 and 8.13.3.3.1.5-3 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.3.1.5-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model for CA**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.45 |
| Cell Id | | | 0 | 1 |
| PDSCH transmission mode | | | 6 | 4 |
| Interference model | | | N/A | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 |
| | Rank 2 | % | N/A | 20 |
| Precoding granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs | 4 for 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 4) | FDD CC | ms | 8 | N/A |
| | TDD CC | ms | 10 or 11 | N/A |

| | | | | |
|---|---|---|---|---|
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 1111 | N/A |
| Physical channel for CQI reporting | | | PUSCH (Note 7) | N/A |
| cqi-pmi-ConfigurationIndex | FDD PCC | | 4 | N/A |
| | TDD SCC | | 5 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2 is the interfering cell.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Note 6: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

Note 7: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3 for TDD CCs, and PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2 for FDD CCs.

**Table 8.13.3.3.1.5-2: Single carrier performance for Enhanced Performance Requirement Type A for FDD PCell and SCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| | | | | | | | | | | 2Rx CC | 4Rx CC |
| 5MHz | R.47-1 FDD | R.47-1 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.78 | -2.02 |
| 10 MHz | R.47 FDD | R.47 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.98 | -1.72 |
| 15MHz | R.47-2 FDD | R.47-2 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.78 | -1.92 |
| 20MHz | R.47-3 FDD | R.47-3 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 2.08 | -1.82 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

**Table 8.13.3.3.1.5-3: Single carrier performance for Enhanced Performance Requirement Type A for TDD SCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) 2Rx CC | SINR (dB) (Note 2) 4Rx CC |
| 5MHz | R.47-1 TDD | R.47-1 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.78 | -1.82 |
| 10 MHz | R.47 TDD | R.47 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 2.28 | -1.52 |
| 15MHz | R.47-2 TDD | R.47-2 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.98 | -1.72 |
| 20MHz | R.47-3 TDD | R.47-3 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 2.28 | -1.32 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\widehat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.3.3.1.5-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.3.1.5-2 and Table 8.13.3.3.1.5-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.3.1.5-2 and Table 8.13.3.3.1.5-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.3.1.5-2 and Table 8.13.3.3.1.5-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.3.3.2 TDD-FDD CA PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model-Enhanced Performance Requirement Type A for TDD Pcell (2DL CA)

### 8.13.3.3.2.1 Test purpose

To verify the closed loop rank-one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 4 interference model defined in clause B.5.3.

### 8.13.3.3.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support 4 Rx antenna ports and enhanced receiver Type A and E-UTRA FDD and TDD and 2DL CA with TDD as PCELL in any FDD or TDD RF band.

### 8.13.3.3.2.3 Minimum conformance requirements

In Table 8.13.3.3.2.3-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

For TDD FDD CA with TDD PCell and with 2 DL CCs, the requirements are specified in Table 8.13.3.3.2.3-4, based on single carrier requirement specified in Table 8.13.3.3.2.3-2 and Table 8.13.3.3.2.3-3, with the addition of the parameters in Table 8.13.3.3.2.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.13.3.3.2.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model for CA**

| Parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| Cell Id | | | 0 | 1 |
| PDSCH transmission mode | | | 6 | 4 |
| Interference model | | | N/A | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 |
| | Rank 2 | % | N/A | 20 |
| Precoding granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs | 4 for 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 4) | FDD CC | ms | 8 | N/A |
| | TDD CC | ms | 10 or 11 | N/A |
| Reporting interval | | ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 1111 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}$´ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2 is the interfering cell.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Note 6: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

**Table 8.13.3.3.2.3-2: Single carrier performance for Enhanced Performance Requirement Type A for FDD SCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) 2Rx CC | SINR (dB) (Note 2) 4Rx CC |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5MHz | R.47-1 FDD | R.47-1 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.8 | -3.0 |
| 10 MHz | R.47 FDD | R.47 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.0 | -2.7 |
| 15MHz | R.47-2 FDD | R.47-2 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.8 | -2.9 |
| 20MHz | R.47-3 FDD | R.47-3 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.1 | -2.8 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.3.3.2.3-3: Single carrier performance for Enhanced Performance Requirement Type A for TDD PCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) 2Rx CC | SINR (dB) (Note 2) 4Rx CC |
| 5MHz | R.47-1 TDD | R.47-1 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.8 | -2.8 |
| 10 MHz | R.47 TDD | R.47 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.3 | -2.5 |
| 15MHz | R.47-2 TDD | R.47-2 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.0 | -2.7 |
| 20MHz | R.47-3 TDD | R.47-3 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.3 | -2.3 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.3.3.2.3-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.3.2.3-2 and Table 8.13.3.3.2.3-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.3.2.3-2 and Table 8.13.3.3.2.3-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.3.2.3-2 and Table 8.13.3.3.2.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.3.3.

### 8.13.3.3.2.4 Test description

#### 8.13.3.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.13.3.3.2.4.1-1.

CA Capability to be tested: Select one according to Table 8.13.3.3.2.4.1-1.

**Table 8.13.3.3.2.4.1-1: Test point selection for TM4 TDD FDD 2DL CA for TDD PCell**

| CA Capability | Bandwidth Combination | | |
|---|---|---|---|
| | 20+20 | 10+20 | 15+20 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 | Test 2 | Test3 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.89.
2. The parameter settings for the cell are set up according to Table 8.2.3-1 and 8.13.3.3.2.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.3.2.4.3.

### 8.13.3.3.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.3.3.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4 SS transmits PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to Tables 8.13.3.3.2.3-1, 8.13.3.3.2.3-2 and 8.13.3.3.1.3-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1, #4, #6 and #9 (Table A.2.3.1.2-1).

5. Set the parameters of the reference channel, MCS, the propagation condition, the correlation matrix and the SNR according to Tables 8.13.3.3.2.5-2 and 8.13.3.3.2.5-3 as appropriate.
6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

### 8.13.3.3.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.13.3.3.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.3.3.2.4.3-2: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm6 | | |
| codebookSubsetRestriction-r10 | 1111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.3.3.2.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.3.3.2.4.3-4: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 4 | | Pcell |
| | 3 | | Scell |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

8.13.3.3.2.5 Test requirement

Tables 8.13.3.3.2.5-2 and 8.13.3.3.2.5-3 define the primary level settings.

For TDD FDD CA with TDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.3.2.5-4 based on single carrier requirement specified in Table 8.13.3.3.2.5-2 and Table 8.13.3.3.2.5-3.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.3.2.5-2 and 8.13.3.3.2.5-3 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.3.2.5-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model for CA**

| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 |
| | $\rho_B$ | dB | -3 (Note 1) | -3 |
| | σ | dB | 0 | 0 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.45 |
| Cell Id | | | 0 | 1 |
| PDSCH transmission mode | | | 6 | 4 |
| Interference model | | | N/A | As specified in clause B.5.3 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | % | N/A | 80 |
| | Rank 2 | % | N/A | 20 |
| Precoding granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs | 4 for 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 4) | FDD CC | ms | 8 | N/A |
| | TDD CC | ms | 10 or 11 | N/A |

| | | | |
|---|---|---|---|
| Reporting interval | ms | 5 | N/A |
| Reporting mode | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | 1111 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2 is the interfering cell.

Note 4: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Note 6: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

**Table 8.13.3.3.2.5-2: Single carrier performance for Enhanced Performance Requirement Type A for FDD SCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| | | | | | | | | | | 2Rx CC | 4Rx CC |
| 5MHz | R.47-1 FDD | R.47-1 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.78 | -2.02 |
| 10 MHz | R.47 FDD | R.47 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.98 | -1.72 |
| 15MHz | R.47-2 FDD | R.47-2 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.78 | -1.92 |
| 20MHz | R.47-3 FDD | R.47-3 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 2.08 | -1.82 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

**Table 8.13.3.3.2.5-3: Single carrier performance for Enhanced Performance Requirement Type A for TDD PCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| | | | | | | | | | | 2Rx CC | 4Rx CC |
| 5MHz | R.47-1 TDD | R.47-1 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.78 | -1.82 |
| 10 MHz | R.47 TDD | R.47 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | [2.28 | -1.52 |
| 15MHz | R.47-2 TDD | R.47-2 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.98 | -1.72 |
| 20MHz | R.47-3 TDD | R.47-3 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 2.28 | -1.32 |

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

**Table 8.13.3.3.2.5-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.3.2.5-2 and Table 8.13.3.3.2.5-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.3.2.5-2 and Table 8.13.3.3.2.5-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.3.2.5-2 and Table 8.13.3.3.2.5-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.3.4 Enhanced Performance Requirements Type A – Single-layer Spatial Multiplexing (User-Specific Reference Symbols)

### 8.13.3.4.1 TDD-FDD CA PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 Interference Model-Enhanced Performance Requirement Type A for FDD Pcell (2DL CA)

#### 8.13.3.4.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4.

#### 8.13.3.4.1.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support 4 Rx antenna ports and enhanced receiver Type A and E-UTRA FDD and TDD and 2DL CA with FDD as PCELL in any FDD or TDD RF band. Applicability requires support for FGI bit 103.

#### 8.13.3.4.1.3 Minimum conformance requirements

In Table 8.13.3.4.1.3-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

For TDD FDD CA with FDD PCell with 2 DL CCs, the requirements are specified in Table 8.13.3.4.1.3-4, based on single carrier requirement specified in Table 8.13.3.4.1.3-2 and Table 8.13.3.4.1.3-3, with the addition of the parameters in Table 8.13.3.4.1.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.13.3.4.1.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model for CA**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |

| | | | | |
|---|---|---|---|---|
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | FDD CC | Subframes | 5 / 2 | N/A |
| | TDD CC | | 5 / 4 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| Cell Id | | | 0 | 126 |
| PDSCH transmission mode | | | 9 | 9 |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |

| | | | | |
|---|---|---|---|---|
| Precoder update granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs | 4 for 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 5) | FDD CC | Ms | 8 | N/A |
| | TDD CC | | 10 or 11 | N/A |
| Reporting interval | | Ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) used for the input signal under test | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note 8) | N/A |
| cqi-pmi-ConfigurationIndex | FDD PCC | | 4 | N/A |
| | TDDS CC | | 5 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 6: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 7: All cells are time-synchronous.

Note 8: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3 for TDD CCs, and PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2 for FDD CCs.

Note 9: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

**Table 8.13.3.4.1.3-2: Single carrier performance for Enhanced Performance Requirement Type A, CDM-multiplexed DM RS for FDD PCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) | |
| | | | | | | | | | | 2Rx CC | 4Rx CC |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5MHz | R.76-1 FDD | R.76-4 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.4 | 0-2. |
| 10 MHz | R.76 FDD | R.76-5 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.1 | -1.8 |
| 15MHz | R.76-2 FDD | R.76-6 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.2 | -1.9 |
| 20MHz | R.76-3 FDD | R.76-7 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.4 | -1.7 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.3.4.1.3-3: Single carrier performance for Enhanced Performance Requirement Type A, CDM-multiplexed DM RS for TDD SCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) 2Rx CC | SINR (dB) (Note 2) 4Rx CC |
| 5MHz | R.76-1 TDD | R.76-4 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.6 | -2.4 |
| 10 MHz | R.76 TDD | R.76-5 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.1 | -2.1 |
| 15MHz | R.76-2 TDD | R.76-6 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.2 | -2.1 |
| 20MHz | R.76-3 TDD | R.76-7 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.4 | -2.1 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.3.4.1.3-4: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.4.1.3-2 and Table 8.13.3.4.1.3-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.4.1.3-2 and Table 8.13.3.4.1.3-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.4.1.3-2 and Table 8.13.3.4.1.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.3.4.

### 8.13.3.4.1.4 Test description

#### 8.13.3.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.13.3.4.1.4.1-1.

CA Capability to be tested: Select one according to Table 8.13.3.4.1.4.1-1.

**Table 8.13.3.4.1.4.1-1: Test point selection for TM9 TDD FDD 2DL CA for FDD PCell**

| CA Capability | Bandwidth Combination | | |
|---|---|---|---|
| | 20+20 | 10+20 | 15+20 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 | Test 2 | Test3 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.94.
2. The parameter settings for the cell are set up according to Table 8.2.3-1] and 8.13.3.4.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.4.1.4.3.

### 8.13.3.4.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.3.4.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4 SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.13.3.4.1.3-1, 8.13.3.4.1.3-2 and 8.13.3.4.1.3-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2, #3, #7 and #8 (Table A.2.2.1.2-1).

5. Set the parameters of the reference channel, MCS, the propagation condition, the correlation matrix and the SNR according to Tables 8.13.3.4.1.5-2 and 8.13.3.4.1.5-3 as appropriate.
BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/PDSCH for the test UE are sent on antenna port 7 (or 8) using two Tx antennas with beam-forming model as specified in Annex B.4.3 and precoder update granularity specified in Table 8.13.3.4.1.5-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.3.
6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

### 8.13.3.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.13.3.4.1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.13.3.4.1.4.3-2: *AntennaInfoDedicated-r10-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 001111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.13.3.4.1.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10-DEFAULT | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.13.3.4.1.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10-DEFAULT | | |
| } | | | |
| } | | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.3.4.1.4.3-5: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.3.4.1.4.3-6: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 4 | | Pcell |
| | 5 | | Scell |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 483 | | Pcell, Scell |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.3.4.1.4.3-7: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 2 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; $T_{\text{CSI-RS}} = 5$; Parameter: $I_{\text{CSI-RS}}$ | PCell |
| | 4 | | SCell |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

8.13.3.4.1.5 Test requirement

Tables 8.13.3.4.1.5-2 and 8.13.3.4.1.5-3 define the primary level settings.

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.4.1.5-4 based on single carrier requirement specified in Table 8.13.3.4.1.5-2 and Table 8.13.3.4.1.5-3.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.4.1.5-2 and 8.13.3.4.1.5-3 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.4.1.5-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model for CA**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |

| | | | | |
|---|---|---|---|---|
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | FDD CC | Subframes | 5 / 2 | N/A |
| | TDD CC | | 5 / 4 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.45 |
| Cell Id | | | 0 | 126 |
| PDSCH transmission mode | | | 9 | 9 |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |

| | | | | |
|---|---|---|---|---|
| Precoder update granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs | 4 for 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 5) | FDD CC | Ms | 8 | N/A |
| | TDD CC | | 10 or 11 | N/A |
| Reporting interval | | Ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) used for the input signal under test | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note 8) | N/A |
| cqi-pmi-ConfigurationIndex | FDD PCC | | 4 | N/A |
| | TDDS CC | | 5 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 6: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 7: All cells are time-synchronous.

Note 8: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3 for TDD CCs, and PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2 for FDD CCs.

Note 9: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

**Table 8.13.3.4.1.5-2: Single carrier performance for Enhanced Performance Requirement Type A, CDM-multiplexed DM RS for FDD PCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) 2Rx CC | SINR (dB) (Note 2) 4Rx CC |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5MHz | R.76-1 FDD | R.76-4 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.58 | -1.02 |
| 10 MHz | R.76 FDD | R.76-5 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.08 | -0.82 |
| 15MHz | R.76-2 FDD | R.76-6 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.78 | -0.92 |
| 20MHz | R.76-3 FDD | R.76-7 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.58 | -0.72 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.3.4.1.5-3: Single carrier performance for Enhanced Performance Requirement Type A, CDM-multiplexed DM RS for TDD SCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) 2Rx CC | SINR (dB) (Note 2) 4Rx CC |
| 5MHz | R.76-1 TDD | R.76-4 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.38 | -1.42 |
| 10 MHz | R.76 TDD | R.76-5 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.88 | -1.12 |
| 15MHz | R.76-2 TDD | R.76-6 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.78 | -1.12 |
| 20MHz | R.76-3 TDD | R.76-7 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.58 | -1.12 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.3.4.1.5-4: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.4.1.5-2 and Table 8.13.3.4.1.5-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.4.1.5-2 and Table 8.13.3.4.1.5-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.4.1.5-2 and Table 8.13.3.4.1.5-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

### 8.13.3.4.2 TDD-FDD CA PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 Interference Model-Enhanced Performance Requirement Type A for TDD Pcell (2DL CA)

#### 8.13.3.4.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for single-layer transmission on antenna ports 7 or 8 without a

simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4.

#### 8.13.3.4.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support 4 Rx antenna ports and enhanced receiver Type A and E-UTRA FDD and TDD and 2DL CA with TDD as PCELL in any FDD or TDD RF band. Applicability requires support for FGI bit 103.

#### 8.13.3.4.2.3 Minimum conformance requirements

In Table 8.13.3.4.2.3-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

For TDD FDD CA with TDD PCell with 2 DL CCs, the requirements are specified in Table 8.13.3.4.2.3-4, based on single carrier requirement specified in Table 8.13.3.4.2.3-2 and Table 8.13.3.4.2.3-3, with the addition of the parameters in Table 8.13.3.4.2.3-1 and the downlink physical channel setup according to Annex C.3.2.

**Table 8.13.3.4.2.3-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model for CA**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | FDD CC | Subframes | 5 / 2 | N/A |
| | TDD CC | | 5 / 4 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.73 |
| Cell Id | | | 0 | 126 |
| PDSCH transmission mode | | | 9 | 9 |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |

| | | | | |
|---|---|---|---|---|
| Precoder update granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs | 4 for 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 5) | FDD CC | Ms | 8 | N/A |
| | TDD CC | | 10 or 11 | N/A |
| Reporting interval | | Ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) used for the input signal under test | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note 8) | N/A |
| cqi-pmi-ConfigurationIndex | FDD CC | | 3 | N/A |
| | TDD CC | | 4 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 6: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 7: All cells are time-synchronous.

Note 8: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3 for TDD CCs, and PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2 for FDD CCs.

Note 9: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

**Table 8.13.3.4.2.3-2: Single carrier performance for Enhanced Performance Requirement Type A, CDM-multiplexed DM RS for FDD SCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) 2Rx CC | SINR (dB) (Note 2) 4Rx CC |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5MHz | R.76-1 FDD | R.76-4 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.4 | -0.2 |
| 10 MHz | R.76 FDD | R.76-5 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.1 | -1.8 |
| 15MHz | R.76-2 FDD | R.76-6 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.2 | -1.9 |
| 20MHz | R.76-3 FDD | R.76-7 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.4 | -1.7 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.3.4.2.3-3: Single carrier performance for Enhanced Performance Requirement Type A, CDM-multiplexed DM RS for TDD PCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) 2Rx CC | SINR (dB) (Note 2) 4Rx CC |
| 5MHz | R.76-1 TDD | R.76-4 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.6 | -2.4 |
| 10 MHz | R.76 TDD | R.76-5 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.1 | -2.1 |
| 15MHz | R.76-2 TDD | R.76-6 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.2 | -2.1 |
| 20MHz | R.76-3 TDD | R.76-7 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | -0.4 | -2.1 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.3.4.2.3-4: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.4.2.3-2 and Table 8.13.3.4.2.3-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.4.2.3-2 and Table 8.13.3.4.2.3-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.4.2.3-2 and Table 8.13.3.4.2.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.3.4.

### 8.13.3.4.2.4 Test description

#### 8.13.3.4.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum WGap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 8.13.3.4.2.4.1-1.

CA Capability to be tested: Select one according to Table 8.13.3.4.2.4.1-1.

**Table 8.13.3.4.2.4.1-1: Test point selection for TM9 TDD FDD 2DL CA for TDD PCell**

| CA Capability | Bandwidth Combination | | |
|---|---|---|---|
| | 20+20 | 10+20 | 15+20 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 | Test 2 | Test3 |
| Note 1: One test point per UE supported CA capability is tested. For each UE supported CA capability, select the largest aggregated CA bandwidth combination supported by the UE within the chosen CA capability. | | | |

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure group A.89.
2. The parameter settings for the cell are set up according to Table 8.2.3-1 and 8.13.3.4.2.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.4.1.4.3.

### 8.13.3.4.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.3.4.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).

4 SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to Tables 8.13.3.4.2.3-1, 8.13.3.4.2.3-2 and 8.13.3.4.2.3-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1, #4, #6 and #9 (Table A.2.3.1.2-1).

5. Set the parameters of the reference channel, MCS, the propagation condition, the correlation matrix and the SNR according to Tables 8.13.3.4.2.5-2 and 8.13.3.4.2.5-3 as appropriate.
BCH/CRS/PDCCH/PCFICH are sent on antenna ports 0 and 1 using two Tx antennas, while DRS/PDSCH for the test UE are sent on antenna port 7 (or 8) using two Tx antennas with beam-forming model as specified in Annex B.4.3 and precoder update granularity specified in Table 8.13.3.4.2.5-1. CSI-RS are sent on antenna ports 15 and 16 using two Tx antennas with mapping according to beam-forming model as specified in Annex B.4.3.
6. Measure the average throughput per component carrier for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5, on both PCC and SCC. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

### 8.13.3.4.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 8.13.3.4.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 8.13.3.4.2.4.3-2: *AntennaInfoDedicated-r10-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 001111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 8.13.3.4.2.4.3-3: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10-DEFAULT | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 8.13.3.4.2.4.3-4: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10-DEFAULT | | |
| } | | | |
| } | | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.3.4.2.4.3-5: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.3.4.2.4.3-6: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | | Pcell |
| | 4 | | Scell |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.3.4.2.4.3-7: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; $T_{\text{CSI-RS}} = 5$; Parameter: $I_{\text{CSI-RS}}$ | PCell |
| | 2 | | SCell |
| p-C-r10 | -3 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

8.13.3.4.2.5 Test requirement

Tables 8.13.3.4.2.5-2 and 8.13.3.4.2.5-3 define the primary level settings.

For TDD FDD CA with TDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.4.2.5-4 based on single carrier requirement specified in Table 8.13.3.4.2.5-2 and Table 8.13.3.4.2.5-3.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.4.2.5-2 and 8.13.3.4.2.5-3 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.4.2.5-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model for CA**

| parameter | | Unit | Cell 1 | Cell 2 |
|---|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 (Note 1) | 0 |
| | σ | dB | -3 | -3 |

| | | | | |
|---|---|---|---|---|
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | FDD CC | Subframes | 5 / 2 | N/A |
| | TDD CC | | 5 / 4 | N/A |
| CSI reference signal configuration | | | 0 | N/A |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 | N/A |
| DIP (Note 2) | | dB | N/A | -1.45 |
| Cell Id | | | 0 | 126 |
| PDSCH transmission mode | | | 9 | 9 |
| Beamforming model | | | As specified in clause B.4.3 (Note 4, 5) | N/A |
| Interference model | | | N/A | As specified in clause B.5.4 |
| Probability of occurrence of transmission rank in interfering cells | Rank 1 | | N/A | 70 |
| | Rank 2 | | N/A | 30 |

| | | | | |
|---|---|---|---|---|
| Precoder update granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs | 4 for 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 5) | FDD CC | Ms | 8 | N/A |
| | TDD CC | | 10 or 11 | N/A |
| Reporting interval | | Ms | 5 | N/A |
| Reporting mode | | | PUCCH 1-1 | N/A |
| CodeBookSubsetRestriction bitmap | | | 001111 | N/A |
| Symbols for unused PRBs | | | OCNG (Note 6) | N/A |
| Simultaneous transmission | | | No simultaneous transmission on the other antenna port in (7 or 8) used for the input signal under test | N/A |
| Physical channel for CQI reporting | | | PUSCH(Note 8) | N/A |
| cqi-pmi-ConfigurationIndex | FDD CC | | 3 | N/A |
| | TDD CC | | 4 | N/A |

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 6: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 7: All cells are time-synchronous.

Note 8: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3 for TDD CCs, and PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2 for FDD CCs.

Note 9: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for tests with 2 CCs.

**Table 8.13.3.4.2.5-2: Single carrier performance for Enhanced Performance Requirement Type A, CDM-multiplexed DM RS for FDD SCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) 2Rx CC | SINR (dB) (Note 2) 4Rx CC |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5MHz | R.76-1 FDD | R.76-4 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.58 | -1.02 |
| 10 MHz | R.76 FDD | R.76-5 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 1.08 | -0.82 |
| 15MHz | R.76-2 FDD | R.76-6 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.78 | -0.92 |
| 20MHz | R.76-3 FDD | R.76-7 FDD | OP.1 FDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.58 | -0.72 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.3.4.2.5-3: Single carrier performance for Enhanced Performance Requirement Type A, CDM-multiplexed DM RS for TDD PCell (FRC)**

| Band-width | Reference Channel | | OCNG Pattern | | Propagation Conditions | | Correlation Matrix and Antenna Configuration (Note 3) | | Reference Value | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2Rx CC | 4Rx CC | Cell 1 | Cell 2 | Cell 1 | Cell 2 | 2Rx CC | 4Rx CC | Fraction of Maximum Throughput (%) | SINR (dB) (Note 2) 2Rx CC | SINR (dB) (Note 2) 4Rx CC |
| 5MHz | R.76-1 TDD | R.76-4 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.38 | -1.42 |
| 10 MHz | R.76 TDD | R.76-5 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.88 | -1.12 |
| 15MHz | R.76-2 TDD | R.76-6 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.78 | -1.12 |
| 20MHz | R.76-3 TDD | R.76-7 TDD | OP.1 TDD | N/A | EVA5 | EVA5 | 2x2 Low | 2x4 Low | 70 | 0.58 | -1.12 |
| Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. | | | | | | | | | | | |
| Note 2: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. | | | | | | | | | | | |
| Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. | | | | | | | | | | | |

**Table 8.13.3.4.2.5-4: Minimum performance (FRC) based on single carrier performance for CA with 2 DL CCs**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.4.2.5-2 and Table 8.13.3.4.2.5-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.4.2.5-2 and Table 8.13.3.4.2.5-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.4.2.5-2 and Table 8.13.3.4.2.5-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

8.13.3.5

## 8.13.3.6 Closed-loop spatial multiplexing performance 4Tx Antenna Port with 256QAM

### 8.13.3.6.1 TDD-FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 with 256QAM for FDD PCell (2DL CA)

#### 8.13.3.6.1.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

#### 8.13.3.6.1.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support 4 Rx antenna ports and E-UTRA FDD and TDD and 2DL CA and 256QAM in DL with FDD as PCell in any FDD or TDD RF band.

#### 8.13.3.6.1.3 Minimum conformance requirements

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.6.1.3-4 based on single carrier requirement specified in Table 8.13.3.6.1.3-2 and Table 8.13.3.6.1.3-3, with the addition of the parameters in Table 8.13.3.6.1.3-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.3.6.1.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | Wideband precoding for 1.4MHz, 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | FDD CC | ms | 8 |
| | TDD CC | ms | 10 or 11 |
| Reporting interval | FDD CC | ms | 1 |
| | TDD CC | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 1-2 |
| CodeBookSubsetRestriction bitmap | | | 00000000000000000000000000000000111111111111111111000000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers.
Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 3.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.13.3.6.1.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.72-1 FDD | R.72-1 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 23.4 | 19.3 |
| 10 MHz | R.72 FDD | R.72 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.6 | 18.0 |
| 15MHz | R.72-2 FDD | R.72-2 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.7 | 17.4 |
| 20MHz | R.72-3 FDD | R.72-3 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.8 | 17.5 |

**Table 8.13.3.6.1.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.72-1 TDD | R.72-1 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.4 | 18.0 |
| 10 MHz | R.72 TDD | R.72 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.4 | 17.5 |
| 15MHz | R.72-2 TDD | R.72-2 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.5 | 17.1 |
| 20MHz | R.72-3 TDD | R.72-3 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.6 | 17.2 |

**Table 8.13.3.6.1.3-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.6.1.3-2 and Table 8.13.3.6.1.3-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.6.1.3-2 and Table 8.13.3.6.1.3-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.6.1.3-2 and Table 8.13.3.6.1.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.3.6.

### 8.13.3.6.1.4 Test description

#### 8.13.3.6.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for Pcell are set up according to Tables [8.13.3-1] and 8.13.3.6.1.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.6.1.4.3.

#### 8.13.3.6.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.3.6.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).
4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.13.3.6.1.3-1 and 8.13.3.6.1.3-2 or 8.13.3.6.1.3-3. The SS sends downlink MAC padding bits on the DL RMC.
5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.3.6.1.5-1 or 8.13.3.6.1.5-2 as appropriate.
7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

#### 8.13.3.6.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.13.3.6.1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.3.6.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000000000000000000011111111111111110000000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| cqi-ReportConfigPCell-v1250 | CQI-ReportConfig-v1250-DEFAULT | | DL 256QAM |
| } | | | |

**Table 8.13.3.6.1.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000000011111111111111110000000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| cqi-ReportConfigSCell-v1250 | CQI-ReportConfig-v1250-DEFAULT | | DL 256QAM |
| } | | | |

**Table 8.13.3.6.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.3.6.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.3.6.1.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.3.6.1.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.3.6.1.4.3-7: CQI-ReportConfig-v1250-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1250 ::= SEQUENCE { | | | |
| csi-SubframePatternConfig-r12 CHOICE { | | | |
| release | NULL | | |
| } | | | |
| cqiCQI-ReportBoth-v1250 | Not present | | |
| cqi-ReportAperiodic-v1250 | Not present | | |
| altCQI-Table-r12 | allSubframes | | DL 256QAM |
| } | | | |

**Table 8.13.3.6.1.4.3-8: *PUSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

8.13.3.6.1.5 Test requirement

Tables 8.13.3.6.1.5-1 and 8.13.3.6.1.5-2 define the primary level settings.

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.6.1.5-3 based on single carrier requirement specified in Table 8.13.3.6.1.5-1 and Table 8.13.3.6.1.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.6.1.5-1 or 8.13.3.6.1.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.6.1.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| **Band-width** | **Reference channel** | | **OCNG pattern** | **Propa-gation condi-tion** | **Correlation matrix and antenna config.** | | **Reference value** | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **Fraction of maximum throughput (%)** | **SNR (dB)** | |
| | **2Rx CC** | **4Rx CC** | | | **2Rx CC** | **4Rx CC** | | **2Rx CC** | **4Rx CC** |
| 5MHz | R.72-1 FDD | R.72-1 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 24.3 | 20.2 |
| 10 MHz | R.72 FDD | R.72 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.5 | 18.9 |
| 15MHz | R.72-2 FDD | R.72-2 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.6 | 18.3 |
| 20MHz | R.72-3 FDD | R.72-3 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.7 | 18.4 |

**Table 8.13.3.6.1.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| **Band-width** | **Reference channel** | | **OCNG pattern** | **Propa-gation condi-tion** | **Correlation matrix and antenna config.** | | **Reference value** | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **Fraction of maximum throughput (%)** | **SNR (dB)** | |
| | **2Rx CC** | **4Rx CC** | | | **2Rx CC** | **4Rx CC** | | **2Rx CC** | **4Rx CC** |
| 5MHz | R.72-1 TDD | R.72-1 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 23.3 | 18.9 |
| 10 MHz | R.72 TDD | R.72 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.3 | 18.4 |
| 15MHz | R.72-2 TDD | R.72-2 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.4 | 18 |
| 20MHz | R.72-3 TDD | R.72-3 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.5 | 18.1 |

**Table 8.13.3.6.1.5-3: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.6.1.5-1 and Table 8.13.3.6.1.5-2 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.6.1.5-1 and Table 8.13.3.6.1.5-2 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.6.1.5-1 and Table 8.13.3.6.1.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.3.6.2 TDD-FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 with 256QAM for TDD PCell (2DL CA)

### 8.13.3.6.2.1 Test purpose

The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

### 8.13.3.6.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support 4 Rx antenna ports and E-UTRA FDD and TDD and 2DL CA and 256QAM in DL with TDD as PCell in any FDD or TDD RF band.

### 8.13.3.6.2.3 Minimum conformance requirements

For TDD FDD CA with TDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.6.2.3-4 based on single carrier requirement specified in Table 8.13.3.6.2.3-2 and Table 8.13.3.6.2.3-3, with the addition of the parameters in Table 8.13.3.6.2.3-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.3.6.2.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | σ | dB | 3 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Precoding granularity | | PRB | Wideband pre-coding for 1.4MHz, 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs |
| PMI delay (Note 2) | FDD CC | ms | 8 |
| | TDD CC | ms | 10 or 11 |
| Reporting interval | FDD CC | ms | 1 |
| | TDD CC | ms | 1 or 4 (Note 3) |

| Reporting mode | | PUSCH 1-2 |
|---|---|---|
| CodeBookSubsetRestriction bitmap | | 00000000000000000000000000000000111111111111111111100000000000000000 |
| CSI request field (Note 3) | | '10' |
| PDSCH transmission mode | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers.
Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 3.
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.13.3.6.2.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.72-1 FDD | R.72-1 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 23.4 | 19.3 |
| 10 MHz | R.72 FDD | R.72 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.6 | 18.0 |
| 15MHz | R.72-2 FDD | R.72-2 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.7 | 17.4 |
| 20MHz | R.72-3 FDD | R.72-3 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.8 | 17.5 |

**Table 8.13.3.6.2.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.72-1 TDD | R.72-1 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.4 | 18.0 |
| 10 MHz | R.72 TDD | R.72 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.4 | 17.5 |
| 15MHz | R.72-2 TDD | R.72-2 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.5 | 17.1 |
| 20MHz | R.72-3 TDD | R.72-3 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 21.6 | 17.2 |

**Table 8.13.3.6.2.3-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.6.2.3-2 and Table 8.13.3.6.2.3-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.6.2.3-2 and Table 8.13.3.6.2.3-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.6.2.3-2 and Table 8.13.3.6.2.3-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.3.6.

#### 8.13.3.6.2.4 Test description

##### 8.13.3.6.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for Pcell are set up according to Tables [8.13.3-1] and 8.13.3.6.2.3-1as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.3.6.2.4.3.

##### 8.13.3.6.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.3.6.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133 [4], clauses 8.3.3.2).
4. For multi-layer spatial multiplexing, SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.13.3.6.2.3-1 and 8.13.3.6.2.3-2 or 8.13.3.6.2.3-3. The SS sends downlink MAC padding bits on the DL RMC.
5. SS schedules the UL transmission to carry the PUSCH CSI feedback via PDCCH DCI format 0 with CSI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.3.6.2.5-1 or 8.13.3.6.2.5-2 as appropriate.
7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3A.5. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest on both component carriers.

##### 8.13.3.6.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 5.5 and 4.6 with the following exceptions:

**Table 8.13.3.6.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.3.6.2.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| cqi-ReportConfigPCell-v1250 | CQI-ReportConfig-v1250-DEFAULT | | DL 256QAM |
| } | | | |

**Table 8.13.3.6.2.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 00000000000000000000 00000000000011111111 11111111000000000000 0000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| cqi-ReportConfigSCell-v1250 | CQI-ReportConfig-v1250-DEFAULT | | DL 256QAM |
| } | | | |

**Table 8.13.3.6.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.3.6.2.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.3.6.2.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.3.6.2.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.3.6.2.4.3-7: CQI-ReportConfig-v1250-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1250 ::= SEQUENCE { | | | |
| csi-SubframePatternConfig-r12 CHOICE { | | | |
| release | NULL | | |
| } | | | |
| cqiCQI-ReportBoth-v1250 | Not present | | |
| cqi-ReportAperiodic-v1250 | Not present | | |
| altCQI-Table-r12 | allSubframes | | DL 256QAM |
| } | | | |

**Table 8.13.3.6.2.4.3-8: *PUSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

8.13.3.6.2.5 Test requirement

Tables 8.13.3.6.2.5-1 and 8.13.3.6.2.5-2 define the primary level settings.

For TDD FDD CA with TDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.6.2.5-3 based on single carrier requirement specified in Table 8.13.3.6.2.5-1 and Table 8.13.3.6.2.5-2.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 and A.3.4.2 for each throughput test shall meet or exceed the specified value in Tables 8.13.3.6.2.5-1 or 8.13.3.6.2.5-2 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.6.2.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)**

| **Band-width** | **Reference channel** | | **OCNG pattern** | **Propa-gation condi-tion** | **Correlation matrix and antenna config.** | | **Reference value** | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **Fraction of maximum throughput (%)** | **SNR (dB)** | |
| | **2Rx CC** | **4Rx CC** | | | **2Rx CC** | **4Rx CC** | | **2Rx CC** | **4Rx CC** |
| 5MHz | R.72-1 FDD | R.72-1 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 24.3 | 20.2 |
| 10 MHz | R.72 FDD | R.72 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.5 | 18.9 |
| 15MHz | R.72-2 FDD | R.72-2 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.6 | 18.3 |
| 20MHz | R.72-3 FDD | R.72-3 FDD | OP.1 FDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.7 | 18.4 |

**Table 8.13.3.6.2.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)**

| Band-width | Reference channel | | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config. | | Reference value | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fraction of maximum throughput (%) | SNR (dB) | |
| | 2Rx CC | 4Rx CC | | | 2Rx CC | 4Rx CC | | 2Rx CC | 4Rx CC |
| 5MHz | R.72-1 TDD | R.72-1 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 23.3 | 18.9 |
| 10 MHz | R.72 TDD | R.72 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.3 | 18.4 |
| 15MHz | R.72-2 TDD | R.72-2 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.4 | 18 |
| 20MHz | R.72-3 TDD | R.72-3 TDD | OP.1 TDD | EPA5 | 4x2 Low | 4x4 Low | 70 | 22.5 | 18.1 |

**Table 8.13.3.6.2.5-3: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.6.2.5-1 and Table 8.13.3.6.2.5-2 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.6.2.5-1 and Table 8.13.3.6.2.5-2 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.6.2.5-1 and Table 8.13.3.6.2.5-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.3.7 Closed-loop spatial multiplexing performance 4Tx Antenna Port with Four layers

### 8.13.3.7.1 TDD-FDD CA PDSCH Closed Loop Four-Layer Spatial Multiplexing for FDD PCell (2DL CA)

#### 8.13.3.7.1.1 Test purpose

To verify the UE's rank-four performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for four-layer transmission on 4Tx and 4Rx under CA.

#### 8.13.3.7.1.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support 4 Rx antenna ports and E-UTRA FDD and TDD and 2DL CA with FDD as PCell in any FDD or TDD RF band.

#### 8.13.3.7.1.3 Minimum conformance requirements

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.7.1.3-4, based on single carrier requirement specified in Table 8.13.3.7.1.3-2 and Table 8.13.3.7.1.3-3, with the addition of the parameters in Table 8.13.3.7.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.3.7.1.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | $\sigma$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cell-specific reference signals | | | Antenna Ports 0,1,2,3 |
| Precoding granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs |
| PMI delay (Note 2) | FDD CC | ms | 8 |
| | TDD CC | ms | 10 or 11 |
| Reporting interval | FDD CC | ms | 1 |
| | TDD CC | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 3-1 |
| CodeBookSubsetRestriction bitmap | | | 0xFFFF000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | 4 |
| PDSCH rank | | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers.
Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.13.3.7.1.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 5MHz | R.74-1 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 14.1 |
| 10MHz | R.74 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 14.9 |
| 15MHz | R.74-2 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 14.3 |
| 20MHz | R.74-3 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 14.4 |

**Table 8.13.3.7.1.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 5MHz | R.74-1 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 14.5 |
| 10MHz | R.74 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 14.4 |
| 15MHz | R.74-2 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 14.6 |
| 20MHz | R.74-3 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 14.8 |

**Table 8.13.3.7.1.3-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.7.1-2 and Table 8.13.3.7.1-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.7.1-2 and Table 8.13.3.7.1-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.7.1-2 and Table 8.13.3.7.1-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.3.7.1.

### 8.13.3.7.1.4 Test description

#### 8.13.3.7.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.

2. The parameter settings for the cell are set up according to Table 8.13.3.7.1.3-1 as appropriate.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.1.3.4.3.

#### 8.13.3.7.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.1.2.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.13.3.7.1.3-1 and 8.13.3.7.1.3-2 and 8.13.3.7.1.3-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to '10' and I_MCS=29 and N_PRB allocated to be less or equal to 20.
6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.3.7.1.5-1 or 8.13.3.7.1.5-2 as appropriate.
7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3A.5 and G.3A.6 in Annex G clause G.3.

#### 8.13.3.7.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 4.6 and 5.5 with the following exceptions.

**Table 8.13.3.7.1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.3.7.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 0xFFFF000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.3.7.1.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 0xFFFF000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.3.7.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.3.7.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.3.7.1.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.3.7.1.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.3.7.1.4.3-7: *RRCConnectionReconfiguration***

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | Not present | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.3.7.1.4.3-8: *PUSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.13.3.7.1.5 Test requirement

Table 8.13.3.7.1.3-1 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Tables 8.13.3.7.1.5-1, 8.13.3.7.1.5-2 and 8.13.3.7.1.5-3 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.7.1.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 5MHz | R.74-1 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 15.0 |
| 10MHz | R.74 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 15.8 |
| 15MHz | R.74-2 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 15.2 |
| 20MHz | R.74-3 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 15.3 |

**Table 8.13.3.7.1.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 5MHz | R.74-1 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 15.4 |
| 10MHz | R.74 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 15.3 |
| 15MHz | R.74-2 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 15.5 |
| 20MHz | R.74-3 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 15.7 |

**Table 8.13.3.7.1.5-3 Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.7.1.5-1 and Table 8.13.3.7.1-2 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.7.1.5-1 and Table 8.13.3.7.1-2 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.7.1.5-1 and Table 8.13.3.7.1-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

## 8.13.3.7.2 TDD-FDD CA PDSCH Closed Loop Four-Layer Spatial Multiplexing for TDD PCell (2DL CA)

### 8.13.3.7.2.1 Test purpose

To verify the UE's rank-four performance and ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for four-layer transmission on 4Tx and 4Rx under CA.

### 8.13.3.7.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD Release 12 and forward UE of categories 5 or higher that support 4 Rx antenna ports and E-UTRA FDD and TDD and 2DL CA with TDD as PCell in any FDD or TDD RF band.

### 8.13.3.7.2.3 Minimum conformance requirements

For TDD FDD CA with TDD PCell and 2DL CCs, the requirements are specified in Table 8.13.3.7.2.3-4, based on single carrier requirement specified in Table 8.13.3.7.2.3-2 and Table 8.13.3.7.2.3-3, with the addition of the parameters in Table 8.13.3.7.2.3-1 and the downlink physical channel setup according to Annex C.3.2. The test coverage for different number of component carriers is defined in 8.1.2.4.

**Table 8.13.3.7.2.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA**

| Parameter | | Unit | Value |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 (Note 1) |
| | $\sigma$ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Cell-specific reference signals | | | Antenna Ports 0,1,2,3 |
| Precoding granularity | | PRB | 25 for 5MHz CCs, 50 for 10MHz CCs, 75 for 15MHz and 100 for 20MHz CCs |
| PMI delay (Note 2) | FDD CC | ms | 8 |
| | TDD CC | ms | 10 or 11 |
| Reporting interval | FDD CC | ms | 1 |
| | TDD CC | ms | 1 or 4 (Note 3) |
| Reporting mode | | | PUSCH 3-1 |
| CodeBookSubsetRestriction bitmap | | | 0xFFFF000000000000 |
| CSI request field (Note 3) | | | '10' |
| PDSCH transmission mode | | | 4 |
| PDSCH rank | | | 4 |

Note 1: $P_B = 1$.
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers.
Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection
Note 5: The same PDSCH transmission mode is applied to each component carrier.

**Table 8.13.3.7.2.3-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell and SCell (FRC)**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 5MHz | R.74-1 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 14.1 |
| 10MHz | R.74 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 14.9 |
| 15MHz | R.74-2 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 14.3 |
| 20MHz | R.74-3 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 14.4 |

**Table 8.13.3.7.2.3-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell (FRC)**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 5MHz | R.74-1 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 14.5 |
| 10MHz | R.74 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 14.4 |
| 15MHz | R.74-2 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 14.6 |
| 20MHz | R.74-3 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 14.8 |

**Table 8.13.3.7.2.3-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.7.2-2 and Table 8.13.3.7.2-3 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.7.2-2 and Table 8.13.3.7.2-3 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.7.2-2 and Table 8.13.3.7.2-3 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 8.13.3.7.2.

### 8.13.3.7.2.4 Test description

#### 8.13.3.7.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: The maximum aggregated bandwidth in the selected CA configuration, as defined in clause 8.1.2.6.5.

CA Capability to be tested: The CA capability containing the maximum number of 4Rx supported CCs, as defined in clause 8.1.2.6.5.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.95.
2. The parameter settings for the cell are set up according to Table 8.13.3.7.2.3-1 as appropriate.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 8.13.1.1.3.4.3.

#### 8.13.3.7.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 8.13.3.7.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. SS transmits PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to Tables 8.13.3.7.2.3-1 and 8.13.3.7.2.3-2 and 8.13.3.7.2.3-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to ‘10’ and I_MCS=29 and N_PRB allocated to be less or equal to 20.

6. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.13.3.7.2.5-1 or 8.13.3.7.2.5-2 as appropriate.

7. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3 on each of the component carriers. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3A.5 and G.3A.6 in Annex G clause G.3.

#### 8.13.3.7.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 4.6 and 5.5 with the following exceptions.

**Table 8.13.3.7.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 8.13.3.7.2.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 0xFFFF000000000000 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 8.13.3.7.2.4.3-2A: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm4 | | |
| codebookSubsetRestriction-r10 | 0xFFFF000000000000 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 8.13.3.7.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 8.13.3.7.2.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | RBC |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 8.13.3.7.2.4.3-5: *CQI-ReportAperiodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-1A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 11000000 | P-Cell, S-Cell report | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.3.7.2.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 8.13.3.7.2.4.3-7: *RRCConnectionReconfiguration***

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | Not present | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 8.13.3.7.2.4.3-8: *PUSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| betaOffset-ACK-Index | 5 | | |
| betaOffset-RI-Index | 6 | | |
| betaOffset-CQI-Index | 5 | | |
| } | | | |

### 8.13.3.7.2.5 Test requirement

Table 8.13.3.7.2.3-1 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2.2 for the throughput test shall meet or exceed the specified value in Tables 8.13.3.7.2.5-1, 8.13.3.7.2.5-2 and 8.13.3.7.2.5-3 for the specified SNR including test tolerances for all throughput tests.

**Table 8.13.3.7.2.5-1: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell and SCell (FRC)**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 5MHz | R.74-1 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 15.0 |
| 10MHz | R.74 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 15.8 |
| 15MHz | R.74-2 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 15.2 |
| 20MHz | R.74-3 FDD | OP.1 FDD | EPA5 | 4x4 Low | 70 | 15.3 |

**Table 8.13.3.7.2.5-2: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell (FRC)**

| Band-width | Reference channel | OCNG pattern | Propa-gation condi-tion | Correlation matrix and antenna config | Reference value | |
|---|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) | SNR (dB) |
| 5MHz | R.74-1 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 15.4 |
| 10MHz | R.74 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 15.3 |
| 15MHz | R.74-2 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 15.5 |
| 20MHz | R.74-3 TDD | OP.1 TDD | EPA5 | 4x4 Low | 70 | 15.7 |

**Table 8.13.3.7.2.5-3: Minimum performance for multiple CA configurations with 2DL CCs (FRC)**

| Test number | Aggregated Bandwidth (MHz) | | | Minimum performance requirement | UE Category |
|---|---|---|---|---|---|
| | Total | FDD CC | TDD CC | | |
| 1 | 2x20 | 20 | 20 | As defined in Table 8.13.3.7.2.5-1 and Table 8.13.3.7.2-2 per CC | ≥5 |
| 2 | 20+10 | 10 | 20 | As defined in Table 8.13.3.7.2.5-1 and Table 8.13.3.7.2-2 per CC | ≥5 |
| 3 | 20+15 | 15 | 20 | As defined in Table 8.13.3.7.2.5-1 and Table 8.13.3.7.2-2 per CC | ≥5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.6. | | | | | |

Decide pass or fail for each subtest according to Annex G.3A.4. Decide the entire test pass or fail according to Annex G.3A.6.

# 9 Reporting of Channel State Information

## 9.1 General

For the cases in this clause it is expected that the UE will not always detect the PDCCH, resulting in a statDTX for the uplink ACK/NACK transmission. The downlink configuration for evaluating CQI performance does not use retransmission. Therefore any BLER and Throughput calculations must exclude any packets where the UE may have attempted to combine data from more than one transmission due to missed new data indicators from lost PDCCH transmissions. Thus in all test cases in which there are not retransmission (Max number of HARQ transmissions = 1), if the number of consecutive discarded statDTX for any one process is an odd number including one, also discard the next response for that HARQ process regardless whether it is an ACK or NACK. In the calculation of Throughput the discarded ACK / NACK is considered as a statDTX.

This section includes requirements for the reporting of channel state information (CSI). For all test cases in this section, the definition of SNR is in accordance with the one given in clause 8.1.1, where $SNR = \frac{\sum \hat{I}_{or}^{(j)}}{\sum N_{oc}^{(j)}}$.

The fading of the signals and the AWGN signals applied to each receiver antenna connector shall be uncorrelated. The levels of the test signal applied to each of the antenna connectors shall be as defined in the respective test cases.

The UE performance in this section is considered to be operating band independent. Therefore, the required performance in the respective test cases can be verified in one of the operating bands supported by the UE under test. All the test points supported by the bands of the multiband UE (based on channel bandwidth, DL and UL configuration) need to be tested.

For CA testing, unless otherwise stated, the logical carriers PCC / SCC are mapped on physical frequencies as defined in Table 9.1-1.

**Table 9.1-1: PCC/SCCs frequency mapping**

| CA Configuration | PCC mapping | Notes |
|---|---|---|
| Intra-band CA | CC1 | 1 |
| Inter-band CA (CA_x-y-z-…-n) | Bx (if not supported by the UE, then any one of the supported bands) | 2 |
| Note 1: Notation CCi means PCC on component carrier CCi and SCCs on all remaining component carriers, with frequencies defined in the corresponding intra-band contiguous / non-contiguous CA band in TS 36.508.<br>Note 2: Notation Bi means PCC on component Band i and SCCs on all remaining component carriers, with frequencies defined in TS 36.508.<br>Note 3: The ordering and numbering of the SCCs does not imply any order in the TC implementation of the SCCs. | | |

### 9.1.1 Applicability of requirements

#### 9.1.1.1 Applicability of requirements for different channel bandwidths

In Clause 9 the test cases may be defined with different channel bandwidth to verify the same CSI requirement.

Test cases defined for 5MHz channel bandwidth that reference this clause are applicable to UEs that support only Band 31, 72 and/or 73.

#### 9.1.1.2 Applicability and test rules for different CA configurations and bandwidth combination sets

The performance requirement for CA CQI tests in Clause 9 are defined independent of CA configurations and bandwidth combination sets specified in Clause 5.4.2A.1. For UEs supporting different CA configurations and bandwidth combination sets, the applicability and test rules are defined for the tests for 2 DL CCs in Table 9.1.1.2-1 and

3 or more DL CCs in Table 9.1.1.2-2. For simplicity, CA configuration below refers to combination of CA configuration and bandwidth combination set.

**Table 9.1.1.2-1: Applicability and test rules for CA UE CQI tests with 2 DL CCs**

| Tests | CA capability where the tests apply | CA configuration from the selected CA capability where the tests apply | CA Bandwidth combination to be tested in priority order |
|---|---|---|---|
| CA tests with 2CCs in Clause 9.6.1.1_A | Any of one of the supported CA capabilities | Any one of the supported FDD CA configurations | 10+10 MHz, 20+20 MHz, 5+5 MHz, 10MHz+5MHz, 15MHz+5MHz |
| CA tests with 2CCs in Clause 9.6.1.2_A | Any of one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported TDD CA configurations with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| Note 1: The applicability and test rules are specified in this table, unless otherwise stated.<br>Note 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.<br>Note 3: A single Uplink CC is configured for all tests | | | |

**Table 9.1.1.2-2: Applicability and test rules for CA UE CQI tests with 3 or more DL CCs**

| Tests | CA capability where the tests apply | CA configuration from the selected CA capability where the tests apply | CA Bandwidth combination to be tested in priority order |
|---|---|---|---|
| CA tests with 3 ore more CCs in Clause 9.6.1.1_A | Any of one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported FDD CA configurations with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 3 or more CCs in Clause 9.6.1.2_A | Any of one of the supported CA capabilities with largest aggregated CA bandwidth combination | Any one of the supported TDD CA configurations with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| Note 1: The applicability and test rules are specified in this table, unless otherwise stated.<br>Note 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.<br>Note 3: A single Uplink CC is configured for all tests | | | |

## 9.1.1.2A Applicability and test rules for different TDD-FDD CA configurations and bandwidth combination sets

The performance requirement for TDD-FDD CA CQI tests in Clause 9 are defined independent of CA configurations and bandwidth combination sets specified in Clause 5.4.2A.1. For UEs supporting different CA configurations and bandwidth combination sets, the applicability and test rules are defined for the tests for 2 DL TDD-FDD CA in Table 9.1.1.2A-1 and for 3 or more DL TDD-FDD CA in Table 9.1.1.2A-2. For simplicity, CA configuration below refers to combination of CA configuration and bandwidth combination set.

**Table 9.1.1.2A-1: Applicability and test rules for CA UE CQI tests for TDD-FDD CA with 2DL CCs**

| Tests | CA capability where the tests apply | CA configuration from the selected CA capability where the tests apply | CA Bandwidth combination to be tested in priority order |
|---|---|---|---|
| CA tests with 2CCs in Clause 9.6.1.3 | Any of one of the supported CA capabilities | Any one of the supported TDD-FDD CA configurations with FDD PCell with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 2CCs in Clause 9.6.1.4 | Any of one of the supported CA capabilities | Any one of the supported TDD-FDD CA configurations with TDD PCell with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| Note 1: The applicability and test rules are specified in this table, unless otherwise stated.<br>Note 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.<br>Note 3: A single Uplink CC is configured for all tests | | | |

**Table 9.1.1.2A-2: Applicability and test rules for CA UE CQI tests for TDD-FDD CA with 3 or more DL CCs**

| Tests | CA capability where the tests apply | CA configuration from the selected CA capability where the tests apply | CA Bandwidth combination to be tested in priority order |
|---|---|---|---|
| CA tests with 3CCs in Clause 9.6.1.3 | Any of one of the supported CA capabilities | Any one of the supported TDD-FDD CA configurations with FDD PCell with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| CA tests with 3CCs in Clause 9.6.1.4 | Any of one of the supported CA capabilities | Any one of the supported TDD-FDD CA configurations with TDD PCell with largest aggregated CA bandwidth combination | Largest aggregated CA bandwidth combination |
| Note 1: The applicability and test rules are specified in this table, unless otherwise stated.<br>Note 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.<br>Note 3: A single Uplink CC is configured for all tests | | | |

## 9.1.1.3 Test coverage for different number of component carriers

For FDD CA tests specified in 9.6.1.1_A, among all supported CA capabilities, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA tests with less than the largest number of CCs supported by the UE.

For TDD CA tests specified in 9.6.1.2_A, among all supported CA capabilities, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA tests with less than the largest number of CCs supported by the UE.

For TDD FDD CA tests specified in 9.6.1.3 and 9.6.1.4, among all supported CA capabilities, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the TDD FDD CA tests with less than the largest number of CCs supported by the UE.

## 9.1.1.4 Applicability of performance requirements for 4Rx capable UEs

### 9.1.1.4.1 Applicability rule and antenna connection for single carrier tests with 2Rx

For 4Rx capable UEs all single carrier tests specified in 9.2 to 9.5 with 2Rx are tested on any of the 2Rx supported RF bands by connecting 2 out of the 4Rx with data source from system simulator, and the other 2 Rx are connected with zero input, depending on UE's declaration and AP configuration. Same requirements specified with 2Rx should be applied.

For 4Rx capable UEs without any 2Rx supported RF bands (see note), all single carrier tests specified in 9.2 to 9.5 with 2Rx are tested on any of the 4Rx supported RF bands by duplicating the fading channel from each Tx antenna and add

independent noise for each Rx antenna. Figure 9.1.1.4.1-1 shows an example of antenna connection for 4Rx UE in any one 4Rx supported RF band to perform a 2Rx performance test with antenna configuration as 2x2 without interference for information. The SNR requirements should be applied with 3 dB less than the number specified with 2Rx, unless there are no SNR requirements specified.

For 4Rx capable UEs without any 2Rx supported RF bands (see note), all single carrier tests specified in 9.3.3 with 2Rx are tested on any of the 4Rx supported RF bands by duplicating the fading channel from each Tx antenna and add independent interference for each Rx antenna.

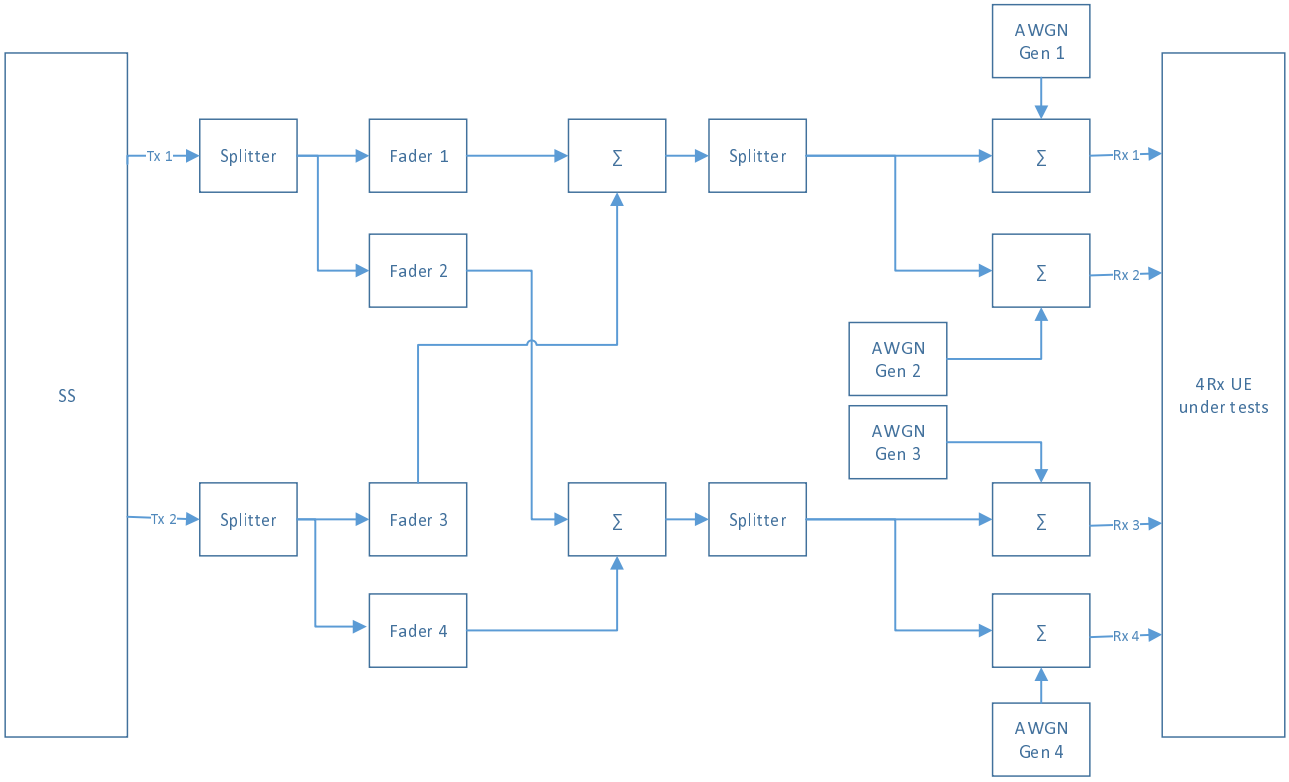



**Figure 9.1.1.4.1-1: Antenna connection example for 2Rx tests with antenna configuration as 2x2 without interference (informative)**

For 4Rx capable UEs without any 2Rx supported RF bands (see note), for all single carrier tests listed in Table 9.1.1.4.1-1 specified from 9.2 to 9.5 with 2Rx can be skipped.

Note: The band capability of the 4Rx UEs and corresponding test case applicability needs to be determined separately per frame structure {FDD, TDD, FS3}

**Table 9.1.1.4.1-1: Requirement lists for 4Rx capable UEs**

| Requirement lists |
|---|
| Enhanced performance requirements type B |
| Requirements with demodulation subframe overlaps with aggressor cell ABS |
| Requirements with demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured |

For 4Rx capable UEs, if corresponding tests listed from the 4Rx test lists from Table 9.1.1.4.1-2 are tested, the test coverage can be considered fulfilled without executing the corresponding tests listed from the 2Rx test lists from Table 9.1.1.4.1-2.

**Table 9.1.1.4.1-2: Applicability rules for single carrier tests with 2Rx**

| 4Rx test lists | 2Rx test lists |
|---|---|
| 9.9.1.1.1 Test 1 | 9.2.1.1 Test 1 |
| 9.9.1.1.1 Test 2 | 9.2.1.1 Test 2 |
| 9.9.1.1.2 Test 1 | 9.2.1.2 Test 1 |
| 9.9.1.1.2 Test 2 | 9.2.1.2 Test 2 |
| 9.9.1.2.1 Test 1 | 9.2.3.1 Test 1 |
| 9.9.1.2.1 Test 2 | 9.2.3.1 Test 2 |
| 9.9.1.2.2 Test 1 | 9.2.3.2 Test 1 |
| 9.9.1.2.2 Test 2 | 9.2.3.2 Test 2 |
| 9.9.2.1.1 | 9.3.5.1.1 |
| 9.9.2.1.2 | 9.3.5.1.2 |
| 9.9.2.2.1 | 9.3.5.2.1 |
| 9.9.2.2.2 | 9.3.5.2.2 |
| 9.9.3.1.1 Test 1 | 9.4.2.3.2 Test 1 |
| 9.9.4.1.1 Test 1 | 9.5.1.1 Test 1 |
| 9.9.4.1.1 Test 2 | 9.5.1.1 Test 2 |
| 9.9.4.1.1 Test 3 | 9.5.1.1 Test 3 |
| 9.9.4.1.2 Test 1 | 9.5.1.2 Test 1 |
| 9.9.4.1.2 Test 2 | 9.5.1.2 Test 2 |
| 9.9.4.1.2 Test 3 | 9.5.1.2 Test 3 |
| 9.9.4.2.1 Test 1 | 9.5.2.1 Test 1 |
| 9.9.4.2.1 Test 2 | 9.5.2.1 Test 2 |
| 9.9.4.2.1 Test 3 | 9.5.2.1 Test 3 |
| 9.9.4.2.2 Test 1 | 9.5.2.2 Test 1 |
| 9.9.4.2.2 Test 2 | 9.5.2.2 Test 2 |
| 9.9.4.2.2 Test 3 | 9.5.2.2 Test 3 |

### 9.1.1.4.2 Applicability rule and antenna connection for CA tests with 2Rx

All tests specified in 9.6 with 2Rx with CA and TDD-FDD CA are tested with 4 Rx capable UEs by connecting all 4Rx with data source from system simulator with the following change on the power level in the test configurations listed in Table 9.1.1.4.2-1 and by scheduling the PDSCH for user data based on the Reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 for FDD cells and Reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for TDD cells.

**Table 9.1.1.4.2-1: Power level for 4Rx capable UE to verify CA tests with 2Rx**

| Number of CCs | | $\hat{I}_{or}^{(j)}$ dB[mW/15kHz] |
|---|---|---|
| 2 | PCell | -88 |
| | SCell | -95 |
| 3,4 | PCell | -85 |
| | SCell1 | -92 |
| | SCell2, SCell3 | -99 |
| 5 | PCell | -85 |
| | SCell1 | -92 |
| | SCell2, SCell3, SCell4 | -99 |

Within the CA configuration if any of the PCell and/or the SCells is a 2Rx supported RF band, keep the same power level listed in Table 9.1.1.4.2-1. Within the CA configuration if any of the PCell and/or the SCells is a 4Rx supported RF band, configure the power level 3 dB smaller than the number listed in Table 9.1.1.4.2-1. Same requirements specified with 2Rx should be applied.

Same applicability rules defined in 9.1.1.2, 9.1.1.2A for CA and TDD-FDD CA applied for different CA configurations and bandwidth combination sets should be applied for 4 Rx capable UEs.

#### 9.1.1.4.3 Applicability rule and antenna connection for single carrier tests with 4Rx

For 4Rx capable UEs all single carrier tests specified in 9.9 with 4Rx are tested on any of the 4 Rx supported RF bands by connecting all 4Rx with data source from system simulator.

### 9.1.1.5 Applicability of requirements for UEs supporting coverage enhancement

For 2Rx capable UEs supporting coverage enhancement mode A (ce-ModeA in UE-EUTRA-Capability [5]), all the tests for CE Mode A specified in 9.8 are tested on any of the 2Rx supported RF bands by connecting all 2Rx with data source from system simulator. The SNR requirements should be applied with 3dB less than the number specified with UE DL Category M1.

For 4Rx capable UEs supporting coverage enhancement mode A (ce-ModeA in UE-EUTRA-Capability [5]), all the tests for CE Mode A specified in 9.8 are tested on any of the 4Rx supported RF bands by connecting all 4Rx with data source from system simulator. The SNR requirements should be applied with 6dB less than the number specified with UE DL Category M1.

## 9.2 CQI Reporting under AWGN conditions

The reporting accuracy of the channel quality indicator (CQI) under frequency non-selective conditions is determined by the reporting variance and the BLER performance using the transport format indicated by the reported CQI median. The purpose is to verify that the reported CQI values are in accordance with the CQI definition given in TS 36.213 [10] clause 7.2. To account for sensitivity of the input SNR the reporting definition is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

### 9.2.1 CQI Reporting under AWGN conditions - PUCCH 1-0 (Cell-Specific Reference Symbols)

#### 9.2.1.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0

Editor's notes:- Some test parameters for 5MHz in Table 9.2.1.1.3-2 are still in square brackets

##### 9.2.1.1.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

##### 9.2.1.1.2 Test applicability

This test applies to E-UTRA FDD UE release 8 and forward.

##### 9.2.1.1.3 Minimum conformance requirements

The following requirements apply to UE Category ≥1. For the parameters specified in Table 9.2.1.1.3-1 and Table 9.2.1.1.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.1 FDD / RC.14 FDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI +1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI –1) shall be less than or equal to 0.1

The applicability of the requirement with 5MHz bandwidth as specified in Table 9.2.1.1.3-2 is defined in clause 9.1.1.1.

**Table 9.2.1.1.3-1: PUCCH 1-0 static test**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | | |
| SNR (Note 2) | | dB | 0 | 1 | 6 | 7 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 | -92 | -91 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_P$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 6 | | | |
| Note 1: Reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1, except for category 1 UE use RC.4 FDD with two sided dynamic OCNG Pattern OP.2 FDD as described in Annex A.5.1.2.<br>Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. | | | | | | |

**Table 9.2.1.1.3-2: PUCCH 1-0 static test (FDD 5MHz)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 5 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | | |
| SNR (Note 2) | | dB | [0] | [1] | [6] | [7] |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | [-98] | [-97] | [-92] | [-91] |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 6 | | | |
| Note 1: Reference measurement channel RC.14 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1, except for category 1 UE use RC.15 FDD with two sided dynamic OCNG Pattern OP.2 FDD as described in Annex A.5.1.2.<br>Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.1.

#### 9.2.1.1.4 Test description

##### 9.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.2.1.1.3-1 and 5MHz for tests defined in Table 9.2.1.1.3-2, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 9.2.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.1.1.4.3.

##### 9.2.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.1.1.3-1 for 10MHz tests or Table 9.2.1.1.3-2 for 5MHz tests as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ ( Median CQI + 1) then continue with step 5, otherwise go to step 8.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.
6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) > 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) $\leq$ 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

9. If both tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the table 9.2.1.1.3-1 for 10MHz or table 9.2.1.1.3-2 for 5MHz for the other Test as appropriate. Otherwise pass the UE.

#### 9.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.2.1.1.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 6 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

### 9.2.1.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.1.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.2.1.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-0

### 9.2.1.2.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based on wideband median CQI-1 and wideband median CQI or the transport format based on wideband median CQI and wideband median CQI +1.

### 9.2.1.2.2 Test applicability

This test applies to E-UTRA TDD UE release 8 and forward.

### 9.2.1.2.3 Minimum conformance requirements

The following requirements apply to UE Category ≥1. For the parameters specified in Table 9.2.1.2.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.1 TDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI +1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI –1) shall be less than or equal to 0.1.

**Table 9.2.1.2.3-1: PUCCH 1-0 static test (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | | |
| SNR (Note 2) | | dB | 0 | 1 | 6 | 7 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 | -92 | -91 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Maximum number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_P$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: Reference measurement channel RC.1 TDD according to clause A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1, except for category 1 UE use RC.4 TDD with two sided dynamic OCNG Pattern OP.2 TDD as described in Annex A.5.2.2.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.2.

#### 9.2.1.2.4 Test description

##### 9.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 9.2.1.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.1.2.4.3.

##### 9.2.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.1.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ ( Median CQI + 1) then continue with step 5, otherwise go to step 8.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.
6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2).

The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

If the ratio (NACK /ACK + NACK) > 0.1

then pass the UE for this test and go to step 9, otherwise go to step 8.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

9. If both tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the table 9.2.1.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.2.1.2.4.3-2: CQI-ReportConfig-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.1.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

### 9.2.1.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.1.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.2.1.3

## 9.2.1.3_C FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC

### 9.2.1.3_C.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC (non-MBSFN ABS)

#### 9.2.1.3_C.1.1 Test purpose

To verify the variance of the wideband CQI reports - in subframes overlapping with aggressor cell ABS and non-ABS subframes - is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

#### 9.2.1.3_C.1.2 Test applicability

This test applies to E-UTRA FDD UE Category ≥1 - release 10 and forward. Applicability requires support for FGI bit 115.

#### 9.2.1.3_C.1.3 Minimum conformance requirements

For the parameters specified in Table 9.2.1.3_C.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 for Cell 1, C.3.3-1 for Cell 2 and C.3.2-2, the reported CQI value according to RC.2 FDD / RC.6 FDD in Table A.4-1 in subframes overlapping with aggressor cell ABS and non-ABS subframes shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER in non-ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ is less than or equal to 0.1, the BLER in non-ABS subframes using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER in non-ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in non-ABS subframes using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1. The value of the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ shall be larger than or equal to 2 and less than or equal to 5 in Test 1 and shall be larger than or equal to 0 and less than or equal to 1 in Test 2.

**Table 9.2.1.3_C.1.3-1: PUCCH 1-0 static test (FDD)**

| Parameter | | Unit | Test 1 | | | Test 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | | Cell 2 | Cell 1 | | Cell 2 |
| Bandwidth | | MHz | 10 | | | 10 | | |
| PDSCH transmission mode | | | 2 | | Note 9 | 2 | | Note 9 |
| Downlink power allocation | $\rho_A$ | dB | -3 | | | -3 | | |
| | $\rho_B$ | dB | -3 | | | -3 | | |
| | σ | dB | 0 | | | 0 | | |
| Propagation condition and antenna configuration | | | Clause B.1 (2x2) | | | Clause B.1 (2x2) | | |
| $\hat{E}_s / N_{oc2}$ (Note 1) | | dB | 4 | 5 | 6 | 4 | 5 | -12 |
| $N_{oc}^{(j)}$ at antenna port | $N_{oc1}^{(j)}$ | dBm/15kHz | -102 (Note 6) | | N/A | -98(Note 6) | | N/A |
| | $N_{oc2}^{(j)}$ | dBm/15kHz | -98 (Note 7) | | N/A | -98(Note 7) | | N/A |
| | $N_{oc3}^{(j)}$ | dBm/15kHz | -94.8 (Note 8) | | N/A | -98(Note 8) | | N/A |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -94 | -93 | -92 | -94 | -93 | -110 |
| Subframe Configuration | | | Non-MBSFN | | Non-MBSFN | Non-MBSFN | | Non-MBSFN |
| Cell Id | | | 0 | | 1 | 0 | | 1 |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | | | 2.5 (synchronous cells) | | |
| ABS pattern (Note 2) | | | N/A | | 01010101<br>01010101<br>01010101<br>01010101<br>01010101 | N/A | | 01010101<br>01010101<br>01010101<br>01010101<br>01010101 |
| RLM/RRM Measurement Subframe Pattern (Note 4) | | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | | N/A | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | | N/A |
| CSI Subframe Sets (Note 3) | $C_{CSI,0}$ | | 01010101<br>01010101<br>01010101<br>01010101<br>01010101 | | N/A | 01010101<br>01010101<br>01010101<br>01010101<br>01010101 | | N/A |
| | $C_{CSI,1}$ | | 10101010<br>10101010<br>10101010<br>10101010<br>10101010 | | N/A | 10101010<br>10101010<br>10101010<br>10101010<br>10101010 | | N/A |
| Number of control OFDM symbols | | | 3 | | | 3 | | |
| Max number of HARQ transmissions | | | 1 | | | 1 | | |
| Physical channel for $C_{CSI,0}$ CQI reporting | | | PUCCH Format 2 | | | PUCCH Format 2 | | |
| Physical channel for $C_{CSI,1}$ CQI reporting | | | PUSCH (Note 11) | | | PUSCH (Note 11) | | |
| PUCCH Report Type | | | 4 | | | 4 | | |
| Reporting periodicity | | Ms | $N_{pd}$ = 5 | | | $N_{pd}$ = 5 | | |
| *cqi-pmi-ConfigurationIndex* $C_{CSI,0}$ (Note 12) | | | 6 | | N/A | 6 | | N/A |
| *cqi-pmi-ConfigurationIndex2* $C_{CSI,1}$ (Note 13) | | | 5 | | N/A | 5 | | N/A |

| | |
|---|---|
| Note 1: | For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. |
| Note 2: | ABS pattern as defined in [14]. |
| Note 3: | As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5] |
| Note 4: | Time-domain measurement resource restriction pattern for PCell measurements as defined in [5] |
| Note 5: | Cell 1 is the serving cell. Cell 2 is the aggressor cell. |
| Note 6: | This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS. |
| Note 7: | This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS. |
| Note 8: | This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS. |
| Note 9: | Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.1.5 |
| Note 10: | Reference measurement channel in Cell 1 RC.2 FDD according to Table A.4-1 for UE Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1, and RC.6 FDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1 and A.5.1.2. |
| Note 11: | To avoid collisions between HARQ-ACK and wideband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3. |
| Note 12: | *cqi-pmi-ConfigurationIndex* is applied for $C_{CSI,0}$. |
| Note 13: | *cqi-pmi-ConfigurationIndex2* is applied for $C_{CSI,1}$. |

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.3.

### 9.2.1.3_C.1.4 Test description

#### 9.2.1.3_C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40.

2. The parameter settings for the cell are set up according to Table 9.2.1.3_C.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.1.3_C.1.4.3.

#### 9.2.1.3_C.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Tables 9.2.1.3_C.1.3-1 and C.3.3-1 of Annex C.3.3 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report for subframe set $C_{CSI,0}$ using PUCCH and for subframe set $C_{CSI,1}$ using PUSCH. Continue transmission of the PDSCH until 2000 wideband CQI reports, respectively for

subframe set $C_{CSI,0}$ and for subframe set $C_{CSI,1}$, have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values for subframe set $C_{CSI,0}$ and for subframe set $C_{CSI,1}$. Calculate respectively the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). These CQI-values are declared respectively as wideband Median $CQI_0$ and Median $CQI_1$.

4. If
Median $CQI_0$ is not equal to 1 or 15, and 1800 or more of the wideband CQI values for subframe set $C_{CSI,0}$ are in the range (Median $CQI_0$ - 1) ≤ Median $CQI_0$ ≤ ( Median $CQI_0$ + 1) AND
Median $CQI_1$ is not equal to 1 or 15, and 1800 or more of the wideband CQI values for subframe set $C_{CSI,1}$ are in the range (Median $CQI_1$ - 1) ≤ Median $CQI_1$ ≤ ( Median $CQI_1$ + 1) AND
the difference Median $CQI_0$ minus Median $CQI_1$ is 2 ≤ (Median $CQI_0$ – Median $CQI_1$) ≤ 5 for Test 1 and 0 ≤ (Median $CQI_0$ – Median $CQI_1$) ≤ 1 for Test 2,
then continue with step 5, otherwise go to step 8.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in non-ABS subframes according to the wideband Median $CQI_1$ value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report for subframe set $C_{CSI,0}$ using PUCCH and for subframe set $C_{CSI,1}$ using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in non-ABS subframes according to the wideband Median $CQI_1$+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report for subframe set $C_{CSI,0}$ using PUCCH and for subframe set $C_{CSI,1}$ using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) > 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in non-ABS subframes according to the wideband Median $CQI_1$-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report for subframe set $C_{CSI,0}$ using PUCCH and for subframe set $C_{CSI,1}$ using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

9. If both tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the table 9.2.1.3_C.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.2.1.3_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.1.3_C.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *Not present* | | |
| cqi-ReportConfig-r10 | *CQI-ReportConfig-r10-DEFAULT* | | |
| } | | | |

**Table 9.2.1.3_C.1.4.3-2: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | setup | | |
| setup SEQUENCE { | subframePatternFDD-r10 | | |
| subframePatternFDD-r10 | '0000010000000100 0000010000000100 00000100' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.1.3_C.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 6 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-pmi-ConfigIndex2-r10 | 5 | | |
| ri-Configindex2-r10 | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '0101010101010101 0101010101010101 01010101' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '1010101010101010 1010101010101010 10101010' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

9.2.1.3_C.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.1.3_C.1.4.2.

## 9.2.1.4

## 9.2.1.4_C TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC

### 9.2.1.4_C.1 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC (non-MBSFN ABS)

9.2.1.4_C.1.1 Test purpose

To verify the variance of the wideband CQI reports - in subframes overlapping with aggressor cell ABS and non-ABS subframes - is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

### 9.2.1.4_C.1.2 Test applicability

This test applies to E-UTRA TDD UE Category ≥1 release 10 and forward. Applicability requires support for FGI bit115.

### 9.2.1.4_C.1.3 Minimum conformance requirements

For the parameters specified in Table 9.2.1.4_C.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 for Cell 1, C.3.3-1 for Cell2 and C.3.2-2, the reported CQI value according to RC.2 TDD / RC.6 TDD in Table A.4-1 in subframes overlapping with aggressor cell ABS and non-ABS subframes shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER in non-ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ is less than or equal to 0.1, the BLER in non-ABS subframes using the transport format indicated by the (median CQI +1) shall be greater than 0.1. If the PDSCH BLER in non-ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in non-ABS subframes using transport format indicated by (median CQI –1) shall be less than or equal to 0.1. The value of the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ shall be larger than or equal to 2 and less than or equal to 5 in Test 1 and shall be larger than or equal to 0 and less than or equal to 1 in Test 2.

**Table 9.2.1.4_C.1.3-1: PUCCH 1-0 static test (TDD)**

| Parameter | | Unit | Test 1 | | | Test 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | | Cell 2 | Cell 1 | | Cell 2 |
| Bandwidth | | MHz | 10 | | | 10 | | |
| PDSCH transmission mode | | | 2 | | Note 9 | 2 | | Note 9 |
| Uplink downlink configuration | | | 1 | | | 1 | | |
| Special subframe configuration | | | 4 | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | | -3 | | |
| | $\rho_B$ | dB | -3 | | | -3 | | |
| | σ | dB | 0 | | | 0 | | |
| Propagation condition and antenna configuration | | | Clause B.1 (2x2) | | | Clause B.1 (2x2) | | |
| $\hat{E}_s / N_{oc2}$ (Note 1) | | dB | 4 | 5 | 6 | 4 | 5 | -12 |
| $N_{oc}^{(j)}$ at antenna port | $N_{oc1}^{(j)}$ | dBm/15kHz | -102(Note 6) | | N/A | -98(Note 6) | | N/A |
| | $N_{oc2}^{(j)}$ | dBm/15kHz | -98(Note 7) | | N/A | -98(Note 7) | | N/A |
| | $N_{oc3}^{(j)}$ | dBm/15kHz | -94.8(Note 8) | | N/A | -98(Note 8) | | N/A |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -94 | -93 | -92 | -94 | -93 | -110 |
| Subframe Configuration | | | Non-MBSFN | | Non-MBSFN | Non-MBSFN | | Non-MBSFN |
| Cell Id | | | 0 | | 1 | 0 | | 1 |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | | | 2.5 (synchronous cells) | | |
| ABS pattern (Note 2) | | | N/A | | 0100010001<br>0100010001 | N/A | | 0100010001<br>0100010001 |
| RLM/RRM Measurement Subframe Pattern (Note 4) | | | 0000000001<br>0000000001 | | N/A | 0000000001<br>0000000001 | | N/A |
| CSI Subframe Sets (Note 3) | $C_{CSI,0}$ | | 0100010001<br>0100010001 | | N/A | 0100010001<br>0100010001 | | N.A |
| | $C_{CSI,1}$ | | 1000101000<br>1000101000 | | N/A | 1000101000<br>1000101000 | | N/A |
| Number of control OFDM symbols | | | 3 | | | 3 | | |
| Max number of HARQ transmissions | | | 1 | | | 1 | | |
| Physical channel for $C_{CSI,0}$ CQI reporting | | | PUCCH Format 2 | | | PUCCH Format 2 | | |
| Physical channel for $C_{CSI,1}$ CQI reporting | | | PUSCH (Note 11) | | | PUSCH (Note 11) | | |
| PUCCH Report Type | | | 4 | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | $N_{pd}$ = 5 | | |
| *cqi-pmi-ConfigurationIndex* $C_{CSI,0}$ (Note 12) | | | 3 | | N/A | 3 | | N/A |
| *cqi-pmi-ConfigurationIndex*2 $C_{CSI,1}$ (Note 13) | | | 4 | | N/A | 4 | | N/A |
| ACK/NACK feedback mode | | | Multiplexing | | | Multiplexing | | |

| | |
|---|---|
| Note 1: | For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. |
| Note 2: | ABS pattern as defined in [14]. |
| Note 3: | As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5]. |
| Note 4: | Time-domain measurement resource restriction pattern for PCell measurements as defined in [5] |
| Note 5: | Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same. |
| Note 6: | This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS. |
| Note 7: | This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS |
| Note 8: | This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS. |
| Note 9: | Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.2.5. |
| Note 10: | Reference measurement channel in Cell 1 RC.2 TDD according to Table A.4-1 for UE Category 2-8 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1, and RC.6 TDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1 and Annex A.5.2.2. |
| Note 11: | To avoid collisions between HARQ-ACK and wideband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3. |
| Note 12: | *cqi-pmi-ConfigurationIndex* is applied for $C_{CSI,0}$. |
| Note 13: | *cqi-pmi-ConfigurationIndex2* is applied for $C_{CSI,1}$. |

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.4.

### 9.2.1.4_C.1.4 Test description

#### 9.2.1.4._C.14.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40.

2. The parameter settings for the cell are set up according to Table 9.2.1.4_C.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.1.4_C.1.4.3.

#### 9.2.1.4_C.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.1.4_C.1.3-1 and C.3.3-1 of Annex C.3.3 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF #8 and #3 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report for subframe set $C_{CSI,0}$ using PUCCH and for subframe set $C_{CSI,1}$ using PUSCH. Continue transmission of the PDSCH until 2000 wideband CQI reports, respectively for

subframe set $C_{CSI,0}$ and for subframe set $C_{CSI,1}$, have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values for subframe set $C_{CSI,0}$ and for subframe set $C_{CSI,1}$. Calculate respectively the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). These CQI-values are declared respectively as wideband Median $CQI_0$ and Median $CQI_1$.

4. If
Median $CQI_0$ is not equal to 1 or 15, and 1800 or more of the wideband CQI values for subframe set $C_{CSI,0}$ are in the range (Median $CQI_0$ - 1) ≤ Median $CQI_0$ ≤ ( Median $CQI_0$ + 1) AND
Median $CQI_1$ is not equal to 1 or 15, and 1800 or more of the wideband CQI values for subframe set $C_{CSI,1}$ are in the range (Median $CQI_1$ - 1) ≤ Median $CQI_1$ ≤ ( Median $CQI_1$ + 1) AND
the difference Median $CQI_0$ minus Median $CQI_1$ is 2 ≤ (Median $CQI_0$ – Median $CQI_1$) ≤ 5 for Test 1 and 0 ≤ (Median $CQI_0$ – Median $CQI_1$) ≤ 1 for Test 2,
then continue with step 5, otherwise go to step 8.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in non-ABS subframes according to the wideband Median $CQI_1$ value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF #8 and #3 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report for subframe set $C_{CSI,0}$ using PUCCH and for subframe set $C_{CSI,1}$ using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in non-ABS subframes according to the wideband Median $CQI_1$+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF #8 and #3 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report for subframe set $C_{CSI,0}$ using PUCCH and for subframe set $C_{CSI,1}$ using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) > 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in non-ABS subframes according to the wideband Median-$CQI_1$-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF #8 and #3 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report for subframe set $C_{CSI,0}$ using PUCCH and for subframe set $C_{CSI,1}$ using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

9. If both tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the table 9.2.1.4_C.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

### 9.2.1.4_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.1.4_C.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *Not present* | | |
| cqi-ReportConfig-r10 | *CQI-ReportConfig-r10-DEFAULT* | | |
| } | | | |

**Table 9.2.1.4_C.1.4.3-2: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE{ | | | |
| subframeConfig1-5-r10 | '0000000001 0000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.1.4_C.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 3 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-pmi-ConfigIndex2-r10 | 4 | | |
| ri-Configindex2-r10 | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '0100010001 0100010001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '1000101000 1000101000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.1.4_C.1.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

9.2.1.4_C.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.1.4_C.1.4.2.

## 9.2.1.5

## 9.2.1.5_E FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for feICIC

### 9.2.1.5_E.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for feICIC (non-MBSFN ABS)

#### 9.2.1.5_E.1.1 Test purpose

To verify the variance of the wideband CQI reports - in subframes overlapping with aggressor cell ABS and non-ABS subframes is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

#### 9.2.1.5_E.1.2 Test applicability

This test applies to E-UTRA FDD UE and CRS interference handling - UE Category ≥2 - release 11 and forward. Applicability requires support of FGI bit 115.

#### 9.2.1.5_E.1.3 Minimum conformance requirements

For the parameters specified in Table 9.2.1.5_E.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 for Cell 1, C.3.3-2 for Cell 2 and Cell 3, and C.3.2-2, the reported CQI value according to RC.2 FDD in Table A.4-1 in subframes overlapping with aggressor cell ABS and non-ABS subframes shall be in the range of ±1 of the reported median more than 90% of the time.

For test 1, if the PDSCH BLER in ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ is less than or equal to 0.1, the BLER in ABS subframes using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER in ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in ABS subframes using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

For test 2, if the PDSCH BLER in ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ is less than or equal to 0.1, the BLER in ABS subframes using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER in ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in ABS subframes using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

For test 2, if the PDSCH BLER in non-ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ is less than or equal to 0.1, the BLER in non-ABS subframes using the transport format indicated by the (median CQI + 2) shall be greater than 0.1. If the PDSCH BLER in non-ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in non-ABS subframes using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

**Table 9.2.1.5_E.1.3-1: PUCCH 1-0 static test (FDD)**

| Parameter | | Unit | Test 1 | | | Test 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | | Cell 2 and 3 | Cell 1 | | Cell 2 and 3 |
| Bandwidth | | MHz | 10 | | | 10 | | |
| PDSCH transmission mode | | | 2 | | Note 10 | 2 | | Note 10 |
| Downlink power allocation | $\rho_A$ | dB | -3 | | | -3 | | |
| | $\rho_B$ | dB | -3 | | | -3 | | |
| | σ | dB | 0 | | | 0 | | |
| Propagation condition and antenna configuration | | | Clause B.1 (2x2) | | | Clause B.1 (2x2) | | |
| $\widehat{E}_s / N_{oc2}$ (Note 1) | | dB | 4 | 5 | Cell 2: 12<br>Cell 3: 10 | 13 | 14 | Cell 2: 12<br>Cell 3: 10 |
| $N_{oc}^{(j)}$ at antenna port | $N_{oc1}^{(j)}$ | dBm/15kHz | -98 (Note 7) | | N/A | -98 (Note 7) | | N/A |
| | $N_{oc2}^{(j)}$ | dBm/15kHz | -98 (Note 8) | | N/A | -98 (Note 8) | | N/A |
| | $N_{oc3}^{(j)}$ | dBm/15kHz | -93 (Note 9) | | N/A | -93 (Note 9) | | N/A |
| Subframe Configuration | | | Non-MBSFN | | Non-MBSFN | Non-MBSFN | | Non-MBSFN |
| Cell Id | | | 0 | | Cell 2: 6<br>Cell 3: 1 | 0 | | Cell 2: 6<br>Cell 3: 1 |
| Time Offset between Cells | | μs | Cell 2: 3 usec<br>Cell 3: -1usec | | | Cell 2: 3 usec<br>Cell 3: -1usec | | |
| Frequency Shift between Cells | | Hz | Cell 2: 300Hz<br>Cell 3: -100Hz | | | Cell 2: 300Hz<br>Cell 3: -100Hz | | |
| ABS pattern (Note 2) | | | N/A | | 01010101<br>01010101<br>01010101<br>01010101<br>01010101 | N/A | | 01010101<br>01010101<br>01010101<br>01010101<br>01010101 |
| RLM/RRM Measurement Subframe Pattern (Note 4) | | | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | | N/A | 00000100<br>00000100<br>00000100<br>00000100<br>00000100 | | N/A |
| CSI Subframe Sets (Note 3) | $C_{CSI,0}$ | | 01010101<br>01010101<br>01010101<br>01010101<br>01010101 | | N/A | 01010101<br>01010101<br>01010101<br>01010101<br>01010101 | | N/A |
| | $C_{CSI,1}$ | | 10101010<br>10101010<br>10101010<br>10101010<br>10101010 | | N/A | 10101010<br>10101010<br>10101010<br>10101010<br>10101010 | | N/A |
| Number of control OFDM symbols | | | 3 | | | 3 | | |
| Max number of HARQ transmissions | | | 1 | | | 1 | | |
| Physical channel for $C_{CSI,0}$ CQI reporting | | | PUCCH Format 2 | | | PUCCH Format 2 | | |
| Physical channel for $C_{CSI,1}$ CQI reporting | | | PUSCH (Note 12) | | | PUSCH (Note 12) | | |
| PUCCH Report Type | | | 4 | | | 4 | | |
| Reporting periodicity | | Ms | $N_{pd}$ = 5 | | | $N_{pd}$ = 5 | | |
| *cqi-pmi-ConfigurationIndex* $C_{CSI,0}$ (Note 13) | | | 6 | | N/A | 6 | | N/A |
| *cqi-pmi-ConfigurationIndex2* $C_{CSI,1}$ (Note 14) | | | 5 | | N/A | 5 | | N/A |

| | |
|---|---|
| Note 1: | For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. |
| Note 2: | ABS pattern as defined in [9]. |
| Note 3: | Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5]. |
| Note 4: | As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5]. |
| Note 5: | Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5]. |
| Note 6: | Cell 1 is the serving cell. Cell 2 and Cell 3 are the aggressor cells. The number of the CRS ports in Cell 1, Cell 2, and Cell 3 are the same. |
| Note 7: | This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS. |
| Note 8: | This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS. |
| Note 9: | This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS. |
| Note 10: | Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex TS 36.521-1 [10] C.3.3 applying OCNG pattern as defined in TS 36.521-1 [10] Annex A.5.1.5 |
| Note 11: | Reference measurement channel in Cell 1 RC.2 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1. |
| Note 12: | To avoid collisions between HARQ-ACK and wideband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3. |
| Note 13: | *cqi-pmi-ConfigurationIndex* is applied for $C_{CSI,0}$. |
| Note 14: | *cqi-pmi-ConfigurationIndex2* is applied for $C_{CSI,1}$. |

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.5.

## 9.2.1.5_E.1.4 Test description

### 9.2.1.5_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 (without faders) for antenna configuration 2x2.

2. The parameter settings for the cell are set up according to Table 9.2.1.5_E.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 9.2.1.5_E.1.4.3.

### 9.2.1.5_E.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.1.5_E.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). The

UE will send ACK/NACK and periodic CQI report for subframe set $C_{CSI,0}$ using PUCCH and for subframe set $C_{CSI,1}$ using PUSCH. Continue transmission of the PDSCH until 2000 wideband CQI reports, respectively for subframe set $C_{CSI,0}$ and for subframe set $C_{CSI,1}$, have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values for subframe set $C_{CSI,0}$ and for subframe set $C_{CSI,1}$. Calculate respectively the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). These CQI-values are declared as wideband Median $CQI_0$ and Median $CQI_1$.

For Test1

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI values for subframe set $C_{CSI,0}$ are in the range (Median $CQI_0$ - 1) ≤ Median $CQI_0$ ≤ ( Median $CQI_0$ + 1), then continue with step 5, otherwise go to step 8.5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in ABS subframes according to the wideband median- $CQI_0$ value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in ABS subframes according to the wideband median- $CQI_0$+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) > 0.1

   then pass the UE for this test and go to step 13, otherwise go to step 8.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in ABS subframes according to the wideband median- $CQI_0$-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then pass the UE for this test and go to step 13, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

For Test2

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI values for subframe set $C_{CSI,0}$ are in the range (Median $CQI_0$ - 1) ≤ Median $CQI_0$ ≤ ( Median $CQI_0$ + 1) AND
   Median $CQI_1$ is not equal to 1 or 15, and 1800 or more of the wideband CQI values for subframe set $C_{CSI,1}$ are in the range (Median $CQI_1$ - 1) ≤ Median $CQI_1$ ≤ ( Median $CQI_1$ + 1), then continue with step 5, otherwise go to step 12.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in ABS subframes according to the wideband median- $CQI_0$ value and Non-ABS subframes according to the wideband median- $CQI_1$ value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). For

any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

For the filtered ACK and NACK responses in ABS and Non-ABS subframes if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6.

For the filtered ACK and NACK responses only in Non-ABS subframes if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 7.

For the filtered ACK and NACK responses only in ABS subframes if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 8, otherwise go to step 11.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in ABS subframes according to the wideband median- $CQI_0$+1 value and Non-ABS subframes according to the wideband median- $CQI_1$+2 value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   For the filtered ACK and NACK responses in ABS and Non-ABS subframes if the ratio (NACK /ACK + NACK) > 0.1 then pass the UE for this test and go to step 13, otherwise go to step 12.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in Non-ABS subframes according to the wideband median- $CQI_1$+2 value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) > 0.1 then pass the UE for this test and in step 10, otherwise go to step 11

8. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in ABS subframes according to the wideband median- $CQI_0$+1 value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) > 0.1 then pass the UE for this test and in step 9, otherwise go to step 11.

9. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in Non-ABS subframes according to the wideband median- $CQI_1$-1 value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) ≤ 0.1 then pass the UE for this test and go to step 13, otherwise go to step 12.

10. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in ABS subframes according to the wideband median- $CQI_0$-1 value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

    If the ratio (NACK /ACK + NACK) ≤ 0.1 then pass the UE for this test and go to step 13, otherwise go to step 12.

11. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in ABS subframes according to the wideband median- $CQI_0$-1 value, Non-ABS subframes according to the wideband median- $CQI_1$-1 value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in uplink SF#8 and #3 (Table A.4.1-1). For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

    For the filtered ACK and NACK responses in ABS and Non-ABS subframes if the ratio (NACK /ACK + NACK) $\leq$ 0.1 then pass the UE for this test and go to step 13, otherwise go to step 12.

12. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 11) for the other SNR point as appropriate. Otherwise fail the UE.

13. If both tests have not been done, then repeat the same procedure (For Test1 steps 1 to 8, For Test2 steps 1 to 12) with test conditions according to the table 9.2.1.5_E.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

### 9.2.1.5_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 9.2.1.5_E.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional FDD PUCCH 1-0 static test performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '0000010000000100 0000010000000100 00000100' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 6 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.1.5_E.1.4.3-2: PhysicalConfigDedicated-DEFAULT: Additional FDD PUCCH 1-0 static test performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 9.2.1.5_E.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT*: Additional FDD PUCCH 1-0 static test performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 6 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-pmi-ConfigIndex2-r10 | 5 | | |
| ri-Configindex2-r10 | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '0101010101010101 0101010101010101 01010101' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '1010101010101010 1010101010101010 10101010' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |

## 9.2.1.5_E.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.1.5_E.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

9.2.1.6

## 9.2.1.6_E TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for feICIC

### 9.2.1.6_E.1 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for feICIC (non-MBSFN ABS)

#### 9.2.1.6_E.1.1 Test purpose

To verify the variance of the wideband CQI reports - in subframes overlapping with aggressor cell ABS and non-ABS subframes is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

#### 9.2.1.6_E.1.2 Test applicability

This test applies to E-UTRA TDD UE and CRS interference handling and ss-CCH interference handling - UE Category ≥2 - release 11 and forward. Applicability requires support of FGI bit 115.

#### 9.2.1.6_E.1.3 Minimum conformance requirements

For the parameters specified in Table 9.2.1.6_E.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 for Cell 1, C.3.3-2 for Cell 2 and Cell 3, and C.3.2-2, the reported CQI value according to RC.2 TDD in Table A.4-1 in subframes overlapping with aggressor cell ABS and non-ABS subframes shall be in the range of ±1 of the reported median more than 90% of the time.

For test 1, if the PDSCH BLER in ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ is less than or equal to 0.1, the BLER in ABS subframes using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER in ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in ABS subframes using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

For test 2, if the PDSCH BLER in ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ is less than or equal to 0.1, the BLER in ABS subframes using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER in ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in ABS subframes using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

For test 2, if the PDSCH BLER in non-ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ is less than or equal to 0.1, the BLER in non-ABS subframes using the transport format indicated by the (median CQI + 2) shall be greater than 0.1. If the PDSCH BLER in non-ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in non-ABS subframes using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

**Table 9.2.1.6_E.1.3-1: PUCCH 1-0 static test (TDD)**

| Parameter | | Unit | Test 1 | | | Test 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | | Cell 2 and 3 | Cell 1 | | Cell 2 and 3 |
| Bandwidth | | MHz | 10 | | | 10 | | |
| PDSCH transmission mode | | | 2 | | Note 10 | 2 | | Note 10 |
| Uplink downlink configuration | | | 1 | | | 1 | | |
| Special subframe configuration | | | 4 | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | | -3 | | |
| | $\rho_B$ | dB | -3 | | | -3 | | |
| | σ | dB | 0 | | | 0 | | |
| Propagation condition and antenna configuration | | | Clause B.1 (2x2) | | | Clause B.1 (2x2) | | |
| $\widehat{E}_s / N_{oc2}$ (Note 1) | | dB | 4 | 5 | Cell 2: 12<br>Cell 3: 10 | 13 | 14 | Cell 2: 12<br>Cell 3: 10 |
| $N_{oc}^{(j)}$ at antenna port | $N_{oc1}^{(j)}$ | dBm/15kHz | -98 (Note 7) | | N/A | -98 (Note 7) | | N/A |
| | $N_{oc2}^{(j)}$ | dBm/15kHz | -98 (Note 8) | | N/A | -98 (Note 8) | | N/A |
| | $N_{oc3}^{(j)}$ | dBm/15kHz | -93 (Note 9) | | N/A | -93 (Note 9) | | N/A |
| Subframe Configuration | | | Non-MBSFN | | Non-MBSFN | Non-MBSFN | | Non-MBSFN |
| Cell Id | | | 0 | | Cell 2: 6<br>Cell 3: 1 | 0 | | Cell 2: 6<br>Cell 3: 1 |
| Time Offset between Cells | | µs | Cell 2: 3 usec<br>Cell 3: -1usec | | | Cell 2: 3 usec<br>Cell 3: -1usec | | |
| Frequency shift between Cells | | Hz | Cell 2: 300Hz<br>Cell 3: -100Hz | | | Cell 2: 300Hz<br>Cell 3: -100Hz | | |
| ABS pattern (Note 2) | | | N/A | | 0100010001<br>0100010001 | N/A | | 0100010001<br>0100010001 |
| RLM/RRM Measurement Subframe Pattern (Note 4) | | | 0000000001<br>0000000001 | | N/A | 0000000001<br>0000000001 | | N/A |
| CSI Subframe Sets (Note 3) | $C_{CSI,0}$ | | 0100010001<br>0100010001 | | N/A | 0100010001<br>0100010001 | | N.A |
| | $C_{CSI,1}$ | | 1000101000<br>1000101000 | | N/A | 1000101000<br>1000101000 | | N/A |
| Number of control OFDM symbols | | | 3 | | | 3 | | |
| Max number of HARQ transmissions | | | 1 | | | 1 | | |
| Physical channel for $C_{CSI,0}$ CQI reporting | | | PUCCH Format 2 | | | PUCCH Format 2 | | |
| Physical channel for $C_{CSI,1}$ CQI reporting | | | PUSCH (Note 12) | | | PUSCH (Note 12) | | |
| PUCCH Report Type | | | 4 | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | $N_{pd}$ = 5 | | |
| *cqi-pmi-ConfigurationIndex* $C_{CSI,0}$ (Note 13) | | | 3 | | N/A | 3 | | N/A |
| *cqi-pmi-ConfigurationIndex2* $C_{CSI,1}$ (Note 14) | | | 4 | | N/A | 4 | | N/A |
| ACK/NACK feedback mode | | | Multiplexing | | | Multiplexing | | |

| | |
|---|---|
| Note 1: | For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. |
| Note 2: | ABS pattern as defined in [9]. |
| Note 3: | Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5]. |
| Note 4: | As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5]. |
| Note 5: | Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5]. |
| Note 6: | Cell 1 is the serving cell. Cell 2 and Cell 3 are the aggressor cells. The number of the CRS ports in Cell 1, Cell 2, and Cell 3 is the same. |
| Note 7: | This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS. |
| Note 8: | This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS |
| Note 9: | This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS. |
| Note 10: | Downlink physical channel setup in Cell 2 and Cell 3 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern as defined in TS 36.521-1 [10] Annex A.5.2.5. |
| Note 11: | Reference measurement channel in Cell 1 RC.2 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. |
| Note 12: | To avoid collisions between HARQ-ACK and wideband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3. |
| Note 13: | *cqi-pmi-ConfigurationIndex* is applied for $C_{CSI,0}$. |
| Note 14: | *cqi-pmi-ConfigurationIndex2* is applied for $C_{CSI,1}$. |

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.6.

## 9.2.1.6_E.1.4 Test description

### 9.2.1.6_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 (without faders) for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Table 9.2.1.6_E.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 9.2.1.6_E.1.4.3.

### 9.2.1.6_E.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.1.6_E.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 in downlink SF#4 and #9 to schedule UL RMC in subframe #8 and subframe #3 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report for subframe set $C_{CSI,0}$ using PUCCH and for

subframe set $C_{CSI,1}$ using PUSCH. Continue transmission of the PDSCH until 2000 wideband CQI reports, respectively for subframe set $C_{CSI,0}$ and for subframe set $C_{CSI,1}$, have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values for subframe set $C_{CSI,0}$ and for subframe set $C_{CSI,1}$. Calculate respectively the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). These CQI-values are declared as wideband Median $CQI_0$ and Median $CQI_1$.

For Test1

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI values for subframe set $C_{CSI,0}$ are in the range (Median $CQI_0$ - 1) ≤ Median $CQI_0$ ≤ ( Median $CQI_0$ + 1) then continue with step 5, otherwise go to step 8.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in ABS subframes according to the wideband median- $CQI_0$ value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #8 and subframe #3 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in ABS subframes according to the wideband median- $CQI_0$+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #8 and subframe #3 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) > 0.1

   then pass the UE for this test and go to step 13, otherwise go to step 8.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in ABS subframes according to the wideband median- $CQI_0$-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #8 and subframe #3 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then pass the UE for this test and go to step 13, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

For Test2

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI values for subframe set $C_{CSI,0}$ are in the range (Median $CQI_0$ - 1) ≤ Median $CQI_0$ ≤ ( Median $CQI_0$ + 1) AND
   Median $CQI_1$ is not equal to 1 or 15, and 1800 or more of the wideband CQI values for subframe set $C_{CSI,1}$ are in the range (Median $CQI_1$ - 1) ≤ Median $CQI_1$ ≤ ( Median $CQI_1$ + 1), then continue with step 5, otherwise go to step 12.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in ABS subframes according to the wideband median- $CQI_0$ value and Non-ABS subframes according to the wideband median- $CQI_1$ value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #8 and subframe #3 (Table A.4.1-2). For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses in ABS and Non-ABS subframes if the ratio (NACK / ACK + NACK) $\leq$ 0.1 then go to step 6.

   For the filtered ACK and NACK responses only in Non-ABS subframes if the ratio (NACK / ACK + NACK) $\leq$ 0.1 then go to step 7.

   For the filtered ACK and NACK responses only in ABS subframes if the ratio (NACK / ACK + NACK) $\leq$ 0.1 then go to step 8, otherwise go to step 11.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in ABS subframes according to the wideband median- $CQI_0$+1 value and Non-ABS subframes according to the wideband median- $CQI_1$+2 value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #8 and subframe #3 (Table A.4.1-2). For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK.*

   For the filtered ACK and NACK responses in ABS and Non-ABS subframes if the ratio (NACK /ACK + NACK) > 0.1 then pass the UE for this test and go to step 13, otherwise go to step 12.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in Non-ABS subframes according to the wideband median- $CQI_1$+2 value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #8 and subframe #3 (Table A.4.1-2). For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) > 0.1 then pass the UE for this test and in step 10, otherwise go to step 11

8. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in ABS subframes according to the wideband median- $CQI_0$+1 value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) > 0.1 then pass the UE for this test and in step 9, otherwise go to step 11.

9. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in Non-ABS subframes according to the wideband median- $CQI_1$-1 value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #8 and subframe #3 (Table A.4.1-2). For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) $\leq$ 0.1 then pass the UE for this test and go to step 13, otherwise go to step 12.

10. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC only in ABS subframes according to the wideband median- $CQI_0$-1 value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling

information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #8 and subframe #3 (Table A.4.1-2). For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

If the ratio (NACK /ACK + NACK) $\leq$ 0.1 then pass the UE for this test and go to step 13, otherwise go to step 12.

11. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in ABS subframes according to the wideband median- $CQI_0$-1 value, Non-ABS subframes according to the wideband median- $CQI_1$-1 value, and the SS shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #8 and subframe #3 (Table A.4.1-2). For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

    For the filtered ACK and NACK responses in ABS and Non-ABS subframes if the ratio (NACK /ACK + NACK) $\leq$ 0.1 then pass the UE for this test and go to step 13, otherwise go to step 12.

12. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 11) for the other SNR point as appropriate. Otherwise fail the UE.

13. If both tests have not been done, then repeat the same procedure (For Test1 steps 1 to 8, For Test2 steps 1 to 12) with test conditions according to the table 9.2.1.6_E.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

### 9.2.1.6_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 9.2.1.6_E.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional TDD PUCCH 1-0 static test performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '0000000001 0000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 6 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.1.6_E.1.4.3-2: PhysicalConfigDedicated-DEFAULT: Additional TDD PUCCH 1-0 static test performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 9.2.1.6_E.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT*: Additional TDD PUCCH 1-0 static test performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 3 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-pmi-ConfigIndex2-r10 | 4 | | |
| ri-Configindex2-r10 | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '0100010001 0100010001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '1000101000 1000101000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.1.6_E.1.4.3-4: TDD-Config-DEFAULT: Additional TDD PUCCH 1-0 static test performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.2.1.6_E.1.4.3-5: PUCCH-ConfigDedicated-DEFAULT: Additional TDD PUCCH 1-0 static test performance downlink power allocation**

| Derivation Path: 36.508 clause4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | | |
| } | | | |

### 9.2.1.6_E.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.16_E.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.2.1.7 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for 256QAM in DL

Editor's note: SNR for 4Rx UE without 2Rx RF bands are still in square brackets

### 9.2.1.7.1 Test purpose

The same test purpose as in clause 9.2.1.1.1.

### 9.2.1.7.2 Test applicability

This test applies to E-UTRA FDD UE release 12 and forward of UE Category 11-12 and DL Category ≥11 that support 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.2.1.7.3 Minimum conformance requirements

The following requirements apply to UE Category 11-12 and DL Category ≥11. For the parameters specified in Table 9.2.1.7.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.1A FDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

In this test, 4-bit CQI Table 2 in Table 7.2.3-2 in TS 36.213 [10], and Modulation and TBS index table 2 in Table 7.1.7.1-1A for PDSCH in TS 36.213 [10] are applied.

**Table 9.2.1.7.3-1: PUCCH 1-0 static test (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | | |
| SNR (Note 2) | | dB | -1 | 0 | 20 | 21 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -99 | -98 | -78 | -77 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 6 | | | |
| Note 1: Reference measurement channel RC.1A FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1. | | | | | | |
| Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.7.

## 9.2.1.7.4 Test description

### 9.2.1.7.4.1 Initial conditions

Same Initial conditions as defined in clause 9.2.1.1.4.1 for 10MHz BW with the following exceptions:

- Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9 for UE with 2Rx RF band and Annex A, Figure A.9a for 4Rx capable UE without any 2Rx RF bands.
- Instead of Table 9.2.1.1.3-1, use Table 9.2.1.7.3-1.
- Instead of Clause 9.2.1.1.4.3, use Clause 9.2.1.7.4.3.

### 9.2.1.7.4.2 Test procedure

Same test procedure as defined in clause 9.2.1.1.4.2 for 10MHz BW with the following exceptions:

- Instead of Table 9.2.1.1.3-1, use Table 9.2.1.7.5-1.
- The SS shall transmit PDSCH via PDCCH DCI format 1 instead 1A.

### 9.2.1.7.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.1.7.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| cqi-ReportConfigPCell-v1250 SEQUENCE { | | | |
| altCQI-Table-r12 | allSubframes | | |
| } | | | |
| } | | | |

**Table 9.2.1.7.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 6 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

#### 9.2.1.7.5 Test requirement

**Table 9.2.1.7.5-1: PUCCH 1-0 static test (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | | |
| SNR for UE with 2Rx RF band (Note 2) | | dB | -1 | 0 | 20 | 21 |
| SNR for 4Rx UE without 2Rx RF band | | dB | [-4] | [-3] | [17] | [18] |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -99 | -98 | -78 | -77 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 6 | | | |

Note 1: Reference measurement channel RC.1A FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 3: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB.

The pass fail decision is as specified in the test procedure in clause 9.2.1.7.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 9.2.1.8 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for 256QAM in DL

Editor's note: SNR for 4Rx UE without 2Rx RF bands are still in square brackets

#### 9.2.1.8.1 Test purpose

The same test purpose as in clause 9.2.1.2.1.

#### 9.2.1.8.2 Test applicability

This test applies to E-UTRA TDD UE release 12 and forward of UE Category 11-12 and DL Category ≥11that supports 256QAM in DL.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.2.1.8.3 Minimum conformance requirements

The following requirements apply to UE Category 11-12 and UE DL Category ≥11. For the parameters specified in Table 9.2.1.8.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.1A TDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the

transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

In this test, 4-bit CQI Table 2 in Table 7.2.3-2 in TS 36.213 [10], and Modulation and TBS index table 2 in Table 7.1.7.1-1A for PDSCH in TS 36.213 [10] are applied.

**Table 9.2.1.8.3-1: PUCCH 1-0 static test (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 20 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | | |
| SNR (Note 2) | | dB | -1 | 0 | 20 | 21 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -99 | -98 | -78 | -77 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: Reference measurement channel RC.1A TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.8.

## 9.2.1.8.4 Test description

### 9.2.1.8.4.1 Initial conditions

Same Initial conditions as in clause 9.2.1.2.4.1 with the following exceptions:

- Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9 for UE with 2Rx RF band and Annex A, Figure A.9a for 4Rx capable UE without any 2Rx RF bands.
- Instead of Table 9.2.1.2.3-1, use Table 9.2.1.8.3-1.
- Instead of Clause 9.2.1.2.4.3, use Clause 9.2.1.8.4.3.

### 9.2.1.8.4.2 Test procedure

Same test procedure as in clause 9.2.1.2.4.2 with the following exceptions:

- Instead of Table 9.2.1.2.3-1, use Table 9.2.1.8.5-1.

- The SS shall transmit PDSCH via PDCCH DCI format 1 instead 1A

#### 9.2.1.8.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.1.8.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| cqi-ReportConfigPCell-v1250 SEQUENCE { | | | |
| altCQI-Table-r12 | allSubframes | | |
| } | | | |
| } | | | |

**Table 9.2.1.8.4.3-2: CQI-ReportConfig-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.1.8.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

#### 9.2.1.8.5 Test requirement

**Table 9.2.1.8.5-1: PUCCH 1-0 static test (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 20 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | | |
| SNR for UE with 2Rx RF band (Note 2) | | dB | -1 | 0 | 20 | 21 |
| SNR for 4Rx UE without 2Rx RF band | | | [4] | [-3] | [17] | [18] |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -99 | -98 | -78 | -77 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: Reference measurement channel RC.1A TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.
Note 4: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB.

The pass fail decision is as specified in the test procedure in clause 9.2.1.8.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.2.2 CQI Reporting under AWGN conditions - PUCCH 1-1 (Cell-Specific Reference Symbols)

### 9.2.2.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1

#### 9.2.2.1.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 - 1$ and median $CQI_1 - 1$ shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

#### 9.2.2.1.2 Test applicability

This test applies to E-UTRA FDD release 8 and forward UEs of Category 2 and onwards.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.2.2.1.3 Minimum conformance requirements

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

The following requirements apply to UE Category ≥2. For the parameters specified in table 9.2.2.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2.2 in TS 36.213 [10]) shall be used to determine the wideband CQI index for codeword #1 as

wideband $CQI_1$ = wideband $CQI_0$ – Codeword 1 offset level

The wideband $CQI_1$ shall be within the set {median $CQI_1$ -1, median $CQI_1$, median $CQI_1$ +1} for more than 90% of the time, where the resulting wideband values $CQI_1$ shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0$ – 1 and median $CQI_1$ – 1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0$ + 1 and median $CQI_1$ + 1 shall be greater than or equal to 0.1.

**Table 9.2.2.1.3-1: PUCCH 1-1 static test (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | | |
| | $\rho_B$ | dB | -3 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | Clause B.1 (2 x 2) | | | |
| CodeBookSubsetRestriction bitmap | | | 010000 | | | |
| SNR (Note 2) | | dB | 10 | 11 | 16 | 17 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -88 | -87 | -82 | -81 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI/PMI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | | |
| PUCCH Report Type for RI | | | 3 | | | |
| Reporting periodicity | | ms | $N_P$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 6 | | | |
| *ri-ConfigIndex* | | | 1 (Note 3) | | | |

Note 1: Reference measurement channel RC.2 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: It is intended to have UL collisions between RI reports and HARQ-ACK, since the RI reports shall not be used by the eNB in this test.

The normative reference for this requirement is TS 36.101 [2] clause 9.2.2.1.

#### 9.2.2.1.4 Test description

##### 9.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 for UE with 2Rx RF band and Annex A, Figure A.10a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.2.2.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.2.1.4.3.

##### 9.2.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.2.1.5-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing both according to CQI value 8 and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband and wideband spatial differential CQI reports respectively.

3. From each wideband CQI report, wideband $CQI_0$ is defined as Wideband CQI of codeword #0 and wideband $CQI_1$ is calculated according to clause 9.2.2.1.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median $CQI_0$ is based on the wideband $CQI_0$ and wideband median $CQI_1$ is based on the wideband $CQI_1$.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband $CQI_1$ values are in the range (Median $CQI_1$ - 1) ≤ Median CQI ≤ ( Median $CQI_1$ + 1) then continue with step 5, otherwise go to step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- $CQI_0$– 1 and the transport format of codeword #1 is according to the wideband median $CQI_1$– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≤ 0.1 for both codeword #0 and codeword #1

then and go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-$CQI_0$ + 1 and the transport format of codeword #1 is according to the wideband median-$CQI_1$ + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≥ 0.1 for both codeword #0 and codeword #1

   then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.2.2.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.2.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| } | | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 010000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.2.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | |
| } | | | |

**Table 9.2.2.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 6 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

## 9.2.2.1.5 Test requirement

**Table 9.2.2.1.5-1: PUCCH 1-1 static test (FDD)**

| **Parameter** | | **Unit** | **Test 1** | | **Test 2** | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | | |
| | $\rho_B$ | dB | -3 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | Clause B.1 (2 x 2) | | | |
| CodeBookSubsetRestriction bitmap | | | 010000 | | | |
| SNR for UE with 2Rx RF band (Note 2) | | dB | 10 | 11 | 16 | 17 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 7 | 8 | 13 | 14 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -88 | -87 | -82 | -81 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI/PMI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | | |
| PUCCH Report Type for RI | | | 3 | | | |
| Reporting periodicity | | ms | $N_P$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 6 | | | |
| *ri-ConfigIndex* | | | 1 (Note 3) | | | |

Note 1: Reference measurement channel RC.2 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: It is intended to have UL collisions between RI reports and HARQ-ACK, since the RI reports shall not be used by the eNB in this test.

Note4: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB.

The pass fail decision is as specified in the test procedure in clause 9.2.2.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

#### 9.2.2.1_D.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.2.1_D.4.2.

[TT TBD]

### 9.2.2.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1

#### 9.2.2.2.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective wideband median $CQI_0 – 1$ and wideband median $CQI_1 – 1$ shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective wideband median $CQI_0 + 1$ and wideband median $CQI_1 + 1$ shall be greater than or equal to 0.1.

#### 9.2.2.2.2 Test applicability

This test applies to E-UTRA TDD release 8 and forward UEs of Category 2 and onwards.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.2.2.2.3 Minimum conformance requirements

The following requirements apply to UE Category ≥2. For the parameters specified in table 9.2.2.2.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2.2 in TS 36.213 [10]) shall be used to determine the wideband CQI index for codeword #1 as:

$$\text{wideband } CQI_1 = \text{wideband } CQI_0 – \text{Codeword 1 offset level}$$

The wideband $CQI_1$ shall be within the set {median $CQI_1$ -1, median $CQI_1$, median $CQI_1$ +1} for more than 90% of the time, where the resulting wideband values $CQI_1$ shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 – 1$ and median $CQI_1 – 1$ shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

**Table 9.2.2.2.3-1: PUCCH 1-1 static test (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 4 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | | |
| | $\rho_B$ | dB | -3 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | Clause B.1 (2 x 2) | | | |
| CodeBookSubsetRestriction bitmap | | | 010000 | | | |
| SNR (Note 2) | | dB | 10 | 11 | 16 | 17 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -88 | -87 | -82 | -81 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Maximum number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type | | | 2 | | | |
| Reporting periodicity | | ms | $N_P$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| *ri-ConfigIndex* | | | 805 (Note 4) | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: Reference measurement channel RC.2 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

Note 4: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.

The normative reference for this requirement is TS 36.101 [2] clause 9.2.2.2.

## 9.2.2.2.4 Test description

### 9.2.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 for UE with 2Rx RF band and Annex A, Figure A.10a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.2.2.2.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.2.2.4.3.

#### 9.2.2.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.2.2.5-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing both according to CQI value 8 and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband and wideband spatial differential CQI reports respectively.

3. From each wideband CQI report, wideband $CQI_0$ is defined as Wideband CQI of codeword #0 and wideband $CQI_1$ is calculated according to clause 9.2.2.2.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median $CQI_0$ is based on the wideband $CQI_0$ and wideband median $CQI_1$ is based on the wideband $CQI_1$.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband $CQI_1$ values are in the range (Median $CQI_1$ - 1) ≤ Median CQI ≤ ( Median $CQI_1$ + 1) then continue with step 5, otherwise go to step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- $CQI_0$– 1 and the transport format of codeword #1 is according to the wideband median $CQI_1$– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK ) ≤ 0.1

   then, and go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-$CQI_0$ + 1 and the transport format of codeword #1 is according to the wideband median-$CQI_1$ + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

If the ratio (NACK /ACK + NACK) ≥ 0.1

then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.2.2.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| } | | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 010000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.2.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | |
| } | | | |

**Table 9.2.2.2.4.3-3: CQI-ReportConfig-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 805 | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.2.2.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa2 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

## 9.2.2.2.5 Test requirement

**Table 9.2.2.2.5-1: PUCCH 1-1 static test (TDD)**

| **Parameter** | | **Unit** | **Test 1** | | **Test 2** | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 4 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | | |
| | $\rho_B$ | dB | -3 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | Clause B.1 (2 x 2) | | | |
| CodeBookSubsetRestriction bitmap | | | 010000 | | | |
| SNR for UE with 2Rx RF band (Note 2) | | dB | 10 | 11 | 16 | 17 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 7 | 8 | 13 | 14 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -88 | -87 | -82 | -81 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Maximum number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type | | | 2 | | | |
| Reporting periodicity | | ms | $N_P$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| *ri-ConfigIndex* | | | 805 (Note 4) | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: Reference measurement channel RC.2 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

Note 4: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.

Note 5: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB.

The pass fail decision is as specified in the test procedure in clause 9.2.2.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.2.3 CQI Reporting under AWGN conditions - PUCCH 1-1 (CSI Reference Symbols)

### 9.2.3.1_D FDD CQI Reporting under AWGN conditions – PUCCH 1-1 for eDL-MIMO

#### 9.2.3.1_D.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 - 1$ and median $CQI_1 - 1$ shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

#### 9.2.3.1_D.2 Test applicability

This test applies to all types of E-UTRA FDD release 10 and forward UEs of Category 2 and onwards. Applicability requires support for FGI bit 103.

#### 9.2.3.1_D.3 Minimum conformance requirements

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

The following requirements apply to UE Category ≥2. For the parameters specified in table 9.2.3.1_D.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2 -2 in TS 36.213 [10]) shall be used to determine the wideband CQI index for codeword #1 as:

$$\text{wideband } CQI_1 = \text{wideband } CQI_0 - \text{Codeword 1 offset level}$$

The wideband $CQI_1$ shall be within the set {median $CQI_1$ -1, median $CQI_1$, median $CQI_1$ +1} for more than 90% of the time, where the resulting wideband values $CQI_1$ shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 - 1$ and median $CQI_1 - 1$ shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

**Table 9.2.3.1_D.3-1: PUCCH 1-1 static test (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 9 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | -3 | | | |
| | σ | dB | -3 | | | |
| Cell-specific reference signals | | | Antenna ports 0, 1 | | | |
| CSI reference signals | | | Antenna ports 15,…,18 | | | |
| Beamforming model | | | As specified in Annex B.4.3 | | | |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | | | |
| CSI reference signal configuration | | | 0 | | | |
| Propagation condition and antenna configuration | | | Clause B.1 (4 x 2) | | | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0100 0000 | | | |
| SNR (Note 2) | | dB | 7 | 8 | 13 | 14 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -91 | -90 | -85 | -84 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | | |
| Physical channel for RI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type for RI | | | 3 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| CQI delay | | ms | 8 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 2 | | | |
| *ri-ConfigIndex* | | | 1 | | | |

Note 1: Reference measurement channel RC.7 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.

The normative reference for this requirement is TS 36.101 [2] clause 9.2.3.1.

## 9.2.3.1_D.4 Test description

### 9.2.3.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.

2. The parameter settings for the cell are set up according to Table 9.2.3.1_D.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.3.1_D.4.3.

### 9.2.3.1_D.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.3.1_D.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing both according to CQI value 8 and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband and wideband spatial differential CQI reports respectively.

3. From each wideband CQI report, wideband $CQI_0$ is defined as Wideband CQI of codeword #0 and wideband $CQI_1$ is calculated according to clause 9.2.3.1_D.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median $CQI_0$ is based on the wideband $CQI_0$ and wideband median $CQI_1$ is based on the wideband $CQI_1$.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband $CQI_1$ values are in the range (Median $CQI_1$ - 1) ≤ Median CQI ≤ ( Median $CQI_1$ + 1) then continue with step 5, otherwise go to step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- $CQI_0$– 1 and the transport format of codeword #1 is according to the wideband median $CQI_1$– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≤ 0.1 for both codeword #0 and codeword #1

   then and go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-$CQI_0$ + 1 and the transport format of codeword #1 is according to the wideband median-$CQI_1$ + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≥ 0.1 for both codeword #0 and codeword #1

then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.2.3.1_D.3-1 for the other Test as appropriate. Otherwise pass the UE.

### 9.2.3.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.3.1_D.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 9.2.3.1_D.4.3-2: *Void***

**Table 9.2.3.1_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0100 0000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.2.3.1_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.2.3.1_D.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 2 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.3.1_D.4.3-6: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

## 9.2.3.1_D.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.3.1_D.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.2.3.2_D TDD CQI Reporting under AWGN conditions – PUCCH 1-1 for eDL-MIMO

### 9.2.3.2_D.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 – 1$ and median $CQI_1 – 1$ shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

### 9.2.3.2_D.2 Test applicability

This test applies to all types of E-UTRA TDD release 10 and forward UEs of Category 2 and onwards. Applicability requires support for FGI bit 104.

### 9.2.3.2_D.3 Minimum conformance requirements

The following requirements apply to UE Category ≥2. The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

For the parameters specified in table 9.2.3.2_D.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2 -2 in TS 36.213 [10]) shall be used to determine the wideband CQI index for codeword #1 as

$$\text{wideband } CQI_1 = \text{wideband } CQI_0 – \text{Codeword 1 offset level}$$

The wideband $CQI_1$ shall be within the set {median $CQI_1$ -1, median $CQI_1$, median $CQI_1$ +1} for more than 90% of the time, where the resulting wideband values $CQI_1$ shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 – 1$ and median $CQI_1 – 1$ shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

**Table 9.2.3.2_D.3-1: PUCCH 1-1 submode 1 static test (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 9 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | -6 | | | |
| | σ | dB | -3 | | | |
| CRS reference signals | | | Antenna ports 0, 1 | | | |
| CSI reference signals | | | Antenna ports 15,…,22 | | | |
| Beamforming model | | | As specified in Annex B.4.3 | | | |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/3 | | | |
| CSI reference signal configuration | | | 0 | | | |
| Propagation condition and antenna configuration | | | Clause B.1 (8 x 2) | | | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0020 0000 0000 0001 0000 | | | |
| SNR (Note 2) | | dB | 4 | 5 | 10 | 11 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -94 | -93 | -88 | -87 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type for CQI/second PMI | | | 2b | | | |
| Physical channel for RI reporting | | | PUSCH | | | |
| PUCCH Report Type for RI/ first PMI | | | 5 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| CQI delay | | ms | 10 or 11 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| *ri-ConfigIndex* | | | 805 (Note 4) | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: Reference measurement channel RC.7 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#7 and #2.

Note 4: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.

The normative reference for this requirement is TS 36.101 [2] clause 9.2.3.2.

## 9.2.3.2_D.4 Test description

### 9.2.3.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure 47.

2. The parameter settings for the cell are set up according to Table 9.2.3.2_D.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.3.2_D.4.3.

### 9.2.3.2_D.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.3.2_D.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing both according to CQI value 8 and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband and wideband spatial differential CQI reports respectively.

3. From each wideband CQI report, wideband $CQI_0$ is defined as Wideband CQI of codeword #0 and wideband $CQI_1$ is calculated according to clause 9.2.3.2_D.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median $CQI_0$ is based on the wideband $CQI_0$ and wideband median $CQI_1$ is based on the wideband $CQI_1$.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband $CQI_1$ values are in the range (Median $CQI_1$ - 1) ≤ Median CQI ≤ ( Median $CQI_1$ + 1) then continue with step 5, otherwise go to step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- $CQI_0$– 1 and the transport format of codeword #1 is according to the wideband median $CQI_1$– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then, and go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-$CQI_0$ + 1 and the transport format of codeword #1 is according to the wideband median-$CQI_1$ + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports

from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK.* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

If the ratio (NACK /ACK + NACK) ≥ 0.1

then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.2.3.2_D.3-1 for the other Test as appropriate. Otherwise pass the UE.

### 9.2.3.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.3.2_D.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 9.2.3.2_D.4.3-2: *Void***

**Table 9.2.3.2_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0020 0000 0000 0001 0000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.2.3.2_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.2.3.2_D.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | submode1 | | |
| } | | | |
| ri-ConfigIndex | 805 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.3.2_D.4.3-6: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.2.3.2_D.4.3-7: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | Multiplexing is selected as default to align with RAN4's assumptions in RF tests. | TDD |
| } | | | |

**Table 9.2.3.2_D.4.3-8: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an8 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 3 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -6 | Parameter: $P_C$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

### 9.2.3.2_D.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.3.2_D.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.2.4 CQI Reporting under AWGN conditions - Single CSI Process

### 9.2.4.1_F FDD CQI Reporting under AWGN conditions - Single CSI Process for CoMP

### 9.2.4.1_F.1 Test purpose

To verify compliance to the minimum requirements for dual codeword transmission being defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*.

### 9.2.4.1_F.2 Test applicability

This test applies to all types of E-UTRA FDD category ≥2 UEs release 11 and forward, supporting Maximum CSI processes of One, Three or Four on a component carrier within a band with PDSCH transmission mode 10.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.2.4.1_F.3 Minimum conformance requirements

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

For the parameters specified in table 9.2.4.1_F-1, and using the downlink physical channels specified in tables C.3.4-1 and C.3.4-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

$$\text{wideband } CQI_1 = \text{wideband } CQI_0 - \text{Codeword 1 offset level}$$

The wideband $CQI_1$ shall be within the set {median $CQI_1$ -1, median $CQI_1$, median $CQI_1$ +1} for more than 90% of the time, where the resulting wideband values $CQI_1$ shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 - 1$ and median $CQI_1 - 1$ shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

**Table 9.2.4.1_F.3-1: PUCCH 1-1 static test (FDD)**

| Parameter | | Unit | Test 1 | | | Test 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | TP1 | TP2 | | TP1 | TP2 | |
| Bandwidth | | MHz | 10 | | | | | |
| PDSCH transmission mode | | | 10 | | | | | |
| Downlink power allocation (Note 1) | $\rho_A$ | dB | 0 | 0 | | 0 | 0 | |
| | $\rho_B$ | dB | 0 | 0 | | 0 | 0 | |
| | $P_c$ | dB | -3 | -3 | | -3 | -3 | |
| | σ | dB | -3 | N/A | | -3 | N/A | |
| Cell ID | | | 0 | | | 0 | | |
| Cell-specific reference signals | | | Antenna ports 0, 1 | (Note 2) | | Antenna ports 0, 1 | (Note 2) | |
| CSI reference signals | | | Antenna ports 15,…,18 | N/A | | Antenna ports 15,…,18 | N/A | |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | N/A | | 5/1 | N/A | |
| CSI-RS configuration | | | 0 | N/A | | 0 | N/A | |
| Zero-Power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 1 / 0010000000000000 | 1 / 1000000000000000 | | 1 / 0010000000000000 | 1 / 1000000000000000 | |
| CSI-IM configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 1 / 0010000000000000 | N/A | | 1 / 0010000000000000 | N/A | |
| CSI process configuration Signal/Interference/Reporting mode | | | CSI-RS/CSI-IM/PUCCH 1-1 | | | CSI-RS/CSI-IM/PUCCH 1-1 | | |
| Propagation condition and antenna configuration | | | Clause B.1 (4 x 2) | Clause B.1 (2 x 2) | | Clause B.1 (4 x 2) | Clause B.1 (2 x 2) | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0100 0000 | 100000 | | 0x0000 0000 0100 0000 | 100000 | |
| SNR (Note 3) | | dB | 20 | 6 | 7 | 20 | 14 | 15 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -78 | -92 | -91 | -78 | -84 | -83 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | | -98 | | |
| Modulation / Information bit payload | | | (Note 4) | QPSK / 4392 | | (Note 4) | QPSK / 4392 | |
| Max number of HARQ transmissions | | | 1 | N/A | | 1 | N/A | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 5) | N/A | | PUSCH (Note 5) | N/A | |
| *PUCCH Report Type for CQI/PMI* | | | 2 | N/A | | 2 | N/A | |
| PUCCH Report Type for RI | | | 3 | N/A | | 3 | N/A | |
| Reporting periodicity | | ms | Npd = 5 | N/A | | $N_{pd}$ = 5 | N/A | |
| CQI Delay | | ms | 8 | N/A | | 8 | N/A | |
| cqi-pmi-ConfigurationIndex | | | 2 | N/A | | 2 | N/A | |
| ri-ConfigIndex | | | 1 | N/A | | 1 | N/A | |
| PDSCH scheduled sub-frames | | | 1,2,3,4,6,7,8,9 | | | 1,2,3,4,6,7,8,9 | | |
| Timing offset between TPs | | us | 0 | | | 0 | | |
| Frequency offset between TPs | | Hz | 0 | | | 0 | | |

Note 1: Reference measurement channel RC.10 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 2: REs for antenna ports 0 and 1 CRS have zero transmission power.
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 4: N/A
Note 5: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.

## 9.2.4.1_F.4 Test description

### 9.2.4.1_F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and AWGN noise source(s) to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A. Figure 52 (without faders) for UE with 2Rx RF band and Annex A, Figure A.52a (without faders) for 4Rx capable UE without any 2Rx RF bands

2. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.4 and uplink signals according to Annex H.1 and H.3.2.

3. Propagation conditions are set according to Annex B.0.

4. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.4.1_F.4.3.

### 9.2.4.1_F.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.4.1_F.5-1 as appropriate.

2. The SS shall transmit PDSCH on TP1 via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing both according to CQI value 8 and keep them regardless of the wideband CQI value sent by the UE. The SS shall transmit PDSCH not addressed to UE on TP2.The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information on TP1 via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband and wideband spatial differential CQI reports respectively.

3. From each wideband CQI report, wideband $CQI_0$ is defined as Wideband CQI of codeword #0 and wideband $CQI_1$ is calculated according to clause 9.2.4.1_F.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median $CQI_0$ is based on the wideband $CQI_0$ and wideband median $CQI_1$ is based on the wideband $CQI_1$.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband $CQI_1$ values are in the range (Median $CQI_1$ - 1) ≤ Median CQI ≤ ( Median $CQI_1$ + 1) then continue with step 5, otherwise go to step 7.

5. The SS shall transmit PDSCH on TP1 via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median $CQI_0$ - 1 and the transport format of codeword #1 is according to the wideband median $CQI_1$ - 1. The SS shall transmit PDSCH not addressed to UE on TP2. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information on TP1 via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process,

discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

If the ratio NACK / (ACK + NACK) ≤ 0.1 for both codeword #0 and codeword #1 then and go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH on TP1 via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-$CQI_0$ + 1 and the transport format of codeword #1 is according to the wideband median-$CQI_1$ + 1. The SS shall transmit PDSCH not addressed to UE on TP2. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information on TP1 via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio NACK / (ACK + NACK) ≥ 0.1 for both codeword #0 and codeword #1 then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.2.4.1_F.3-1 for the other Test as appropriate. Otherwise pass the UE.

### 9.2.4.1_F.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 9.2.4.1_F.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.8.2, Condition DL_CoMP | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| pdsch-ConfigDedicated | PDSCH-ConfigDedicated-DEFAULT | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| csi-RS-ConfigNZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-NZP-r11)) OF { | 1 entry | | |
| CSI-RS-ConfigNZP-r11[1] | CSI-RS-ConfigNZP-r11-DEFAULT | | |
| } | | | |
| csi-RS-ConfigZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-ZP-r11)) OF { | 1 entry | | |
| CSI-RS-ConfigZP-r11[1] | CSI-RS-ConfigZP-r11-DEFAULT | | |
| } | | | |
| cqi-ReportConfig-v1130 | CQI-ReportConfig-v1130-DEFAULT | | |
| } | | | |

**Table 9.2.4.1_F.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | Due to 4TX | |
| } | | | |

**Table 9.2.4.1_F.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0100 0000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.2.4.1_F.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | Using r10 periodic reporting only, since only 1 process | |
| } | | | |

**Table 9.2.4.1_F.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-pmi-ConfigIndex | 2 | SF#0 and #5 (see Table 7.2.2-1A in TS 36.213) | |
| ri-ConfigIndex | 1 | SF#4 and #9 (see Table 7.2.2-1B in TS 36.213) | |
| } | | | |
| } | | | |

**Table 9.2.4.1_F.4.3-6: *CSI-RS-ConfigNZP-r11-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigNZP-r11 ::= SEQUENCE { | | Non-Zero Power CSI-RS | |
| csi-RS-ConfigNZPId-r11 | 1 | | |
| antennaPortsCount-r11 | An4 | | |
| resourceConfig-r11 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r11 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |

**Table 9.2.4.1_F.4.3-7: *CSI-RS-ConfigZP-r11-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigZP-r11 ::= SEQUENCE { | | Zero Power CSI-RS - CSI-IM process must use a ZP CSI-RS resource. | |
| csi-RS-ConfigZPId-r11 | 1 | | |
| resourceConfigList-r11 | 0x0010000000000000 | A bitmap because >1 possible | |
| subframeConfig-r11 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |

**Table 9.2.4.1_F.4.3-8: *CQI-ReportConfig-v1130-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 | Not present | Using r10 periodic process only, additional extension processes not needed | |
| } | | | |
| cqi-ReportBoth-r11 SEQUENCE { | | | |
| csi-IM-ConfigToReleaseList-r11 | Not present | | |
| csi-IM-ConfigToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-IM-r11)) OF SEQUENCE { | 1 entry | CSI-IM Element | |
| csi-IM-ConfigId-r11[1] | 1 | | |
| resourceConfig-r11[1] | 2 | Has to be one of the ZP configs, 2 corresponds to 0x0010… | |
| subframeConfig-r11[1] | 1 | | |
| } | | | |
| csi-ProcessToReleaseList-r11 | Not present | | |
| csi-ProcessToAddModList-r11SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF SEQUENCE { | 1 entry | CSI-RS-Process Element | |
| csi-ProcessId-r11[1] | 1 | | |
| csi-RS-ConfigNZPId-r11[1] | 1 | | |
| csi-IM-ConfigId-r11[1] | 1 | | |
| p-C-AndCBSRList-r11[1] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[1] | -3 | | |
| codebookSubsetRestriction-r11[1] | 0x0000 0000 0100 0000 | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[1] | 0 | 0 is the process defined in CQI-ReportPeriodic.r10 | |
| } | | | |
| } | | | |
| } | | | |

9.2.4.1_F.5 Test requirement

**Table 9.2.4.1_F.5-1: PUCCH 1-1 static test (FDD)**

| Parameter | | Unit | Test 1 | | | Test 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | TP1 | TP2 | | TP1 | TP2 | |
| Bandwidth | | MHz | 10 | | | | | |
| PDSCH transmission mode | | | 10 | | | | | |
| Downlink power allocation (Note 1) | $\rho_A$ | dB | 0 | 0 | | 0 | 0 | |
| | $\rho_B$ | dB | 0 | 0 | | 0 | 0 | |
| | $P_c$ | dB | -3 | -3 | | -3 | -3 | |
| | $\sigma$ | dB | -3 | N/A | | -3 | N/A | |
| Cell ID | | | 0 | | | 0 | | |
| Cell-specific reference signals | | | Antenna ports 0, 1 | (Note 2) | | Antenna ports 0, 1 | (Note 2) | |
| CSI reference signals | | | Antenna ports 15,…,18 | N/A | | Antenna ports 15,…,18 | N/A | |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | N/A | | 5/1 | N/A | |
| CSI-RS configuration | | | 0 | N/A | | 0 | N/A | |
| Zero-Power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 1 / 0010000000000000 | 1 / 1000000000000000 | | 1 / 0010000000000000 | 1 / 1000000000000000 | |
| CSI-IM configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 1 / 0010000000000000 | N/A | | 1 / 0010000000000000 | N/A | |
| CSI process configuration Signal/Interference/Reporting mode | | | CSI-RS/CSI-IM/PUCCH 1-1 | | | CSI-RS/CSI-IM/PUCCH 1-1 | | |
| Propagation condition and antenna configuration | | | Clause B.1 (4 x 2) | Clause B.1 (2 x 2) | | Clause B.1 (4 x 2) | Clause B.1 (2 x 2) | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0100 0000 | 100000 | | 0x0000 0000 0100 0000 | 100000 | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 20 | 6 | 7 | 20 | 14 | 15 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 17 | 3 | 4 | 17 | 11 | 12 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -78 | -92 | -91 | -78 | -84 | -83 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | | -98 | | |
| Modulation / Information bit payload | | | (Note 4) | QPSK / 4392 | | (Note 4) | QPSK / 4392 | |
| Max number of HARQ transmissions | | | 1 | N/A | | 1 | N/A | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 5) | N/A | | PUSCH (Note 5) | N/A | |
| *PUCCH Report Type for CQI/PMI* | | | 2 | N/A | | 2 | N/A | |
| PUCCH Report Type for RI | | | 3 | N/A | | 3 | N/A | |
| Reporting periodicity | | ms | Npd = 5 | N/A | | $N_{pd}$ = 5 | N/A | |
| CQI Delay | | ms | 8 | N/A | | 8 | N/A | |
| cqi-pmi-ConfigurationIndex | | | 2 | N/A | | 2 | N/A | |
| ri-ConfigIndex | | | 1 | N/A | | 1 | N/A | |
| PDSCH scheduled sub-frames | | | 1,2,3,4,6,7,8,9 | | | 1,2,3,4,6,7,8,9 | | |
| Timing offset between TPs | | us | 0 | | | 0 | | |
| Frequency offset between TPs | | Hz | 0 | | | 0 | | |

| | |
|---|---|
| Note 1: | Reference measurement channel RC.10 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1. |
| Note 2: | REs for antenna ports 0 and 1 CRS have zero transmission power. |
| Note 3: | For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. |
| Note 4: | N/A |
| Note 5: | To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5. |
| Note 6: | The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB. |

The pass fail decision is as specified in the test procedure in clause 9.2.4.1_F.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.2.4.2_F TDD CQI Reporting under AWGN conditions - Single CSI Process for CoMP

### 9.2.4.2_F.1 Test purpose

To verify compliance to the minimum requirements for dual codeword transmission being defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*.

### 9.2.4.2_F.2 Test applicability

This test applies to all types of E-UTRA TDD category ≥2 UEs release 11 and forward, supporting Maximum CSI processes of One, Three or Four on a component carrier within a band with PDSCH transmission mode 10.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.2.4.2_F.3 Minimum conformance requirements

The following requirements apply to UE Category ≥2. For the parameters specified in table 9.2.4.2_F.3-1, and using the downlink physical channels specified in tables C.3.4-1 and C.3.4-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2-2 in TS 36.213) shall be used to determine the wideband CQI index for codeword #1 as

$$\text{wideband } CQI_1 = \text{wideband } CQI_0 - \text{Codeword 1 offset level}$$

The wideband $CQI_1$ shall be within the set {median $CQI_1$ -1, median $CQI_1$, median $CQI_1$ +1} for more than 90% of the time, where the resulting wideband values $CQI_1$ shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 - 1$ and median $CQI_1 - 1$ shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

**Table 9.2.4.2_F.3-1: PUCCH 1-1 static test (TDD)**

| Parameter | | Unit | Test 1 | | | Test 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | TP1 | TP2 | | TP1 | TP2 | |
| Bandwidth | | MHz | 10 | | | | | |
| PDSCH transmission mode | | | 10 | | | | | |
| Uplink downlink configuration | | | 2 | | | | | |
| Special subframe configuration | | | 4 | | | | | |
| Downlink power allocation (Note 1) | $\rho_A$ | dB | 0 | 0 | | 0 | 0 | |
| | $\rho_B$ | dB | 0 | 0 | | 0 | 0 | |
| | $P_c$ | dB | -6 | -6 | | -6 | -6 | |
| | $\sigma$ | dB | -3 | N/A | | -3 | N/A | |
| Cell ID | | | 0 | | | 0 | | |
| Cell-specific reference signals | | | Antenna ports 0, 1 | (Note 2) | | Antenna ports 0, 1 | (Note 2) | |
| CSI reference signals | | | Antenna ports 15,…,22 | N/A | | Antenna ports 15,…,22 | N/A | |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | | 5/3 | N/A | | 5/3 | N/A | |
| CSI-RS configuration | | | 0 | N/A | | 0 | N/A | |
| Zero-Power CSI-RS configuration $I_{CSI\text{-}RS}$ / *ZeroPowerCSI-RS*bitmap | | | 3 / 0010000000000000 | 3 / 1000010000000000 | | 3 / 0010000000000000 | 3 / 1000010000000000 | |
| CSI-IM configuration $I_{CSI\text{-}RS}$ / *ZeroPowerCSI-RS* bitmap | | | 3 / 0010000000000000 | N/A | | 3 / 0010000000000000 | N/A | |
| CSI process configuration Signal/Interference/Reporting mode | | | CSI-RS/CSI-IM/PUCCH 1-1 | | | CSI-RS/CSI-IM/PUCCH 1-1 | | |
| Propagation condition and antenna configuration | | | Clause B.1 (8 x 2) | Clause B.1 (2 x 2) | | Clause B.1 (8 x 2) | Clause B.1 (2 x 2) | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 0000 0000 0001 0000 | 100000 | | 0x0000 0000 0000 0000 0000 0001 0000 | 100000 | |
| SNR (Note 3) | | dB | 17 | 6 | 7 | 17 | 14 | 15 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -81 | -92 | -91 | -81 | -84 | -83 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | | -98 | | |
| Modulation / Information bit payload | | | (Note 4) | QPSK / 4392 | | (Note 4) | QPSK / 4392 | |
| Max number of HARQ transmissions | | | 1 | N/A | | 1 | N/A | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 5) | N/A | | PUSCH (Note 5) | N/A | |
| PUCCH Report Type for CQI/second PMI | | | 2b | N/A | | 2b | N/A | |
| Physical channel for RI reporting | | | PUSCH | N/A | | PUSCH | N/A | |
| PUCCH Report Type for RI/ first PMI | | | 5 | N/A | | 5 | N/A | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | N/A | | $N_{pd}$ = 5 | N/A | |
| CQI Delay | | ms | 10 or 11 | N/A | | 10 or 11 | N/A | |
| cqi-pmi-ConfigurationIndex | | | 3 | N/A | | 3 | N/A | |
| ri-ConfigIndex | | | 805 (Note 6) | N/A | | 805 (Note 6) | N/A | |
| ACK/NACK feedback mode | | | Multiplexing | N/A | | Multiplexing | N/A | |
| PDSCH scheduled sub-frames | | | 3,4,8,9 | | | 3,4,8,9 | | |
| Timing offset between TPs | | us | 0 | | | 0 | | |
| Frequency offset between TPs | | Hz | 0 | | | 0 | | |

| | |
|---|---|
| Note 1: | Reference measurement channel RC.10 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. |
| Note 2: | REs for antenna ports 0 and 1 CRS have zero transmission power. |
| Note 3: | For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. |
| Note 4: | N/A |
| Note 5: | To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#7 and #2. |
| Note 6: | RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification. |

The normative reference for this requirement is TS 36.101 clause 9.2.4.2.

## 9.2.4.2_F.4 Test description

### 9.2.4.2_F.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.53(without faders) for UE with 2Rx RF band and Annex A, Figure A.53a (without faders) for 4Rx capable UE without any 2Rx RF bands.

2. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.4 and uplink signals according to Annex H.1 and H.3.2.

3. Propagation conditions are set according to Annex B.0.

4. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.4.2_F.4.3.

### 9.2.4.2_F.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.4.2_F.5-1 as appropriate.

2. The SS shall transmit PDSCH on TP1 via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing both according to CQI value 8 and keep them regardless of the wideband CQI value sent by the UE. The SS shall transmit PDSCH not addressed to UE on TP2. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information on TP1 via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe # 2 and subframe #7 (Table A.4.1-2). The UE will send periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband and wideband spatial differential CQI reports respectively.

3. From each wideband CQI report, wideband CQI0 is defined as Wideband CQI of codeword #0 and wideband CQI1 is calculated according to clause 9.2.4.2_F.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for

each codewords. Wideband Median CQI0 is based on the wideband CQI0 and wideband median CQI1 is based on the wideband CQI1.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI1 values are in the range (Median CQI1 - 1) ≤ Median CQI ≤ (Median CQI1 + 1) then continue with step 5, otherwise go to step 7.

5. The SS shall transmit PDSCH on TP1 via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- CQI0 - 1 and the transport format of codeword #1 is according to the wideband median CQI1 – 1. The SS shall transmit PDSCH not addressed to UE on TP2. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information on TP1 via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio NACK / (ACK + NACK) ≤ 0.1 for both codeword #0 and codeword #1 then go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH on TP1 via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband medianCQI0 + 1 and the transport format of codeword #1 is according to the wideband median-CQI1 + 1. The SS shall transmit PDSCH not addressed to UE on TP2. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information on TP1 via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio NACK / (ACK + NACK) ≥ 0.1 for both codeword #0 and codeword #1 then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.2.4.2_F.3-1 for the other Test as appropriate. Otherwise pass the UE.

### 9.2.4.2_F.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

**Table 9.2.4.2_F.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.8.2, Condition DL_CoMP | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| pdsch-ConfigDedicated | PDSCH-ConfigDedicated-DEFAULT | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| csi-RS-ConfigNZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-NZP-r11)) OF { | 1 entry | | |
| CSI-RS-ConfigNZP-r11[1] | CSI-RS-ConfigNZP-r11-DEFAULT | | |
| } | | | |
| csi-RS-ConfigZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-ZP-r11)) OF { | 1 entry | | |
| CSI-RS-ConfigZP-r11[1] | CSI-RS-ConfigZP-r11-DEFAULT | | |
| } | | | |
| cqi-ReportConfig-v1130 | CQI-ReportConfig-v1130-DEFAULT | | |
| } | | | |

**Table 9.2.4.2_F.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | Due to 8TX | |
| } | | | |

**Table 9.2.4.2_F.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0000 0000 0000 0001 0000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.2.4.2_F.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | Using r10 periodic reporting only, since only 1 process | |
| } | | | |

**Table 9.2.4.2_F.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-pmi-ConfigIndex | 3 | SF #2 and #7(see Table 7.2.2-1C in TS 36.213) | |
| ri-ConfigIndex | 805 | Maximum 32*5=160ms periodicity for minimal cqi-pmi conflicts(see Table 7.2.2-1B in TS 36.213) | |
| } | | | |
| } | | | |

**Table 9.2.4.2_F.4.3-6: *CSI-RS-ConfigNZP-r11-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigNZP-r11 ::= SEQUENCE { | | Non-Zero Power CSI-RS | |
| csi-RS-ConfigNZPId-r11 | 1 | | |
| antennaPortsCount-r11 | An8 | | |
| resourceConfig-r11 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r11 | 3 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |

**Table 9.2.4.2_F.4.3-7: *CSI-RS-ConfigZP-r11-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigZP-r11 ::= SEQUENCE { | | Zero Power CSI-RS - CSI-IM process must use a ZP CSI-RS resource. | |
| csi-RS-ConfigZPId-r11 | 1 | | |
| resourceConfigList-r11 | 0x0010000000000000 | A bitmap because >1 possible | |
| subframeConfig-r11 | 3 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |

**Table 9.2.4.2_F.4.3-8: *CQI-ReportConfig-v1130-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 | Not present | Using r10 periodic process only, additional extension processes not needed | |
| } | | | |
| cqi-ReportBoth-r11 SEQUENCE { | | | |
| csi-IM-ConfigToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-IM-r11)) OF SEQUENCE { | 1 entry | CSI-IM Element | |
| csi-IM-ConfigId-r11[1] | 1 | | |
| resourceConfig-r11[1] | 2 | Has to be one of the ZP configs, 2 corresponds to 0x0010… | |
| subframeConfig-r11[1] | 3 | | |
| } | | | |
| csi-ProcessToAddModList-r11SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF SEQUENCE { | 1 entry | CSI-RS-Process Element | |
| csi-ProcessId-r11[1] | 1 | | |
| csi-RS-ConfigNZPId-r11[1] | 1 | | |
| csi-IM-ConfigId-r11[1] | 1 | | |
| p-C-AndCBSRList-r11[1] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[1] | -6 | | |
| codebookSubsetRestriction-r11[1] | 0x0000 0000 0000 0000 0000 0001 0000 | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[1] | 0 | 0 is the process defined in CQI-ReportPeriodic.r10 | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.4.2_F.4.3-9: *TDD-Config-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa2 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

9.2.4.2_F.5 Test requirement

**Table 9.2.4.2_F.5-1: PUCCH 1-1 static test (TDD)**

| Parameter | | Unit | Test 1 | | | Test 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | TP1 | TP2 | | TP1 | TP2 | |
| Bandwidth | | MHz | 10 | | | | | |
| PDSCH transmission mode | | | 10 | | | | | |
| Uplink downlink configuration | | | 2 | | | | | |
| Special subframe configuration | | | 4 | | | | | |
| Downlink power allocation (Note 1) | $\rho_A$ | dB | 0 | 0 | | 0 | 0 | |
| | $\rho_B$ | dB | 0 | 0 | | 0 | 0 | |
| | $P_c$ | dB | -6 | -6 | | -6 | -6 | |
| | $\sigma$ | dB | -3 | N/A | | -3 | N/A | |
| Cell ID | | | 0 | | | 0 | | |
| Cell-specific reference signals | | | Antenna ports 0, 1 | (Note 2) | | Antenna ports 0, 1 | (Note 2) | |
| CSI reference signals | | | Antenna ports 15,…,22 | N/A | | Antenna ports 15,…,22 | N/A | |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/3 | N/A | | 5/3 | N/A | |
| CSI-RS configuration | | | 0 | N/A | | 0 | N/A | |
| Zero-Power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS*bitmap | | | 3 / 0010000000000000 | 3 / 1000010000000000 | | 3 / 0010000000000000 | 3 / 1000010000000000 | |
| CSI-IM configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 3 / 0010000000000000 | N/A | | 3 / 0010000000000000 | N/A | |
| CSI process configuration Signal/Interference/Reporting mode | | | CSI-RS/CSI-IM/PUCCH 1-1 | | | CSI-RS/CSI-IM/PUCCH 1-1 | | |
| Propagation condition and antenna configuration | | | Clause B.1 (8 x 2) | Clause B.1 (2 x 2) | | Clause B.1 (8 x 2) | Clause B.1 (2 x 2) | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 0000 0000 0001 0000 | 100000 | | 0x0000 0000 0000 0000 0000 0001 0000 | 100000 | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 17 | 6 | 7 | 17 | 14 | 15 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 14 | 3 | 4 | 14 | 11 | 12 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -81 | -92 | -91 | -81 | -84 | -83 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | | -98 | | |
| Modulation / Information bit payload | | | (Note 4) | QPSK / 4392 | | (Note 4) | QPSK / 4392 | |
| Max number of HARQ transmissions | | | 1 | N/A | | 1 | N/A | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 5) | N/A | | PUSCH (Note 5) | N/A | |
| PUCCH Report Type for CQI/second PMI | | | 2b | N/A | | 2b | N/A | |
| Physical channel for RI reporting | | | PUSCH | N/A | | PUSCH | N/A | |
| PUCCH Report Type for RI/ first PMI | | | 5 | N/A | | 5 | N/A | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | N/A | | $N_{pd}$ = 5 | N/A | |
| CQI Delay | | ms | 10 or 11 | N/A | | 10 or 11 | N/A | |
| cqi-pmi-ConfigurationIndex | | | 3 | N/A | | 3 | N/A | |
| ri-ConfigIndex | | | 805 (Note 6) | N/A | | 805 (Note 6) | N/A | |
| ACK/NACK feedback mode | | | Multiplexing | N/A | | Multiplexing | N/A | |
| PDSCH scheduled sub-frames | | | 3,4,8,9 | | | 3,4,8,9 | | |
| Timing offset between TPs | | us | 0 | | | 0 | | |

| | | | |
|---|---|---|---|
| Frequency offset between TPs | Hz | 0 | 0 |

Note 1: Reference measurement channel RC.10 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
Note 2: REs for antenna ports 0 and 1 CRS have zero transmission power.
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 4: N/A
Note 5: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#7 and #2.
Note 6: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.
Note 7: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

The pass fail decision is as specified in the test procedure in clause 9.2.4.2_F.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.2.5 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 (when *csi-SubframeSet –r12* and *EIMTA-MainConfigServCell-r12* are configured)

### 9.2.5.1 Test purpose

To verify for each subframe set, the variance of the reported CQI value is within the limits defined, the PDSCH BLER of 10% falls between the transport format indicated by median CQI-1 and CQI or the transport format indicated by median CQI and CQI+1, and the difference of the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ and the median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ shall be larger than or equal to 3.

### 9.2.5.2 Test applicability

This test applies to E-UTRA TDD release 12 and forward UEs of Category 2 and onwards which supports eIMTA TDD UL-DL reconfiguration for TDD serving cell(s) via monitoring PDCCH with eIMTA-RNTI and Rel-12 CSI subframe sets.

### 9.2.5.3 Minimum conformance requirements

The following requirements apply to UE Category ≥2 which supports eIMTA TDD UL-DL reconfiguration for TDD serving cell(s) via monitoring PDCCH with eIMTA-RNTI and Rel-12 CSI subframe sets. For the parameters specified in table 9.2.5.3-1, and using the downlink physical channels specified in Tables C.3.2-1 and C.3.2-2, for each CSI subframe set, the reported CQI value shall be in the range of ±1 of the reported median more than 90% of the time. For each CSI subframe set, if the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1. The difference of the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ and the median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ shall be larger than or equal to 3.

**Table 9.2.5.3-1: PUCCH 1-1 static test (TDD)**

| Parameter | | Unit | Test | |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 | |
| PDSCH transmission mode | | | 9 | |
| Uplink downlink configuration in SIB1 | | | 0 | |
| Downlink HARQ reference configuration (eimta-HarqReferenceConfig-r12) (Note 4) | | | 2 | |
| Set of dynamic TDD UL-DL configurations (Notes 4,5) | | | {0, 2} | |
| Periodicity of monitoring the L1 reconfiguration DCI (eimta-CommandPeriodicity-r12) | | ms | 10 | |
| Set of subframes to monitor the L1 reconfiguration DCI (eimta-CommandSubframeSet-r12) | | | SF#5 | |
| CSI-MeasSubframeSet-r12 | | | 0001100011 | |
| Special subframe configuration | | | 4 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| | $P_C$ | dB | 0 | |
| | $\sigma$ | dB | -3 | |
| CRS reference signals | | | Antenna ports 0, 1 | |
| CSI reference signals | | | Antenna ports 15,16 | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/4 | |
| CSI reference signal configuration | | | 4 | |
| Zero-Power CSI-RS configuration 0 $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | | 0 / 0000010000000000 | |
| Zero-Power CSI-RS configuration 1 $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | | 4 / 0100000000000000 | |
| Propagation condition and antenna configuration | | | Clause B.1 (2 x 2) | |
| Beamforming Model | | | As specified in Section B.4.3 | |
| CodeBookSubsetRestriction bitmap | | | '000001' | |
| SNR in CSI subframe set 0 | | dB | 0 | 1 |
| SNR in CSI subframe set 1 | | dB | 10 | 11 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 |
| $N_{oc1}^{(j)}$ for CSI subframe set 0 | | dB[mW/15kHz] | -98 | -98 |
| $N_{oc2}^{(j)}$ for CSI subframe set 1 | | dB[mW/15kHz] | -108 | -108 |
| PDSCH scheduled subframes for CSI subframe set 0 | | | 0,5 | |
| PDSCH scheduled subframes for CSI subframe set 1 | | | 3,4,8,9 | |
| Max number of HARQ transmissions | | | 1 | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 6) | |
| PUCCH Report Type for CQI/second PMI | | | 2b | |
| Physical channel for RI reporting | | | PUSCH | |
| PUCCH Report Type for RI/ first PMI | | | 5 | |
| Reporting periodicity | | ms | $N_{\text{pd}}$ = 10 for each Rel-12 CSI subframe set | |
| CQI delay | | ms | 14 for CSI subframe set 0<br>12 for CSI subframe set 1 | |
| *cqi-pmi-ConfigurationIndex* | | | 8 for set 0<br>13 for set 1 | |
| *ri-ConfigIndex* | | | 805 for both set 0 and set 1 (Note 7) | |
| ACK/NACK feedback mode | | | Multiplexing | |

| | |
|---|---|
| Note 1: | Reference measurement channel RC.19 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD and dynamic OCNG Pattern with multiple non-contiguous blocks OP.7 TDD as described in Annex A.5.2.1/7 for CSI subframe set 0. |
| Note 2: | Reference measurement channel RC.20 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for CSI subframe set 1. |
| Note 3: | In the test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level for each CSI subframe set separately. |
| Note 4: | As specified in Table 4.2-2 in TS 36.211. |
| Note 5: | UL/DL configuration in PDCCH with eIMTA-RNTI is cyclically selected from the given set on a per-DCI basis. |
| Note 6: | To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#7 and #2. CQI/PMI reports for CSI subframe set 0 is transmitted in SF#2 and CQI/PMI reports for CSI subframe set 1 is transmitted in SF#7. |
| Note 7: | RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification. |

The normative reference for this requirement is TS 36.101 [2] clause 9.2.5.

## 9.2.5.4 Test description

### 9.2.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 for UE with 2Rx RF.

2. The parameter settings for the cell are set up according to Table 9.2.5.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.5.4.3.

### 9.2.5.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.5.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband CQI reports for each CSI subframe sets have been gathered. In this process the SS collects wideband CQI reports for CSI subframe set 0 at every SF#2 and wideband CQI reports for CSI subframe set 1 at every SF#7, and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.

3. For each CSI subframe set, set up a relative frequency distribution for the reported wideband CQI-values. Calculate the median values (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). These CQI-values are declared as wideband Median $CQI_0$ for CSI subframe set 0 and Median $CQI_1$ for CSI subframe set 1.

4. If for both CSI subframe sets, the Median CQIs are not equal to 1 or 15 and 1800 or more of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ ( Median CQI + 1), and the difference between the 2 Median CQIs is larger than or equal to 3, then continue with step 5, otherwise go to step 10.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on CSI subframe set 0 according to the Median $CQI_0$, and on CSI subframe set 1 according to the Median $CQI_1$ and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for 2 CSI subframe sets respectively. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK.* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each CSI subframe set reaches 1000.

   For the filtered ACK and NACK responses:

   if the ratio (NACK / ACK + NACK) in CSI subframe set 0 ≤ 0.1, and the ratio (NACK / ACK + NACK) in CSI subframe set 1 ≤ 0.1, then go to step 6,

   if the ratio (NACK / ACK + NACK) in CSI subframe set 0 ≤ 0.1, and the ratio (NACK / ACK + NACK) in CSI subframe set 1 > 0.1, then go to step 7,

   if the ratio (NACK / ACK + NACK) in CSI subframe set 0 > 0.1, and the ratio (NACK / ACK + NACK) in CSI subframe set 1 ≤ 0.1, then go to step 8,

   if the ratio (NACK / ACK + NACK) in CSI subframe set 0 > 0.1, and the ratio (NACK / ACK + NACK) in CSI subframe set 1 > 0.1, then go to step 9.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on CSI subframe set 0 according to the Median $CQI_0$+1, and on CSI subframe set 1 according to the Median $CQI_1$+1 and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses for each CSI subframe set are gathered. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   if the ratio (NACK / ACK + NACK) in CSI subframe set 0 > 0.1, and the ratio (NACK / ACK + NACK) in CSI subframe set 1 > 0.1, then pass the UE for this test, otherwise go to step 10.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on CSI subframe set 0 according to the Median $CQI_0$+1, and on CSI subframe set 1 according to the Median $CQI_1$-1 and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses for each CSI subframe set are gathered. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   if the ratio (NACK / ACK + NACK) in CSI subframe set 0 > 0.1, and the ratio (NACK / ACK + NACK) in CSI subframe set 1 ≤ 0.1, then pass the UE for this test, otherwise go to step 10.

8. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on CSI subframe set 0 according to the Median $CQI_0$-1, and on CSI subframe set 1 according to the Median $CQI_1$+1 and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record and filter the ACK, NACK and statDTX

responses as in step 5 until 1000 filtered ACK+NACK responses for each CSI subframe set are gathered. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

if the ratio (NACK / ACK + NACK) in CSI subframe set 0 ≤ 0.1, and the ratio (NACK / ACK + NACK) in CSI subframe set 1 > 0.1, then pass the UE for this test, otherwise go to step 10.

9. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on CSI subframe set 0 according to the Median $CQI_0$-1, and on CSI subframe set 1 according to the Median $CQI_1$-1 and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses for each CSI subframe set are gathered. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   if the ratio (NACK / ACK + NACK) in CSI subframe set 0 ≤ 0.1, and the ratio (NACK / ACK + NACK) in CSI subframe set 1 ≤ 0.1, then pass the UE for this test, otherwise go to step 10.

10. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 9) for the other SNR point as appropriate. Otherwise fail the UE.

#### 9.2.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.5.4.3-1: *TDD-Config-DEFAULT*: TDD PDSCH Transmit Diversity 2x2 for eIMTA requirement**

| Derivation Path: 36.508 Table 4.6.3-23 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa0 | | |
| } | | | |

**Table 9.2.5.4.3-2: *RadioResourceConfigDedicated*: TDD PDSCH Transmit Diversity 2x2 for eIMTA requirement**

| Derivation Path: 36.508 Table 4.6.3-16 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | PhysicalConfigDedicated -eIMTA using condition RBC and eIMTA | For signalling test cases see subclause 6.6B.1.1.1. Otherwise, see subclause 4.8.2 | |
| } | | | |

**Table 9.2.5.4.3-3: *PhysicalConfigDedicated-eIMTA* (In Table 9.2.5.4.3-2)**

| Derivation Path: 36.508 Table 4.8.2.1.6-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-eIMTA ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 000001 | | |
| ue-TransmitAntennaSelection | | | |
| release | | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10 | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| eimta-MainConfig-r12 CHOICE { | | | |
| setup SEQUENCE { | | | |
| eimta-RNTI-r12 | Set to the value of the C-RNTI of the UE | | |
| eimta-CommandPeriodicity-r12 | sf10 | | |
| eimta-CommandSubframeSet-r12 | 0000010000 | | |
| } | | | |
| } | | | |
| eimta-MainConfigPCell-r12 CHOICE { | | | |
| setup SEQUENCE { | | | |
| eimta-UL-DL-ConfigIndex-r12 | 1 | | |
| eimta-HARQ-ReferenceConfig-r12 | sa2 | | |
| mbsfn-SubframeConfigList-v1250 | Not present | | |
| } | | | |
| } | | | |
| cqi-ReportConfigPCell-v1250 SEQUENCE { | | | |
| csi-SubframePatternConfig-r12 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSets-r12 | 0001100011 | | |
| } | | | |
| } | | | |
| } | | | |
| csi-RS-Config-v1250 SEQUENCE { | | | |
| zeroTxPowerCSI-RS2-r12 SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r12 | 4 | | |
| zeroTxPowerSubframeConfig-r12 | 0100000000000000 | | |
| } | | | |
| ds-ZeroTxPowerCSI-RS-r12 | Not present | | |
| } | | | |
| | | | |
| } | | | |

**Table 9.2.5.4.3-4: *CQI-ReportConfig-r10* (In Table 9.2.5.4.3-3)**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10 | | |
| pmi-RI-Report-r9 | setup | | |
| csi-SubframePatternConfig-r10 | Not Present | | |
| } | | | |

**Table 9.2.5.4.3-5: *CQI-ReportPeriodic-r10* (In Table 9.2.5.4.3-4)**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 8 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 805 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-pmi-ConfigIndex2-r10 | 13 | | |
| ri-ConfigIndex2-r10 | 805 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.5.4.3-6: *CSI-RS-Config-r10* (In Table 9.2.5.4.3-3)**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 4 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r12 | 0 | | |
| zeroTxPowerSubframeConfig-r12 | 0000010000000000 | | |
| } | | | |
| } | | | |
| } | | | |

### 9.2.5.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.5.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.2.6 CQI Reporting under AWGN Conditions-PUSCH 3-0 – LAA (Cell-Specific Reference Symbols)

### 9.2.6.1 LAA CQI Reporting under AWGN Conditions with Frame Structure Type 3 with FDD as Pcell (PUSCH 3-0)

#### 9.2.6.1.1 Test purpose

To verify the variance of the wideband CQI reports for LAA SCell is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1. To verify that the UE reports different CQI indices for LAA SCell if the cell experiences different SNR(s) caused by different power boosts.

#### 9.2.6.1.2 Test applicability

This test applies to all types of E-UTRA FDD Release 13 and forward UEs of category ≥ 1 that support LAA with E-UTRA FDD as PCell.

#### 9.2.6.1.3 Minimum conformance requirements

The following requirements apply to UE Category ≥1. For the parameters specified in Table 9.2.6.1.3-1, Table 9.2.6.1.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, two sets of CQI reports are obtained for LAA Scell. The first one is obtained by reports whose reference resource is in the downlink subframes with 6 dB transmission power boost, i.e., high power subframes. The second one is obtained by reports whose reference resource is in the downlink subframe with 0 dB transmission power boost, i.e., low power subframe. In the test, PDSCH transport format in high power subframe is determined by first set of CQI reports and PDSCH transport format in low power subframe is determined by second set of CQI reports.

The reported CQI value in the first set of reports shall be in the range of ±1 of the reported median more than 90% of the first set of reports. The reported CQI value in the second set of reports shall be in the range of ±1 of the reported median more than 90% of the second set of reports.

If the PDSCH BLER in the high power subframes using the transport format indicated by wideband CQI median is less than or equal to 0.1, the BLER in high power subframes using the transport format indicated by the (wideband CQI median + 1) shall be greater than 0.1. If the PDSCH BLER in the high power subframes using the transport format indicated by the wideband CQI median is greater than 0.1, the BLER in high power subframes using transport format indicated by (wideband CQI median – 1) shall be less than or equal to 0.1.

If the PDSCH BLER in the low power subframes using the transport format indicated by wideband CQI median is less than or equal to 0.1, the BLER in low power subframes using the transport format indicated by the (wideband CQI median + 1) shall be greater than 0.1. If the PDSCH BLER in the low power subframes using the transport format indicated by the wideband CQI median is greater than 0.1, the BLER in low power subframes using transport format indicated by (wideband CQI median – 1) shall be less than or equal to 0.1.

The value of the wideband CQI median for first set of CQI reports minus the wideband CQI median for second set of CQI reports shall be larger than or equal to 2 in Test 1 and Test 2.

**Table 9.2.6.1.3-1: Parameters for PUSCH 3-0 static test on FDD Pcell**

| Parameter | | Unit | Value |
|---|---|---|---|
| Bandwidth | | MHz | 20 |
| PDSCH transmission mode | | | 3 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| Propagation condition and antenna configuration | | | Clause B.1 (2 x 2) |
| SNR | | dB | 20 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -78 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Max number of HARQ transmissions | | | 1 |
| Reporting mode | | | PUSCH 3-0 |
| CSI request field | | | '10' |
| trigger1 (Note 2) | | | 01000000 |
| trigger2 (Note 2) | | | 00000000 |

Note 1: PCell is used for HARQ ACK/NACK feedback and aperiodic CSI triggering/reporting. One sided dynamic OCNG Pattern OP.1 FDD as described in A.5.1.1 is transmitted on PCell on all RBs, but PDSCH is not transmitted on PCell.

Note 2: trigger1 and trigger2 are defined as TS 36.331 for aperiodicCSI-Trigger. They Indicate for which serving cell(s) the aperiodic CSI report is triggered when one or more SCells are configured. PDCCH DCI format 0 with a trigger for aperiodic CQI is transmitted periodically in subframe 1 and subframe 6 with 5ms periodicity.

**Table 9.2.6.1.3-2: PUSCH 3-0 static test on LAA Scell**

| Parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Bandwidth | | MHz | 20 | |
| PDSCH transmission mode | | | 3 | |
| Downlink power allocation | $\rho_A$ | dB | -3 | |
| | $\rho_B$ | dB | -3 | |
| | σ | dB | 0 | |
| Propagation condition and antenna configuration | | | Clause B.1 (2x2) | |
| SNR in subframes with 6 dB power boost (Note 2) | | dB | 9 | 10 |
| SNR in subframes with 0 dB power boost (Note 2) | | dB | 3 | 4 |
| $\hat{I}_{or}^{(j)}$ in subframes with 6 dB power | | dB[mW/15kHz] | -89 | -88 |
| $\hat{I}_{or}^{(j)}$ in subframes with 0 dB power | | dB[mW/15kHz] | -95 | -94 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | |
| MBSFN subframe Configuration | | | Non-MBSFN | |
| Cell Id | | | 0 | |
| dmtc-Periodicity | | ms | 80 | |
| dmtc-Offset | | | 0 | |
| Number of control OFDM symbols | | | 3 | |
| Max number of HARQ transmissions | | | 1 | |
| Reporting mode | | | PUSCH 3-0 | |
| PDSCH transmission model | Basic model | | As specified in Section B.8 | |
| | subframeStartPosition | | s0 | |
| | Number of occupied symbols per subframe | | 14 | |
| | The number of subframes set ( ) per burst | | {3,8} | |
| | Random variable *p* defined in B.8 | | 0.5 | |
| | Power configuration for each burst | | $\hat{I}_{or}^{(j)}$ is randomly selected from 6 dB power boosting or 0 dB power boosting with equal probability | |

Note 1: Reference measurement channel RC.2A FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FS3 as described in Annex A.5.4.1, except for category 1 UE use RC.4A FDD with two sided dynamic OCNG Pattern OP.2 FS3 as described in Annex A.5.4.2.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

The normative reference for this requirement is TS 36.101 [2] clause 9.2.6.1.

### 9.2.6.1.4 Test description

#### 9.2.6.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: 20 MHz + 20 MHz, as defined in TS 36.508 [7] clause 4.3.1

1. Connect the SS, AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.36 (without faders) as appropriate.
2. The parameter settings for the cell are set up according to Table 9.2.6.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.6.1.4.3.

#### 9.2.6.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. Configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 9.2.6.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, SNR and the power configuration of each burst for LAA SCell according to Table 9.2.6.1.3-2.
5. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. Continue transmission of the PDSCH until at least 2000 wideband CQI reports have been gathered for each, low power subframes and high power subframes. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request field set to 10 and I_MCS=29 and N_PRB allocated to be less or equal to 4.In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI.
6. Set up a relative frequency distribution for the first 2000 reported wideband CQI-values whose reference resource is in the downlink subframe with 6 dB transmission power boost, i.e., high power subframe. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as Median $CQI_{high}$ value.
7. If Median $CQI_{high}$ is equal to 1 or 15, or 1800 or less of the wideband CQI values for high power subframes are in the range (Median $CQI_{high}$ - 1) ≤ Median $CQI_{high}$ ≤ (Median $CQI_{high}$ + 1), then fail the UE.
8. Set up a relative frequency distribution for the first 2000 reported wideband CQI-values whose reference resource is in the downlink subframe with 0 dB transmission power boost, i.e., low power subframe. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as Median $CQI_{low}$ value.
9. If Median $CQI_{low}$ is equal to 1 or 15, or 1800 or less of the wideband CQI values for low power subframes are in the range (Median $CQI_{low}$ - 1) ≤ Median $CQI_{low}$ ≤ (Median $CQI_{low}$ + 1), then fail the UE.
10. If Median $CQI_{high}$ - Median $CQI_{low}$ < 2 then fail the UE.
11. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI value Median $CQI_{high}$ for high power subframes and according to the wideband median-CQI value Median $CQI_{low}$ for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH transmitted by the SS, record the associated ACK and NACK/DTX responses. The responses are then recorded in two sets. The first set is obtained by responses for high power subframes. The second set is obtained by responses for low power subframes. Continue to gather data until the number of filtered ACK+NACK/DTX responses reaches at least 1000 for each set.

    For the filtered ACK and NACK/DTX responses:

    If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for low power subframes then go to step 12.

If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) > 0.1 for low power subframes then go to step 13.

If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) > 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for low power subframes then go to step 14.

If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) > 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) > 0.1 for low power subframes then go to step 15.

12. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ + 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ + 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK and NACK/DTX responses as in step 11 until 1000 filtered ACK+NACK/DTX responses are gathered in each set.

    If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) > 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) > 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

13. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ + 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ - 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK and NACK/DTX responses as in step 11 until 1000 filtered ACK+NACK/DTX responses are gathered in each set.

    If the ratio ((NACK/DTX) / (ACK + NACK/DTX))) > 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

14. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ - 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ + 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK and NACK/DTX responses as in step 11 until 1000 filtered ACK+NACK/DTX responses are gathered in each set.

    If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) > 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

15. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ - 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ - 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK and NACK/DTXX responses as in step 11 until 1000 filtered ACK+NACK/DTX responses are gathered in each set.

    If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

16. If both Tests have not been done, then repeat the same procedure (steps 1 to 15) with test conditions according to Table 9.2.6.1.3-1 and Table 9.2.6.1.3-2 for the other Test as appropriate. Otherwise pass the UE.

#### 9.2.6.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.6.1.4.3-1: CQI-ReportConfig-r10-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 9.2.6.1.4.3-2: CQI-ReportAperiodic-r10-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm30 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 01000000 | Configure report only for SCell | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.6.1.4.3-3: PDSCH-ConfigDedicated-DEFAULT**

| Derivation Path: TS 36.508 [7] clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | |
| } | | | |

**Table 9.2.6.1.4.3-4: *MeasDS-Config-DEFAULT***

| Derivation Path: 36.508 clause 4.6.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasDS-Config-DEFAULT ::= CHOICE { | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| dmtc-PeriodOffset-r12 CHOICE { | | | |
| ms80-r12 | 0 | | |
| } | | | |
| ds-OccasionDuration-r12 CHOICE { | | | |
| durationTDD-r12 | 2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.6.1.4.3-5: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 01 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.6.1.4.3-6: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 01 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 9.2.6.1.4.3-7: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm30 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

### 9.2.6.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.6.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.2.6.2 LAA CQI Reporting under AWGN Conditions with Frame Structure Type 3 with TDD as Pcell (PUSCH 3-0)

### 9.2.6.2.1 Test purpose

To verify the variance of the wideband CQI reports for LAA SCell is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1. To verify that the UE reports different CQI indices for LAA SCell if the cell experiences different SNR(s) caused by different power boosts.

### 9.2.6.2.2 Test applicability

This test applies to all types of E-UTRA TDD Release 13 and forward UEs of category ≥ 1 that support LAA with E-UTRA TDD as PCell.

### 9.2.6.2.3 Minimum conformance requirements

The following requirements apply to UE Category ≥1. For the parameters specified in Table 9.2.6.2.3-1, Table 9.2.6.2.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, two sets of CQI reports are obtained for LAA Scell. The first one is obtained by reports whose reference resource is in the downlink subframes with 6 dB transmission power boost, i.e., high power subframes. The second one is obtained by reports whose reference resource is in the downlink subframe with 0 dB transmission power boost, i.e., low power subframe. In the test, PDSCH transport format in high power subframe is determined by first set of CQI reports and PDSCH transport format in low power subframe is determined by second set of CQI reports.

The reported CQI value in the first set of reports shall be in the range of ±1 of the reported median more than 90% of the first set of reports. The reported CQI value in the second set of reports shall be in the range of ±1 of the reported median more than 90% of the second set of reports.

If the PDSCH BLER in the high power subframes using the transport format indicated by wideband CQI median is less than or equal to 0.1, the BLER in high power subframes using the transport format indicated by the (wideband CQI median + 1) shall be greater than 0.1. If the PDSCH BLER in the high power subframes using the transport format indicated by the wideband CQI median is greater than 0.1, the BLER in high power subframes using transport format indicated by (wideband CQI median - 1) shall be less than or equal to 0.1.

If the PDSCH BLER in the low power subframes using the transport format indicated by wideband CQI median is less than or equal to 0.1, the BLER in low power subframes using the transport format indicated by the (wideband CQI median + 1) shall be greater than 0.1. If the PDSCH BLER in the low power subframes using the transport format indicated by the wideband CQI median is greater than 0.1, the BLER in low power subframes using transport format indicated by (wideband CQI median - 1) shall be less than or equal to 0.1.

The value of the wideband CQI median for first set of CQI reports minus the wideband CQI median for second set of CQI reports shall be larger than or equal to 2 in Test 1 and Test 2.

**Table 9.2.6.2.3-1: Parmeters for PUSCH 3-0 static test on TDD Pcell**

| Parameter | | Unit | Value |
|---|---|---|---|
| Bandwidth | | MHz | 20 |
| Uplink downlink configuration | | | 2 |
| Special subframe configuration | | | 4 |
| PDSCH transmission mode | | | 3 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| Propagation condition and antenna configuration | | | Clause B.1 (2 x 2) |
| SNR | | dB | 20 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -78 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Max number of HARQ transmissions | | | 1 |
| Reporting mode | | | PUSCH 3-0 |
| CSI request field | | | '10' |
| trigger1 (Note 2) | | | 01000000 |
| trigger2 (Note 2) | | | 00000000 |

Note 1: PCell is used for HARQ ACK/NACK feedback and aperiodic CSI triggering/reporting. One sided dynamic OCNG Pattern OP.1 TDD as described in A.5.2.1 is transmitted on PCell on all RBs, but PDSCH for user data is not transmitted on PCell.

Note 2: trigger1 and trigger2 are defined as TS 36.331 for aperiodicCSI-Trigger. They Indicate for which serving cell(s) the aperiodic CSI report is triggered when one or more SCells are configured. PDCCH DCI format 0 with a trigger for aperiodic CQI is transmitted periodically in subframe 3 and subframe 8 with 5ms periodicity.

**Table 9.2.6.2.3-2: PUSCH 3-0 static test on LAA Scell**

| Parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Bandwidth | | MHz | 20 | |
| PDSCH transmission mode | | | 3 | |
| Downlink power allocation | $\rho_A$ | dB | -3 | |
| | $\rho_B$ | dB | -3 | |
| | σ | dB | 0 | |
| Propagation condition and antenna configuration | | | Clause B.1 (2x2) | |
| SNR in subframes with 6 dB power boost (Note 2) | | dB | 9 | 10 |
| SNR in subframes with 0 dB power boost (Note 2) | | dB | 3 | 4 |
| $\hat{I}_{or}^{(j)}$ in subframes with 6 dB power | | dB[mW/15kHz] | -89 | -88 |
| $\hat{I}_{or}^{(j)}$ in subframes with 0 dB power | | dB[mW/15kHz] | -95 | -94 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | |
| MBSFN subframe Configuration | | | Non-MBSFN | |
| Cell Id | | | 0 | |
| dmtc-Periodicity | | ms | 80 | |
| dmtc-Offset | | | 0 | |
| Number of control OFDM symbols | | | 3 | |
| Max number of HARQ transmissions | | | 1 | |
| Reporting mode | | | PUSCH 3-0 | |
| PDSCH transmission model | Basic model | | As specified in Section B.8 | |
| | subframeStartPosition | | s0 | |
| | Number of occupied symbols per subframe | | 14 | |
| | The number of subframes set ( ) per burst | | {3,8} | |
| | Random variable *p* defined in B.8 | | 0.5 | |
| | Power configuration for each burst | | $\hat{I}_{or}^{(j)}$ is randomly selected from 6 dB power boosting or 0 dB power boosting with equal probability | |

Note 1: Reference measurement channel RC.2A FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FS3 as described in Annex A.5.4.1, except for category 1 UE use RC.4A FDD with two sided dynamic OCNG Pattern OP.2 FS3 as described in Annex A.5.4.2.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

The normative reference for this requirement is TS 36.101 [2] clause 9.2.6.2.

### 9.2.6.2.4 Test description

#### 9.2.6.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: 20 MHz + 20 MHz, as defined in TS 36.508 [7] clause 4.3.1

1. Connect the SS, AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.36 (without faders) as appropriate.

2. The parameter settings for the cell are set up according to Table 9.2.6.2.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.6.2.4.3.

#### 9.2.6.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. Configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 9.2.6.2.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, SNR and the power configuration of each burst for LAA SCell according to Table 9.2.6.2.3-2.

5. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. Continue transmission of the PDSCH until at least 2000 wideband CQI reports have been gathered for each, low power subframes and high power subframes. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request field set to 10 and I_MCS=29 and N_PRB allocated to be less or equal to 4.In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI.

6. Set up a relative frequency distribution for the first 2000 reported wideband CQI-values whose reference resource is in the downlink subframe with 6 dB transmission power boost, i.e., high power subframe. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as Median $CQI_{high}$ value.

7. If Median $CQI_{high}$ is equal to 1 or 15, or 1800 or less of the wideband CQI values for high power subframes are in the range (Median $CQI_{high}$ - 1) ≤ Median $CQI_{high}$ ≤ (Median $CQI_{high}$ + 1), then fail the UE.

8. Set up a relative frequency distribution for the first 2000 reported wideband CQI-values whose reference resource is in the downlink subframe with 0 dB transmission power boost, i.e., low power subframe. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as Median $CQI_{low}$ value.

9. If Median $CQI_{low}$ is equal to 1 or 15, or 1800 or less of the wideband CQI values for low power subframes are in the range (Median $CQI_{low}$ - 1) ≤ Median $CQI_{low}$ ≤ (Median $CQI_{low}$ + 1), then fail the UE.

10. If Median $CQI_{high}$ - Median $CQI_{low}$ < 2 then fail the UE.

11. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI value Median $CQI_{high}$ for high power subframes and according to the wideband median-CQI value Median $CQI_{low}$ for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. The responses are then recorded in two sets. The first set is obtained by responses for high power subframes. The second set is obtained by responses for low power subframes. Continue to gather data until the number of filtered ACK+NACK responses reaches at least 1000 for each set.

    For the filtered ACK and NACK responses:

If the ratio (NACK / ACK + NACK) ≤ 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) ≤ 0.1 for low power subframes then go to step 12.

If the ratio (NACK / ACK + NACK) ≤ 0.1 for high power subframes AND the ratio (NACK /ACK + NACK) > 0.1 for low power subframes then go to step 13.

If the ratio (NACK /ACK + NACK) > 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) ≤ 0.1 for low power subframes then go to step 14.

If the ratio (NACK / ACK + NACK) > 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) > 0.1 for low power subframes then go to step 15.

12. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ + 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ + 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 11 until 1000 filtered ACK+NACK responses are gathered in each set.

    If the ratio (NACK / ACK + NACK) > 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) > 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

13. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ + 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ - 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 11 until 1000 filtered ACK+NACK responses are gathered in each set.

    If the ratio (NACK / ACK + NACK) > 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) ≤ 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

14. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ - 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ + 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 11 until 1000 filtered ACK+NACK responses are gathered in each set.

    If the ratio (NACK / ACK + NACK) ≤ 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) > 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

15. The SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ - 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ - 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 11 until 1000 filtered ACK+NACK responses are gathered in each set.

    If the ratio (NACK / ACK + NACK) ≤ 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) ≤ 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

16. If both Tests have not been done, then repeat the same procedure (steps 1 to 15) with test conditions according to Table 9.2.6.2.3-1 and Table 9.2.6.2.3-2 for the other Test as appropriate. Otherwise pass the UE.

#### 9.2.6.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.6.2.4.3-1: CQI-ReportConfig-r10-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 9.2.6.2.4.3-2: CQI-ReportAperiodic-r10-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm30 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 01000000 | Configure report only for SCell | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.6.2.4.3-3: PDSCH-ConfigDedicated-DEFAULT**

| Derivation Path: TS 36.508 [7] clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | |
| } | | | |

**Table 9.2.6.2.4.3-4: *MeasDS-Config-DEFAULT***

| Derivation Path: 36.508 clause 4.6.6 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MeasDS-Config-DEFAULT ::= CHOICE { | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| dmtc-PeriodOffset-r12 CHOICE { | | | |
| ms80-r12 | 0 | | |
| } | | | |
| ds-OccasionDuration-r12 CHOICE { | | | |
| durationTDD-r12 | 2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.6.2.4.3-5: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3-23 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| } | | | |

**Table 9.2.6.2.4.3-6: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1, Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | 01 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.6.2.4.3-7: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-6A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm3 | | |
| codebookSubsetRestriction-r10 | 01 | BIT STRING | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 9.2.6.2.4.3-8: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm30 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

### 9.2.6.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.6.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.2.7 CQI Reporting under AWGN Conditions-PUSCH 3-1 - LAA

### 9.2.7.1 LAA CQI Reporting under AWGN Conditions with Frame Structure Type 3 with FDD as Pcell (PUSCH 3-1)

#### 9.2.7.1.1 Test purpose

To verify the variance of the wideband CQI reports for LAA SCell is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1. To verify that the UE reports different CQI indices for LAA SCell if the cell experiences different SNR(s) caused by different power boosts.

#### 9.2.7.1.2 Test applicability

This test applies to all types of E-UTRA FDD Release 13 and forward UEs that support LAA with E-UTRA FDD as PCell. Applicability requires support for TM9 on LAA Cell

#### 9.2.7.1.3 Minimum conformance requirements

The following requirements apply to UE Category ≥1. For the parameters specified in Table 9.2.7.1.3-1, Table 9.2.7.1.3-2 and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, two sets of CQI reports are obtained for LAA Scell, The first one is obtained by reports whose reference resource is in the downlink subframes with 6 dB transmission power boost, i.e., high power subframes. The second one is obtained by reports whose reference resource is in the downlink subframe with 0 dB transmission power boost, i.e., low power subframe. In the test, PDSCH transport format in high power subframe is determined by first set of CQI reports and PDSCH transport format in low power subframe is determined by second set of CQI reports.

The reported CQI value in the first set of reports shall be in the range of ±1 of the reported median more than 90% of the first set of reports. The reported CQI value in the second set of reports shall be in the range of ±1 of the reported median more than 90% of the second set of reports.

If the PDSCH BLER in the high power subframes using the transport format indicated by wideband CQI median is less than or equal to 0.1, the BLER in high power subframes using the transport format indicated by the (wideband CQI median + 1) shall be greater than 0.1. If the PDSCH BLER in high power subframes using the transport format indicated by the wideband CQI median is greater than 0.1, the BLER in high power subframes using transport format indicated by (wideband CQI median – 1) shall be less than or equal to 0.1.

If the PDSCH BLER in the low power subframes using the transport format indicated by wideband CQI median is less than or equal to 0.1, the BLER in low power subframes using the transport format indicated by the (wideband CQI median + 1) shall be greater than 0.1. If the PDSCH BLER in the low power subframes using the transport format indicated by the wideband CQI median is greater than 0.1, the BLER in low power subframes using transport format indicated by (wideband CQI median – 1) shall be less than or equal to 0.1.

The value of the wideband CQI for the first set of CQI report minus the wideband CQI median for second set of CQI shall be larger than or equal to 2 in Test 1 and Test 2.

**Table 9.2.7.1.3-1: Parameters for PUSCH 3-1 static test on FDD Pcell**

| Parameter | | Unit | Value |
|---|---|---|---|
| Bandwidth | | MHz | 20 |
| PDSCH transmission mode | | | 9 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | $P_C$ | dB | 0 |
| | σ | dB | 0 |
| Propagation condition and antenna configuration | | | Clause B.1 (2 x 2) |
| Beamforming Model | | | As specified in Section B.4.3 |
| SNR | | dB | 20 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -78 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| CRS reference signals | | | Antenna ports 0 |
| CSI reference signals | | | Antenna ports 15, 16 |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | | 5/ 1 |
| CSI-RS reference signal configuration | | | 4 |
| CodeBookSubsetRestriction bitmap | | | 000001 |
| Number of control OFDM symbols | | | 3 |
| Max number of HARQ transmissions | | | 1 |
| Reporting mode | | | PUSCH 3-1 |
| CSI request field | | | '10' |
| trigger1 (Note 2) | | | 01000000 |
| trigger2 (Note 2) | | | 00000000 |

Note 1: PCell is used for HARQ ACK/NACK feedback and aperiodic CSI triggering/reporting. One sided dynamic OCNG Pattern OP.1 FDD as described in A.5.1.1 is transmitted on PCell on all RBs, but PDSCH for user data is not transmitted on PCell.

Note 2: trigger1 and trigger2 are defined as TS 36.331 for aperiodicCSI-Trigger. They Indicate for which serving cell(s) the aperiodic CSI report is triggered when one or more SCells are configured. PDCCH DCI format 0 with a trigger for aperiodic CQI is transmitted periodically in subframe 1 and subframe 6 with 5ms periodicity.

**Table 9.2.7.1.3-2: PUSCH 3-1 static test on LAA Scell**

| Parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Bandwidth | | MHz | 20 MHz | |
| Transmission mode | | | 9 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| | $P_C$ | dB | 0 | |
| | $\sigma$ | dB | 0 | |
| SNR in subframes with 6 dB power boost (Note 3) | | dB | 9 | 10 |
| SNR in subframes with 0 dB power boost (Note 3) | | | 3 | 4 |
| $\hat{I}_{or}^{(j)}$ in subframes with 6 dB power | | | -89 | -88 |
| $\hat{I}_{or}^{(j)}$ in subframes with 0 dB power | | dB[mW/15kHz] | -95 | -94 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| MBSFN subframe Configuration | | | Non-MBSFN | |
| Cell Id | | | 0 | |
| dmtc-Periodicity | | ms | 80 | |
| dmtc-Offset | | | 0 | |
| Propagation condition and antenna configuration | | | Clause B.1 (2x2) | |
| Beamforming Model | | | As specified in Section B.4.3 | |
| CRS reference signals | | | Antenna ports 0 | |
| CSI reference signals | | | Antenna ports 15, 16 | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/ 1 | |
| CSI-RS reference signal configuration | | | 4 | |
| CodeBookSubsetRestriction bitmap | | | 000001 | |
| Number of control OFDM symbols | | | 3 | |
| Max number of HARQ transmissions | | | 1 | |
| Reporting mode | | | PUSCH 3-1 | |
| PDSCH transmission model | Basic model | | As specified in Section B.8 | |
| | subframeStartPosition | | s0 | |
| | Number of occupied symbols per subframe | | 14 | |
| | The number of subframes set ( ) per burst | | {3, 8} | |
| | Random variable *p* defined in B.8 | | 0.5 | |
| | Power configuration for each burst | | $\hat{I}_{or}^{(j)}$ is randomly selected from 6 dB power boosting or 0 dB power boosting with equal probability | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.9A FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FS3 as described in Annex A.5.4.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

The normative reference for this requirement is TS 36.101 [2] clause 9.2.7.1.

#### 9.2.7.1.4 Test description

##### 9.2.7.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: 20MHz + 20MHz, as defined in TS 36.508 [7] clause 4.3.1

1. Connect the SS, AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.36 (without faders) as appropriate.
2. The parameter settings for the cell are set up according to Table 9.2.7.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.7.1.4.3.

##### 9.2.7.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. Configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 9.2.7.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, SNR and the power configuration of each burst for LAA SCell according to Table 9.2.7.1.3-2.
5. The SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. Continue transmission of the PDSCH until at least 2000 wideband CQI reports have been gathered for each, low power subframes and high power subframes. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request field set to 10 and I_MCS=29 and N_PRB allocated to be less or equal to 4.In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI.
6. Set up a relative frequency distribution for the first 2000 reported wideband CQI-values whose reference resource is in the downlink subframe with 6 dB transmission power boost, i.e., high power subframe. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as Median $CQI_{high}$ value.
7. If Median $CQI_{high}$ is equal to 1 or 15, or 1800 or less of the wideband CQI values for high power subframes are in the range (Median $CQI_{high}$ - 1) ≤ Median $CQI_{high}$ ≤ (Median $CQI_{high}$ + 1), then fail the UE.
8. Set up a relative frequency distribution for the first 2000 reported wideband CQI-values whose reference resource is in the downlink subframe with 0 dB transmission power boost, i.e., low power subframe. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as Median $CQI_{low}$ value.
9. If Median $CQI_{low}$ is equal to 1 or 15, or 1800 or less of the wideband CQI values for low power subframes are in the range (Median $CQI_{low}$ - 1) ≤ Median $CQI_{low}$ ≤ (Median $CQI_{low}$ + 1), then fail the UE.

10. If Median $CQI_{high}$ - Median $CQI_{low}$ < 2 then fail the UE.

11. The SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband median-CQI value Median $CQI_{high}$ for high power subframes and according to the wideband median-CQI value Median $CQI_{low}$ for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH transmitted by the SS, record the associated ACK and NACK/DTX responses. The responses are then recorded in two sets. The first set is obtained by responses for high power subframes. The second set is obtained by responses for low power subframes. Continue to gather data until the number of filtered ACK+NACK/DTX responses reaches at least 1000 for each set.

    For the filtered ACK and NACK/DTX responses:

    If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for low power subframes then go to step 12.

    If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for high power subframes AND the ratio ((NACK/DTX) /(ACK + (NACK/DTX))) > 0.1 for low power subframes then go to step 13.

    If the ratio ((NACK/DTX) /(ACK + (NACK/DTX))) > 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for low power subframes then go to step 14.

    If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) > 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) > 0.1 for low power subframes then go to step 15.

12. The SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ + 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ + 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK and NACK/DTX responses as in step 11 until 1000 filtered ACK+NACK/DTX responses are gathered in each set.

    If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) > 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) > 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

13. The SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ + 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ - 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK and NACK/DTX responses as in step 11 until 1000 filtered ACK+NACK/DTX responses are gathered in each set.

    If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) > 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

14. The SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ - 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ + 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK and NACK/DTX responses as in step 11 until 1000 filtered ACK+NACK/DTX responses are gathered in each set.

    If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) > 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

15. The SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ - 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ - 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK and NACK/DTX responses as in step 11 until 1000 filtered ACK+NACK/DTX responses are gathered in each set.

If the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for high power subframes AND the ratio ((NACK/DTX) / (ACK + (NACK/DTX))) ≤ 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

16. If both Tests have not been done, then repeat the same procedure (steps 1 to 15) with test conditions according to Table 9.2.7.1.3-1 and Table 9.2.7.1.3-2 for the other Test as appropriate. Otherwise pass the UE.

### 9.2.7.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.7.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

**Table 9.2.7.1.4.3-2: PhysicalConfigDedicatedSCell-r10-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 | AntennaInfoDedicated-r10 | | |
| crossCarrierSchedulingConfig-r10 | Not present | | |
| csi-RS-Config- r10 ::= SEQUENCE { | CSI-RS-Config-r10 | | |
| pdsch-ConfigDedicated-r10 | PDSCH-ConfigDedicated-DEFAULT | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.2.7.1.4.3-3: AntennaInfoDedicated-r10**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 000001 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.2.7.1.4.3-4: CQI-ReportConfig-r10-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 9.2.7.1.4.3-5: CQI-ReportAperiodic-r10-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 01000000 | Configure report only for SCell | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.7.1.4.3-6: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | 2 antenna ports for transmission of CSI reference signals | |
| resourceConfig-r10 | 4 | | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}}$ = $I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.2.7.1.4.3-7: Void**

**Table 9.2.7.1.4.3-8: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | setup | | |
| } | | | |

### 9.2.7.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.7.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.2.7.2 LAA CQI Reporting under AWGN Conditions with Frame Structure Type 3 with TDD as Pcell (PUSCH 3-1)

### 9.2.7.2.1 Test purpose

To verify the variance of the wideband CQI reports for LAA SCell is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1. To verify that the UE reports different CQI indices for LAA SCell if the cell experiences different SNR(s) caused by different power boosts.

### 9.2.7.2.2 Test applicability

This test applies to all types of E-UTRA TDD Release 13 and forward UEs that support LAA with E-UTRA TDD as PCell. Applicability requires support for TM9 on LAA Cell.

### 9.2.7.2.3 Minimum conformance requirements

The following requirements apply to UE Category ≥1. For the parameters specified in Table 9.2.7.2.3-1, Table 9.2.7.2.3-2 and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, two sets of CQI reports are obtained for LAA Scell, The first one is obtained by reports whose reference resource is in the downlink subframes with 6 dB transmission power boost, i.e., high power subframes. The second one is obtained by reports whose reference resource is in the downlink subframe with 0 dB transmission power boost, i.e., low power subframe. In the test, PDSCH transport format in high power subframe is determined by first set of CQI reports and PDSCH transport format in low power subframe is determined by second set of CQI reports.

The reported CQI value in the first set of reports shall be in the range of ±1 of the reported median more than 90% of the first set of reports. The reported CQI value in the second set of reports shall be in the range of ±1 of the reported median more than 90% of the second set of reports.

If the PDSCH BLER in the high power subframes using the transport format indicated by wideband CQI median is less than or equal to 0.1, the BLER in high power subframes using the transport format indicated by the (wideband CQI median + 1) shall be greater than 0.1. If the PDSCH BLER in high power subframes using the transport format indicated by the wideband CQI median is greater than 0.1, the BLER in high power subframes using transport format indicated by (wideband CQI median – 1) shall be less than or equal to 0.1.

If the PDSCH BLER in the low power subframes using the transport format indicated by wideband CQI median is less than or equal to 0.1, the BLER in low power subframes using the transport format indicated by the (wideband CQI median + 1) shall be greater than 0.1. If the PDSCH BLER in the low power subframes using the transport format

indicated by the wideband CQI median is greater than 0.1, the BLER in low power subframes using transport format indicated by (wideband CQI median – 1) shall be less than or equal to 0.1.

The value of the wideband CQI for the first set of CQI report minus the wideband CQI median for second set of CQI shall be larger than or equal to 2 in Test 1 and Test 2.

**Table 9.2.7.2.3-1: Parameters for PUSCH 3-1 static test on TDD Pcell**

| Parameter | | Unit | Value |
|---|---|---|---|
| Bandwidth | | MHz | 20 |
| PDSCH transmission mode | | | 9 |
| Uplink downlink configuration | | | 2 |
| Special subframe configuration | | | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | $P_C$ | dB | 0 |
| | σ | dB | 0 |
| Propagation condition and antenna configuration | | | Clause B.1 (2 x 2) |
| SNR | | dB | 20 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -78 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| CRS reference signals | | | Antenna ports 0 |
| CSI reference signals | | | Antenna ports 15, 16 |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | | 5/ 1 |
| CSI-RS reference signal configuration | | | 4 |
| CodeBookSubsetRestriction bitmap | | | 000001 |
| Number of control OFDM symbols | | | 3 |
| Max number of HARQ transmissions | | | 1 |
| Reporting mode | | | PUSCH 3-1 |
| CSI request field | | | '10' |
| trigger1 (Note 2) | | | 01000000 |
| trigger2 (Note 2) | | | 00000000 |

Note 1: PCell is used for HARQ ACK/NACK feedback and aperiodic CSI triggering/reporting. One sided dynamic OCNG Pattern OP.1 FDD as described in A.5.1.1 is transmitted on PCell on all RBs, but PDSCH for user data is not transmitted on PCell.

Note 2: trigger1 and trigger2 are defined as TS 36.331 for aperiodicCSI-Trigger. They Indicate for which serving cell(s) the aperiodic CSI report is triggered when one or more SCells are configured. PDCCH DCI format 0 with a trigger for aperiodic CQI is transmitted periodically in subframe 3 and subframe 8 with 5ms periodicity.

**Table 9.2.7.2.3-2: PUSCH 3-1 static test on LAA Scell**

| Parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Bandwidth | | MHz | 20 MHz | |
| Transmission mode | | | 9 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| | $P_C$ | dB | 0 | |
| | $\sigma$ | dB | 0 | |
| SNR in subframes with 6 dB power boost (Note 3) | | dB | 9 | 10 |
| SNR in subframes with 0 dB power boost (Note 3) | | | 3 | 4 |
| $\hat{I}_{or}^{(j)}$ in subframes with 6 dB power | | | -89 | -88 |
| $\hat{I}_{or}^{(j)}$ in subframes with 0 dB power | | dB[mW/15kHz] | -95 | -94 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| MBSFN subframe Configuration | | | Non-MBSFN | |
| Cell Id | | | 0 | |
| dmtc-Periodicity | | ms | 80 | |
| dmtc-Offset | | | 0 | |
| Propagation condition and antenna configuration | | | Clause B.1 (2x2) | |
| Beamforming Model | | | As specified in Section B.4.3 | |
| CRS reference signals | | | Antenna ports 0 | |
| CSI reference signals | | | Antenna ports 15, 16 | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/ 3 | |
| CSI-RS reference signal configuration | | | 4 | |
| CodeBookSubsetRestriction bitmap | | | 000001 | |
| Number of control OFDM symbols | | | 3 | |
| Max number of HARQ transmissions | | | 1 | |
| Reporting mode | | | PUSCH 3-1 | |
| PDSCH transmission model | Basic model | | As specified in Section B.8 | |
| | subframeStartPosition | | s0 | |
| | Number of occupied symbols per subframe | | 14 | |
| | The number of subframes set ( ) per burst | | {3, 8} | |
| | Random variable *p* defined in B.8 | | 0.5 | |
| | Power configuration for each burst | | $\hat{I}_{or}^{(j)}$ is randomly selected from 6 dB power boosting or 0 dB power boosting with equal probability | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.9A FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FS3 as described in Annex A.5.4.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

The normative reference for this requirement is TS 36.101 [2] clause 9.2.7.2.

#### 9.2.7.2.4 Test description

##### 9.2.7.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: 20MHz + 20MHz, as defined in TS 36.508 [7] clause 4.3.1

1. Connect the SS, AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure group A.36 (without faders) as appropriate.
2. The parameter settings for the cell are set up according to Table 9.2.7.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.7.2.4.3.

##### 9.2.7.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. Configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents are defined in clause 9.2.7.2.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, SNR and the power configuration of each burst for LAA SCell according to Table 9.2.7.2.3-2.
5. The SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. Continue transmission of the PDSCH until at least 2000 wideband CQI reports have been gathered for each, low power subframes and high power subframes. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request field set to 10 and I_MCS=29 and N_PRB allocated to be less or equal to 4.In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI.
6. Set up a relative frequency distribution for the first 2000 reported wideband CQI-values whose reference resource is in the downlink subframe with 6 dB transmission power boost, i.e., high power subframe. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as Median $CQI_{high}$ value.
7. If Median $CQI_{high}$ is equal to 1 or 15, or 1800 or less of the wideband CQI values for high power subframes are in the range (Median $CQI_{high}$ - 1) ≤ Median $CQI_{high}$ ≤ (Median $CQI_{high}$ + 1), then fail the UE.
8. Set up a relative frequency distribution for the first 2000 reported wideband CQI-values whose reference resource is in the downlink subframe with 0 dB transmission power boost, i.e., low power subframe. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as Median $CQI_{low}$ value.
9. If Median $CQI_{low}$ is equal to 1 or 15, or 1800 or less of the wideband CQI values for low power subframes are in the range (Median $CQI_{low}$ - 1) ≤ Median $CQI_{low}$ ≤ (Median $CQI_{low}$ + 1), then fail the UE.

10. If Median $CQI_{high}$ - Median $CQI_{low}$ < 2 then fail the UE.

11. The SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband median-CQI value Median $CQI_{high}$ for high power subframes and according to the wideband median-CQI value Median $CQI_{low}$ for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. The responses are then recorded in two sets. The first set is obtained by responses for high power subframes. The second set is obtained by responses for low power subframes. Continue to gather data until the number of filtered ACK+NACK responses reaches at least 1000 for each set.

    For the filtered ACK and NACK responses:

    If the ratio (NACK / ACK + NACK) ≤ 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) ≤ 0.1 for low power subframes then go to step 12.

    If the ratio (NACK / ACK + NACK) ≤ 0.1 for high power subframes AND the ratio (NACK /ACK + NACK) > 0.1 for low power subframes then go to step 13.

    If the ratio (NACK /ACK + NACK) > 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) ≤ 0.1 for low power subframes then go to step 14.

    If the ratio (NACK / ACK + NACK) > 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) > 0.1 for low power subframes then go to step 15.

12. The SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ + 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ + 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 11 until 1000 filtered ACK+NACK responses are gathered in each set.

    If the ratio (NACK / ACK + NACK) > 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) > 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

13. The SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ + 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ - 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 11 until 1000 filtered ACK+NACK responses are gathered in each set.

    If the ratio (NACK / ACK + NACK) > 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) ≤ 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

14. The SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ - 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ + 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 11 until 1000 filtered ACK+NACK responses are gathered in each set.

    If the ratio (NACK / ACK + NACK) ≤ 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) > 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

15. The SS transmits PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to wideband CQI value (Median $CQI_{high}$ - 1) for high power subframes and according to wideband CQI value (Median $CQI_{low}$ - 1) for low power subframes. The SS does not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 11 until 1000 filtered ACK+NACK responses are gathered in each set.

    If the ratio (NACK / ACK + NACK) ≤ 0.1 for high power subframes AND the ratio (NACK / ACK + NACK) ≤ 0.1 for low power subframes then pass the UE for this test and go to step 16, otherwise fail the UE.

16. If both Tests have not been done, then repeat the same procedure (steps 1 to 15) with test conditions according to Table 9.2.7.2.3-1 and Table 9.2.7.2.3-2 for the other Test as appropriate. Otherwise pass the UE.

#### 9.2.7.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.2.7.2.4.3-1: *TDD-Config-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.2.7.2.4.3-2: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

**Table 9.2.7.2.4.3-3: PhysicalConfigDedicatedSCell-r10-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated SCell-r10-DEFAULT ::= SEQUENCE { | | | |
| nonUL-Configuration-r10 SEQUENCE { | | | |
| antennaInfo-r10 | AntennaInfoDedicated-r10 | | |
| crossCarrierSchedulingConfig-r10 | Not present | | |
| csi-RS-Config- r10 ::= SEQUENCE { | CSI-RS-Config-r10 | | |
| pdsch-ConfigDedicated-r10 | PDSCH-ConfigDedicated-DEFAULT | | |
| } | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.2.7.2.4.3-4: AntennaInfoDedicated-r10**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 000001 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.2.7.2.4.3-5: CQI-ReportConfig-r10-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | CQI-ReportAperiodic-r10-DEFAULT | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| csi-SubframePatternConfig-r10 | Not present | | |
| } | | | |

**Table 9.2.7.2.4.3-6: CQI-ReportAperiodic-r10-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportAperiodic-r10 ::=CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| aperiodicCSI-Trigger-r10 ::= SEQUENCE { | | | |
| trigger1-r10 | 01000000 | Configure report only for SCell | |
| trigger2-r10 | 00000000 | No report | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.7.2.4.3-7: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | 2 antenna ports for transmission of CSI reference signals | |
| resourceConfig-r10 | 4 | | |
| subframeConfig-r10 | 3 | $\Delta_{\text{CSI-RS}}$ = $I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.2.7.2.4.3-8: Void**

**Table 9.2.7.2.4.3-9: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 Table 4.6.3-2AB | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | Not present | | |
| pmi-RI-Report-r10 | setup | | |
| } | | | |

### 9.2.7.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.7.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

# 9.3 CQI Reporting under fading conditions

## 9.3.1 Frequency-selective scheduling mode

The accuracy of sub-band channel quality indicator (CQI) reporting under frequency selective fading conditions is determined by a double-sided percentile of the reported differential CQI offset level 0 per sub-band, and the relative increase of the throughput obtained when transmitting on any one of the sub-bands with the highest reported differential CQI offset level the corresponding transport format compared to the case for which a fixed format is transmitted on any sub-band in set of TS 36.213 [10]. To account for sensitivity of the input SNR the sub-band CQI reporting under frequency selective fading conditions is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

### 9.3.1.1 CQI Reporting under fading conditions – PUSCH 3-0 (Cell-Specific Reference Symbols)

#### 9.3.1.1.1 FDD CQI Reporting under fading conditions – PUSCH 3-0

##### 9.3.1.1.1.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

##### 9.3.1.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

Note: This test also applies to UE supporting 4Rx antenna ports.

##### 9.3.1.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.1.1.1.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band;

b) the ratio of the throughput obtained when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

c) when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI.

**Table 9.3.1.1.1.3-1: Sub-band test for single antenna transmission (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| SNR (Note 3) | | dB | 9 | 10 | 14 | 15 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -89 | -88 | -84 | -83 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Antenna configuration | | | 1x2 | | | |
| Reporting interval | | ms | 5 | | | |
| CQI delay | | ms | 8 | | | |
| Reporting mode | | | PUSCH 3-0 | | | |
| Sub-band size | | RB | 6 (full size) | | | |
| Max number of HARQ transmissions | | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.3 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

**Table 9.3.1.1.1.3-2: Minimum requirement (FDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| α [%] | 2 | 2 |
| β [%] | 55 | 55 |
| γ | 1.1 | 1.1 |
| UE Category | 1-8 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.1.1.1.

### 9.3.1.1.1.4 Test description

#### 9.3.1.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9 for UE with 2Rx RF band and Annex A, Figure A.9a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.3.1.1.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.1.1.1.4.3.

#### 9.3.1.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.1.1.1.5-2 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. Check if "2000*$\alpha$%/100 ≤ number of CQI reports with index 0 for each full-size subband ≤ 2000*$\beta$%/100". (2000= No of full-size subband reports, 100 because of %) If yes, continue with step5, otherwise goto step 7.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI value in an each TTI randomly selected full-size subband regardless of UE wideband and full-size subband CQI report. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.
6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the subbands in which UE reports the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput and (NACK /(ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) ≥ $\gamma$ and (NACK /(ACK + NACK))≥ 0.05 , pass the UE for this test and go to step 8. Otherwise, go to step 7.
7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.
8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.1.1.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.3.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.1.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.3.1.1.1.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm30 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |
| } | | | |

9.3.1.1.1.5 Test requirement

**Table 9.3.1.1.1.5-1: Test requirement (FDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.09 | 1.09 |
| BLER | 0.05 | 0.05 |

**Table 9.3.1.1.1.5-2: Sub-band test for single antenna transmission (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 9 | 10 | 14 | 15 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 6 | 7 | 11 | 12 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -89 | -88 | -84 | -83 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Antenna configuration | | | 1x2 | | | |
| Reporting interval | | ms | 5 | | | |
| CQI delay | | ms | 8 | | | |
| Reporting mode | | | PUSCH 3-0 | | | |
| Sub-band size | | RB | 6 (full size) | | | |
| Max number of HARQ transmissions | | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel RC.3 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note4: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

To pass the test, α and β and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.3.1.1.2 TDD CQI Reporting under fading conditions – PUSCH 3-0

### 9.3.1.1.2.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

### 9.3.1.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.3.1.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.1.1.2.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band;

b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each available downlink transmission instance].

**Table 9.3.1.1.2.3-1: Sub-band test for single antenna transmission (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $\sigma$ | dB | 0 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| SNR | | dB | 9 | 10 | 14 | 15 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -89 | -88 | -84 | -83 |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s *a* = 1, $f_D = 5$ Hz | | | |
| Antenna configuration | | | 1 x 2 | | | |
| Reporting interval | | ms | 5 | | | |
| Minimum CQI delay | | ms | 10 or 11 | | | |
| Reporting mode | | | PUSCH 3-0 | | | |
| Sub-band size | | RB | 6 (full size) | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.3 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

**Table 9.3.1.1.2.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.1 | 1.1 |
| UE Category | 1-8 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.1.

#### 9.3.1.1.2.4 Test description

##### 9.3.1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9 for UE with 2Rx RF band and Annex A, Figure A.9a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.3.1.1.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.1.1.2.4.3.

##### 9.3.1.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.1.1.2.5-2 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and full-size subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI report for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. For each subband, if subband CQI of index 0 is reported, at least $\alpha$% but less than $\beta$% of 2000 full-size subband CQI report, then continue to step 5, otherwise, go to step 7.
5. The SS shall send PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI value in an each available downlink transmission instance randomly selected full-size subband regardless of UE wideband and subband CQI report. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3 Declare the throughput as $t_{median}$.
6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE report the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the

PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput and (NACK /(ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) $\geq \gamma$ and (NACK /(ACK + NACK))$\geq$ 0.05, pass the UE and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.1.1.2.3-1 for the other test as appropriate.

#### 9.3.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.1.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.3.1.1.2.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm30 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |
| } | | | |

**Table 9.3.1.1.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa2 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

#### 9.3.1.1.2.5 Test requirement

**Table 9.3.1.1.2.5-1: Test requirement (TDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.09 | 1.09 |
| BLER | 0.05 | 0.05 |

**Table 9.3.1.1.2.5-2: Sub-band test for single antenna transmission (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| SNR for UE with 2Rx RF band | | dB | 9 | 10 | 14 | 15 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 6 | 7 | 11 | 12 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -89 | -88 | -84 | -83 |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s<br>*a* = 1, $f_D = 5$ Hz | | | |
| Antenna configuration | | | 1 x 2 | | | |
| Reporting interval | | ms | 5 | | | |
| Minimum CQI delay | | ms | 10 or 11 | | | |
| Reporting mode | | | PUSCH 3-0 | | | |
| Sub-band size | | RB | 6 (full size) | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.3 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

To pass the test, α and β and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.3.1.1.3 to 9.3.1.1.4

## 9.3.1.1.5 TDD CQI Reporting under fading conditions – PUCCH 3-0 (when csi-SubframeSet –r12 is configured)

### 9.3.1.1.5.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling

#### 9.3.1.1.5.2 Test applicability

This test applies to E-UTRA TDD release 12 and forward UEs of Category 1 and onwards which supports Rel-12 CSI subframe sets.

#### 9.3.1.1.5.3 Minimum conformance requirements

The following requirements apply to UE Category ≥1 which supports Rel-12 CSI subframe sets. For the parameters specified in Table 9.3.1.1.5.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.1.5.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band for each CSI subframe set;

b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$ for each CSI subframe set;

c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05 and less than 0.60 for each CSI subframe set.

d) the difference of the wide-band median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ and the wide-band median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ shall be larger than or equal to 3.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each available downlink transmission instance. Sub-bands of a size smaller than full size are excluded from the test.

**Table 9.3.1.1.5.3-1: Sub-band test for TDD**

| Parameter | | Unit | Test | |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 | |
| Transmission mode | | | 2 | |
| Uplink downlink configuration | | | 2 | |
| Special subframe configuration | | | 4 | |
| CSI-MeasSubframeSet-r12 | | | 0001100000 | |
| Downlink power allocation | $\rho_A$ | dB | -3 | |
| | $\rho_B$ | dB | -3 | |
| | σ | dB | 0 | |
| SNR in CSI subframe set 0 | | dB | 0 | 1 |
| SNR in CSI subframe set 1 | | dB | 10 | 11 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 |
| $N_{oc1}^{(j)}$ for CSI subframe set 0 | | dB[mW/15kHz] | -98 | -98 |
| $N_{oc2}^{(j)}$ for CSI subframe set 1 | | dB[mW/15kHz] | -108 | -108 |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | |
| Antenna configuration | | | 2x2 | |
| CRS reference signals | | | Antenna port 0 and 1 | |
| Zero-Power CSI-RS configuration 0 $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 3 / 0000010000000000 | |
| Zero-Power CSI-RS configuration 1 $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 4 / 0100000000000000 | |
| PDSCH scheduled subframes for CSI subframe set 0 | | | 8,9 | |
| PDSCH scheduled subframes for CSI subframe set 1 | | | 3,4 | |
| Reporting interval (Note 4) | | ms | 10 per subframe set | |
| CQI delay | | ms | 15 for CSI subframe set 0<br>15 for CSI subframe set 1 | |
| Reporting mode | | | PUSCH 3-0 | |
| Sub-band size | | RB | 6 (full size) | |
| Max number of HARQ transmissions | | | 1 | |
| ACK/NACK feedback mode | | | Multiplexing | |
| Number of EPDCCH Sets Configured | | | 2 (Note 5,6) | |
| Number of PRB per EPDCCH Set | | | 4 | |
| EPDCCH Subframe Monitoring | | | NA | |
| EPDCCH Aggregation level | | | 8ECCE | |
| EPDCCH beamforming model | | | Annex B.4.4 | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.17 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: In the test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level for each subframe set separately..

Note 4: For CSI subframe set 0, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF #7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#8 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#2.

Note 5: In case UE supports EPDCCH, the PDSCH scheduling grants are transmitted via EPDCCH, otherwise PDCCH is used.

Note 6: The two sets are distributed EPDCCH sets and non-overlapping with PRB = {0, 3, 6, 9} for the first set and PRB = {40, 43, 46, 49} for the second set. EPDCCH set is selected after scheduling decision for PDSCH to avoid collision between PDSCH and EPDCCH PRBs, respectively. EPDCCH is only transmitted from one set. The starting symbol for EPDCCH is derived from the PCFICH. RRC signalling epdcch-StartSymbol-r11is not configured

**Table 9.3.1.1.5.3-2: Minimum requirement (TDD)**

| | Test |
|---|---|
| $\alpha$ [%] | 2 |
| $\beta$ [%] | 55 |
| $\gamma$ | 1.1 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.1.1.5.

### 9.3.1.1.5.4 Test description

#### 9.3.1.1.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9 for UE with 2Rx RF band.
2. The parameter settings for the cell are set up according to Table 9.3.1.1.5.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.1.1.5.4.3.

#### 9.3.1.1.5.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.1.1.5.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and full-size subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI report, for each full-size subband and for each CSI subframe sets have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports for CSI subframe set 0 at every SF#2 and wideband CQI reports for CSI subframe set 1 at every SF#7, and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.
3. For each CSI subframe set, set up a relative frequency distribution for the reported wideband CQI-values. Calculate the median values (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). These CQI-values are declared as wideband Median $CQI_0$ for CSI subframe set 0 and Median $CQI_1$ for CSI subframe set 1.
4. If the difference between Median $CQI_0$ and Median $CQI_1$ is larger than or equal to 3, and for both CSI subframe sets and for each subband, if subband CQI of index 0 is reported, at least $\alpha$% but less than $\beta$% of 2000 full-size subband CQI report, then continue to step 5, otherwise, go to step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the Median $CQI_0$ on CSI subframe set 0, and according to the Median $CQI_1$ on CSI subframe set 1, in a randomly selected full-size subband regardless of UE wideband and subband CQI report. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3 Declare the throughput as $t_{median}$.

6. For each CSI subframe set, the SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE report the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput, and (NACK /(ACK + NACK)) for each CSI subframe set according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) $\geq \gamma$, and for each CSI subframe set $0.05 \leq$ (NACK /(ACK + NACK))<0.6, pass the UE. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

#### 9.3.1.1.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.1.1.5.4.3-1: *TDD-Config-DEFAULT*: TDD CQI Reporting under fading conditions (when csi-SubframeSet –r12 is configured) requirement**

| Derivation Path: 36.508 Table 4.6.3-23 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.3.1.1.5.4.3-2: *PhysicalConfigDedicated-DEFAULT*: TDD CQI Reporting under fading conditions (when csi-SubframeSet –r12 is configured) requirement**

| Derivation Path: 36.508 Table 4.8.2.1.6-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-eIMTA ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| explicitValue SEQUENCE { | | | |
| transmissionMode-r10 | tm2 | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| epdcch-Config-r11 | EPDCCH-Config-r11-DEFAULT | | |
| cqi-ReportConfigPCell-v1250 SEQUENCE { | | | |
| csi-SubframePatternConfig-r12 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSets-r12 | 0001100000 | | |
| } | | | |
| } | | | |
| cqi-ReportBoth-v1250 | Not present | | |
| cqi-ReportAperiodic-v1250 | rm30 | | |
| altCQI-Table-r12 | Not present | | |
| } | | | |
| csi-RS-Config-v1250 SEQUENCE { | | | |
| zeroTxPowerCSI-RS2-r12 SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r12 | 4 | | |
| zeroTxPowerSubframeConfig-r12 | 0100000000000000 | | |
| } | | | |
| ds-ZeroTxPowerCSI-RS-r12 | Not present | | |
| } | | | |
| } | | | |

**Table 9.3.1.1.5.4.3-3: *CQI-ReportConfig-r10-DEFAULT* (In Table 9.3.1.1.5.4.3-2)**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm30 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| } | | | |

**Table 9.3.1.1.5.4.3-4: *CSI-RS-Config-r10* (In Table 9.3.1.1.5.4.3-2)**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 4 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r12 | 3 | | |
| zeroTxPowerSubframeConfig-r12 | 0000010000000000 | | |
| } | | | |
| } | | | |
| } | | | |

9.3.1.1.5.5 Test requirement

**Table 9.3.1.1.5.5-1: Minimum requirement (TDD)**

| | **Test** |
|---|---|
| $\alpha$ [%] | 2 |
| $\beta$ [%] | 55 |
| $\gamma$ | 1.09 |
| BLER | 0.05~0.6 |
| Delta CQI | 3 |

**Table 9.3.1.1.5.5-2: Sub-band test for TDD**

| Parameter | | Unit | Test | |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 | |
| Transmission mode | | | 2 | |
| Uplink downlink configuration | | | 2 | |
| Special subframe configuration | | | 4 | |
| CSI-MeasSubframeSet-r12 | | | 0001100000 | |
| Downlink power allocation | $\rho_A$ | dB | -3 | |
| | $\rho_B$ | dB | -3 | |
| | σ | dB | 0 | |
| SNR in CSI subframe set 0 | | dB | 0 | 1 |
| SNR in CSI subframe set 1 | | dB | 10 | 11 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 |
| $N_{oc1}^{(j)}$ for CSI subframe set 0 | | dB[mW/15kHz] | -98 | -98 |
| $N_{oc2}^{(j)}$ for CSI subframe set 1 | | dB[mW/15kHz] | -108 | -108 |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, *a* = 1, $f_D = 5$ Hz | |
| Antenna configuration | | | 2x2 | |
| CRS reference signals | | | Antenna port 0 and 1 | |
| Zero-Power CSI-RS configuration 0 $I_{CSI\text{-}RS}$ / *ZeroPowerCSI-RS* bitmap | | | 3 / 0000010000000000 | |
| Zero-Power CSI-RS configuration 1 $I_{CSI\text{-}RS}$ / *ZeroPowerCSI-RS* bitmap | | | 4 / 0100000000000000 | |
| PDSCH scheduled subframes for CSI subframe set 0 | | | 8,9 | |
| PDSCH scheduled subframes for CSI subframe set 1 | | | 3,4 | |
| Reporting interval (Note 4) | | ms | 10 per subframe set | |
| CQI delay | | ms | 15 for CSI subframe set 0<br>15 for CSI subframe set 1 | |
| Reporting mode | | | PUSCH 3-0 | |
| Sub-band size | | RB | 6 (full size) | |
| Max number of HARQ transmissions | | | 1 | |
| ACK/NACK feedback mode | | | Multiplexing | |
| Number of EPDCCH Sets Configured | | | 2 (Note 5,6) | |
| Number of PRB per EPDCCH Set | | | 4 | |
| EPDCCH Subframe Monitoring | | | NA | |
| EPDCCH Aggregation level | | | 8ECCE | |
| EPDCCH beamforming model | | | Annex B.4.4 | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.17 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: In the test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level for each subframe set separately..

Note 4: For CSI subframe set 0, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF #7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#8 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#2.

Note 5: In case UE supports EPDCCH, the PDSCH scheduling grants are transmitted via EPDCCH, otherwise PDCCH is used.

Note 6: The two sets are distributed EPDCCH sets and non-overlapping with PRB = {0, 3, 6, 9} for the first set and PRB = {40, 43, 46, 49} for the second set. EPDCCH set is selected after scheduling decision for PDSCH to avoid collision between PDSCH and EPDCCH PRBs, respectively. EPDCCH is only transmitted from one set. The starting symbol for EPDCCH is derived from the PCFICH. RRC signalling epdcch-StartSymbol-r11is not configured

To pass the test, α and β and γ and BLER and Delta CQI must be fulfilled.

To pass the test, one **or** the other SNR point must be fulfilled.

## 9.3.1.2 CQI Reporting under fading conditions – PUSCH 3-1 (CSI Reference Symbols)

### 9.3.1.2.1_D FDD CQI Reporting under fading conditions – PUSCH 3-1 for eDL MIMO

#### 9.3.1.2.1_D.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

#### 9.3.1.2.1_D.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward. Applicability requires support for FGI bit 103.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.3.1.2.1_D.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.2.1_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.2.1_D.3-2 and by the following:

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band;

b) the ratio of the throughput obtained when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

c) when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI.

**Table 9.3.1.2.1_D.3-1: Sub-band test for FDD**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 9 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| SNR (Note 3) | | dB | 4 | 5 | 11 | 12 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -94 | -93 | -87 | 86 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Antenna configuration | | | 2x2 | | | |
| CRS reference signals | | | Antenna port 0 | | | |
| CSI reference signals | | | Antenna ports 15, 16 | | | |
| Beamforming model | | | Annex B.4.3 | | | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/ 1 | | | |
| CSI-RS reference signal configuration | | | 4 | | | |
| CodeBookSubsetRestriction bitmap | | | 000001 | | | |
| Reporting interval (Note 4) | | Ms | 5 | | | |
| CQI delay | | Ms | 8 | | | |
| Reporting mode | | | PUSCH 3-1 | | | |
| Sub-band size | | RB | 6 (full size) | | | |
| Max number of HARQ transmissions | | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.8 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.

**Table 9.3.1.2.1_D.3-2: Minimum requirement (FDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| α [%] | 2 | 2 |
| β [%] | 40 | 40 |
| γ | 1.1 | 1.1 |
| UE Category | 1-8 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.1.2.1.

### 9.3.1.2.1_D.4 Test description

#### 9.3.1.2.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 for UE with 2Rx RF band and Annex A, Figure A.10a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.3.1.2.1_D.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.1.2.1_D.4.3.

### 9.3.1.2.1_D.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.1.2.1_D.5-2 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. Check if "2000*$\alpha$%/100 ≤ number of CQI reports with index 0 for each full-size subband ≤ 2000*$\beta$%/100". (2000= No of full-size subband reports, 100 because of %) If yes, continue with step5, otherwise goto step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2Cfor C_RNTI to transmit the DL RMC according to the wideband median-CQI value in an each TTI randomly selected full-size subband regardless of UE wideband and full-size subband CQI report. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the subbands in which UE reports the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput and (NACK /(ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) ≥ $\gamma$ and (NACK /(ACK + NACK))≥ 0.05 , pass the UE for this test and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.1.2.1_D.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.3.1.2.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.1.2.1_D.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | *CQI-ReportConfig-r10-DEFAULT* | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 9.3.1.2.1_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.3.1.2.1_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 000001 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

**Table 9.3.1.2.1_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.3.1.2.1_D.4.3-5: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 4 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.3.1.2.1_D.5 Test requirement

**Table 9.3.1.2.1.5-1: Test requirement (FDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 40 | 40 |
| $\gamma$ | 1.09 | 1.09 |
| UE Category | 1-8 | 1-8 |
| BLER | 0.05 | 0.05 |

**Table 9.3.1.2.1_D.5-2: Sub-band test for FDD**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 9 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 4 | 5 | 11 | 12 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 1 | 2 | 8 | 9 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -94 | -93 | -87 | 86 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Antenna configuration | | | 2x2 | | | |
| CRS reference signals | | | Antenna port 0 | | | |
| CSI reference signals | | | Antenna ports 15, 16 | | | |
| Beamforming model | | | Annex B.4.3 | | | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/ 1 | | | |
| CSI-RS reference signal configuration | | | 4 | | | |
| CodeBookSubsetRestriction bitmap | | | 000001 | | | |
| Reporting interval (Note 4) | | Ms | 5 | | | |
| CQI delay | | Ms | 8 | | | |
| Reporting mode | | | PUSCH 3-1 | | | |
| Sub-band size | | RB | 6 (full size) | | | |
| Max number of HARQ transmissions | | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: Reference measurement channel RC.8 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.
Note5: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

To pass the test, α and β and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.3.1.2.2_D TDD CQI Reporting under fading conditions – PUSCH 3-1 for eDL MIMO

### 9.3.1.2.2_D.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

### 9.3.1.2.2_D.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit 103.

Note: This test also applies to UE supporting 4Rx antenna ports

9.3.1.2.2_D.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.2.2_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.2.2_D.3-2 and by the following:

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band;

b) the ratio of the throughput obtained when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

c) when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI.

**Table 9.3.1.2.2_D.3-1: Sub-band test for TDD**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 9 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | 0 | | | |
| | $\sigma$ | dB | 0 | | | |
| SNR (Note 3) | | dB | 4 | 5 | 11 | 12 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -94 | -93 | -87 | -86 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Antenna configuration | | | 2x2 | | | |
| CRS reference signals | | | Antenna port 0 | | | |
| CSI reference signals | | | Antenna ports 15,16 | | | |
| Beamforming model | | | Annex B.4.3 | | | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/ 3 | | | |
| CSI-RS reference signal configuration | | | 4 | | | |
| CodeBookSubsetRestriction bitmap | | | 000001 | | | |
| Reporting interval (Note 4) | | ms | 5 | | | |
| CQI delay | | ms | 10 | | | |
| Reporting mode | | | PUSCH 3-1 | | | |
| Sub-band size | | RB | 6 (full size) | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: Reference measurement channel RC.8 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 and #8 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#2 and #7.

**Table 9.3.1.2.2_D.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| α [%] | 2 | 2 |
| β [%] | 40 | 40 |
| γ | 1.1 | 1.1 |
| UE Category | 1-8 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.1.2.2.

### 9.3.1.2.2_D.4 Test description

#### 9.3.1.2.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 for UE with 2Rx RF band and Annex A, Figure A.10a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.3.1.2.2_D.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.1.2.2_D.4.3.

#### 9.3.1.2.2_D.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.1.2.2_D.5-2 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and full-size subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI report for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. For each subband, if subband CQI of index 0 is reported, at least $\alpha$% but less than $\beta$% of 2000 full-size subband CQI report, then continue to step 5, otherwise, go to step 7.

5. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband median-CQI value in an each available downlink transmission instance randomly selected full-size subband regardless of UE wideband and subband CQI report. Note that each full-size subband is selected in

equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3 Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE report the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput and (NACK /(ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) $\geq \gamma$ and (NACK /(ACK + NACK))$\geq$ 0.05, pass the UE and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.1.2.2_D.3-1 for the other test as appropriate.

### 9.3.1.2.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.1.2.2_D.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | *CQI-ReportConfig-r10-DEFAULT* | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 9.3.1.2.2_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.3.1.2.2_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 000001 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

**Table 9.3.1.2.2_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.3.1.2.2_D.4.3-5: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.3.1.2.2_D.4.3-6: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | Multiplexing is selected as default to align with RAN4's assumptions in RF tests. | TDD |
| } | | | |

**Table 9.3.1.2.2_D.4.3-7: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 4 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 3 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.3.1.2.2_D.5 Test requirement

**Table 9.3.1.2.2.5-1: Test requirement (TDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 40 | 40 |
| $\gamma$ | 1.09 | 1.09 |
| UE Category | 1-8 | 1-8 |
| BLER | 0.05 | 0.05 |

**Table 9.3.1.2.2_D.5-2: Sub-band test for TDD**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 9 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 4 | 5 | 11 | 12 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 1 | 2 | 8 | 9 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -94 | -93 | -87 | -86 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Antenna configuration | | | 2x2 | | | |
| CRS reference signals | | | Antenna port 0 | | | |
| CSI reference signals | | | Antenna ports 15,16 | | | |
| Beamforming model | | | Annex B.4.3 | | | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/ 3 | | | |
| CSI-RS reference signal configuration | | | 4 | | | |
| CodeBookSubsetRestriction bitmap | | | 000001 | | | |
| Reporting interval (Note 4) | | ms | 5 | | | |
| CQI delay | | ms | 10 | | | |
| Reporting mode | | | PUSCH 3-1 | | | |
| Sub-band size | | RB | 6 (full size) | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: Reference measurement channel RC.8 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 and #8 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#2 and #7.
Note 5: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

To pass the test, α and β and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

### 9.3.1.2.3 FDD CQI Reporting under fading conditions – PUSCH 3-1 for 256QAM in DL

#### 9.3.1.2.3.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

#### 9.3.1.2.3.2 Test applicability

This test applies to E-UTRA FDD UE release 12 and forward of UE Category 11-12 and DL Category ≥11 that supports 256QAM in DL. Applicability requires support for FGI bit 103.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.3.1.2.3.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.2.3.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.2.3.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band;

b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

In this test, 4-bit CQI Table 2 in Table 7.2.3-2 in TS 36.213 [10], and Modulation and TBS index table 2 in Table 7.1.7.1-1A for PDSCH in TS 36.213 [10] are applied.

**Table 9.3.1.2.3.3-1: Sub-band test for FDD**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | |
| Transmission mode | | | 9 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| | $P_C$ | dB | 0 | |
| | $\sigma$ | dB | 0 | |
| SNR (Note 3) | | dB | 16 | 17 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -82 | -81 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | |
| Antenna configuration | | | 2x2 | |
| Beamforming Model | | | As specified in Section B.4.3 | |
| CRS reference signals | | | Antenna ports 0 | |
| CSI reference signals | | | Antenna ports 15, 16 | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/ 1 | |
| CSI-RS reference signal configuration | | | 4 | |
| CodeBookSubsetRestriction bitmap | | | 000001 | |
| Reporting interval (Note 4) | | ms | 5 | |
| CQI delay | | ms | 8 | |
| Reporting mode | | | PUSCH 3-1 | |
| Sub-band size | | RB | 6 (full size) | |
| Max number of HARQ transmissions | | | 1 | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.8A FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.

**Table 9.3.1.2.3.3-2: Minimum requirement (FDD)**

| | Test 1 |
|---|---|
| $\alpha$ [%] | 2 |
| $\beta$ [%] | 40 |
| $\gamma$ | 1.1 |
| UE Category | 11-12 |
| UE DL Category | ≥11 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.1.2.3.

### 9.3.1.2.3.4 Test description

#### 9.3.1.2.3.4.1 Initial conditions

Same Initial conditions as in clause 9.3.1.2.1_D.4.1 with the following exceptions:

- Instead of Table 9.3.1.2.1_D.3-1, use Table 9.3.1.2.3.3-1.
- Instead of Clause 9.3.1.2.1_D.4.3, use Clause 9.3.1.2.3.4.3.

#### 9.3.1.2.3.4.2 Test procedure

Same test procedure as in clause 9.3.1.2.1_D.4.2 without step 8 and with the following exceptions:

- Instead of Table 9.3.1.2.1_D.3-1, use Table 9.3.1.2.3.5-2.

#### 9.3.1.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.1.2.3.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | *CQI-ReportConfig-r10-DEFAULT* | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| cqi-ReportConfigPCell-v1250 SEQUENCE { | | | |
| altCQI-Table-r12 | allSubframes | | |
| } | | | |
| } | | | |

**Table 9.3.1.2.3.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.3.1.2.3.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 000001 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

**Table 9.3.1.2.3.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| } | | | |
| } | | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.3.1.2.3.4.3-5: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 4 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.3.1.2.3.5 Test requirement

**Table 9.3.1.2.3.5-1: Test requirement (FDD)**

| | Test 1 |
|---|---|
| $\alpha$ [%] | 2 |
| $\beta$ [%] | 40 |
| $\gamma$ | 1.09 |
| UE Category | 11-12 |
| UE DL Category | ≥11 |

**Table 9.3.1.2.3.5-2: Sub-band test for FDD**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | |
| Transmission mode | | | 9 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| | $P_C$ | dB | 0 | |
| | σ | dB | 0 | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 16 | 17 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 13 | 14 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -82 | -81 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | |
| Antenna configuration | | | 2x2 | |
| Beamforming Model | | | As specified in Section B.4.3 | |
| CRS reference signals | | | Antenna ports 0 | |
| CSI reference signals | | | Antenna ports 15, 16 | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/ 1 | |
| CSI-RS reference signal configuration | | | 4 | |
| CodeBookSubsetRestriction bitmap | | | 000001 | |
| Reporting interval (Note 4) | | ms | 5 | |
| CQI delay | | ms | 8 | |
| Reporting mode | | | PUSCH 3-1 | |
| Sub-band size | | RB | 6 (full size) | |
| Max number of HARQ transmissions | | | 1 | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.8A FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.

Note 5: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

To pass the test, α, β and γ must be fulfilled.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

### 9.3.1.2.4 TDD CQI Reporting under fading conditions – PUSCH 3-1 for 256QAM in DL

#### 9.3.1.2.4.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

#### 9.3.1.2.4.2 Test applicability

This test applies to E-UTRA TDD UE release 12 and forward of UE Category 11-12 and DL Category ≥11 that supports 256QAM in DL. Applicability requires support for FGI bit 103.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.3.1.2.4.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.2.4.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.2.4.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band;

b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be ≥ $\gamma$;

c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

In this test, 4-bit CQI Table 2 in Table 7.2.3-2 in TS 36.213 [10], and Modulation and TBS index table 2 in Table 7.1.7.1-1A for PDSCH in TS 36.213 [10] are applied.

**Table 9.3.1.2.4.3-1: Sub-band test for TDD**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 20 MHz |
| Transmission mode | | | 9 |
| Uplink downlink configuration | | | 2 |
| Special subframe configuration | | | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | $P_C$ | dB | 0 |
| | σ | dB | 0 |

| | | | |
|---|---|---|---|
| SNR (Note 3) | dB | 16 | 17 |
| $\hat{I}_{or}^{(j)}$ | dB[mW/15kHz] | -82 | -81 |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | |
| Antenna configuration | | 2x2 | |
| Beamforming Model | | As specified in Section B.4.3 | |
| CRS reference signals | | Antenna port 0 | |
| CSI reference signals | | Antenna port 15,16 | |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | 5/ 3 | |
| CSI-RS reference signal configuration | | 4 | |
| CodeBookSubsetRestriction bitmap | | 000001 | |
| Reporting interval (Note 4) | ms | 5 | |
| CQI delay | ms | 10 | |
| Reporting mode | | PUSCH 3-1 | |
| Sub-band size | RB | 8 (full size) | |
| Max number of HARQ transmissions | | 1 | |
| ACK/NACK feedback mode | | Multiplexing | |
| Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)<br>Note 2: Reference measurement channel RC.8A TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.<br>Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.<br>Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 and #8 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#2 and #7. | | | |

**Table 9.3.1.2.4.3-2: Minimum requirement (TDD)**

| | **Test 1** |
|---|---|
| $\alpha$ [%] | 2 |
| $\beta$ [%] | 40 |
| $\gamma$ | 1.1 |
| UE Category | 11-12 |
| UE DL Category | ≥11 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.1.2.4.

### 9.3.1.2.4.4 Test description

#### 9.3.1.2.4.4.1 Initial conditions

Same Initial conditions as in clause 9.3.1.2.2_D.4.1 with the following exceptions:

- Instead of Table 9.3.1.2.2_D.3-1, use Table 9.3.1.2.4.3-1.
- Instead of Clause 9.3.1.2.2_D.4.3, use Clause 9.3.1.2.4.4.3.

#### 9.3.1.2.4.4.2 Test procedure

Same test procedure as in clause 9.3.1.2.2_D.4.2 without step 8 and with the following exceptions:

- Instead of Table 9.3.1.2.2_D.3-1, use Table 9.3.1.2.4.5-2.

#### 9.3.1.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.1.2.4.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | *CQI-ReportConfig-r10-DEFAULT* | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| cqi-ReportConfigPCell-v1250 SEQUENCE { | | | |
| altCQI-Table-r12 | allSubframes | | |
| } | | | |
| } | | | |

**Table 9.3.1.2.4.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.3.1.2.4.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 000001 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

**Table 9.3.1.2.4.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm31 | | |
| } | | | |
| } | | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.3.1.2.4.4.3-5: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.3.1.2.4.4.3-6: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | Multiplexing is selected as default to align with RAN4's assumptions in RF tests. | TDD |
| } | | | |

**Table 9.3.1.2.4.4.3-7: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 4 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 3 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.3.1.2.4.5 Test requirement

**Table 9.3.1.2.4.5-1: Test requirement (TDD)**

| | Test 1 |
|---|---|
| $\alpha$ [%] | 2 |
| $\beta$ [%] | 40 |
| $\gamma$ | 1.09 |
| UE Category | 11-12 |
| UE DL Category | ≥11 |

**Table 9.3.1.2.4.5-2: Sub-band test for TDD**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| Bandwidth | | MHz | 20 MHz | |
| Transmission mode | | | 9 | |
| Uplink downlink configuration | | | 2 | |
| Special subframe configuration | | | 4 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| | $P_C$ | dB | 0 | |
| | σ | dB | 0 | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 16 | 17 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 13 | 14 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -82 | -81 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | |
| Antenna configuration | | | 2x2 | |
| Beamforming Model | | | As specified in Section B.4.3 | |
| CRS reference signals | | | Antenna port 0 | |
| CSI reference signals | | | Antenna port 15,16 | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/ 3 | |
| CSI-RS reference signal configuration | | | 4 | |
| CodeBookSubsetRestriction bitmap | | | 000001 | |
| Reporting interval (Note 4) | | ms | 5 | |
| CQI delay | | ms | 10 | |
| Reporting mode | | | PUSCH 3-1 | |
| Sub-band size | | RB | 8 (full size) | |
| Max number of HARQ transmissions | | | 1 | |
| ACK/NACK feedback mode | | | Multiplexing | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.8A TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 and #8 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#2 and #7.

Note 5: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

To pass the test, α and β and γ must be fulfilled.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

9.3.1.2.5

## 9.3.1.2.6 TDD CQI Reporting under fading conditions – PUCCH 3-1 (when csi-SubframeSet –r12 is configured with one CSI process)

### 9.3.1.2.6.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling

### 9.3.1.2.6.2 Test applicability

This test applies to E-UTRA TDD release 12 and forward UEs of Category 1 and onwards which supports Rel-12 CSI subframe sets and TM10.

### 9.3.1.2.6.3 Minimum conformance requirements

The following requirements apply to UE Category ≥1 which supports Rel-12 CSI subframe sets and TM10. For the parameters specified in Table 9.3.1.2.6.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.2.6.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band for each CSI subframe set;

b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$ for each CSI subframe set;

c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.01 for each CSI subframe set.

d) The difference of the wide-band median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ and the wide-band median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ shall be larger than or equal to 3.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each available downlink transmission instance. Sub-bands of a size smaller than full size are excluded from the test.

**Table 9.3.1.2.6-1: Sub-band test for TDD**

| Parameter | | Unit | Test | |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 | |
| Transmission mode | | | 10 | |
| Uplink downlink configuration | | | 2 | |
| Special subframe configuration | | | 4 | |
| CSI-MeasSubframeSet-r12 | | | 0001100000 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| | $P_C$ | dB | -3 | |
| | σ | dB | -3 | |
| SNR in CSI subframe set 0 | | dB | 0 | 1 |
| SNR in CSI subframe set 1 | | dB | 10 | 11 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 |
| $N_{oc1}^{(j)}$ for CSI subframe set 0 | | dB[mW/15kHz] | -98 | -98 |
| $N_{oc2}^{(j)}$ for CSI subframe set 1 | | dB[mW/15kHz] | -108 | -108 |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | |
| Antenna configuration | | | 2x2 | |
| Beamforming Model | | | As specified in Section B.4.3 | |
| CRS reference signals | | | Antenna port 0 and 1 | |
| CSI reference signals | | | Antenna port 15,16 | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/ 0 | |
| CSI-RS reference signal configuration | | | 0 | |
| Zero-Power CSI-RS configuration 0 $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | | 3 / 0000010000000000 | |
| Zero-Power CSI-RS configuration 1 $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | | 4 / 0100000000000000 | |
| CSI-IM configuration 0 $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | | 3 / 0000010000000000 | |
| CSI-IM configuration 1 $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | | 4 / 0100000000000000 | |
| CSI process configuration Signal/Interference/Reporting mode for CSI subframe set 0 | | | CSI-RS/CSI-IM 0/PUSCH 3-1 | |
| CSI process configuration Signal/Interference/Reporting mode for CSI subframe set 1 | | | CSI-RS/CSI-IM 1/PUSCH 3-1 | |
| CodeBookSubsetRestriction bitmap | | | 000001 | |
| Reporting interval (Note 4) | | ms | 10 per subframe set | |
| CQI delay | | ms | 15 for CSI subframe set 0<br>15 for CSI subframe set 1 | |
| Sub-band size | | RB | 6 (full size) | |
| PDSCH scheduled subframes for CSI subframe set 0 | | | 8,9 | |
| PDSCH scheduled subframes for CSI subframe set 1 | | | 3,4 | |
| Max number of HARQ transmissions | | | 1 | |
| ACK/NACK feedback mode | | | Multiplexing | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.18 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level for each subframe set separately.

Note 4: For CSI subframe set 0, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF #7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#8 to allow aperiodic CQI/PMI/RI to be transmitted

| |
|---|
| on uplink SF#2. |

**Table 9.3.1.2.6-2: Minimum requirement (TDD)**

| | Test |
|---|---|
| $\alpha$ [%] | 2 |
| $\beta$ [%] | 55 |
| $\gamma$ | 1.02 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.1.2.6.

### 9.3.1.2.6.4 Test description

#### 9.3.1.2.6.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 for UE with 2Rx RF band.
2. The parameter settings for the cell are set up according to Table 9.3.1.2.6.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.1.2.6.4.3.

#### 9.3.1.2.6.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.1.2.6.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and full-size subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI report, for each full-size subband and for each CSI subframe sets have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports for CSI subframe set 0 at every SF#2 and wideband CQI reports for CSI subframe set 1 at every SF#7, and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.
3. For each CSI subframe set, set up a relative frequency distribution for the reported wideband CQI-values. Calculate the median values (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). These CQI-values are declared as wideband Median $CQI_0$ for CSI subframe set 0 and Median $CQI_1$ for CSI subframe set 1.

4. If the difference between Median $CQI_0$ and Median $CQI_1$ is larger than or equal to 3, and for both CSI subframe sets and for each subband, if subband CQI of index 0 is reported, at least $\alpha$% but less than $\beta$% of 2000 full-size subband CQI report, then continue to step 5, otherwise, go to step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the Median $CQI_0$ on CSI subframe set 0, and according to the Median $CQI_1$ on CSI subframe set 1, in a randomly selected full-size subband regardless of UE wideband and subband CQI report. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3 Declare the throughput as $t_{median}$.

6. For each CSI subframe set, the SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE report the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput, and (NACK /(ACK + NACK)) for each CSI subframe set according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) $\geq \gamma$, and for each CSI subframe set (NACK /(ACK + NACK))≥0.01, pass the UE. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

#### 9.3.1.2.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.1.2.6.4.3-1: *TDD-Config-DEFAULT*: TDD CQI Reporting under fading conditions (when csi-SubframeSet –r12 is configured with one CSI process) requirement**

| Derivation Path: 36.508 Table 4.6.3-23 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.3.1.2.6.4.3-2: *PhysicalConfigDedicated-DEFAULT*: TDD CQI Reporting under fading conditions (when csi-SubframeSet –r12 is configured with one CSI process) requirement**

| Derivation Path: 36.508 Table 4.8.2.1.6-2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-eIMTA ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| codebookSubsetRestriction-r10 | 000001 | | |
| ue-TransmitAntennaSelection | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| cqi-ReportConfigPCell-v1250 SEQUENCE { | | | |
| csi-SubframePatternConfig-r12 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSets-r12 | 0001100000 | | |
| } | | | |
| } | | | |
| cqi-ReportBoth-v1250 | Not present | | |
| cqi-ReportAperiodic-v1250 | rm31 | | |
| altCQI-Table-r12 | Not present | | |
| } | | | |
| csi-RS-Config-v1250 SEQUENCE { | | | |
| zeroTxPowerCSI-RS2-r12 SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r12 | 4 | | |
| zeroTxPowerSubframeConfig-r12 | 0100000000000000 | | |
| } | | | |
| ds-ZeroTxPowerCSI-RS-r12 | Not present | | |
| } | | | |
| } | | | |

**Table 9.3.1.2.6.4.3-3: *CQI-ReportConfig-r10-DEFAULT* (In Table 9.3.1.2.6.4.3-2)**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| } | | | |

**Table 9.3.1.2.6.4.3-4: *CSI-RS-Config-r10* (In Table 9.3.1.2.6.4.3-2)**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 0 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r12 | 3 | | |
| zeroTxPowerSubframeConfig-r12 | 0000010000000000 | | |
| } | | | |
| } | | | |
| } | | | |

9.3.1.2.6.5 Test requirement

**Table 9.3.1.2.6.5-1: Minimum requirement (TDD)**

| | **Test** |
|---|---|
| $\alpha$ [%] | 2 |
| $\beta$ [%] | 55 |
| $\gamma$ | 1.01 |
| BLER | 0.01 |
| Delta CQI | 3 |
| UE Category | ≥1 |

**Table 9.3.1.2.6.5-2: Sub-band test for TDD**

| Parameter | | Unit | Test | |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 | |
| Transmission mode | | | 10 | |
| Uplink downlink configuration | | | 2 | |
| Special subframe configuration | | | 4 | |
| CSI-MeasSubframeSet-r12 | | | 0001100000 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| | $P_C$ | dB | -3 | |
| | σ | dB | -3 | |
| SNR in CSI subframe set 0 | | dB | 0 | 1 |
| SNR in CSI subframe set 1 | | dB | 10 | 11 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 |
| $N_{oc1}^{(j)}$ for CSI subframe set 0 | | dB[mW/15kHz] | -98 | -98 |
| $N_{oc2}^{(j)}$ for CSI subframe set 1 | | dB[mW/15kHz] | -108 | -108 |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | |
| Antenna configuration | | | 2x2 | |
| Beamforming Model | | | As specified in Section B.4.3 | |
| CRS reference signals | | | Antenna port 0 and 1 | |
| CSI reference signals | | | Antenna port 15,16 | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/ 0 | |
| CSI-RS reference signal configuration | | | 0 | |
| Zero-Power CSI-RS configuration 0 $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | | 3 / 0000010000000000 | |
| Zero-Power CSI-RS configuration 1 $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | | 4 / 0100000000000000 | |
| CSI-IM configuration 0 $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | | 3 / 0000010000000000 | |
| CSI-IM configuration 1 $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | | 4 / 0100000000000000 | |
| CSI process configuration Signal/Interference/Reporting mode for CSI subframe set 0 | | | CSI-RS/CSI-IM 0/PUSCH 3-1 | |
| CSI process configuration Signal/Interference/Reporting mode for CSI subframe set 1 | | | CSI-RS/CSI-IM 1/PUSCH 3-1 | |
| CodeBookSubsetRestriction bitmap | | | 000001 | |
| Reporting interval (Note 4) | | ms | 10 per subframe set | |
| CQI delay | | ms | 15 for CSI subframe set 0<br>15 for CSI subframe set 1 | |
| Sub-band size | | RB | 6 (full size) | |
| PDSCH scheduled subframes for CSI subframe set 0 | | | 8,9 | |
| PDSCH scheduled subframes for CSI subframe set 1 | | | 3,4 | |
| Max number of HARQ transmissions | | | 1 | |
| ACK/NACK feedback mode | | | Multiplexing | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.18 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level for each subframe set separately.

Note 4: For CSI subframe set 0, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF #7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#8 to allow aperiodic CQI/PMI/RI to be transmitted

| |
|---|
| on uplink SF#2. |

To pass the test, $\alpha$ and $\beta$ and $\gamma$ and BLER and Delta CQI must be fulfilled.

To pass the test, one **or** the other SNR point must be fulfilled.

## 9.3.1.3 CQI Reporting under fading conditions – PUSCH 3-0 (Cell-Specific Reference Symbols)

## 9.3.1.3.1

## 9.3.1.3.1_E FDD CQI Reporting under fading conditions – PUSCH 3-0 for feICIC

## 9.3.1.3.1_E.1 FDD CQI Reporting under fading conditions – PUSCH 3-0 for feICIC (non-MBSFN ABS)

### 9.3.1.3.1_E.1.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

### 9.3.1.3.1_E.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE and CRS interference handling release 11 and forward. Applicability requires support of FGI bit 115.

### 9.3.1.3.1_E.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.3.1_E.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.3.1_E.1.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band;

b) the ratio of the throughput in ABS subframes obtained when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

c) when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to $\varepsilon$.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. T

**Table 9.3.1.3.1_E.1.3-1: Sub-band test for single antenna transmission (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 and 3 | Cell 1 | Cell 2 and 3 |
| Bandwidth | | MHz | 10 | | 10 | |
| PDSCH transmission mode | | | 1 | Note 10 | 1 | Note 10 |
| Downlink power allocation | $\rho_A$ | dB | 0 | | 0 | |
| | $\rho_B$ | dB | 0 | | 0 | |
| | σ | dB | 0 | | 0 | |
| Propagation condition | | | Clause B.2.4 with Td = 0.45 us, a = 1, fd = 5 Hz | EVA5 Low antenna correlation | Clause B.2.4 with Td = 0.45 us, a = 1, fd = 5 Hz | EVA5 Low antenna correlation |
| Antenna configuration | | | 1x2 | | 1x2 | |
| $\hat{E}_s / N_{oc2}$ (Note 1) | | dB | 4 5 | Cell 2: 12 Cell 3: 10 | 14 15 | Cell 2: 12 Cell 3: 10 |
| $N_{oc}^{(j)}$ at antenna port | $N_{oc1}^{(j)}$ | dBm/15kHz | -98 (Note 7) | N/A | -98 (Note 7) | N/A |
| | $N_{oc2}^{(j)}$ | dBm/15kHz | -98 (Note 8) | N/A | -98 (Note 8) | N/A |
| | $N_{oc3}^{(j)}$ | dBm/15kHz | -93 (Note 9) | N/A | -93 (Note 9) | N/A |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Cell Id | | | 0 | Cell 2: 6 Cell 3: 1 | 0 | Cell 2: 6 Cell 3: 1 |
| Time Offset between Cells | | μs | Cell 2: 3 usec Cell 3: -1usec | | Cell 2: 3 usec Cell 3: -1usec | |
| Frequency Shift between Cells | | Hz | Cell 2: 300Hz Cell 3: -100Hz | | Cell 2: 300Hz Cell 3: -100Hz | |
| ABS pattern (Note 2) | | | N/A | 01010101 01010101 01010101 01010101 01010101 | N/A | 01010101 01010101 01010101 01010101 01010101 |
| RLM/RRM Measurement Subframe Pattern (Note 4) | | | 00000100 00000100 00000100 00000100 00000100 | N/A | 00000100 00000100 00000100 00000100 00000100 | N/A |
| CSI Subframe Sets (Note 3) | $C_{CSI,0}$ | | 01010101 01010101 01010101 01010101 01010101 | N/A | 01010101 01010101 01010101 01010101 01010101 | N/A |
| | $C_{CSI,1}$ | | 10101010 10101010 10101010 10101010 10101010 | N/A | 10101010 10101010 10101010 10101010 10101010 | N/A |
| Number of control OFDM symbols | | | 3 | | 3 | |
| Max number of HARQ transmissions | | | 1 | | 1 | |
| CQI delay | | ms | 8 | | | |
| Reporting interval (Note 13) | | ms | 10 | | | |
| Reporting mode | | | PUSCH 3-0 | | | |
| Sub-band size | | RB | 6 (full size) | | | |

Note 1: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 2: ABS pattern as defined in [9]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 3: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 4: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36331 [5].
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 6: Cell 1 is the serving cell. Cell 2 and Cell 3 are the aggressor cells. The number of the CRS ports in Cell 1, Cell 2, and Cell 3 are the same.
Note 7: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 8: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 9: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 10: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern as defined in TS 36.521-1 [10] Annex A.5.1.5.
Note 11: Reference measurement channel in Cell 1 RC.3 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
Note 12: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 13: The CSI reporting is such that reference subframes belong to $C_{csi,0}$.

**Table 9.3.1.3.1_E.1.3-2: Minimum requirement (FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.1 | 1.1 |
| $\varepsilon$ | 0.01 | 0.01 |
| UE Category | ≥1 | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.1.1.3.

### 9.3.1.3.1_E.1.4 Test description

#### 9.3.1.3.1_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.54 for antenna configuration 1x2.

2. The parameter settings for the cell are set up according to Table 9.3.1.3.1_E.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 9.3.1.3.1_E.1.4.3.

### 9.3.1.3.1_E.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.1.3.1_E.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in ABS protected subframes according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband for subframe set $C_{CSI,0}$ have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 10 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 (transmitted in SF#3) with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 10 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values for subframe set $C_{CSI,0}$. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median $CQI_0$.

4. Check if "2000*$\alpha$%/100 ≤ number of CQI reports with index 0 for each full-size subband ≤ 2000*$\beta$%/100". (2000= No of full-size subband reports, 100 because of %) If yes, continue with step5, otherwise goto step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in ABS protected subframes according to the wideband Median $CQI_0$ in each downlink transmission instance randomly selected full-size subband regardless of UE wideband and full-size subband CQI report. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 10 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 (transmitted in SF#3) with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput during ABS according to Annex G.5.3. Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in ABS protected subframes according to the highest UE reported full-size subband CQI value in one full-size subband selected among the subbands in which UE reports the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 10 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 (transmitted in SF#3) with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput during ABS and (NACK /(ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) ≥ $\gamma$ and (NACK /(ACK + NACK)) ≥ $\varepsilon$, pass the UE for this test and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.1.3.1_E.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

### 9.3.1.3.1_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 9.3.1.3.1_E.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '0000010000000100 0000010000000100 00000100' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 6 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an1 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.1.3.1_E.1.4.3-2: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 9.3.1.3.1_E.1-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm30 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '0101010101010101 0101010101010101 01010101' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '1010101010101010 1010101010101010 10101010' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

9.3.1.3.1_E.1.5 Test requirement

**Table 9.3.1.3.1_E.1.5-1: Test requirement (FDD)**

| | **Test 1** | **Test 2** |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.09 | 1.09 |
| $\varepsilon$ | 0.01 | 0.01 |
| UE Category | ≥1 | ≥1 |

To pass the test, $\alpha$ and $\beta$ and $\gamma$ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.3.1.3.2

## 9.3.1.3.2_E TDD CQI Reporting under fading conditions – PUSCH 3-0 for feICIC

## 9.3.1.3.2_E.1 TDD CQI Reporting under fading conditions – PUSCH 3-0 for feICIC (non-MBSFN ABS)

### 9.3.1.3.2_E.1.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

### 9.3.1.3.2_E.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE and CRS interference handling and ss-CCH interference handling release 11 and forward. Applicability requires support of FGI bit 115.

#### 9.3.1.3.2_E.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.3.2_E.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.3.2_E.1.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band;

b) the ratio of the throughput in ABS subframes obtained when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

c) when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to $\varepsilon$.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD.6.

**Table 9.3.1.3.2_E.1.3-1: Sub-band test for single antenna transmission (TDD)**

| Parameter | | Unit | Test 1 | | | Test 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | Cell 1 | | Cell 2 and 3 | Cell 1 | | Cell 2 and 3 |
| Bandwidth | | MHz | 10 | | | 10 | | |
| PDSCH transmission mode | | | 1 | | Note 10 | 1 | | Note 10 |
| Uplink downlink configuration | | | 1 | | | 1 | | |
| Special subframe configuration | | | 4 | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | 0 | | |
| | $\rho_B$ | dB | 0 | | | 0 | | |
| | σ | dB | 0 | | | 0 | | |
| Propagation condition | | | Clause B.2.4 with Td = 0.45 us, a = 1, fd = 5 Hz | | EVA5 Low antenna correlation | Clause B.2.4 with Td = 0.45 us, a = 1, fd = 5 Hz | | EVA5 Low antenna correlation |
| Antenna configuration | | | 1x2 | | | 1x2 | | |
| $\widehat{E}_s / N_{oc2}$ (Note 1) | | dB | 4 | 5 | Cell 2: 12 Cell 3: 10 | 14 | 15 | Cell 2: 12 Cell 3: 10 |
| $N_{oc}^{(j)}$ at antenna port | $N_{oc1}^{(j)}$ | dBm/15kHz | -98 (Note 7) | | N/A | -98 (Note 7) | | N/A |
| | $N_{oc2}^{(j)}$ | dBm/15kHz | -98 (Note 8) | | N/A | -98 (Note 8) | | N/A |
| | $N_{oc3}^{(j)}$ | dBm/15kHz | -93 (Note 9) | | N/A | -93 (Note 9) | | N/A |
| Subframe Configuration | | | Non-MBSFN | | Non-MBSFN | Non-MBSFN | | Non-MBSFN |
| Cell Id | | | 0 | | Cell 2: 6 Cell 3: 1 | 0 | | Cell 2: 6 Cell 3: 1 |
| Time Offset between Cells | | µs | Cell 2: 3 usec Cell 3: -1usec | | | Cell 2: 3 usec Cell 3: -1usec | | |
| Frequency shift between Cells | | Hz | Cell 2: 300Hz Cell 3: -100Hz | | | Cell 2: 300Hz Cell 3: -100Hz | | |
| ABS pattern (Note 2) | | | N/A | | 0100010001 0100010001 | N/A | | 0100010001 0100010001 |
| RLM/RRM Measurement Subframe Pattern (Note 4) | | | 0000000001 0000000001 | | N/A | 0000000001 0000000001 | | N/A |
| CSI Subframe Sets (Note 3) | $C_{CSI,0}$ | | 0100010001 0100010001 | | N/A | 0100010001 0100010001 | | N.A |
| | $C_{CSI,1}$ | | 1000101000 1000101000 | | N/A | 1000101000 1000101000 | | N/A |
| Number of control OFDM symbols | | | 3 | | | 3 | | |
| Max number of HARQ transmissions | | | 1 | | | 1 | | |
| CQI delay | | ms | 10 | | | | | |
| Reporting interval (Note 13) | | ms | 10 | | | | | |
| Reporting mode | | | PUSCH 3-0 | | | | | |
| Sub-band size | | RB | 6 (full size) | | | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | Multiplexing | | |

Note 1: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 2: ABS pattern as defined in [9]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 3: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 4: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 6: Cell 1 is the serving cell. Cell 2 and Cell 3 are the aggressor cells. The number of the CRS ports in Cell1, Cell 2, and Cell 3 is the same.
Note 7: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 8: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 9: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 10: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern as defined in TS 36.521-1 [10] Annex A.5.2.5
Note 11: Reference measurement channel in Cell 1 RC.3 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.
Note 12: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 13: The CSI reporting is such that reference subframes belong to $C_{csi,0}$.

**Table 9.3.1.3.2_E.1.3-2: Minimum requirement (TDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.1 | 1.1 |
| $\varepsilon$ | 0.01 | 0.01 |
| UE Category | ≥1 | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.1.1.4.

### 9.3.1.3.2_E.1.4 Test description

#### 9.3.1.3.2_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.54 for antenna configuration 1x2.

2. The parameter settings for the cell are set up according to Table 9.3.1.3.2_E.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 9.3.1.3.2_E.1.4.3.

#### 9.3.1.3.2_E.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.1.3.2_E.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in ABS protected subframes according to CQI value 8 and keep it regardless of the wideband and full-size subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI report for each full-size subband for subframe set $C_{CSI,0}$ have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 (transmitted in DL SF#1) with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 10 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values for subframe set $C_{CSI,0.}$ Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median $CQI_0$.

4. For each subband, if subband CQI of index 0 is reported, at least $\alpha$% but less than $\beta$% of 2000 full-size subband CQI report, then continue to step 5, otherwise, go to step 7.

5. The SS shall send PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in ABS protected subframes according to the wideband Median $CQI_0$ in each downlink transmission instance randomly selected full-size subband regardless of UE wideband and subband CQI report. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 (transmitted in DL SF#1) with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput during ABS according to Annex G.5.3 Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in ABS protected subframes according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE report the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 (transmitted in DL SF#1) with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput during ABS and (NACK /(ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) $\geq \gamma$ and (NACK /(ACK + NACK))$\geq \varepsilon$, pass the UE and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.1.3.2_E.1.3-1 for the other test as appropriate.

#### 9.3.1.3.2_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 9.3.1.3.2_E.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | 0000000001 0000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 6 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an1 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.1.3.2_E.1.4.3-2: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 9.3.1.3.2_E.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm30 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '0100010001 0100010001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '1000101000 1000101000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.1.3.2_E.1.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.3.1.3.2_E.1.4.3-5: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | | |
| } | | | |

9.3.1.3.2_E.1.5 Test requirement

**Table 9.3.1.3.2_E.1.5-1: Test requirement (TDD)**

| | **Test 1** | **Test 2** |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.09 | 1.09 |
| $\varepsilon$ | 0.01 | 0.01 |
| UE Category | ≥1 | ≥1 |

To pass the test, $\alpha$ and $\beta$ and $\gamma$ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.3.2 Frequency non-selective scheduling mode

The reporting accuracy of the channel quality indicator (CQI) under frequency non-selective fading conditions is determined by the reporting variance, and the relative increase of the throughput obtained when the transport format transmitted is that indicated by the reported CQI compared to the case for which a fixed transport format configured according to the reported median CQI is transmitted. In addition, the reporting accuracy is determined by a minimum BLER using the transport formats indicated by the reported CQI. To account for sensitivity of the input SNR the CQI reporting under frequency non-selective fading conditions is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

### 9.3.2.1 CQI Reporting under fading conditions – PUCCH 1-0 (Cell-Specific Reference Symbols)

#### 9.3.2.1.1 FDD CQI Reporting under fading conditions – PUCCH 1-0

##### 9.3.2.1.1.1 Test purpose

To verify that the UE is tracking the channel variations and selecting the largest transport format possible according to the prevailing channel state for frequently non-selective scheduling

##### 9.3.2.1.1.2 Test applicability

This test applies to E-UTRA FDD UE release 8 and forward of UE category ≥2.

Note: This test also applies to UE supporting 4Rx antenna ports

##### 9.3.2.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.2.1.1.3-1 and Table 9.3.2.1.1.3-3, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.2.1.1.3-2 and Table 9.3.2.1.1.3-4 and by the following:

a) CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least $\alpha$% of the time;

b) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be $\geq \gamma$;

c) when transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02

The applicability of the requirement with 5MHz bandwidth as specified in Table 9.3.2.1.1.3-3 and Table 9.3.2.1.1.3-4 is defined in clause 9.1.1.1.

**Table 9.3.2.1.1.3-1 Fading test for single antenna (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| SNR (Note 3) | | dB | 6 | 7 | 12 | 13 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -92 | -91 | -86 | -85 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | EPA5 | | | |
| Correlation and antenna configuration | | | High (1 x 2) | | | |
| Reporting mode | | | PUCCH 1-0 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 2 | | | |
| CQI delay | | ms | 8 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 4) | | | |
| PUCCH Report Type | | | 4 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 1 | | | |
| Max number of HARQ transmissions | | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.1 FDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 and RC.4 FDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

**Table 9.3.2.1.1.3-2 Minimum requirement (FDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| α [%] | 20 | 20 |
| γ | 1.05 | 1.05 |
| UE Category | 1-8 | 1-8 |

**Table 9.3.2.1.1.3-3: Fading test for single antenna (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 5 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| SNR (Note 3) | | dB | 6 | 7 | 12 | 13 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -92 | -91 | -86 | -85 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | EPA5 | | | |
| Correlation and antenna configuration | | | High (1 x 2) | | | |
| Reporting mode | | | PUCCH 1-0 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 2 | | | |
| CQI delay | | ms | 8 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 4) | | | |
| PUCCH Report Type | | | 4 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 1 | | | |
| Max number of HARQ transmissions | | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.14 FDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 and RC.15 FDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

**Table 9.3.2.1.1.3-4: Minimum requirement (FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 20 | 20 |
| $\gamma$ | 1.05 | 1.05 |
| UE Category | 1-8 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.2.1.1.

### 9.3.2.1.1.4 Test description

#### 9.3.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.3.2.1.1.3-1 and 5MHz for tests defined in Table 9.3.2.1.1.3-3, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9 for UE with 2Rx RF band and Annex A, Figure A.9a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.3.2.1.1.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2, and uplink signals according to Annex H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.2.1.1.4.3.

#### 9.3.2.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.2.1.1.5-3 for 10MHz tests or Table 9.3.2.1.1.3-3 for 5MHz tests as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1,#3,#5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH Continue transmission of the PDSCH until 100000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 2 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. If less than (100-$\alpha$)/100*100000 of the wideband CQI values are in the range (Median CQI - 1) $\leq$ Median CQI $\leq$ ( Median CQI + 1) then continue with step 5, otherwise go to step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI value regardless of UE wideband CQI report. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1,#3,#5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1,#3,#5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{wideband}$. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
   If the ratio ($t_{wideband}$ / $t_{median}$) $\geq \gamma$ and ratio (NACK /(ACK + NACK)) is greater or equal to 0.02, then pass the UE for this test and go to step 8. Otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.2.1.1.3-1 for 10MHz or table 9.3.2.1.1.3-3 for 5MHz for the other Test as appropriate. Otherwise pass the UE.

9.3.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.2.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.3.2.1.1.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 1 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

9.3.2.1.1.5 Test requirement

The applicability of the test requirement with 5MHz bandwidth as specified in Table 9.3.2.1.1.5-2 is defined in clause 9.1.1.1.

**Table 9.3.2.1.1.5-1: Test requirement (10MHz FDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 20 | 20 |
| $\gamma$ | 1.04 | 1.04 |
| BLER | 0.02 | 0.02 |
| UE category | ≥2 | ≥2 |

**Table 9.3.2.1.1.5-2: Test requirement (5MHz FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 20 | 20 |
| $\gamma$ | 1.04 | 1.04 |
| BLER | 0.02 | 0.02 |
| UE Category | ≥2 | ≥2 |

**Table 9.3.2.1.1.5-3 Fading test for single antenna (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 6 | 7 | 12 | 13 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 3 | 4 | 9 | 10 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -92 | -91 | -86 | -85 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | EPA5 | | | |
| Correlation and antenna configuration | | | High (1 x 2) | | | |
| Reporting mode | | | PUCCH 1-0 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 2 | | | |
| CQI delay | | ms | 8 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 4) | | | |
| PUCCH Report Type | | | 4 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 1 | | | |
| Max number of HARQ transmissions | | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.1 FDD according to Table A.4-1 for Category ≥2 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 and RC.4 FDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

Note 5: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

To pass the test, α and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.3.2.1.1_1 FDD CQI Reporting under fading conditions - PUCCH 1-0 (Release 9 and forward)

### 9.3.2.1.1_1.1 Test purpose

Same test purpose as in clause 9.3.2.1.1.1.

#### 9.3.2.1.1_1.2 Test applicability

This test applies to E-UTRA FDD UE release 9 and forward of UE category 1.

#### 9.3.2.1.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.3.2.1.1.3.

#### 9.3.2.1.1_1.4 Test description

##### 9.3.2.1.1_1.4.1 Initial conditions

Same initial conditions as in clause 9.3.2.1.1.4.1.

##### 9.3.2.1.1_1.4.2 Test procedure

Same test procedure as in clause 9.3.2.1.1.4.2.

##### 9.3.2.1.1_1.4.3 Message contents

Same message contents as in clause 9.3.2.1.1.4.3.

#### 9.3.2.1.1_1.5 Test requirement

Same test requirements as in clause 9.3.2.1.1.5 with the following exceptions:

Instead of table 9.3.2.1.1.5.1-> use table 9.3.2.1.1_1.5-1 below for 10MHz bandwidth tests:

**Table 9.3.2.1.1_1.5-1: Test requirement (FDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 20 | 20 |
| $\gamma$ | 1.04 | 1.04 |
| BLER | 0.02 | 0.02 |
| UE category | 1 | 1 |

Or instead of table 9.3.2.1.1.5.2-> use table 9.3.2.1.1_1.5-2 below for 5MHz bandwidth tests:

**Table 9.3.2.1.1_1.5-2: Test requirement (5MHz FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 20 | 20 |
| $\gamma$ | 1.04 | 1.04 |
| BLER | 0.02 | 0.02 |
| UE Category | 1 | 1 |

### 9.3.2.1.2 TDD CQI Reporting under fading conditions – PUCCH 1-0

#### 9.3.2.1.2.1 Test purpose

To verify that the UE is tracking the channel variations and selecting the transport format according to the prevailing channel state for frequently non-selective scheduling

#### 9.3.2.1.2.2 Test applicability

This test applies to E-UTRA TDD UE release 8 and forward of UE category $\geq$2.

9.3.2.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.2.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.2.1.2.3-2 and by the following

a) a CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least $\alpha$% of the time;

b) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be $\geq \gamma$;

c) when transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02

**Table 9.3.2.1.2.3-1: Fading test for single antenna (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $\sigma$ | dB | 0 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| SNR | | dB | 6 | 7 | 12 | 13 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -92 | -91 | -86 | -85 |
| Propagation channel | | | EPA5 | | | |
| Correlation and antenna configuration | | | High (1 x 2) | | | |
| Reporting mode | | | PUCCH 1-0 | | | |
| Reporting periodicity | | ms | $N_P$ = 5 | | | |
| CQI delay | | ms | 10 or 11 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 4) | | | |
| PUCCH Report Type | | | 4 | | | |
| cqi-pmi-ConfigurationIndex | | | 3 | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.1 TDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 and RC.4 TDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

**Table 9.3.2.1.2.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 20 | 20 |
| $\gamma$ | 1.05 | 1.05 |
| UE Category | 1-8 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.2.1.2.

### 9.3.2.1.2.4 Test description

#### 9.3.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 9.3.2.1.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.2.1.2.4.3.

#### 9.3.2.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.2.1.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH Continue transmission of the PDSCH until 100000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. If less than (100-$\alpha$)/100*100000 of the wideband CQI values are in the range (Median CQI - 1) $\leq$ Median CQI $\leq$ ( Median CQI + 1) then continue with step 5, otherwise go to step 7.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI value regardless of UE wideband CQI report. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Declare the throughput as $t_{wideband}$ . For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
   If the ratio ( $t_{wideband}$ / $t_{median}$ ) $\geq \gamma$ and ratio (NACK /(ACK + NACK )) is greater or equal to 0.02, then pass the UE and go to step 8. Otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.2.1.2.3-1 for the other test as appropriate.

#### 9.3.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.2.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.3.2.1.2.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1C in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.2.1.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa2 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

9.3.2.1.2.5 Test requirement

**Table 9.3.2.1.2.5-1: Test requirement (TDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| α [%] | 20 | 20 |
| γ | 1.04 | 1.04 |
| BLER | 0.02 | 0.02 |
| UE category | 2-8 | 2-8 |

To pass the test, α and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

9.3.2.1.2_1 TDD CQI Reporting under fading conditions - PUCCH 1-0 (Release 9 and forward)

9.3.2.1.2_2.1 Test purpose

Same test purpose as in clause 9.3.2.1.2.1.

9.3.2.1.2_1.2 Test applicability

This test applies to E-UTRA TDD UE release 9 and forward of UE category 1.

9.3.2.1.2_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.3.2.1.2.3.

9.3.2.1.2_1.4 Test description

9.3.2.1.2_1.4.1 Initial conditions

Same initial conditions as in clause 9.3.2.1.2.4.1.

9.3.2.1.2_1.4.2 Test procedure

Same test procedure as in clause 9.3.2.1.2.4.2.

9.3.2.1.2_1.4.3 Message contents

Same message contents as in clause 9.3.2.1.2.4.3.

9.3.2.1.2_1.5 Test requirement

Same test requirements as in clause 9.3.2.1.2.5 with the following exceptions:

Instead of table 9.3.2.1.2.5-1 use table 9.3.2.1.2_1.5-1 below:

**Table 9.3.2.1.2_1.5-1: Test requirement (TDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| α [%] | 20 | 20 |
| γ | 1.04 | 1.04 |
| BLER | 0.02 | 0.02 |
| UE category | 1 | 1 |

## 9.3.2.2 CQI Reporting under fading conditions – PUCCH 1-1 (CSI Reference Symbols)

### 9.3.2.2.1_D FDD CQI Reporting under fading conditions – PUCCH 1-1 for eDL-MIMO

#### 9.3.2.2.1_D.1 Test purpose

To verify that the UE is tracking the channel variations and selecting the largest transport format possible according to the prevailing channel state for frequently non-selective scheduling.

#### 9.3.2.2.1_D.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward of Category 2-8. Applicability requires support for FGI bit 103.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.3.2.2.1_D.3 Minimum conformance requirements

For the parameters specified in Table 9.3.2.2.1_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.2.2.1_D.3-2 and by the following:

a) CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least $\alpha$% of the time;

b) The ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be $\geq \gamma$;

c) When transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

**Table 9.3.2.2.1_D.3-1: Fading test for FDD**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 9 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | -3 | | | |
| | σ | dB | -3 | | | |
| SNR (Note 3) | | dB | 2 | 3 | 7 | 8 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -96 | -95 | -91 | -90 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | EPA5 | | | |
| Correlation and antenna configuration | | | ULA High (4 x 2) | | | |
| Cell-specific reference signals | | | Antenna ports 0,1 | | | |
| CSI reference signals | | | Antenna ports 15,…,18 | | | |
| Beamforming model | | | As specified in Annex B.4.3 | | | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/1 | | | |
| CSI-RS reference signal configuration | | | 2 | | | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 0001 | | | |
| Reporting mode | | | PUCCH 1-1 | | | |
| Reporting periodicity | | ms | $N_{\text{pd}}$ = 5 | | | |
| CQI delay | | ms | 8 | | | |
| Physical channel for CQI/ PMI reporting | | | PUSCH (Note 4) | | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | | |
| PUCCH channel for RI reporting | | | PUCCH Format 2 | | | |
| PUCCH report type for RI | | | 3 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 2 | | | |
| *ri-ConfigIndex* | | | 1 | | | |
| Max number of HARQ transmissions | | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.7 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.

**Table 9.3.2.2.1_D.3-2: Minimum requirement (FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 20 | 20 |
| $\gamma$ | 1.05 | 1.05 |
| UE Category | 2-8 | 2-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.2.2.1.

### 9.3.2.2.1_D.4 Test description

#### 9.3.2.2.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11 for UE with 2Rx RF band and Annex A, Figure A.11a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.3.2.2.1_D.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2, and uplink signals according to Annex H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.2.2.1_D.4.3.

### 9.3.2.2.1_D.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.2.2.1_D.5-2 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. If less than (100-$\alpha$)/100*2000 of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ ( Median CQI + 1) then continue with step 5, otherwise go to step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband median-CQI value regardless of UE wideband CQI report. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{wideband}$. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
   If the ratio ($t_{wideband}$ / $t_{median}$) ≥ $\gamma$ and ratio (NACK /(ACK + NACK)) is greater or equal to 0.02, then pass the UE for this test and go to step 8. Otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.2.2.1_D.3-1 for the other test as appropriate.

### 9.3.2.2.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.2.2.1_D.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not Present | | |
| antennaInfo-r10 CHOICE{ | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| csi-ReportConfig-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 9.3.2.2.1_D.4.3-2: *Void***

**Table 9.3.2.2.1_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0000 0001 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.3.2.2.1_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.3.2.2.1_D.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 2 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.2.2.1_D.4.3-6: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 2 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.3.2.2.1_D.5 Test requirement

**Table 9.3.2.2.1_D.3-2: Test requirement (FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 20 | 20 |
| $\gamma$ | 1.04 | 1.04 |
| UE Category | 2-8 | 2-8 |
| BLER | 0.02 | 0.02 |

**Table 9.3.2.2.1_D.5-2: Fading test for FDD**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 9 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | -3 | | | |
| | σ | dB | -3 | | | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 2 | 3 | 7 | 8 |
| SNR for 4Rx UE without 2Rx RF band | | dB | -1 | 0 | 4 | 5 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -96 | -95 | -91 | -90 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | EPA5 | | | |
| Correlation and antenna configuration | | | ULA High (4 x 2) | | | |
| Cell-specific reference signals | | | Antenna ports 0,1 | | | |
| CSI reference signals | | | Antenna ports 15,…,18 | | | |
| Beamforming model | | | As specified in Annex B.4.3 | | | |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | | 5/1 | | | |
| CSI-RS reference signal configuration | | | 2 | | | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 0001 | | | |
| Reporting mode | | | PUCCH 1-1 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| CQI delay | | ms | 8 | | | |
| Physical channel for CQI/ PMI reporting | | | PUSCH (Note 4) | | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | | |
| PUCCH channel for RI reporting | | | PUCCH Format 2 | | | |
| PUCCH report type for RI | | | 3 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 2 | | | |
| *ri-ConfigIndex* | | | 1 | | | |
| Max number of HARQ transmissions | | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.7 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.

Note 5: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

To pass the test, α and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.3.2.2.2_D TDD CQI Reporting under fading conditions – PUCCH 1-1 for eDL-MIMO

### 9.3.2.2.2_D.1 Test purpose

To verify that the UE is tracking the channel variations and selecting the largest transport format possible according to the prevailing channel state for frequently non-selective scheduling.

### 9.3.2.2.2_D.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward of Category ≥2. Applicability requires support for FGI bits 104 and 110.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.3.2.2.2_D.3 Minimum conformance requirements

For the parameters specified in Table 9.3.2.2.2_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.2.2.2_D.3-2 and by the following:

a) CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least $\alpha$% of the time;

b) The ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be $\geq \gamma$;

c) When transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

**Table 9.3.2.2.2_D.3-1: Fading test for TDD**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 9 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | -6 | | | |
| | σ | dB | -3 | | | |
| SNR (Note 3) | | dB | 1 | 2 | 7 | 8 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -97 | -96 | -91 | -90 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | EPA5 | | | |
| Correlation and antenna configuration | | | XP High (8 x 2) | | | |
| CRS reference signals | | | Antenna ports 0, 1 | | | |
| CSI reference signals | | | Antenna ports 15,…,22 | | | |
| Beamforming model | | | As specified in Annex B.4.3 | | | |
| CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/ 3 | | | |
| CSI-RS reference signal configuration | | | 2 | | | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 0020 0000 0000 0001 | | | |
| Reporting mode | | | PUCCH 1-1 (Sub-mode: 2) | | | |
| Reporting periodicity | | ms | $N_{\text{pd}}$ = 5 | | | |
| CQI delay | | ms | 10 | | | |
| Physical channel for CQI/ PMI reporting | | | PUSCH (Note 4) | | | |
| PUCCH Report Type for CQI/ PMI | | | 2c | | | |
| Physical channel for RI reporting | | | PUCCH Format 2 | | | |
| PUCCH report type for RI | | | 3 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| *ri-ConfigIndex* | | | 805 (Note 5) | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.7 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#2 and #7.

Note 5: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available.

**Table 9.3.2.2.2_D.3-2: Minimum requirement (TDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 20 | 20 |
| $\gamma$ | 1.05 | 1.05 |
| UE Category | ≥2 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.2.2.2.

### 9.3.2.2.2_D.4 Test description

#### 9.3.2.2.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure 47 for UE with 2Rx RF band and Annex A, Figure A.47a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.3.2.2.2_D.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2, and uplink signals according to Annex H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.2.2.2_D.4.3.

#### 9.3.2.2.2_D.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.2.2.2_D.5-2 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMCaccording to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. If less than (100-$\alpha$)/100*2000 of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ ( Median CQI + 1) then continue with step 5, otherwise go to step 7.
5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMCaccording to the wideband median-CQI value regardless of UE wideband CQI report. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Declare the throughput as $t_{median}$.
6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMCaccording to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Declare the throughput as $t_{wideband}$. For any PDSCH transmitted by the SS,

record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.

If the ratio ( $t_{wideband}$ / $t_{median}$ ) $\geq \gamma$ and ratio (NACK /(ACK + NACK)) is greater or equal to 0.02, then pass the UE and go to step 8. Otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.2.2.2_D.3-1 for the other test as appropriate.

### 9.3.2.2.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.2.2.2_D.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT::= SEQUENCE { | | | |
| antennaInfo | Not Present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| csi-ReportConfig-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 9.3.2.2.2_D.4.3-2: *Void***

**Table 9.3.2.2.2_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0000 0020 0000 0000 0001 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.3.2.2.2_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| Pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.3.2.2.2_D.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | submode2 | | |
| } | | | |
| ri-ConfigIndex | 805 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.2.2.2_D.4.3-6: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.3.2.2.2_D.4.3-7: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | Multiplexing is selected as default to align with RAN4's assumptions in RF tests. | TDD |
| } | | | |

**Table 9.3.2.2.2_D.4.3-8: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an8 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 2 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 3 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -6 | Parameter: $P_C$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.3.2.2.2_D.5 Test requirement

**Table 9.3.2.2.2_D.5-1: Test requirement (TDD)**

| | **Test 1** | **Test 2** |
|---|---|---|
| $\alpha$ [%] | 20 | 20 |
| $\gamma$ | 1.04 | 1.04 |
| UE Category | ≥2 | ≥2 |
| BLER | 0.02 | 0.02 |

**Table 9.3.2.2.2_D.5-2: Fading test for TDD**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 9 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | -6 | | | |
| | σ | dB | -3 | | | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 1 | 2 | 7 | 8 |
| SNR for 4Rx UE without 2Rx RF band | | dB | -2 | -1 | 4 | 5 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -97 | -96 | -91 | -90 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | EPA5 | | | |
| Correlation and antenna configuration | | | XP High (8 x 2) | | | |
| CRS reference signals | | | Antenna ports 0, 1 | | | |
| CSI reference signals | | | Antenna ports 15,…,22 | | | |
| Beamforming model | | | As specified in Annex B.4.3 | | | |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | | 5/ 3 | | | |
| CSI-RS reference signal configuration | | | 2 | | | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 0020 0000 0000 0001 | | | |
| Reporting mode | | | PUCCH 1-1 (Sub-mode: 2) | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| CQI delay | | ms | 10 | | | |
| Physical channel for CQI/ PMI reporting | | | PUSCH (Note 4) | | | |
| PUCCH Report Type for CQI/ PMI | | | 2c | | | |
| Physical channel for RI reporting | | | PUCCH Format 2 | | | |
| PUCCH report type for RI | | | 3 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| *ri-ConfigIndex* | | | 805 (Note 5) | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.7 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#2 and #7.

Note 5: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available.

Note 6: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

To pass the test, α and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.3.3 Frequency-selective interference

The accuracy of sub-band channel quality indicator (CQI) reporting under frequency selective interference conditions is determined by a double-sided percentile of the reported differential CQI offset level +2 for a preferred sub-band, and the relative increase of the throughput obtained when transmitting on any one of the sub-bands with the highest reported differential CQI offset level the corresponding transport format compared to the case for which a fixed format is transmitted on any sub-band in set of TS 36.213 [10]. The purpose is to verify that preferred sub-bands are used for frequently-selective scheduling under frequency-selective interference conditions.

### 9.3.3.1 CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0 (Cell-Specific Reference Symbols)

#### 9.3.3.1.1 FDD CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0

##### 9.3.3.1.1.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling with frequency-selective interference situation.

##### 9.3.3.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

Note: This test also applies to UE supporting 4Rx antenna ports

##### 9.3.3.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.3.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.3.1.1.3-2 and by the following:

a) a sub-band differential CQI offset level of +2 shall be reported at least $\alpha$% for at least one of the sub-bands of full size at the channel edges;

b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set $S$ shall be $\geq \gamma$;

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

**Table 9.3.3.1.1.3-1 Sub-band test for single antenna transmission (FDD)**

| Parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | 10 MHz |
| Transmission mode | | | 1 (port 0) | 1 (port 0) |
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 | 0 |
| | σ | dB | 0 | 0 |
| $I_{ot}^{(j)}$ for RB 0…5 Note 3 | | dB[mW/15kHz] | -102 | -93 |
| $I_{ot}^{(j)}$ for RB 6…41 Note 3 | | dB[mW/15kHz] | -93 | -93 |
| $I_{ot}^{(j)}$ for RB 42…49 Note 3 | | dB[mW/15kHz] | -93 | -102 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -94 | -94 |
| Max number of HARQ transmissions | | | 1 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | |
| Reporting interval | | ms | 5 | |
| Antenna configuration | | | 1 x 2 | |
| CQI delay | | ms | 8 | |
| Reporting mode | | | PUSCH 3-0 | |
| Sub-band size | | RB | 6 (full size) | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.3 FDD according to Table A.4-1.with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2

Note 3: Iot shall be modelled as connecting Gaussian distributed uncorrelated interference source for each UE receive antenna port. The received power spectral density of the interfering signal as measured at the UE antenna connector is to be scaled accordingly for different RB groups.

**Table 9.3.3.1.1.3-2: Minimum requirement (FDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| α [%] | 60 | 60 |
| γ | 1.6 | 1.6 |
| UE Category | ≥1 | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.3.1.1.

### 9.3.3.1.1.4 Test description

#### 9.3.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, interfering source and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.21 for UE with 2Rx RF band and Annex A, Figure A.21a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.3.3.1.1.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.3.1.1.4.3.

#### 9.3.3.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.3.1.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. If for at least one of the full-size subbands at the channel edges, a subband differential CQI offset level of +2 is reported in $\alpha$% or more of 2000 reports, then continue with step 5, otherwise fail the UE.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on an each TTI randomly selected full-size subband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each full-size subband shall be selected in the equal probability The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE reports the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.
   If $t_{subband} / t_{median} \geq \gamma$, then pass the UE for this test and go to step 7. Otherwise fail the UE.

7. If both tests have not been done, then repeat the same procedure (steps 1 to 6) with test conditions according to the table 9.3.3.1.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.3.3.1.1.4.3 Message contents

**Table 9.3.3.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.3.3.1.1.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm30 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | Not present | | |
| } | | | |
| } | | | |

9.3.3.1.1.5 Test requirement

**Table 9.3.3.1.1.5-1: Test requirement (FDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 40 | 40 |
| $\gamma$ | 1.50 | 1.50 |

## 9.3.3.1.2 TDD CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0

9.3.3.1.2.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling with frequency-selective interference situation.

9.3.3.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

Note: This test also applies to UE supporting 4Rx antenna ports

9.3.3.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.3.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.3.1.2.3-2 and by the following:

a) a sub-band differential CQI offset level of +2 shall be reported at least $\alpha$% for at least one of the sub-bands of full size at the channel edges;

b) the ratio of the throughput obtained when transmitting on any one of the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

**Table 9.3.3.1.2.3-1: Sub-band test for single antenna transmission (TDD)**

| Parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | 10 MHz |
| Transmission mode | | | 1 (port 0) | 1 (port 0) |
| Downlink power allocation | $\rho_A$ | dB | 0 | 0 |
| | $\rho_B$ | dB | 0 | 0 |
| | σ | dB | 0 | 0 |
| Uplink downlink configuration | | | 2 | |
| Special subframe configuration | | | 4 | |
| $I_{ot}^{(j)}$ for RB 0…[5] Note 3 | | dB[mW/15kHz] | -102 | -93 |
| $I_{ot}^{(j)}$ for RB 6…[41] Note 3 | | dB[mW/15kHz] | -93 | -93 |
| $I_{ot}^{(j)}$ for RB [42]…49 Note 3 | | dB[mW/15kHz] | -93 | -102 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -94 | -94 |
| Max number of HARQ transmissions | | | 1 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | |
| Antenna configuration | | | 1 x 2 | |
| Reporting interval | | ms | 5 | |
| CQI delay | | ms | 10 or 11 | |
| Reporting mode | | | PUSCH 3-0 | |
| Sub-band size | | RB | 6 (full size) | |
| ACK/NACK feedback mode | | | Multiplexing | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.3 TDD according to table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: Iot shall be modelled as connecting Gaussian distributed uncorrelated interference source for each UE receive antenna port. The received power spectral density of the interfering signal as measured at the UE antenna connector is to be scaled accordingly for different RB groups.

**Table 9.3.3.1.2.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| α [%] | 60 | 60 |
| γ | 1.6 | 1.6 |
| UE Category | 1-8 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.3.1.2.

### 9.3.3.1.2.4 Test description

#### 9.3.3.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and interfering source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.21 for UE with 2Rx RF band and Annex A, Figure A.21a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.3.3.1.2.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.3.1.2.4.3.

### 9.3.3.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.3.1.2.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. If for at least one of the full-size subbands at the channel edges, a subband differential CQI offset level of +2 is reported in $\alpha$% or more of 2000 reports, then continue with step 5, otherwise fail the UE.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in an each available downlink transmission instance randomly selected full-size subband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each full-size subband shall be selected in the equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE reports the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.

   If $t_{subband}$ / $t_{median} \geq \gamma$, then pass the UE for this test and go to step 7. Otherwise fail the UE.

7. If both tests have not been done, then repeat the same procedure (steps 1 to 6) with test conditions according to the table 9.3.3.1.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.3.3.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.3.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.3.3.1.2.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm30 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | Not present | | |
| } | | | |
| } | | | |

**Table 9.3.3.1.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa2 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

#### 9.3.3.1.2.5 Test requirement

**Table 9.3.3.1.2.5-1: Test requirement (TDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 40 | 40 |
| $\gamma$ | 1.50 | 1.50 |

## 9.3.4 UE-selected subband CQI

The accuracy of UE-selected subband channel quality indicator (CQI) reporting under frequency-selective fading conditions is determined by the relative increase of the throughput obtained when transmitting on the UE-selected subbands with the corresponding transport format compared to the case for which a fixed format is transmitted on any subband in set *S* of TS 36.213 [10]. The purpose is to verify that correct subbands are accurately reported for frequency-selective scheduling. To account for sensitivity of the input SNR the subband CQI reporting under frequency-selective fading conditions is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

## 9.3.4.1 CQI Reporting under fading conditions – PUSCH 2-0 (Cell-Specific Reference Symbols)

### 9.3.4.1.1 FDD CQI Reporting under fading conditions – PUSCH 2-0

#### 9.3.4.1.1.1 Test purpose

To verify that UE-selected sub-bands can be used for frequently-selective scheduling.

#### 9.3.4.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward. Applicability requires support for FGI bit 1.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.3.4.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.4.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.4.1.1.3-2 and by the following:

a) the ratio of the throughput obtained when transmitting on a randomly selected subband among the best M subbands reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected subband in set *S* shall be $\geq \gamma$;

The requirements only apply for subbands of full size and the random scheduling across the subbands is done by selecting a new subband in each TTI for FDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the $N_{PRB}$ entry in Table 7.1.7.2.1-1 of TS 36.213 [10] that corresponds to the subband size.

**Table 9.3.4.1.1.3-1: Subband test for single antenna transmission (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| SNR (Note 3) | | dB | 9 | 10 | 14 | 15 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -89 | -88 | -84 | -83 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Reporting interval | | ms | 5 | | | |
| CQI delay | | ms | 8 | | | |
| Reporting mode | | | PUSCH 2-0 | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| Subband size (*k*) | | RBs | 3 (full size) | | | |
| Number of preferred subbands (*M*) | | | 5 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.5 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

**Table 9.3.4.1.1.3-2: Minimum requirement (FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| γ | 1.2 | 1.2 |
| UE Category | 1-8 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.4.1.1.

### 9.3.4.1.1.4 Test description

#### 9.3.4.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9 for UE with 2Rx RF band and Annex A, Figure A.9a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.3.4.1.1.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.4.1.1.4.3.

#### 9.3.4.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.4.1.1.5-2 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on a randomly selected full-size subband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each full-size subband shall be selected in the equal probability The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in one full-size subband selected among the M subbands reported by the UE and with the corresponding TBS. Differential CQI offset level is selected from {1, 2, 3, 4}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.
   If $t_{subband} / t_{median} \geq \gamma$, then pass the UE for this test and go to step 7. Otherwise go to step 6.

6. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 5) for the other SNR point as appropriate. Otherwise fail the UE.

7. If both tests have not been done, then repeat the same procedure (steps 1 to 5) with test conditions according to the table 9.3.4.1.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.3.4.1.1.4.3 Message contents

**Table 9.3.4.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.3.4.1.1.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm20 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | Not present | | |
| } | | | |
| } | | | |

9.3.4.1.1.5 Test requirement

**Table 9.3.4.1.1.5-1: Test requirement (FDD)**

| | **Test 1** | **Test 2** |
|---|---|---|
| γ | 1.19 | 1.19 |
| UE Category | 1-8 | 1-8 |

**Table 9.3.4.1.1.5-2: Subband test for single antenna transmission (FDD)**

| **Parameter** | | **Unit** | **Test 1** | | **Test 2** | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 9 | 10 | 14 | 15 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 6 | 7 | 11 | 12 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -89 | -88 | -84 | -83 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Reporting interval | | ms | 5 | | | |
| CQI delay | | ms | 8 | | | |
| Reporting mode | | | PUSCH 2-0 | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| Subband size (*k*) | | RBs | 3 (full size) | | | |
| Number of preferred subbands (*M*) | | | 5 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.5 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

### 9.3.4.1.2 TDD CQI Reporting under fading conditions – PUSCH 2-0

#### 9.3.4.1.2.1 Test purpose

To verify that UE-selected sub-bands can be used for frequently-selective scheduling.

#### 9.3.4.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward. Applicability requires support for FGI bit 1.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.3.4.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.4.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.4.1.2.3-2 and by the following:

a) the ratio of the throughput obtained when transmitting on a randomly selected subband among the best M subbands reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected subband in set *S* shall be $\geq \gamma$;

The requirements only apply for subbands of full size and the random scheduling across the subbands is done by selecting a new subband in each available downlink transmission instance for TDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the $N_{PRB}$ entry in Table 7.1.7.2.1-1 of TS 36.213 [10] that corresponds to the subband size.

**Table 9.3.4.1.2.3-1: Sub-band test for single antenna transmission (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| SNR (Note 3) | | dB | 9 | 10 | 14 | 15 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -89 | -88 | -84 | -83 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Reporting interval | | ms | 5 | | | |
| CQI delay | | ms | 10 or 11 | | | |
| Reporting mode | | | PUSCH 2-0 | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| Subband size (*k*) | | RBs | 3 (full size) | | | |
| Number of preferred subbands (*M*) | | | 5 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.5 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

**Table 9.3.4.1.2.3-2: Minimum requirement (TDD)**

| | Test 1 | Test 2 |
|---|---|---|
| γ | 1.2 | 1.2 |
| UE Category | 1-8 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.4.1.2.

### 9.3.4.1.2.4 Test description

#### 9.3.4.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9 for UE with 2Rx RF band and Annex A, Figure A.9a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.3.4.1.2.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.4.1.2.4.3.

#### 9.3.4.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.4.1.2.5-2 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on a randomly selected full-size subband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each full-size subband shall be selected in the equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in one full-size subband selected among the M subbands reported by the UE and with the corresponding TBS. Differential CQI offset level is selected from {1, 2, 3, 4}. Note that the SS shall send PDSCH in the same full-size until next UE report is available. In case when same full-size subbands are reported subsequently, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.
   If $t_{subband} / t_{median} \geq \gamma$, then pass the UE for this test and go to step 7. Otherwise go to step 6.

6. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 5) for the other SNR point as appropriate. Otherwise fail the UE.

7. If both tests have not been done, then repeat the same procedure (steps 1 to 6) with test conditions according to the table 9.3.4.1.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.3.4.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.4.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.3.4.1.2.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm20 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | Not present | | |
| } | | | |
| } | | | |

**Table 9.3.4.1.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa2 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

9.3.4.1.2.5 Test requirement

**Table 9.3.4.1.2.5-1: Test requirement (TDD)**

| | **Test 1** | **Test 2** |
|---|---|---|
| $\gamma$ | 1.19 | 1.19 |
| UE Category | 1-8 | 1-8 |

**Table 9.3.4.1.2.5-2: Sub-band test for single antenna transmission (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 9 | 10 | 14 | 15 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 6 | 7 | 11 | 12 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -89 | -88 | -84 | -83 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Reporting interval | | ms | 5 | | | |
| CQI delay | | ms | 10 or 11 | | | |
| Reporting mode | | | PUSCH 2-0 | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| Subband size (*k*) | | RBs | 3 (full size) | | | |
| Number of preferred subbands (*M*) | | | 5 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.5 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

## 9.3.4.2 CQI Reporting under fading conditions – PUCCH 2-0 (Cell-Specific Reference Symbols)

### 9.3.4.2.1 FDD CQI Reporting under fading conditions – PUCCH 2-0

#### 9.3.4.2.1.1 Test purpose

To verify that UE-selected sub-bands can be used for frequently-selective scheduling.

#### 9.3.4.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward. Applicability requires support for FGI bit 2.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.3.4.2.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.4.2.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.4.2.1.3-2 and by the following

a) the ratio of the throughput obtained when transmitting on subbands reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected subband in set *S* shall be $\geq \gamma$;

The requirements only apply for subbands of full size and the random scheduling across the subbands is done by selecting a new subband in each TTI for FDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the $N_{PRB}$ entry in Table 7.1.7.2.1-1 of TS 36.213 [10] that corresponds to the subband size.

**Table 9.3.4.2.1.3-1: Subband test for single antenna transmission (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| SNR (Note 3) | | dB | 8 | 9 | 13 | 14 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -90 | -89 | -85 | -84 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, *a* = 1, $f_D = 5$ Hz | | | |
| Reporting periodicity | | ms | $N_P$ = 2 | | | |
| CQI delay | | ms | 8 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 4) | | | |
| PUCCH Report Type for wideband CQI | | | 4 | | | |
| PUCCH Report Type for subband CQI | | | 1 | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| Subband size (*k*) | | RBs | 6 (full size) | | | |
| Number of bandwidth parts (*J*) | | | 3 | | | |
| K | | | 1 | | | |
| *cqi-pmi-ConfigIndex* | | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.3 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

Note 5: CQI reports for the short subband (having 2RBs in the last bandwidth part) are to be disregarded and data scheduling according to the most recent subband CQI report for bandwidth part with j=1.

Note 6: In the case where wideband CQI is reported, data is to be scheduled according to the most recently used subband CQI report.

**Table 9.3.4.2.1.3-2: Minimum requirement (FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| γ | 1.15 | 1.15 |
| UE Category | 1-8 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.4.2.1.

#### 9.3.4.2.1.4 Test description

##### 9.3.4.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9 for UE with 2Rx RF band and Annex A, Figure A.9a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.3.4.2.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.4.2.1.4.3.

##### 9.3.4.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.4.2.1.5-2 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1, #3, #5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. In this process the SS collects wideband CQI reports and also cases where UE transmits nothing in its wideband CQI timing are counted as wideband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on a randomly selected full-size subband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each full-size subband shall be selected in the equal probability The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1, #3, #5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in the full-size subband reported by the UE and with the corresponding TBS. When the UE reports a non-full-size SB, the SS schedules the recent reported SB for bandwidth part with j=1 and with the corresponding TBS. Note that the SS shall send PDSCH in the same full-size subband until next subband UE report is available. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1, #3, #5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$. Count the number of NACKs, ACKs

and statDTXs on the UL during the test interval.

If $t_{subband}$ / $t_{median}$ $\geq \gamma$, then pass the UE for this test and go to step 7. Otherwise go to step 6.

6. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 5) for the other SNR point as appropriate. Otherwise fail the UE.

7. If both tests have not been done, then repeat the same procedure (steps 1 to 6) with test conditions according to the table 9.3.4.2.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.3.4.1.1.4.3 Message contents

**Table 9.3.4.2.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.3.4.2.1.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 1 | (see Table 7.2.2-1A in TS 36.213 | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| subbandCQI | 1 | | |
| } | | | |
| ri-ConfigIndex | 483 | (see Table 7.2.2-1B in TS 36.213 | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

9.3.4.2.1.5 Test requirement

**Table 9.3.4.2.1.5-1: Test requirement (FDD)**

| | **Test 1** | **Test 2** |
|---|---|---|
| $\gamma$ | 1.14 | 1.14 |
| UE Category | 1-8 | 1-8 |

**Table 9.3.4.2.1.5-2: Subband test for single antenna transmission (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 8 | 9 | 13 | 14 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 5 | 6 | 10 | 11 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -90 | -89 | -85 | -84 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Reporting periodicity | | ms | $N_P$ = 2 | | | |
| CQI delay | | ms | 8 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 4) | | | |
| PUCCH Report Type for wideband CQI | | | 4 | | | |
| PUCCH Report Type for subband CQI | | | 1 | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| Subband size (*k*) | | RBs | 6 (full size) | | | |
| Number of bandwidth parts (*J*) | | | 3 | | | |
| K | | | 1 | | | |
| *cqi-pmi-ConfigIndex* | | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.3 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

Note 5: CQI reports for the short subband (having 2RBs in the last bandwidth part) are to be disregarded and data scheduling according to the most recent subband CQI report for bandwidth part with j=1.

Note 6: In the case where wideband CQI is reported, data is to be scheduled according to the most recently used subband CQI report.

Note 7: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

## 9.3.4.2.2 TDD CQI Reporting under fading conditions – PUCCH 2-0

### 9.3.4.2.2.1 Test purpose

To verify that UE-selected sub-bands can be used for frequently-selective scheduling.

#### 9.3.4.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward. Applicability requires support for FGI bit 2.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.3.4.2.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.4.2.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.4.2.2.3-2 and by the following:

a) the ratio of the throughput obtained when transmitting on subbands reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected subband in set *S* shall be $\geq \gamma$;

The requirements only apply for subbands of full size and the random scheduling across the subbands is done by selecting a new subband in each available downlink transmission instance for TDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the $N_{PRB}$ entry in Table 7.1.7.2.1-1 of TS 36.213 [10] that corresponds to the subband size.

**Table 9.3.4.2.2.3-1: Sub-band test for single antenna transmission (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| SNR (Note 3) | | dB | 8 | 9 | 13 | 14 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -90 | -89 | -85 | -84 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Reporting periodicity | | ms | $N_P$ = 5 | | | |
| CQI delay | | ms | 10 or 11 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 4) | | | |
| PUCCH Report Type for wideband CQI | | | 4 | | | |
| PUCCH Report Type for subband CQI | | | 1 | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| Subband size (*k*) | | RBs | 6 (full size) | | | |
| Number of bandwidth parts (*J*) | | | 3 | | | |
| K | | | 1 | | | |
| *cqi-pmi-ConfigIndex* | | | 3 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.3 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

Note 5: CQI reports for the short subband (having 2RBs in the last bandwidth part) are to be disregarded and data scheduling according to the most recent subband CQI report for bandwidth part with j=1.

Note 6: In the case where wideband CQI is reported, data is to be scheduled according to the most recently used subband CQI report.

**Table 9.3.4.2.2.3-2: Minimum requirement (TDD)**

| | Test 1 | Test 2 |
|---|---|---|
| γ | 1.15 | 1.15 |
| UE Category | 1-8 | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.4.2.2.

#### 9.3.4.2.2.4 Test description

##### 9.3.4.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9 for UE with 2Rx RF band and Annex A, Figure A.9a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.3.4.2.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.4.2.2.4.3.

##### 9.3.4.2.2.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.4.2.2.5-2 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. In this process the SS collects wideband CQI reports and also cases where UE transmits nothing in its wideband CQI timing are counted as wideband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on a randomly selected full-size subband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each full-size subband shall be selected in the equal probability. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC in the full-size subband reported by the UE and with the corresponding TBS. When the UE reports a non-full-size SB, the SS schedules the recent reported SB for bandwidth part with j=1 and with the corresponding TBS. Note that the SS shall send PDSCH in the same full-size subband until next subband UE report is available. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$. Count the number of NACKs, ACKs and

statDTXs on the UL during the test interval.

If $t_{subband}$ / $t_{median}$ $\geq \gamma$, then pass the UE for this test and go to step 7. Otherwise go to step 6.

6. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 5) for the other SNR point as appropriate. Otherwise fail the UE.

7. If both tests have not been done, then repeat the same procedure (steps 1 to 6) with test conditions according to the table 9.3.4.2.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.3.4.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.4.2.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.3.4.2.2.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| subbandCQI | 1 | | |
| } | | | |
| ri-ConfigIndex | 484 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.4.2.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa2 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

#### 9.3.4.2.2.5 Test requirement

**Table 9.3.4.2.2.5-1: Test requirement (TDD)**

| | **Test 1** | **Test 2** |
|---|---|---|
| $\gamma$ | 1.14 | 1.14 |
| UE Category | 1-8 | 1-8 |

**Table 9.3.4.2.2.5-2: Sub-band test for single antenna transmission (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 8 | 9 | 13 | 14 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 5 | 6 | 10 | 11 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -90 | -89 | -85 | -84 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Reporting periodicity | | ms | $N_P$ = 5 | | | |
| CQI delay | | ms | 10 or 11 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 4) | | | |
| PUCCH Report Type for wideband CQI | | | 4 | | | |
| PUCCH Report Type for subband CQI | | | 1 | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| Subband size (*k*) | | RBs | 6 (full size) | | | |
| Number of bandwidth parts (*J*) | | | 3 | | | |
| K | | | 1 | | | |
| *cqi-pmi-ConfigIndex* | | | 3 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.3 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

Note 5: CQI reports for the short subband (having 2RBs in the last bandwidth part) are to be disregarded and data scheduling according to the most recent subband CQI report for bandwidth part with j=1.

Note 6: In the case where wideband CQI is reported, data is to be scheduled according to the most recently used subband CQI report.

Note 7: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

## 9.3.5 Additional requirements for enhanced receiver Type A

### 9.3.5.1 PUCCH 1-0 (Cell-Specific Reference Symbol)

#### 9.3.5.1.1 FDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A

##### 9.3.5.1.1.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality is based on the receiver of the enhanced Type A. Performance requirements are specified in terms of the relative increase of the throughput obtained when the transport format is that indicated by the reported CQI subject to an interference model compared to the case with a white Gaussian noise model, and a requirement on the minimum BLER of the transmitted transport formats indicated by the reported CQI subject to an interference model.

##### 9.3.5.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward that support enhanced receiver Type A.

##### 9.3.5.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.5.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.5.1.1.3-2 and by the following

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;

b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

**Table 9.3.5.1.1.3-1: Fading test for single antenna (FDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 1 (port 0) | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -2 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | N/A |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (1 x 2) | (1 x 2) |
| DIP (Note 4) | dB | N/A | -0.41 |
| Reference measurement channel | | Note 2 | R.2 FDD |
| Reporting mode | | PUCCH 1-0 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 2 | N/A |
| CQI delay | ms | 8 | N/A |
| Physical channel for CQI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type | | 4 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 1 | N/A |
| Max number of HARQ transmissions | | 1 | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.1 FDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 and RC.4 FDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. The number of the CRS ports in both cells is the same. Interfering cell is fully loaded.

Note 6: Both cells are time-synchronous.

Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.

Note 8: SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

**Table 9.3.5.1.1.3-2: Minimum requirement (FDD)**

| | |
|---|---|
| $\gamma$ | 1.8 |
| UE Category | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.5.1.1.

#### 9.3.5.1.1.4 Test description

##### 9.3.5.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.50.
2. The parameter settings for the cell 1 are set up according to Table 9.3.5.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.5.1.1.4.3.

##### 9.3.5.1.1.4.2 Test procedure

1. Set the cell 1 and 2 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.5.1.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1,#3,#5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_interference}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
3. Deactivate i.e., stop transmitting anything from the cell 2 and set the cell 1 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.5.1.1.3-1 as appropriate.
4. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1,#3,#5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_gaussian_noise}}$.
5. If the ratio ($t_{\text{wideband_interference}} / t_{\text{wideband_gaussian_noise}}$) $\geq \gamma$ and ratio (NACK /(ACK + NACK)) calculated in step 2 is greater or equal to 0.02, then pass the UE for this test. Otherwise fail the UE.

##### 9.3.5.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.5.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.3.5.1.1.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 1 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

9.3.5.1.1.5 Test requirement

**Table 9.3.5.1.1.5-1: Test Parameters for Fading test with single antenna (FDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 1 (port 0) | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -1.97 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | N/A |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (1 x 2) | (1 x 2) |
| DIP (Note 4) | dB | N/A | -0.38 |
| Reference measurement channel | | Note 2 | R.2 FDD |
| Reporting mode | | PUCCH 1-0 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 2 | N/A |
| CQI delay | ms | 8 | N/A |
| Physical channel for CQI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type | | 4 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 1 | N/A |
| Max number of HARQ transmissions | | 1 | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.1 FDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 and RC.4 FDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. The number of the CRS ports in both cells is the same. Interfering cell is fully loaded.

Note 6: Both cells are time-synchronous.

Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.

Note 8: SINR corresponds to $\widehat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

**Table 9.3.5.1.1.5-2: Test requirement (FDD)**

| | |
|---|---|
| $\gamma$ | 1.79 |
| UE Category | 1-8 |

### 9.3.5.1.2 TDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A

#### 9.3.5.1.2.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality is based on the receiver of the enhanced Type A. Performance requirements are specified in terms of the relative increase of the throughput obtained when the transport format is that indicated by the reported CQI subject to an interference model compared to the case with a white Gaussian noise model, and a requirement on the minimum BLER of the transmitted transport formats indicated by the reported CQI subject to an interference model.

#### 9.3.5.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 11 and forward that support enhanced receiver Type A.

#### 9.3.5.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.5.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.5.1.2.3-2 and by the following

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;

b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

**Table 9.3.5.1.2.3-1: Fading test for single antenna (TDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 1 (port 0) | |
| Uplink downlink configuration | | 2 | |
| Special subframe configuration | | 4 | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -2 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (1 x 2) | (1 x 2) |
| DIP (Note 4) | dB | N/A | -0.41 |
| Reference measurement channel | | Note 2 | R.2A TDD |
| Reporting mode | | PUCCH 1-0 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 5 | N/A |
| CQI delay | ms | 10 or 11 | N/A |
| Physical channel for CQI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type | | 4 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 3 | N/A |
| Max number of HARQ transmissions | | 1 | N/A |
| ACK/NACK feedback mode | | Multiplexing | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.1 TDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 and RC.4 TDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. The number of the CRS ports in both cells is the same. Interfering cell is fully loaded.

Note 6: Both cells are time-synchronous.

Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.

Note 8: SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

**Table 9.3.5.1.2.3-2: Minimum requirement (TDD)**

| | |
|---|---|
| $\gamma$ | 1.8 |
| UE Category | 1-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.5.1.2.

#### 9.3.5.1.2.4 Test description

##### 9.3.5.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.50.
2. The parameter settings for the cell 1 are set up according to Table 9.3.5.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.5.1.2.4.3.

##### 9.3.5.1.2.4.2 Test procedure

1. Set the cell 1 and 2 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.5.1.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_interference}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
3. Deactivate i.e., stop transmitting anything from the cell 2 and set the cell 1 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.5.1.2.3-1 as appropriate.
4. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_gaussian_noise}}$.
5. If the ratio ($t_{\text{wideband_interference}} / t_{\text{wideband_gaussian_noise}}$) $\geq \gamma$ and ratio (NACK /(ACK + NACK)) calculated in step 2 is greater or equal to 0.02, then pass the UE for this test. Otherwise fail the UE.

##### 9.3.5.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.5.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.3.5.1.2.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.5.1.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa2 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

9.3.5.1.2.5 Test requirement

**Table 9.3.5.1.2.5-1: Test Parameters for Fading test with single antenna (TDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 1 (port 0) | |
| Uplink downlink configuration | | 2 | |
| Special subframe configuration | | 4 | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -1.97 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (1 x 2) | (1 x 2) |
| DIP (Note 4) | dB | N/A | -0.38 |
| Reference measurement channel | | Note 2 | R.2A TDD |
| Reporting mode | | PUCCH 1-0 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 5 | N/A |
| CQI delay | ms | 10 or 11 | N/A |
| Physical channel for CQI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type | | 4 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 3 | N/A |
| Max number of HARQ transmissions | | 1 | N/A |
| ACK/NACK feedback mode | | Multiplexing | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.1 TDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 and RC.4 TDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. The number of the CRS ports in both cells is the same. Interfering cell is fully loaded.

Note 6: Both cells are time-synchronous.

Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.

Note 8: SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

**Table 9.3.5.1.2.5-2: Test requirement (TDD)**

| | |
|---|---|
| $\gamma$ | 1.79 |
| UE Category | 1-8 |

## 9.3.5.2 PUCCH 1-1 (CSI Reference Symbol)

### 9.3.5.2.1 FDD CQI Reporting under fading conditions - PUCCH 1-1 - Enhanced Performance Requirement Type A

#### 9.3.5.2.1.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality is based on the receiver of the enhanced Type A. Performance requirements are specified in terms of the relative increase of the throughput obtained when the transport format is that indicated by the reported CQI subject to an interference model compared to the case with a white Gaussian noise model, and a requirement on the minimum BLER of the transmitted transport formats indicated by the reported CQI subject to an interference model.

#### 9.3.5.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward of Category ≥2 that support enhanced receiver Type A.

Applicability requires support for FGI bit 103.

#### 9.3.5.2.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.5.2.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.5.2.1.3-2 and by the following

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;

b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

**Table 9.3.5.2.1.3-1: Fading test for single antenna (FDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 9 | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -2 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | N/A |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (2 x 2) | (1 x 2) |
| Beamforming Model | | As specified in Section B.4.3 (Note 10, 11) | N/A |
| DIP (Note 4) | dB | N/A | -0.41 |
| Cell-specific reference signals | | Antenna ports 0,1 | Antenna port 0 |
| CSI reference signals | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset | | 5/1 | N/A |
| CSI-RS reference signal configuration | | 2 | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | Subframes / bitmap | N/A | 1 / 0010000000000000 |
| CodeBookSubsetRestriction bitmap | | 001111 | N/A |
| Reference measurement channel | | Note 2 | R.2 FDD |
| Reporting mode | | PUCCH 1-1 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 5 | N/A |
| CQI delay | ms | 8 | N/A |
| Physical channel for CQI/PMI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type for CQI/PMI | | 2 | N/A |
| PUCCH channel for RI reporting | | PUCCH Format 2 | N/A |
| PUCCH Report Type for RI | | 3 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 2 | N/A |
| *ri-ConfigIndex* | | 1 | N/A |
| Max number of HARQ transmissions | | 1 | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.11 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.

Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. Interfering cell is fully loaded.

Note 6: Both cells are time-synchronous.

| | |
|---|---|
| Note 7: | Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present. |
| Note 8: | SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1. |
| Note 9: | N/A. |
| Note 10: | The precoder in clause B.4.3 follows UE recommended PMI. |
| Note 11: | If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). |

**Table 9.3.5.2.1.3-2: Minimum requirement (FDD)**

| | |
|---|---|
| $\gamma$ | 1.8 |
| UE Category | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.5.2.1.

### 9.3.5.2.1.4 Test description

#### 9.3.5.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.51.
2. The parameter settings for the cell 1 are set up according to Table 9.3.5.2.1.5-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.5.2.1.4.3.

#### 9.3.5.2.1.4.2 Test procedure

1. Set the cell 1 and 2 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.5.2.1.5-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_interference}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
3. Deactivate i.e., stop transmitting anything from the cell 2 and set the cell 1 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.5.2.1.5-1 as appropriate.

4. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_gaussian_noise}}$.

5. If the ratio ($t_{\text{wideband_interference}} / t_{\text{wideband_gaussian_noise}}$) $\geq \gamma$ in Table 9.3.5.2.1.5-2 and ratio (NACK /(ACK + NACK)) calculated in step 2 is greater or equal to 0.02, then pass the UE for this test. Otherwise fail the UE.

#### 9.3.5.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.5.2.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 9.3.5.2.1.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 001111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.3.5.2.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.3.5.2.1.4.3-4: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 2 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 1 | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.5.2.1.4.3-5: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 2 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.3.5.2.1.4.3-6: *Void***

9.3.5.2.1.5 Test requirement

**Table 9.3.5.2.1.5-1: Test Parameters for fading test for single antenna (FDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 9 | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -1.97 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | N/A |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (2 x 2) | (1 x 2) |
| Beamforming Model | | As specified in Section B.4.3 (Note: 10, 11) | N/A |
| DIP (Note 4) | dB | N/A | -0.38 |
| Cell-specific reference signals | | Antenna ports 0,1 | Antenna port 0 |
| CSI reference signals | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset | | 5/1 | N/A |
| CSI-RS reference signal configuration | | 2 | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | Subframes / bitmap | N/A | 1 / 0010000000000000 |
| CodeBookSubsetRestriction bitmap | | 001111 | N/A |
| Reference measurement channel | | Note 2 | R.2 FDD |
| Reporting mode | | PUCCH 1-1 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 5 | N/A |
| CQI delay | ms | 8 | N/A |
| Physical channel for CQI/PMI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type for CQI/PMI | | 2 | N/A |
| PUCCH channel for RI reporting | | PUCCH Format 2 | N/A |
| PUCCH Report Type for RI | | 3 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 2 | N/A |
| *ri-ConfigIndex* | | 1 | N/A |
| Max number of HARQ transmissions | | 1 | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.11 FDD according to Table A.4-1with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.

Note 4: The respective received power spectral density of each interfering

| | |
|---|---|
| | cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1. |
| Note 5: | Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. Interfering cell is fully loaded. |
| Note 6: | Both cells are time-synchronous. |
| Note 7: | Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present. |
| Note 8: | SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. |
| Note 9: | N/A. |
| Note 10: | The precoder in clause B.4.3 follows UE recommended PMI. |
| Note 11: | If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). |

**Table 9.3.5.2.1.5-2: Test requirement (FDD)**

| | |
|---|---|
| $\gamma$ | 1.79 |
| UE Category | ≥2 |

## 9.3.5.2.2 TDD CQI Reporting under fading conditions - PUCCH 1-1 - Enhanced Performance Requirement Type A

### 9.3.5.2.2.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality is based on the receiver of the enhanced Type A. Performance requirements are specified in terms of the relative increase of the throughput obtained when the transport format is that indicated by the reported CQI subject to an interference model compared to the case with a white Gaussian noise model, and a requirement on the minimum BLER of the transmitted transport formats indicated by the reported CQI subject to an interference model.

### 9.3.5.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 11 and forward of Category ≥2 that support enhanced receiver Type A.

Applicability requires support for FGI bit 103.

### 9.3.5.2.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.5.2.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.3.5.2.2.3-2 and by the following

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;

b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

**Table 9.3.5.2.2.3-1: Fading test for single antenna (TDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 9 | |
| Uplink downlink configuration | | 2 | |
| Special subframe configuration | | 4 | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -2 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (2 x 2) | (1 x 2) |
| Beamforming Model | | As specified in Section B.4.3 (Note 11, 12) | N/A |
| DIP (Note 4) | dB | N/A | -0.41 |
| Cell-specific reference signals | | Antenna ports 0,1 | Antenna port 0 |
| CSI reference signals | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset | | 5/3 | N/A |
| CSI-RS reference signal configuration | | 2 | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | Subframes / bitmap | N/A | 3 / 0010000000000000 |
| CodeBookSubsetRestriction bitmap | | 001111 | N/A |
| Reference measurement channel | | Note 2 | R.2A TDD |
| Reporting mode | | PUCCH 1-1 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 5 | N/A |
| CQI delay | ms | 10 | N/A |
| Physical channel for CQI/PMI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type for CQI/PMI | | 2 | N/A |
| Physical channel for RI reporting | | PUCCH Format 2 | N/A |
| PUCCH Report Type for RI | | 3 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 3 | N/A |
| *ri-ConfigIndex* | | 805 (Note 9) | N/A |
| Max number of HARQ transmissions | | 1 | N/A |
| ACK/NACK feedback mode | | Multiplexing | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.11 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in

uplink subframe SF#2 and #7.

Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. Interfering cell is fully loaded.

Note 6: Both cells are time-synchronous.

Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.

Note 8: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1.

Note 9: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available.

Note 10: N/A.

Note 11: The precoder in clause B.4.3 follows UE recommended PMI.

Note 12: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

**Table 9.3.5.2.2.3-2: Minimum requirement (TDD)**

| $\gamma$ | 1.8 |
|---|---|
| UE Category | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.5.2.2.

### 9.3.5.2.2.4 Test description

#### 9.3.5.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.51.
2. The parameter settings for the cell 1 are set up according to Table 9.3.5.2.2.5-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.5.2.2.4.3.

#### 9.3.5.2.2.4.2 Test procedure

1. Set the cell 1 and 2 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.5.2.2.5-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_interference}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.

3. Deactivate i.e., stop transmitting anything from the cell 2 and set the cell 1 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.5.2.2.5-1 as appropriate.

4. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_gaussian_noise}}$.

5. If the ratio ($t_{\text{wideband_interference}} / t_{\text{wideband_gaussian_noise}}$) $\geq \gamma$ in Table 9.3.5.2.2.5-2 and ratio (NACK /(ACK + NACK)) calculated in step 2 is greater or equal to 0.02, then pass the UE for this test. Otherwise fail the UE.

#### 9.3.5.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.5.2.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 9.3.5.2.2.4.3-2 *Void***

**Table 9.3.5.2.2.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 001111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.3.5.2.2.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.3.5.2.2.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 3 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 805 | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.5.2.2.4.3-6: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 2 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 3 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.3.5.2.2.4.3-7: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa2 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

9.3.5.2.2.5 Test requirement

**Table 9.3.5.2.2.5-1: Test parameters for fading test for single antenna (TDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 9 | |
| Uplink downlink configuration | | 2 | |
| Special subframe configuration | | 4 | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -1.97 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (2 x 2) | (1 x 2) |
| Beamforming Model | | As specified in Section B.4.3 (Note 11, 12) | N/A |
| DIP (Note 4) | dB | N/A | -0.38 |
| Cell-specific reference signals | | Antenna ports 0,1 | Antenna port 0 |
| CSI reference signals | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset | | 5/3 | N/A |
| CSI-RS reference signal configuration | | 2 | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | Subframes / bitmap | N/A | 3 / 0010000000000000 |
| CodeBookSubsetRestriction bitmap | | 001111 | N/A |
| Reference measurement channel | | Note 2 | R.2A TDD |
| Reporting mode | | PUCCH 1-1 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 5 | N/A |
| CQI delay | ms | 10 | N/A |
| Physical channel for CQI/PMI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type for CQI/PMI | | 2 | N/A |
| Physical channel for RI reporting | | PUCCH Format 2 | N/A |
| PUCCH Report Type for RI | | 3 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 3 | N/A |
| *ri-ConfigIndex* | | 805 (Note 9) | N/A |
| Max number of HARQ transmissions | | 1 | N/A |
| ACK/NACK feedback mode | | Multiplexing | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.11 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH

DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#2 and #7.

Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. Interfering cell is fully loaded.

Note 6: Both cells are time-synchronous.

Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.

Note 8: SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

Note 9: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available.

Note 10: N/A.

Note 11: The precoder in clause B.4.3 follows UE recommended PMI.

Note 12: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

**Table 9.3.5.2.2.5-2: Test requirement (TDD)**

| | |
|---|---|
| $\gamma$ | 1.79 |
| UE Category | ≥2 |

## 9.3.6 CQI Reporting under fading conditions (With multiple CSI processes)

### 9.3.6.1_F FDD CQI Reporting under fading conditions with CSI processes for CoMP

#### 9.3.6.1_F.1 FDD CQI Reporting under fading conditions with Single CSI process for CoMP

##### 9.3.6.1_F.1.1 Test purpose

The purpose of the test is to verify the reporting accuracy of the CQI and the UE processing capability for single CSI process.

##### 9.3.6.1_F.1.2 Test applicability

This test applies to all types of E-UTRA FDD UEs release 11 and forward, supporting Maximum CSI processes of One on a component carrier within a band with PDSCH transmission mode 10.

Note: This test also applies to UE supporting 4Rx antenna ports

##### 9.3.6.1_F.1.3 Minimum conformance requirements

Each CSI process is associated with a CSI-RS resource and a CSI-IM resource as shown in Table 9.3.6.1_F.1.3-1. For UE supports one CSI process, CSI process 2 is configured and the corresponding requirements shall be fulfilled. For UE supports three CSI processes, CSI processes 0, 1 and 2 are configured and the corresponding requirements shall be fulfilled. For UE supports four CSI processes, CSI processes 0, 1, 2 and 3 are configured and the corresponding requirements shall be fulfilled. And the Table 9.3.6.1_F.1.3-1 is valid for FDD and TDD.

**Table 9.3.6.1_F.1.3-1: Configuration of CSI processes**

| | CSI process 0 | CSI process 1 | CSI process 2 | CSI process 3 |
|---|---|---|---|---|
| CSI-RS resource | CSI-RS signal 0 | CSI-RS signal 1 | CSI-RS signal 0 | CSI-RS signal 1 |
| CSI-IM resource | CSI-IM resource 0 | CSI-IM resource 0 | CSI-IM resource 1 | CSI-IM resource 2 |

For the parameters specified in Table 9.3.6.1_F.1.3-2, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.6.1_F.1.3-3 and by the following:

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band for CSI process 1, 2, or 3;

b) a CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least $\delta$% of the time for CSI process 0;

c) the difference of the median CQIs of the reported wideband CQI for configured CSI processes shall be greater or equal to the values as in Table 9.3.6.1_F.1.3-4;

d) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

e) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

**Table 9.3.6.1_F.1.3-2: Fading test for FDD**

| Parameter | | Unit | Test 1 | | | | Test 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | TP1 | | TP2 | | TP1 | | TP2 | |
| Bandwidth | | MHz | 10 MHz | | | | 10 MHz | | | |
| Transmission mode | | | 10 | | 10 | | 10 | | 10 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | | 0 | | | |
| | $\rho_B$ | dB | 0 | | | | 0 | | | |
| | $P_C$ | dB | -3 | | 0 | | -3 | | 0 | |
| | σ | dB | -3 | | | | -3 | | | |
| SNR (Note 7) | | dB | 10 | 11 | 7 | 8 | 14 | 15 | 9 | 10 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -88 | -87 | -91 | -90 | -84 | -85 | -89 | -88 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | | | -98 | | | |
| Propagation channel | | | EPA 5 Low | | Clause B.2.4.1 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | EPA 5 Low | | Clause B.2.4.1 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | |
| Antenna configuration | | | 4x2 | | 2x2 | | 4x2 | | 2x2 | |
| Beamforming Model | | | As specified in Section B.4.3 | | | | As specified in Section B.4.3 | | | |
| Timing offset between TPs | | us | 0 | | | | 0 | | | |
| Frequency offset between TPs | | Hz | 0 | | | | 0 | | | |
| Cell-specific reference signals | | | Antenna ports 0,1 | | | | Antenna ports 0,1 | | | |
| CSI-RS signal 0 | | | Antenna ports 15,…,18 | | N/A | | Antenna ports 15,…,18 | | N/A | |
| CSI-RS 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | | N/A | | 5/1 | | N/A | |
| CSI-RS 0 configuration | | | 0 | | N/A | | 0 | | N/A | |
| CSI-RS signal 1 | | | N/A | | Antenna ports 15,16 | | N/A | | Antenna ports 15,16 | |
| CSI-RS 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | | 5/1 | | N/A | | 5/1 | |
| CSI-RS 1 configuration | | | N/A | | 5 | | N/A | | 5 | |
| Zero-power CSI-RS 0 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | N/A | | 1 / 1110000000000000 | | N/A | | 1 / 1110000000000000 | |
| Zero-power CSI-RS 1 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 1 / 0010011000000000 | | N/A | | 1 / 0010011000000000 | | N/A | |
| CSI-IM 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | | 5/1 | | 5/1 | | 5/1 | |
| CSI-IM 0 configuration | | | 2 | | 2 | | 2 | | 2 | |
| CSI-IM 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | | N/A | | 5/1 | | N/A | |
| CSI-IM 1 configuration | | | 6 | | N/A | | 6 | | N/A | |
| CSI-IM 2 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | | 5/1 | | N/A | | 5/1 | |
| CSI-IM 2 configuration | | | N/A | | 1 | | N/A | | 1 | |
| CSI process 0 | CSI-RS | | CSI-RS 0 | | | | CSI-RS 0 | | | |
| | CSI-IM | | CSI-IM 0 | | | | CSI-IM 0 | | | |
| | Reporting mode | | PUCCH 1-1 | | | | PUCCH 1-1 | | | |
| | CodeBookSubsetRestriction bitmap | | 0x0000 0000 0000 0001 | | | | 0x0000 0000 0000 0001 | | | |
| | Reporting periodicity | ms | $N_{pd}$ = 5 | | | | $N_{pd}$ = 5 | | | |
| | CQI delay | ms | 11 | | | | 11 | | | |
| | Physical channel for CQI/ PMI reporting | | PUSCH (Note 6) | | | | PUSCH (Note 6) | | | |
| | PUCCH Report Type for CQI/PMI | | 2 | | | | 2 | | | |
| | PUCCH channel | | PUCCH Format 2 | | | | PUCCH Format 2 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | for RI reporting | | | | | |
| | PUCCH report type for RI | | 3 | | 3 | |
| | *cqi-pmi-ConfigurationIndex* | | 4 | | 4 | |
| | *ri-ConfigIndex* | | 2 | | 2 | |
| CSI process 1 | CSI-RS | | CSI-RS 1 | | CSI-RS 1 | |
| | CSI-IM | | CSI-IM 0 | | CSI-IM 0 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 000001 | | 000001 | |
| | Reporting interval (Note 10) | ms | 5 | | 5 | |
| | CQI delay | ms | 11 | | 11 | |
| | Sub-band size | RB | 6 (full size) | | 6 (full size) | |
| CSI process 2 (For UE configured single process) | CSI-RS | | CSI-RS 0 | | CSI-RS 0 | |
| | CSI-IM | | CSI-IM 1 | | CSI-IM 1 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 0x0000 0000 0000 0001 | | 0x0000 0000 0000 0001 | |
| | Reporting interval (Note 8) | ms | 5 | | 5 | |
| | CQI delay | ms | 8 | | 8 | |
| | Sub-band size | RB | 6 (full size) (Note 9) | | 6 (full size) (Note 9) | |
| CSI process 2 (For UE configured multiple processes) | CSI-RS | | CSI-RS 0 | | CSI-RS 0 | |
| | CSI-IM | | CSI-IM 1 | | CSI-IM 1 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 0x0000 0000 0000 0001 | | 0x0000 0000 0000 0001 | |
| | Reporting interval (Note 10) | ms | 5 | | 5 | |
| | CQI delay | ms | 11 | | 11 | |
| | Sub-band size | RB | 6 (full size) (Note 9) | | 6 (full size) (Note 9) | |
| CSI process 3 | CSI-RS | | CSI-RS 1 | | CSI-RS 1 | |
| | CSI-IM | | CSI-IM 2 | | CSI-IM 2 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 000001 | | 000001 | |
| | Reporting interval (Note 10) | ms | 5 | | 5 | |
| | CQI delay | ms | 11 | | 11 | |
| | Sub-band size | RB | 6 (full size) | | 6 (full size) | |
| CSI process for PDSCH scheduling | | | CSI process 2 | | CSI process 2 | |
| Cell ID | | | 0 | 6 | 0 | 6 |
| Quasi-co-located CSI-RS | | | CSI-RS 0 | CSI-RS 1 | CSI-RS 0 | CSI-RS 1 |
| Quasi-co-located CRS | | | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 |
| PMI for subframe 2, 3, 4, 7, 8 and 9 | | | 0x0000 0000 0000 0001 | 100000 | 0x0000 0000 0000 0001 | 100000 |
| PMI for subframe 1 and 6 | | | 0x0000 0000 0001 0000 | 100000 | 0x0000 0000 0001 0000 | 100000 |
| Max number of HARQ transmissions | | | 1 | N/A | 1 | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: 3 symbols allocated to PDCCH.
Note 3: Reference measurement channel RC.12 FDD according to Table A.4-1. PDSCH transmission is scheduled on subframe 2, 3, 4, 7, 8 and 9 from TP1.
Note 4: TM10 OCNG as specified in A.5.1.8 is transmitted on subframe 1 and 6 from TP1.
Note 5: TM10 OCNG as specified in A.5.1.8 is transmitted on subframe 1, 2, 3, 4, 6, 7, 8 and 9 from TP2.
Note 6: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#2 and #7.
Note 7: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 8: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.
Note 9: For these sub-bands which are not selected for PDSCH transmission, TM10 OCNG should be transmitted.

Note 10: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#2 and #7 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#1 and #6.

**Table 9.3.6.1_F.1.3-3: Minimum requirement (FDD)**

| | CSI process 0 | CSI process 1 | CSI process 2 | CSI process 3 |
|---|---|---|---|---|
| $\alpha$ [%] | N/A | 2 | 2 | 2 |
| $\beta$ [%] | N/A | 40 | 40 | 40 |
| $\delta$ [%] | 10 | N/A | N/A | N/A |
| $\gamma$ | N/A | N/A | 1.02 | N/A |
| UE Category | ≥1 | | | |

**Table 9.3.6.1_F.1.3-4: Minimum median CQI difference between configured CSI processes (FDD)**

| | CSI process 1 | CSI process 2 | CSI process 3 |
|---|---|---|---|
| **CSI process 0** | N/A | 1 | 3 |
| UE Category | ≥1 | | |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.6.1.

### 9.3.6.1_F.1.4 Test description

#### 9.3.6.1_F.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.52 for UE with 2Rx RF band and Annex A, Figure A.52a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.3.6.1_F.1.3-2.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.6.1_F.1.4.3.

#### 9.3.6.1_F.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.6.1_F.1.5-2 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered for CSI process 2. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH CQI feedback for CSI process 2 via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less

or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. Check if "2000*$\alpha$%/100 ≤ number of CQI reports with index 0 for each full-size subband ≤ 2000*$\beta$%/100" for CSI process 2. (2000= No of full-size subband reports, 100 because of %) If yes, continue with step5, otherwise goto step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the wideband median-CQI value in an each TTI randomly selected full-size subband regardless of UE wideband and full-size subband CQI report based on CSI process 2. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the subbands in which UE reports the highest full-size subband CQI based on CSI process 2. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput and (NACK /(ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) ≥ $\gamma$ and (NACK /(ACK + NACK))≥ 0.02 , pass the UE for this test and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.6.1_F.1.3-2 for the other Test as appropriate. Otherwise pass the UE.

#### 9.3.6.1_F.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 9.3.6.1_F.1.4.3-1: CQI-ReportConfig-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2ABA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| simultaneousAckNackAndCQI-Format3-r11 | Not present | PUCCH Format 2 | |
| cqi-ReportPeriodicProcExtToReleaseList-r11 | Not present | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF SEQUENCE { | 1 entry | | |
| cqi-ReportPeriodicProcExtId-r11[1] SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtId-r11 | 1 | | |
| cqi-pmi-ConfigIndex-r11 | 2 | | |
| cqi-FormatIndicatorPeriodic-r11 CHOICE { | | | |
| widebandCQI-r11 SEQUENCE { | | | |
| csi-ReportMode-r11 | submode1 | | |
| } | | | |
| subbandCQI-r11 | Not present | PUCCH 1-1 | |
| } | | | |
| ri-ConfigIndex-r11 | 1 | | |
| csi-ConfigIndex-r11 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportBoth-r11 SEQUENCE { | | | |
| csi-IM-ConfigToReleaseList-r11 | Not present | | |
| csi-IM-ConfigToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-IM-r11)) OF SEQUENCE { | 1 entry | | |
| csi-IM-ConfigId-r11[1] | 2 | CSI-IM 1 | |
| resourceConfig-r11[1] | 6 | | |
| subframeConfig-r11[1] | 1 | | |
| } | | | |
| csi-ProcessToReleaseList-r11 | Not present | | |
| csi-ProcessToAddModList-r11SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF SEQUENCE { | 1 entry | | |
| csi-ProcessId-r11[1] | 3 | CSI process 2 | |
| csi-RS-ConfigNZPId-r11[1] | 1 | | |
| csi-IM-ConfigId-r11[1] | 2 | | |
| p-C-AndCBSRList-r11[1] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[1] | -3 | | |
| codebookSubsetRestriction-r11[1] | 0x0000 0000 0000 0001 | | |
| } | | | |
| cqi-ReportBothProc-r11[1] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 3 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[1] | Not present | | |
| cqi-ReportAperiodicProc-r11[1] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.6.1_F.1.4.3-2: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated ::= SEQUENCE { | | | |
| csi-RS-ConfigNZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-NZP-r11)) OF SEQUENCE { | 1 entry | | |
| csi-RS-ConfigNZPId-r11[1] | 1 | CSI-RS signal 0 | |
| antennaPortsCount-r11[1] | an4 | | |
| resourceConfig-r11[1] | 0 | | |
| subframeConfig-r11[1] | 1 | | |
| qcl-CRS-Info-r11 SEQUENCE[1] { | | | |
| crs-PortsCount-r11[1] | n2 | | |
| mbsfn-SubframeConfigList-r11 CHOICE[1] | Not present | | |
| } | | | |
| } | | | |
| csi-RS-ConfigZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-ZP-r11)) OF SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11[1] | 1 | Zero-power CSI-RS 0 | |
| resourceConfigList-r11[1] | 1110000000000000 | For TP2 | |
| subframeConfig-r11[1] | 1 | | |
| csi-RS-ConfigZPId-r11[2] | 2 | Zero-power CSI-RS 1 | |
| resourceConfigList-r11[2] | 0010011000000000 | For TP1 | |
| subframeConfig-r11[2] | 1 | | |
| } | | | |
| } | | | |

9.3.6.1_F.1.5 Test requirement

**Table 9.3.6.1_F.1.5-1: Test requirement (FDD)**

| | **CSI process 2** |
|---|---|
| $\alpha$ [%] | 2 |
| $\beta$ [%] | 40 |
| $\delta$ [%] | N/A |
| $\gamma$ | 1.01 |
| UE Category | ≥1 |

**Table 9.3.6.1_F.1.5-2: Fading test for FDD**

| Parameter | | Unit | Test 1 | | | | Test 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | TP1 | | TP2 | | TP1 | | TP2 | |
| Bandwidth | | MHz | 10 MHz | | | | 10 MHz | | | |
| Transmission mode | | | 10 | | 10 | | 10 | | 10 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | | 0 | | | |
| | $\rho_B$ | dB | 0 | | | | 0 | | | |
| | $P_C$ | dB | -3 | | 0 | | -3 | | 0 | |
| | σ | dB | -3 | | | | -3 | | | |
| SNR for UE with 2Rx RF band (Note 7) | | dB | 10 | 11 | 7 | 8 | 14 | 15 | 9 | 10 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 7 | 8 | 4 | 5 | 11 | 12 | 6 | 7 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -88 | -87 | -91 | -90 | -84 | -85 | -89 | -88 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | | | -98 | | | |
| Propagation channel | | | EPA 5 Low | | Clause B.2.4.1 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | EPA 5 Low | | Clause B.2.4.1 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | |
| Antenna configuration | | | 4x2 | | 2x2 | | 4x2 | | 2x2 | |
| Beamforming Model | | | As specified in Section B.4.3 | | | | As specified in Section B.4.3 | | | |
| Timing offset between TPs | | us | 0 | | | | 0 | | | |
| Frequency offset between TPs | | Hz | 0 | | | | 0 | | | |
| Cell-specific reference signals | | | Antenna ports 0,1 | | | | Antenna ports 0,1 | | | |
| CSI-RS signal 0 | | | Antenna ports 15,…,18 | | N/A | | Antenna ports 15,…,18 | | N/A | |
| CSI-RS 0 periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/1 | | N/A | | 5/1 | | N/A | |
| CSI-RS 0 configuration | | | 0 | | N/A | | 0 | | N/A | |
| CSI-RS signal 1 | | | N/A | | Antenna ports 15,16 | | N/A | | Antenna ports 15,16 | |
| CSI-RS 1 periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | N/A | | 5/1 | | N/A | | 5/1 | |
| CSI-RS 1 configuration | | | N/A | | 5 | | N/A | | 5 | |
| Zero-power CSI-RS 0 configuration $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | | N/A | | 1 / 1110000000000000 | | N/A | | 1 / 1110000000000000 | |
| Zero-power CSI-RS 1 configuration $I_{\text{CSI-RS}}$ / *ZeroPowerCSI-RS* bitmap | | | 1 / 0010011000000000 | | N/A | | 1 / 0010011000000000 | | N/A | |
| CSI-IM 0 periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/1 | | 5/1 | | 5/1 | | 5/1 | |
| CSI-IM 0 configuration | | | 2 | | 2 | | 2 | | 2 | |
| CSI-IM 1 periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/1 | | N/A | | 5/1 | | N/A | |
| CSI-IM 1 configuration | | | 6 | | N/A | | 6 | | N/A | |
| CSI-IM 2 periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | N/A | | 5/1 | | N/A | | 5/1 | |
| CSI-IM 2 configuration | | | N/A | | 1 | | N/A | | 1 | |
| CSI process 0 | CSI-RS | | CSI-RS 0 | | | | CSI-RS 0 | | | |
| | CSI-IM | | CSI-IM 0 | | | | CSI-IM 0 | | | |
| | Reporting mode | | PUCCH 1-1 | | | | PUCCH 1-1 | | | |
| | CodeBookSubsetRestriction bitmap | | 0x0000 0000 0000 0001 | | | | 0x0000 0000 0000 0001 | | | |
| | Reporting periodicity | ms | $N_{\text{pd}}$ = 5 | | | | $N_{\text{pd}}$ = 5 | | | |
| | CQI delay | ms | 11 | | | | 11 | | | |
| | Physical channel for CQI/ PMI reporting | | PUSCH (Note 6) | | | | PUSCH (Note 6) | | | |
| | PUCCH Report Type for CQI/PMI | | 2 | | | | 2 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | PUCCH channel for RI reporting | | PUCCH Format 2 | | PUCCH Format 2 | |
| | PUCCH report type for RI | | 3 | | 3 | |
| | *cqi-pmi-ConfigurationIndex* | | 4 | | 4 | |
| | *ri-ConfigIndex* | | 2 | | 2 | |
| CSI process 1 | CSI-RS | | CSI-RS 1 | | CSI-RS 1 | |
| | CSI-IM | | CSI-IM 0 | | CSI-IM 0 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 000001 | | 000001 | |
| | Reporting interval (Note 10) | ms | 5 | | 5 | |
| | CQI delay | ms | 11 | | 11 | |
| | Sub-band size | RB | 6 (full size) | | 6 (full size) | |
| CSI process 2 (For UE configured single process) | CSI-RS | | CSI-RS 0 | | CSI-RS 0 | |
| | CSI-IM | | CSI-IM 1 | | CSI-IM 1 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 0x0000 0000 0000 0001 | | 0x0000 0000 0000 0001 | |
| | Reporting interval (Note 8) | ms | 5 | | 5 | |
| | CQI delay | ms | 8 | | 8 | |
| | Sub-band size | RB | 6 (full size) (Note 9) | | 6 (full size) (Note 9) | |
| CSI process 2 (For UE configured multiple processes) | CSI-RS | | CSI-RS 0 | | CSI-RS 0 | |
| | CSI-IM | | CSI-IM 1 | | CSI-IM 1 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 0x0000 0000 0000 0001 | | 0x0000 0000 0000 0001 | |
| | Reporting interval (Note 10) | ms | 5 | | 5 | |
| | CQI delay | ms | 11 | | 11 | |
| | Sub-band size | RB | 6 (full size) (Note 9) | | 6 (full size) (Note 9) | |
| CSI process 3 | CSI-RS | | CSI-RS 1 | | CSI-RS 1 | |
| | CSI-IM | | CSI-IM 2 | | CSI-IM 2 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 000001 | | 000001 | |
| | Reporting interval (Note 10) | ms | 5 | | 5 | |
| | CQI delay | ms | 11 | | 11 | |
| | Sub-band size | RB | 6 (full size) | | 6 (full size) | |
| CSI process for PDSCH scheduling | | | CSI process 2 | | CSI process 2 | |
| Cell ID | | | 0 | 6 | 0 | 6 |
| Quasi-co-located CSI-RS | | | CSI-RS 0 | CSI-RS 1 | CSI-RS 0 | CSI-RS 1 |
| Quasi-co-located CRS | | | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 |
| PMI for subframe 2, 3, 4, 7, 8 and 9 | | | 0x0000 0000 0000 0001 | 100000 | 0x0000 0000 0000 0001 | 100000 |
| PMI for subframe 1 and 6 | | | 0x0000 0000 0001 0000 | 100000 | 0x0000 0000 0001 0000 | 100000 |
| Max number of HARQ transmissions | | | 1 | N/A | 1 | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: 3 symbols allocated to PDCCH.
Note 3: Reference measurement channel RC.12 FDD according to Table A.4-1. PDSCH transmission is scheduled on subframe 2, 3, 4, 7, 8 and 9 from TP1.
Note 4: TM10 OCNG as specified in A.5.1.8 is transmitted on subframe 1 and 6 from TP1.
Note 5: TM10 OCNG as specified in A.5.1.8 is transmitted on subframe 1, 2, 3, 4, 6, 7, 8 and 9 from TP2.
Note 6: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#2 and #7.
Note 7: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 8: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.

| | |
|---|---|
| Note 9: | For these sub-bands which are not selected for PDSCH transmission, TM10 OCNG should be transmitted. |
| Note 10: | PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#2 and #7 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#1 and #6. |
| Note 11: | The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB |

To pass the test, $\alpha$ and $\beta$ and $\delta$ and $\gamma$ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one or the other SNR point within one test must be fulfilled.

## 9.3.6.1_F.2 FDD CQI Reporting under fading conditions with Three CSI processes for CoMP

### 9.3.6.1_F.2.1 Test purpose

The purpose of the test is to verify the reporting accuracy of the CQI and the UE processing capability for Three CSI processes.

### 9.3.6.1_F.2.2 Test applicability

This test applies to all types of E-UTRA FDD UEs release 11 and forward, supporting Maximum CSI processes of Three on a component carrier within a band with PDSCH transmission mode 10.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.3.6.1_F.2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.3.6.1_F.1.3.

### 9.3.6.1_F.2.4 Test description

#### 9.3.6.1_F.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.52 for UE with 2Rx RF band and Annex A, Figure A.52a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.3.6.1_F.1.3-2.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.6.1_F.2.4.3.

#### 9.3.6.1_F.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.6.1_F.1.5-2 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered for each of CSI process 0, 1 and 2. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe subframe #1 and subframe #6 to carry the PUSCH CQI feedback for CSI process 1 and 2 via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. But for CSI process 0, SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUCCH CQI feedback. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. Check if "2000*$\alpha$%/100 ≤ number of CQI reports with index 0 for each full-size subband ≤ 2000*$\beta$%/100" for CSI process 1 and 2. And check if the number of CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least 2000*$\delta$%/100 for CSI process 0. And check if the difference of the median CQIs of the reported wideband CQI for configured CSI processes 0, 1 and 2 shall be greater or equal to the values as in Table 9.3.6.1_F.2.5-2.(2000= No of full-size subband reports, 100 because of %).. If yes, continue with step 5, otherwise goto step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the wideband median-CQI value in an each TTI randomly selected full-size subband regardless of UE wideband and full-size subband CQI report based on CSI process 2. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #1 and subframe #6 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. But for CSI process 0, SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUCCH CQI feedback. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the subbands in which UE reports the highest full-size subband CQI based on CSI process 2. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #1 and subframe #6 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. But for CSI process 0, SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUCCH CQI feedback. Measure the average throughput and (NACK / (ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) ≥ $\gamma$ and (NACK / (ACK + NACK))≥ 0.02 , pass the UE for this test and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to table 9.3.6.1_F.1.3-2 for the other Test as appropriate. Otherwise pass the UE.

### 9.3.6.1_F.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 9.3.6.1_F.2.4.3-1: CQI-ReportConfig-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2ABA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| simultaneousAckNackAndCQI-Format3-r11 | Not present | PUCCH Format 2 | |
| cqi-ReportPeriodicProcExtToReleaseList-r11 | Not present | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF SEQUENCE { | 1 entry | | |
| cqi-ReportPeriodicProcExtId-r11[1] SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtId-r11 | 1 | | |
| cqi-pmi-ConfigIndex-r11 | 2 | | |
| cqi-FormatIndicatorPeriodic-r11 CHOICE { | | | |
| widebandCQI-r11 SEQUENCE { | | | |
| csi-ReportMode-r11 | submode1 | | |
| } | | | |
| subbandCQI-r11 | Not present | PUCCH 1-1 | |
| } | | | |
| ri-ConfigIndex-r11 | 1 | | |
| csi-ConfigIndex-r11 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportBoth-r11 SEQUENCE { | | | |
| csi-IM-ConfigToReleaseList-r11 | Not present | | |
| csi-IM-ConfigToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-IM-r11)) OF SEQUENCE { | 3 entries | | |
| csi-IM-ConfigId-r11[1] | 1 | CSI-IM 0 | |
| resourceConfig-r11[1] | 2 | | |
| subframeConfig-r11[1] | 1 | | |
| csi-IM-ConfigId-r11[2] | 2 | CSI-IM 1 | |
| resourceConfig-r11[2] | 6 | | |
| subframeConfig-r11[2] | 1 | | |
| } | | | |
| csi-ProcessToReleaseList-r11 | Not present | | |
| csi-ProcessToAddModList-r11SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF SEQUENCE { | 3 entries | | |
| csi-ProcessId-r11[1] | 1 | CSI process 0 | |
| csi-RS-ConfigNZPId-r11[1] | 1 | | |
| csi-IM-ConfigId-r11[1] | 1 | | |
| p-C-AndCBSRList-r11[1] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[1] | -3 | | |
| codebookSubsetRestriction-r11[1] | 0x0000 0000 0000 0001 | | |
| } | | | |
| cqi-ReportBothProc-r11[1] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 1 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[1] | 1 | | |
| cqi-ReportAperiodicProc-r11[1] | Not present | | |
| csi-ProcessId-r11[2] | 2 | CSI process 1 | |
| csi-RS-ConfigNZPId-r11[2] | 2 | | |
| csi-IM-ConfigId-r11[2] | 1 | | |
| p-C-AndCBSRList-r11[2] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[2] | 0 | | |
| codebookSubsetRestriction-r11[2] | 000001 | | |
| } | | | |
| cqi-ReportBothProc-r11[2] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 2 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |

| | | | |
|---|---|---|---|
| cqi-ReportPeriodicProcId-r11[2] | Not present | | |
| cqi-ReportAperiodicProc-r11[2] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| csi-ProcessId-r11[3] | 3 | CSI process 2 | |
| csi-RS-ConfigNZPId-r11[3] | 1 | | |
| csi-IM-ConfigId-r11[3] | 2 | | |
| p-C-AndCBSRList-r11[3] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[3] | -3 | | |
| codebookSubsetRestriction-r11[3] | 0x0000 0000 0000 0001 | | |
| } | | | |
| cqi-ReportBothProc-r11[3] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 3 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[3] | Not present | | |
| cqi-ReportAperiodicProc-r11[3] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.6.1_F.2.4.3-2: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated ::= SEQUENCE { | | | |
| csi-RS-ConfigNZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-NZP-r11)) OF SEQUENCE { | 2 entries | | |
| csi-RS-ConfigNZPId-r11[1] | 1 | CSI-RS signal 0 | |
| antennaPortsCount-r11[1] | an4 | | |
| resourceConfig-r11[1] | 0 | | |
| subframeConfig-r11[1] | 1 | | |
| qcl-CRS-Info-r11 SEQUENCE[1] { | | | |
| crs-PortsCount-r11[1] | n2 | | |
| mbsfn-SubframeConfigList-r11 CHOICE[1] | Not present | | |
| } | | | |
| csi-RS-ConfigNZPId-r11[2] | 2 | CSI-RS signal 1 | |
| antennaPortsCount-r11[2] | an2 | | |
| resourceConfig-r11[2] | 5 | | |
| subframeConfig-r11[2] | 1 | | |
| qcl-CRS-Info-r11 SEQUENCE[2] { | | | |
| crs-PortsCount-r11[2] | n2 | | |
| mbsfn-SubframeConfigList-r11 CHOICE[2] | Not present | | |
| } | | | |
| } | | | |
| csi-RS-ConfigZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-ZP-r11)) OF SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11[1] | 1 | Zero-power CSI-RS 0 | |
| resourceConfigList-r11[1] | 1110000000000000 | For TP2 | |
| subframeConfig-r11[1] | 1 | | |
| csi-RS-ConfigZPId-r11[2] | 2 | Zero-power CSI-RS 1 | |
| resourceConfigList-r11[2] | 0010011000000000 | For TP1 | |
| subframeConfig-r11[2] | 1 | | |
| } | | | |
| } | | | |

9.3.6.1_F.2.5 Test requirement

**Table 9.3.6.1_F.2.5-1: Test requirement (FDD)**

| | **CSI process 0** | **CSI process 1** | **CSI process 2** |
|---|---|---|---|
| $\alpha$ [%] | N/A | 2 | 2 |
| $\beta$ [%] | N/A | 40 | 40 |
| $\delta$ [%] | 10 | N/A | N/A |
| $\gamma$ | N/A | N/A | 1.01 |
| UE Category | ≥1 | | |

**Table 9.3.6.1_F.2.5-2: Minimum median CQI difference between configured CSI processes (FDD)**

| | **CSI process 1** | **CSI process 2** |
|---|---|---|
| **CSI process 0** | N/A | 1 |
| UE Category | ≥1 | |

To pass the test, $\alpha$ and $\beta$ and $\delta$ and $\gamma$ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one or the other SNR point within one test must be fulfilled.

## 9.3.6.1_F.3 FDD CQI Reporting under fading conditions with Four CSI processes for CoMP

### 9.3.6.1_F.3.1 Test purpose

The purpose of the test is to verify the reporting accuracy of the CQI and the UE processing capability for Four CSI processes.

### 9.3.6.1_F.3.2 Test applicability

This test applies to all types of E-UTRA FDD UEs release 11 and forward, supporting Maximum CSI processes of Four on a component carrier within a band with PDSCH transmission mode 10.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.3.6.1_F.3.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.3.6.1_F.1.3.

### 9.3.6.1_F.3.4 Test description

#### 9.3.6.1_F.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.52 for UE with 2Rx RF band and Annex A, Figure A.52a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.3.6.1_F.1.3-2.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.6.1_F.3.4.3.

#### 9.3.6.1_F.3.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.6.1_F.1.5-2 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered for each of CSI process 0, 1, 2, and 3. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #1 and subframe #6 to carry the PUSCH CQI feedback for CSI process 1, 2, and 3 via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. But for CSI process 0, SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUCCH CQI feedback. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. Check if "2000*$\alpha$%/100 ≤ number of CQI reports with index 0 for each full-size subband ≤ 2000*$\beta$%/100" for CSI process 1, 2 and 3. And check if the number of CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least 2000*$\delta$%/100 for CSI process 0. And check if the difference of the median CQIs of the reported wideband CQI for configured CSI processes 0, 1, 2 and 3 shall be greater or equal to the values as in Table 9.3.6.1_F.3.5-2.
(2000= No of full-size subband reports, 100 because of %). If yes, continue with step 5, otherwise goto step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the wideband median-CQI value in an each TTI randomly selected full-size subband regardless of UE wideband and full-size subband CQI report based on CSI process 2. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #1 and subframe #6 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. But for CSI process 0, SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUCCH CQI feedback.Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the subbands in which UE reports the highest full-size subband CQI based on CSI process 2. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #1 and subframe #6 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. But for CSI process 0, SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUCCH CQI feedback.Measure the average throughput and (NACK / (ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) ≥ $\gamma$ and (NACK / (ACK + NACK))≥ 0.02 , pass the UE for this test and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to table 9.3.6.1_F.1.3-2 for the other Test as appropriate. Otherwise pass the UE.

### 9.3.6.1_F.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 9.3.6.1_F.3.4.3-1: CQI-ReportConfig-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2ABA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| simultaneousAckNackAndCQI-Format3-r11 | Not present | PUCCH Format 2 | |
| cqi-ReportPeriodicProcExtToReleaseList-r11 | Not present | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF SEQUENCE { | 1 entry | | |
| cqi-ReportPeriodicProcExtId-r11[1] SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtId-r11 | 1 | | |
| cqi-pmi-ConfigIndex-r11 | 2 | | |
| cqi-FormatIndicatorPeriodic-r11 CHOICE { | | | |
| widebandCQI-r11 SEQUENCE { | | | |
| csi-ReportMode-r11 | submode1 | | |
| } | | | |
| subbandCQI-r11 | Not present | PUCCH 1-1 | |
| } | | | |
| ri-ConfigIndex-r11 | 1 | | |
| csi-ConfigIndex-r11 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportBoth-r11 SEQUENCE { | | | |
| csi-IM-ConfigToReleaseList-r11 | Not present | | |
| csi-IM-ConfigToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-IM-r11)) OF SEQUENCE { | 3 entries | | |
| csi-IM-ConfigId-r11[1] | 1 | CSI-IM 0 | |
| resourceConfig-r11[1] | 2 | | |
| subframeConfig-r11[1] | 1 | | |
| csi-IM-ConfigId-r11[2] | 2 | CSI-IM 1 | |
| resourceConfig-r11[2] | 6 | | |
| subframeConfig-r11[2] | 1 | | |
| csi-IM-ConfigId-r11[3] | 3 | CSI-IM 2 | |
| resourceConfig-r11[3] | 1 | | |
| subframeConfig-r11[3] | 1 | | |
| } | | | |
| csi-ProcessToReleaseList-r11 | Not present | | |
| csi-ProcessToAddModList-r11SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF SEQUENCE { | 4 entries | | |
| csi-ProcessId-r11[1] | 1 | CSI process 0 | |
| csi-RS-ConfigNZPId-r11[1] | 1 | | |
| csi-IM-ConfigId-r11[1] | 1 | | |
| p-C-AndCBSRList-r11[1] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[1] | -3 | | |
| codebookSubsetRestriction-r11[1] | 0x0000 0000 0000 0001 | | |
| } | | | |
| cqi-ReportBothProc-r11[1] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 1 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[1] | 1 | | |
| cqi-ReportAperiodicProc-r11[1] | Not present | | |
| csi-ProcessId-r11[2] | 2 | CSI process 1 | |
| csi-RS-ConfigNZPId-r11[2] | 2 | | |
| csi-IM-ConfigId-r11[2] | 1 | | |
| p-C-AndCBSRList-r11[2] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[2] | 0 | | |
| codebookSubsetRestriction-r11[2] | 000001 | | |
| } | | | |
| cqi-ReportBothProc-r11[2] SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| ri-Ref-CSI-ProcessId-r11 | 2 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[2] | Not present | | |
| cqi-ReportAperiodicProc-r11[2] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| csi-ProcessId-r11[3] | 3 | CSI process 2 | |
| csi-RS-ConfigNZPId-r11[3] | 1 | | |
| csi-IM-ConfigId-r11[3] | 2 | | |
| p-C-AndCBSRList-r11[3] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[3] | -3 | | |
| codebookSubsetRestriction-r11[3] | 0x0000 0000 0000 0001 | | |
| } | | | |
| cqi-ReportBothProc-r11[3] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 3 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[3] | Not present | | |
| cqi-ReportAperiodicProc-r11[3] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| csi-ProcessId-r11[4] | 4 | CSI process 3 | |
| csi-RS-ConfigNZPId-r11[4] | 2 | | |
| csi-IM-ConfigId-r11[4] | 3 | | |
| p-C-AndCBSRList-r11[4] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[4] | 0 | | |
| codebookSubsetRestriction-r11[4] | 000001 | | |
| } | | | |
| cqi-ReportBothProc-r11[4] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 4 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[4] | Not present | | |
| cqi-ReportAperiodicProc-r11[4] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.6.1_F.3.4.3-2: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated ::= SEQUENCE { | | | |
| csi-RS-ConfigNZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-NZP-r11)) OF SEQUENCE { | 2 entries | | |
| csi-RS-ConfigNZPId-r11[1] | 1 | CSI-RS signal 0 | |
| antennaPortsCount-r11[1] | an4 | | |
| resourceConfig-r11[1] | 0 | | |
| subframeConfig-r11[1] | 1 | | |
| qcl-CRS-Info-r11 SEQUENCE[1] { | | | |
| crs-PortsCount-r11[1] | n2 | | |
| mbsfn-SubframeConfigList-r11 CHOICE[1] | Not present | | |
| } | | | |
| csi-RS-ConfigNZPId-r11[2] | 2 | CSI-RS signal 1 | |
| antennaPortsCount-r11[2] | an2 | | |
| resourceConfig-r11[2] | 5 | | |
| subframeConfig-r11[2] | 1 | | |
| qcl-CRS-Info-r11 SEQUENCE[2] { | | | |
| crs-PortsCount-r11[2] | n2 | | |
| mbsfn-SubframeConfigList-r11 CHOICE[2] | Not present | | |
| } | | | |
| } | | | |
| csi-RS-ConfigZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-ZP-r11)) OF SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11[1] | 1 | Zero-power CSI-RS 0 | |
| resourceConfigList-r11[1] | 1110000000000000 | For TP2 | |
| subframeConfig-r11[1] | 1 | | |
| csi-RS-ConfigZPId-r11[2] | 2 | Zero-power CSI-RS 1 | |
| resourceConfigList-r11[2] | 0010011000000000 | For TP1 | |
| subframeConfig-r11[2] | 1 | | |
| } | | | |
| } | | | |

9.3.6.1_F.3.5 Test requirement

**Table 9.3.6.1_F.3.5-1: Test requirement (FDD)**

| | **CSI process 0** | **CSI process 1** | **CSI process 2** | **CSI process 3** |
|---|---|---|---|---|
| $\alpha$ [%] | N/A | 2 | 2 | 2 |
| $\beta$ [%] | N/A | 40 | 40 | 40 |
| $\delta$ [%] | 10 | N/A | N/A | N/A |
| $\gamma$ | N/A | N/A | 1.01 | N/A |
| UE Category | ≥1 | | | |

**Table 9.3.6.1_F.3.5-2: Minimum median CQI difference between configured CSI processes (FDD)**

| | **CSI process 1** | **CSI process 2** | **CSI process 3** |
|---|---|---|---|
| **CSI process 0** | N/A | 1 | 3 |
| UE Category | ≥1 | | |

To pass the test, $\alpha$ and $\beta$ and $\delta$ and $\gamma$ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one or the other SNR point within one test must be fulfilled.

## 9.3.6.2_F TDD CQI Reporting under fading conditions with CSI processes for CoMP

### 9.3.6.2_F.1 TDD CQI Reporting under fading conditions with Single CSI process for CoMP

#### 9.3.6.2_F.1.1 Test purpose

The purpose of the test is to verify the reporting accuracy of the CQI and the UE processing capability for single CSI process.

#### 9.3.6.2_F.1.2 Test applicability

This test applies to all types of E-UTRA TDD UEs release 11 and forward, supporting Maximum CSI processes of One on a component carrier within a band with PDSCH transmission mode 10.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.3.6.2_F.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.6.2_F.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.6.2_F.1.3-2 and by the following:

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band for CSI process 1, 2, or 3;

b) a CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least $\delta$% of the time for CSI process 0;

c) the difference of the median CQIs of the reported wideband CQI for configured CSI processes shall be greater or equal to the values as in Table 9.3.6.2_F.1.3-3;

d) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

e) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

**Table 9.3.6.2_F.1.3-1: Fading test for TDD**

| Parameter | | Unit | Test 1 | | | | Test 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | TP1 | | TP2 | | TP1 | | TP2 | |
| Bandwidth | | MHz | 10 MHz | | | | 10 MHz | | | |
| Transmission mode | | | 10 | | 10 | | 10 | | 10 | |
| Uplink downlink configuration | | | 2 | | 2 | | 2 | | 2 | |
| Special subframe configuration | | | 4 | | 4 | | 4 | | 4 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | | 0 | | | |
| | $\rho_B$ | dB | 0 | | | | 0 | | | |
| | $P_C$ | dB | -3 | | 0 | | -3 | | 0 | |
| | σ | dB | -3 | | | | -3 | | | |
| SNR (Note 7) | | dB | 10 | 11 | 7 | 8 | 14 | 15 | 9 | 10 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -88 | -87 | -91 | -90 | -84 | -85 | -89 | -88 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | | | -98 | | | |
| Propagation channel | | | EPA 5 Low | | Clause B.2.4.1 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | EPA 5 Low | | Clause B.2.4.1 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | |
| Antenna configuration | | | 4x2 | | 2x2 | | 4x2 | | 2x2 | |
| Beamforming Model | | | As specified in Section B.4.3 | | | | As specified in Section B.4.3 | | | |
| Timing offset between TPs | | us | 0 | | | | 0 | | | |
| Frequency offset between TPs | | Hz | 0 | | | | 0 | | | |
| Cell-specific reference signals | | | Antenna ports 0,1 | | | | Antenna ports 0,1 | | | |
| CSI-RS signal 0 | | | Antenna ports 15,…, 18 | | N/A | | Antenna ports 15,…, 18 | | N/A | |
| CSI-RS 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/3 | | N/A | | 5/3 | | N/A | |
| CSI-RS 0 configuration | | | 0 | | N/A | | 0 | | N/A | |
| CSI-RS signal 1 | | | N/A | | Antenna ports 15, 16 | | N/A | | Antenna ports 15, 16 | |
| CSI-RS 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | | 5/3 | | N/A | | 5/3 | |
| CSI-RS 1 configuration | | | N/A | | 5 | | N/A | | 5 | |
| Zero-power CSI-RS 0 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | N/A | | 3 / 1110000000000000 | | N/A | | 3 / 1110000000000000 | |
| Zero-power CSI-RS 1 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 3 / 0010011000000000 | | N/A | | 3 / 0010011000000000 | | N/A | |
| CSI-IM 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/3 | | 5/3 | | 5/3 | | 5/3 | |
| CSI-IM 0 configuration | | | 2 | | 2 | | 2 | | 2 | |
| CSI-IM 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/3 | | N/A | | 5/3 | | N/A | |
| CSI-IM 1 configuration | | | 6 | | N/A | | 6 | | N/A | |
| CSI-IM 2 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | | 5/3 | | N/A | | 5/3 | |
| CSI-IM 2 configuration | | | N/A | | 1 | | N/A | | 1 | |
| CSI process 0 | CSI-RS | | CSI-RS 0 | | | | CSI-RS 0 | | | |
| | CSI-IM | | CSI-IM 0 | | | | CSI-IM 0 | | | |
| | Reporting mode | | PUCCH 1-1 | | | | PUCCH 1-1 | | | |
| | CodeBookSubsetRestriction bitmap | | 0x0000 0000 0000 0001 | | | | 0x0000 0000 0000 0001 | | | |
| | Reporting periodicity | ms | $N_{pd}$ = 5 | | | | $N_{pd}$ = 5 | | | |
| | CQI delay | ms | 12 | | | | 12 | | | |
| | Physical channel for CQI/ PMI reporting | | PUSCH (Note 6) | | | | PUSCH (Note 6) | | | |
| | PUCCH Report | | 2 | | | | 2 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Type for CQI/PMI | | | | | |
| | PUCCH channel for RI reporting | | PUCCH Format 2 | | PUCCH Format 2 | |
| | PUCCH report type for RI | | 3 | | 3 | |
| | *cqi-pmi-ConfigurationIndex* | | 3 | | 3 | |
| | *ri-ConfigIndex* | | 805 (Note 10) | | 805 (Note 10) | |
| CSI process 1 | CSI-RS | | CSI-RS 1 | | CSI-RS 1 | |
| | CSI-IM | | CSI-IM 0 | | CSI-IM 0 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 000001 | | 000001 | |
| | Reporting interval (Note 9) | ms | 5 | | 5 | |
| | CQI delay | ms | 12 | | 12 | |
| | Sub-band size | RB | 6 (full size) | | 6 (full size) | |
| CSI process 2 | CSI-RS | | CSI-RS 0 | | CSI-RS 0 | |
| | CSI-IM | | CSI-IM 1 | | CSI-IM 1 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 0x0000 0000 0000 0001 | | 0x0000 0000 0000 0001 | |
| | Reporting interval (Note 9) | ms | 5 | | 5 | |
| | CQI delay | ms | 12 | | 12 | |
| | Sub-band size | RB | 6 (full size) (Note 8) | | 6 (full size) (Note 8) | |
| CSI process 3 | CSI-RS | | CSI-RS 1 | | CSI-RS 1 | |
| | CSI-IM | | CSI-IM 2 | | CSI-IM 2 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 000001 | | 000001 | |
| | Reporting interval (Note 9) | ms | 5 | | 5 | |
| | CQI delay | ms | 12 | | 12 | |
| | Sub-band size | RB | 6 (full size) | | 6 (full size) | |
| CSI process for PDSCH scheduling | | | CSI process 2 | | CSI process 2 | |
| Cell ID | | | 0 | 6 | 0 | 6 |
| Quasi-co-located CSI-RS | | | CSI-RS 0 | CSI-RS 1 | CSI-RS 0 | CSI-RS 1 |
| Quasi-co-located CRS | | | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 |
| PMI for subframe 4 and 9 | | | 0x0000 0000 0000 0001 | 100000 | 0x0000 0000 0000 0001 | 100000 |
| PMI for subframe 3 and 8 | | | 0x0000 0000 0001 0000 | 100000 | 0x0000 0000 0001 0000 | 100000 |
| Max number of HARQ transmissions | | | 1 | N/A | 1 | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A | Multiplexing | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: 3 symbols allocated to PDCCH
Note 3: Reference measurement channel RC.12 TDD according to Table A.4-1. PDSCH transmission is scheduled on subframe 4 and 9 from TP1.
Note 4: TM10 OCNG is transmitted as specified in A.5.2.8 on subframe 3 and 8 from TP1.
Note 5: TM10 OCNG is transmitted as specified in A.5.2.8 on subframe 3, 4, 8 and 9 from TP2
Note 6: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#7 and #2.
Note 7: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 8: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 and #8 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#7 and #2.
Note 9: For these sub-bands which are not selected for PDSCH transmission, TM10 OCNG should be transmitted.
Note 10: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available.

**Table 9.3.6.2_F.1.3-2: Minimum requirement (TDD)**

| | CSI process 0 | CSI process 1 | CSI process 2 | CSI process 3 |
|---|---|---|---|---|
| $\alpha$ [%] | N/A | 2 | 2 | 2 |
| $\beta$ [%] | N/A | 40 | 40 | 40 |
| $\delta$ [%] | 10 | N/A | N/A | N/A |
| $\gamma$ | N/A | N/A | 1.02 | N/A |
| UE Category | ≥1 | | | |

**Table 9.3.6.2_F.1.3-3: Minimum median CQI difference between configured CSI processes (TDD)**

| | CSI process 1 | CSI process 2 | CSI process 3 |
|---|---|---|---|
| **CSI process 0** | N/A | 1 | 3 |
| UE Category | ≥1 | | |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.6.2.

### 9.3.6.2_F.1.4 Test description

#### 9.3.6.2_F.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.52 for UE with 2Rx RF band and Annex A, Figure A.52a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.3.6.2_F.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.6.2_F.1.4.3.

#### 9.3.6.2_F.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.6.2_F.1.5-2 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to CQI value 10 and keep it regardless of the wideband and full-size subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI report for each full-size subband have been gathered for CSI process 2. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback for CSI process 2 via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. Check if "2000*$\alpha$%/100 ≤ number of CQI reports with index 0 for each full-size subband ≤ 2000*$\beta$%/100" for CSI process 2. (2000= No of full-size subband reports, 100 because of %). If yes, continue with step 5, otherwise goto step 7.

5. The SS shall send PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the wideband median-CQI value in an each available downlink transmission instance randomly selected full-size subband regardless of UE wideband and subband CQI report based on CSI process 2. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3 Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE report the highest full-size subband CQI based on CSI process 2. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput and (NACK / (ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) ≥ $\gamma$ and (NACK / (ACK + NACK))≥ 0.02, pass the UE and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to table 9.3.6.2_F.1.3-1 for the other test as appropriate.

### 9.3.6.2_F.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 9.3.6.2_F.1.4.3-1: CQI-ReportConfig-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2ABA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| simultaneousAckNackAndCQI-Format3-r11 | Not present | PUCCH Format 2 | |
| cqi-ReportPeriodicProcExtToReleaseList-r11 | Not present | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF SEQUENCE { | 1 entry | | |
| cqi-ReportPeriodicProcExtId-r11[1] SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtId-r11 | 1 | | |
| cqi-pmi-ConfigIndex-r11 | 3 | | |
| cqi-FormatIndicatorPeriodic-r11 CHOICE { | | | |
| widebandCQI-r11 SEQUENCE { | | | |
| csi-ReportMode-r11 | submode1 | | |
| } | | | |
| subbandCQI-r11 | Not present | PUCCH 1-1 | |
| } | | | |
| ri-ConfigIndex-r11 | 805 | | |
| csi-ConfigIndex-r11 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportBoth-r11 SEQUENCE { | | | |
| csi-IM-ConfigToReleaseList-r11 | Not present | | |
| csi-IM-ConfigToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-IM-r11)) OF SEQUENCE { | 1 entry | | |
| csi-IM-ConfigId-r11[1] | 2 | CSI-IM 1 | |
| resourceConfig-r11[1] | 6 | | |
| subframeConfig-r11[1] | 3 | | |
| } | | | |
| csi-ProcessToReleaseList-r11 | Not present | | |
| csi-ProcessToAddModList-r11SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF SEQUENCE { | 1 entry | | |
| csi-ProcessId-r11[1] | 3 | CSI process 2 | |
| csi-RS-ConfigNZPId-r11[1] | 1 | | |
| csi-IM-ConfigId-r11[1] | 2 | | |
| p-C-AndCBSRList-r11[1] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[1] | -3 | | |
| codebookSubsetRestriction-r11[1] | 0x0000 0000 0000 0001 | | |
| } | | | |
| cqi-ReportBothProc-r11[1] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 3 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[1] | Not present | | |
| cqi-ReportAperiodicProc-r11[1] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.6.2_F.1.4.3-2: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated ::= SEQUENCE { | | | |
| csi-RS-ConfigNZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-NZP-r11)) OF SEQUENCE { | 1 entry | | |
| csi-RS-ConfigNZPId-r11[1] | 1 | CSI-RS signal 0 | |
| antennaPortsCount-r11[1] | an4 | | |
| resourceConfig-r11[1] | 0 | | |
| subframeConfig-r11[1] | 3 | | |
| qcl-CRS-Info-r11 SEQUENCE[1] { | | | |
| crs-PortsCount-r11[1] | n2 | | |
| mbsfn-SubframeConfigList-r11 CHOICE[1] | Not present | | |
| } | | | |
| } | | | |
| csi-RS-ConfigZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-ZP-r11)) OF SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11[1] | 1 | Zero-power CSI-RS 0 | |
| resourceConfigList-r11[1] | 1110000000000000 | For TP2 | |
| subframeConfig-r11[1] | 3 | | |
| csi-RS-ConfigZPId-r11[2] | 2 | Zero-power CSI-RS 1 | |
| resourceConfigList-r11[2] | 0010011000000000 | For TP1 | |
| subframeConfig-r11[2] | 3 | | |
| } | | | |
| } | | | |

9.3.6.2_F.1.5 Test requirement

**Table 9.3.6.2_F.1.5-1: Test requirement (TDD)**

| | **CSI process 2** |
|---|---|
| $\alpha$ [%] | 2 |
| $\beta$ [%] | 40 |
| $\delta$ [%] | N/A |
| $\gamma$ | 1.01 |
| UE Category | ≥1 |

**Table 9.3.6.2_F.1.5-2: Fading test for TDD**

| Parameter | | Unit | Test 1 | | | | Test 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | TP1 | | TP2 | | TP1 | | TP2 | |
| Bandwidth | | MHz | 10 MHz | | | | 10 MHz | | | |
| Transmission mode | | | 10 | | 10 | | 10 | | 10 | |
| Uplink downlink configuration | | | 2 | | 2 | | 2 | | 2 | |
| Special subframe configuration | | | 4 | | 4 | | 4 | | 4 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | | 0 | | | |
| | $\rho_B$ | dB | 0 | | | | 0 | | | |
| | $P_C$ | dB | -3 | | 0 | | -3 | | 0 | |
| | σ | dB | -3 | | | | -3 | | | |
| SNR for UE with 2Rx RF band (Note 7) | | dB | 10 | 11 | 7 | 8 | 14 | 15 | 9 | 10 |
| SNR for 4Rx UE without 2Rx RF band | | dB | 7 | 8 | 4 | 5 | 11 | 12 | 6 | 7 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -88 | -87 | -91 | -90 | -84 | -85 | -89 | -88 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | | | -98 | | | |
| Propagation channel | | | EPA 5 Low | | Clause B.2.4.1 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | EPA 5 Low | | Clause B.2.4.1 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | |
| Antenna configuration | | | 4x2 | | 2x2 | | 4x2 | | 2x2 | |
| Beamforming Model | | | As specified in Section B.4.3 | | | | As specified in Section B.4.3 | | | |
| Timing offset between TPs | | us | 0 | | | | 0 | | | |
| Frequency offset between TPs | | Hz | 0 | | | | 0 | | | |
| Cell-specific reference signals | | | Antenna ports 0,1 | | | | Antenna ports 0,1 | | | |
| CSI-RS signal 0 | | | Antenna ports 15,…, 18 | | N/A | | Antenna ports 15,…, 18 | | N/A | |
| CSI-RS 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/3 | | N/A | | 5/3 | | N/A | |
| CSI-RS 0 configuration | | | 0 | | N/A | | 0 | | N/A | |
| CSI-RS signal 1 | | | N/A | | Antenna ports 15, 16 | | N/A | | Antenna ports 15, 16 | |
| CSI-RS 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | | 5/3 | | N/A | | 5/3 | |
| CSI-RS 1 configuration | | | N/A | | 5 | | N/A | | 5 | |
| Zero-power CSI-RS 0 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | N/A | | 3 / 1110000000000000 | | N/A | | 3 / 1110000000000000 | |
| Zero-power CSI-RS 1 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 3 / 0010011000000000 | | N/A | | 3 / 0010011000000000 | | N/A | |
| CSI-IM 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/3 | | 5/3 | | 5/3 | | 5/3 | |
| CSI-IM 0 configuration | | | 2 | | 2 | | 2 | | 2 | |
| CSI-IM 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/3 | | N/A | | 5/3 | | N/A | |
| CSI-IM 1 configuration | | | 6 | | N/A | | 6 | | N/A | |
| CSI-IM 2 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | | 5/3 | | N/A | | 5/3 | |
| CSI-IM 2 configuration | | | N/A | | 1 | | N/A | | 1 | |
| CSI process 0 | CSI-RS | | CSI-RS 0 | | | | CSI-RS 0 | | | |
| | CSI-IM | | CSI-IM 0 | | | | CSI-IM 0 | | | |
| | Reporting mode | | PUCCH 1-1 | | | | PUCCH 1-1 | | | |
| | CodeBookSubsetRestriction bitmap | | 0x0000 0000 0000 0001 | | | | 0x0000 0000 0000 0001 | | | |
| | Reporting periodicity | ms | $N_{pd}$ = 5 | | | | $N_{pd}$ = 5 | | | |
| | CQI delay | ms | 12 | | | | 12 | | | |
| | Physical channel for CQI/ PMI reporting | | PUSCH (Note 6) | | | | PUSCH (Note 6) | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | PUCCH Report Type for CQI/PMI | | 2 | | 2 | |
| | PUCCH channel for RI reporting | | PUCCH Format 2 | | PUCCH Format 2 | |
| | PUCCH report type for RI | | 3 | | 3 | |
| | *cqi-pmi-ConfigurationIndex* | | 3 | | 3 | |
| | *ri-ConfigIndex* | | 805 (Note 10) | | 805 (Note 10) | |
| CSI process 1 | CSI-RS | | CSI-RS 1 | | CSI-RS 1 | |
| | CSI-IM | | CSI-IM 0 | | CSI-IM 0 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 000001 | | 000001 | |
| | Reporting interval (Note 9) | ms | 5 | | 5 | |
| | CQI delay | ms | 12 | | 12 | |
| | Sub-band size | RB | 6 (full size) | | 6 (full size) | |
| CSI process 2 | CSI-RS | | CSI-RS 0 | | CSI-RS 0 | |
| | CSI-IM | | CSI-IM 1 | | CSI-IM 1 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 0x0000 0000 0000 0001 | | 0x0000 0000 0000 0001 | |
| | Reporting interval (Note 9) | ms | 5 | | 5 | |
| | CQI delay | ms | 12 | | 12 | |
| | Sub-band size | RB | 6 (full size) (Note 8) | | 6 (full size) (Note 8) | |
| CSI process 3 | CSI-RS | | CSI-RS 1 | | CSI-RS 1 | |
| | CSI-IM | | CSI-IM 2 | | CSI-IM 2 | |
| | Reporting mode | | PUSCH 3-1 | | PUSCH 3-1 | |
| | CodeBookSubsetRestriction bitmap | | 000001 | | 000001 | |
| | Reporting interval (Note 9) | ms | 5 | | 5 | |
| | CQI delay | ms | 12 | | 12 | |
| | Sub-band size | RB | 6 (full size) | | 6 (full size) | |
| CSI process for PDSCH scheduling | | | CSI process 2 | | CSI process 2 | |
| Cell ID | | | 0 | 6 | 0 | 6 |
| Quasi-co-located CSI-RS | | | CSI-RS 0 | CSI-RS 1 | CSI-RS 0 | CSI-RS 1 |
| Quasi-co-located CRS | | | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 |
| PMI for subframe 4 and 9 | | | 0x0000 0000 0000 0001 | 100000 | 0x0000 0000 0000 0001 | 100000 |
| PMI for subframe 3 and 8 | | | 0x0000 0000 0001 0000 | 100000 | 0x0000 0000 0001 0000 | 100000 |
| Max number of HARQ transmissions | | | 1 | N/A | 1 | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A | Multiplexing | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: 3 symbols allocated to PDCCH
Note 3: Reference measurement channel RC.12 TDD according to Table A.4-1. PDSCH transmission is scheduled on subframe 4 and 9 from TP1.
Note 4: TM10 OCNG is transmitted as specified in A.5.2.8 on subframe 3 and 8 from TP1.
Note 5: TM10 OCNG is transmitted as specified in A.5.2.8 on subframe 3, 4, 8 and 9 from TP2
Note 6: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#7 and #2.
Note 7: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 8: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 and #8 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#7 and #2.
Note 9: For these sub-bands which are not selected for PDSCH transmission, TM10 OCNG should be transmitted.
Note 10: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available.

| Note 11: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB |
|---|

To pass the test, $\alpha$ and $\beta$ and $\delta$ and $\gamma$ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.3.6.2_F.2 TDD CQI Reporting under fading conditions with Three CSI processes for CoMP

### 9.3.6.2_F.2.1 Test purpose

The purpose of the test is to verify the reporting accuracy of the CQI and the UE processing capability for Three CSI processes.

### 9.3.6.2_F.2.2 Test applicability

This test applies to all types of E-UTRA TDD UEs release 11 and forward, supporting Maximum CSI processes of Three on a component carrier within a band with PDSCH transmission mode 10.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.3.6.2_F.2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.3.6.2_F.1.3.

### 9.3.6.2_F.2.4 Test description

#### 9.3.6.2_F.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.52 for UE with 2Rx RF band and Annex A, Figure A.9a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.3.6.2_F.1.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.6.2_F.2.4.3.

#### 9.3.6.2_F.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.6.2_F.1.5-2 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to CQI value 10 ,and keep it regardless of the wideband and full-size subband CQI value sent by the UE. Continue

transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI report for each full-size subband have been gathered for each of CSI process 0, 1 and 2. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback for CSI process 1and 2 via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. But for CSI process 0, SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUCCH CQI feedback. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. Check if "2000*$\alpha$%/100 ≤ number of CQI reports with index 0 for each full-size subband ≤ 2000*$\beta$%/100" for CSI process 1and 2. And check if the number of CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least 2000*$\delta$%/100 for CSI process 0. And check if the difference of the median CQIs of the reported wideband CQI for configured CSI processes 0, 1 and 2 shall be greater or equal to the values as in Table 9.3.6.2_F.2.5-2.
(2000= No of full-size subband reports, 100 because of %) If yes, continue with step5, otherwise goto step 7.

5. The SS shall send PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the wideband median-CQI value in an each available downlink transmission instance randomly selected full-size subband regardless of UE wideband and subband CQI report based on CSI process 2. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.
Measure the average throughput according to Annex G.5.3 Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE report the highest full-size subband CQI based on CSI process 2. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput and (NACK /(ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) ≥ $\gamma$ and (NACK /(ACK + NACK))≥ FFS, pass the UE and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.6.2_F.1.3-1 for the other test as appropriate.

### 9.3.6.2_F.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 9.3.6.2_F.2.4.3-1: CQI-ReportConfig-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2ABA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| simultaneousAckNackAndCQI-Format3-r11 | Not present | PUCCH Format 2 | |
| cqi-ReportPeriodicProcExtToReleaseList-r11 | Not present | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF SEQUENCE { | 1 entry | | |
| cqi-ReportPeriodicProcExtId-r11[1] SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtId-r11 | 1 | | |
| cqi-pmi-ConfigIndex-r11 | 3 | | |
| cqi-FormatIndicatorPeriodic-r11 CHOICE { | | | |
| widebandCQI-r11 SEQUENCE { | | | |
| csi-ReportMode-r11 | submode1 | | |
| } | | | |
| subbandCQI-r11 | Not present | PUCCH 1-1 | |
| } | | | |
| ri-ConfigIndex-r11 | 805 | | |
| csi-ConfigIndex-r11 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportBoth-r11 SEQUENCE { | | | |
| csi-IM-ConfigToReleaseList-r11 | Not present | | |
| csi-IM-ConfigToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-IM-r11)) OF SEQUENCE { | 3 entries | | |
| csi-IM-ConfigId-r11[1] | 1 | CSI-IM 0 | |
| resourceConfig-r11[1] | 2 | | |
| subframeConfig-r11[1] | 3 | | |
| csi-IM-ConfigId-r11[2] | 2 | CSI-IM 1 | |
| resourceConfig-r11[2] | 6 | | |
| subframeConfig-r11[2] | 3 | | |
| } | | | |
| csi-ProcessToReleaseList-r11 | Not present | | |
| csi-ProcessToAddModList-r11SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF SEQUENCE { | 4 entries | | |
| csi-ProcessId-r11[1] | 1 | CSI process 0 | |
| csi-RS-ConfigNZPId-r11[1] | 1 | | |
| csi-IM-ConfigId-r11[1] | 1 | | |
| p-C-AndCBSRList-r11[1] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[1] | -3 | | |
| codebookSubsetRestriction-r11[1] | 0x0000 0000 0000 0001 | | |
| } | | | |
| cqi-ReportBothProc-r11[1] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 1 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[1] | 1 | | |
| cqi-ReportAperiodicProc-r11[1] | Not present | | |
| csi-ProcessId-r11[2] | 2 | CSI process 1 | |
| csi-RS-ConfigNZPId-r11[2] | 2 | | |
| csi-IM-ConfigId-r11[2] | 1 | | |
| p-C-AndCBSRList-r11[2] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[2] | 0 | | |
| codebookSubsetRestriction-r11[2] | 000001 | | |
| } | | | |
| cqi-ReportBothProc-r11[2] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 2 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |

| | | | |
|---|---|---|---|
| cqi-ReportPeriodicProcId-r11[2] | Not present | | |
| cqi-ReportAperiodicProc-r11[2] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| csi-ProcessId-r11[3] | 3 | CSI process 2 | |
| csi-RS-ConfigNZPId-r11[3] | 1 | | |
| csi-IM-ConfigId-r11[3] | 2 | | |
| p-C-AndCBSRList-r11[3] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[3] | -3 | | |
| codebookSubsetRestriction-r11[3] | 0x0000 0000 0000 0001 | | |
| } | | | |
| cqi-ReportBothProc-r11[3] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 3 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[3] | Not present | | |
| cqi-ReportAperiodicProc-r11[3] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.6.2_F.2.4.3-2: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated ::= SEQUENCE { | | | |
| csi-RS-ConfigNZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-NZP-r11)) OF SEQUENCE { | 2 entries | | |
| csi-RS-ConfigNZPId-r11[1] | 1 | CSI-RS signal 0 | |
| antennaPortsCount-r11[1] | an4 | | |
| resourceConfig-r11[1] | 0 | | |
| subframeConfig-r11[1] | 3 | | |
| qcl-CRS-Info-r11 SEQUENCE[1] { | | | |
| crs-PortsCount-r11[1] | n2 | | |
| mbsfn-SubframeConfigList-r11 CHOICE[1] | Not present | | |
| } | | | |
| csi-RS-ConfigNZPId-r11[2] | 2 | CSI-RS signal 1 | |
| antennaPortsCount-r11[2] | an2 | | |
| resourceConfig-r11[2] | 5 | | |
| subframeConfig-r11[2] | 3 | | |
| qcl-CRS-Info-r11 SEQUENCE[2] { | | | |
| crs-PortsCount-r11[2] | n2 | | |
| mbsfn-SubframeConfigList-r11 CHOICE[2] | Not present | | |
| } | | | |
| } | | | |
| csi-RS-ConfigZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-ZP-r11)) OF SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11[1] | 1 | Zero-power CSI-RS 0 | |
| resourceConfigList-r11[1] | 1110000000000000 | For TP2 | |
| subframeConfig-r11[1] | 3 | | |
| csi-RS-ConfigZPId-r11[2] | 2 | Zero-power CSI-RS 1 | |
| resourceConfigList-r11[2] | 0010011000000000 | For TP1 | |
| subframeConfig-r11[2] | 3 | | |
| } | | | |
| } | | | |

9.3.6.2_F.2.5 Test requirement

**Table 9.3.6.2_F.2.5-1: Test requirement (TDD)**

| | **CSI process 0** | **CSI process 1** | **CSI process 2** |
|---|---|---|---|
| $\alpha$ [%] | N/A | 2 | 2 |
| $\beta$ [%] | N/A | 40 | 40 |
| $\delta$ [%] | 10 | N/A | N/A |
| $\gamma$ | N/A | N/A | 1.01 |
| UE Category | ≥1 | | |

**Table 9.3.6.2_F.2.5-2: Minimum median CQI difference between configured CSI processes (TDD)**

| | **CSI process 1** | **CSI process 2** |
|---|---|---|
| **CSI process 0** | N/A | 1 |
| UE Category | ≥1 | |

To pass the test, $\alpha$ and $\beta$ and $\delta$ and $\gamma$ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.3.6.2_F.3 TDD CQI Reporting under fading conditions with Four CSI processes for CoMP

### 9.3.6.2_F.3.1 Test purpose

The purpose of the test is to verify the reporting accuracy of the CQI and the UE processing capability for Four CSI processes.

### 9.3.6.2_F.3.2 Test applicability

This test applies to all types of E-UTRA TDD UEs release 11 and forward, supporting Maximum CSI processes of Four on a component carrier within a band with PDSCH transmission mode 10.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.3.6.2_F.3.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.3.6.2_F.1.3.

### 9.3.6.2_F.3.4 Test description

#### 9.3.6.2_F.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.52 for UE with 2Rx RF band and Annex A, Figure A.52a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.3.6.2_F.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.6.2_F.3.4.3.

#### 9.3.6.2_F.3.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.6.2_F.1.5-2 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to CQI value 10 and keep it regardless of the wideband and full-size subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI report for each full-size subband have been gathered for each of CSI process 0, 1, 2, and 3. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback for CSI process 1, 2, and 3 via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. But for CSI process 0, SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUCCH CQI feedback. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. Check if "2000*$\alpha$%/100 ≤ number of CQI reports with index 0 for each full-size subband ≤ 2000*$\beta$%/100" for CSI process 1, 2 and 3. And check if the number of CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least 2000*$\delta$%/100 for CSI process 0. And check if the difference of the median CQIs of the reported wideband CQI for configured CSI processes 0, 1, 2 and 3 shall be greater or equal to the values as in Table 9.3.6.2_F.3.5-2.
(2000= No of full-size subband reports, 100 because of %). If yes, continue with step 5, otherwise goto step 7.

5. The SS shall send PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the wideband median-CQI value in an each available downlink transmission instance randomly selected full-size subband regardless of UE wideband and subband CQI report based on CSI process 2. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3 Declare the throughput as $t_{median}$.

6. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE report the highest full-size subband CQI based on CSI process 2. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput and (NACK / (ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) ≥ $\gamma$ and (NACK / (ACK + NACK))≥ 0.02, pass the UE and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to table 9.3.6.2_F.1.3-1 for the other test as appropriate.

#### 9.3.6.2_F.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:

**Table 9.3.6.2_F.3.4.3-1: CQI-ReportConfig-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2ABA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| simultaneousAckNackAndCQI-Format3-r11 | Not present | PUCCH Format 2 | |
| cqi-ReportPeriodicProcExtToReleaseList-r11 | Not present | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF SEQUENCE { | 1 entry | | |
| cqi-ReportPeriodicProcExtId-r11[1] SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtId-r11 | 1 | | |
| cqi-pmi-ConfigIndex-r11 | 3 | | |
| cqi-FormatIndicatorPeriodic-r11 CHOICE { | | | |
| widebandCQI-r11 SEQUENCE { | | | |
| csi-ReportMode-r11 | submode1 | | |
| } | | | |
| subbandCQI-r11 | Not present | PUCCH 1-1 | |
| } | | | |
| ri-ConfigIndex-r11 | 805 | | |
| csi-ConfigIndex-r11 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportBoth-r11 SEQUENCE { | | | |
| csi-IM-ConfigToReleaseList-r11 | Not present | | |
| csi-IM-ConfigToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-IM-r11)) OF SEQUENCE { | 3 entries | | |
| csi-IM-ConfigId-r11[1] | 1 | CSI-IM 0 | |
| resourceConfig-r11[1] | 2 | | |
| subframeConfig-r11[1] | 3 | | |
| csi-IM-ConfigId-r11[2] | 2 | CSI-IM 1 | |
| resourceConfig-r11[2] | 6 | | |
| subframeConfig-r11[2] | 3 | | |
| csi-IM-ConfigId-r11[3] | 3 | CSI-IM 2 | |
| resourceConfig-r11[3] | 1 | | |
| subframeConfig-r11[3] | 3 | | |
| } | | | |
| csi-ProcessToReleaseList-r11 | Not present | | |
| csi-ProcessToAddModList-r11SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF SEQUENCE { | 4 entries | | |
| csi-ProcessId-r11[1] | 1 | CSI process 0 | |
| csi-RS-ConfigNZPId-r11[1] | 1 | | |
| csi-IM-ConfigId-r11[1] | 1 | | |
| p-C-AndCBSRList-r11[1] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[1] | -3 | | |
| codebookSubsetRestriction-r11[1] | 0x0000 0000 0000 0001 | | |
| } | | | |
| cqi-ReportBothProc-r11[1] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 1 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[1] | 1 | | |
| cqi-ReportAperiodicProc-r11[1] | Not present | | |
| csi-ProcessId-r11[2] | 2 | CSI process 1 | |
| csi-RS-ConfigNZPId-r11[2] | 2 | | |
| csi-IM-ConfigId-r11[2] | 1 | | |
| p-C-AndCBSRList-r11[2] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[2] | 0 | | |
| codebookSubsetRestriction-r11[2] | 000001 | | |
| } | | | |
| cqi-ReportBothProc-r11[2] SEQUENCE { | | | |

| | | | |
|---|---|---|---|
| ri-Ref-CSI-ProcessId-r11 | 2 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[2] | Not present | | |
| cqi-ReportAperiodicProc-r11[2] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| csi-ProcessId-r11[3] | 3 | CSI process 2 | |
| csi-RS-ConfigNZPId-r11[3] | 1 | | |
| csi-IM-ConfigId-r11[3] | 2 | | |
| p-C-AndCBSRList-r11[3] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[3] | -3 | | |
| codebookSubsetRestriction-r11[3] | 0x0000 0000 0000 0001 | | |
| } | | | |
| cqi-ReportBothProc-r11[3] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 3 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[3] | Not present | | |
| cqi-ReportAperiodicProc-r11[3] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| csi-ProcessId-r11[4] | 4 | CSI process 3 | |
| csi-RS-ConfigNZPId-r11[4] | 2 | | |
| csi-IM-ConfigId-r11[4] | 3 | | |
| p-C-AndCBSRList-r11[4] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[4] | 0 | | |
| codebookSubsetRestriction-r11[4] | 000001 | | |
| } | | | |
| cqi-ReportBothProc-r11[4] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 4 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[4] | Not present | | |
| cqi-ReportAperiodicProc-r11[4] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.6.2_F.3.4.3-2: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated ::= SEQUENCE { | | | |
| csi-RS-ConfigNZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-NZP-r11)) OF SEQUENCE { | 2 entries | | |
| csi-RS-ConfigNZPId-r11[1] | 1 | CSI-RS signal 0 | |
| antennaPortsCount-r11[1] | an4 | | |
| resourceConfig-r11[1] | 0 | | |
| subframeConfig-r11[1] | 3 | | |
| qcl-CRS-Info-r11 SEQUENCE[1] { | | | |
| crs-PortsCount-r11[1] | n2 | | |
| mbsfn-SubframeConfigList-r11 CHOICE[1] | Not present | | |
| } | | | |
| csi-RS-ConfigNZPId-r11[2] | 2 | CSI-RS signal 1 | |
| antennaPortsCount-r11[2] | an2 | | |
| resourceConfig-r11[2] | 5 | | |
| subframeConfig-r11[2] | 3 | | |
| qcl-CRS-Info-r11 SEQUENCE[2] { | | | |
| crs-PortsCount-r11[2] | n2 | | |
| mbsfn-SubframeConfigList-r11 CHOICE[2] | Not present | | |
| } | | | |
| } | | | |
| csi-RS-ConfigZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-ZP-r11)) OF SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11[1] | 1 | Zero-power CSI-RS 0 | |
| resourceConfigList-r11[1] | 1110000000000000 | For TP2 | |
| subframeConfig-r11[1] | 3 | | |
| csi-RS-ConfigZPId-r11[2] | 2 | Zero-power CSI-RS 1 | |
| resourceConfigList-r11[2] | 0010011000000000 | For TP1 | |
| subframeConfig-r11[2] | 3 | | |
| } | | | |
| } | | | |

9.3.6.2_F.3.5 Test requirement

**Table 9.3.6.2_F.3.5-1: Test requirement (TDD)**

| | **CSI process 0** | **CSI process 1** | **CSI process 2** | **CSI process 3** |
|---|---|---|---|---|
| $\alpha$ [%] | N/A | 2 | 2 | 2 |
| $\beta$ [%] | N/A | 40 | 40 | 40 |
| $\delta$ [%] | 10 | N/A | N/A | N/A |
| $\gamma$ | N/A | N/A | 1.01 | N/A |
| UE Category | ≥1 | | | |

**Table 9.3.6.2_F.3.5-2: Minimum median CQI difference between configured CSI processes (TDD)**

| | **CSI process 1** | **CSI process 2** | **CSI process 3** |
|---|---|---|---|
| **CSI process 0** | N/A | 1 | 3 |
| UE Category | ≥1 | | |

To pass the test, $\alpha$ and $\beta$ and $\delta$ and $\gamma$ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.3.7 PUSCH 3-2 for eDL MIMO Enhancement

### 9.3.7.1 FDD CQI Reporting under fading conditions - PUSCH 3-2 for eDL MIMO Enhancement

#### 9.3.7.1.1 Test purpose

The purpose of the test is to verify the reporting accuracy of the sub band CQI and sub band PMI operation.

#### 9.3.7.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE releases 12 and forward. Applicability requires support for FGI bit 103.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.3.7.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.7.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.7.1.3-2 and by the following.

a) the ratio of the throughput obtained when transmitting based on UE PUSCH 3-2 reported wideband CQI and subband PMI and that obtained when transmitting based on PUSCH 3-1 reported wideband CQI and wideband PMI shall be $\geq \alpha$;

b) The ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS based on UE PUSCH 3-2 reported subband CQI and subband PMI and that obtained when transmitting on a randomly selected sub-band in set S based on PUSCH 1-2 reported wideband CQI and subband PMI shall be $\geq \beta$;

The transport block sizes TBS for wideband CQI and subband CQI are selected according to RC.16 FDD for test 1 and according to RC.17 FDD for test 2.

**Table 9.3.7.1.3-1: Sub-band test for FDD**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10MHz | | | |
| PDSCH resource allocation | | RB | 50PRB | | a subband, 6PRB | |
| Transmission mode | | | TM6 | | TM9 | |
| Downlink power allocation | $\rho_A$ | dB | -6 | | 0 | |
| | $\rho_B$ | dB | -6 | | 0 | |
| | $P_C$ | dB | - | | -3 | |
| | σ | dB | 3 | | -3 | |
| SNR (Note 3) | | dB | 0 | 1 | 5 | 6 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 | -93 | -92 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 | -98 |
| Propagation channel | | | EVA5 | | EVA5 | |
| Antenna configuration | | | 4x2 ULA low | | 4x2 XP high (Note 4) | |
| Beamforming Model | | | - | | B.4.3 | |
| CRS reference signals | | | Antenna ports 0, 1, 2, 3 | | Antenna ports 0, 1 | |
| Time offset between TX antenna (Note 5) | | ns | 65 | | - | |
| CSI reference signals | | | - | | Antenna ports 15, 16, 17, 18 | |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | - | | 5/ 1 | |
| CSI-RS reference signal configuration | | | - | | 4 | |
| alternativeCodebookEnabledFor4TX | | | No | | Yes | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 FFFF | | 0x0000 0000 0000 FFFF 0000 FFFF | |
| Reporting interval (Note 6) | | ms | 5 | | 5 | |
| CQI delay | | ms | 8 | | 8 | |
| Reporting mode | | | PUSCH 3-2, PUSCH 3-1 | | PUSCH 3-2, PUSCH 1-2 | |
| Sub-band size | | RB | 6 (full size) | | 6 (full size) | |
| Max number of HARQ transmissions | | | 1 | | 1 | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: Reference measurement channel according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 4: Randomization of the principle beam direction shall be used as specified in B.2.3A.4.
Note 5: The values of time offset are [0ns 65ns 0ns 65ns] for antenna port [0, 1, 2, 3] respectively.
Note 6: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.

**Table 9.3.7.1.3-2: Minimum requirement (FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| α | 1.05 | - |
| β | - | 1.15 |
| UE Category | ≥2 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.7.1.

### 9.3.7.1.4 Test description

#### 9.3.7.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11 for UE with 2Rx RF band and Annex A, Figure A.11a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.3.7.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.7.1.4.3.

#### 9.3.7.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.7.1.5-2 as appropriate.

For Test1

2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to the wideband and subband CQI value sent by the UE and according to the wideband and subband PMI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports, wideband PMI reports, full-size subband CQI reports, and full-size subband PMI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.
3. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to the wideband CQI value and wideband PMI value. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH 3-1 CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{wideband}$ .
4. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit to 0 to schedule UL RMC in every subframe (Table A.4.1-1).
5. The SS shall transmit an RRC Connection Reconfiguration message to set reporting mode according to Table 9.3.7.1.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to the wideband CQI value and subband PMI value. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH 3-2 CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$ .

8. If the ratio ( $t_{subband}$ / $t_{wideband}$ ) ≥ α which is specified in Table 9.3.7.1.5-1, pass the UE for this test and go to step 16. Otherwise, go to step 15.

For Test2

9. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband and subband CQI value sent by the UE and according to the wideband and subband PMI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports, wideband PMI reports, full-size subband CQI reports, and full-size subband PMI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

10. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value and subband PMI value in each available downlink transmission instance randomly selected full-size subband. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH 1-2 CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{wideband}$ .

11. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit to 0 to schedule UL RMC in every subframe (Table A.4.1-1).

12. The SS shall transmit an RRC Connection Reconfiguration message to set reporting mode according to Table 9.3.7.1.3-1.

13. The UE shall transmit RRC Connection Reconfiguration Complete message.

14. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value and ull-size subband PMI value in one full-size subband selected among the subbands in which UE reports the highest full-size subband CQI and full-size subband PMI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH 3-2 CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$ . If the ratio ($t_{subband}$ / $t_{wideband}$ ) ≥ β which is specified in Table 9.3.7.1.5-1, pass the UE for this test and go to step 16. Otherwise, go to step15.

15. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 14) for the other SNR point as appropriate. Otherwise fail the UE.

16. If both tests have not been done, then repeat the same procedure (steps 1 to 15) with test conditions according to the Table 9.3.7.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.3.7.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.7.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | Test 1 | |
| antennaInfo CHOICE { | | Test 1 | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE{ | | | |
| n4TxAntenna-tm6 | 1111111111111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| antennaInfo | Not present | Test 2 | |
| antennaInfo-r10 CHOICE { | | Test 2 | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | Test 2 | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | Test 2 | |
| antennaInfo-v1250 | AntennaInfoDedicated-v1250 | Test 2 | |
| } | | | |

**Table 9.3.7.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | Test 1 | |
| | dB0 | Test 2 | |
| } | | | |

**Table 9.3.7.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm32-v1250, rm31 | Test 1 | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 9.3.7.1.4.3-4: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | Test 2 | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0000 FFFF 0000 FFFF | Test 2 | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.3.7.1.4.3-5: *AntennaInfoDedicated-v1250***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-v1250 ::= SEQUENCE { | | | |
| alternativeCodebookEnabledFor4TX-r12 | TRUE | Test 2 | |
| } | | | |

**Table 9.3.7.1.4.3-6: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm32-v1250, rm12 | Test 2 | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| } | | | |

**Table 9.3.7.1.4.3-7: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 4 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_C$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| } | | | |

9.3.7.1.5 Test requirement

**Table 9.3.7.1.5-1: Test requirement (FDD)**

| | **Test 1** | **Test 2** |
|---|---|---|
| α | 1.04 | - |
| β | - | 1.14 |
| UE Category | ≥2 | ≥2 |

**Table 9.3.7.1.5-2: Sub-band test for FDD**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10MHz | | | |
| PDSCH resource allocation | | RB | 50PRB | | a subband, 6PRB | |
| Transmission mode | | | TM6 | | TM9 | |
| Downlink power allocation | $\rho_A$ | dB | -6 | | 0 | |
| | $\rho_B$ | dB | -6 | | 0 | |
| | $P_C$ | dB | - | | -3 | |
| | σ | dB | 3 | | -3 | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 0 | 1 | 5 | 6 |
| SNR for 4Rx UE without 2Rx RF band | | dB | -3 | -2 | 2 | 3 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 | -93 | -92 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 | -98 |
| Propagation channel | | | EVA5 | | EVA5 | |
| Antenna configuration | | | 4x2 ULA low | | 4x2 XP high (Note 4) | |
| Beamforming Model | | | - | | B.4.3 | |
| CRS reference signals | | | Antenna ports 0, 1, 2, 3 | | Antenna ports 0, 1 | |
| Time offset between TX antenna (Note 5) | | ns | 65 | | - | |
| CSI reference signals | | | - | | Antenna ports 15, 16, 17, 18 | |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | - | | 5/ 1 | |
| CSI-RS reference signal configuration | | | - | | 4 | |
| alternativeCodebookEnabledFor4TX | | | No | | Yes | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 FFFF | | 0x0000 0000 0000 FFFF 0000 FFFF | |
| Reporting interval (Note 6) | | ms | 5 | | 5 | |
| CQI delay | | ms | 8 | | 8 | |
| Reporting mode | | | PUSCH 3-2, PUSCH 3-1 | | PUSCH 3-2, PUSCH 1-2 | |
| Sub-band size | | RB | 6 (full size) | | 6 (full size) | |
| Max number of HARQ transmissions | | | 1 | | 1 | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: Reference measurement channel according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 4: Randomization of the principle beam direction shall be used as specified in B.2.3A.4.
Note 5: The values of time offset are [0ns 65ns 0ns 65ns] for antenna port [0, 1, 2, 3] respectively.
Note 6: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.
Note 7: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

To pass the test, α and β must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.3.7.2 TDD CQI Reporting under fading conditions - PUSCH 3-2 for eDL MIMO Enhancement

### 9.3.7.2.1 Test purpose

The purpose of the test is to verify the reporting accuracy of the sub band CQI and sub band PMI operation.

#### 9.3.7.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE releases 12 and forward. Applicability requires support for FGI bit 103.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.3.7.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.7.2.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.7.2.3-2 and by the following.

a) the ratio of the throughput obtained when transmitting based on UE PUSCH 3-2 reported wideband CQI and subband PMI and that obtained when transmitting based on PUSCH 3-1 reported wideband CQI and wideband PMI shall be $\geq \alpha$;

b) The ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS based on UE PUSCH3-2 reported subband CQI and subband PMI and that obtained when transmitting on a randomly selected sub-band in set S based on PUSCH 1-2 reported wideband CQI and subband PMI shall be $\geq \beta$;

The transport block sizes TBS for wideband CQI and subband CQI are selected according to RC.14 TDD for test 1 and RC.15 TDD for test 2.

**Table 9.3.7.2.3-1: Sub-band test for TDD**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10MHz | | | |
| PDSCH resource allocation | | RB | 50PRB | | a subband, 6PRB | |
| Transmission mode | | | TM6 | | TM9 | |
| Uplink downlink configuration | | | 1 | | 1 | |
| Special subframe configuration | | | 4 | | 4 | |
| Downlink power allocation | $\rho_A$ | dB | -6 | | 0 | |
| | $\rho_B$ | dB | -6 | | 0 | |
| | $P_C$ | dB | - | | -3 | |
| | σ | dB | 3 | | -3 | |
| SNR (Note 3) | | dB | 0 | 1 | 5 | 6 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 | -93 | -92 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 | -98 |
| Propagation channel | | | EVA5 | | EVA5 | |
| Antenna configuration | | | 4x2 ULA low | | 4x2 XP high (Note 4) | |
| Beamforming Model | | | - | | B.4.3 | |
| CRS reference signals | | | Antenna ports 0, 1, 2, 3 | | Antenna ports 0, 1 | |
| Time offset between TX antenna (Note 5) | | ns | 65 | | - | |
| CSI reference signals | | | - | | Antenna ports 15, 16, 17, 18 | |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | - | | 5/ 4 | |
| CSI-RS reference signal configuration | | | - | | 4 | |
| alternativeCodebookEnabledFor4TX | | | No | | Yes | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 FFFF | | 0x0000 0000 0000 FFFF 0000 FFFF | |
| Reporting interval (Note 6) | | ms | 5 | | 5 | |
| CQI delay | | ms | 8 | | 8 | |
| Reporting mode | | | PUSCH 3-2, PUSCH 3-1 | | PUSCH 3-2, PUSCH 1-2 | |
| Sub-band size | | RB | 6 (full size) | | 6 (full size) | |
| Max number of HARQ transmissions | | | 1 | | 1 | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: Reference measurement channel according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 4: Randomization of the principle beam direction shall be used as specified in B.2.3A.4.
Note 5: The values of time offset are [0ns 65ns 0ns 65ns] for antenna port [0, 1, 2, 3] respectively.
Note 6: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#3 and #8.

**Table 9.3.7.2.3-2: Minimum requirement (TDD)**

| | Test 1 | Test 2 |
|---|---|---|
| α | 1.05 | - |
| β | - | 1.15 |
| UE Category | ≥2 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.7.2.

### 9.3.7.2.4 Test description

#### 9.3.7.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11 for UE with 2Rx RF band and Annex A, Figure A.11a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.3.7.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.7.2.4.3.

### 9.3.7.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.7.2.5-2 as appropriate.

For Test1

2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to the wideband and subband CQI value sent by the UE and according to the wideband and subband PMI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports, wideband PMI reports, full-size subband CQI reports, and full-size subband PMI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #3 and subframe #8 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.
3. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to the wideband CQI value and wideband PMI value. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #3 and subframe #8 to carry the PUSCH 3-1 CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{wideband}$ .
4. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit to 0 to schedule UL RMC in subframe#3 and #8 (Table A.4.1-2).
5. The SS shall transmit an RRC Connection Reconfiguration message to set reporting mode according to Table 9.3.7.2.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC according to the wideband CQI value and subband PMI value. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #3 and subframe #8 to carry the PUSCH 3-2 CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$ .

8. If the ratio ( $t_{subband}$ / $t_{wideband}$ ) ≥ α which is specified in Table 9.3.7.2.5-1, pass the UE for this test and go to step 16. Otherwise, go to step 15.

For Test2

9. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband and subband CQI value sent by the UE and according to the wideband and subband PMI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports, wideband PMI reports, full-size subband CQI reports, and full-size subband PMI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #3 and subframe #8 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

10. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value and subband PMI value in each available downlink transmission instance randomly selected full-size subband. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #3 and subframe #8 to carry the PUSCH 1-2 CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{wideband}$ .

11. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit to 0 to schedule UL RMC in subframe#3 and #8 (Table A.4.1-2).

12. The SS shall transmit an RRC Connection Reconfiguration message to set reporting mode according to Table 9.3.7.2.3-1.

13. The UE shall transmit RRC Connection Reconfiguration Complete message.

14. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value and ull-size subband PMI value in one full-size subband selected among the subbands in which UE reports the highest full-size subband CQI and full-size subband PMI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #3 and subframe #8 to carry the PUSCH 3-2 CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$ . If the ratio ($t_{subband}$ / $t_{wideband}$ ) ≥ β which is specified in Table 9.3.7.2.5-1, pass the UE for this test and go to step 16. Otherwise, go to step 15.

15. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 14) for the other SNR point as appropriate. Otherwise fail the UE.

16. If both tests have not been done, then repeat the same procedure (steps 1 to 15) with test conditions according to the Table 9.3.7.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.3.7.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.7.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | Test 1 | |
| antennaInfo CHOICE { | | Test 1 | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE{ | | | |
| n4TxAntenna-tm6 | 1111111111111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| antennaInfo | Not present | Test 2 | |
| antennaInfo-r10 CHOICE { | | Test 2 | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | Test 2 | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | Test 2 | |
| antennaInfo-v1250 | AntennaInfoDedicated-v1250 | Test 2 | |
| } | | | |

**Table 9.3.7.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | Test 1 | |
| | dB0 | Test 2 | |
| } | | | |

**Table 9.3.7.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm32-v1250, rm31 | Test 1 | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

**Table 9.3.7.2.4.3-4: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | Test 2 | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0000 FFFF 0000 FFFF | Test 2 | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.3.7.2.4.3-5: *AntennaInfoDedicated-v1250***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-v1250 ::= SEQUENCE { | | | |
| alternativeCodebookEnabledFor4TX-r12 | TRUE | Test 2 | |
| } | | | |

**Table 9.3.7.2.4.3-6: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm32-v1250, rm12 | Test 2 | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| } | | | |

**Table 9.3.7.2.4.3-7: *CSI-RS-Config, Test 2***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 4 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_C$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.7.2.4.3-7: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

9.3.7.2.5 Test requirement

**Table 9.3.7.2.3-1: Test requirement (TDD)**

| | Test 1 | Test 2 |
|---|---|---|
| α | 1.04 | - |
| β | - | 1.14 |
| UE Category | ≥2 | ≥2 |

**Table 9.3.7.2.5-2: Sub-band test for TDD**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10MHz | | | |
| PDSCH resource allocation | | RB | 50PRB | | a subband, 6PRB | |
| Transmission mode | | | TM6 | | TM9 | |
| Uplink downlink configuration | | | 1 | | 1 | |
| Special subframe configuration | | | 4 | | 4 | |
| Downlink power allocation | $\rho_A$ | dB | -6 | | 0 | |
| | $\rho_B$ | dB | -6 | | 0 | |
| | $P_C$ | dB | - | | -3 | |
| | σ | dB | 3 | | -3 | |
| SNR for UE with 2Rx RF band (Note 3) | | dB | 0 | 1 | 5 | 6 |
| SNR for 4Rx UE without 2Rx RF band | | dB | -3 | -2 | 2 | 3 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 | -93 | -92 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 | -98 |
| Propagation channel | | | EVA5 | | EVA5 | |
| Antenna configuration | | | 4x2 ULA low | | 4x2 XP high (Note 4) | |
| Beamforming Model | | | - | | B.4.3 | |
| CRS reference signals | | | Antenna ports 0, 1, 2, 3 | | Antenna ports 0, 1 | |
| Time offset between TX antenna (Note 5) | | ns | 65 | | - | |
| CSI reference signals | | | - | | Antenna ports 15, 16, 17, 18 | |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | - | | 5/ 4 | |
| CSI-RS reference signal configuration | | | - | | 4 | |
| alternativeCodebookEnabledFor4TX | | | No | | Yes | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 FFFF | | 0x0000 0000 0000 FFFF 0000 FFFF | |
| Reporting interval (Note 6) | | ms | 5 | | 5 | |
| CQI delay | | ms | 8 | | 8 | |
| Reporting mode | | | PUSCH 3-2, PUSCH 3-1 | | PUSCH 3-2, PUSCH 1-2 | |
| Sub-band size | | RB | 6 (full size) | | 6 (full size) | |
| Max number of HARQ transmissions | | | 1 | | 1 | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: Reference measurement channel according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 4: Randomization of the principle beam direction shall be used as specified in B.2.3A.4.
Note 5: The values of time offset are [0ns 65ns 0ns 65ns] for antenna port [0, 1, 2, 3] respectively.
Note 6: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#3 and #8.
Note 7: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

To pass the test, α and β must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.3.8 Additional requirements for enhanced receiver Type B

### 9.3.8.1 PUCCH 1-1 (Cell-Specific Reference Symbols)

#### 9.3.8.1.1 FDD CQI Reporting under fading conditions - PUCCH 1-1 (Cell-Specific Reference Symbols) TM4 - Enhanced Receiver Type B

##### 9.3.8.1.1.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality based on the receiver of the enhanced Type B meets a minimum performance. Performance requirements are specified in terms of the relative throughput obtained when the transport format is that indicated by the reported CQI with NeighCellsInfo-r12 configured compared to the case without NeighCellsInfo-r12 configured. Cell 1 is the serving cell, and Cell 2 and Cell 3 are the interference cells.

##### 9.3.8.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD release 12 and forward UE of Category $\geq 2$ that support enhanced performance requirement Type B.

##### 9.3.8.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.8.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.8.1.1.3-2 and by the following

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources with NeighCellsInfo-r12 configured and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources without NeighCellsInfo-r12 configured shall be $\geq \gamma$;

**Table 9.3.8.1.1.3-1: Fading test for (FDD)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| Transmission mode | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | |
| | $\rho_B$ | dB | -3 | | |
| | σ | dB | 0 | | |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| SNR | | dB | 8.34 | N/A | N/A |
| $\hat{E}_s/N_{oc}$ | | dB | N/A | 3.28 | 0.74 |
| $\hat{I}_{or}^{(j)}$ | | dB [mW/15kHz] | -89.66 | -94.72 | -97.26 |
| $N_{oc}$ | | dB [mW/15kHz] | -98 | | |
| Propagation channel | | | EPA5 | EPA5 | EPA5 |
| Correlation and antenna configuration | | | Low 2 x 2 | Low 2 x 2 | Low 2 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| Interference model | | | N/A | As specified in clause B.6.3 | As specified in clause B.6.3 |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | N/A | N/A |
| Physical channel for CQI/PMI reporting | | | PUCCH Format 2 | N/A | N/A |
| PUCCH Report Type for CQI/PMI | | | 2 | N/A | N/A |
| PUCCH Report Type for RI | | | 3 | N/A | N/A |
| *cqi-pmi-ConfigurationIndex* | | | 6 | N/A | N/A |
| *ri-ConfigurationIndex* | | | 1 | N/A | N/A |
| *CodeBookSubsetRestriction bitmap* | | | 000001 | N/A | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | N/A |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel RC.2 FDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 3: All cells are time-synchronous.
Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331[5].

**Table 9.3.8.1.1.3-2: Minimum requirement (FDD)**

| | Test |
|---|---|
| $\gamma$ | 0.925 |
| UE Category | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.8.1.1.

### 9.3.8.1.1.4 Test description

#### 9.3.8.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Table 9.3.8.1.1.-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.8.1.1.4.3.

#### 9.3.8.1.1.4.2 Test procedure

1. Set the cell 1, 2 and 3 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.8.1.1.5-1 as appropriate.
2. [SS shall not setup NAICS-AssistanceInfo for the next test step.]
3. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The UE will send ACK/NACK and periodic CQI, PMI and RI report using PUCCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{NAICS_OFF}}$.
4. SS shall setup NAICS-AssistanceInfo as per TS 36.508 [7] clause 5.2A.6.1.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The UE will send ACK/NACK and periodic CQI, PMI and RI report using PUCCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{NAICS_ON}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
6. If the ratio ($t_{\text{NAICS_ON}} / t_{\text{NAICS_OFF}}$) $\geq \gamma$ then pass the UE for this test. Otherwise fail the UE.
7. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

#### 9.3.8.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.8.1.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| } | | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 000001 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.8.1.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | |
| } | | | |

**Table 9.3.8.1.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 6 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

9.3.8.1.1.5 Test requirement

**Table 9.3.8.1.1.5-1: Test Parameters for Fading test for (FDD)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| Transmission mode | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | |
| | $\rho_B$ | dB | -3 | | |
| | σ | dB | 0 | | |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| SNR | | dB | 8.97 | N/A | N/A |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 4.08 | 1.54 |
| $\hat{I}_{or}^{(j)}$ | | dB [mW/15kHz] | -89.03 | -93.92 | -96.46 |
| $N_{oc}$ | | dB [mW/15kHz] | -98 | | |
| Propagation channel | | | EPA5 | EPA5 | EPA5 |
| Correlation and antenna configuration | | | Low 2 x 2 | Low 2 x 2 | Low 2 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| Interference model | | | N/A | As specified in clause B.6.3 | As specified in clause B.6.3 |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | N/A | N/A |
| Physical channel for CQI/PMI reporting | | | PUCCH Format 2 | N/A | N/A |
| PUCCH Report Type for CQI/PMI | | | 2 | N/A | N/A |
| PUCCH Report Type for RI | | | 3 | N/A | N/A |
| *cqi-pmi-ConfigurationIndex* | | | 6 | N/A | N/A |
| *ri-ConfigurationIndex* | | | 1 | N/A | N/A |
| *CodeBookSubsetRestriction bitmap* | | | 000001 | N/A | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | N/A |
| NeighCellsInfo-r12 (Note 4) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel RC.2 FDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 3: All cells are time-synchronous.
Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331[5].

**Table 9.3.8.1.1.5-2: Test requirement (FDD)**

| | Test |
|---|---|
| $\gamma$ | 0.915 |
| UE Category | ≥2 |

## 9.3.8.1.2 TDD CQI Reporting under fading conditions - PUCCH 1-1 (Cell-Specific Reference Symbols) TM4 - Enhanced Receiver Type B

9.3.8.1.2.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality based on the receiver of the enhanced Type B meets a minimum performance. Performance requirements are specified in terms of the relative throughput obtained

when the transport format is that indicated by the reported CQI with NeighCellsInfo-r12 configured compared to the case without NeighCellsInfo-r12 configured. Cell 1 is the serving cell, and Cell 2 and Cell 3 are the interference cells.

#### 9.3.8.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD release 12 and forward UE of Category ≥ 2 that support enhanced performance requirement Type B.

#### 9.3.8.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.8.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.8.1.2.3-2 and by the following:

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources with NeighCellsInfo-r12 configured and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources without NeighCellsInfo-r12 configured shall be ≥ $\gamma$;

**Table 9.3.8.1.2.3-1: Fading test for (TDD)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| Transmission mode | | | 4 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | |
| | $\rho_B$ | dB | -3 | | |
| | σ | dB | 0 | | |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| SNR | | dB | 8.34 | N/A | N/A |
| $\hat{E}_s/N_{oc}$ | | dB | N/A | 3.28 | 0.74 |
| $\hat{I}_{or}^{(j)}$ | | dB [mW/15kHz] | -89.66 | -94.72 | -97.26 |
| $N_{oc}$ | | dB [mW/15kHz] | -98 | | |
| Propagation channel | | | EPA5 | EPA5 | EPA5 |
| Correlation and antenna configuration | | | Low 2 x 2 | Low 2 x 2 | Low 2 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| Interference model | | | N/A | As specified in clause B.6.3 | As specified in clause B.6.3 |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | N/A | N/A |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | N/A | N/A |
| PUCCH Report Type | | | 2 | N/A | N/A |
| *cqi-pmi-ConfigurationIndex* | | | 3 | N/A | N/A |
| *ri-ConfigIndex* | | | 805 (Note 5) | N/A | N/A |
| *CodeBookSubsetRestriction bitmap* | | | 000001 | N/A | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| NeighCellsInfo-r12 (Note 6) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel RC.2 TDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.
Note 4: All cells are time-synchronous.
Note 5: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.
Note 6: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331[5].

**Table 9.3.8.1.2.3-2: Minimum requirement (TDD)**

| | Test |
|---|---|
| $\gamma$ | 0.925 |
| UE Category | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.8.1.2.

#### 9.3.8.1.2.4 Test description

##### 9.3.8.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Table 9.3.8.1.2.-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.8.1.2.4.3.

##### 9.3.8.1.2.4.2 Test procedure

1. Set the cell 1, 2 and 3 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.8.1.2.5-1 as appropriate.
2. [SS shall not setup NAICS-AssistanceInfo for the next test step.]
3. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{NAICS_OFF}}$.
4. SS shall setup NAICS-AssistanceInfo as per TS 36.508 [7] clause 5.2A.6.1.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{NAICS_ON}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
6. If the ratio ($t_{\text{NAICS_ON}} / t_{\text{NAICS_OFF}}$) $\geq \gamma$ then pass the UE for this test. Otherwise fail the UE.
7. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

##### 9.3.8.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.8.1.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| } | | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm4 | 000001 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.8.1.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | |
| } | | | |

**Table 9.3.8.1.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 805 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

9.3.8.1.2.5 Test requirement

**Table 9.3.8.1.2.5-1: Test Parameters for Fading test for (TDD)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| Transmission mode | | | 4 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | |
| | $\rho_B$ | dB | -3 | | |
| | σ | dB | 0 | | |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| SNR | | dB | 8.97 | N/A | N/A |
| $\hat{E}_s/N_{oc}$ | | dB | N/A | 4.08 | 1.54 |
| $\hat{I}_{or}^{(j)}$ | | dB [mW/15kHz] | -89.03 | -93.92 | -96.46 |
| $N_{oc}$ | | dB [mW/15kHz] | -98 | | |
| Propagation channel | | | EPA5 | EPA5 | EPA5 |
| Correlation and antenna configuration | | | Low 2 x 2 | Low 2 x 2 | Low 2 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| Interference model | | | N/A | As specified in clause B.6.3 | As specified in clause B.6.3 |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | N/A | N/A |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | N/A | N/A |
| PUCCH Report Type | | | 2 | N/A | N/A |
| *cqi-pmi-ConfigurationIndex* | | | 3 | N/A | N/A |
| *ri-ConfigIndex* | | | 805 (Note 5) | N/A | N/A |
| *CodeBookSubsetRestriction bitmap* | | | 000001 | N/A | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| NeighCellsInfo-r12 (Note 6) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel RC.2 TDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.
Note 4: All cells are time-synchronous.
Note 5: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.
Note 6: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331[5].

**Table 9.3.8.1.2.5-2: Test requirement (TDD)**

| | Test |
|---|---|
| $\gamma$ | 0.915 |
| UE Category | ≥2 |

## 9.3.8.2 PUCCH 1-1 (CSI Reference Symbols)

### 9.3.8.2.1 FDD CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) TM9 - Enhanced Receiver Type B

#### 9.3.8.2.1.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality based on the receiver of the enhanced Type B meets a minimum performance. Performance requirements are specified in terms of the relative throughput obtained when the transport format is that indicated by the reported CQI with NeighCellsInfo-r12 configured compared to the case without NeighCellsInfo-r12 configured. Cell 1 is the serving cell, and Cell 2 and Cell 3 are the interference cells.

#### 9.3.8.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD release 12 and forward UE of Category ≥ 2 that support enhanced performance requirement Type B. Applicability requires support for FGI bit 103.

#### 9.3.8.2.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.8.2.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.8.2.1.3-2 and by the following

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources with NeighCellsInfo-r12 configured and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources without NeighCellsInfo-r12 configured shall be ≥ $\gamma$;

**Table 9.3.8.2.1.3-1: Fading test for FDD**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| Transmission mode | | | 9 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| | Pc | dB | 0 | | |
| | σ | dB | 0 | | |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| SNR | | dB | 8.34 | N/A | N/A |
| $\hat{E}_s/N_{oc}$ | | | N/A | 3.28 | 0.74 |
| $\hat{I}_{or}^{(j)}$ | | dB [mW/15kHz] | -89.66 | -94.72 | -97.26 |
| $N_{oc}$ | | dB [mW/15kHz] | -98 | | |
| Propagation channel | | | EPA5 | EPA5 | EPA5 |
| Correlation and antenna configuration | | | Low 2 x 2 | Low 2 x 2 | Low 2 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| Beamforming Model | | | As specified in Section B.4.3 | | |
| CSI reference signals | | | Antenna ports 15,16 | N/A | N/A |
| CSI-RS periodicity and subframe offset | | | 5/1 | N/A | N/A |
| CSI-RS reference signal configuration | | | 2 | N/A | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | N/A | 1 / 0001000000000000 | 1 / 0001000000000000 |
| CodeBookSubsetRestriction bitmap | | | 000001 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | N/A | N/A |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | N/A | N/A |
| PUCCH Report Type for CQI/PMI | | | 2 | N/A | N/A |
| PUCCH channel for RI reporting | | | PUCCH Format 2 | N/A | N/A |
| PUCCH Report Type for RI | | | 3 | N/A | N/A |
| *cqi-pmi-ConfigurationIndex* | | | 2 | N/A | N/A |
| *ri-ConfigIndex* | | | 1 | N/A | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | N/A |
| NeighCellsInfo-r12 (Note 5) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel RC.11 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.
Note 4: All cells are time-synchronous.
Note 5: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS 36.331 [5].

**Table 9.3.8.2.1.3-2: Minimum requirement (FDD)**

| | Test 1 |
|---|---|
| $\gamma$ | 0.925 |
| UE Category | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.8.2.1.

### 9.3.8.2.1.4 Test description

#### 9.3.8.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Table 9.3.8.2.1.-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.8.1.1.4.3.

#### 9.3.8.2.1.4.2 Test procedure

1. Set the cell 1, 2 and 3 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.8.2.1.5-1 as appropriate.
2. SS shall not setup NAICS-AssistanceInfo for the next test step.
3. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI, PMI and RI report using PUCCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{NAICS_OFF}}$.
4. SS shall setup NAICS-AssistanceInfo as per TS 36.508 [7] clause 5.2A.6.1.
5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI, PMI and RI report using PUCCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{NAICS_ON}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
6. If the ratio ($t_{\text{NAICS_ON}} / t_{\text{NAICS_OFF}}$) $\geq \gamma$ then pass the UE for this test. Otherwise fail the UE.

7. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

#### 9.3.8.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.8.2.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo-r10 CHOICE { | | | |
| antennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| } | | | |
| codebookSubsetRestriction-r10 | 00000000000000000000000000000000000000000000000000000000111111111111111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.8.2.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.3.8.2.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 2 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.8.2.1.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 2 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.3.8.2.1.5 Test requirement

**Table 9.3.8.2.1.5-1: Test Parameters for Fading test for (FDD)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| Transmission mode | | | 9 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| | Pc | dB | 0 | | |
| | σ | dB | 0 | | |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| SNR | | dB | 8.97 | N/A | N/A |
| $\hat{E}_s/N_{oc}$ | | | N/A | 4.08 | 1.54 |
| $\hat{I}_{or}^{(j)}$ | | dB [mW/15kHz] | -89.03 | -93.92 | -96.46 |
| $N_{oc}$ | | dB [mW/15kHz] | -98 | | |
| Propagation channel | | | EPA5 | EPA5 | EPA5 |
| Correlation and antenna configuration | | | Low 2 x 2 | Low 2 x 2 | Low 2 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| Beamforming Model | | | As specified in Section B.4.3 | | |
| CSI reference signals | | | Antenna ports 15,16 | N/A | N/A |
| CSI-RS periodicity and subframe offset | | | 5/1 | N/A | N/A |
| CSI-RS reference signal configuration | | | 2 | N/A | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | N/A | 1 / 0001000000000000 | 1 / 0001000000000000 |
| CodeBookSubsetRestriction bitmap | | | 000001 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | N/A | N/A |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | N/A | N/A |
| PUCCH Report Type for CQI/PMI | | | 2 | N/A | N/A |
| PUCCH channel for RI reporting | | | PUCCH Format 2 | N/A | N/A |
| PUCCH Report Type for RI | | | 3 | N/A | N/A |
| *cqi-pmi-ConfigurationIndex* | | | 2 | N/A | N/A |
| *ri-ConfigIndex* | | | 1 | N/A | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | N/A |
| NeighCellsInfo-r12 (Note 5) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel RC.11 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.
Note 4: All cells are time-synchronous.
Note 5: NeighCellsInfo-r12 is described in subclause 6.3.2 of TS 36.331 [5].

**Table 9.3.8.2.1.5-2: Test requirement (FDD)**

| | Test |
|---|---|
| $\gamma$ | 0.915 |
| UE Category | ≥2 |

## 9.3.8.2.2 TDD CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) TM9 - Enhanced Receiver Type B

### 9.3.8.2.2.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality based on the receiver of the enhanced Type B meets a minimum performance. Performance requirements are specified in terms of the relative throughput obtained when the transport format is that indicated by the reported CQI with NeighCellsInfo-r12 configured compared to the case without NeighCellsInfo-r12 configured. Cell 1 is the serving cell, and Cell 2 and Cell 3 are the interference cells.

### 9.3.8.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD release 12 and forward UE of Category $\geq$ 2 that support enhanced performance requirement Type B. Applicability requires support for FGI bit 103.

### 9.3.8.2.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.8.2.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.8.2.2.3-2 and by the following:

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources with NeighCellsInfo-r12 configured and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources without NeighCellsInfo-r12 configured shall be $\geq \gamma$;

**Table 9.3.8.2.2.3-1: Fading test for (TDD)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| Transmission mode | | | 9 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| | Pc | dB | 0 | | |
| | σ | dB | 0 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| SNR | | dB | 8.34 | N/A | N/A |
| $\hat{E}_s / N_{oc}$ | | | N/A | 3.28 | 0.74 |
| $\hat{I}_{or}^{(j)}$ | | dB [mW/15kHz] | -89.66 | -94.72 | -97.26 |
| $N_{oc}$ | | dB [mW/15kHz] | -98 | | |
| Propagation channel | | | EPA5 | EPA5 | EPA5 |
| Correlation and antenna configuration | | | Low 2 x 2 | Low 2 x 2 | Low 2 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| Beamforming Model | | | As specified in Section B.4.3 | | |
| CSI reference signals | | | Antenna ports 15,16 | N/A | N/A |
| CSI-RS periodicity and subframe offset | | | 5/3 | N/A | N/A |
| CSI-RS reference signal configuration | | | 2 | N/A | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | N/A | 3 / 0001000000000000 | 3 / 0001000000000000 |
| CodeBookSubsetRestriction bitmap | | | 000001 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | N/A | N/A |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | N/A | N/A |
| PUCCH Report Type for CQI/PMI | | | 2 | N/A | N/A |
| Physical channel for RI reporting | | | PUCCH Format 2 | N/A | N/A |
| PUCCH Report Type for RI | | | 3 | N/A | N/A |
| *cqi-pmi-ConfigurationIndex* | | | 3 | N/A | N/A |
| *ri-ConfigIndex* | | | 805 (Note 5) | N/A | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| NeighCellsInfo -r12 (Note 6) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmission ModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.11 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#2 and #7.

Note 4: All cells are time-synchronous.

| | |
|---|---|
| Note 5: | RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available. |
| Note 6: | NeighCellsInfo-r12 is described in subclause 6.3.2 of TS 36.331 [5]. |

**Table 9.3.8.2.2.3-2: Minimum requirement (TDD)**

| | Test 1 |
|---|---|
| $\gamma$ | 0.925 |
| UE Category | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.8.2.2.

### 9.3.8.2.2.4 Test description

#### 9.3.8.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Table 9.3.8.2.2.-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.8.2.2.4.3.

#### 9.3.8.2.2.4.2 Test procedure

1. Set the cell 1, 2 and 3 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.8.2.2.5-1 as appropriate.
2. SS shall not setup NAICS-AssistanceInfo for the next test step.
3. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\mathrm{NAICS_OFF}}$.
4. SS shall setup NAICS-AssistanceInfo as per TS 36.508 [7] clause 5.2A.6.1.
5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using

PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{NAICS_ON}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.

6. If the ratio ($t_{NAICS_ON}$ / $t_{NAICS_OFF}$) $\geq \gamma$ then pass the UE for this test. Otherwise fail the UE.

7. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

#### 9.3.8.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.8.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo-r10 CHOICE { | | | |
| antennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| } | | | |
| codebookSubsetRestriction-r10 | 00000000000000000000<br>00000000000000000000<br>00000000111111111111<br>1111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.8.2.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.3.8.2.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 805 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.8.2.1.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 2 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.3.8.2.2.5 Test requirement

**Table 9.3.8.2.2.5-1: Test Parameters for Fading test for (TDD)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| Transmission mode | | | 9 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| | Pc | dB | 0 | | |
| | σ | dB | 0 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| SNR | | dB | 8.97 | N/A | N/A |
| $\hat{E}_s / N_{oc}$ | | | N/A | 4.08 | 1.54 |
| $\hat{I}_{or}^{(j)}$ | | dB [mW/15kHz] | -89.03 | -93.92 | -96.46 |
| $N_{oc}$ | | dB [mW/15kHz] | -98 | | |
| Propagation channel | | | EPA5 | EPA5 | EPA5 |
| Correlation and antenna configuration | | | Low 2 x 2 | Low 2 x 2 | Low 2 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna ports 0,1 | Antenna ports 0,1 |
| Beamforming Model | | | As specified in Section B.4.3 | | |
| CSI reference signals | | | Antenna ports 15,16 | N/A | N/A |
| CSI-RS periodicity and subframe offset | | | 5/3 | N/A | N/A |
| CSI-RS reference signal configuration | | | 2 | N/A | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | N/A | 3 / 0001000000000000 | 3 / 0001000000000000 |
| CodeBookSubsetRestriction bitmap | | | 000001 | N/A | N/A |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | N/A | N/A |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | N/A | N/A |
| PUCCH Report Type for CQI/PMI | | | 2 | N/A | N/A |
| Physical channel for RI reporting | | | PUCCH Format 2 | N/A | N/A |
| PUCCH Report Type for RI | | | 3 | N/A | N/A |
| *cqi-pmi-ConfigurationIndex* | | | 3 | N/A | N/A |
| *ri-ConfigIndex* | | | 805 (Note 5) | N/A | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| NeighCellsInfo -r12 (Note 6) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmission ModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.11 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to

| | |
|---|---|
| | allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#2 and #7. |
| Note 4: | All cells are time-synchronous. |
| Note 5: | RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available. |
| Note 6: | NeighCellsInfo-r12 is described in subclause 6.3.2 of TS 36.331 [5]. |

**Table 9.3.8.2.2.5-2: Minimum requirement (TDD)**

| | **Test 1** |
|---|---|
| $\gamma$ | 0.915 |
| UE Category | ≥2 |

## 9.3.8.3 CSI process

### 9.3.8.3.1 FDD CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) TM10 with TM9 interference - Enhanced Receiver Type B

#### 9.3.8.3.1.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality based on the receiver of the enhanced Type B meets a minimum performance. Performance requirements are specified in terms of the relative throughput obtained when the transport format is that indicated by the reported CQI with NeighCellsInfo-r12 configured compared to the case without NeighCellsInfo-r12 configured. Cell 1 is the serving cell, and Cell 2 and Cell 3 are the interference cells.

#### 9.3.8.3.1.2 Test applicability

This test applies to all types of E-UTRA FDD release 12 and forward UE of Category $\geq 2$ that support enhanced performance requirement Type B.

#### 9.3.8.3.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.8.3.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.8.3.1.3-2 and by the following:

a) the ratio of the throughput obtained for the Type B receiver with NAICS assistance information when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources with specified $\hat{E}_s/N_{oc}$ and that obtained for the Type B receiver without NAICS assistance information when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources with the same specified $\hat{E}_s/N_{oc}$ shall be $\geq \gamma$;

**Table 9.3.8.3.1.3-1: Fading test for single antenna (FDD)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| Transmission mode | | | 10 | 9 | 9 |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| | Pc | dB | 0 | | |
| | σ | dB | 0 | | |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| SNR | | dB | 8.34 | N/A | N/A |
| $\hat{E}_s/N_{oc}$ | | dB | N/A | 3.28 | 0.74 |
| $\hat{I}_{or}^{(j)}$ | | dB [mW/15kHz] | -89.66 | -94.72 | -97.26 |
| $N_{oc}$ | | dB[mW/15kHz] | -98 | | |
| Propagation channel | | | EPA5 | EPA5 | EPA5 |
| Correlation and antenna configuration | | | Low 2 x 2 | Low 2 x 2 | Low 2 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna port 0, 1 | Antenna port 0, 1 |
| Beamforming Model | | | As specified in Section B.4.3 | | |
| CSI reference signals | | | Antenna ports 15,16 | N/A | N/A |
| CSI-RS periodicity and subframe offset | | | 5/1 | N/A | N/A |
| CSI-RS reference signal configuration | | | 2 | N/A | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | N/A | 1 / 0001000000000000 | 1 / 0001000000000000 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI process | CSI-RS | | CSI-RS | N/A | N/A |
| | CSI-IM | | CSI-IM | N/A | N/A |
| | Reporting mode | | PUCCH 1-1 | N/A | N/A |
| | CodeBookSubsetRestriction bitmap | | 000001 | N/A | N/A |
| | Reporting periodicity | ms | $N_{pd}$ = 5 | N/A | N/A |
| | CQI delay | ms | 8 | N/A | N/A |
| | Physical channel for CQI/ PMI reporting | | PUSCH (Note 3) | N/A | N/A |
| | PUCCH Report Type for CQI/PMI | | 2 | N/A | N/A |
| | PUCCH channel for RI reporting | | PUCCH Format 2 | N/A | N/A |
| | PUCCH report type for RI | | 3 | N/A | N/A |
| | *cqi-pmi-ConfigurationIndex* | | 2 | N/A | N/A |
| | *ri-ConfigIndex* | | 1 | N/A | N/A |
| CSI-IM periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | N/A | N/A |
| CSI-IM configuration | | | 6 | N/A | N/A |
| CSI process for PDSCH scheduling | | | CSI process | N/A | N/A |
| Quasi-co-located CSI-RS | | | CSI-RS | N/A | N/A |
| Quasi-co-located CRS | | | Same Cell ID as Cell 1 | N/A | N/A |
| Reference measurement channel | | | Note 2 | N/A | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | N/A |
| NeighCellsInfo-r12 (Note 5) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.11 FDD according to Table A.4-1 with one sided dynamic OCNG

| | |
|---|---|
| | Pattern OP.1 FDD as described in Annex A.5.1.1. |
| Note 3: | To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5. |
| Note 4: | All cells are time-synchronous. |
| Note 5: | NeighCellsInfo-r12 is described in subclause 6.3.2 of TS 36.331 [5]. |

**Table 9.3.8.3.1.3-2: Minimum requirement (FDD)**

| | Test 1 |
|---|---|
| $\gamma$ | 0.925 |
| UE Category | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.8.3.1.

### 9.3.8.3.1.4 Test description

#### 9.3.8.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Table 9.3.8.3.1.-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.8.1.1.4.3.

#### 9.3.8.3.1.4.2 Test procedure

1. Set the cell 1, 2 and 3 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.8.3.1.5-1 as appropriate.
2. SS shall not setup NAICS-AssistanceInfo for the next test step.
3. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI, PMI and RI report using PUCCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{NAICS_OFF}}$.
4. SS shall setup NAICS-AssistanceInfo as per TS 36.508 [7] clause 5.2A.6.1.
5. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI, PMI and RI

report using PUCCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{NAICS_ON}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.

6. If the ratio ($t_{\text{NAICS_ON}} / t_{\text{NAICS_OFF}}$) $\geq \gamma$ then pass the UE for this test. Otherwise fail the UE.

7. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

#### 9.3.8.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.8.3.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo-r10 CHOICE { | | | |
| antennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.8.3.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.3.8.3.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 2 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.8.3.1.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 2 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.3.8.3.1.4.3-5: CQI-ReportConfig-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2ABA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| simultaneousAckNackAndCQI-Format3-r11 | Not present | PUCCH Format 2 | |
| cqi-ReportPeriodicProcExtToReleaseList-r11 | Not present | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF SEQUENCE { | 1 entry | | |
| cqi-ReportPeriodicProcExtId-r11[1] SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtId-r11 | 1 | | |
| cqi-pmi-ConfigIndex-r11 | 2 | | |
| ri-ConfigIndex-r11 | 1 | | |
| csi-ConfigIndex-r11 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportBoth-r11 SEQUENCE { | | | |
| csi-IM-ConfigToReleaseList-r11 | Not present | | |
| csi-IM-ConfigToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-IM-r11)) OF SEQUENCE { | 1 entry | | |
| csi-IM-ConfigId-r11[1] | 2 | CSI-IM 1 | |
| resourceConfig-r11[1] | 6 | | |
| subframeConfig-r11[1] | 1 | | |
| } | | | |
| csi-ProcessToReleaseList-r11 | Not present | | |
| csi-ProcessToAddModList-r11SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF SEQUENCE { | 1 entry | | |
| csi-ProcessId-r11[1] | 3 | CSI process 2 | |
| csi-RS-ConfigNZPId-r11[1] | 1 | | |
| csi-IM-ConfigId-r11[1] | 2 | | |
| p-C-AndCBSRList-r11[1] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[1] | 0 | | |
| codebookSubsetRestriction-r11[1] | 0x00001 | | |
| } | | | |
| cqi-ReportBothProc-r11[1] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 3 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[1] | Not present | | |
| cqi-ReportAperiodicProc-r11[1] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

9.3.8.3.1.5 Test requirement

**Table 9.3.8.3.1.5-1: Test Parameters for Fading test for single antenna (FDD)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| Transmission mode | | | 10 | 9 | 9 |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| | Pc | dB | 0 | | |
| | σ | dB | 0 | | |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| SNR | | dB | 8. 97 | N/A | N/A |
| $\hat{E}_s / N_{oc}$ | | dB | N/A | 4.08 | 1.54 |
| $\hat{I}_{or}^{(j)}$ | | dB [mW/15kHz] | -89. 03 | -93. 92 | -96. 46 |
| $N_{oc}$ | | dB[mW/15kHz] | -98 | | |
| Propagation channel | | | EPA5 | EPA5 | EPA5 |
| Correlation and antenna configuration | | | Low 2 x 2 | Low 2 x 2 | Low 2 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna port 0, 1 | Antenna port 0, 1 |
| Beamforming Model | | | As specified in Section B.4.3 | | |
| CSI reference signals | | | Antenna ports 15,16 | N/A | N/A |
| CSI-RS periodicity and subframe offset | | | 5/1 | N/A | N/A |
| CSI-RS reference signal configuration | | | 2 | N/A | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | N/A | 1 / 0001000000000000 | 1 / 0001000000000000 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI process | CSI-RS | | CSI-RS | N/A | N/A |
| | CSI-IM | | CSI-IM | N/A | N/A |
| | Reporting mode | | PUCCH 1-1 | N/A | N/A |
| | CodeBookSubsetRestriction bitmap | | 000001 | N/A | N/A |
| | Reporting periodicity | ms | $N_{pd}$ = 5 | N/A | N/A |
| | CQI delay | ms | 8 | N/A | N/A |
| | Physical channel for CQI/ PMI reporting | | PUSCH (Note 3) | N/A | N/A |
| | PUCCH Report Type for CQI/PMI | | 2 | N/A | N/A |
| | PUCCH channel for RI reporting | | PUCCH Format 2 | N/A | N/A |
| | PUCCH report type for RI | | 3 | N/A | N/A |
| | *cqi-pmi-ConfigurationIndex* | | 2 | N/A | N/A |
| | *ri-ConfigIndex* | | 1 | N/A | N/A |
| CSI-IM periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | N/A | N/A |
| CSI-IM configuration | | | 6 | N/A | N/A |
| CSI process for PDSCH scheduling | | | CSI process | N/A | N/A |
| Quasi-co-located CSI-RS | | | CSI-RS | N/A | N/A |
| Quasi-co-located CRS | | | Same Cell ID as Cell 1 | N/A | N/A |
| Reference measurement channel | | | Note 2 | N/A | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | N/A |
| NeighCellsInfo-r12 (Note 5) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |
| Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at | | | | | |

| | |
|---|---|
| | a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4) |
| Note 2: | Reference measurement channel RC.11 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1. |
| Note 3: | To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5. |
| Note 4: | All cells are time-synchronous. |
| Note 5: | NeighCellsInfo-r12 is described in subclause 6.3.2 of TS36.331 [5]. |

**Table 9.3.8.3.1.5-2: Test requirement (FDD)**

| | Test |
|---|---|
| $\gamma$ | 0.915 |
| UE Category | ≥2 |

## 9.3.8.3.2 TDD CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) TM10 with TM9 interference - Enhanced Receiver Type B

### 9.3.8.3.2.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality based on the receiver of the enhanced Type B meets a minimum performance. Performance requirements are specified in terms of the relative throughput obtained when the transport format is that indicated by the reported CQI with NeighCellsInfo-r12 configured compared to the case without NeighCellsInfo-r12 configured. Cell 1 is the serving cell, and Cell 2 and Cell 3 are the interference cells.

### 9.3.8.3.2.2 Test applicability

This test applies to all types of E-UTRA TDD release 12 and forward UE of Category ≥ 2 that support enhanced performance requirement Type B.

### 9.3.8.3.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.8.3.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.8.3.2.3-2 and by the following:

a) the ratio of the throughput obtained for the Type B receiver with NAICS assistance information when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources with specified $\hat{E}_s/N_{oc}$ and that obtained for the Type B receiver without NAICS assistance information when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources with the same specified $\hat{E}_s/N_{oc}$ shall be $\geq \gamma$;

**Table 9.3.8.3.2.3-1: Fading test for single antenna (TDD)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| Transmission mode | | | 10 | 9 | 9 |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| | Pc | dB | 0 | | |
| | σ | dB | 0 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| SNR | | dB | 8.34 | N/A | N/A |
| $\hat{E}_s/N_{oc}$ | | dB | N/A | 3.28 | 0.74 |
| $\hat{I}_{or}^{(j)}$ | | dB [mW/15kHz] | -89.66 | -94.72 | -97.26 |
| $N_{oc}$ | | dB[mW/15kHz] | -98 | | |
| Propagation channel | | | EPA5 | EPA5 | EPA5 |
| Correlation and antenna configuration | | | Low 2 x 2 | Low 2 x 2 | Low 2 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna port 0,1 | Antenna port 0,1 |
| Beamforming Model | | | As specified in Section B.4.3 | | |
| CSI reference signals | | | Antenna ports 15,16 | N/A | N/A |
| CSI-RS periodicity and subframe offset | | | 5/3 | N/A | N/A |
| CSI-RS reference signal configuration | | | 2 | N/A | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | N/A | 3 / 0001000000000000 | 3 / 0001000000000000 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI process | CSI-RS | | CSI-RS | N/A | N/A |
| | CSI-IM | | CSI-IM | N/A | N/A |
| | Reporting mode | | PUCCH 1-1 | N/A | N/A |
| | CodeBookSubsetRestriction bitmap | | 000001 | N/A | N/A |
| | Reporting periodicity | ms | $N_{pd}$ = 5 | N/A | N/A |
| | CQI delay | ms | 8 | N/A | N/A |
| | Physical channel for CQI/ PMI reporting | | PUSCH (Note 3) | N/A | N/A |
| | PUCCH Report Type for CQI/PMI | | 2 | N/A | N/A |
| | PUCCH channel for RI reporting | | PUCCH Format 2 | N/A | N/A |
| | PUCCH report type for RI | | 3 | N/A | N/A |
| | *cqi-pmi-ConfigurationIndex* | | 3 | N/A | N/A |
| | *ri-ConfigIndex* | | 805 (Note 5) | N/A | N/A |
| CSI-IM periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | N/A | N/A |
| CSI-IM configuration | | | 6 | N/A | N/A |
| CSI process for PDSCH scheduling | | | CSI process | N/A | N/A |
| Quasi-co-located CSI-RS | | | CSI-RS | N/A | N/A |
| Quasi-co-located CRS | | | Same Cell ID as Cell 1 | N/A | N/A |
| Reference measurement channel | | | Note 2 | N/A | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| NeighCellsInfo-r12 (Note 6) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |
| Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink | | | | | |

| | |
|---|---|
| | before SF#(n+4) |
| Note 2: | Reference measurement channel RC.11 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. |
| Note 3: | To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5. |
| Note 4: | All cells are time-synchronous. |
| Note 5: | RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available. |
| Note 6: | NeighCellsInfo-r12 is described in subclause 6.3.2 of TS 36.331 [5]. |

**Table 9.3.8.3.2.3-2: Minimum requirement (TDD)**

| | Test 1 |
|---|---|
| $\gamma$ | 0.925 |
| UE Category | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.3.8.3.2.

### 9.3.8.3.2.4 Test description

#### 9.3.8.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48.
2. The parameter settings for the cell 1 are set up according to Table 9.3.8.3.2.-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.8.3.2.4.3.

#### 9.3.8.3.2.4.2 Test procedure

1. Set the cell 1, 2 and 3 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.8.3.2.5-1 as appropriate.
2. SS shall not setup NAICS-AssistanceInfo for the next test step.
3. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\mathrm{NAICS_OFF}}$.
4. SS shall setup NAICS-AssistanceInfo as per TS 36.508 [7] clause 5.2A.6.1.

5. The SS shall transmit PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{NAICS_ON}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.

6. If the ratio ($t_{\text{NAICS_ON}} / t_{\text{NAICS_OFF}}$) $\geq \gamma$ then pass the UE for this test. Otherwise fail the UE.

7. The SS shall release all NAICS configuration in the UE using procedure in TS 36.508 [7] clause 5.2A.6.1 with the condition NAICS_RELEASE.

#### 9.3.8.3.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.3.8.3.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo-r10 CHOICE { | | | |
| antennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | Tm10-v1120 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.8.3.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.3.8.3.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 805 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.3.8.3.2.4.3-4: *CSI-RS-Config-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 2 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 dB | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.3.8.3.2.4.3-5: CQI-ReportConfig-v1130-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3, Table 4.6.3-2ABA | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| simultaneousAckNackAndCQI-Format3-r11 | Not present | PUCCH Format 2 | |
| cqi-ReportPeriodicProcExtToReleaseList-r11 | Not present | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF SEQUENCE { | 1 entry | | |
| cqi-ReportPeriodicProcExtId-r11[1] SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtId-r11 | 1 | | |
| cqi-pmi-ConfigIndex-r11 | 3 | | |
| ri-ConfigIndex-r11 | 805 | | |
| csi-ConfigIndex-r11 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportBoth-r11 SEQUENCE { | | | |
| csi-IM-ConfigToReleaseList-r11 | Not present | | |
| csi-IM-ConfigToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-IM-r11)) OF SEQUENCE { | 1 entry | | |
| csi-IM-ConfigId-r11[1] | 2 | CSI-IM 1 | |
| resourceConfig-r11[1] | 6 | | |
| subframeConfig-r11[1] | 3 | | |
| } | | | |
| csi-ProcessToReleaseList-r11 | Not present | | |
| csi-ProcessToAddModList-r11SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF SEQUENCE { | 1 entry | | |
| csi-ProcessId-r11[1] | 3 | CSI process 2 | |
| csi-RS-ConfigNZPId-r11[1] | 1 | | |
| csi-IM-ConfigId-r11[1] | 2 | | |
| p-C-AndCBSRList-r11[1] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[1] | 0 | | |
| codebookSubsetRestriction-r11[1] | 0x000001 | | |
| } | | | |
| cqi-ReportBothProc-r11[1] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 3 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11[1] | Not present | | |
| cqi-ReportAperiodicProc-r11[1] SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r11 | rm31 | | |
| trigger01-r11 | 1 | | |
| trigger10-r11 | 1 | | |
| trigger11-r11 | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

9.3.8.3.2.5 Test requirement

**Table 9.3.8.3.2.5-1: Test Parameters for Fading test for single antenna (TDD)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| Transmission mode | | | 10 | 9 | 9 |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| | Pc | dB | 0 | | |
| | σ | dB | 0 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Cyclic Prefix | | | Normal | Normal | Normal |
| Cell ID | | | 0 | 1 | 6 |
| SNR | | dB | 8.97 | N/A | N/A |
| $\hat{E}_s/N_{oc}$ | | dB | N/A | 4.08 | 1.54 |
| $\hat{I}_{or}^{(j)}$ | | dB [mW/15kHz] | -89.03 | -93.92 | -96.46 |
| $N_{oc}$ | | dB[mW/15kHz] | -98 | | |
| Propagation channel | | | EPA5 | EPA5 | EPA5 |
| Correlation and antenna configuration | | | Low 2 x 2 | Low 2 x 2 | Low 2 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 | Antenna port 0,1 | Antenna port 0,1 |
| Beamforming Model | | | As specified in Section B.4.3 | | |
| CSI reference signals | | | Antenna ports 15,16 | N/A | N/A |
| CSI-RS periodicity and subframe offset | | | 5/3 | N/A | N/A |
| CSI-RS reference signal configuration | | | 2 | N/A | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | Subframes / bitmap | N/A | 3 / 0001000000000000 | 3 / 0001000000000000 |
| Interference model | | | N/A | As specified in clause B.6.4 | As specified in clause B.6.4 |
| CSI process | CSI-RS | | CSI-RS | N/A | N/A |
| | CSI-IM | | CSI-IM | N/A | N/A |
| | Reporting mode | | PUCCH 1-1 | N/A | N/A |
| | CodeBookSubsetRestriction bitmap | | 000001 | N/A | N/A |
| | Reporting periodicity | ms | $N_{pd}$ = 5 | N/A | N/A |
| | CQI delay | ms | 8 | N/A | N/A |
| | Physical channel for CQI/ PMI reporting | | PUSCH (Note 3) | N/A | N/A |
| | PUCCH Report Type for CQI/PMI | | 2 | N/A | N/A |
| | PUCCH channel for RI reporting | | PUCCH Format 2 | N/A | N/A |
| | PUCCH report type for RI | | 3 | N/A | N/A |
| | *cqi-pmi-ConfigurationIndex* | | 3 | N/A | N/A |
| | *ri-ConfigIndex* | | 805 (Note 5) | N/A | N/A |
| CSI-IM periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | N/A | N/A |
| CSI-IM configuration | | | 6 | N/A | N/A |
| CSI process for PDSCH scheduling | | | CSI process | N/A | N/A |
| Quasi-co-located CSI-RS | | | CSI-RS | N/A | N/A |
| Quasi-co-located CRS | | | Same Cell ID as Cell 1 | N/A | N/A |
| Reference measurement channel | | | Note 2 | N/A | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| NeighCellsInfo-r12 (Note 6) | p-aList-r12 | | N/A | {dB-6, dB-3, dB0} | {dB-6, dB-3, dB0} |
| | transmissionModeList-r12 | | N/A | {2,3,4,8,9} | {2,3,4,8,9} |

| | |
|---|---|
| Note 1: | If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4) |
| Note 2: | Reference measurement channel RC.11 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. |
| Note 3: | To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5. |
| Note 4: | All cells are time-synchronous. |
| Note 5: | RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available. |
| Note 6: | NeighCellsInfo-r12 is described in subclause 6.3.2 of TS 36.331 [5]. |

**Table 9.3.8.3.2-2: Minimum requirement (TDD)**

| | Test 1 |
|---|---|
| $\gamma$ | 0.915 |
| UE Category | ≥2 |

# 9.4 Reporting of Precoding Matrix Indicator (PMI)

The minimum performance requirements of PMI reporting are defined based on the precoding gain, expressed as the relative increase in throughput when the transmitter is configured according to the UE reports compared to the case when the transmitter is using random precoding. When the transmitter uses random precoding, for each PDSCH allocation a precoder is randomly generated and applied to the PDSCH. A fixed transport format (FRC) configured for all requirements.

The requirements for transmission mode 6 and transmission mode 9 with 4 TX are specified in terms of the ratio

$$\gamma = \frac{t_{ue}}{t_{rnd}}$$

In the definition of $\gamma$, for PUSCH 3-1 single PMI and PUSCH 1-2 multiple PMI requirements, $t_{rnd}$ is 60% of the maximum throughput obtained at $SNR_{rnd}$ using random precoding, and $t_{ue}$ the throughput measured at $SNR_{rnd}$ with precoders configured according to the UE reports.

For the PUCCH 2-1 single PMI requirement, $t_{rnd}$ is 60% of the maximum throughput obtained at $SNR_{rnd}$ using random precoding on a randomly selected full-size subband in set S subbands, and $t_{ue}$ the throughput measured at $SNR_{rnd}$ with both the precoder and the preferred full-size subband applied according to the UE reports;

For PUSCH 2-2 multiple PMI requirements, $t_{rnd}$ is 60% of the maximum throughput obtained at $SNR_{rnd}$ using random precoding on a randomly selected full-size subband in set S subbands, and $t_{ue}$ the throughput measured at $SNR_{rnd}$ with both the subband precoder and a randomly selected full-size subband (within the preferred subbands) applied according to the UE reports.

The requirements for transmission mode 9 with 8 TX and transmission mode 9 with 4TX enhanced codebook are specified in terms of the ratio

$$\gamma = \frac{t_{ue,\,follow1,\,follow2}}{t_{rnd1,\,rnd2}}$$

In the definition of γ, for PUSCH 3-1 single PMI and PUSCH 1-2 multiple PMI requirements, $t_{follow1,\,follow2}$ is 70% of the maximum throughput obtained at $SNR_{follow1,\,follow2}$ using the precoders configured according to the UE reports, and $t_{rnd1,\,rnd2}$ is the throughput measured at $SNR_{follow1,\,follow2}$ with random precoding.

The requirements for transmission mode 9 with 12 TX, 16 TX, 24TX and 32 TX Class A codebook are specified in terms of the ratio

$$\gamma = \frac{t_{ue,\,follow1,1,\,follow1,2,\,follow2}}{t_{rnd1,1,\,rnd1,2,rnd2}}$$

In the definition of $\gamma$, for PUSCH 3-1 single PMI and PUSCH 1-2 multiple PMI requirements, $t_{ue,\,follow1,1,\,follow1,2,\,follow2}$ is 90% of the maximum throughput obtained at $SNR_{follow1,1,\,follow1,2,follow2}$ using the precoders configured according to the UE reports, and $t_{rnd1,1,\,rnd1,2,rnd2}$ is the throughput measured at $SNR_{follow1,1,\,follow1,2,follow2}$ with random precoding.

## 9.4.1 Single PMI

### 9.4.1.1 PMI Reporting – PUSCH 3-1 (Single PMI) (Cell-Specific Reference Symbols)

#### 9.4.1.1.1 FDD PMI Reporting – PUSCH 3-1 (Single PMI)

##### 9.4.1.1.1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

##### 9.4.1.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

Note: This test also applies to UE supporting 4Rx antenna ports

##### 9.4.1.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.1.1.1.3-2.

**Table 9.4.1.1.1.3-1: PMI test for single-layer (FDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 6 |
| Propagation channel | | | EVA5 |
| Precoding granularity | | PRB | 50 |
| Correlation and antenna configuration | | | Low 2 x 2 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | $\sigma$ | dB | 0 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH 3-1 |
| Reporting interval | | ms | 1 |
| PMI delay (Note 2) | | ms | 8 |
| Measurement channel | | | R.10 FDD |
| OCNG Pattern | | | OP.1 FDD |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |
| Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity)<br>Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). | | | |

**Table 9.4.1.1.1.3-2: Minimum requirement (FDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.1 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.1.1.

### 9.4.1.1.1.4 Test description

#### 9.4.1.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.for UE with 2Rx RF band and Annex A, Figure A.10a for 4Rx capable UE without any 2Rx RF bands
2. The parameter settings for the cell are set up according to Table 9.4.1.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.1.1.1.4.3.

#### 9.4.1.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.1.1.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC.SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{rnd}$ and $SNR_{rnd}$ according to annex G.5.2

3. Set SNR to $SNR_{rnd}$ . The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4 every subframe. Measure $t_{ue}$ according to Annex G.5.3

4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$ If the ratio (throughput / $t_{rnd}$ ) ≥ γ which is specified in table 9.4.1.1.1.5-1, then the test is pass. Otherwise, the test is fail.

#### 9.4.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.1.1.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| explicitValue | AntennaInfoDedicated | | |
| } | | | |
| } | | | |

**Table 9.4.1.1.1.4.3-2: *AntennaInfoDedicated***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE{ | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |

**Table 9.4.1.1.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

9.4.1.1.1.5 Test requirement

**Table 9.4.1.1.1.5-1: Test requirement (FDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.09 |

The ratio of throughput using precoding matrix of PMI reports from the UE to using random precoding matrix shall equal or exceed the value specified in table 9.4.1.1.1.5.

## 9.4.1.1.2 TDD PMI Reporting – PUSCH 3-1 (Single PMI)

### 9.4.1.1.2.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

### 9.4.1.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.4.1.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.4.1.1.2.3-2.

**Table 9.4.1.1.2.3-1: PMI test for single-layer (TDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 6 |
| Uplink downlink configuration | | | 1 |
| Special subframe configuration | | | 4 |
| Propagation channel | | | EVA5 |
| Precoding granularity | | PRB | 50 |
| Correlation and antenna configuration | | | Low 2 x 2 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH 3-1 |
| Reporting interval | | ms | 1 |
| Minimum PMIdelay (Node-2) | | ms | 10 or 11 |
| Measurement channel | | | R.10 TDD |
| OCNG Pattern | | | OP.1 TDD |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |
| ACK/NACK feedback mode | | | Multiplexing |

Note 1: For random precoder selection, the precoder shall be updated in each available downlink transmission instance

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)

**Table 9.4.1.1.2.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 |
|---|---|
| γ | 1.1 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.1.2.

### 9.4.1.1.2.4 Test description

#### 9.4.1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 for UE with 2Rx RF band and Annex A, Figure A.10a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.1.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2.Message contents are defined in clause 9.4.1.1.2.4.3.

#### 9.4.1.1.2.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.1.1.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{rnd}$ and $SNR_{rnd}$ according to annex G.5.2.
3. Set SNR to $SNR_{rnd}$ . The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure $t_{ue}$ according to Annex G.5.3
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$

#### 9.4.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.1.1.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| explicitValue | AntennaInfoDedicated | | |
| } | | | |
| } | | | |

**Table 9.4.1.1.2.4.3-2: *AntennaInfoDedicated***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE{ | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |

**Table 9.4.1.1.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

9.4.1.1.2.5 Test requirement

**Table 9.4.1.1.2.5-1: Test requirement (TDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.09 |

## 9.4.1.2 PMI Reporting – PUCCH 2-1 (Single PMI) (Cell-Specific Reference Symbols)

### 9.4.1.2.1 FDD PMI Reporting – PUCCH 2-1 (Single PMI)

#### 9.4.1.2.1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

#### 9.4.1.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward. Applicability requires support for FGI bit 2.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.4.1.2.1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.2.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.1.2.1.3-2.

**Table 9.4.1.2.1.3-1: PMI test for single-layer (FDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 6 |
| Propagation channel | | | EVA5 |
| Correlation and antenna configuration | | | Low 4 x 2 |
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 |
| | σ | dB | 3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| PMI delay | | ms | 8 or 9 |
| Reporting mode | | | PUCCH 2-1 (Note 6) |
| Reporting periodicity | | ms | $N_P$ = 2 |
| Physical channel for CQI reporting | | | PUSCH (Note 3) |
| PUCCH Report Type for wideband CQI/PMI | | | 2 |
| PUCCH Report Type for subband CQI | | | 1 |
| Measurement channel | | | R.14-1 FDD |
| OCNG Pattern | | | OP.1/2 FDD |
| Precoding granularity | | PRB | 6 (full size) |
| Number of bandwidth parts (*J*) | | | 3 |
| K | | | 1 |
| *cqi-pmi-ConfigIndex* | | | 1 |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |

Note 1: For random precoder selection, the precoder shall be updated every two TTI (2 ms granularity)

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: To avoid collisions between HARQ-ACK and wideband CQI/PMI or subband CQI, it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

Note 4: Reports for the short subband (having 2RBs in the last bandwidth part) are to be disregarded and instead data is to be transmitted on the most recently used subband for bandwidth part with j=1.

Note 5: In the case where wideband PMI is reported, data is to be transmitted on the most recently used subband.

Note 6: The bit field for PMI confirmation in DCI format 1B shall be mapped to “0” and TPMI information shall indicate the codebook index used in Table 6.3.4.2.3-2 of TS 36.211 [4] according to the latest PMI report on PUCCH.

**Table 9.4.1.2.1.3-2: Minimum requirement (FDD)**

| | Test 1 |
|---|---|
| $\gamma$ | 1.2 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.2.1.

#### 9.4.1.2.1.4 Test description

##### 9.4.1.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11 for UE with 2Rx RF band and Annex A, Figure A.11a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.1.2.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.1.2.1.4.3.

##### 9.4.1.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.1.2.1.3-1 as appropriate.
2. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-1 FDD) on a randomly selected full-size subband with a randomly selected precoding matrix from the codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]), regardless of the SB and PMI reports from the UE. Note that each full-size subband and each precoding matrix shall be selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. The SS shall transmit PDCCH DCI format 0 in downlink SF#1, #3, #7 and #9 to schedule UL RMC in uplink subframes #5, #7, #1 and #3 (Table A.4.1-1). The UE will send ACK/NACK and periodic CSI reports using PUSCH.
   Establish $t_{rnd}$ and $SNR_{rnd}$ according to annex G.5.2.
3. Set SNR to $SNR_{rnd}$ . The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-1 FDD) on the full-size subband and with the latest precoding matrix reported by the UE. When the UE reports a non-full-size subband, the SS schedules the recent reported subband for bandwidth part with j=1 with the latest reported precoding matrix. Note that the SS shall send PDSCH in the same full-size subband and with the latest reported precoding matrix until next UE subband report is available. The SS sends downlink MAC padding bits on the DL RMC.
   The SS shall transmit PDCCH DCI format 0 in downlink SF#1, #3, #7 and #9 to schedule UL RMC in uplink subframes #5, #7, #1 and #3 (Table A.4.1-1). The UE will send ACK/NACK and periodic CSI reports using PUSCH. Measure $t_{ue}$ according to Annex G.5.3.
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$ If the ratio (throughput / $t_{rnd}$ ) $\geq \gamma$ which is specified in table 9.4.1.2.2.5-1, then the test is pass. Otherwise, the test is fail.

##### 9.4.1.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.1.2.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| explicitValue | AntennaInfoDedicated | | |
| } | | | |
| } | | | |

**Table 9.4.1.2.1.4.3-2: *AntennaInfoDedicated***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE{ | | | |
| n4TxAntenna-tm6 | 1111111111111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.1.2.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 1 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| subbandCQI | 1 | | |
| } | | | |
| ri-ConfigIndex | 483 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

9.4.1.2.1.5 Test requirement

**Table 9.4.1.2.1.5-1: Test requirement (FDD)**

| | **Test 1** |
|---|---|
| γ | 1.19 |
| UE Category | ≥1 |

The ratio of throughput using precoding matrix of PMI reports from the UE to using random precoding matrix shall equal or exceed the value specified in table 9.4.1.2.1.5.

#### 9.4.1.2.2 TDD PMI Reporting – PUCCH 2-1 (Single PMI)

##### 9.4.1.2.2.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

##### 9.4.1.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward. Applicability requires support for FGI bit 2.

Note: This test also applies to UE supporting 4Rx antenna ports

##### 9.4.1.2.2.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.2.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.4.1.2.2.3-2.

**Table 9.4.1.2.2.3-1: PMI test for single-layer (TDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 6 |
| Uplink downlink configuration | | | 1 |
| Special subframe configuration | | | 4 |
| Propagation channel | | | EVA5 |
| Correlation and antenna configuration | | | Low 4 x 2 |
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 |
| | σ | dB | 3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| PMI delay | | ms | 10 |
| Reporting mode | | | PUCCH 2-1 (Note 6) |
| Reporting periodicity | | ms | $N_P$ = 5 |
| Physical channel for CQI reporting | | | PUSCH (Note 3) |
| PUCCH Report Type for wideband CQI/PMI | | | 2 |
| PUCCH Report Type for subband CQI | | | 1 |
| Measurement channel | | | R.14-1 TDD |
| OCNG Pattern | | | OP.1/2 TDD |
| Precoding granularity | | PRB | 6 (full size) |
| Number of bandwidth parts (*J*) | | | 3 |
| K | | | 1 |
| *cqi-pmi-ConfigIndex* | | | 4 |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |
| ACK/NACK feedback mode | | | Multiplexing |

Note 1: For random precoder selection, the precoder shall be updated in each available downlink transmission instance

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)

Note 3: To avoid collisions between HARQ-ACK and wideband CQI/PMI or subband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

Note 4: Reports for the short subband (having 2RBs in the last bandwidth part) are to be disregarded and instead data is to be transmitted on the most recently used subband for bandwidth part with j=1.

Note 5: In the case where wideband PMI is reported, data is to be transmitted on the most recently used subband.

Note 6: The bit field for PMI confirmation in DCI format 1B shall be mapped to “0” and TPMI information shall indicate the codebook index used in Table 6.3.4.2.3-2 of TS 36.211 [4] according to the latest PMI report on PUCCH.

**Table 9.4.1.2.2.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 |
|---|---|
| γ | 1.2 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.2.2.

### 9.4.1.2.2.4 Test description

#### 9.4.1.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11 for UE with 2Rx RF band and Annex A, Figure A.11a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.1.2.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2.Message contents are defined in clause 9.4.1.2.2.4.3.

#### 9.4.1.2.2.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.1.2.2.3-1 as appropriate.
2. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-1 TDD) on a randomly selected full-size subband with a randomly selected precoding matrix from the codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]), regardless of the SB and PMI reports from the UE. Note that each full-size subband and each precoding matrix shall be selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC.
   The SS shall transmit PDCCH DCI format 0 in downlink SF#4 and #9 to schedule UL RMC in uplink subframes #8 and #3 (Table A.4.1-2). The UE will send ACK/NACK and periodic CSI reports using PUSCH.
   Establish $t_{rnd}$ and $SNR_{rnd}$ according to annex G.5.2.
3. Set SNR to $SNR_{rnd}$ . The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-1 TDD) on the full-size subband and with the latest precoding matrix reported by the UE. When the UE reports a non-full-size subband, the SS schedules the recent reported subband for bandwidth part with j=1 with the latest reported precoding matrix. Note that the SS shall send PDSCH in the same full-size subband and with the latest reported precoding matrix until next UE subband report is available. The SS sends downlink MAC padding bits on the DL RMC.
   The SS shall transmit PDCCH DCI format 0 in downlink SF#4 and #9 to schedule UL RMC in uplink subframes #8 and #3 (Table A.4.1-2). The UE will send ACK/NACK and periodic CSI reports using PUSCH.
   Measure $t_{ue}$ according to Annex G.5.3.
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$ If the ratio (throughput / $t_{rnd}$ ) $\geq \gamma$ which is specified in table 9.4.1.2.2.5-1, then the test is pass. Otherwise, the test is fail.

#### 9.4.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.1.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| explicitValue | AntennaInfoDedicated | | |
| } | | | |
| } | | | |

**Table 9.4.1.2.2.4.3-2: *AntennaInfoDedicated***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE{ | | | |
| n4TxAntenna-tm6 | 1111111111111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.1.2.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 4 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| subbandCQI | 1 | | |
| } | | | |
| ri-ConfigIndex | 484 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

9.4.1.2.2.5 Test requirement

**Table 9.4.1.2.2.5-1: Test requirement (TDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.19 |
| UE Category | ≥1 |

## 9.4.1.3 PMI Reporting – PUSCH 3-1 (Single PMI) (CSI Reference Symbols)

### 9.4.1.3.1

### 9.4.1.3.1_D FDD Reporting of PMI – PUSCH 3-1 (Single PMI) for eDL MIMO

#### 9.4.1.3.1_D.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

#### 9.4.1.3.1_D.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward. Applicability requires support for FGI bit 103.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.4.1.3.1_D.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.3.1_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.3.1_D.3-2.

**Table 9.4.1.3.1_D.3-1: PMI test for single-layer (FDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 9 |
| Propagation channel | | | EPA5 |
| Precoding granularity | | PRB | 50 |
| Correlation and antenna configuration | | | Low<br>ULA 4 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 |
| Beamforming model | | | Annex B.4.3 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/ 1 |
| CSI-RS reference signal configuration | | | 6 |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 FFFF |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | Pc | dB | -3 |
| | σ | dB | -3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH 3-1 |
| Reporting interval | | ms | 5 |
| PMI delay (Note 2) | | ms | 8 |
| Measurement channel | | | R.44 FDD |
| OCNG Pattern | | | OP.1 FDD |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |

Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity).

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: PDSCH _RA= 0 dB, PDSCH_RB= 0 dB in order to have the same PDSCH and OCNG power per subcarrier at the receiver.

**Table 9.4.1.3.1_D.3-2: Minimum requirement (FDD)**

| Parameter | Test 1 |
|---|---|
| γ | 1.2 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.3.1.

## 9.4.1.3.1_D.4 Test description

### 9.4.1.3.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11 for UE with 2Rx RF band and Annex A, Figure A.11a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.1.3.1_D.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.1.3.1_D.4.3.

### 9.4.1.3.1_D.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.1.3.1_D.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC.SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{rnd}$ and $SNR_{rnd}$ according to annex G.5.2
3. Set SNR to $SNR_{rnd}$ . The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4 in subframe #0, #5. Measure $t_{ue}$ according to Annex G.5.3
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$ If the ratio (throughput / $t_{rnd}$ ) $\geq \gamma$ which is specified in table 9.4.1.3.1_D.5-1, then the test is pass. Otherwise, the test is fail.

### 9.4.1.3.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.1.3.1_D.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | *CQI-ReportConfig-r10-DEFAULT* | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 9.4.1.3.1_D.4.3-2: *Void***

**Table 9.4.1.3.1_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0000 FFFF | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.1.3.1_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic –r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.4.1.3.1_D.4.3-5: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 6 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_C$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.4.1.3.1_D.5 Test requirement

**Table 9.4.1.3.1_D.5-1: Test requirement (FDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.19 |

The ratio of throughput using precoding matrix of PMI reports from the UE to using random precoding matrix shall equal or exceed the value specified in table 9.4.1.1.1_D.5.

## 9.4.1.3.2_D TDD Reporting of PMI – PUSCH 3-1 (Single PMI) for eDL-MIMO

### 9.4.1.3.2_D.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

### 9.4.1.3.2_D.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit 104.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.4.1.3.2_D.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.3.2_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.3.2_D.3-2.

**Table 9.4.1.3.2_D.3-1: PMI test for single-layer (TDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 9 |
| Uplink downlink configuration | | | 1 |
| Special subframe configuration | | | 4 |
| Propagation channel | | | EVA5 |
| Precoding granularity | | PRB | 50 |
| Antenna configuration | | | 8 x 2 |
| Correlation modelling | | | High, Cross polarized |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,22 |
| Beamforming model | | | Annex B.4.3 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/ 4 |
| CSI-RS reference signal configuration | | | 0 |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 001F FFE0 0000 0000 FFFF |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | Pc | dB | -6 |
| | σ | dB | -3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH 3-1 |
| Reporting interval | | ms | 5 |
| PMI delay (Note 2) | | ms | 10 |
| Measurement channel | | | R.45-1 TDD for UE Category 1, R.45 TDD for UE Category 2-8 |
| OCNG Pattern | | | OP.1 TDD |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |
| ACK/NACK feedback mode | | | Multiplexing |

Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity).

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#3 and #8.

Note 4: Randomization of the principle beam direction shall be used as specified in B.2.3A.4

**Table 9.4.1.3.2_D.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 |
|---|---|
| γ | 3 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.3.2.

### 9.4.1.3.2_D.4 Test description

#### 9.4.1.3.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure 47 for UE with 2Rx RF band and Annex A, Figure A.47a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.1.3.2_D.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.1.3.2_D.4.3.

#### 9.4.1.3.2_D.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.1.3.2_D.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{ue,\,follow1,\,follow2}$ and $SNR_{follow1,\,follow2}$ according to annex G.5.2.
3. Set SNR to $SNR_{follow1,\,follow2}$. The SS shall transmit PDSCH with randomly selected precoding matrix from codebook (Table 7.2.4-1 in TS 36.213 [10]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure $t_{rnd1,\,rnd2}$ according to Annex G.5.3
4. Calculate $\gamma = \frac{t_{ue,\,follow1,\,follow2}}{t_{rnd1,\,rnd2}}$ If the ratio (throughput / $t_{rnd1,\,rnd2}$ ) ≥ γ which is specified in table 9.4.1.3.2_D.5-1, then the test is pass. Otherwise, the test is fail.

9.4.1.3.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.1.3.2_D.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | *CQI-ReportConfig-r10-DEFAULT* | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 9.4.1.3.2_D.4.3-2: *Void***

**Table 9.4.1.3.2_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 001F FFE0 0000 0000 FFFF | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.1.3.2_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic –r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.4.1.3.2_D.4.3-5: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.4.1.3.2_D.4.3-6: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | Multiplexing is selected as default to align with RAN4's assumptions in RF tests. | TDD |
| } | | | |

**Table 9.4.1.3.2_D.4.3-7: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an8 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -6 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.4.1.3.2_D.5 Test requirement

**Table 9.4.1.3.2_D.5-1: Test requirement (TDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 2.99 |

The ratio of throughput using precoding matrix of PMI reports from the UE to using random precoding matrix shall equal or exceed the value specified in table 9.4.1.3.2_D.5.

#### 9.4.1.3.3 FDD PMI Reporting with 12Tx Class A codebook – PUSCH 3-1 (Single PMI) for FD-MIMO

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- Connection diagram is undefined

##### 9.4.1.3.3.1 Test purpose

To verify reporting accuracy of the Precoding Matrix Indicator (PMI) reporting with non-precoded CSI-RS for FD-MIMO.

##### 9.4.1.3.3.2 Test applicability

This test applies to all types of E-UTRA FDD UE releases 13 and forward of Category 2 or higher.

Note: This test also applies to UE supporting 4Rx antenna ports

##### 9.4.1.3.3.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.3.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.3.3-2.

**Table 9.4.1.3.3-1: PMI test for single-layer (FDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 9 |
| Propagation channel | | | EPA5 |
| Precoding granularity | | PRB | 50 |
| Correlation and antenna configuration | | | High 2D XP 12(2,3,2) x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,26 |
| Beamforming model | | | Annex B.4.3 |
| CDM Type | | | CDM2 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/ 1 |
| NZP-CSI-RS-Configuration-List | | | {0,1,2} |
| eMIMO-Type | | | Class A |
| codebookConfig-N1 | | | 2 |
| codebookConfig-N2 | | | 3 |
| codebook-Over-Sampling-RateConfig-O1 | | | 8 |
| codebook-Over-Sampling-RateConfig-O2 | | | 4 |
| Codebook-Config | | | Note 5 |
| codebookSubsetRestriction-1 | | | 0x01 FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF |
| codebookSubsetRestriction-2 | | | Codebook-Config 1: 0000 0000 1111 Codebook-Config 2,3,4: 0x 00 000000 0000 FFFF |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | Pc | dB | -8 |
| | σ | dB | -3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH 3-1 |
| Reporting interval | | ms | 5 |
| PMI delay (Note 2) | | ms | 8 |
| Measurement channel | | | R.77 FDD |
| Rank Number of PDSCH | | | 1 |
| OCNG Pattern | | | OP.1 FDD |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |

Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity).
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: PDSCH _RA= 0 dB, PDSCH_RB= 0 dB in order to have the same PDSCH and OCNG power per subcarrier at the receiver.
Note 4: Randomization of the principle beam direction shall be used as specified in B.2.3B.4.
Note 5: Value of parameter codebookConfig shall be random selected one value from UE supported codebook configurations.

**Table 9.4.1.3.3-2: Minimum requirement (FDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 2.5 |
| UE Category | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.3.3.

### 9.4.1.3.3.4 Test description

#### 9.4.1.3.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure TBD for UE with 2Rx RF band and Annex A, Figure TBD for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.4.1.3.3.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clause B.0

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in 9.4.1.3.3.4.3. The SS randomly selects one codebook config among the UE supported ones.

#### 9.4.1.3.3.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.1.3.3.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{ue,follow1,1,follow1,2,follow2}$ and $SNR_{ue,follow1,1,follow1,2,follow2}$ defined in clause 9.4 according to annex G.5.2.

3. Set SNR to $SNR_{ue,follow1,1,follow1,2,follow2}$. The SS shall transmit PDSCH with randomly selected precoding matrix from codebook (Table 7.2.4-10 in TS 36.213 [10]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput. Measure $t_{rnd1,1rnd1,2rnd2}$ defined in clause 9.4 according to Annex G.5.3.

4. Calculate $\gamma$ as defined in clause 9.4.

#### 9.4.1.3.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.1.3.3.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| csi-RS-Config-v1310 | CSI-RS-Config-v1310 | | |
| antennaInfo-v1250 | Not present | | |
| } | | | |

**Table 9.4.1.3.3.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.4.1.3.3.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | Not present | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.1.3.3.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic –r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.4.1.3.3.4.3-5: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-v1310 ::= SEQUENCE { | | | |
| eMIMO-Type-r13 | CSI-RS-ConfigEMIMO-r13 | | |
| } | | | |

**Table 9.4.1.3.3.4.3-6: CSI-RS-ConfigEMIMO-r13**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigEMIMO-r13 ::= CHOICE { | | | |
| setup CHOICE{ | | | |
| nonPrecoded-r13 | CSI-RS-ConfigNonPrecoded-r13 | Class A codebook | |
| } | | | |
| } | | | |

**Table 9.4.1.3.3.4.3-7: CSI-RS-ConfigNonPrecoded-r13**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigNonPrecoded-r13 ::= SEQUENCE { | | | |
| p-C-AndCBSRList-r13 | P-C-AndCBSR-Pair-r13 | | |
| codebookConfigN1-r13 | 2 | | |
| codebookConfigN2-r13 | 3 | | |
| codebookOverSamplingRateConfig-O1-r13 | 8 | | |
| codebookOverSamplingRateConfig-O2-r13 | 4 | | |
| codebookConfig-r13 | 1, 2, 3 or 4 | Select one random value | |
| csi-IM-ConfigIdList-r13 | | | |
| csi-RS-ConfigNZP-EMIMO-r13 CHOICE { | {0,1,2} | | |
| setup SEQUENCE{ | | | |
| nzp-resourceConfigList-r13 SEQUENCE{ | | | |
| NZP-ResourceConfig-r13 SEQUENCE{ | | | |
| resourceConfig-r13 | 0 | | |
| resourceConfig-r13 | 1 | | |
| resourceConfig-r13 | 2 | | |
| } | | | |
| } | | | |
| cdmType-r13 | cdm2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.4.1.3.3.4.3-8: P-C-AndCBSR-Pair-r13**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| P-C-AndCBSR-Pair-r13 ::= SEQUENCE { | | | |
| P-C-AndCBSR-r13 SEQUENCE{ | | | |
| p-C-r13 | -8 | Parameter: $P_C$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| cbsr-Selection-r13 CHOICE{ | | | |
| nonPrecoded-r13 SEQUENCE { | | | |
| codebookSubsetRestriction1-r13 | 0xFFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF | | |
| codebookSubsetRestriction2-r13 | Codebook-Config 1: 0000 0000 1111 Codebook-Config 2,3,4: 0x0000 0000 0000 FFFF | Number of bits depend on codebookConfig-r13 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

9.4.1.3.3.5 Test requirement

**Table 9.4.1.3.3.5-1: Test requirement (FDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 2.49 |
| UE Category | ≥2 |

The ratio of throughput using precoding matrix of PMI reports from the UE to using random precoding matrix shall equal or exceed the value specified in Table 9.4.1.3.3.5-1.

## 9.4.1.4 PMI Reporting – PUCCH 1-1 (Single PMI) (CSI Reference Symbol)

### 9.4.1.4.1 FDD PMI Reporting with 4Tx enhanced codebook – PUCCH 1-1 (Single PMI) for eDL MIMO Enhancement

#### 9.4.1.4.1.1 Test purpose

To verify reporting accuracy of the Precoding Matrix Indicator (PMI) reporting with 4Tx enhanced codebook (Single PMI) for eDL MIMO Enhancement.

#### 9.4.1.4.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE releases 12 and forward. Applicability requires support for FGI bit 103.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.4.1.4.1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.4.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.4.1.3-2.

**Table 9.4.1.4.1.3-1: PMI test for single-layer (FDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 9 |
| Propagation channel | | | EPA5 |
| Precoding granularity | | PRB | 50 |
| Correlation and antenna configuration | | | High XP 4 x 2 |
| Beamforming model | | | Annex B.4.3 |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $I_{CSI-RS}$ | | | 5/ 1 |
| CSI-RS reference signal configuration | | | 6 |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 FFFF 0000 00FF |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | Pc | dB | -3 |
| | σ | dB | -3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUCCH 1-1 submode1 |
| Reporting interval | | ms | 5 |
| PMI delay (Note 2) | | ms | 10 |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) |
| PUCCH Report Type for CQI/second PMI | | | 2b |
| Physical channel for RI reporting | | | PUSCH |
| PUCCH Report Type for RI/ first PMI | | | 5 |
| *cqi-pmi-ConfigurationIndex* | | | 4 |
| *ri-ConfigIndex* | | | 1 |
| Measurement channel | | | R.60 FDD |
| OCNG Pattern | | | OP.1 FDD |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |

Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity)
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH.
Note 4: PDSCH _RA= 0 dB, PDSCH_RB= 0 dB in order to have the same PDSCH and OCNG power per subcarrier at the receiver.
Note 5: Randomization of the principle beam direction shall be used as specified in B.2.3A.4

**Table 9.4.1.4.1.3-2: Minimum requirement (FDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.8 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.4.1.

### 9.4.1.4.1.4 Test description

#### 9.4.1.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11 for UE with 2Rx RF band and Annex A, Figure A.11a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.4.1.4.1.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clause B.0

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in 9.4.1.4.1.4.3.

#### 9.4.1.4.1.4.2 Test procedure

1.Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.1.4.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall transmit PDCCH DCI format 0 in downlink SF#3 and #8 to schedule to schedule UL RMC in subframe #2 and #7 (Table A.4.1-1). Establish $t_{ue,\,follow1,\,follow2}$ and $SNR_{follow1,\,follow2}$ according to annex G.5.2.

3. Set SNR to $SNR_{follow1,\,follow2}$. The SS shall transmit PDSCH with randomly selected precoding matrix from codebook (Table 7.2.4-0A in TS 36.213 [10]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities.The SS sends downlink MAC padding bits on the DL RMC. The SS shall transmit PDCCH DCI format 0 in downlink SF#3 and #8 to schedule to schedule UL RMC in subframe #2 and #7 (Table A.4.1-1). Measure the average throughput. Measure $t_{rnd1,\,rnd2}$ according to Annex G.5.3.

4. Calculate $\gamma = \dfrac{t_{ue,\,follow1,\,follow2}}{t_{rnd1,\,rnd2}}$

#### 9.4.1.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.1.4.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| antennaInfo-v1250 | AntennaInfoDedicated-v1250 | | |
| } | | | |

**Table 9.4.1.4.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.4.1.4.1.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0000 FFFF 0000 00FF | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.1.4.1.4.3-4: *AntennaInfoDedicated-v1250***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-v1250 ::= SEQUENCE { | | | |
| alternativeCodebookEnabledFor4TX-r12 | TRUE | | |
| } | | | |

**Table 9.4.1.4.1.4.3-5: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.4.1.4.1.4.3-6: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-pmi-ConfigIndex | 4 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | submode1 | | |
| } | | | |
| ri-ConfigIndex | 1 | | |
| } | | | |
| } | | | |

**Table 9.4.1.4.1.4.3-7: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 6 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_C$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| } | | | |

9.4.1.4.1.5 Test requirement

**Table 9.4.1.4.1.5 -1: Test requirement (FDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.79 |
| UE Category | ≥1 |

The ratio of throughput using precoding matrix of PMI reports from the UE to using random precoding matrix shall equal or exceed the value specified in Table 9.4.1.4.1.5-1.

### 9.4.1.4.2 TDD PMI Reporting with 4Tx enhanced codebook – PUCCH 1-1 (Single PMI) for eDL MIMO Enhancement

#### 9.4.1.4.2.1 Test purpose

To verify reporting accuracy of the Precoding Matrix Indicator (PMI) reporting with 4Tx enhanced codebook (Single PMI) for eDL MIMO Enhancement.

#### 9.4.1.4.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward. Applicability requires support for FGI bit 103.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.4.1.4.2.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.4.2.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.4.2.3-2.

**Table 9.4.1.4.2.3-1: PMI test for single-layer (TDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 9 |
| Uplink downlink configuration | | | 1 |
| Special subframe configuration | | | 4 |
| Propagation channel | | | EPA5 |
| Precoding granularity | | PRB | 50 |
| Correlation and antenna configuration | | | High XP 4 x 2 |
| Beamforming model | | | Annex B.4.3 |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $I_{CSI\text{-}RS}$ | | | 5/ 4 |
| CSI-RS reference signal configuration | | | 6 |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 FFFF 0000 00FF |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | Pc | dB | -3 |
| | σ | dB | -3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUCCH 1-1 submode1 |
| Reporting interval | | ms | 5 |
| PMI delay (Note 2) | | ms | 15 |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) |
| PUCCH Report Type for CQI/second PMI | | | 2b |
| Physical channel for RI reporting | | | PUSCH |
| PUCCH Report Type for RI/ first PMI | | | 5 |
| *cqi-pmi-ConfigurationIndex* | | | 4 |
| *ri-ConfigIndex* | | | 1 |
| Measurement channel | | | R.60 TDD |
| OCNG Pattern | | | OP.1 TDD |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |
| ACK/NACK feedback mode | | | Multiplexing |

Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity)
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH.
Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#3 and #8.
Note 5: Randomization of the principle beam direction shall be used as specified in B.2.3A.4.

**Table 9.4.1.4.2.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.8 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.4.2.

### 9.4.1.4.2.4 Test description

#### 9.4.1.4.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11 for UE with 2Rx RF band and Annex A, Figure A.11a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.1.4.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.1.4.2.4.3.

#### 9.4.1.4.2.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.1.4.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall transmit PDCCH DCI format 0 in downlink SF#4 and #9 to schedule to schedule UL RMC in subframe #3 and #8 (Table A.4.1-2). Establish $t_{ue,\,follow1,\,follow2}$ and $SNR_{follow1,\,follow2}$ according to annex G.5.2.
3. Set SNR to $SNR_{follow1,\,follow2}$. The SS shall transmit PDSCH with randomly selected precoding matrix from codebook (Table 7.2.4-0A in TS 36.213 [10]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities.The SS sends downlink MAC padding bits on the DL RMC. The SS shall transmit PDCCH DCI format 0 in downlink SF#4 and #9 to schedule to schedule UL RMC in subframe #3 and #8 (Table A.4.1-2). Measure $t_{rnd1,\,rnd2}$ according to Annex G.5.3
4. Calculate $\gamma = \dfrac{t_{ue,\,follow1,\,follow2}}{t_{rnd1,\,rnd2}}$

#### 9.4.1.4.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.1.4.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| antennaInfo-v1250 | AntennaInfoDedicated-v1250 | | |
| } | | | |

**Table 9.4.1.4.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.4.1.4.2.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0000 FFFF 0000 00FF | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.1.4.2.4.3-4: *AntennaInfoDedicated-v1250***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-v1250 ::= SEQUENCE { | | | |
| alternativeCodebookEnabledFor4TX-r12 | TRUE | | |
| } | | | |

**Table 9.4.1.4.2.4.3-5: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.4.1.4.2.4.3-6: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-pmi-ConfigIndex | 4 | (see Table 7.2.2-1C in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | submode1 | | |
| } | | | |
| ri-ConfigIndex | 1 | | |
| } | | | |
| } | | | |

**Table 9.4.1.4.2.4.3-7: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 6 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_C$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.4.1.4.2.4.3-8: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.4.1.4.2.4.3-9: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | Multiplexing is selected as default to align with RAN4's assumptions in RF tests. | TDD |
| } | | | |

9.4.1.4.2.5 Test requirement

**Table 9.4.1.4.2.5 -1: Test requirement (FDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.79 |
| UE Category | ≥1 |

The ratio of throughput using precoding matrix of PMI reports from the UE to using random precoding matrix shall equal or exceed the value specified in Table 9.4.1.4.2_G.5-1.

## 9.4.2 Multiple PMI

### 9.4.2.1 PMI Reporting – PUSCH 1-2 (Multiple PMI) (Cell-Specific Reference Symbols)

#### 9.4.2.1.1 FDD PMI Reporting – PUSCH 1-2 (Multiple PMI)

##### 9.4.2.1.1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

##### 9.4.2.1.1.2 Test applicability

This test applies to E-UTRA FDD UE release 8 of UE category 2-5.

Note: This test also applies to UE supporting 4Rx antenna ports

##### 9.4.2.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.2.1.1.3-2.

**Table 9.4.2.1.1.3-1 PMI test for single-layer (FDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 20 |
| Transmission mode | | | 6 |
| Propagation channel | | | EPA5 |
| Precoding granularity (only for reporting and following PMI) | | PRB | 8 |
| Correlation and antenna configuration | | | Low 2 x 2 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | σ | dB | 0 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH 1-2 |
| Reporting interval | | ms | 1 |
| PMI delay | | ms | 8 |
| Measurement channel | | | R.30 FDD |
| OCNG Pattern | | | OP.1 FDD |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |
| Note 1: For random precoder selection, the precoders shall be updated in each TTI (1 ms granularity)<br>Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4) | | | |

**Table 9.4.2.1.1.3-2: Minimum requirement (FDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.2 |
| UE Category | 2-5 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.1.1.

### 9.4.2.1.1.4 Test description

#### 9.4.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 20MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 for UE with 2Rx RF band and Annex A, Figure A.10a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.2.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clause B.0

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.1.1.4.3.

#### 9.4.2.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.2.1.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{rnd}$ and $SNR_{rnd}$ according to annex G.5.2

3. Set SNR to $SNR_{rnd}$ . The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4 every subframe. Measure the average throughput.
   Measure $t_{ue}$ according to Annex G.5.3

4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$

#### 9.4.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.2.1.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| explicitValue | AntennaInfoDedicated | | |
| } | | | |
| } | | | |

**Table 9.4.2.1.1.4.3-2: *AntennaInfoDedicated***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE{ | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.2.1.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

9.4.2.1.1.5 Test requirement

**Table 9.4.2.1.1.5-1: Test requirement (FDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.19 |
| UE Category | 2-5 |

## 9.4.2.1.1_1 FDD PMI Reporting – PUSCH 1-2 (Multiple PMI) (Release 9 and forward)

### 9.4.2.1.1_1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

### 9.4.2.1.1_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.4.2.1.1_1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.1.1_1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.2.1.1_1.3-2.

**Table 9.4.2.1.1_1.3-1: PMI test for single-layer (FDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 6 |
| Propagation channel | | | EPA5 |
| Precoding granularity (only for reporting and following PMI) | | PRB | 6 |
| Correlation and antenna configuration | | | Low 2 x 2 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | $\sigma$ | dB | 0 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH 1-2 |
| Reporting interval | | ms | 1 |
| PMI delay | | ms | 8 |
| Measurement channel | | | R.11-3 FDD for UE Category 1, R.11 FDD for UE Category 2-8 |
| OCNG Pattern | | | OP.1/2 FDD |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |

Note 1: For random precoder selection, the precoders shall be updated in each TTI (1 ms granularity)

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)

Note 3: One/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2 shall be used.

**Table 9.4.2.1.1_1.3-2: Minimum requirement (FDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.2 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.1.1.

### 9.4.2.1.1_1.4 Test description

#### 9.4.2.1.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 for UE with 2Rx RF band and Annex A, Figure A.10a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.2.1.1_1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.1.1_1.4.3.

### 9.4.2.1.1_1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.2.1.1_1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.11-3 FDD for UE Category 1 with allocation centred within the transmission bandwidth configuration or R.11 FDD for UE Category2-8) with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{rnd}$ and $SNR_{rnd}$ according to annex G.5.2
3. Set SNR to $SNR_{rnd}$ . The SS shall transmit PDSCH via PDCCH DCI format 1B for C-RNTI to transmit the DL RMC (R.11-3 FDD for UE Category 1 with allocation centred within the transmission bandwidth configuration or R.11 FDD for UE Category 2-8) with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4 every subframe. Measure the average throughput.
   Measure $t_{ue}$ according to Annex G.5.3
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$

### 9.4.2.1.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.2.1.1_1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| explicitValue | AntennaInfoDedicated | | |
| } | | | |
| } | | | |

**Table 9.4.2.1.1_1.4.3-2: *AntennaInfoDedicated***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE{ | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.2.1.1_1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

9.4.2.1.1_1.5 Test requirement

**Table 9.4.2.1.1_1.5-1: Test requirement (FDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.19 |
| UE Category | ≥1 |

## 9.4.2.1.2 TDD PMI Reporting – PUSCH 1-2 (Multiple PMI)

### 9.4.2.1.2.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

### 9.4.2.1.2.2 Test applicability

This test applies to E-UTRA TDD UE release 8 of UE category 2-5.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.4.2.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.2.1.2.3-2.

**Table 9.4.2.1.2.3-1: PMI test for single-layer (TDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 20 |
| Transmission mode | | | 6 |
| Uplink downlink configuration | | | 1 |
| Special subframe configuration | | | 4 |
| Propagation channel | | | EPA5 |
| Precoding granularity (only for reporting and following PMI) | | PRB | 8 |
| Correlation and antenna configuration | | | Low 2 x 2 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | $\sigma$ | dB | 0 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH 1-2 |
| Reporting interval | | ms | 1 |
| Minimum PMI delay | | ms | 10 or 11 |
| Measurement channel | | | R.30 TDD |
| OCNG Pattern | | | OP.1 TDD |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |
| ACK/NACK feedback mode | | | Multiplexing |
| Note 1: For random precoder selection, the precoders shall be updated in each available downlink transmission instance<br>Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4) | | | |

**Table 9.4.2.1.2.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.2 |
| UE Category | 2-5 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.1.2.

### 9.4.2.1.2.4 Test description

#### 9.4.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 20MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 for UE with 2Rx RF band and Annex A, Figure A.10a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.2.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.1.2.4.3.

#### 9.4.2.1.2.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.2.1.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{rnd}$ and $SNR_{rnd}$ according to annex G.5.2
3. Set SNR to $SNR_{rnd}$ . The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure $t_{ue}$ according to Annex G.5.3
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$

#### 9.4.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.2.1.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| explicitValue | AntennaInfoDedicated | | |
| } | | | |
| } | | | |

**Table 9.4.2.1.2.4.3-2: *AntennaInfoDedicated***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE{ | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |

**Table 9.4.2.1.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

9.4.2.1.2.5 Test requirement

**Table 9.4.2.1.2.5-1: Test requirement (TDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.19 |
| UE Category | 2-5 |

## 9.4.2.1.2_1 TDD PMI Reporting – PUSCH 1-2 (Multiple PMI) (Release 9 and forward)

### 9.4.2.1.2_1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

### 9.4.2.1.2_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.4.2.1.2_1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.1.2_1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.2.1.2_1.3-2.

**Table 9.4.2.1.2_1.3-1: PMI test for single-layer (TDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 6 |
| Uplink downlink configuration | | | 1 |
| Special subframe configuration | | | 4 |
| Propagation channel | | | EPA5 |
| Precoding granularity (only for reporting and following PMI) | | PRB | 6 |
| Correlation and antenna configuration | | | Low 2 x 2 |
| Downlink power allocation | $\rho_A$ | dB | -3 |
| | $\rho_B$ | dB | -3 |
| | $\sigma$ | dB | 0 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH 1-2 |
| Reporting interval | | ms | 1 |
| PMI delay | | ms | 10 or 11 |
| Measurement channel | | | R.11-3 TDD for UE Category 1 R.11 TDD for UE Category 2-8 |
| OCNG Pattern | | | OP.1/2 TDD |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |
| ACK/NACK feedback mode | | | Multiplexing |

Note 1: For random precoder selection, the precoders shall be updated in each available downlink transmission instance

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)

Note 3: One/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2 shall be used.

**Table 9.4.2.1.2_1.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.2 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.1.2.

### 9.4.2.1.2_1.4 Test description

#### 9.4.2.1.2_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 for UE with 2Rx RF band and Annex A, Figure A.10a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.2.1.2_1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.1.2_1.4.3.

### 9.4.2.1.2_1.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.2.1.2_1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.11-3 TDD for UE Category 1 with allocation centred within the transmission bandwidth configuration or R.11 TDD for UE Category2-8) with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{rnd}$ and $SNR_{rnd}$ according to annex G.5.2
3. Set SNR to $SNR_{rnd}$ . The SS shall transmit PDSCH via PDCCH DCI format 1B for C-RNTI to transmit the DL RMC (R.11-3 TDD for UE Category 1 with allocation centred within the transmission bandwidth configuration or R.11 TDD for UE Category 2-8) with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure $t_{ue}$ according to Annex G.5.3
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$

### 9.4.2.1.2_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.2.1.2_1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| explicitValue | AntennaInfoDedicated | | |
| } | | | |
| } | | | |

**Table 9.4.2.1.2_1.4.3-2: *AntennaInfoDedicated***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE{ | | | |
| n2TxAntenna-tm6 | 1111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.2.1.2_1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

9.4.2.1.2_1.5 Test requirement

**Table 9.4.2.1.2_1.5-1: Test requirement (TDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.19 |
| UE Category | ≥1 |

## 9.4.2.2 PMI Reporting – PUSCH 2-2 (Multiple PMI) (Cell-Specific Reference Symbols)

### 9.4.2.2.1 FDD PMI Reporting – PUSCH 2-2 (Multiple PMI)

#### 9.4.2.2.1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

#### 9.4.2.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward. Applicability requires support of FGI bit 1.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.4.2.2.1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.2.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.2.2.1.3-2.

**Table 9.4.2.2.1.3-1: PMI test for single-layer (FDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 6 |
| Propagation channel | | | EVA5 |
| Correlation and antenna configuration | | | Low 4 x 2 |
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 |
| | σ | dB | 3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| PMI delay | | ms | 8 |
| Reporting mode | | | PUSCH 2-2 |
| Reporting interval | | ms | 1 |
| Measurement channel | | | R.14-2 FDD |
| OCNG Pattern | | | OP.1/2 FDD |
| Subband size (*k*) | | RBs | 3 (full size) |
| Number of preferred subbands (*M*) | | | 5 |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |
| Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity)<br>Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)<br>Note 3: One/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2 shall be used | | | |

**Table 9.4.2.2.1.3-2: Minimum requirement (FDD)**

| | Test 1 |
|---|---|
| γ | 1.2 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.2.1.

### 9.4.2.2.1.4 Test description

#### 9.4.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11 for UE with 2Rx RF band and Annex A, Figure A.11a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.4.2.2.1.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clause B.0

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.2.1.4.3.

#### 9.4.2.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.2.2.1.3-1 as appropriate.

2. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-2 FDD) on a randomly selected full-size subband with a randomly selected precoding matrix from the codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]), regardless of the SB and PMI reports from the UE. Note that each full-size subband and each precoding matrix shall be selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC.
   The SS shall transmit PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. The UE will send aperiodic CSI report on PUSCH.
   Establish $t_{rnd}$ and $SNR_{rnd}$ according to annex G.5.2.

3. Set SNR to $SNR_{rnd}$. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-2 FDD) on one full-size subband selected among the M preferred subbands and the corresponding subband precoding matrix reported by the UE. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same M preferred subbands are reported subsequently, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC.
   The SS shall transmit PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. The UE will send aperiodic CSI report on PUSCH.
   Measure $t_{ue}$ according to Annex G.5.3.

4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$

#### 9.4.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.2.2.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| explicitValue | AntennaInfoDedicated | | |
| } | | | |
| } | | | |

**Table 9.4.2.2.1.4.3-2: *AntennaInfoDedicated***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE{ | | | |
| n4TxAntenna-tm6 | 1111111111111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.2.2.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm22 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

9.4.2.2.1.5 Test requirement

**Table 9.4.2.2.1.5-1: Test requirement (FDD)**

| | **Test 1** |
|---|---|
| $\gamma$ | 1.19 |
| UE Category | ≥1 |

## 9.4.2.2.2 TDD PMI Reporting – PUSCH 2-2 (Multiple PMI)

### 9.4.2.2.2.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

### 9.4.2.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward. Applicability requires support of FGI bit 1.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.4.2.2.2.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.2.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.2.2.2.3-2.

**Table 9.4.2.2.2.3-1: PMI test for single-layer (TDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 6 |
| Uplink downlink configuration | | | 1 |
| Special subframe configuration | | | 4 |
| Propagation channel | | | EVA5 |
| Correlation and antenna configuration | | | Low 4 x 2 |
| Downlink power allocation | $\rho_A$ | dB | -6 |
| | $\rho_B$ | dB | -6 |
| | σ | dB | 3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| PMI delay | | ms | 10 |
| Reporting mode | | | PUSCH 2-2 |
| Reporting interval | | ms | 1 |
| Measurement channel | | | R.14-2 TDD |
| OCNG Pattern | | | OP.1/2 TDD |
| Subband size (*k*) | | RBs | 3 (full size) |
| Number of preferred subbands (*M*) | | | 5 |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |
| ACK/NACK feedback mode | | | Multiplexing |

Note 1: For random precoder selection, the precoders shall be updated in each available downlink transmission instance

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)

Note 3: One/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2 shall be used

**Table 9.4.2.2.2.3-2: Minimum requirement (TDD)**

| | Test 1 |
|---|---|
| γ | 1.15 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.2.2.

### 9.4.2.2.2.4 Test description

#### 9.4.2.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11 for UE with 2Rx RF band and Annex A, Figure A.11a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.2.2.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.2.2.4.3.

### 9.4.2.2.2.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.2.2.2.3-1 as appropriate.
2. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-2 TDD) on a randomly selected full-size subband with a randomly selected precoding matrix from the codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]), regardless of the SB and PMI reports from the UE. Note that each full-size subband and each precoding matrix shall be selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC.
   The SS shall transmit PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. The UE will send aperiodic CSI report on PUSCH.
   Establish $t_{rnd}$ and $SNR_{rnd}$ according to annex G.5.2.
3. Set SNR to $SNR_{rnd}$. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-2 TDD) on one full-size subband selected among the M preferred subbands and the corresponding subband precoding matrix reported by the UE. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same M preferred subbands are reported subsequently, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC.
   The SS shall transmit PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. The UE will send aperiodic CSI report on PUSCH.
   Measure $t_{ue}$ according to Annex G.5.3.
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$

### 9.4.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.2.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| explicitValue | AntennaInfoDedicated | | |
| } | | | |
| } | | | |

**Table 9.4.2.2.2.4.3-2: *AntennaInfoDedicated***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm6 | | |
| codebookSubsetRestriction CHOICE{ | | | |
| n4TxAntenna-tm6 | 1111111111111111 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.2.2.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm22 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |

9.4.2.2.2.5 Test requirement

**Table 9.4.2.2.2.5-1: Test requirement (TDD)**

| | **Test 1** |
|---|---|
| $\gamma$ | 1.14 |
| UE Category | ≥1 |

## 9.4.2.3 PMI Reporting – PUSCH 1-2 (Multiple PMI) (CSI Reference Symbols)

9.4.2.3.1

### 9.4.2.3.1_D FDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO

#### 9.4.2.3.1_D.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

#### 9.4.2.3.1_D.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward. Applicability requires support for FGI bit 103.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.4.2.3.1_D.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.3.1_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.2.3.1_D.3-2.

**Table 9.4.2.3.1_D.3-1: PMI test for single-layer (FDD) for eDL-MIMO**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 9 |
| Propagation channel | | | EVA5 |
| Precoding granularity (only for reporting and following PMI) | | PRB | 6 |
| Correlation and antenna configuration | | | Low ULA 4 x 2 |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 |
| Beamforming model | | | Annex B.4.3 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/ 1 |
| CSI-RS reference signal configuration | | | 8 |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0000 FFFF |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | Pc | dB | -3 |
| | σ | dB | -3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH 1-2 |
| Reporting interval | | ms | 5 |
| PMI delay | | ms | 8 |
| Measurement channel | | | R.45-1 FDD for UE Category 1, R.45 FDD for UE Category 2-8 |
| OCNG Pattern | | | OP.7 FDD for UE Category 1 OP.1 FDD for UE Category 2-8 |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |

Note 1: For random precoder selection, the precoders shall be updated in each TTI (1 ms granularity).
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: Void
Note 4: PDSCH _RA= 0 dB, PDSCH_RB= 0 dB in order to have the same PDSCH and OCNG power per subcarrier at the receiver.

**Table 9.4.2.3.1_D.3-2: Minimum requirement (FDD) for eDL-MIMO**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.3 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.3.1.

### 9.4.2.3.1_D.4 Test description

#### 9.4.2.3.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11 for UE with 2Rx RF band and Annex A, Figure A.11a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.2.3.1_D.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.3.1_D.4.3.

#### 9.4.2.3.1_D.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.2.3.1_D.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{rnd}$ and $SNR_{rnd}$ according to annex G.5.2
3. Set SNR to $SNR_{rnd}$. The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4 in subframe #0, #5. Measure the average throughput.
   Measure $t_{ue}$ according to Annex G.5.3
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$ If the ratio (throughput / $t_{rnd}$ ) ≥ γ which is specified in table 9.4.2.3.1_D.5-1, then the test is pass. Otherwise, the test is fail.

#### 9.4.2.3.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.2.3.1_D.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | *CQI-ReportConfig-r10-DEFAULT* | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 9.4.2.3.1_D.4.3-2: *Void***

**Table 9.4.2.3.1_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0000 FFFF | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.2.3.1_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.4.2.3.1_D.4.3-5: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 8 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.4.2.3.1_D.5 Test requirement

**Table 9.4.2.3.1_D.5-1: Test requirement (FDD) for eDL-MIMO**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.29 |
| UE Category | ≥1 |

## 9.4.2.3.2_D TDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO

### 9.4.2.3.2_D.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

### 9.4.2.3.2_D.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit 104.

### 9.4.2.3.2_D.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.3.2_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.2.3.2_D.3-2.

**Table 9.4.2.3.2_D.3-1: PMI test for single-layer (TDD) for eDL-MIMO**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 9 |
| Uplink downlink configuration | | | 1 |
| Special subframe configuration | | | 4 |
| Propagation channel | | | EVA5 |
| Precoding granularity (only for reporting and following PMI) | | PRB | 6 |
| Antenna configuration | | | 8 x 2 |
| Correlation modelling | | | High, Cross polarized |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,22 |
| Beamforming model | | | Annex B.4.3 |
| CSI-RS periodicity and subframe offset $\boldsymbol{T}_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ | | | 5/ 4 |
| CSI-RS reference signal configuration | | | 4 |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 001F FFE0 0000 0000 FFFF |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | Pc | dB | -6 |
| | σ | dB | -3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH 1-2 |
| Reporting interval | | ms | 5 (Note 4) |
| PMI delay | | ms | 10 |
| Measurement channel | | | R.45-1 TDD for UE Category 1, R.45 TDD for UE Category 2-8 |
| OCNG Pattern | | | OP.7 TDD for UE Category 1 OP.1 TDD for UE Category 2-8 |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |
| ACK/NACK feedback mode | | | Multiplexing |

Note 1: For random precoder selection, the precoders shall be updated in each TTI (1 ms granularity).
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI. estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: One/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2 shall be

| | |
|---|---|
| | used. |
| Note 4: | PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#3 and #8. |
| Note 5: | Randomization of the principle beam direction shall be used as specified in B.2.3A.4 |

**Table 9.4.2.3.2_D.3-2: Minimum requirement (TDD) for eDL-MIMO**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 3.5 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.3.2.

### 9.4.2.3.2_D.4 Test description

#### 9.4.2.3.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure 47.
2. The parameter settings for the cell are set up according to Table 9.4.2.3.2_D.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.3.2_D.4.3.

#### 9.4.2.3.2_D.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.2.3.2_D.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{ue,\,follow1,\,follow2}$ and $SNR_{follow1,\,follow2}$ according to annex G.5.2.
3. Set SNR to $SNR_{follow1,\,follow2}$. The SS shall transmit PDSCH with randomly selected precoding matrix from codebook (Table 7.2.4-1 in TS 36.213 [10]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure $t_{rnd1,\,rnd2}$ according to Annex G.5.3.

4. Calculate $\gamma = \frac{t_{ue,\,follow1,\,follow2}}{t_{rnd1,\,rnd2}}$. If the ratio (throughput / $t_{rnd1,\,rnd2}$ ) ≥ γ which is specified in table 9.4.2.3.2_D.5-1, then the test is pass. Otherwise, the test is fail.

### 9.4.2.3.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.2.3.2_D.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | *CQI-ReportConfig-r10-DEFAULT* | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 9.4.2.3.2_D.4.3-2: *Void***

**Table 9.4.2.3.2_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 001F FFE0 0000 0000 FFFF | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.2.3.2_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.4.2.3.2_D.4.3-5: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | Multiplexing is selected as default to align with RAN4's assumptions in RF tests. | TDD |
| } | | | |

**Table 9.4.2.3.2_D.4.3-6: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.4.2.3.2_D.4.3-7: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an8 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 4 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -6 | Parameter: $P_C$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.4.2.3.2_D.5 Test requirement

**Table 9.4.2.3.2_D.5-1: Test requirement (TDD) for eDL-MIMO**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 3.49 |
| UE Category | ≥1 |

## 9.4.2.3.3 FDD PMI Reporting with 4Tx enhanced codebook - PUSCH 1-2 (Multiple PMI) for eDL-MIMO Enhancement

### 9.4.2.3.3.1 Test purpose

To verify reporting accuracy of the Precoding Matrix Indicator (PMI) reporting with 4Tx enhanced codebook (Multiple PMI) for eDL MIMO Enhancement.

### 9.4.2.3.3.2 Test applicability

This test applies to all types of E-UTRA FDD UE releases 12 and forward. Applicability requires support for FGI bit 103.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.4.2.3.3.3 Minimum conformance requirements

For the parameter specified in Table 9.4.2.3.3.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.2.3.3.3-2.

**Table 9.4.2.3.3.3-1: PMI test for dual-layer (FDD) for eDL-MIMO Enhancement**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 9 |
| Propagation channel | | | EVA5 |
| Precoding granularity (only for reporting and following PMI) | | PRB | 6 |
| Correlation and antenna configuration | | | High XP 4 x 2 |
| Beamforming model | | | Annex B.4.3 |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $I_{CSI-RS}$ | | | 5/ 1 |
| CSI-RS reference signal configuration | | | 8 |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 FFFF 0000 FFFF 0000 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | Pc | dB | -3 |
| | σ | dB | -3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH1-2 |
| Reporting interval | | ms | 5 |
| PMI delay (Note 2) | | ms | 8 |
| Measurement channel | | | R.45-1 FDD for UE Category 1, R.45 FDD for UE Category 2-8 |
| Rank Number of PDSCH | | | 2 |
| OCNG Pattern | | | OP.7 FDD for UE Category 1<br>OP.1 FDD for UE Category 2-8 |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |

Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity)
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: Void
Note 4: PDSCH _RA= 0 dB, PDSCH_RB= 0 dB in order to have the same PDSCH and OCNG power per subcarrier at the receiver.
Note 5: Randomization of the principle beam direction shall be used as specified in B.2.3A.4

**Table 9.4.2.3.3.3-2: Minimum requirement (FDD) for eDL-MIMO Enhancement**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.2 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.3.3.

#### 9.4.2.3.3.4 Test description

##### 9.4.2.3.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11 for UE with 2Rx RF band and Annex A, Figure A.11a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.2.3.3.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in 9.4.2.3.3.4.3.

##### 9.4.2.3.3.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table9.4.2.3.3.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{ue,\,follow1,\,follow2}$ and $SNR_{follow1,\,follow2}$ according to annex G.5.2.
3. Set SNR to $SNR_{follow1,\,follow2}$. The SS shall transmit PDSCH with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities.The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4 every subframe. Measure the average throughput. Measure $t_{rnd1,\,rnd2}$ according to Annex G.5.3.
4. Calculate $\gamma = \frac{t_{ue,\,follow1,\,follow2}}{t_{rnd1,\,rnd2}}$

##### 9.4.2.3.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.2.3.3.4.3-1: *PhysicalConfigDedicated***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated::= SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| antennaInfo-v1250 | AntennaInfoDedicated-v1250 | | |
| } | | | |

**Table 9.4.2.3.3.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.4.2.3.3.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 FFFF 0000 FFFF 0000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.2.3.3.4.3-4: *AntennaInfoDedicated-v1250***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-v1250 ::= SEQUENCE { | | | |
| alternativeCodebookEnabledFor4TX-r12 | TRUE | | |
| } | | | |

**Table 9.4.2.3.3.4.3-5: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| } | | | |

**Table 9.4.2.3.3.4.3-6: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 8 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| } | | | |

9.4.2.3.3.5 Test requirement

**Table 9.4.2.3.3.5-1: Test requirement (FDD) for eDL-MIMO Enhancement**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.19 |
| UE Category | ≥1 |

## 9.4.2.3.4 TDD PMI Reporting with 4Tx enhanced codebook - PUSCH 1-2 (Multiple PMI) for eDL-MIMO Enhancement

### 9.4.2.3.4.1 Test purpose

To verify reporting accuracy of the Precoding Matrix Indicator (PMI) reporting with 4Tx enhanced codebook (Multiple PMI) for eDL MIMO Enhancement.

### 9.4.2.3.4.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 12 and forward. Applicability requires support for FGI bit 103.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.4.2.3.4.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.3.4.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in 9.4.2.3.4.3-2.

**Table 9.4.2.3.4.3-1: PMI test for dual-layer (TDD) for eDL-MIMO Enhancement**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 9 |
| Uplink downlink configuration | | | 1 |
| Special subframe configuration | | | 4 |
| Propagation channel | | | EVA5 |
| Precoding granularity (only for reporting and following PMI) | | PRB | 6 |
| Correlation and antenna configuration | | | XP High 4 x 2 |
| Beamforming model | | | Annex B.4.3 |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,18 |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $I_{CSI\text{-}RS}$ | | | 5/ 4 |
| CSI-RS reference signal configuration | | | 4 |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 FFFF 0000 FFFF 0000 |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | Pc | dB | -3 |
| | σ | dB | -3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH1-2 |
| Reporting interval | | ms | 5 |
| PMI delay (Note 2) | | ms | 10 |
| Measurement channel | | | R.61-1 TDD for UE Category 1, R.61 TDD for UE Category 2-8 |
| Rank Number of PDSCH | | | 2 |
| OCNG Pattern | | | OP.1 TDD |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,1,2,3} |
| ACK/NACK feedback mode | | | Multiplexing |

Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity)

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: One/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.1.1/2 shall be used.

Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#3 and #8.

Note 5: Randomization of the principle beam direction shall be used as specified in B.2.3A.4.

**Table 9.4.2.3.4.3-2: Minimum requirement (TDD) for eDL-MIMO Enhancement**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.2 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.3.4.

### 9.4.2.3.4.4 Test description

#### 9.4.2.3.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11 for UE with 2Rx RF band and Annex A, Figure A.11a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.4.2.3.4.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.3.4.4.3.

#### 9.4.2.3.4.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.2.3.4.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{ue,\,follow1,\,follow2}$ and $SNR_{follow1,\,follow2}$ according to annex G.5.2.
3. Set SNR to $SNR_{follow1,\,follow2}$. The SS shall transmit PDSCH with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-2 in TS 36.213 [10]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities.The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure $t_{rnd1,\,rnd2}$ according to Annex G.5.3
4. Calculate $\gamma = \frac{t_{ue,\,follow1,\,follow2}}{t_{rnd1,\,rnd2}}$

#### 9.4.2.3.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.4.2.3.4.4.3-1: *PhysicalConfigDedicated***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated::= SEQUENCE { | | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| antennaInfo-v1250 | AntennaInfoDedicated-v1250 | | |
| } | | | |

**Table 9.4.2.3.4.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.4.2.3.4.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 FFFF 0000 FFFF 0000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.4.2.3.4.4.3-4: *AntennaInfoDedicated-v1250***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-v1250 ::= SEQUENCE { | | | |
| alternativeCodebookEnabledFor4TX-r12 | TRUE | | |
| } | | | |

**Table 9.4.2.3.4.4.3-5: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | rm12 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| } | | | |

**Table 9.4.2.3.4.4.3-6: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 4 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.4.2.3.4.4.3-7: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.4.2.3.4.4.3-8: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| Release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | Multiplexing is selected as default to align with RAN4's assumptions in RF tests | TDD |
| } | | | |

9.4.2.3.4.5 Test requirement

**Table 9.4.2.3.4.5-1: Test requirement (TDD) for eDL-MIMO Enhancement**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 1.19 |
| UE Category | ≥1 |

# 9.5 Reporting of Rank Indicator (RI)

The purpose of this test is to verify that the reported rank indicator accurately represents the channel rank. The accuracy of RI (CQI) reporting is determined by the relative increase of the throughput obtained when transmitting based on the reported rank compared to the case for which a fixed rank is used for transmission. Transmission mode 4 is used with the specified CodebookSubSetRestriction.

For fixed rank 1 transmission, the RI and PMI reporting is restricted to two single-layer precoders, For fixed rank 2 transmission, the RI and PMI reporting is restricted to one two-layer precoder, For follow RI transmission, the RI and PMI reporting is restricted to select the union of these precoders. Channels with low and high correlation are used to ensure that RI reporting reflects the channel condition.

## 9.5.1 RI Reporting (Cell-Specific Reference Symbols)

### 9.5.1.1 FDD RI Reporting– PUCCH 1-1

#### 9.5.1.1.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank.

#### 9.5.1.1.2 Test applicability

This test applies to E-UTRA FDD UE release 8 and 9 of UE category from 2 to 5.

#### 9.5.1.1.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.1.1.3-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.5.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.5.1.1.3-2.

**Table 9.5.1.1.3-1: RI Test (FDD)**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| PDSCH transmission mode | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | |
| | $\rho_B$ | dB | -3 | | |
| | σ | dB | 0 | | |
| CodeBookSubsetRestriction bitmap | | | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | | |
| Propagation condition and antenna configuration | | | 2 x 2 EPA5 | | |
| Antenna correlation | | | Low | Low | High |
| RI configuration | | | Fixed RI=2 and follow RI | Fixed RI=1 and follow RI | Fixed RI=2 and follow RI |
| SNR | | dB | 0 | 20 | 20 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -78 | -78 |
| Maximum number of HARQ transmissions | | | 1 | | |
| Reporting mode | | | PUCCH 1-1 (Note 4) | | |
| Physical channel for CQI/PMI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | |
| Physical channel for RI reporting | | | PUSCH (Note 3) | | |
| PUCCH Report Type for RI | | | 3 | | |
| Reporting periodicity | | ms | $N_P$ = 5 | | |
| PMI and CQI delay | | ms | 8 | | |
| *cqi-pmi-ConfigurationIndex* | | | 6 | | |
| *ri-ConfigurationInd* | | | 1 (Note 5) | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.2 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between RI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic RI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

Note 4: The bit field for precoding information in DCI format 2 shall be mapped as:
- For reported RI = 1 and PMI = 0 >> precoding information bit field index = 1
- For reported RI = 1 and PMI = 1 >> precoding information bit field index = 2
- For reported RI = 2 and PMI = 0 >> precoding information bit field index = 0

Note 5: To avoid the ambiguity of SS behaviour when applying CQI and PMI during rank switching, RI reports are to be applied at the SS with one subframe delay in addition to Note 1 to align with CQI and PMI reports.

**Table 9.5.1.1.3-2: Minimum requirement (FDD)**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.05 | N/A |
| $\gamma_2$ | 1 | N/A | 1.1 |
| UE Category | 2-5 | 2-5 | 2-5 |

The normative reference for this requirement is TS 36.101 [2] clause 9.5.1.1.

### 9.5.1.1.4 Test description

#### 9.5.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.5.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.1.1.4.3.

#### 9.5.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.1.1.3-1 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and fixed RI as defined in Table 9.5.1.1.3-1. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and #8 (Table A.4.1-1). Measure the $t_{fix}$ according to annex G.5.3.
3. Propagation conditions are set according to Annex B.1.
4. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in every subframe (Table A.4.1-1).
5. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.1.1.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. Propagation conditions are set according to Table 9.5.1.1.3-1.
8. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and #8 (Table A.4.1-1). Measure $t_{reported}$ according to Annex G.5.3

   If the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.5.1.1.5-1, then pass the UE for this test and go to step 9. Otherwise, fail the UE.
9. If all tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the Table 9.5.1.1.3-2 for the other Tests as appropriate. Otherwise pass the UE.

9.5.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.5.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | PhysicalConfigDedicated - DEFAULT using condition RBC | | |
| } | | | |

**Table 9.5.1.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| } | | | |
| codebookSubsetRestriction CHOICE { | | | |
| N2TxAntenna-tm4 | According to each test | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.1.1.4.3-3: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | |
| } | | | |

**Table 9.5.1.1.4.3-4: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 6 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

### 9.5.1.1.5 Test requirement

**Table 9.5.1.1.5-1: Test requirement (FDD)**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.04 | N/A |
| $\gamma_2$ | 0.99 | N/A | 1.09 |
| UE Category | 2-5 | 2-5 | 2-5 |

## 9.5.1.1_1 FDD RI Reporting– PUCCH 1-1 (Release 10)

### 9.5.1.1_1.1 Test purpose

Same test purpose as in clause 9.5.1.1.1.

### 9.5.1.1_1.2 Test applicability

This test applies to E-UTRA FDD UE release 10 of UE category from 2 to 8..

### 9.5.1.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.5.1.1.3 with the following exceptions:

- Instead of Table 9.5.1.1.3-1 → use Table 9.5.1.1_1.3-1.
- Instead of Table 9.5.1.1.3-2 → use Table 9.5.1.1_1.3-2.

**Table 9.5.1.1_1.3-1: RI Test (FDD)**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | | |
| | $\rho_B$ | dB | -3 | | | |
| | σ | dB | 0 | | | |
| CodeBookSubsetRestriction bitmap | | | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | | | |
| Propagation condition and antenna configuration | | | 2 x 2 EPA5 | | | |
| Antenna correlation | | | Low | Low | High | |
| RI configuration | | | Fixed RI=2 and follow RI | Fixed RI=1 and follow RI | Fixed RI=1 and follow RI | Fixed RI=2 and follow RI |
| SNR | | dB | 0 | 20 | 20 | 20 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 | -98 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -78 | -78 | -78 |
| Maximum number of HARQ transmissions | | | 1 | | | |
| Reporting mode | | | PUCCH 1-1 (Note 4) | | | |
| Physical channel for CQI/PMI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | | |
| Physical channel for RI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type for RI | | | 3 | | | |
| Reporting periodicity | | ms | $N_P$ = 5 | | | |
| PMI and CQI delay | | ms | 8 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 6 | | | |
| *ri-ConfigurationInd* | | | 1 (Note 5) | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.2 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between RI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic RI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

Note 4: The bit field for precoding information in DCI format 2 shall be mapped as:
- For reported RI = 1 and PMI = 0 >> precoding information bit field index = 1
- For reported RI = 1 and PMI = 1 >> precoding information bit field index = 2
- For reported RI = 2 and PMI = 0 >> precoding information bit field index = 0

Note 5: To avoid the ambiguity of SS behaviour when applying CQI and PMI during rank switching, RI reports are to be applied at the SS with one subframe delay in addition to Note 1 to align with CQI and PMI reports.

**Table 9.5.1.1_1.3-2: Minimum requirement (FDD)**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.05 | 0.9 (Note 1) |
| $\gamma_2$ | 1 | N/A | 1.1 (Note 1) |
| UE Category | 2-8 | 2-8 | 2-8 |

Note 1: For Test 3, the minimum requirements shall be fulfilled for at least one of $\gamma_1$ or $\gamma_2$.

## 9.5.1.1_1.4 Test description

Same test description as in clause 9.5.1.1.4 with the following exceptions:

- Instead of Table 9.5.1.1.3-1 → use Table 9.5.1.1_1.3-1.
- Instead of Table 9.5.1.1.3-2 → use Table 9.5.1.1_1.3-2.
- Instead of Table 9.5.1.1.5-1 → use Table 9.5.1.1_1.5-1.

#### 9.5.1.1_1.4.1 Initial conditions

Same initial conditions as in clause 9.5.1.1.4.1.

#### 9.5.1.1_1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.1.1_1.3-1 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and fixed RI as defined in Table 9.5.1.1_1.3-1. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and #8 (Table A.4.1-1). Measure the $t_{fix}$ according to annex G.5.3.
3. Propagation conditions are set according to Annex B.1.
4. For Test 3 the SS repeats steps 1 to 3 to get two values for $t_{fix}$, one value for fixed Rank 1 case and the other value for fixed Rank 2 case.
5. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in every subframe (Table A.4.1-1).
6. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.1.1_1.3-1.
7. The UE shall transmit RRC Connection Reconfiguration Complete message.
8. Propagation conditions are set according to Table 9.5.1.1_1.3-1.
9. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and #8 (Table A.4.1-1). Measure $t_{reported}$ according to Annex G.5.3
10. For Test 1 and Test 2 if the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.5.1.1_1.5-1, then pass the UE for Test 1 and Test 2.
11. For Test 3 if the ratio ($t_{reported}$ / $t_{fix}$) satisfies at least one of the $\gamma_1$ or $\gamma_2$ requirements in Table 9.5.1.1_1.5-1, then pass the UE for Test 3.
12. For a complete test case to pass the UE has to pass all test cases 1, 2 and 3. Otherwise, fail the UE.
13. If all tests have not been done, then repeat the same procedure (steps 1 to 12) with test conditions according to the Table 9.5.1.1_1.3-2 for the other Tests as appropriate.

#### 9.5.1.1_1.4.3 Message contents

Same message contents as in clause 9.5.1.1.4.3.

### 9.5.1.1_1.5 Test requirement

Same test requirements as in clause 9.5.1.1.5 with the following exceptions:

- Instead of Table 9.5.1.1.5-1 → use Table 9.5.1.1_1.5-1

**Table 9.5.1.1_1.5-1: Test requirement (FDD)**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.04 | 0.89 (Note 1) |
| $\gamma_2$ | 0.99 | N/A | 1.09 (Note 1) |
| UE Category | 2-8 | 2-8 | 2-8 |
| Note 1: For Test 3, the minimum requirements shall be fulfilled for at least one of $\gamma_1$ or $\gamma_2$. | | | |

## 9.5.1.1_2 FDD RI Reporting– PUCCH 1-1 (Release 11)

### 9.5.1.1_2.1 Test purpose

Same test purpose as in clause 9.5.1.1.1.

### 9.5.1.1_2.2 Test applicability

This test applies to E-UTRA FDD UE release 11 and forward of UE category ≥2.

### 9.5.1.1_2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.5.1.1.3 with the following exceptions:

- Instead of Table 9.5.1.1.3-1 → use Table 9.5.1.1_2.3-1.
- Instead of Table 9.5.1.1.3-2 → use Table 9.5.1.1_2.3-2.

**Table 9.5.1.1_2.3-1: RI Test (FDD)**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| PDSCH transmission mode | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | |
| | $\rho_B$ | dB | -3 | | |
| | σ | dB | 0 | | |
| Propagation condition and antenna configuration | | | 2 x 2 EPA5 | | |
| CodeBookSubsetRestriction bitmap | | | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | | |
| Antenna correlation | | | Low | Low | High |
| RI configuration | | | Fixed RI=2 and follow RI | Fixed RI=1 and follow RI | Fixed RI=1 and follow RI |
| SNR | | dB | 0 | 20 | 20 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -78 | -78 |
| Maximum number of HARQ transmissions | | | 1 | | |
| Reporting mode | | | PUCCH 1-1 (Note 4) | | |
| Physical channel for CQI/PMI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | |
| Physical channel for RI reporting | | | PUSCH (Note 3) | | |
| PUCCH Report Type for RI | | | 3 | | |
| Reporting periodicity | | ms | $N_{pd}$= 5 | | |
| PMI and CQI delay | | ms | 8 | | |
| *cqi-pmi-ConfigurationIndex* | | | 6 | | |
| *ri-ConfigurationInd* | | | 1 (Note 5) | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.2 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between RI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic RI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

Note 4: The bit field for precoding information in DCI format 2 shall be mapped as:
- For reported RI = 1 and PMI = 0 >> precoding information bit field index = 1
- For reported RI = 1 and PMI = 1 >> precoding information bit field index = 2
- For reported RI = 2 and PMI = 0 >> precoding information bit field index = 0

Note 5: To avoid the ambiguity of TE behaviour when applying CQI and PMI during rank switching, RI reports are to be applied at the TE with one subframe delay in addition to Note 1 to align with CQI and PMI reports.

**Table 9.5.1.1_2.3-2: Minimum requirement (FDD)**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.05 | 0.9 |
| $\gamma_2$ | 1 | N/A | N/A |
| UE Category | ≥2 | ≥2 | ≥2 |

## 9.5.1.1_2.4 Test description

Same test description as in clause 9.5.1.1.4 with the following exceptions:

- Instead of Table 9.5.1.1.3-1 → use Table 9.5.1.1_2.3-1.
- Instead of Table 9.5.1.1.3-2 → use Table 9.5.1.1_2.3-2.
- Instead of Table 9.5.1.1.5-1 → use Table 9.5.1.1_2.5-1.

### 9.5.1.1_2.5 Test requirement

Same test requirements as in clause 9.5.1.1.5 with the following exceptions:

- Instead of Table 9.5.1.1.5-1 → use Table 9.5.1.1_2.5-1

**Table 9.5.1.1_2.5-1: Test requirement (FDD)**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.04 | 0.89 |
| $\gamma_2$ | 0.99 | N/A | N/A |
| UE Category | ≥2 | ≥2 | ≥2 |

## 9.5.1.2 TDD RI Reporting – PUSCH 3-1

### 9.5.1.2.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank.

### 9.5.1.2.2 Test applicability

This test applies to E-UTRA TDD UE release 8 and 9, which support UE Category from 2 to 5.

### 9.5.1.2.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.1.2.3-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.5.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.5.1.2.3-2.

**Table 9.5.1.2.3-1: RI Test (TDD)**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| PDSCH transmission mode | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | |
| | $\rho_B$ | dB | -3 | | |
| | σ | dB | 0 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Propagation condition and antenna configuration | | | 2 x 2 EPA5 | | |
| CodeBookSubsetRestriction bitmap | | | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | | |
| Antenna correlation | | | Low | Low | High |
| RI configuration | | | Fixed RI=2 and follow RI | Fixed RI=1 and follow RI | Fixed RI=2 and follow RI |
| SNR | | dB | 0 | 20 | 20 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -78 | -78 |
| Maximum number of HARQ transmissions | | | 1 | | |
| Reporting mode | | | PUSCH 3-1 (Note 3) | | |
| Reporting interval | | ms | 5 | | |
| PMI and CQI delay | | ms | 10 or 11 | | |
| ACK/NACK feedback mode | | | Bundling | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel RC.2 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
Note 3: Reported wideband CQI and PMI are used and sub-band CQI is discarded.

**Table 9.5.1.2.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.05 | N/A |
| $\gamma_2$ | 1 | N/A | 1.1 |
| UE Category | 2-5 | 2-5 | 2-5 |

The normative reference for this requirement is TS 36.101 [2] clause 9.5.1.2.

## 9.5.1.2.4 Test description

### 9.5.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.

2. The parameter settings for the cell are set up according to Table 9.5.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.1.2.4.3.

#### 9.5.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.1.2.3-1 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and fixed RI as defined in Table 9.5.1.2.3-1. The SS sends downlink MAC padding bits on the DL RMC. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the $t_{fix}$ according to annex G.5.3
3. Propagation conditions are set according to Annex B.1.
4. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit to 0 to schedule UL RMC in subframe#2 and #7 (Table A.4.1-2).
5. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.1.2.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. Propagation conditions are set according to Table 9.5.1.2.3-1.
8. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure $t_{reported}$ according to Annex G.5.3
   If the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.5.1.2.5-1, then pass the UE for this test and go to step 9. Otherwise, fail the UE.
9. If all tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the Table 9.5.1.2.3-2 for the other Tests as appropriate. Otherwise pass the UE.

#### 9.5.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.5.1.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| } | | | |
| codebookSubsetRestriction CHOICE { | | | |
| N2TxAntenna-tm4 | According to each test | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.1.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | |
| } | | | |

**Table 9.5.1.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | Not Present | | |
| } | | | |
| } | | | |

**Table 9.5.1.2.4.3-4: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Bundling | Multiplexing is selected as default to align with RAN4's assumptions in RF tests. | TDD |
| } | | | |

#### 9.5.1.2.5 Test requirement

**Table 9.5.1.2.5-1: Test requirement (TDD)**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.04 | N/A |
| $\gamma_2$ | 0.99 | N/A | 1.09 |
| UE Category | 2-5 | 2-5 | 2-5 |

### 9.5.1.2_1 TDD RI Reporting – PUSCH 3-1 (Release 10)

#### 9.5.1.2_1.1 Test purpose

Same test purpose as in clause 9.5.1.2.1.

#### 9.5.1.2_1.2 Test applicability

This test applies to E-UTRA TDD UE release 10, which supports UE Category from 2 to 8.

#### 9.5.1.2_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.5.1.2.3 with the following exceptions:

- Instead of Table 9.5.1.2.3-1 → use Table 9.5.1.2_1.3-1.
- Instead of Table 9.5.1.2.3-2 → use Table 9.5.1.2_1.3-2.

**Table 9.5.1.2_1.3-1: RI Test (TDD)**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | | |
| | $\rho_B$ | dB | -3 | | | |
| | σ | dB | 0 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| *Propagation condition and antenna configuration* | | | 2 x 2 EPA5 | | | |
| CodeBookSubsetRestriction bitmap | | | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | | | |
| Antenna correlation | | | Low | Low | High | High |
| RI configuration | | | Fixed RI=2 and follow RI | Fixed RI=1 and follow RI | Fixed RI=1 and follow RI | Fixed RI=2 and follow RI |
| SNR | | dB | 0 | 20 | 20 | 20 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 | -98 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -78 | -78 | -78 |
| Maximum number of HARQ transmissions | | | 1 | | | |
| Reporting mode | | | PUSCH 3-1 (Note 3) | | | |
| Reporting interval | | ms | 5 | | | |
| PMI and CQI delay | | ms | 10 or 11 | | | |
| ACK/NACK feedback mode | | | Bundling | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel RC.2 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
Note 3: Reported wideband CQI and PMI are used and sub-band CQI is discarded.

**Table 9.5.1.2_1.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.05 | 0.9 (Note 1) |
| $\gamma_2$ | 1 | N/A | 1.1 (Note 1) |
| UE Category | 2-8 | 2-8 | 2-8 |

Note 1: For Test 3, the minimum requirements shall be fulfilled for at least one of $\gamma_1$ or $\gamma_2$.

## 9.5.1.2_1.4 Test description

### 9.5.1.2_1.4.1 Initial conditions

Same initial conditions as in clause 9.5.1.2.4.1.

### 9.5.1.2_1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.1.2_1.3-1 as appropriate.

2. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and fixed RI as defined in Table 9.5.1.2_1.3-1. The SS sends downlink MAC padding bits on the DL RMC. The SS schedules the UL transmission to carry the PUSCH CQI feedback

via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the $t_{fix}$ according to annex G.5.3

3. Propagation conditions are set according to Annex B.1.
4. For Test 3 the SS repeats steps 1 to 3 to get two values for $t_{fix}$, one value for fixed Rank 1 case and the other value for fixed Rank 2 case.
5. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit to 0 to schedule UL RMC in subframe#2 and #7 (Table A.4.1-2).
6. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.1.2_1.3-1.
7. The UE shall transmit RRC Connection Reconfiguration Complete message.
8. Propagation conditions are set according to Table 9.5.1.2_1.3-1.
9. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure $t_{reported}$ according to Annex G.5.3
10. For Test 1 and Test 2 if the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.5.1.2_1.5-1, then pass the UE for Test 1 and Test 2.
11. For Test 3 if the ratio ($t_{reported}$ / $t_{fix}$) satisfies at least one of the $\gamma_1$ or $\gamma_2$ requirements in Table 9.5.1.2_1.5-1, then pass the UE for Test 3.
12. For a complete test case to pass the UE has to pass all test cases 1, 2 and 3. Otherwise, fail the UE
13. If all tests have not been done, then repeat the same procedure (steps 1 to 12) with test conditions according to the Table 9.5.1.2_1.3-2 for the other Tests as appropriate.

#### 9.5.1.2_1.4.3 Message contents

Same message contents as in clause 9.5.1.2.4.3.

### 9.5.1.2_1.5 Test requirement

Same test requirements as in clause 9.5.1.2.5 with the following exceptions:

- Instead of Table 9.5.1.2.5-1 → use Table 9.5.1.2_1.5-1

**Table 9.5.1.2_1.5-1: Test requirement (TDD)**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.04 | 0.89 (Note 1) |
| $\gamma_2$ | 0.99 | N/A | 1.09 (Note 1) |
| UE Category | 2-8 | 2-8 | 2-8 |
| Note 1: For Test 3, the minimum requirements shall be fulfilled for at least one of $\gamma_1$ or $\gamma_2$. | | | |

## 9.5.1.2_2 TDD RI Reporting – PUSCH 3-1 (Release 11)

### 9.5.1.2_2.1 Test purpose

Same test purpose as in clause 9.5.1.2.1.

### 9.5.1.2_2.2 Test applicability

This test applies to E-UTRA TDD UE release 11 and forward, which supports UE Category ≥2.

### 9.5.1.2_2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.5.1.2.3 with the following exceptions:

- Instead of Table 9.5.1.2.3-1 → use Table 9.5.1.2_2.3-1.
- Instead of Table 9.5.1.2.3-2 → use Table 9.5.1.2_2.3-2.

**Table 9.5.1.2_2.3-1: RI Test (TDD)**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| PDSCH transmission mode | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | |
| | $\rho_B$ | dB | -3 | | |
| | σ | dB | 0 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Propagation condition and antenna configuration | | | 2 x 2 EPA5 | | |
| CodeBookSubsetRestriction bitmap | | | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | | |
| Antenna correlation | | | Low | Low | High |
| RI configuration | | | Fixed RI=2 and follow RI | Fixed RI=1 and follow RI | Fixed RI=1 and follow RI |
| SNR | | dB | 0 | 20 | 20 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -78 | -78 |
| Maximum number of HARQ transmissions | | | 1 | | |
| Reporting mode | | | PUSCH 3-1 (Note 3) | | |
| Reporting interval | | ms | 5 | | |
| PMI and CQI delay | | ms | 10 or 11 | | |
| ACK/NACK feedback mode | | | Bundling | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel RC.2 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
Note 3: Reported wideband CQI and PMI are used and sub-band CQI is discarded.

**Table 9.5.1.2_2.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.05 | 0.9 |
| $\gamma_2$ | 1 | N/A | N/A |
| UE Category | ≥2 | ≥2 | ≥2 |

### 9.5.1.2_2.4 Test description

Same test description as in clause 9.5.1.2.4 with the following exceptions:

- Instead of Table 9.5.1.2.3-1 → use Table 9.5.1.2_2.3-1.

- Instead of Table 9.5.1.2.3-2 → use Table 9.5.1.2_2.3-2.
- Instead of Table 9.5.1.2.5-1 → use Table 9.5.1.2_2.5-1.

#### 9.5.1.2_2.5 Test requirement

Same test requirements as in clause 9.5.1.2.5 with the following exceptions:

- Instead of Table 9.5.1.2.5-1 → use Table 9.5.1.2_2.5-1

**Table 9.5.1.2_2.5-1: Test requirement (TDD)**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.04 | 0.89 |
| $\gamma_2$ | 0.99 | N/A | N/A |
| UE Category | ≥2 | ≥2 | ≥2 |

## 9.5.2 RI Reporting (CSI Reference Symbols)

### 9.5.2.1

### 9.5.2.1_D FDD RI Reporting- PUCCH 1-1 for eDL-MIMO

#### 9.5.2.1_D.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank.

#### 9.5.2.1_D.2 Test applicability

This test applies to E-UTRA FDD UE release 10 and forward of Category 2-8. Applicability requires support for FGI bit 103.

#### 9.5.2.1_D.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.2.1_D.3-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.5.2.1_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.2.1_D.3-2.

**Table 9.5.2.1_D.3-1: RI Test (FDD) for eDL-MIMO**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| PDSCH transmission mode | | | 9 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| | Pc | dB | 0 | | |
| | σ | dB | 0 | | |
| Propagation condition and antenna configuration | | | 2 x 2 EPA5 | | |
| Cell-specific reference signals | | | Antenna ports 0 | | |
| CSI reference signals | | | Antenna ports 15, 16 | | |
| Beamforming model | | | As specified in Annex B.4.3 | | |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | | |
| CSI reference signal configuration | | | 6 | | |
| CodeBookSubsetRestriction bitmap | | | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | | |
| Antenna correlation | | | Low | Low | High |
| RI configuration | | | Fixed RI=2 and follow RI | Fixed RI=1 and follow RI | Fixed RI=1 and follow RI |
| SNR | | dB | 0 | 20 | 20 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -78 | -78 |
| Maximum number of HARQ transmissions | | | 1 | | |
| Reporting mode | | | PUCCH 1-1 | | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | |
| Physical channel for RI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type for RI | | | 3 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | |
| PMI and CQI delay | | ms | 8 | | |
| *cqi-pmi-ConfigurationIndex* | | | 2 | | |
| *ri-ConfigurationInd* | | | 1 (Note 4) | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.9 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.

Note 4: To avoid the ambiguity of TE behaviour when applying CQI and PMI during rank switching, RI reports are to be applied at the TE with one subframe delay in addition to Note 1 to align with CQI and PMI reports.

**Table 9.5.2.1_D.3-2: Minimum requirement (FDD) for eDL-MIMO**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.05 | 0.9 |
| $\gamma_2$ | 1 | N/A | N/A |
| UE Category | 2-8 | 2-8 | 2-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.5.2.1.

## 9.5.2.1_D.4 Test description

### 9.5.2.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.5.2.1_D.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.2.1_D.4.3.

### 9.5.2.1_D.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.2.1_D.3-1 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and fixed RI as defined in Table 9.5.2.1_D.3-1. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4.1-1). Measure the $t_{fix}$ according to annex G.5.3.
3. Propagation conditions are set according to Annex B.1.
4. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in every subframe(Table A.4.1-1).
5. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.2.1_D.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. Propagation conditions are set according to Table 9.5.2.1_D.3-1.
8. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4.1-1). Measure $t_{reported}$ according to Annex G.5.3

   If the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.5.2.1_D.5-1, then pass the UE for this test and go to step 9. Otherwise, fail the UE.

9. If all tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the Table 9.5.2.1_D.3-2 for the other Tests as appropriate. Otherwise pass the UE.

### 9.5.2.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.5.2.1_D.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

**Table 9.5.2.1_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.5.2.1_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | According to each test | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.5.2.1_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.5.2.1_D.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 2 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.2.1_D.4.3-6: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 6 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_C$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

### 9.5.2.1_D.5 Test requirement

**Table 9.5.2.1_D.5-1: Test requirement (FDD) for eDL-MIMO**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.04 | 0.89 |
| $\gamma_2$ | 0.99 | N/A | N/A |
| UE Category | 2-8 | 2-8 | 2-8 |

## 9.5.2.2_D TDD RI Reporting- PUCCH 1-1 for eDL-MIMO

### 9.5.2.2_D.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank.

### 9.5.2.2_D.2 Test applicability

This test applies to E-UTRA TDD UE Release 10 and forward of Category 2-8. Applicability requires support for FGI bit 103.

### 9.5.2.2_D.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.2.2_D.3-2 is defined as:

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.5.2.2_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.2.2_D.3-2.

**Table 9.5.2.2_D.3-1: RI Test (TDD) for eDL-MIMO**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | |
| PDSCH transmission mode | | | 9 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| | Pc | dB | 0 | | |
| | σ | dB | 0 | | |
| Uplink downlink configuration | | | 1 | | |
| Special subframe configuration | | | 4 | | |
| Propagation condition and antenna configuration | | | 2 x 2 EPA5 | | |
| Cell-specific reference signals | | | Antenna ports 0 | | |
| CSI reference signals | | | Antenna ports 15, 16 | | |
| CSI reference signal configuration | | | 4 | | |
| Beamforming model | | | As specified in Annex B.4.3 | | |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/4 | | |
| CodeBookSubsetRestriction bitmap | | | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | | |
| Antenna correlation | | | Low | Low | High |
| RI configuration | | | Fixed RI=2 and follow RI | Fixed RI=1 and follow RI | Fixed RI=1 and follow RI |
| SNR | | dB | 0 | 20 | 20 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -78 | -78 |
| Maximum number of HARQ transmissions | | | 1 | | |
| Reporting mode | | | PUCCH 1-1 | | |
| Physical channel for CQI/ PMI reporting | | | PUSCH (Note 3) | | |
| PUCCH report type for CQI/ PMI | | | 2 | | |
| Physical channel for RI reporting | | | PUCCH Format 2 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | |
| PMI and CQI delay | | ms | 10 | | |
| ACK/NACK feedback mode | | | Bundling | | |
| *cqi-pmi-ConfigurationIndex* | | | 4 | | |
| *ri-ConfigurationInd* | | | 1 | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.9 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#3 and #8.

**Table 9.5.2.2_D.3-2: Minimum requirement (TDD) for eDL-MIMO**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.05 | 0.9 |
| $\gamma_2$ | 1 | N/A | N/A |
| UE Category | 2-8 | 2-8 | 2-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.5.2.2.

## 9.5.2.2_D.4 Test description

### 9.5.2.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.5.2.2_D.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.2.2_D.4.3.

### 9.5.2.2_D.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.2.2_D.3-1 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and fixed RI as defined in Table 9.5.2.2_D.3-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and #8 (Table A.4.1-2). Measure the $t_{fix}$ according to annex G.5.3
3. Propagation conditions are set according to Annex B.1.
4. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit to 0 to schedule UL RMC in subframe#3 and #8 (Table A.4.1-2).
5. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.2.2_D.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. Propagation conditions are set according to Table 9.5.2.2_D.3-1.
8. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and subframe #8 (Table A.4.1-2). Measure $t_{reported}$ according to Annex G.5.3

   If the ratio ( $t_{reported}$ / $t_{fix}$ ) satisfies the requirement in Table 9.5.2.2_D.5-1, then pass the UE for this test and go to step 9. Otherwise, fail the UE.
9. If all tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the Table 9.5.2.2_D.3-2 for the other Tests as appropriate. Otherwise pass the UE.

9.5.2.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.5.2.2_D.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

**Table 9.5.2.2_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.5.2.2_D.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | According to each test | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.5.2.2_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.5.2.2_D.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 4 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.2.2_D.4.3-6: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Bundling | Multiplexing is selected as default to align with RAN4's assumptions in RF tests. | TDD |
| } | | | |

**Table 9.5.2.2_D.4.3-7: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.5.2.2_D.4.3-8: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 4 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_C$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

### 9.5.2.2_D.5 Test requirement

**Table 9.5.2.2_D.5-1: Test requirement (TDD) for eDL-MIMO**

| Parameter | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\gamma_1$ | N/A | 1.04 | 0.89 |
| $\gamma_2$ | 0.99 | N/A | N/A |
| UE Category | 2-8 | 2-8 | 2-8 |

## 9.5.3 RI Reporting (two CSI subframe sets are configured)

### 9.5.3.1_C FDD RI Reporting – PUCCH 1-0 for eICIC

### 9.5.3.1_C.1 FDD RI Reporting – PUCCH 1-0 for eICIC (non-MBSFN ABS)

#### 9.5.3.1_C.1.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank under time domain resource restriction i.e. in case two CSI subframe sets are configured.

#### 9.5.3.1_C.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE - Category 2-8 - release 10 and forward. Applicability requires support for FGI bit 115.

### 9.5.3.1_C.1.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.3.1_C.1.3-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$

For the parameters specified in Table 9.5.3.1_C.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.3.1_C.1.3-2.

**Table 9.5.3.1_C.1.3-1: RI Test (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Bandwidth | | MHz | 10 | | 10 | |
| PDSCH transmission mode | | | 3 | Note 10 | 3 | Note 10 |
| Downlink power allocation | $\rho_A$ | dB | -3 | | -3 | |
| | $\rho_B$ | dB | -3 | | -3 | |
| | σ | dB | 0 | | 0 | |
| Propagation condition and antenna configuration | | | 2 x 2 EPA5 | | 2 x 2 EPA5 | |
| CodeBookSubsetRestriction bitmap | | | 01 for fixed RI = 1<br>10 for fixed RI = 2<br>11 for UE reported RI | N/A | 01 for fixed RI = 1<br>10 for fixed RI = 2<br>11 for UE reported RI | N/A |
| Antenna correlation | | | Low | | Low | |
| RI configuration | | | Fixed RI=1 and follow RI | N/A | Fixed RI=1 and follow RI | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | 0 | -12 | 20 | 6 |
| $N_{oc}^{(j)}$ | $N_{oc1}^{(j)}$ | dBmW/15kHz | -98 (Note 3) | N/A | -102 (Note 3) | N/A |
| | $N_{oc2}^{(j)}$ | | -98 (Note 4) | N/A | -98 (Note 4) | N/A |
| | $N_{oc3}^{(j)}$ | | -98 (Note 5) | N/A | -94.8 (Note 5) | N/A |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -110 | -78 | -92 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Cell Id | | | 0 | 1 | 0 | 1 |
| Time Offset between Cells | | μs | 2.5 (synchronous cells) | | 2.5 (synchronous cells) | |
| ABS Pattern (Note 6) | | | N/A | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 |
| RLM/RRM Measurement Subframe Pattern (Note 7) | | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A |
| CSI Subframe Sets (Note 8) | $C_{CSI,0}$ | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A |
| | $C_{CSI,1}$ | | 01111111<br>01111111<br>01111111<br>01111111<br>01111111 | | 01111111<br>01111111<br>01111111<br>01111111<br>01111111 | |
| Number of control OFDM Symbols | | | 3 | 3 | 3 | 3 |
| Maximum number of HARQ transmissions | | | 1 | | 1 | |
| Reporting mode | | | PUCCH 1-0 | | PUCCH 1-0 | |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | PUCCH Format 2 | |
| PUCCH Report Type for CQI | | | 4 | | 4 | |

| | | | | | |
|---|---|---|---|---|---|
| Physical channel for RI reporting | | PUCCH Format 2 | | PUCCH Format 2 | |
| PUCCH Report Type for RI | | 3 | | 3 | |
| Reporting periodicity | ms | $N_{pd}$= 10 | | $N_{pd}$= 10 | |
| *cqi-pmi-ConfigurationIndex* | | 11 | | 11 | |
| *ri-ConfigurationInd* | | 5 | | 5 | |
| *cqi-pmi-ConfigurationIndex2* | | 10 | | 10 | |
| *ri-ConfigurationInd2* | | 2 | | 2 | |
| Cyclic prefix | | Normal | Normal | Normal | Normal |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel in Cell 1 RC.2 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 3: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 5: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 6: ABS pattern as defined in TS 36.423 [14]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 7: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 8: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 9: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell 1 and Cell 2 is the same.
Note 10: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern OP.5 FDD as defined in Annex A.5.1.5.

**Table 9.5.3.1_C.1.3-2: Minimum requirement (FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\gamma_1$ | 0.9 | 1.05 |
| UE Category | 2-8 | 2-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.5.3.1.

### 9.5.3.1_C.1.4 Test description

#### 9.5.3.1_C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, FigureA.40.
2. The parameter settings for the cell are set up according to Table 9.5.3.1_C.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF (in Cell 1) according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.3.1_C.1.4.3.

### 9.5.3.1_C.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.3.1_C.1.3-1 and C.3.3-1 of Annex C.3.3 as appropriate.

2. The SS shall send PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to the UE reported CQI and fixed RI as defined in Table 9.5.3.1_C.1.3-1. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC.

3. Measure the $t_{fix}$ according to annex G.5.3.

4. Propagation conditions are set according to Annex B.1.

5. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in every subframe (Table A.4.1-1).

6. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.3.1_C.1.3-1.

7. The UE shall transmit RRC Connection Reconfiguration Complete message.

8. Propagation conditions are set according to Table 9.5.3.1_C.1.3-1.

9. The SS shall send PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to the UE reported CQI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC.

10. Measure $t_{reported}$ according to Annex G.5.3

    If the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.5.3.1_C.1.5-1, then pass the UE for this test and go to step 11. Otherwise, fail the UE.

11. If all tests have not been done, then repeat the same procedure (steps 1 to 10) with test conditions according to the Table 9.5.3.1_C.1.3-1 for the other Tests as appropriate. Otherwise pass the UE.

### 9.5.3.1_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.5.3.1_C.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | According to each test | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | Release | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig | *Not present* | | |
| cqi-ReportConfig-r10 | *CQI-ReportConfig-r10-DEFAULT* | | |
| } | | | |

**Table 9.5.3.1_C.1.4.3-2: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '10000000100000001000 00001000000010000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.3.1_C.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 11 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 5 | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-pmi-ConfigIndex2-r10 | 10 | | |
| ri-Configindex2-r10 | 2 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '10000000100000001000 00001000000010000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '01111111011111110111 11110111111101111111' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

9.5.3.1_C.1.5 Test requirement

**Table 9.5.3.1_C.1.5-1: Minimum requirement (FDD)**

| | **Test 1** | **Test 2** |
|---|---|---|
| $\gamma_1$ | 0.89 | 1.04 |
| UE Category | 2-8 | 2-8 |

## 9.5.3.2_C TDD RI Reporting – PUCCH 1-0 for eICIC

### 9.5.3.2_C.1 TDD RI Reporting – PUCCH 1-0 for eICIC (non-MBSFN ABS)

#### 9.5.3.2_C.1.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank under time domain resource restriction i.e. in case two CSI subframe sets are configured.

#### 9.5.3.2_C.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE - Category 2-8 -release 10 and forward. Applicability requires support for FGI bit 115.

#### 9.5.3.2_C.1.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.3.2_C.1.3-2 is defined as:

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$.

For the parameters specified in Table 9.5.3.2_C.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.3.2_C.1.3-2.

**Table 9.5.3.2_C.1.3-1: RI Test (TDD)**

| Parameter | | Unit | Test1 | | Test2 | |
|---|---|---|---|---|---|---|
| | | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Bandwidth | | MHz | 10 | | 10 | |
| PDSCH transmission mode | | | 3 | Note 11 | 3 | Note 11 |
| Uplink downlink configuration | | | 1 | | 1 | |
| Special subframe configuration | | | 4 | | 4 | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | -3 | |
| | $\rho_B$ | dB | -3 | | -3 | |
| | σ | dB | 0 | | 0 | |
| Propagation condition and antenna configuration | | | 2 x 2 EPA5 | | 2 x 2 EPA5 | |
| CodeBookSubsetRestriction bitmap | | | 01 for fixed RI = 1<br>10 for fixed RI = 2<br>11 for UE reported RI | N/A | 01 for fixed RI = 1<br>10 for fixed RI = 2<br>11 for UE reported RI | N/A |
| Antenna correlation | | | Low | | Low | |
| RI configuration | | | Fixed RI=1 and follow RI | N/A | Fixed RI=1 and follow RI | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | 0 | -12 | 20 | 6 |
| $N_{oc}^{(j)}$ | $N_{oc1}^{(j)}$ | dB[mW/15kHz] | -98 (Note 4) | N/A | -102 (Note 4) | N/A |
| | $N_{oc2}^{(j)}$ | | -98 (Note 5) | N/A | -98 (Note 5) | N/A |
| | $N_{oc3}^{(j)}$ | | -98 (Note 6) | N/A | -94.8 (Note 6) | N/A |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -110 | -78 | -92 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Cell Id | | | 0 | 1 | 0 | 1 |
| Time Offset between Cells | | µs | 2.5 (synchronous cells) | | 2.5 (synchronous cells) | |
| ABS Pattern (Note 7) | | | N/A | 0000000001 0000000001 | N/A | 0000000001 0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 8) | | | 0000000001 0000000001 | N/A | 0000000001 0000000001 | N/A |
| CSI Subframe Sets (Note 9) | $C_{CSI,0}$ | | 0000000001 0000000001 | N/A | 0000000001 0000000001 | N/A |
| | $C_{CSI,1}$ | | 1100111000 1100111000 | | 1100111000 1100111000 | |
| Number of control OFDM Symbols | | | 3 | 3 | 3 | 3 |
| Maximum number of HARQ transmissions | | | 1 | | 1 | |
| Reporting mode | | | PUCCH 1-0 | | PUCCH 1-0 | |
| Physical channel for $C_{CSI,0}$ CQI and RI reporting | | | PUCCH Format 2 | | PUCCH Format 2 | |
| PUCCH Report Type for CQI | | | 4 | | 4 | |

| | | | | | |
|---|---|---|---|---|---|
| Physical channel for $C_{CSI,1}$ CQI and RI reporting | | PUSCH (Note 3) | | PUSCH (Note 3) | |
| PUCCH Report Type for RI | | 3 | | 3 | |
| Reporting periodicity | ms | $N_{pd}$= 10 | | $N_{pd}$= 10 | |
| ACK/NACK feedback mode | | Multiplexing | | Multiplexing | |
| *cqi-pmi-ConfigurationIndex* | | 8 | | 8 | |
| *ri-ConfigurationInd* | | 5 | | 5 | |
| *cqi-pmi-ConfigurationIndex2* | | 9 | | 9 | |
| *ri-ConfigurationInd2* | | 0 | | 0 | |
| Cyclic prefix | | Normal | Normal | Normal | Normal |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel in Cell 1 RC.2 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
Note 3: To avoid collisions between RI/CQI reports and HARQ-ACK it is necessary to report them on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#9 to allow periodic RI/CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe #3.
Note 4: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
Note 5: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 6: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 7: ABS pattern as defined in TS 36.423 [14]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 8: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 9: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 10: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell 1 and Cell 2 is the same.
Note 11: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern OP.5 TDD as defined in Annex A.5.2.5.

**Table 9.5.3.2_C.1.3-2: Minimum requirement (TDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\gamma_1$ | 0.9 | 1.05 |
| UE Category | 2-8 | 2-8 |

The normative reference for this requirement is TS 36.101 [2] clause 9.5.3.2.

### 9.5.3.2_C.1.4 Test description

#### 9.5.3.2_C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40.

2. The parameter settings for the cell are set up according to Table 9.5.3.2_C.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.3.2_C.1.4.3.

### 9.5.3.2_C.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.3.2_C.1.3-1 and C.3.3-1 of Annex C.3.3 as appropriate.

2. The SS shall send PDSCH in via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to the UE reported CQI and fixed RI as defined in Table 9.5.3.2_C.1.3-1. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC.
   The SS sends uplink scheduling information via PDCCH DCI format 0 in subframe #9 with CQI request bit set to 0 to schedule UL RMC in subframe #3 (Table A.4.1-2).

3. Measure the $t_{fix}$ according to annex G.5.3.

4. Propagation conditions are set according to Annex B.1.

5. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in subframe #3 and #8 (Table A.4.1-2).

6. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.3.2_C.1.3-1.

7. The UE shall transmit RRC Connection Reconfiguration Complete message.

8. Propagation conditions are set according to Table 9.5.3.2_C.1.3-1.

9. The SS shall send PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to the UE reported CQI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC.
   The SS sends uplink scheduling information via PDCCH DCI format 0 in subframe #9 with CQI request bit set to 0 to schedule UL RMC in subframe #3 (Table A.4.1-2).

10. Measure $t_{reported}$ according to Annex G.5.3

    If the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.5.3.2_C.1.5-1, then pass the UE for this test and go to step 11. Otherwise, fail the UE.

11. If all tests have not been done, then repeat the same procedure (steps 1 to 10) with test conditions according to the Table 9.5.3.2_C.1.3-1 for the other Tests as appropriate. Otherwise pass the UE.

### 9.5.3.2_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.5.3.2_C.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 Table 5.5.1.2-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm3 | | |
| codebookSubsetRestriction CHOICE { | | | |
| n2TxAntenna-tm3 | According to each test | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | Release | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportConfig | *Not present* | | |
| cqi-ReportConfig-r10 | *CQI-ReportConfig-r10-DEFAULT* | | |
| } | | | |

**Table 9.5.3.2_C.1.4.3-2: *RadioResourceConfigDedicated-SRB2-DRB(n, m)***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE{ | | | |
| subframeConfig1-5-r10 | '00000000010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.3.2_C.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 8 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 5 | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-pmi-ConfigIndex2-r10 | 9 | | |
| ri-Configindex2-r10 | 0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '00000000010000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '11001110001100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.3.2_C.1.4.3-4: *TDD-Config-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

9.5.3.2_C.1.5 Test requirement

**Table 9.5.3.2_C.1.5-1: Minimum requirement (TDD)**

| | **Test 1** | **Test 2** |
|---|---|---|
| $\gamma_1$ | 0.89 | 1.04 |
| UE Category | 2-8 | 2-8 |

## 9.5.4 RI Reporting (two CSI subframe sets and CRS assistance information are configured)

### 9.5.4.1_E FDD RI Reporting – PUCCH 1-0 for feICIC

#### 9.5.4.1_E.1 FDD RI Reporting – PUCCH 1-0 for feICIC (non-MBSFN ABS)

##### 9.5.4.1_E.1.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank under time domain resource restriction i.e. in case two CSI subframe sets are configured.

##### 9.5.4.1_E.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE and CRS interference handling – UE Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

##### 9.5.4.1_E.1.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.4.1_E.1.3-2 is defined as:

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$.

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

In Table 9.5.4.1_E.1.3-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [5] including Cell 2 and Cell 3 is provided.

**Table 9.5.4.1_E.1.3-1: RI Test (FDD)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | 10 | 10 |
| PDSCH transmission mode | | | 3 | As defined in Note 1 | As defined in Note 1 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 | -3 | -3 |
| | σ | dB | 0 | N/A | N/A |
| Propagation condition and antenna configuration | | | 2×2 EPA5 (Note 2) | 2×2 EPA5 (Note 2) | 2×2 EPA5 (Note 2) |
| CodeBookSubsetRestriction bitmap | | | 01 for fixed RI = 1<br>10 for fixed RI = 2<br>11 for UE reported RI | As defined in Note 1 | As defined in Note 1 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dB[mW/15kHz] | -98 (Note 3) | N/A | N/A |
| | $N_{oc2}$ | dBmW/15kHz | -98 (Note 4) | N/A | N/A |
| | $N_{oc3}$ | dB[mW/15kHz] | -93 (Note 5) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 9.5.4.1_E.1.3-2 for each test | 12 | 10 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | Reference Value in Table 9.5.4.1_E.1.3-2 for each test | -86 | -88 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 6) | | | N/A | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 |
| RLM/RRM Measurement Subframe Pattern (Note 7) | | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A | N/A |
| CSI Subframe Sets (Note 8) | $C_{CSI,0}$ | | 10000000<br>10000000<br>10000000<br>10000000<br>10000000 | N/A | N/A |
| | $C_{CSI,1}$ | | 01111111<br>01111111<br>01111111<br>01111111<br>01111111 | N/A | N/A |
| Number of control OFDM symbols | | | 3 | Note 9 | Note 9 |
| Maximum number of HARQ transmissions | | | 1 | N/A | N/A |
| Reporting mode | | | PUCCH 1-0 | N/A | N/A |
| Physical channel for CQI reporting | | | PUCCH format 2 | N/A | N/A |
| PUCCH Report Type for CQI | | | 4 | N/A | N/A |
| Physical channel for RI reporting | | | PUCCH Format 2 | N/A | N/A |

| | | | | |
|---|---|---|---|---|
| PUCCH Report Type for RI | | 3 | N/A | N/A |
| Reporting periodicity | ms | $N_{pd}$= 10 | N/A | N/A |
| *cqi-pmi-ConfigurationIndex* | | 11 | N/A | N/A |
| *ri-ConfigurationInd* | | 5 | N/A | N/A |
| *cqi-pmi-ConfigurationIndex2* | | 10 | N/A | N/A |
| *ri-ConfigurationInd2* | | 2 | N/A | N/A |
| Cyclic prefix | | Normal | Normal | Normal |

Note 1: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex TS 36.521-1 [10] C.3.3 applying OCNG pattern OP.5 FDD as defined in TS 36.521-1 [10] Annex A.5.1.5.
Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 3: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 5: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 6: ABS pattern as defined in TS 36.423 [14]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 7: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 8: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 9: The number of control OFDM symbols is not available for ABS and is 3 for the subframe indicated by "0" of ABS pattern.
Note 10: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 11: Reference measurement channel in Cell 1 RC.2 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 12: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 13: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

**Table 9.5.4.1_E.1.3-2: Minimum requirement (FDD)**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\hat{E}_s / N_{oc2}$ for Cell 1 (dB) | 4 | 20 | 20 |
| $\hat{I}_{or}^{(j)}$ for Cell 1 (dB[mW/15kHz]) | -94 | -78 | -78 |
| Antenna correlation | High for Cell 1, low for Cell 2 and Cell 3 | Low for Cell 1, Cell 2 and Cell 3 | High for Cell 1, low for Cell 2 and Cell 3 |
| $\gamma_1$ | N/A | 1.05 | 0.9 |
| $\gamma_2$ | 1.05 | N/A | N/A |
| UE Category | ≥2 | ≥2 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.5.4.1.

### 9.5.4.1_E1.4 Test description

#### 9.5.4.1_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.

2. The parameter settings for the cell are set up according to Table 9.5.4.1_E.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF (in Cell 1) according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 9.5.4.1_E.1.4.3.

### 9.5.4.1_E.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.4.1_E.1.3-1 as appropriate.
2. Set the Cell 2 and Cell 3 as defined in Table 9.5.4.1_E.1.3-1 and according to Annex C3.3.
3. The SS shall send PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to the UE reported CQI and fixed RI as defined in Table 9.5.4.1_E.1.3-1. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC.
4. Measure $t_{fix}$ during ABS according to annex G.5.3.
5. Propagation conditions are set according to Annex B.1.
6. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in every subframe (Table A.4.1-1).
7. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.4.1_E.1.3-1.
8. The UE shall transmit RRC Connection Reconfiguration Complete message.
9. Propagation conditions are set according to Table 9.5.4.1_E.1.3-1.
10. The SS shall send PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to the UE reported CQI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC.
11. Measure $t_{reported}$ during ABS according to Annex G.5.3

    If the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.5.4.1_E.1.5-1, then pass the UE for this test and go to step 12. Otherwise, fail the UE.
12. If all tests have not been done, then repeat the same procedure (steps 1 to 11) with test conditions according to the Table 9.5.4.1_E.1.3-1 for the other Tests as appropriate. Otherwise pass the UE.

### 9.5.4.1_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 9.5.4.1_E.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional FDD RI test performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternFDD-r10 | '1000000010000000 1000000010000000 10000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::=SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 126 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.4.1_E.1.4.3-2: PhysicalConfigDedicated-DEFAULT: Additional FDD RI test performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 9.5.4.1_E.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT*: Additional FDD RI test performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 11 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 5 | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-pmi-ConfigIndex2-r10 | 10 | | |
| ri-Configindex2-r10 | 2 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '1000000010000000 1000000010000000 10000000' | BIT STRING (SIZE (40)) | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternFDD-r10 | '01111111 01111111 01111111 01111111 01111111' | BIT STRING (SIZE (40)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.4.1_E.1.4.3-4: *AntennaInfoDedicated-r10:* Additional FDD RI test performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm3 for Cell 1<br><br>Cell 2 and Cell 3 according to test | Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex TS 36.521-1 [10] C.3.3 applying OCNG pattern OP.5 FDD as defined in TS 36.521-1 [10] Annex A.5.1.5. | |
| codebookSubsetRestriction-r10 | 01 for fixed RI = 1<br>10 for fixed RI = 2<br>11 for UE reported RI for Cell 1<br><br>Cell 2 and Cell 3 according to test | Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex TS 36.521-1 [10] C.3.3 applying OCNG pattern OP.5 FDD as defined in TS 36.521-1 [10] Annex A.5.1.5. | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

9.5.4.1_E.1.5 Test requirement

**Table 9.5.4.1_E.1.5-1: Test requirement (FDD)**

| | **Test 1** | **Test 2** | **Test 3** |
|---|---|---|---|
| $\hat{E}_s / N_{oc2}$ for Cell 1 (dB) | 4 | 20 | 20 |
| $\hat{I}_{or}^{(j)}$ for Cell 1 (dB[mW/15kHz]) | -94 | -78 | -78 |
| Antenna correlation | High for Cell 1, low for Cell 2 and Cell 3 | Low for Cell 1, Cell 2 and Cell 3 | High for Cell 1, low for Cell 2 and Cell 3 |
| $\gamma_1$ | N/A | 1.04 | 0.89 |
| $\gamma_2$ | 1.04 | N/A | N/A |
| UE Category | ≥2 | ≥2 | ≥2 |

## 9.5.4.2_E TDD RI Reporting – PUCCH 1-0 for feICIC

### 9.5.4.2_E.1 TDD RI Reporting – PUCCH 1-0 for feICIC (non-MBSFN ABS)

#### 9.5.4.2_E.1.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank under time domain resource restriction i.e. in case two CSI subframe sets are configured.

#### 9.5.4.2_E.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE and CRS interference handling and ss-CCH interference handling – UE Category ≥2 release 11 and forward. Applicability requires support of FGI bit 115.

#### 9.5.4.2_E.1.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.4.2_E.1.3-2 is defined as:

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$.

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

In Table 9.5.4.2_E.1.3-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [5] including Cell 2 and Cell 3 is provided.

**Table 9.5.4.2_E.1.3-1: RI Test (TDD)**

| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | 10 | 10 |
| PDSCH transmission mode | | | 3 | As defined in Note 1 | As defined in Note 1 |
| Uplink downlink configuration | | | 1 | 1 | 1 |
| Special subframe configuration | | | 4 | 4 | 4 |
| Downlink power allocation | $\rho_A$ | dB | -3 | -3 | -3 |
| | $\rho_B$ | dB | -3 | -3 | -3 |
| | σ | dB | 0 | N/A | N/A |
| Propagation condition and antenna configuration | | | 2×2 EPA5 (Note 2) | 2×2 EPA5 (Note 2) | 2×2 EPA5 (Note 2) |
| CodeBookSubsetRestriction bitmap | | | 01 for fixed RI = 1<br>10 for fixed RI = 2<br>11 for UE reported RI | As defined in Note 1 | As defined in Note 1 |
| $N_{oc}$ at antenna port | $N_{oc1}$ | dB[mW/15kHz] | -98](Note 3) | N/A | N/A |
| | $N_{oc2}$ | dB[mW/15kHz] | -98 (Note 4) | N/A | N/A |
| | $N_{oc3}$ | dB[mW/15kHz] | -93 (Note 5) | N/A | N/A |
| $\hat{E}_s / N_{oc2}$ | | dB | Reference Value in Table 9.5.4.2_E.1.3-2 for each test | 12 | 10 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | Reference Value in Table 9.5.4.2_E.1.3-2 for each test | -86 | -88 |
| Subframe Configuration | | | Non-MBSFN | Non-MBSFN | Non-MBSFN |
| Time Offset between Cells | | μs | N/A | 3 | -1 |
| Frequency shift between Cells | | Hz | N/A | 300 | -100 |
| Cell Id | | | 0 | 126 | 1 |
| ABS pattern (Note 6) | | | N/A | 0000000001<br>0000000001 | 0000000001<br>0000000001 |
| RLM/RRM Measurement Subframe Pattern (Note 7) | | | 0000000001<br>0000000001 | N/A | N/A |
| CSI Subframe Sets (Note 8) | $C_{CSI,0}$ | | 0000000001<br>0000000001 | N/A | N/A |
| | $C_{CSI,1}$ | | 1100111000<br>1100111000 | N/A | N/A |
| Number of control OFDM symbols | | | 3 | Note 9 | Note 9 |
| Maximum number of HARQ transmissions | | | 1 | N/A | N/A |
| Reporting mode | | | PUCCH 1-0 | N/A | N/A |
| Physical channel for $C_{CSI,0}$ CQI and RI reporting | | | PUCCH format 2 | N/A | N/A |
| Physical channel for $C_{CSI,1}$ CQI and RI reporting | | | PUSCH (Note ) | N/A | N/A |
| PUCCH Report Type for CQI | | | 4 | N/A | N/A |
| PUCCH Report Type for RI | | | 3 | N/A | N/A |
| Reporting periodicity | | ms | $N_{pd}$= 10 | N/A | N/A |
| ACK/NACK feedback mode | | | Multiplexing | N/A | N/A |
| *cqi-pmi-ConfigurationIndex* | | | 8 | N/A | N/A |
| *ri-ConfigurationInd* | | | 5 | N/A | N/A |
| *cqi-pmi-ConfigurationIndex2* | | | 9 | N/A | N/A |
| *ri-ConfigurationInd2* | | | 0 | N/A | N/A |
| Cyclic prefix | | | Normal | Normal | Normal |

| | |
|---|---|
| Note 1: | Downlink physical channel setup in Cell 2 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern OP.5 TDD as defined in TS 36.521-1 [10] Annex A.5.2.5. |
| Note 2: | The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. |
| Note 3: | This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS. |
| Note 4: | This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS. |
| Note 5: | This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS. |
| Note 6: | ABS pattern as defined in [9]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. |
| Note 7: | Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5]. |
| Note 8: | As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331[5]. |
| Note 9: | The number of control OFDM symbols is not available for ABS and is 3 for the subframe indicated by “0” of ABS pattern. |
| Note 10: | If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4). |
| Note 11: | Reference measurement channel in Cell 1 RC.2 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. |
| Note 12: | The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same. |
| Note 13: | SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test. |
| Note 14: | To avoid collisions between RI/CQI reports and HARQ-ACK it is necessary to report them on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic RI/CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3. |

**Table 9.5.4.2_E.1.3-2: Minimum requirement (TDD)**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\hat{E}_s / N_{oc2}$ for Cell 1 (dB) | 4 | 20 | 20 |
| $\hat{I}_{or}^{(j)}$ for Cell 1 (dB[mW/15kHz]) | -94 | -78 | -78 |
| Antenna correlation | High for Cell 1, low for Cell 2 and Cell 3 | Low for Cell 1, Cell 2 and Cell 3 | High for Cell 1, low for Cell 2 and Cell 3 |
| $\gamma_1$ | N/A | 1.05 | 0.9 |
| $\gamma_2$ | 1.05 | N/A | N/A |
| UE Category | ≥2 | ≥2 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.5.4.2.

### 9.5.4.2_E1.4 Test description

#### 9.5.4.2_E.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.48 for antenna configuration 2x2.

2. The parameter settings for the cell are set up according to Table 9.5.4.2_E.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2 with exceptions listed in 5.2A.5. Message contents are defined in clause 9.5.4.2_E.1.4.3.

### 9.5.4.2_E.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.4.2_E.1.3-1 as appropriate.

2. Set the Cell 2 and Cell 3 as defined in Tables 9.5.4.2_E.1.3-1 and according to Annex C3.3.

3. The SS shall send PDSCH in via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to the UE reported CQI and fixed RI as defined in Table 9.5.4.2_E.1.3-1. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC.
   The SS sends uplink scheduling information via PDCCH DCI format 0 in subframe #4 and #9 with CQI request bit set to 0 to schedule UL RMC in subframe #8 and #3 (Table A.4.1-2).

4. Measure $t_{fix}$ during ABS according to annex G.5.3.

5. Propagation conditions are set according to Annex B.1.

6. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in subframe #3 and #8 (Table A.4.1-2).

7. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.4.2_E.1.3-1.

8. The UE shall transmit RRC Connection Reconfiguration Complete message.

9. Propagation conditions are set according to Table 9.5.4.2_E.1.3-1.

10. The SS shall send PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to the UE reported CQI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC.
    The SS sends uplink scheduling information via PDCCH DCI format 0 in subframe #4 and #9 with CQI request bit set to 0 to schedule UL RMC in subframe #8 and #3 (Table A.4.1-2).

11. Measure $t_{reported}$ during ABS according to Annex G.5.3
    If the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.5.4.2_E.1.5-1, then pass the UE for this test and go to step 12. Otherwise, fail the UE.

12. If all tests have not been done, then repeat the same procedure (steps 1 to 11) with test conditions according to the Table 9.5.4.2_E.1.3-1 for the other Tests as appropriate. Otherwise pass the UE.

### 9.5.4.2_E.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

**Table 9.5.4.2_E.1.4.3-1: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: Additional TDD RI test performance downlink power allocation**

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 RadioResourceConfigDedicated-SRB2-DRB(n,m) | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| MeasSubframePatternPCell-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '0000000001 0000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| CRS-AssistancedInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11{ | | 2 entries | |
| CRS-AssistancedInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | 126 | | Cell 2 |
| | 1 | | Cell 3 |
| antennaPortsCount-r11 | an2 | | Cell 2, Cell 3 |
| mbsfn-SubframeConfigList-r11::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig{ | | | Cell 2, Cell 3 |
| MBSFN-SubframeConfig:: = SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '000000' B | non-MBSFN | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.4.2_E.1.4.3-2: PhysicalConfigDedicated-DEFAULT: Additional TDD RI test performance downlink power allocation**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | |
| } | | | |

**Table 9.5.4.2_E.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT*: Additional TDD RI test performance downlink power allocation**

| Derivation Path: 36.508 [7] clause 4.6.3, Table 4.6.3-2AA CQI-ReportConfig-r10-DEFAULT_ | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 8 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 5 | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 CHOICE{ | | | |
| setup SEQUENCE{ | | | |
| cqi-pmi-ConfigIndex2-r10 | 9 | | |
| ri-Configindex2-r10 | 0 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| pmi-RI-Report-r9 | Not present | | |
| csi-SubframePatternConfig-r10 CHOICE { | | | |
| setup SEQUENCE { | | | |
| csi-MeasSubframeSet1-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '0000000001 0000000001' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| csi-MeasSubframeSet2-r10 CHOICE { | | | |
| subframePatternTDD-r10 CHOICE { | | | |
| subframeConfig1-5-r10 | '1100111000 1100111000' | BIT STRING (SIZE (20)) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.4.2_E.1.4.3-4: *PDSCH-ConfigDedicated-DEFAULT:* Additional TDD RI test performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-3 | | |
| } | | | |

**Table 9.5.4.2_E.1.4.3-5: *AntennaInfoDedicated-r10:* Additional TDD RI test performance downlink power allocation**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm3 for Cell 1<br><br>Cell 2 and Cell 3 according to test | Downlink physical channel setup in Cell 2 and Cell 3 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern OP.5 TDD as defined in TS 36.521-1 [10] Annex A.5.2.5. | |
| codebookSubsetRestriction-r10 | 01 for fixed RI = 1<br>10 for fixed RI = 2<br>11 for UE reported RI for Cell 1<br><br>Cell 2 and Cell 3 according to test | Downlink physical channel setup in Cell 2 and Cell 3 in accordance with TS 36.521-1 [10] Annex C.3.3 applying OCNG pattern OP.5 TDD as defined in TS 36.521-1 [10] Annex A.5.2.5. | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

**Table 9.5.4.2_E.1.4.3-6: TDD-Config-DEFAULT: Additional TDD RI test performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.5.4.2_E.1.4.3-7: PUCCH-ConfigDedicated-DEFAULT*:* Additional TDD RI test performance downlink power allocation**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | | |
| } | | | |

9.5.4.2_E.1.5 Test requirement

**Table 9.5.4.2_E.1.5-1: Test requirement (TDD)**

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| $\hat{E}_s / N_{oc2}$ for Cell 1 (dB) | 4 | 20 | 20 |
| $\hat{I}_{or}^{(j)}$ for Cell 1 (dB[mW/15kHz]) | -94 | -78 | -78 |
| Antenna correlation | High for Cell 1, low for Cell 2 and Cell 3 | Low for Cell 1, Cell 2 and Cell 3 | High for Cell 1, low for Cell 2 and Cell 3 |
| $\gamma_1$ | N/A | 1.04 | 0.89 |
| $\gamma_2$ | 1.04 | N/A | N/A |
| UE Category | ≥2 | ≥2 | ≥2 |

# 9.5.5 RI Reporting (with CSI processes)

## 9.5.5.1_F FDD RI Reporting with CSI processes for CoMP

### 9.5.5.1_F.1 FDD RI Reporting with Single CSI process for CoMP

#### 9.5.5.1_F.1.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank with one CSI process configured.

#### 9.5.5.1_F.1.2 Test applicability

This test applies to all types of E-UTRA FDD category ≥2 UEs release 11 and forward, supporting Maximum CSI processes of One on a component carrier within a band with PDSCH transmission mode 10.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.5.5.1_F.1.3 Minimum conformance requirements

Each CSI process is associated with a CSI-RS resource and a CSI-IM resource as shown in Table 9.5.5.1_F.1.3-1. For UE supports one CSI process CSI process 0 is configured for Test 1 and Test 2, but CSI process 1 is not configured for Test 2. The corresponding γ requirements for Test 1 and Test 2 shall be fulfilled. The requirement on reported RI for CSI process 1 in Test 2 is not applicable.

For UE supports multiple CSI processes, CSI process 0 is configured for Test 1 and CSI processes 0 and 1 are configured for Test 2. The corresponding γ requirements for Test 1 and Test 2 shall be fulfilled, and also the requirement on reported RI for CSI process 1 in Test 2.

The minimum performance requirement in Table 9.5.5.1_F.1.3-2 is defined as:

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be ≥ $\gamma_1$.

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be ≥ $\gamma_2$;

c) For Test 2, the RI reported for CSI process 1 shall be the same as the most recent RI reported for CSI process 0 if UE is configured with multiple CSI processes.

For the parameters specified in Table 9.5.5.1_F.1.3-2, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.5.1_F.1.3-3.

**Table 9.5.5.1_F.1.3-1: Configuration of CSI processes**

| | CSI process 0 | CSI process 1 |
|---|---|---|
| CSI-RS resource | CSI-RS signal 0 | CSI-RS signal 1 |
| CSI-IM resource | CSI-IM resource 0 | CSI-IM resource 1 |

**Table 9.5.5.1_F.1.3-2: Test Parameters for RI Reporting with Single CSI process for CoMP (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | TP1 | TP2 | TP1 | TP2 |
| Bandwidth | | MHz | 10 MHz | | 10 MHz | |
| Transmission mode | | | 10 | 10 | 10 | 10 |
| Downlink power allocation | $\rho_A$ | dB | 0 | | 0 | |
| | $\rho_B$ | dB | 0 | | 0 | |
| | $P_C$ | dB | 0 | 0 | 0 | 0 |
| | σ | dB | 0 | | 0 | |
| SNR | | dB | 0 | 0 | 20 | 20 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -78 | -78 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | EPA 5 Low | EPA 5 Low | EPA 5 Low | EPA 5 High |
| Antenna configuration | | | 2x2 | 2x2 | 2x2 | 2x2 |
| Beamforming Model | | | As specified in Section B.4.3 | | As specified in Section B.4.3 | |
| Timing offset between TPs | | us | 0 | | 0 | |
| Frequency offset between TPs | | Hz | 0 | | 0 | |
| Cell-specific reference signals | | | Antenna ports 0 | | Antenna ports 0 | |
| CSI-RS signal 0 | | | Antenna ports 15,16 | N/A | Antenna ports 15,16 | N/A |
| CSI-RS 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | N/A | 5/1 | N/A |
| CSI-RS 0 configuration | | | 0 | N/A | 0 | N/A |
| CSI-RS signal 1 | | | N/A | Antenna ports 15,16 | N/A | Antenna ports 15,16 |
| CSI-RS 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | 5/1 | N/A | 5/1 |
| CSI-RS 1 configuration | | | N/A | 3 | N/A | 3 |
| Zero-power CSI-RS 0 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | N/A | 1 / 1000001000000000 | N/A | 1 / 1000001000000000 |
| Zero-power CSI-RS 1 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 1 / 0011000000000000 | N/A | 1 / 0011000000000000 | N/A |
| CSI-IM 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | N/A | 5/1 | N/A |
| CSI-IM 0 configuration | | | 2 | N/A | 2 | N/A |
| CSI-IM 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | 5/1 | N/A | 5/1 |
| CSI-IM 1 configuration | | | N/A | 6 | N/A | 6 |
| RI configuration | | | Fixed RI=2 and follow RI | N/A | Fixed RI=1 and follow RI | N/A |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 6) | N/A | PUSCH (Note 6) | PUSCH (Note 6) |
| PUCCH Report Type for CQI/PMI | | | 2 | N/A | 2 | 2 |
| Physical channel for RI reporting | | | PUCCH Format 2 | N/A | PUCCH Format 2 | PUCCH Format 2 |
| PUCCH Report Type for RI | | | 3 | N/A | 3 | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| CSI process 0 (Note 7) | CSI-RS | | CSI-RS 0 | N/A | CSI-RS 0 | N/A |
| | CSI-IM | | CSI-IM 0 | N/A | CSI-IM 0 | N/A |
| | Reporting mode | | PUCCH 1-1 | N/A | PUCCH 1-1 | N/A |
| | Reporting periodicity | ms | $N_{pd}$ = 5 | N/A | $N_{pd}$ = 5 | N/A |
| | CQI delay | ms | 8 | N/A | 10 | N/A |
| | *cqi-pmi-ConfigurationIndex* | | 6 | N/A | 6 | N/A |
| | *ri-ConfigIndex* | | 1 | N/A | 1 | N/A |
| CSI process 1 (Note 7, Note 9) | CSI-RS | | N/A | N/A | N/A | CSI-RS 1 |
| | CSI-IM | | N/A | N/A | N/A | CSI-IM 1 |
| | Reporting mode | | N/A | N/A | N/A | PUCCH 1-1 |
| | Reporting periodicity | ms | N/A | N/A | N/A | $N_{pd}$ = 5 |
| | CQI delay | ms | N/A | N/A | N/A | 10 |
| | *cqi-pmi-ConfigurationIndex* | | N/A | N/A | N/A | 4 |
| | *ri-ConfigIndex* | | N/A | N/A | N/A | 1 |
| CSI process for PDSCH scheduling | | | CSI process 0 | | CSI process 0 | |
| Cell ID | | | 0 | 6 | 0 | 6 |
| Quasi-co-located CSI-RS | | | CSI-RS 0 | CSI-RS 1 | CSI-RS 0 | CSI-RS 1 |
| Quasi-co-located CRS | | | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 |
| PMI for subframe 2, 3, 4, 7, 8 and 9 | | | 010000 for fixed RI = 2 010011 for UE reported RI | 100000 | 000011 for fixed RI = 1 010011 for UE reported RI | N/A |
| PMI for subframe 1 and 6 | | | 100000 | 100000 | 100000 | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | 1 | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: 3 symbols allocated to PDCCH.
Note 3: Reference measurement channel RC.13 FDD according to Table A.4-1. PDSCH transmission is scheduled on subframe 2, 3, 4, 7, 8 and 9 from TP1.
Note 4: TM10 OCNG is transmitted as specified in A.5.1.8 is transmitted on subframe 1 and 6 from TP1.
Note 5: TM10 OCNG is transmitted as specified in A.5.1.8 is transmitted on subframe 1, 2, 3, 4, 6, 7, 8 and 9 from TP2 for Test 1; TP2 is blanked for Test 2.
Note 6: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.
Note 7: If UE supports multiple CSI processes, CSI process 0 is configured as 'RI-reference CSI process' for CSI process 1.
Note 8: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.
Note 9: If UE supports one CSI process, CSI process 1 is not configured in Test 2.

**Table 9.5.5.1_F.1.3-3: Minimum requirements for RI Reporting with Single CSI process for CoMP (FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\gamma_1$ | N/A | 1.0 |
| $\gamma_2$ | 1.0 | N/A |
| UE Category | ≥2 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.5.5.1.

### 9.5.5.1_F.1.4 Test description

#### 9.5.5.1_F.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2 for UE with 2Rx RF band and Annex A, Figure A.40a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.5.5.1_F.1.3-2.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.5.1_F.1.4.3.

### 9.5.5.1_F.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction, PMI for subframe for fixed Rank and the SNR according to Table 9.5.5.1_F.1.3-2 and C.3.2-1 of Annex C.3.2 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and fixed RI as defined in Table 9.5.5.1_F.1.3-2. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4.1-1).
3. Measure the $t_{fix}$ (fixed Rank 1 or fixed Rank 2) according to annex G.5.3.
4. Propagation conditions are set according to Annex B.1.
5. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in every subframe (Table A.4.1-1).
6. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.5.1_F.1.5-2.
7. The UE shall transmit RRC Connection Reconfiguration Complete message.
8. Propagation conditions are set according to Table 9.5.5.1_F.1.5-2.
9. The SS shall send PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4.1-1).
10. Measure $t_{reported}$ according to Annex G.5.3

    If the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.5.5.1_F.1.5-1, then pass the UE for this test and go to step 11. Otherwise, fail the UE.
11. If all tests have not been done, then repeat the same procedure (steps 1 to 10) with test conditions according to the Table 9.5.5.1_F.1.3-1 for the other Tests as appropriate. Otherwise pass the UE.

### 9.5.5.1_F.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.5.5.1_F.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-ConfigZPToAddModList-r11 | *CSI-RS-ConfigZP-r11-DEFAULT* | | |
| cqi-ReportConfig-v1130 | *CQI-ReportConfig-v1130-DEFAULT* | | |
| } | | | |

**Table 9.5.5.1_F.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path:36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.5.5.1_F.1.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| codebookSubsetRestriction-r10 | Not present | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.5.5.1_F.1.4.3-4: *CQI-ReportConfig-v1130-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF SEQUENCE { | 1 entry | | |
| cqi-ReportPeriodicProcExtId-r11[1] SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtId-r11 | 1 | | |
| cqi-pmi-ConfigIndex-r11 | 6 | CSI process 0 | |
| cqi-FormatIndicatorPeriodic-r11 CHOICE { | | | |
| widebandCQI-r11 SEQUENCE { | | | |
| csi-ReportMode-r11 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex-r11 | 1 | CSI process 0 | |
| csi-ConfigIndex-r11 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportBoth-r11 SEQUENCE { | | | |
| csi-ProcessToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF SEQUENCE { | 1 entry | | |
| p-C-AndCBSRList-r11[1] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11[1] | 0 | | |
| codebookSubsetRestriction-r11[1] | According to each test | 010000 for fixed RI = 2,<br>000011 for fixed RI = 1,<br>010011 for UE reported RI | |
| } | | | |
| cqi-ReportBothProc-r11[1] SEQUENCE { | | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.5.1_F.1.4.3-5: *CSI-RS-ConfigZP-r11-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11 | 1 | | |
| resourceConfigList-r11 | For Zero-power CSI-RS 0 = 0011000000000000<br>For Zero-power CSI-RS 1 configuration = 1000001000000000 | Parameter: *ZeroPowerCSI-RS* | |
| subframeConfig-r11 | 1 | $\Delta_{\text{CSI-RS}}$ = $I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4;<br>Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |

9.5.5.1_F.1.5 Test requirement

**Table 9.5.5.1_F.1.5-1: Test requirements for RI Reporting with Single CSI process for CoMP (FDD)**

| | **Test 1** | **Test 2** |
|---|---|---|
| $\gamma_1$ | N/A | 0.99 |
| $\gamma_2$ | 0.99 | N/A |
| UE Category | ≥2 | ≥2 |

**Table 9.5.5.1_F.1.5-2: Test Parameters for RI Reporting with Single CSI process for CoMP (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | TP1 | TP2 | TP1 | TP2 |
| Bandwidth | | MHz | 10 MHz | | 10 MHz | |
| Transmission mode | | | 10 | 10 | 10 | 10 |
| Downlink power allocation | $\rho_A$ | dB | 0 | | 0 | |
| | $\rho_B$ | dB | 0 | | 0 | |
| | $P_C$ | dB | 0 | 0 | 0 | 0 |
| | σ | dB | 0 | | 0 | |
| SNR for UE with 2Rx RF band | | dB | 0 | 0 | 20 | 20 |
| SNR for 4Rx UE without 2Rx RF band | | dB | -3 | -3 | 17 | 17 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -78 | -78 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | EPA 5 Low | EPA 5 Low | EPA 5 Low | EPA 5 High |
| Antenna configuration | | | 2x2 | 2x2 | 2x2 | 2x2 |
| Beamforming Model | | | As specified in Section B.4.3 | | As specified in Section B.4.3 | |
| Timing offset between TPs | | us | 0 | | 0 | |
| Frequency offset between TPs | | Hz | 0 | | 0 | |
| Cell-specific reference signals | | | Antenna ports 0 | | Antenna ports 0 | |
| CSI-RS signal 0 | | | Antenna ports 15,16 | N/A | Antenna ports 15,16 | N/A |
| CSI-RS 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | N/A | 5/1 | N/A |
| CSI-RS 0 configuration | | | 0 | N/A | 0 | N/A |
| CSI-RS signal 1 | | | N/A | Antenna ports 15,16 | N/A | Antenna ports 15,16 |
| CSI-RS 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | 5/1 | N/A | 5/1 |
| CSI-RS 1 configuration | | | N/A | 3 | N/A | 3 |
| Zero-power CSI-RS 0 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | N/A | 1 / 1000001000000000 | N/A | 1 / 1000001000000000 |
| Zero-power CSI-RS 1 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 1 / 0011000000000000 | N/A | 1 / 0011000000000000 | N/A |
| CSI-IM 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | N/A | 5/1 | N/A |
| CSI-IM 0 configuration | | | 2 | N/A | 2 | N/A |
| CSI-IM 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | 5/1 | N/A | 5/1 |
| CSI-IM 1 configuration | | | N/A | 6 | N/A | 6 |
| RI configuration | | | Fixed RI=2 and follow RI | N/A | Fixed RI=1 and follow RI | N/A |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 6) | N/A | PUSCH (Note 6) | PUSCH (Note 6) |
| PUCCH Report Type for CQI/PMI | | | 2 | N/A | 2 | 2 |
| Physical channel for RI reporting | | | PUCCH Format 2 | N/A | PUCCH Format 2 | PUCCH Format 2 |
| PUCCH Report Type for RI | | | 3 | N/A | 3 | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| CSI process 0 (Note 7) | CSI-RS | | CSI-RS 0 | N/A | CSI-RS 0 | N/A |
| | CSI-IM | | CSI-IM 0 | N/A | CSI-IM 0 | N/A |
| | Reporting mode | | PUCCH 1-1 | N/A | PUCCH 1-1 | N/A |
| | Reporting periodicity | ms | $N_{pd}$ = 5 | N/A | $N_{pd}$ = 5 | N/A |
| | CQI delay | ms | 8 | N/A | 10 | N/A |
| | *cqi-pmi-ConfigurationIndex* | | 6 | N/A | 6 | N/A |
| | *ri-ConfigIndex* | | 1 | N/A | 1 | N/A |
| CSI process 1 (Note 7, Note 9) | CSI-RS | | N/A | N/A | N/A | CSI-RS 1 |
| | CSI-IM | | N/A | N/A | N/A | CSI-IM 1 |
| | Reporting mode | | N/A | N/A | N/A | PUCCH 1-1 |
| | Reporting periodicity | ms | N/A | N/A | N/A | $N_{pd}$ = 5 |
| | CQI delay | ms | N/A | N/A | N/A | 10 |
| | *cqi-pmi-ConfigurationIndex* | | N/A | N/A | N/A | 4 |
| | *ri-ConfigIndex* | | N/A | N/A | N/A | 1 |
| CSI process for PDSCH scheduling | | | CSI process 0 | | CSI process 0 | |
| Cell ID | | | 0 | 6 | 0 | 6 |
| Quasi-co-located CSI-RS | | | CSI-RS 0 | CSI-RS 1 | CSI-RS 0 | CSI-RS 1 |
| Quasi-co-located CRS | | | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 |
| PMI for subframe 2, 3, 4, 7, 8 and 9 | | | 010000 for fixed RI = 2 010011 for UE reported RI | 100000 | 000011 for fixed RI = 1 010011 for UE reported RI | N/A |
| PMI for subframe 1 and 6 | | | 100000 | 100000 | 100000 | N/A |
| Max number of HARQ transmissions | | | 1 | N/A | 1 | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: 3 symbols allocated to PDCCH.
Note 3: Reference measurement channel RC.13 FDD according to Table A.4-1. PDSCH transmission is scheduled on subframe 2, 3, 4, 7, 8 and 9 from TP1.
Note 4: TM10 OCNG is transmitted as specified in A.5.1.8 is transmitted on subframe 1 and 6 from TP1.
Note 5: TM10 OCNG is transmitted as specified in A.5.1.8 is transmitted on subframe 1, 2, 3, 4, 6, 7, 8 and 9 from TP2 for Test 1; TP2 is blanked for Test 2.
Note 6: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.
Note 7: If UE supports multiple CSI processes, CSI process 0 is configured as 'RI-reference CSI process' for CSI process 1.
Note 8: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.
Note 9: If UE supports one CSI process, CSI process 1 is not configured in Test 2.
Note 10: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

### 9.5.5.1_F.2 FDD RI Reporting with Multiple CSI processes for CoMP

Editor's Note: The test procedure to test the reported RI requirement for CSI process 1 in Test 2 for multiple CSI process is TBD

#### 9.5.5.1_F.2.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank with multiple CSI process configured.

#### 9.5.5.1_F.2.2 Test applicability

This test applies to all types of E-UTRA FDD category≥ 2 UEs release 11 and forward, supporting Maximum CSI processes of Three or Four on a component carrier within a band with PDSCH transmission mode 10.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.5.5.1_F.2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.5.5.1_F.1.3

#### 9.5.5.1_F.2.4 Test description

##### 9.5.5.1_F.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2 for UE with 2Rx RF band and Annex A, Figure A.40a for 4Rx capable UE without any 2Rx RF bands.
2. The parameter settings for the cell are set up according to Table 9.5.5.1_F.2.3-2.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.5.1_F.2.4.3.

##### 9.5.5.1_F.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction, PMI for subframe for fixed Rank and the SNR according to Table 9.5.5.1_F.1.3-2 and C.3.2-1 of Annex C.3.2 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and fixed RI. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-1. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4.1-1).
3. Measure the $t_{fix}$ (fixed Rank 1 or fixed Rank 2) according to annex G.5.3.
4. Propagation conditions are set according to Annex B.1.
5. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in every subframe (Table A.4.1-1).
6. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.5.1_F.1.5-2.
7. The UE shall transmit RRC Connection Reconfiguration Complete message.
8. Propagation conditions are set according to Table 9.5.5.1_F.1.5-2.
9. The SS shall send PDSCH via PDCCH DCI format 2D for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-1. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4.1-1).

10. Measure $t_{reported}$ according to Annex G.5.3

    If the ratio ( $t_{reported}$ / $t_{fix}$ ) satisfies the requirement in Table 9.5.5.1_F.2.5-1, then pass the UE for this test and go to step 11. Otherwise, fail the UE.

11. If all tests have not been done, then repeat the same procedure (steps 1 to 10) with test conditions according to the Table 9.5.5.1_F.1.3-2 for the other Tests as appropriate. Otherwise pass the UE.

### 9.5.5.1_F.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.5.5.1_F.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.8.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-ConfigNZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-NZP-r11)) OF { | 2 entry | | |
| CSI-RS-ConfigNZP-r11 | CSI-RS-ConfigNZP-r11-DEFAULT | | |
| } | | | |
| csi-RS-ConfigZPToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-RS-ZP-r11)) OF { | 2 entry | | |
| CSI-RS-ConfigZP-r11 | CSI-RS-ConfigZP-r11-DEFAULT | | |
| } | | | |
| } | | | |

**Table 9.5.5.1_F.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.5.5.1_F.2.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| codebookSubsetRestriction-r10 | Not present | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.5.5.1_F.2.4.3-4: *CQI-ReportConfig- v1130-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF SEQUENCE { | 2 entry | | |
| cqi-ReportPeriodicProcExtId-r11[1] SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtId-r11 | For CSI process 0 = 1<br>For CSI process 1 = 2 | | |
| cqi-pmi-ConfigIndex-r11 | For CSI process 0 = 6<br>For CSI process 1 = 4 | | |
| cqi-FormatIndicatorPeriodic-r11 CHOICE { | | | |
| widebandCQI-r11 SEQUENCE { | | | |
| csi-ReportMode-r11 | Not present | | |
| } | | | |
| } | | | |
| ri-ConfigIndex-r11 | 1 | | |
| csi-ConfigIndex-r11 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| cqi-ReportBoth-r11 SEQUENCE { | | | |
| csi-IM-ConfigToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-IM-r11)) OF SEQUENCE { | 2 entry | | |
| csi-IM-ConfigId-r11 | For CSI-IM 0 = 1<br>For CSI-IM 1 = 2 | | |
| resourceConfig-r11 | For CSI-IM 0 = 2<br>For CSI-IM 1 = 6 | | |
| subframeConfig-r11 | 1 | | |
| } | | | |
| | | | |
| csi-ProcessToAddModList-r11 SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF SEQUENCE { | 2 entry | | |
| p-C-AndCBSRList-r11[1] SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11 | 0 | | |
| codebookSubsetRestriction-r11 | According to each test | 010000 for fixed RI = 2,<br>000011 for fixed RI = 1,<br>010011 for UE reported RI | |
| } | | | |
| cqi-ReportBothProc-r11[1] SEQUENCE { | | | |
| ri-Ref-CSI-ProcessId-r11 | 1 | | |
| pmi-RI-Report-r11 | setup | | |
| } | | | |
| cqi-ReportPeriodicProcId-r11 | For CSI process 0 = 1<br>For CSI process 1 = 2 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.5.1_F.2.4.3-5: *CSI-RS-ConfigNZP-r11-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigNZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigNZPId-r11 | For CSI-RS 0 = 1<br>For CSI-RS 1 = 2 | | |
| resourceConfig-r11 | For CSI-RS 0 = 0<br>For CSI-RS 1 = 3 | | |
| } | | | |

**Table 9.5.5.1_F.2.4.3-6: *CSI-RS-ConfigZP-r11-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11 | For Zero-power CSI-RS 0 = 1<br>For Zero-power CSI-RS 1 = 2 | | |
| resourceConfigList-r11 | For Zero-power CSI-RS 0 = 0011000000000000<br>For Zero-power CSI-RS 1 = 1000001000000000 | | |
| } | | | |

9.5.5.1_F.2.5 Test requirement

**Table 9.5.5.1_F.2.5-1: Test requirements for RI Reporting with Multiple CSI processes for CoMP (FDD)**

| | **Test 1** | **Test 2** |
|---|---|---|
| $\gamma_1$ | N/A | 0.99 |
| $\gamma_2$ | 0.99 | N/A |
| UE Category | ≥2 | ≥2 |

## 9.5.5.2_F TDD RI Reporting with CSI processes for CoMP

### 9.5.5.2_F.1 TDD RI Reporting with Single CSI process for CoMP

#### 9.5.5.2_F.1.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank with one CSI process configured.

#### 9.5.5.2_F.1.2 Test applicability

This test applies to all types of E-UTRA TDD category ≥2 UEs release 11 and forward, supporting Maximum CSI processes of One on a component carrier within a band with PDSCH transmission mode 10.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.5.5.2_F.1.3 Minimum conformance requirements

Each CSI process is associated with a CSI-RS resource and a CSI-IM resource as shown in Table 9.5.5.2_F.1.3-1. For UE supports one CSI process CSI process 0 is configured for Test 1 and Test 2, but CSI process 1 is not configured for Test 2.The corresponding γ requirements for Test 1 and Test 2 shall be fulfilled. The requirement on reported RI for CSI process 1 in Test 2 is not applicable.

For UE supports multiple CSI processes, CSI process 0 is configured for Test 1 and CSI processes 0 and 1 are configured for Test 2. The corresponding γ requirements for Test 1 and Test 2 shall be fulfilled, and also the requirement on reported RI for CSI process 1 in Test 2.

The minimum performance requirement in Table 9.5.5.2_F.1.3-2 is defined as:

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$.

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

c) For Test 2, the RI reported for CSI process 1 shall be the same as the most recent RI reported for CSI process 0 if UE is configured with multiple CSI processes

For the parameters specified in Table 9.5.5.2_F.1.3-2, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.5.2_F.1.3-3.

**Table 9.5.5.2_F.1.3-1: Configuration of CSI processes**

| | CSI process 0 | CSI process 1 |
|---|---|---|
| CSI-RS resource | CSI-RS signal 0 | CSI-RS signal 1 |
| CSI-IM resource | CSI-IM resource 0 | CSI-IM resource 1 |

**Table 9.5.5.2_F.1.3-2: Test Parameters for RI Reporting with Single CSI process for CoMP (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | TP1 | TP2 | TP1 | TP2 |
| Bandwidth | | MHz | 10 MHz | | 10 MHz | |
| Transmission mode | | | 10 | 10 | 10 | 10 |
| Downlink power allocation | $\rho_A$ | dB | 0 | | 0 | |
| | $\rho_B$ | dB | 0 | | 0 | |
| | $P_C$ | dB | 0 | 0 | 0 | 0 |
| | σ | dB | 0 | | 0 | |
| Uplink downlink configuration | | | 2 | 2 | 2 | 2 |
| Special subframe configuration | | | 4 | 4 | 4 | 4 |
| SNR | | dB | 0 | 0 | 20 | 20 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -78 | -78 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | EPA 5 Low | EPA 5 Low | EPA 5 Low | EPA 5 High |
| Antenna configuration | | | 2x2 | 2x2 | 2x2 | 2x2 |
| Beamforming Model | | | As specified in Section B.4.3 | | As specified in Section B.4.3 | |
| Timing offset between TPs | | us | 0 | | 0 | |
| Frequency offset between TPs | | Hz | 0 | | 0 | |
| Cell-specific reference signals | | | Antenna ports 0 | | Antenna ports 0 | |
| CSI-RS signal 0 | | | Antenna ports 15,16 | N/A | Antenna ports 15,16 | N/A |
| CSI-RS 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/3 | N/A | 5/3 | N/A |
| CSI-RS 0 configuration | | | 0 | N/A | 0 | N/A |
| CSI-RS signal 1 | | | N/A | Antenna ports 15,16 | N/A | Antenna ports 15,16 |
| CSI-RS 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | 5/3 | N/A | 5/3 |
| CSI-RS 1 configuration | | | N/A | 3 | N/A | 3 |
| Zero-power CSI-RS 0 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | N/A | 3 / 1000001000000000 | N/A | 3 / 1000001000000000 |
| Zero-power CSI-RS 1 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 3 / 0011000000000000 | N/A | 3 / 0011000000000000 | N/A |
| CSI-IM 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/3 | N/A | 5/3 | N/A |
| CSI-IM 0 configuration | | | 2 | N/A | 2 | N/A |
| CSI-IM 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | 5/3 | N/A | 5/3 |
| CSI-IM 1 configuration | | | N/A | 6 | N/A | 6 |
| RI configuration | | | Fixed RI=2 and follow RI | N/A | Fixed RI=1 and follow RI | N/A |
| CSI process 0 (Note 6, 7) | CSI-RS | | CSI-RS 0 | N/A | CSI-RS 0 | N/A |
| | CSI-IM | | CSI-IM 0 | N/A | CSI-IM 0 | N/A |
| | Reporting mode | | PUSCH 3-1 | N/A | PUSCH 3-1 | N/A |
| | Reporting Interval | ms | *5* | N/A | *5* | N/A |
| | CQI delay | ms | 11 | N/A | 11 | N/A |
| CSI process 1 (Note 6, 7, 9) | CSI-RS | | N/A | N/A | N/A | CSI-RS 1 |
| | CSI-IM | | N/A | N/A | N/A | CSI-IM 1 |
| | Reporting mode | | N/A | N/A | N/A | PUSCH 3-1 |
| | Reporting Interval | ms | N/A | N/A | N/A | *5* |
| | CQI delay | ms | N/A | N/A | N/A | 11 |
| CSI process for PDSCH scheduling | | | CSI process 0 | | CSI process 0 | |
| Cell ID | | | 0 | 6 | 0 | 6 |
| Quasi-co-located CSI-RS | | | CSI-RS 0 | CSI-RS 1 | CSI-RS 0 | CSI-RS 1 |
| Quasi-co-located CRS | | | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 |
| PMI for subframe 4 and 9 | | | 010000 for fixed RI = 2 010011 for UE | 100000 | 000011 for fixed RI = 1 010011 for UE | N/A |

| | | | | | |
|---|---|---|---|---|---|
| | | reported RI | | reported RI | |
| PMI for subframe 3 and 8 | | 100000 | 100000 | 100000 | N/A |
| Max number of HARQ transmissions | | 1 | N/A | 1 | N/A |
| ACK/NACK feedback mode | | Multiplexing | N/A | Multiplexing | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: 3 symbols allocated to PDCCH
Note 3: Reference measurement channel RC.13 TDD according to Table A.4-1. PDSCH transmission is scheduled on subframe 4 and 9 from TP1.
Note 4: TM10 OCNG as specified in A.5.2.8 is transmitted on subframe 3 and 8 from TP1.
Note 5: TM10 OCNG as specified in A.5.2.8 is transmitted on subframe 3, 4, 8 and 9 from TP2 for Test 1; TP2 is blanked for Test 2.
Note 6: Reported wideband CQI and PMI are used and sub-band CQI is discarded.
Note 7: If UE supports multiple CSI processes, CSI process 0 is configured as 'RI-reference CSI process' for CSI process 1.
Note 8: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3and #8 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#7 and #2.
Note 9: If UE supports one CSI process, CSI process 1 is not configured in Test 2.

**Table 9.5.5.2_F.1.3-3: Minimum requirements for RI Reporting with Single CSI process for CoMP (TDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\gamma_1$ | N/A | 1.0 |
| $\gamma_2$ | 1.0 | N/A |
| UE Category | ≥2 | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.5.5.2.

### 9.5.5.2_F.1.4 Test description

#### 9.5.5.2_F.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2 for UE with 2Rx RF band and Annex A, Figure A.40a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.5.5.2_F.1.3-2.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.5.2_F.1.4.3.

#### 9.5.5.2_F.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction, PMI for subframe for fixed Rank and the SNR according to Table 9.5.5.2_F.1.3-1 as and C.3.3-1 of Annex C.3.3 as appropriate.

2. The SS shall send PDSCH in via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and fixed RI as defined in Table 9.5.5.2_F.1.3-2. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2).

3. Measure the $t_{fix}$ according to annex G.5.3.

4. Propagation conditions are set according to Annex B.1.

5. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2).

6. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.5.2_F.1.3-1.

7. The UE shall transmit RRC Connection Reconfiguration Complete message.

8. Propagation conditions are set according to Table 9.5.5.2_F.1.5-2.

9. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 in subframe #2 and #7 (Table A.4.1-2).

10. Measure $t_{reported}$ according to Annex G.5.3.
    If the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.5.5.2_F.1.5-1, then pass the UE for this test and go to step 12. Otherwise, fail the UE.

11. If all tests have not been done, then repeat the same procedure (steps 1 to 10) with test conditions according to the Table 9.5.5.2_F.1.3-1 for the other Tests as appropriate. Otherwise pass the UE.

### 9.5.5.2_F.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.5.5.2_F.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| pdsch-ConfigDedicated | *PDSCH-ConfigDedicated-DEFAULT* | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-ConfigZPToAddModList-r11 | *CSI-RS-ConfigZP-r11-DEFAULT* | | |
| cqi-ReportConfig-v1130 | *CQI-ReportConfig-v1130-DEFAULT* | | |
| } | | | |

**Table 9.5.5.2_F.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.5.5.2_F.1.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.5.5.2_F.1.4.3-4: *CQI-ReportConfig- v1130-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF SEQUENCE { | 1 entry | | |
| cqi-ReportPeriodicProcExtId-r11[1] SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtId-r11 | 1 | | |
| cqi-pmi-ConfigIndex-r11 | 10 | CSI process 0 | |
| ri-ConfigIndex-r11 | 1 | CSI process 0 | |
| csi-ConfigIndex-r11 CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-pmi-ConfigIndex2-r11 | According to each test | For CSI process 1:<br>Test 1 = N/A<br>Test 2 = 15 | |
| ri-ConfigIndex2-r11 | According to each test | For CSI process 1:<br>Test 1 = N/A<br>Test 2 = 1 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.5.2_F.1.4.3-5: *CSI-RS-ConfigZP-r11-DEFAULT***

| Derivation Path: 36.3508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-ConfigZP-r11 ::= SEQUENCE { | | | |
| csi-RS-ConfigZPId-r11 | 1 | | |
| resourceConfigList-r11 | For Zero-power CSI-RS 0 = 0011000000000000<br>For Zero-power CSI-RS 1 configuration = 1000001000000000 | Parameter: *ZeroPowerCSI-RS* | |
| subframeConfig-r11 | 3 | $\Delta_{\text{CSI-RS}}$ = $I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4;<br>Parameter: $I_{\text{CSI-RS}}$ | |
| } | | | |

9.5.5.2_F.1.5 Test requirement

**Table 9.5.5.2_F.1.5-1: Test requirements for RI Reporting with Single CSI process for CoMP (FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\gamma_1$ | N/A | 0.99 |
| $\gamma_2$ | 0.99 | N/A |
| UE Category | ≥2 | ≥2 |

**Table 9.5.5.2_F.1.5-2: Test Parameters for RI Reporting with Single CSI process for CoMP (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | TP1 | TP2 | TP1 | TP2 |
| Bandwidth | | MHz | 10 MHz | | 10 MHz | |
| Transmission mode | | | 10 | 10 | 10 | 10 |
| Downlink power allocation | $\rho_A$ | dB | 0 | | 0 | |
| | $\rho_B$ | dB | 0 | | 0 | |
| | $P_C$ | dB | 0 | 0 | 0 | 0 |
| | σ | dB | 0 | | 0 | |
| Uplink downlink configuration | | | 2 | 2 | 2 | 2 |
| Special subframe configuration | | | 4 | 4 | 4 | 4 |
| SNR for UE with 2Rx RF band | | dB | 0 | 0 | 20 | 20 |
| SNR for 4Rx UE without 2Rx RF band | | dB | -3 | -3 | 17 | 17 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -78 | -78 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | EPA 5 Low | EPA 5 Low | EPA 5 Low | EPA 5 High |
| Antenna configuration | | | 2x2 | 2x2 | 2x2 | 2x2 |
| Beamforming Model | | | As specified in Section B.4.3 | | As specified in Section B.4.3 | |
| Timing offset between TPs | | us | 0 | | 0 | |
| Frequency offset between TPs | | Hz | 0 | | 0 | |
| Cell-specific reference signals | | | Antenna ports 0 | | Antenna ports 0 | |
| CSI-RS signal 0 | | | Antenna ports 15,16 | N/A | Antenna ports 15,16 | N/A |
| CSI-RS 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/3 | N/A | 5/3 | N/A |
| CSI-RS 0 configuration | | | 0 | N/A | 0 | N/A |
| CSI-RS signal 1 | | | N/A | Antenna ports 15,16 | N/A | Antenna ports 15,16 |
| CSI-RS 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | 5/3 | N/A | 5/3 |
| CSI-RS 1 configuration | | | N/A | 3 | N/A | 3 |
| Zero-power CSI-RS 0 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | N/A | 3 / 1000001000000000 | N/A | 3 / 1000001000000000 |
| Zero-power CSI-RS 1 configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | | | 3 / 0011000000000000 | N/A | 3 / 0011000000000000 | N/A |
| CSI-IM 0 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/3 | N/A | 5/3 | N/A |
| CSI-IM 0 configuration | | | 2 | N/A | 2 | N/A |
| CSI-IM 1 periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | N/A | 5/3 | N/A | 5/3 |
| CSI-IM 1 configuration | | | N/A | 6 | N/A | 6 |
| RI configuration | | | Fixed RI=2 and follow RI | N/A | Fixed RI=1 and follow RI | N/A |
| CSI process 0 (Note 6, 7) | CSI-RS | | CSI-RS 0 | N/A | CSI-RS 0 | N/A |
| | CSI-IM | | CSI-IM 0 | N/A | CSI-IM 0 | N/A |
| | Reporting mode | | PUSCH 3-1 | N/A | PUSCH 3-1 | N/A |
| | Reporting Interval | ms | *5* | N/A | *5* | N/A |
| | CQI delay | ms | 11 | N/A | 11 | N/A |
| CSI process 1 (Note 6, 7, 9) | CSI-RS | | N/A | N/A | N/A | CSI-RS 1 |
| | CSI-IM | | N/A | N/A | N/A | CSI-IM 1 |
| | Reporting mode | | N/A | N/A | N/A | PUSCH 3-1 |
| | Reporting Interval | ms | N/A | N/A | N/A | *5* |
| | CQI delay | ms | N/A | N/A | N/A | 11 |
| CSI process for PDSCH scheduling | | | CSI process 0 | | CSI process 0 | |
| Cell ID | | | 0 | 6 | 0 | 6 |
| Quasi-co-located CSI-RS | | | CSI-RS 0 | CSI-RS 1 | CSI-RS 0 | CSI-RS 1 |
| Quasi-co-located CRS | | | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 | Same Cell ID as Cell 1 | Same Cell ID as Cell 2 |
| PMI for subframe 4 and 9 | | | 010000 for fixed RI = 2 | 100000 | 000011 for fixed RI = 1 | N/A |

| | | | | | |
|---|---|---|---|---|---|
| | | 010011 for UE reported RI | | 010011 for UE reported RI | |
| PMI for subframe 3 and 8 | | 100000 | 100000 | 100000 | N/A |
| Max number of HARQ transmissions | | 1 | N/A | 1 | N/A |
| ACK/NACK feedback mode | | Multiplexing | N/A | Multiplexing | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: 3 symbols allocated to PDCCH
Note 3: Reference measurement channel RC.13 TDD according to Table A.4-1. PDSCH transmission is scheduled on subframe 4 and 9 from TP1.
Note 4: TM10 OCNG as specified in A.5.2.8 is transmitted on subframe 3 and 8 from TP1.
Note 5: TM10 OCNG as specified in A.5.2.8 is transmitted on subframe 3, 4, 8 and 9 from TP2 for Test 1; TP2 is blanked for Test 2.
Note 6: Reported wideband CQI and PMI are used and sub-band CQI is discarded.
Note 7: If UE supports multiple CSI processes, CSI process 0 is configured as 'RI-reference CSI process' for CSI process 1.
Note 8: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3and #8 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#7 and #2.
Note 9: If UE supports one CSI process, CSI process 1 is not configured in Test 2.
Note 10: The SNR requirement for 4Rx capable UEs is as specified in 9.1.1.4.1. For 4Rx UE without 2Rx RF bands SNR requirement is reduced by [3] dB

## 9.5.5.2_F.2 TDD RI Reporting with Multiple CSI processes for CoMP

Editor's Note: The test procedure to test the reported RI requirement for CSI process 1 in Test 2 for multiple CSI process is TBD

### 9.5.5.2_F.2.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank with Multiple CSI processes configured.

### 9.5.5.2_F.2.2 Test applicability

This test applies to all types of E-UTRA TDD category ≥2 UEsrelease 11 and forward, supporting Maximum CSI processes of Three or Four on a component carrier within a band with PDSCH transmission mode 10.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.5.5.2_F.2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.5.5.2_F.1.3

### 9.5.5.2_F.2.4 Test description

#### 9.5.5.2_F.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.40 for antenna configuration 2x2 for UE with 2Rx RF band and Annex A, Figure A.40a for 4Rx capable UE without any 2Rx RF bands.

2. The parameter settings for the cell are set up according to Table 9.5.5.2_F.2.3-2.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.5.2_F.2.4.3.

### 9.5.5.2_F.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction, PMI for subframe for fixed Rank and the SNR according to Table 9.5.5.2_F.1.3-2 as and C.3.3-1 of Annex C.3.3 as appropriate.

2. The SS shall send PDSCH in via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and fixed RI. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2).

3. Measure the $t_{fix}$ according to annex G.5.3.

4. Propagation conditions are set according to Annex B.1.

5. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2).

6. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.5.2_F.1.5-2.

7. The UE shall transmit RRC Connection Reconfiguration Complete message.

8. Propagation conditions are set according to Table 9.5.5.2_F.5.3-2.

9. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2).

10. Measure $t_{reported}$ according to Annex G.5.3

    If the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.5.5.2_F.2.5-1, then pass the UE for this test and go to step 12. Otherwise, fail the UE.

11. If all tests have not been done, then repeat the same procedure (steps 1 to 10) with test conditions according to the Table 9.5.5.2_F.1.3-2 for the other Tests as appropriate. Otherwise pass the UE.

### 9.5.5.2_F.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.5.5.2_F.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *CQI-ReportConfig-r10-DEFAULT* using condition RBC | | |
| antennaInfo CHOICE { | | | |
| explicitValue | AntennaInfoDedicated | | |
| } | | | |
| } | | | |

**Table 9.5.5.2_F.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.5.5.2_F.2.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm10-v1130 | | |
| } | | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |

**Table 9.5.5.2_F.2.4.3-4: *CQI-ReportConfig- v1130-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-v1130 ::= SEQUENCE { | | | |
| cqi-ReportPeriodic-v1130 SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtToAddModList-r11 SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF SEQUENCE { | 1 entry | | |
| cqi-ReportPeriodicProcExtId-r11[1] SEQUENCE { | | | |
| cqi-ReportPeriodicProcExtId-r11 | 1 | | |
| cqi-pmi-ConfigIndex-r11 | 6 | CSI process 0 | |
| } | | | |
| ri-ConfigIndex-r11 | 1 | CSI process 0 | |
| csi-ConfigIndex-r11 CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-pmi-ConfigIndex2-r11 | According to each test | For CSI process 1:<br>Test 1 = N/A<br>Test 2 = 4 | |
| ri-ConfigIndex2-r11 | According to each test | For CSI process 1:<br>Test 1 = N/A<br>Test 2 = 1 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.5.2_F.2.4.3-5: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | For CSI-RS 0 configuration = 0<br>For CSI-RS1 configuration = 3 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 3 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE { | | | |
| release | | | |
| setup SEQUENCE { | | | |
| zeroTxPowerResourceConfigList-r10 | 5 | | |
| zeroTxPowerSubframeConfig-r10 | 3 | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.5.5.2_F.2.4.3-6: *CSI-Process***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-Process-r11::= SEQUENCE { | | | |
| CSI-ProcessId-r11 | 1 | | |
| CSI-RS-ConfigNZPId-r11 | According to each CSI process | For CSI-RS 0 = 1<br>For CSI-RS 1 = 2 | |
| CSI-IM-ConfigId-r11 | 1 | | |
| p-C-AndCBSRList-r11 SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 1 entry | | |
| p-C-r11 | 0 | | |
| codebookSubsetRestriction-r11 | According to each test | | |
| } | | | |

9.5.5.2_F.2.5 Test requirement

**Table 9.5.5.2_F.2.5-1: Test requirements for RI Reporting with Multiple CSI processes for CoMP (TDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\gamma_1$ | N/A | 0.99 |
| $\gamma_2$ | 0.99 | N/A |
| UE Category | ≥2 | ≥2 |

# 9.6 Additional requirements for carrier aggregation

This clause includes requirements for the reporting of channel state information (CSI) with the UE configured for carrier aggregation. The purpose is to verify that the channel state for each cell is correctly reported with multiple cells configured for periodic reporting.

Unless otherwise stated, the logical carriers PCC / SCC are mapped on physical frequencies as defined in Table 9.6-1.

**Table 9.6-1: PCC/SCCs frequency mapping**

| CA Configuration | PCC-SCC mapping | Notes |
|---|---|---|
| Intra-band CA | CC1-CC2 | 1 |
| Inter-band CA (CA_x-y) | Bx-By (if not supported by the UE, then By-Bx) | 2 |
| Note 1: Notation CCi-CCj means PCC on component carrier CCi and SCC on component carrier CCj, with CCi/j frequencies defined in the corresponding intra-band contiguous / non-contiguous CA band in TS 36.508. | | |
| Note 2: Notation Bi–Bj means PCC on component Band i and SCC on component Band j, with single Band i/j frequencies defined in TS 36.508. | | |

## 9.6.1 Periodic reporting on multiple cells (Cell-Specific Reference Symbols)

### 9.6.1.1_A FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA

#### 9.6.1.1_A.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA(2DL CA)

##### 9.6.1.1_A.1.1 Test purpose

To verify that the UE reports different CQI indices for Pcell and Scell if each cell experiences a different SNR.

##### 9.6.1.1_A.1.2 Test applicability

This test applies to

all types of E-UTRA FDD release 10 and forward UE of category 3 or higher that support inter-band OR intra-band contiguous DL CA.

This test also applies to all types of E-UTRA FDD release 11 and forward UE of category 3 or higher that support intra-band non contiguous DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports

##### 9.6.1.1_A.1.3 Minimum conformance requirements

The following requirements apply to UE Category ≥3. For the parameters specified in Table 9.6.1.1_A.1.3-1 and Table 9.6.1.1_A.1.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of Pcell and Scell reported shall be such that

$$\text{wideband CQI}_{\text{Pcell}} - \text{wideband CQI}_{\text{Scell}} \geq 2$$

for more than 90% of the time.

**Table 9.6.1.1_A.1.3-1: Parameters for PUCCH 1-0 static test on multiple cells (FDD)**

| Parameter | | Unit | Pcell | Scell |
|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | |
| SNR | | dB | 10 | 4 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -88 | -94 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | |
| PUCCH Report Type | | | 4 | |
| Reporting periodicity | | Ms | $N_{pd}$ = 10 | |
| *cqi-pmi-ConfigurationIndex* | | | 11 | 16 [shift of 5 ms relative to Pcell] |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1. | | | | |

**Table 9.6.1.1_A.1.3-2: PUCCH 1-0 static test (FDD)**

| Test number | Bandwidth combination |
|---|---|
| 1 | 10MHz for both cells |
| 2 | 20MHz for both cells |
| 3 | 5MHz for both cells |
| 4 | 5MHz for PCell and 10MHz for SCell |
| 5 | 5MHz for PCell and 15MHz for SCell |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2. | |

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.1.

### 9.6.1.1_A.1.4 Test description

#### 9.6.1.1_A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.1_A.1.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.1_A.1.4.1-1

**Table 9.6.1.1_A.1.4.1-1: Test point selection for PUCCH 1-0 static test**

| CA Applicability | Bandwidth combination |
|---|---|
| | |

| | 10+10 | 20+20 | 5+5 | 5+10 | 5+15 |
|---|---|---|---|---|---|
| Inter-band CA (two bands) (CA2_A2) | Test 1 | Test 2 | Test 3 | Test4 | Test 5 |
| Intra-band contiguous CA (CA2_C) | Test 1 | Test 2 | Test 3 | Test4 | Test 5 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA2_N2) | Test 1 | Test 2 | Test 3 | Test4 | Test 5 |
| Note 1: Only one test point is tested. Select the first UE supported CA bandwidth combination (moving from left to right) and then choose any one of the UE supported CA capabilities. | | | | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure group A.45 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 9.6.1.1_A.1.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.1_A.1.4.3.

### 9.6.1.1_A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined Table 9.6.1.1_A.1.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.1_A.1.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.1_A.1.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.1_A.1.4.3-7.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.1_A.1.5-1 as appropriate.

5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCC, according to Table 9.6.1.1_A.1.5-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.

6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cell. For each CSI report calculate the respective difference $CQI_{P\text{-}S}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell}$.

7. If more than 1800 values of $CQI_{P\text{-}S}$ are $\geq 2$ pass the UE. Otherwise fail the UE.

### 9.6.1.1_A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.1_A.1.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.1_A.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.1_A.1.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | setup | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 11 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | widebandCQI | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.1_A.1.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicated SCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.1_A.1.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 9.6.1.1_A.1.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.1_A.1.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 16 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

9.6.1.1_A.1.5 Test requirement

**Table 9.6.1.1_A.1.5-1: Parameters for PUCCH 1-0 static test on multiple cells (FDD)**

| Parameter | | Unit | Pcell | Scell |
|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | |
| SNR | | dB | 10 | 4 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -88 | -94 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | -91 | -97 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | |
| PUCCH Report Type | | | 4 | |
| Reporting periodicity | | Ms | $N_{pd}$ = 10 | |
| *cqi-pmi-ConfigurationIndex* | | | 11 | 16 [shift of 5 ms relative to Pcell] |

Note 1: 3 symbols are allocated to PDCCH.
Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2
Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 FDD as described in Annex A.5.1.1
Note 4: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 for both PCell and SCells

The pass fail decision is as specified in the test procedure in clause 9.6.1.1_A.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.6.1.1_A.2 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (3DL CA)

### 9.6.1.1_A.2.1 Test purpose

To verify that the UE reports different CQI indices for Pcell and Scells if each cell experiences a different SNR.

### 9.6.1.1_A.2.2 Test applicability

This test case applies to all types of E-UTRA FDD release 10 and forward UE of category 5 or higher that support 3DL Intra-band contiguous CA or 3DL Inter-band CA, or 3DL with Intra-band contiguous and Inter-band CA.

This test case also applies to all types of E-UTRA FDD release 11 and forward UE of category 5 or higher that support 3DL with Intra-band non-contiguous and Inter-band CA, or 3DL with Intra-band non-contiguous and Intra-band contiguous CA.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.6.1.1_A.2.3 Minimum conformance requirements

The following requirements apply to UE Category ≥5. For the parameters specified in Table 9.6.1.1_A.2.3-1 and Table 9.6.1.1_A.2.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of Pcell and Scell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2 reported shall be such that

$$\text{wideband CQI}_{\text{Pcell}} - \text{wideband CQI}_{\text{Scell1}} \geq 2$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell2}} \geq 2$$

for more than 90% of the time.

**Table 9.6.1.1_A.2.3-1: Parameters for PUCCH 1-0 static test on multiple cells (FDD, 3 DL CA)**

| Parameter | | Unit | Pcell | Scell1 | Scell2 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -86 | -92 | -98 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 21 | 26 [shift of 5 ms relative to Pcell] | 31 [shift of 10 ms relative to Pcell] |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1. | | | | | |

**Table 9.6.1.1_A.2.3-2: PUCCH 1-0 static test (FDD, 3DL CA)**

| Test number | Bandwidth combination (MHz) |
|---|---|
| 1 | 3x20 |
| 2 | 20+20+15 |
| 3 | 20+20+10 |
| 4 | 20+15+15 |
| 5 | 20+15+10 |
| 6 | 20+10+10 |
| 7 | 15+15+10 |
| 8 | 20+10+5 |
| 9 | 20+15+5 |
| 10 | 10+10+5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2. | |

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.1.

### 9.6.1.1_A.2.4 Test description

#### 9.6.1.1_A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.1_A.2.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.1_A.2.4.1-1.

**Table 9.6.1.1_A.2.4.1-1: Test point selection for PUCCH 1-0 static test**

| CA Applicability | Bandwidth combination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 3x20 | 20+20+15 | 20+20+10 | 20+15+15 | 20+15+10 | 20+10+10 | 15+15+10 | 20+10+5 | 20+15+5 | 10+10+5 |
| Intra-band contiguous (CA_C) | Test 1 | Test 2 | Test 3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Inter-band (CA_A_2) | Test 1 | Test 2 | Test 3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Inter-band (CA_A_3) | Test 1 | Test 2 | Test 3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Intra-band non-contiguous (CA_N) | Test 1 | Test 2 | Test 3 | Test4 | Test5 | Test6 | Test7 | Test8 | Test9 | Test10 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | | | | | | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.59 without faders for for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC..
2. The parameter settings for the cell are set up according to Table 9.6.1.1_A.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.1_A.2.4.3.

### 9.6.1.1_A.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined Table 9.6.1.1_A.2.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.1_A.2.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.1_A.2.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.1_A.2.4.3-7.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.1_A.2.5-1 as appropriate.
5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCCs, according to Table 9.6.1.1_A.2.5-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.
6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cells. For each CSI report calculate the respective difference $CQI_{P\text{-}S1}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell1}$ and the respective difference $CQI_{S1\text{-}S2}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell2}$.
7. If more than 1800 values of $CQI_{P\text{-}S1}$ are $\geq 2$ and more than 1800 values of $CQI_{S1\text{-}S2}$ are $\geq 2$, pass the UE. Otherwise fail the UE.

9.6.1.1_A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.1_A.2.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.1_A.2.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.1_A.2.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | setup | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 21 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | widebandCQI | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.1_A.2.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicated SCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.1_A.2.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 9.6.1.1_A.2.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.1_A.2.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 26 | | Scell1 |
| | 31 | | Scell2 |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

9.6.1.1_A.2.5 Test requirement

**Table 9.6.1.1_A.2.5-1: Parameters for PUCCH 1-0 static test on multiple cells (FDD, 3 DL CA)**

| Parameter | | Unit | Pcell | Scell1 | Scell2 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -86 | -92 | -98 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | -89 | -95 | -101 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 21 | 26 [shift of 5 ms relative to Pcell] | 31 [shift of 10 ms relative to Pcell] |

Note 1: 3 symbols are allocated to PDCCH.
Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2
Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 FDD as described in Annex A.5.1.1
Note 4: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 for both PCell and SCells

The pass fail decision is as specified in the test procedure in clause 9.6.1.1_A.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.6.1.1_A.3 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (4DL CA)

### 9.6.1.1_A.3.1 Test purpose

To verify that the UE reports different CQI indices for Pcell and Scells if each cell experiences a different SNR.

### 9.6.1.1_A.3.2 Test applicability

This test case applies to all types of E-UTRA FDD release 11 and forward UE of category 8 or higher that support 4DL Intra-band contiguous CA or 4DL Inter-band CA, or 4DL with Intra-band contiguous and Inter-band CA.

This test case also applies to all types of E-UTRA FDD release 11 and forward UE of category 8 or higher that support 4DL with Intra-band non-contiguous and Inter-band CA, or 4DL with Intra-band non-contiguous and Intra-band contiguous CA.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.6.1.1_A.3.3 Minimum conformance requirements

The following requirements for 4DL CA apply to UE Category ≥8. For CA with 4 DL CC, for the parameters specified in Table 9.6.1.1_A.3.3-1 and Table 9.6.1.1_A.3.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell 1 and SCell2, and SCell 1 and SCell 3 reported shall be such that

$$\text{wideband CQI}_{\text{PCell}} - \text{wideband CQI}_{\text{SCell1}} \geq 2$$

wideband $CQI_{SCell1}$ – wideband $CQI_{SCell2} \geq 2$

wideband $CQI_{SCell1}$ – wideband $CQI_{SCell3} \geq 2$

for more than 90% of the time.

**Table 9.6.1.1_A.3.3-1: Parameters for PUCCH 1-0 static test on multiple cells (FDD, 3 and 4 DL CA)**

| Parameter | | Unit | Pcell | Scell1 | Scell2, 3 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -86 | -92 | -98 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 21 | 26 (shift of 5 ms relative to Pcell) | 31 for Scell2 (shift of 10 ms relative to Pcell) , 36 for Scell3 (shift of 15ms relative to Pcell) |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1. | | | | | |

**Table 9.6.1.1_A.3.3-2: PUCCH 1-0 static test (FDD, 4DL CA)**

| Test number | Bandwidth combination (MHz) |
|---|---|
| 1 | 4x20 |
| 2 | 20+20+20+10 |
| 3 | 20+20+10+10 |
| 4 | 20+10+10+5 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2. The test coverage for different number of component carriers is defined in 9.1.1.3. | |
| Note 2: If more than one cell can be configured as PCell, choose one with the smallest bandwidth as PCell. If all the cells which can be configured as PCell have the same bandwidth, randomly choose one as PCell. Randomly associate the other cells to SCell 1, SCell 2 and SCell3. | |

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.1.

### 9.6.1.1_A.3.4 Test description

#### 9.6.1.1_A.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.1_A.3.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.1_A.3.4.1-1.

**Table 9.6.1.1_A.3.4.1-1: Test point selection for PUCCH 1-0 static test**

| CA Applicability | Bandwidth combination | | | |
|---|---|---|---|---|
| | 4x20 | 20+20+20+10 | 20+20+10+10 | 20+10+10+5 |
| Intra-band contiguous (CA_C) | Test 1 | Test 2 | Test 3 | Test 4 |
| Inter-band (CA_A_2) | Test 1 | Test 2 | Test 3 | Test 4 |
| Inter-band (CA_A_3) | Test 1 | Test 2 | Test 3 | Test 4 |
| Intra-band non-contiguous (CA_N) | Test 1 | Test 2 | Test 3 | Test 4 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.59 without faders for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 9.6.1.1_A.3.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.1_A.3.4.3.

### 9.6.1.1_A.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined Table 9.6.1.1_A.3.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.1_A.3.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.1_A.3.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.1_A.3.4.3-7.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.1_A.3.5-1 as appropriate.
5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCCs, according to Table 9.6.1.1_A.3.5-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.
6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cells. For each CSI report calculate the respective difference $CQI_{P\text{-}S1}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell1,}$ the respective difference $CQI_{S1\text{-}S2}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell2}$ and the respective difference $CQI_{S1\text{-}S3}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell3}$.

7. If more than 1800 values of $CQI_{P-S1}$ are $\geq 2$, more than 1800 values of $CQI_{S1-S2}$ are $\geq 2$ and more than 1800 values of $CQI_{S1-S3}$ are $\geq 2$, pass the UE. Otherwise fail the UE.9.6.1.1_A.3.4.3Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.1_A.3.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.1_A.3.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.1_A.3.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | setup | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 21 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | widebandCQI | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.1_A.3.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicated SCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.1_A.3.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 9.6.1.1_A.3.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.1_A.3.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 26 | | Scell1 |
| | 31 | | Scell2 |
| | 36 | | Scell3 |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

9.6.1.1_A.3.5 Test requirement

**Table 9.6.1.1_A.3.5-1: Parameters for PUCCH 1-0 static test on multiple cells (FDD, 3 and 4 DL CA)**

| Parameter | | Unit | Pcell | Scell1 | Scell2, 3 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -86 | -92 | -98 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | [-89] | -95 | -101 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 21 | 26 (shift of 5 ms relative to Pcell) | 31 for Scell2 (shift of 10 ms relative to Pcell) , 36 for Scell3 (shift of 15ms relative to Pcell) |

Note 1: 3 symbols are allocated to PDCCH.
Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2
Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 FDD as described in Annex A.5.1.1
Note 4: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 for both PCell and SCells

The pass fail decision is as specified in the test procedure in clause 9.6.1.1_A.3.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.6.1.1_A.4 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (5DL CA)

### 9.6.1.1_A.4.1 Test purpose

To verify that the UE reports different CQI indices for Pcell and Scells if each cell experiences a different SNR.

### 9.6.1.1_A.4.2 Test applicability

This test case applies to all types of E-UTRA FDD release 11 and forward UE of category 8 and 11 or higher that support 5DL with Intra-band contiguous and Inter-band CA or 5DL with Intra-band non-contiguous and Inter-band CA or 5DL with Intra-band non-contiguous and Intra-band contiguous CA.

This test case also applies to all types of E-UTRA FDD release 12 and forward UE of category 8 and 11 or higher that support 5DL Inter-band CA,

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.6.1.1_A.4.3 Minimum conformance requirements

The following requirements for 5DL CA apply to UE Category 8 and ≥11. For CA with 5 DL CC, for the parameters specified in Table 9.6.1.1_A.4.3-1 and Table 9.6.1.1_A.4.3-2, and using the downlink physical channels specified in

tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell 1 and SCell2, SCell 1 and SCell 3, and SCell 1 and SCell 4 reported shall be such that

$$\text{wideband CQI}_{\text{PCell}} - \text{wideband CQI}_{\text{SCell1}} \geq 2$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell2}} \geq 2$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell3}} \geq 2$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell4}} \geq 2$$

for more than 90% of the time.

**Table 9.6.1.1_A.4.3-1: Parameters for PUCCH 1-0 static test on multiple cells (FDD, 5 DL CA)**

| Parameter | | Unit | Pcell | Scell1 | Scell2, 3, 4 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -86 | -92 | -98 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 40 | | |
| *cqi-pmi-ConfigurationIndex* | | | 41 | 46 (shift of 5 ms relative to Pcell) | 51 for Scell 2 (shift of 10 ms relative to Pcell), 56 for Scell 3 (shift of 15ms relative to Pcell), 61 for Scell4 (shift of 20ms relative to Pcell) |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1. | | | | | |

**Table 9.6.1.1_A.4.3-2: PUCCH 1-0 static test (FDD, 5DL CA)**

| Test number | Bandwidth combination (MHz) |
|---|---|
| 1 | 5x20 |
| 2 | 15+4x20 |
| 3 | 10+4x20 |
| 4 | 2x10+3x20 |
| 5 | 5+10+3x20 |
| 6 | 3x10+2x20 |
| 7 | 4x10+20 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2. The test coverage for different number of component carriers is defined in 9.1.1.3.<br>Note 2: If more than one cell can be configured as PCell, choose one of the cells with the smallest bandwidth as PCell. Mapping of PCell and Scells to the CCs shall be constant for all the iterations during the test. Each execution of the test shall use the same mapping. | |

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.1.

### 9.6.1.1_A.4.4 Test description

#### 9.6.1.1_A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.1_A.4.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.1_A.4.4.1-1.

**Table 9.6.1.1_A.4.4.1-1: Test point selection for PUCCH 1-0 static test**

| CA Applicability | Bandwidth combination | | | | | | |
|---|---|---|---|---|---|---|---|
| | 5x20 | 15+4x20 | 10+4x20 | 2x10+3x20 | 5+10+3x20 | 3x10+2x20 | 4x10+20 |
| Intra-band contiguous (CA5_C) | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band (CA5_A2) | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band (CA5_A3) | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band (CA5_A4) | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band (CA5_A5) | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Intra-band non-contiguous (CA5_N2) | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | | | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.59 without faders for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 9.6.1.1_A.4.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.1_A.4.4.3.

#### 9.6.1.1_A.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined Table 9.6.1.1_A.4.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.1_A.4.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.1_A.4.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.1_A.4.4.3-7.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.1_A.4.5-1 as appropriate.

5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCCs, according to Table 9.6.1.1_A.4.5-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.

6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cells. For each CSI report calculate the respective difference $CQI_{P\text{-}S1}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell1}$, the respective difference $CQI_{S1\text{-}S2}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell2}$, the respective difference $CQI_{S1\text{-}S3}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell3}$ and the respective difference $CQI_{S1\text{-}S4}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell4}$.

7. If more than 1800 values of $CQI_{P\text{-}S1}$ are $\geq 2$ and more than 1800 values of $CQI_{S1\text{-}S2}$ are $\geq 2$ and more than 1800 values of $CQI_{S1\text{-}S3}$ are $\geq 2$ and more than 1800 values of $CQI_{S1\text{-}S4}$ are $\geq 2$ and if all the conditions are met, then pass the UE. Otherwise fail the UE.

### 9.6.1.1_A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.1_A.4.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.1_A.4.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.1_A.4.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | setup | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 41 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | widebandCQI | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.1_A.4.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicatedSCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.1_A.4.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | CQI-ReportConfigSCell-r10-DEFAULT | | |
| } | | | |
| } | | | |

**Table 9.6.1.1_A.4.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.1_A.4.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 46 | | Scell1 |
| | 51 | | Scell2 |
| | 56 | | Scell3 |
| | 61 | | Scell4 |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

9.6.1.1_A.4.5 Test requirement

**Table 9.6.1.1_A.4.5-1: Parameters for PUCCH 1-0 static test on multiple cells (FDD, 5 DL CA)**

| **Parameter** | | **Unit** | **Pcell** | **Scell1** | **Scell2, 3, 4** |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -86 | -92 | -98 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | -89 | -95 | -101 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 40 | | |
| *cqi-pmi-ConfigurationIndex* | | | 41 | 46 (shift of 5 ms relative to Pcell) | 51 for Scell 2 (shift of 10 ms relative to Pcell), 56 for Scell 3 (shift of 15ms relative to Pcell), 61 for Scell4 (shift of 20ms relative to Pcell) |
| Note 1: 3 symbols are allocated to PDCCH.<br>Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2<br>Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 FDD as described in Annex A.5.1.1<br>Note 4:For a UE with 4Rx antenna capability, use reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 for both PCell and SCells | | | | | |

The pass fail decision is as specified in the test procedure in clause 9.6.1.1_A.4.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.6.1.2_A TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA

### 9.6.1.2_A.1 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (2DL CA)

#### 9.6.1.2_A.1.1 Test purpose

To verify that the UE reports different CQI indices for Pcell and Scell if each cell experiences a different SNR.

#### 9.6.1.2_A.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward with category 3 or higher that support intra-band contiguous DL CA or inter band DL CA.

This test applies to all types of E-UTRA TDD UE release 11 and forward with category 3 or higher that support intra-band non-contiguous DL CA.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.6.1.2_A.1.3 Minimum conformance requirements

The following requirements apply to UE Category ≥3. For the parameters specified in Table 9.6.1.2_A.1.3-1 and Table 9.6.1.2_A.1.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of Pcell and Scell reported shall be such that

$$\text{wideband CQI}_{\text{Pcell}} - \text{wideband CQI}_{\text{Scell}} \geq 2$$

for more than 90% of the time.

**Table 9.6.1.2_A.1.3-1: PUCCH 1-0 static test on multiple cells (TDD, 2 DL CA)**

| Parameter | | Unit | Pcell | Scell |
|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | |
| Uplink downlink configuration | | | 2 | |
| Special subframe configuration | | | 4 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | |
| SNR | | dB | 10 | 4 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -88 | -94 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | |
| PUCCH Report Type | | | 4 | |
| Reporting periodicity | | ms | $N_{pd}$ = 10 | |
| *cqi-pmi-ConfigurationIndex* | | | 8 | 13 [shift of 5 ms relative to Pcell] |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. | | | | |

**Table 9.6.1.2_A.1.3-2: PUCCH 1-0 static test (TDD, 2 DL CA)**

| Test number | Bandwidth combination |
|---|---|
| 1 | 20MHz for both cells |
| 2 | 15MHz for PCell and 20MHz for SCell |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2. | |

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.2.

### 9.6.1.2_A.1.4 Test description

#### 9.6.1.2_A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.2_A.1.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.2_A.1.4.1-1.

**Table 9.6.1.2_A.1.4.1-1: Test point selection for CQI Reporting under AWGN conditions – PUCCH 1-0 for 2DL CA**

| CA Capability | Bandwidth Combination | |
|---|---|---|
| | 20+20 | 20+15 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 | N/A |
| Intra-band contiguous CA (CA2_C) | Test 1 | Test 2 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA2_N2) | Test 1 | N/A |
| Note 1: Only one test point is tested. Select the first Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure group A.45 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 9.6.1.2_A.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.2_A.1.4.3.

#### 9.6.1.2_A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined Table 9.6.1.2_A.1.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.2_A.1.4.3-5, *CQI-ReportConfigSCell-*

*r10-DEFAULT* is defined in Table 9.6.1.2_A.1.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.2_A.1.4.3-7.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.2_A.1.5-1 as appropriate.

5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCC, according to Table 9.6.1.2_A.1.5-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.

6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cell. For each CSI report calculate the respective difference $CQI_{P\text{-}S}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell}$.

7. If more than 1800 values of $CQI_{P\text{-}S}$ are $\geq 2$ pass the UE. Otherwise fail the UE.

### 9.6.1.2_A.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.2_A.1.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.2_A.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.2_A.1.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 8 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.2_A.1.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicatedSCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.2_A.1.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.6.1.2_A.1.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.2_A.1.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 13 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

9.6.1.2_A.1.5 Test requirement

**Table 9.6.1.2_A.1.5-1: PUCCH 1-0 static test on multiple cells (TDD, 2 DL CA)**

| **Parameter** | | **Unit** | **Pcell** | **Scell** |
|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | |
| Uplink downlink configuration | | | 2 | |
| Special subframe configuration | | | 4 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | |
| SNR | | dB | 10 | 4 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -88 | -94 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | -91 | -97 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | |
| PUCCH Report Type | | | 4 | |
| Reporting periodicity | | ms | $N_{pd}$ = 10 | |
| *cqi-pmi-ConfigurationIndex* | | | 8 | 13 [shift of 5 ms relative to Pcell] |
| Note 1: 3 symbols are allocated to PDCCH.Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2<br>Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 TDD as described in Annex A.5.2.1<br>Note 4: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for both PCell and SCells | | | | |

The pass fail decision is as specified in the test procedure in clause 9.6.1.2_A.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.6.1.2_A.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (3DL CA)

### 9.6.1.2_A.2.1 Test purpose

To verify that the UE reports different CQI indices for Pcell and Scells if each cell experiences a different SNR.

### 9.6.1.2_A.2.2 Test applicability

This test case applies to all types of E-UTRA TDD release 10 and forward UE of category 5 or higher that support 3DL Intra-band contiguous CA or 3DL Inter-band CA, or 3DL with Intra-band contiguous and Inter-band CA.
This test case also applies to all types of E-UTRA TDD release 11 and forward UE of category 5 or higher that support 3DL Intra-band non-contiguous CA or 3DL with Intra-band non-contiguous and Inter-band CA, or 3DL with Intra-band non-contiguous and Intra-band contiguous CA.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.6.1.2_A.2.3 Minimum conformance requirements

The following requirements apply to UE Category ≥5. For the parameters specified in Table 9.6.1.2_A.2.3-1 and Table 9.6.1.2_A.2.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of Pcell and Scell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2 reported shall be such that

$$\text{wideband CQI}_{\text{Pcell}} - \text{wideband CQI}_{\text{Scell1}} \geq 2$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell2}} \geq 2$$

for more than 90% of the time.

**Table 9.6.1.2_A.2.3-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD, 3 DL CA)**

| Parameter | | Unit | Pcell | Scell1 | Scell2 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -86 | -92 | -98 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 18 | 23 [shift of 5 ms relative to Pcell] | 28 [shift of 10 ms relative to Pcell] |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. | | | | | |

**Table 9.6.1.2_A.2.3-2: PUCCH 1-0 static test (TDD, 3DL CA)**

| Test number | Bandwidth combination (MHz) |
|---|---|
| 1 | 3x20 |
| 2 | 20+20+15 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2. | |

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.2.

### 9.6.1.2_A.2.4 Test description

#### 9.6.1.2_A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.2_A.2.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.2_A.2.4.1-1

**Table 9.6.1.2_A.2.4.1-1: Test point selection for PUCCH 1-0 static test**

| CA Applicability | Bandwidth combination | |
|---|---|---|
| | 3x20 | 20+20+15 |
| Intra-band contiguous (CA_C) | Test 1 | Test 2 |
| Inter-band (CA_A_2) | Test 1 | Test 2 |
| Inter-band (CA_A_3) | Test 1 | Test 2 |
| Intra-band non-contiguous (CA_N) | Test 1 | Test 2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.59 without faders for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 9.6.1.2_A.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.2_A.2.4.3.

#### 9.6.1.2_A.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined Table 9.6.1.2_A.2.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.2_A.2.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.2_A.2.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.2_A.2.4.3-7.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.2_A.2.5-1 as appropriate.
5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCCs, according to Table 9.6.1.2_A.2.5-1. The SS sends downlink MAC padding bits on the DL RMC.
6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cells. For each CSI report calculate the respective difference $CQI_{P\text{-}S1}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell1}$ and the respective difference $CQI_{S1\text{-}S2}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell2}$.
7. If more than 1800 values of $CQI_{P\text{-}S1}$ are $\geq 2$ and more than 1800 values of $CQI_{S1\text{-}S2}$ are $\geq 2$, pass the UE. Otherwise fail the UE.

#### 9.6.1.2_A.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.2_A.2.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.2_A.2.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.2_A.2.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 18 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.2_A.2.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicatedSCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.2_A.2.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.6.1.2_A.2.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.2_A.2.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 23 | | Scell1 |
| | 28 | | Scell2 |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

9.6.1.2_A.2.5 Test requirement

**Table 9.6.1.2_A.2.3-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD, 3 DL CA)**

| Parameter | | Unit | Pcell | Scell1 | Scell2 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -86 | -92 | -98 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | -89 | -95 | -101 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 18 | 23 [shift of 5 ms relative to Pcell] | 28 [shift of 10 ms relative to Pcell] |

Note 1: 3 symbols are allocated to PDCCH.Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2

Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 TDD as described in Annex A.5.2.1

Note 4: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for both PCell and SCells

The pass fail decision is as specified in the test procedure in clause 9.6.1.2_A.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.6.1.2_A.3 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (4DL CA)

### 9.6.1.2_A.3.1 Test purpose

To verify that the UE reports different CQI indices for Pcell and Scells if each cell experiences a different SNR.

### 9.6.1.2_A.3.2 Test applicability

This test case applies to all types of E-UTRA TDD release 11 and forward UE of category 8 or higher that support 4DL Intra-band contiguous CA or 4DL Inter-band CA, or 4DL with Intra-band contiguous and Inter-band CA.
This test case also applies to all types of E-UTRA TDD release 11 and forward UE of category 8 or higher that support 4DL Intra-band non-contiguous CA or 4DL with Intra-band non-contiguous and Inter-band CA, or 4DL with Intra-band non-contiguous and Intra-band contiguous CA.

Note: This test also applies to UE supporting 4Rx antenna ports.

### 9.6.1.2_A.3.3 Minimum conformance requirements

The following requirements apply to UE Category ≥8. For the parameters specified in Table 9.6.1.2_A.3.3-1 and Table 9.6.1.2_A.3.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of Pcell and Scell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2, and SCell1 and SCell3 reported shall be such that

$$\text{wideband CQI}_{\text{Pcell}} - \text{wideband CQI}_{\text{Scell1}} \geq 2$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell2}} \geq 2$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell3}} \geq 2$$

for more than 90% of the time.

**Table 9.6.1.2_A.3.3-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD, 4 DL CA)**

| Parameter | | Unit | Pcell | Scell1 | Scell2, 3 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -86 | -92 | -98 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 18 | 23 (shift of 5 ms relative to Pcell) | 28 (shift of 10 ms relative to Pcell), 33 for Scell3 (shift of 15 ms relative to Pcell) |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. | | | | | |

**Table 9.6.1.2_A.3.3-2: PUCCH 1-0 static test (TDD, 4DL CA)**

| Test number | Bandwidth combination (MHz) |
|---|---|
| 1 | 4x20 |
| 2 | 20+20+20+15 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2. | |

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.2.

### 9.6.1.2_A.3.4 Test description

#### 9.6.1.2_A.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.2_A.3.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.2_A.3.4.1-1

**Table 9.6.1.2_A.3.4.1-1: Test point selection for PUCCH 1-0 static test**

| CA Applicability | Bandwidth combination | |
|---|---|---|
| | 4x20 | 20+20+20+15 |
| Intra-band contiguous (CA4_C) | Test 1 | Test 2 |
| Inter-band (CA4_A2) | Test 1 | Test 2 |
| Inter-band (CA4_A3) | Test 1 | Test 2 |
| Inter-band (CA4_A4) | Test 1 | Test 2 |
| Intra-band non-contiguous (CA4_N2) | Test 1 | Test 2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.59 without faders for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 9.6.1.2_A.3.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.2_A.3.4.3.

9.6.1.2_A.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined Table 9.6.1.2_A.3.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.2_A.3.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.2_A.3.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.2_A.3.4.3-7.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.2_A.3.5-1 as appropriate.

5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCCs, according to Table 9.6.1.2_A.3.5-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.

6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cells. For each CSI report calculate the respective difference $CQI_{P\text{-}S1}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell1}$, the respective difference $CQI_{S1\text{-}S2}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell2}$ and the respective difference $CQI_{S1\text{-}S3}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell3}$.

7. If more than 1800 values of $CQI_{P\text{-}S1}$ are $\geq 2$, more than 1800 values of $CQI_{S1\text{-}S2}$ are $\geq 2$ and more than 1800 values of $CQI_{S1\text{-}S3}$ are $\geq 2$, pass the UE. Otherwise fail the UE.

9.6.1.2_A.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.2_A.3.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.2_A.3.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.2_A.3.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 18 | (see Table 7.2.2-1C in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.2_A.3.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicatedSCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.2_A.3.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.6.1.2_A.3.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.2_A.3.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 23 | | Scell1 |
| | 28 | | Scell2 |
| | 33 | | Scell3 |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

9.6.1.2_A.3.5 Test requirement

**Table 9.6.1.2_A.3.5-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD, 4 DL CA)**

| Parameter | | Unit | Pcell | Scell1 | Scell2, 3 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -86 | -92 | -98 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | -89 | -95 | -101 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 18 | 23 (shift of 5 ms relative to Pcell) | 28 (shift of 10 ms relative to Pcell), 33 for Scell3 (shift of 15 ms relative to Pcell) |

Note 1: 3 symbols are allocated to PDCCH.Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2

Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 TDD as described in Annex A.5.2.1

Note 4: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for both PCell and SCells

The pass fail decision is as specified in the test procedure in clause 9.6.1.2_A.3.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 9.6.1.2_A.4 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (5DL CA)

Editor's notes: This test case is incomplete. The following item is incomplete:

- Test parameters in minimum requirements are still in square brackets

#### 9.6.1.2_A.4.1 Test purpose

To verify that the UE reports different CQI indices for Pcell and Scells if each cell experiences a different SNR.

#### 9.6.1.2_A.4.2 Test applicability

This test case applies to all types of E-UTRA TDD release 11 and forward UE of category 8 and 11 or higher that support 5DL Intra-band contiguous CA or 5DL Inter-band CA, or 5DL with Intra-band contiguous and Inter-band CA. This test case also applies to all types of E-UTRA TDD release 11 and forward UE of category 8 and 11 or higher that support 5DL Intra-band non-contiguous CA or 5DL with Intra-band non-contiguous and Inter-band CA, or 5DL with Intra-band non-contiguous and Intra-band contiguous CA.

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.6.1.2_A.4.3 Minimum conformance requirements

The following requirements for 5DL CA apply to UE Category 8 and ≥11. For CA with 5 DL CC, for the parameters specified in 9.6.1.1_A.4.3-1 and Table 9.6.1.1_A.4.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell 1 and SCell2, SCell 1 and SCell 3, and SCell 1 and SCell 4 reported shall be such that

$$\text{wideband CQI}_{\text{PCell}} - \text{wideband CQI}_{\text{SCell1}} \geq [2]$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell2}} \geq [2]$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell3}} \geq [2]$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell4}} \geq [2]$$

for more than 90% of the time.

**Table 9.6.1.2_A.4.3-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD, 5 DL CA)**

| Parameter | | Unit | Pcell | Scell1 | Scell2, 3, 4 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -86 | -92 | -98 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 40 | | |
| *cqi-pmi-ConfigurationIndex* | | | 38 | 43 (shift of 5 ms relative to Pcell) | 48 (shift of 10 ms relative to Pcell), 53 for Scell3 (shift of 15ms relative to Pcell), 58 for Scell4 (shift of 20ms relative to Pcell) |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. | | | | | |

**Table 9.6.1.2_A.4.3-2: PUCCH 1-0 static test (TDD, 5 DL CA)**

| Test number | Bandwidth combination (MHz) |
|---|---|
| 1 | 5x20 |
| 2 | 15+4x20 |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2. The test coverage for different number of component carriers is defined in 9.1.1.3.<br>Note 2: If more than one cell can be configured as PCell, choose one of the cells with the smallest bandwidth as PCell. Mapping of PCell and Scells to the CCs shall be constant for all the iterations during the test. Each execution of the test shall use the same mapping. | |

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.2.

### 9.6.1.2_A.4.4 Test description

#### 9.6.1.2_A.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.2_A.4.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.2_A.4.4.1-1

**Table 9.6.1.2_A.4.4.1-1: Test point selection for PUCCH 1-0 static test**

| CA Applicability | Bandwidth combination | |
|---|---|---|
| | 5x20 | 15+4X20 |
| Intra-band (CA5_C) | Test 1 | Test 2 |
| Inter-band (CA5_A2) | Test 1 | Test 2 |
| Inter-band (CA5_A3) | Test 1 | Test 2 |
| Inter-band (CA5_A4) | Test 1 | Test 2 |
| Inter-band (CA5_A5) | Test 1 | Test 2 |
| Intra-band non-contiguous (CA5_N2) | Test 1 | Test 2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.59 without faders for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 9.6.1.2_A.4.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.2_A.4.4.3.

### 9.6.1.2_A.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined Table 9.6.1.2_A.4.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.2_A.4.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.2_A.4.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.2_A.4.4.3-7.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.2_A.4.5-1 as appropriate.

5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCCs, according to Table 9.6.1.2_A.4.5-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.

6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cells. For each CSI report calculate the respective difference $CQI_{P\text{-}S1}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell1}$, the respective difference $CQI_{S1\text{-}S2}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell2}$, the respective difference $CQI_{S1\text{-}S3}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell3}$ and the respective difference $CQI_{S1\text{-}S4}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell4}$.

7. If more than 1800 values of $CQI_{P-S1}$ are ≥ 2 and more than 1800 values of $CQI_{S1-S2}$ are ≥ 2 and more than 1800 values of $CQI_{S1-S3}$ are ≥ 2 and more than 1800 values of $CQI_{S1-S4}$ are ≥ 2 and if all the conditions are met, then pass the UE. Otherwise fail the UE.

### 9.6.1.2_A.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.2_A.4.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.2_A.4.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.2_A.4.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 38 | (see Table 7.2.2-1C in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.2_A.4.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicated SCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.2_A.4.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.6.1.2_A.4.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.2_A.4.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 43 | | Scell1 |
| | 48 | | Scell2 |
| | 53 | | Scell3 |
| | 58 | | Scell4 |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

9.6.1.2_A.4.5 Test requirement

**Table 9.6.1.2_A.4.5-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD, 5 DL CA)**

| Parameter | | Unit | Pcell | Scell1 | Scell2, 3, 4 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | 2 | | |
| Special subframe configuration | | | 4 | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -86 | -92 | -98 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | -89 | -95 | -101 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 40 | | |
| *cqi-pmi-ConfigurationIndex* | | | 38 | 43 (shift of 5 ms relative to Pcell) | 48 (shift of 10 ms relative to Pcell), 53 for Scell3 (shift of 15ms relative to Pcell), 58 for Scell4 (shift of 20ms relative to Pcell) |

Note 1: 3 symbols are allocated to PDCCH.Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2.
Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 TDD as described in Annex A.5.2.1
Note 4: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for both PCell and SCells

The pass fail decision is as specified in the test procedure in clause 9.6.1.2_A.4.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.6.1.3 TDD-FDD CA for FDD PCell

### 9.6.1.3.1 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (2DL CA)

#### 9.6.1.3.1.1 Test purpose

To verify that the UE reports different CQI indices for FDD PCell and SCell if each cell experiences a different SNR.

#### 9.6.1.3.1.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD UE release 12 and forward that support 2DL CA with FDD as PCell (UE categories 5 and onwards).

Note: This test also applies to UE supporting 4Rx antenna ports.

#### 9.6.1.3.1.3 Minimum conformance requirements

The following requirements apply to UE Category ≥3. For TDD-FDD CA with FDD PCell with 2 DL CC , for the parameters specified in Table 9.6.1.3.1.3-1 and Table 9.6.1.3.1.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of Pcell and Scell reported shall be such that

$$\text{wideband CQI}_{\text{Pcell}} - \text{wideband CQI}_{\text{Scell}} \geq 2$$

for more than 90% of the time.

**Table 9.6.1.3.1.3-1: PUCCH 1-0 static test on multiple cells (TDD-FDD CA with FDD PCell, 2DL CA)**

| Parameter | | Unit | PCell | SCell |
|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | |
| Uplink downlink configuration | | | N/A | 2 |
| Special subframe configuration | | | N/A | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | |
| SNR | | dB | 10 | 4 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -88 | -94 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | |
| PUCCH Report Type | | | 4 | |
| Reporting periodicity | | ms | $N_{pd}$ = 10 | |
| *cqi-pmi-ConfigurationIndex* | | | 9 | 14 (shift of 5 ms relative to Pcell) |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD and OP.1 TDD as described in Annex A.5.1.1 and A.5.2.1. | | | | |

**Table 9.6.1.3.1.3-2: PUCCH 1-0 static test (TDD-FDD CA with FDD PCell, 2DL CA)**

| Test number | Bandwidth combination |
|---|---|
| 1 | 20MHz for FDD cell and 20MHz for TDD cell |
| 2 | 10MHz for FDD cell and 20MHz for TDD cell |
| 3 | 15MHz for FDD cell and 20MHz for TDD cell |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2A. The test coverage for different number of component carriers is defined in 9.1.1.3. | |

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.3.

#### 9.6.1.3.1.4 Test description

##### 9.6.1.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.3.1.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.3.1.4.1-1.

**Table 9.6.1.3.1.4.1-1: Test point selection for CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (2DL CA)**

| CA Applicability | Bandwidth combination | | |
|---|---|---|---|
| | 20+20 | 10+20 | 15+20 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 | Test 2 | Test3 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure group A.45 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 9.6.1.3.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.3.1.4.3.

### 9.6.1.3.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined Table 9.6.1.3.1.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.3.1.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.3.1.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.3.1.4.3-7, *TDD-Config-DEFAULT* is defined in Table 9.6.1.3.1.4.3-8.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.3.1.5-1 as appropriate.
5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCC, according to Table 9.6.1.3.1.5-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.
6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cell. For each CSI report calculate the respective difference $CQI_{P\text{-}S}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell}$.
7. If more than 1800 values of $CQI_{P\text{-}S}$ are $\geq 2$ pass the UE. Otherwise fail the UE.

### 9.6.1.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.3.1.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.3.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.3.1.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 9 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.3.1.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicated SCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.3.1.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.6.1.3.1.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.3.1.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 14 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.3.1.4.3-8: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | SCell | TDD |
| specialSubframePatterns | ssp4 | SCell | TDD |
| } | | | |

9.6.1.3.1.5 Test requirement

**Table 9.6.1.3.1.3-1: PUCCH 1-0 static test on multiple cells (TDD-FDD CA with FDD PCell, 2DL CA)**

| Parameter | | Unit | PCell | SCell |
|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | |
| Uplink downlink configuration | | | N/A | 2 |
| Special subframe configuration | | | N/A | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | |
| SNR | | dB | 10 | 4 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -88 | -94 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | -91 | -97 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | |
| PUCCH Report Type | | | 4 | |
| Reporting periodicity | | ms | $N_{pd}$ = 10 | |
| *cqi-pmi-ConfigurationIndex* | | | 9 | 14 (shift of 5 ms relative to Pcell) |

Note 1: 3 symbols are allocated to PDCCH.Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2

Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 FDD as described in Annex A.5.1.1 for FDD Serving Cells

Note 4: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 for FDD PCell and SCells

Note 5: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 TDD as described in Annex A.5.2.1 for TDD Serving Cells

Note 6: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for TDD PCell and SCells

The pass fail decision is as specified in the test procedure in clause 9.6.1.3.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.6.1.3.2 TDD FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (3DL CA)

### 9.6.1.3.2.1 Test purpose

To verify that the UE reports different CQI indices for FDD PCell and SCells if each cell experiences a different SNR.

Note: This test also applies to UE supporting 4Rx antenna ports

### 9.6.1.3.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD UE release 12 and forward that support 3DL CA with FDD as PCell (UE categories 5 and onwards).

9.6.1.3.2.3 Minimum conformance requirements

The following requirements apply to UE Category ≥5. For TDD-FDD CA with FDD PCell with 3DL CC, for the parameters specified in Table 9.6.1.3.2.3-1 and Table 9.6.1.3.2.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of Pcell and Scell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2 reported shall be such that

$$\text{wideband CQI}_{\text{Pcell}} - \text{wideband CQI}_{\text{Scell1}} \geq 2$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell2}} \geq 2$$

for more than 90% of the time.

**Table 9.6.1.3.2.3-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD-FDD CA with FDD PCell, 3DL CA)**

| Parameter | | Unit | PCell | SCell1 | SCell2 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | N/A | 2 if Scell1 is TDD Cell<br>N/A if Scell1 is FDD Cell | 2 |
| Special subframe configuration | | | N/A | 4 if Scell1 is TDD Cell<br>N/A if Scell1 is FDD Cell | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -86 | -92 | -98 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 19 | 24 (shift of 5 ms relative to Pcell) | 29 (shift of 10 ms relative to Pcell) |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD and OP.1 TDD as described in Annex A.5.1.1 and A.5.2.1. | | | | | |

**Table 9.6.1.3.2.3-2: PUCCH 1-0 static test (TDD-FDD CA with FDD PCell, 3DL CA)**

| Test number | Bandwidth combination (MHz) |
|---|---|
| 1 | 20MHz for FDD cell and 2x20MHz for TDD cell |
| 2 | 15MHz for FDD cell and 2x20MHz for TDD cell |
| 3 | 10MHz for FDD cell and 2x20MHz for TDD cell |
| 4 | 2x20MHz for FDD cell and 20MHz for TDD cell |
| 5 | 20+15MHz for FDD cell and 20MHz for TDD cell |
| 6 | 20+10MHz for FDD cell and 20MHz for TDD cell |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2A. The test coverage for different number of component carriers is defined in 9.1.1.3.<br>Note 2: If more than one cell can be configured as PCell, choose one with the smallest bandwidth as PCell. If all the cells which can be configured as PCell have the same bandwidth, randomly choose one as PCell. Randomly associate the other cells to SCell 1 and SCell 2. | |

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.3.

#### 9.6.1.3.2.4 Test description

##### 9.6.1.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.3.2.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.3.2.4.1-1

**Table 9.6.1.3.2.4.1-1: Test point selection for CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (3DL CA)**

| CA Applicability | | Bandwidth combination | | | | | |
|---|---|---|---|---|---|---|---|
| | FDD cell | 20 | 15 | 10 | 2x20 | 20+15 | 20+10 |
| | TDD cell | 2x20 | 2x20 | 2x20 | 20 | 20 | 20 |
| Inter-band CA (two bands) (CA3_A2) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 |
| Inter-band CA (three bands) (CA3_A3) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA3_N2) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | | | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.59 without faders for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 9.6.1.3.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.3.2.4.3.

##### 9.6.1.3.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined Table 9.6.1.3.2.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.3.2.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.3.2.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.3.2.4.3-7, *TDD-Config-DEFAULT* is defined in Table 9.6.1.3.2.4.3-8.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.3.2.5-1 as appropriate.

5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCCs, according to Table 9.6.1.3.2.5-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.

6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cells. For each CSI report calculate the respective difference $CQI_{P\text{-}S1}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell1}$ and the respective difference $CQI_{S1\text{-}S2}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell2}$.

7. If more than 1800 values of $CQI_{P\text{-}S1}$ are $\geq 2$ and more than 1800 values of $CQI_{S1\text{-}S2}$ are $\geq 2$, pass the UE. Otherwise fail the UE.

#### 9.6.1.3.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.3.2.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.3.2.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.3.2.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 19 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.3.2.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicatedSCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.3.2.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.6.1.3.2.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.3.2.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 24 | SCell1 | |
| | 29 | SCell2 | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.3.2.4.3-8: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | 2 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | TDD |
| | sa2 | SCell 2 | |
| specialSubframePatterns | ssp4 | 4 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | TDD |
| | ssp4 | SCell 2 | |
| } | | | |

9.6.1.3.2.5 Test requirement

**Table 9.6.1.3.2.5-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD-FDD CA with FDD PCell, 3DL CA)**

| Parameter | | Unit | PCell | SCell1 | SCell2 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | N/A | 2 if Scell1 is TDD Cell<br>N/A if Scell1 is FDD Cell | 2 |
| Special subframe configuration | | | N/A | 4 if Scell1 is TDD Cell<br>N/A if Scell1 is FDD Cell | 4 |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -86 | -92 | -98 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | -89 | -95 | -101 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 19 | 24 (shift of 5 ms relative to Pcell) | 29 (shift of 10 ms relative to Pcell) |

Note 1: 3 symbols are allocated to PDCCH.Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2
Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 FDD as described in Annex A.5.1.1 for FDD Serving Cells
Note 4: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 for FDD PCell and SCells
Note 5: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 TDD as described in Annex A.5.2.1 for TDD Serving Cells
Note 6: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for TDD PCell and SCells

The pass fail decision is as specified in the test procedure in clause 9.6.1.3.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.6.1.3.3 TDD FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (4DL CA)

### 9.6.1.3.3.1 Test purpose

To verify that the UE reports different CQI indices for FDD PCell and SCells if each cell experiences a different SNR.

### 9.6.1.3.3.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD UE release 12 and forward that support 4DL CA with FDD as PCell (UE categories 8 and onwards).

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.6.1.3.3.3 Minimum conformance requirements

The following requirements for 4DL CA apply to UE Category ≥8. For TDD-FDD CA with FDD PCell with 4 DL CC, for the parameters specified in 9.6.1.3.3.3-1 and Table 9.6.1.3.3.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2, and SCell1 and SCell3 reported shall be such that

$$\text{wideband CQI}_{\text{PCell}} - \text{wideband CQI}_{\text{SCell1}} \geq 2$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell2}} \geq 2$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell3}} \geq 2$$

for more than 90% of the time.

**Table 9.6.1.3.3.3-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD-FDD CA with FDD PCell, 4DL CA)**

| Parameter | | Unit | PCell | SCell1 | SCell2, 3 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | N/A | 2 for TDD Cell<br>N/A for FDD Cell | |
| Special subframe configuration | | | N/A | 4 for TDD Cell<br>N/A for FDD Cell | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -86 | -92 | -98 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 19 | 24 (shift of 5 ms relative to Pcell) | 29 for SCell 2 (shift of 10 ms relative to Pcell) , 34 for SCell 3 (shift of 15ms relative to PCell) |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD and OP.1 TDD as described in Annex A.5.1.1 and A.5.2.1. | | | | | |

**Table 9.6.1.3.3.3-2: PUCCH 1-0 static test (TDD-FDD CA with FDD PCell, 4 DL CA)**

| Test number | Bandwidth combination (MHz) |
|---|---|
| 1 | 20MHz for FDD cell and 3x20MHz for TDD cell |
| 2 | 2x20MHz for FDD cell and 2x20MHz for TDD cell |
| 3 | 20+15MHz for FDD cell and 2x20MHz for TDD cell |
| 4 | 2x15MHz for FDD cell and 2x20MHz for TDD cell |
| 5 | 2x20+15MHz for FDD cell and 20MHz for TDD cell |
| 6 | 2x15+20MHz for FDD cell and 20MHz for TDD cell |
| 7 | 2x20+10MHz for FDD cell and 20MHz for TDD cell |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2A. The test coverage for different number of component carriers is defined in 9.1.1.3.<br>Note 2: If more than one cell can be configured as PCell, choose one with the smallest bandwidth as PCell. If all the cells which can be configured as PCell have the same bandwidth, randomly choose one as PCell. Randomly associate the other cells to SCell 1, SCell 2 and SCell3. | |

The normative reference for this requirement is TS 36101 [2] clause 9.6.1.3.

### 9.6.1.3.3.4 Test description

#### 9.6.1.3.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.3.3.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.3.3.4.1-1

**Table 9.6.1.3.3.4.1-1: Test point selection for CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (4DL CA)**

| CA Applicability | | Bandwidth combination | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | FDD cell | 20 | 2x20 | 20+15 | 2x15 | 2x20+15 | 2x15+20 | 2x20+10 |
| | TDD cell | 3x20 | 2x20 | 2x20 | 2x20 | 20 | 20 | 20 |
| Inter-band CA (two bands) (CA4_A2) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (three bands) (CA4_A3) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (four bands) (CA4_A4) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | | | | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.59 without faders for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.

2. The parameter settings for the cell are set up according to Table 9.6.1.3.3.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.3.3.4.3.

#### 9.6.1.3.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined in Table 9.6.1.3.3.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.3.3.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.3.3.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.3.3.4.3-7.

3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.3.3.5-1 as appropriate.

5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCCs, according to Table 9.6.1.3.3.5-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.

6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cells. For each CSI report calculate the respective difference $CQI_{P\text{-}S1}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell1,}$ the respective difference $CQI_{S1\text{-}S2}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell2}$ and the respective difference $CQI_{S1\text{-}S3}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell3.}$

7. If more than 1800 values of $CQI_{P\text{-}S1}$ are $\geq 2$, more than 1800 values of $CQI_{S1\text{-}S2}$ are $\geq 2$ and more than 1800 values of $CQI_{S1\text{-}S3}$ are $\geq 2$, pass the UE. Otherwise fail the UE.

#### 9.6.1.3.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.3.3.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.3.3.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.3.3.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 19 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.3.3.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicatedSCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.3.3.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.6.1.3.3.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.3.3.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 24 | | SCell1 |
| | 29 | | SCell2 |
| | 34 | | SCell3 |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.3.3.4.3-8: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | 2 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | TDD |
| | sa2 | SCell 2 | |
| specialSubframePatterns | ssp4 | 4 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | TDD |
| | ssp4 | SCell 2 | |
| } | | | |

9.6.1.3.3.5 Test requirement

**Table 9.6.1.3.3.5-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD-FDD CA with FDD PCell, 4DL CA)**

| Parameter | | Unit | PCell | SCell1 | SCell2, 3 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | N/A | 2 for TDD Cell<br>N/A for FDD Cell | |
| Special subframe configuration | | | N/A | 4 for TDD Cell<br>N/A for FDD Cell | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -86 | -92 | -98 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | -89 | -95 | -101 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 19 | 24 (shift of 5 ms relative to Pcell) | 29 for SCell 2 (shift of 10 ms relative to Pcell) , 34 for SCell 3 (shift of 15ms relative to PCell) |

Note 1: 3 symbols are allocated to PDCCH.Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2
Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 FDD as described in Annex A.5.1.1 for FDD Serving Cells
Note 4: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 for FDD PCell and SCells
Note 5: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 TDD as described in Annex A.5.2.1 for TDD Serving Cells
Note 6: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for TDD PCell and SCells

The pass fail decision is as specified in the test procedure in clause 9.6.1.3.3.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.6.1.3.4 TDD FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (5DL CA)

Editor's notes: This test case is incomplete. The following items are missing or are incomplete:

- Annex G is still absent.

### 9.6.1.3.4.1 Test purpose

To verify that the UE reports different CQI indices for FDD PCell and SCells if each cell experiences a different SNR.

#### 9.6.1.3.4.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD UE release 12 and forward that support 5DL CA with FDD as PCell (UE categories 8 or 11 and onwards).

#### 9.6.1.3.4.3 Minimum conformance requirements

The following requirements for 5DL CA apply to UE Category 8 and ≥11. For TDD-FDD CA with FDD PCell with 5 DL CC, for the parameters specified in Table 9.6.1.3.4.3-1 and Table 9.6.1.3.4.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2, SCell1 and SCell3, and SCell 1 and SCell 4 reported shall be such that

$$\text{wideband CQI}_{\text{PCell}} - \text{wideband CQI}_{\text{SCell1}} \geq [2]$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell2}} \geq [2]$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell3}} \geq [2]$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell4}} \geq [2]$$

for more than 90% of the time.

**Table 9.6.1.3.4.3-1: PUCCH 1-0 static test on multiple cells (TDD-FDD CA with FDD PCell, 5 DL CA)**

| Parameter | | Unit | PCell | SCell1 | SCell2, SCell3, SCell4 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | N/A | 2 for TDD Cell<br>N/A for FDD Cell | |
| Special subframe configuration | | | N/A | 4 for TDD Cell<br>N/A for FDD Cell | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -86 | -92 | -98 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 40 | | |
| *cqi-pmi-ConfigurationIndex* | | | 39 | 44 (shift of 5 ms relative to Pcell) | 49 for SCell 2 (shift of 10 ms relative to Pcell), 54 for SCell 3 (shift of 15 ms relative to Pcell), 59 for SCell 4 (shift of 20 ms relative to Pcell) |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD and OP.1 TDD as described in Annex A.5.1.1 and A.5.2.1. | | | | | |

**Table 9.6.1.3.4.3-2: PUCCH 1-0 static test (TDD-FDD CA with FDD PCell, 5 DL CA)**

| Test number | Bandwidth combination (MHz) |
|---|---|
| 1 | 15MHz+2×20MHz for FDD cell and 2x20MHz for TDD cell |
| 2 | 2×15MHz+20MHz for FDD cell and 2x20MHz for TDD cell |
| 3 | 4x20(FDD)+20(TDD)MHz |
| 4 | 3x20(FDD)+2x20(TDD)MHz |
| 5 | 2x20(FDD)+3x20(TDD)MHz |
| 6 | 20(FDD)+4x20(TDD)MHz |
| 7 | 10(FDD)+4x20(TDD)MHz |
| 8 | 2x10(FDD)+3x20(TDD)MH |
| 9 | 10+20(FDD)+3x20(TDD)MHz |
| 10 | 10+2×20(FDD)+2×20(TDD)MHz |
| 11 | 10+15+20(FDD)+2x20(TDD)MHz |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2A. The test coverage for different number of component carriers is defined in 9.1.1.3. | |
| Note 2: If more than one cell can be configured as PCell, choose one of the cells with the smallest bandwidth as PCell. Mapping of PCell and Scells to the CCs shall be constant for all the iterations during the test. Each execution of the test shall use the same mapping. | |

The normative reference for this requirement is TS 36101 [2] clause 9.6.1.3.

### 9.6.1.3.4.4 Test description

#### 9.6.1.3.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.3.4.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.3.4.4.1-1

**Table 9.6.1.3.4.4.1-1: Test point selection for CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (5DL CA)**

| CA Applicability | | Bandwidth combination | |
|---|---|---|---|
| | FDD cell | 2x20+15 | 2x15+20 |
| | TDD cell | 2x20 | 2x20 |
| Inter-band CA (two bands) (CA5_A2) | | Test 1 | Test 2 |
| Inter-band CA (three bands) (CA5_A3) | | Test 1 | Test 2 |
| Inter-band CA (four bands) (CA5_A4) | | Test 1 | Test 2 |
| Inter-band CA (five bands) (CA5_A5) | | Test 1 | Test 2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.59 without faders.
2. The parameter settings for the cell are set up according to Table 9.6.1.3.4.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.3.4.4.3.

#### 9.6.1.3.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined in Table 9.6.1.3.4.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.3.4.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.3.4.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.3.4.4.3-7.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.3.4.3-1 as appropriate.
5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCCs, according to Table 9.6.1.3.4.3-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.
6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cells. For each CSI report calculate the respective difference $CQI_{P\text{-}S1}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell1,}$ the respective difference $CQI_{S1\text{-}S2}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell2}$ and the respective difference $CQI_{S1\text{-}S3}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell3}$ and the respective difference $CQI_{S1\text{-}S4}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell4}$.
7. If more than 1800 values of $CQI_{P\text{-}S1}$ are $\geq 2$, more than 1800 values of $CQI_{S1\text{-}S2}$ are $\geq 2$, more than 1800 values of $CQI_{S1\text{-}S3}$ are $\geq 2$ and more than 1800 values of $CQI_{S1\text{-}S4}$ are $\geq 2$, pass the UE. Otherwise fail the UE.

#### 9.6.1.3.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.3.4.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.3.4.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.3.4.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 39 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.3.4.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicatedSCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.3.4.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.6.1.3.4.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.3.4.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 44 | SCell1 | |
| | 49 | SCell2 | |
| | 54 | SCell3 | |
| | 59 | SCell4 | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.3.4.4.3-8: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | PCell | TDD |
| | sa2 | 2 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | |
| specialSubframePatterns | ssp4 | PCell | TDD |
| | ssp4 | 4 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | |
| } | | | |

### 9.6.1.3.4.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.6.1.3.4.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.6.1.4 TDD-FDD CA for TDD PCell

### 9.6.1.4.1 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (2DL CA)

#### 9.6.1.4.1.1 Test purpose

To verify that the UE reports different CQI indices for TDD PCell and SCell if each cell experiences a different SNR.

#### 9.6.1.4.1.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD UE release 12 and forward that support 2DL CA with TDD PCell (UE categories 5 and onwards).

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.6.1.4.1.3 Minimum conformance requirements

The following requirements apply to UE Category ≥3. For TDD-FDD CA with TDD PCell with 2 DL CC , for the parameters specified in Table 9.6.1.4.1.3-1 and Table 9.6.1.4.1.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of Pcell and Scell reported shall be such that

$$\text{wideband CQI}_{\text{Pcell}} - \text{wideband CQI}_{\text{Scell}} \geq 2$$

for more than 90% of the time.

**Table 9.6.1.4.1.3-1: PUCCH 1-0 static test on multiple cells (TDD-FDD CA with TDD PCell, 2 DL CA)**

| Parameter | | Unit | PCell | SCell |
|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | |
| Uplink downlink configuration | | | 2 | N/A |
| Special subframe configuration | | | 4 | N/A |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | |
| SNR | | dB | 10 | 4 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -88 | -94 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | |
| PUCCH Report Type | | | 4 | |
| Reporting periodicity | | ms | $N_{pd}$ = 10 | |
| *cqi-pmi-ConfigurationIndex* | | | 8 | 13 (shift of 5 ms relative to Pcell) |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD and OP.1 TDD as described in Annex A.5.1.1 and A.5.2.1. | | | | |

**Table 9.6.1.4.1.3-2: PUCCH 1-0 static test (TDD-FDD CA with TDD PCell, 2 DL CA)**

| Test number | Bandwidth combination |
|---|---|
| 1 | 20MHz for TDD cell and 20MHz for FDD cell |
| 2 | 20MHz for TDD cell and 10MHz for FDD cell |
| 3 | 20MHz for TDD cell and 15MHz for FDD cell |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2A. The test coverage for different number of component carriers is defined in 9.1.1.3. | |

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.4.

### 9.6.1.4.1.4 Test description

#### 9.6.1.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA otherwise Mid Range as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.4.1.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.4.1.4.1-1.

**Table 9.6.1.4.1.4.1-1: Test point selection for CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (2DL CA)**

| CA Applicability | Bandwidth combination | | |
|---|---|---|---|
| | 20+20 | 20+10 | 20+15 |
| Inter-band CA (two bands) (CA2_A2) | Test 1 | Test 2 | Test3 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure group A.45 as appropriate for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 9.6.1.4.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.4.1.4.3.

#### 9.6.1.4.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined Table 9.6.1.4.1.4.3-4,

*PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.4.1.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.4.1.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.4.1.4.3-7, *TDD-Config-DEFAULT* is defined in Table 9.6.1.4.1.4.3-8.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.4.1.5-1 as appropriate.

5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCC, according to Table 9.6.1.4.1.5-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.

6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cell. For each CSI report calculate the respective difference $CQI_{P\text{-}S}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell}$.

7. If more than 1800 values of $CQI_{P\text{-}S}$ are $\geq 2$ pass the UE. Otherwise fail the UE.

#### 9.6.1.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.4.1.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.4.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.4.1.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 8 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.4.1.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicatedSCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.4.1.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.6.1.4.1.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.4.1.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 13 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.4.1.4.3-8: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | PCell | |
| | sa2 | 2 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | TDD |
| specialSubframePatterns | ssp4 | PCell | |
| | ssp4 | 4 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | TDD |
| } | | | |

9.6.1.4.1.5 Test requirement

**Table 9.6.1.4.1.5-1: PUCCH 1-0 static test on multiple cells (TDD-FDD CA with TDD PCell, 2 DL CA)**

| Parameter | | Unit | PCell | SCell |
|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | |
| Uplink downlink configuration | | | 2 | N/A |
| Special subframe configuration | | | 4 | N/A |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | |
| SNR | | dB | 10 | 4 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -88 | -94 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | -91 | -97 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | |
| PUCCH Report Type | | | 4 | |
| Reporting periodicity | | ms | $N_{pd}$ = 10 | |
| *cqi-pmi-ConfigurationIndex* | | | 8 | 13 (shift of 5 ms relative to Pcell) |

Note 1: 3 symbols are allocated to PDCCH.Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2

Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 FDD as described in Annex A.5.1.1 for FDD Serving Cells

Note 4: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 for FDD PCell and SCells

Note 5: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 TDD as described in Annex A.5.2.1 for TDD Serving Cells

Note 6: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for TDD PCell and SCells

The pass fail decision is as specified in the test procedure in clause 9.6.1.4.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.6.1.4.2 TDD FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (3DL CA)

### 9.6.1.4.2.1 Test purpose

To verify that the UE reports different CQI indices for TDD PCell and SCells if each cell experiences a different SNR.

### 9.6.1.4.2.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD UE release 12 and forward that support 3DL CA with TDD as PCell (UE categories 5 and onwards).

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.6.1.4.2.3 Minimum conformance requirements

The following requirements apply to UE Category ≥5. For TDD-FDD CA with TDD PCell with 3 DL CC, for the parameters specified in Table 9.6.1.4.2.3-1 and Table 9.6.1.4.2.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of Pcell and Scell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2 reported shall be such that

$$\text{wideband CQI}_{\text{Pcell}} - \text{wideband CQI}_{\text{Scell1}} \geq 2$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell2}} \geq 2$$

for more than 90% of the time.

**Table 9.6.1.4.2.3-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD-FDD CA with TDD PCell, 3DL CA)**

| Parameter | | Unit | PCell | SCell1 | SCell2 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | 2 | 2 if Scell1 is TDD Cell<br>N/A if Scell1 is FDD Cell | N/A |
| Special subframe configuration | | | 4 | 4 if Scell1 is TDD Cell<br>N/A if Scell1 is FDD Cell | N/A |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -86 | -92 | -98 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 18 | 23 (shift of 5 ms relative to Pcell) | 28 (shift of 10 ms relative to Pcell) |

Note 1: 3 symbols are allocated to PDCCH.
Note 2: Reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 for FDD serving cells
Note 3: Reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for TDD serving cells

**Table 9.6.1.4.2.3-2: PUCCH 1-0 static test (TDD-FDD CA with TDD PCell, 3DL CA)**

| Test number | Bandwidth combination (MHz) |
|---|---|
| 1 | 2x20MHz for TDD cell and 20MHz for FDD cell |
| 2 | 2x20MHz for TDD cell and 15MHz for FDD cell |
| 3 | 2x20MHz for TDD cell and 10MHz for FDD cell |
| 4 | 2x20MHz for FDD cell and 20MHz for TDD cell |
| 5 | 20+15MHz for FDD cell and 20MHz for TDD cell |
| 6 | 20+10MHz for FDD cell and 20MHz for TDD cell |

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2A. The test coverage for different number of component carriers is defined in 9.1.1.3.

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.4.

#### 9.6.1.4.2.4 Test description

##### 9.6.1.4.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.4.2.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.4.2.4.1-1.

**Table 9.6.1.4.2.4.1-1: Test point selection for CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (3DL CA)**

| CA Applicability | | Bandwidth combination | | | | | |
|---|---|---|---|---|---|---|---|
| | TDD cell | 2x20 | 2x20 | 2x20 | 20 | 20 | 20 |
| | FDD cell | 20 | 15 | 10 | 2x20 | 20+15 | 20+10 |
| Inter-band CA (two bands) (CA3_A2) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 |
| Inter-band CA (three bands) (CA3_A3) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 |
| Intra-band non-contiguous CA (with two sub-blocks) (CA3_N2) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | | | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.59 without faders for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 9.6.1.4.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.4.2.4.3.

##### 9.6.1.4.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined Table 9.6.1.4.2.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.4.2.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.4.2.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.4.2.4.3-7, *TDD-Config-DEFAULT* is defined in Table 9.6.1.4.2.4.3-8.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).

4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.4.2.5-1 as appropriate.

5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCCs, according to Table 9.6.1.4.2.5-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.

6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cells. For each CSI report calculate the respective difference $CQI_{P\text{-}S1}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell1}$ and the respective difference $CQI_{S1\text{-}S2}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell2}$.

7. If more than 1800 values of $CQI_{P\text{-}S1}$ are $\geq 2$ and more than 1800 values of $CQI_{S1\text{-}S2}$ are $\geq 2$, pass the UE. Otherwise fail the UE.

#### 9.6.1.4.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.4.2.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.4.2.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.4.2.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 18 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.4.2.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicatedSCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.4.2.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.6.1.4.2.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.4.2.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 23 | SCell 1 | |
| | 28 | SCell 2 | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.4.2.4.3-8: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | PCell | |
| | sa2 | 2 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | TDD |
| specialSubframePatterns | ssp4 | PCell | |
| | ssp4 | 4 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | TDD |
| } | | | |

9.6.1.4.2.5 Test requirement

**Table 9.6.1.4.2.5-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD-FDD CA with TDD PCell, 3DL CA)**

| Parameter | | Unit | PCell | SCell1 | SCell2 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | 2 | 2 if Scell1 is TDD Cell<br>N/A if Scell1 is FDD Cell | N/A |
| Special subframe configuration | | | 4 | 4 if Scell1 is TDD Cell<br>N/A if Scell1 is FDD Cell | N/A |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -86 | -92 | -98 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | -89 | -95 | -101 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 18 | 23 (shift of 5 ms relative to Pcell) | 28 (shift of 10 ms relative to Pcell) |

Note 1: 3 symbols are allocated to PDCCH.Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2

Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 FDD as described in Annex A.5.1.1 for FDD Serving Cells

Note 4: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 for FDD PCell and SCells

Note 5: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 TDD as described in Annex A.5.2.1 for TDD Serving Cells

Note 6: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for TDD PCell and SCells

The pass fail decision is as specified in the test procedure in clause 9.6.1.4.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 9.6.1.4.3 TDD FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (4DL CA)

#### 9.6.1.4.3.1 Test purpose

To verify that the UE reports different CQI indices for TDD PCell and SCells if each cell experiences a different SNR.

#### 9.6.1.4.3.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD UE release 12 and forward that support 4DL CA with TDD as PCell (UE categories 8 and onwards).

Note: This test also applies to UE supporting 4Rx antenna ports

#### 9.6.1.4.3.3 Minimum conformance requirements

The following requirements for 4DL CA apply to UE Category ≥8. For TDD-FDD CA with TDD PCell with 4 DL CC, for the parameters specified in Table 9.6.1.4.3.3-1 and Table 9.6.1.4.3.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2, and SCell1 and SCell3 reported shall be such that

$$\text{wideband CQI}_{\text{PCell}} - \text{wideband CQI}_{\text{SCell1}} \geq 2$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell2}} \geq 2$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell3}} \geq 2$$

for more than 90% of the time.

**Table 9.6.1.4.3.3-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD-FDD CA with TDD PCell, 4DL CA)**

| Parameter | | Unit | PCell | SCell1 | SCell2, SCell3 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | 2 | 2 for TDD Cell<br>N/A for FDD Cell | |
| Special subframe configuration | | | 4 | 4 for TDD Cell<br>N/A for FDD Cell | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -86 | -92 | -98 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 18 | 23 (shift of 5 ms relative to Pcell) | 28 for SCell 2 (shift of 10 ms relative to Pcell) , 33 for SCell 3 (shift of 15ms relative to PCell) |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD and OP.1 TDD as described in Annex A.5.1.1 and A.5.2.1. | | | | | |

**Table 9.6.1.4.3.3-2: PUCCH 1-0 static test (TDD-FDD CA with TDD PCell, 4 DL CA)**

| Test number | Bandwidth combination (MHz) |
|---|---|
| 1 | 3x20MHz for TDD cell and 20MHz for FDD cell |
| 2 | 2x20MHz for FDD cell and 2x20MHz for TDD cell |
| 3 | 20+15MHz for FDD cell and 2x20MHz for TDD cell |
| 4 | 2x15MHz for FDD cell and 2x20MHz for TDD cell |
| 5 | 2x20+15MHz for FDD cell and 20MHz for TDD cell |
| 6 | 2x15+20MHz for FDD cell and 20MHz for TDD cell |
| 7 | 2x20+10MHz for FDD cell and 20MHz for TDD cell |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2A. The test coverage for different number of component carriers is defined in 9.1.1.3.<br>Note 2: If more than one cell can be configured as PCell, choose one with the smallest bandwidth as PCell. If all the cells which can be configured as PCell have the same bandwidth, randomly choose one as PCell. Randomly associate the other cells to SCell 1, SCell 2 and SCell3. | |

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.4.

### 9.6.1.4.3.4 Test description

#### 9.6.1.4.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.4.3.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.4.3.4.1-1.

**Table 9.6.1.4.3.4.1-1: Test point selection for CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (4DL CA)**

| CA Applicability | Bandwidth combination | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | FDD cell | 20 | 2x20 | 20+15 | 2x15 | 2x20+15 | 2x15+20 | 2x20+10 |
| | TDD cell | 3x20 | 2X20 | 2X20 | 2X20 | 20 | 20 | 20 |
| Inter-band CA (two bands) (CA4_A2) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (three bands) (CA4_A3) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Inter-band CA (four bands) (CA4_A4) | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | | | | | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.59 without faders for UE supporting only 2Rx RF bands on all CC. Annex A, Figure A.86 for UE supporting 4Rx RF band on any of the CC.
2. The parameter settings for the cell are set up according to Table 9.6.1.4.3.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.4.3.4.3.

### 9.6.1.4.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined in Table 9.6.1.4.3.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.4.2.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.4.3.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.4.3.4.3-7.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.4.3.5-1 as appropriate.
5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCCs, according to Table 9.6.1.4.3.5-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.
6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cells. For each CSI report calculate the respective difference

$CQI_{P\text{-}S1}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell1,}$ the respective difference $CQI_{S1\text{-}S2}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell2}$and respective difference $CQI_{S1\text{-}S3}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell3}$

7. If more than 1800 values of $CQI_{P\text{-}S1}$ are ≥ 2, more than 1800 values of $CQI_{S1\text{-}S2}$ are ≥ 2 and more than 1800 values of $CQI_{S1\text{-}S3}$ are ≥ 2, pass the UE. Otherwise fail the UE.

#### 9.6.1.4.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.4.3.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.4.3.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.4.3.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 18 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.4.3.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicated SCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.4.3.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.6.1.4.3.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.4.3.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 23 | SCell1 | |
| | 28 | SCell2 | |
| | 33 | SCell3 | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.4.3.4.3-8: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | PCell | |
| | sa2 | 2 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | TDD |
| specialSubframePatterns | ssp4 | PCell | |
| | ssp4 | 4 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | TDD |
| } | | | |

9.6.1.4.3.5 Test requirement

**Table 9.6.1.4.3.5-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD-FDD CA with TDD PCell, 4DL CA)**

| Parameter | | Unit | PCell | SCell1 | SCell2, SCell3 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | 2 | 2 for TDD Cell<br>N/A for FDD Cell | |
| Special subframe configuration | | | 4 | 4 for TDD Cell<br>N/A for FDD Cell | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 2) | | |
| SNR | | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ for CC on 2Rx supported RF band | | dB[mW/15kHz] | -86 | -92 | -98 |
| $\hat{I}_{or}^{(j)}$ for CC on 4Rx supported RF band | | dB[mW/15kHz] | [-89] | -95 | -101 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | |
| PUCCH Report Type | | | 4 | | |
| Reporting periodicity | | ms | $N_{pd}$ = 20 | | |
| *cqi-pmi-ConfigurationIndex* | | | 18 | 23 (shift of 5 ms relative to Pcell) | 28 for SCell 2 (shift of 10 ms relative to Pcell) , 33 for SCell 3 (shift of 15ms relative to PCell) |

Note 1: 3 symbols are allocated to PDCCH. Note 2: The power level requirement for CC on 4Rx supported RF band is as specified 9.1.1.4.2

Note 3: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 FDD as described in Annex A.5.1.1 for FDD Serving Cells

Note 4: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 for FDD PCell and SCells

Note 5: For a UE without 4Rx antenna capability, no PDSCH for user data is scheduled for the UE with one-sided dynamic OCNG pattern OP.1 TDD as described in Annex A.5.2.1 for TDD Serving Cells

Note 6: For a UE with 4Rx antenna capability, use reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for TDD PCell and SCells

The pass fail decision is as specified in the test procedure in clause 9.6.1.4.3.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 9.6.1.4.4 TDD FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (5DL CA)

Editor's notes: This test case is incomplete. The following items are missing or are incomplete:

- Annex G is still absent.

#### 9.6.1.4.4.1 Test purpose

To verify that the UE reports different CQI indices for TDD PCell and SCells if each cell experiences a different SNR.

#### 9.6.1.4.4.2 Test applicability

This test applies to all types of E-UTRA FDD and TDD UE release 12 and forward that support 5DL CA with TDD as PCell (UE categories 8 or 11 and onwards).

#### 9.6.1.4.4.3 Minimum conformance requirements

The following requirements for 5DL CA apply to UE Category 8 and ≥11. For TDD-FDD CA with TDD PCell with 5 DL CC, for the parameters specified in Table 9.6.1.4.4.3-1 and Table 9.6.1.4.4.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2, SCell1 and SCell3 and SCell 1 and SCell 4 reported shall be such that

$$\text{wideband CQI}_{\text{PCell}} - \text{wideband CQI}_{\text{SCell1}} \geq [2]$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell2}} \geq [2]$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell3}} \geq [2]$$

$$\text{wideband CQI}_{\text{SCell1}} - \text{wideband CQI}_{\text{SCell4}} \geq [2]$$

for more than 90% of the time.

**Table 9.6.1.4.4.3-1: PUCCH 1-0 static test on multiple cells (TDD-FDD CA with TDD PCell, 5 DL CA)**

| Parameter | | Unit | PCell | SCell1 | SCell2, SCell3, SCell4 |
|---|---|---|---|---|---|
| PDSCH transmission mode | | | 1 | | |
| Uplink downlink configuration | | | 2 | 2 if Scell1 is TDD Cell<br>N/A if Scell1 is FDD Cell | |
| Special subframe configuration | | | 4 | 4 if Scell1 is TDD Cell<br>N/A if Scell1 is FDD Cell | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | |
| | $\rho_B$ | dB | 0 | | |

| Propagation condition and antenna configuration | | AWGN (1 x 2) | | |
|---|---|---|---|---|
| SNR | dB | 12 | 6 | 0 |
| $\hat{I}_{or}^{(j)}$ | dB[mW/15kHz] | -86 | -92 | -98 |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | -98 | -98 |
| Physical channel for CQI reporting | | PUCCH Format 2 | | |
| PUCCH Report Type | | 4 | | |
| Reporting periodicity | ms | $N_{pd}$ = 40 | | |
| *cqi-pmi-ConfigurationIndex* | | 38 | 43 (shift of 5 ms relative to Pcell) | 48 for SCell 2 (shift of 10 ms relative to Pcell), 53 for SCell 3 (shift of 15 ms relative to Pcell), 58 for SCell 4 (shift of 20 ms relative to Pcell) |
| Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG pattern OP.1 FDD and OP.1 TDD as described in Annex A.5.1.1 and A.5.2.1 | | | | |

**Table 9.6.1.4.4.3-2: PUCCH 1-0 static test (TDD-FDD CA with TDD PCell, 5 DL CA)**

| Test number | Bandwidth combination (MHz) |
|---|---|
| 1 | 15MHz+2×20MHz for FDD cell and 2x20MHz for TDD cell |
| 2 | 2×15MHz+20MHz for FDD cell and 2x20MHz for TDD cell |
| 3 | 4x20(FDD)+20(TDD)MHz |
| 4 | 3x20(FDD)+2x20(TDD)MHz |
| 5 | 2x20(FDD)+3x20(TDD)NA |
| 6 | 20(FDD)+4x20(TDD)MHz |
| 7 | 10(FDD)+4x20(TDD)MHz |
| 8 | 2x10(FDD)+3x20(TDD)MH |
| 9 | 10+20(FDD)+3x20(TDD)MHz |
| 10 | 10+2×20(FDD)+2×20(TDD)MHz |
| 11 | 10+15+20(FDD)+2x20(TDD)MHz |
| Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2A. The test coverage for different number of component carriers is defined in 9.1.1.3.<br>Note 2: If more than one cell can be configured as PCell, choose one of the cells with the smallest bandwidth as PCell. Mapping of PCell and Scells to the CCs shall be constant for all the iterations during the test. Each execution of the test shall use the same mapping. | |

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.4.

### 9.6.1.4.4.4 Test description

#### 9.6.1.4.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Maximum Wgap for Intra-band non-contiguous CA, otherwise Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: Select one according to Table 9.6.1.4.4.4.1-1.

CA Capability to be tested: Select one according to Table 9.6.1.4.4.4.1-1.

**Table 9.6.1.4.4.4.1-1: Test point selection for CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (5DL CA)**

| CA Applicability | | Bandwidth combination | |
|---|---|---|---|
| | FDD cell | 2x20+15 | 2x15+20 |
| | TDD cell | 2x20 | 2x20 |
| Inter-band CA (two bands) (CA5_A2) | | Test 1 | Test 2 |
| Inter-band CA (three bands) (CA5_A3) | | Test 1 | Test 2 |
| Inter-band CA (four bands) (CA5_A4) | | Test 1 | Test 2 |
| Inter-band CA (five bands) (CA5_A5) | | Test 1 | Test 2 |
| Note 1: Only one test point is tested. Select the largest aggregated CA bandwidth combination supported by the UE among the UE supported CA capabilities. | | | |

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.59 without faders.
2. The parameter settings for the cell are set up according to Table 9.6.1.4.4.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.4.4.4.3.

### 9.6.1.4.4.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1 and Annex C.3.2 for all downlink physical channels.
2. The SS shall configure SCCs as per TS 36.508 [7] clause 5.2A.4. Message contents for *RadioResourceConfigDedicatedSCell-r10-DEFAULT* are defined in Table 9.6.1.4.4.4.3-4, *PhysicalConfigDedicatedSCell-r10-DEFAULT* is defined in Table 9.6.1.4.2.4.3-5, *CQI-ReportConfigSCell-r10-DEFAULT* is defined in Table 9.6.1.4.4.4.3-6, *CQI-ReportPeriodic-r10-DEFAULT* is defined in Table 9.6.1.4.4.4.3-7.
3. SS activates SCCs by sending the activation MAC-CE (Refer TS 36.321 [13], clauses 5.13, 6.1.3.8). Wait for at least 2 seconds (Refer TS 36.133, clauses 8.3.3.2).
4. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.4.4.3-1 as appropriate.
5. For a UE with 4Rx antenna capability, SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC on both PCC and SCCs, according to Table 9.6.1.4.4.3-1. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC when receiving CQI report. The UE will send ACK/NACK and periodic CQI report using PUSCH.
6. The SS shall start gathering CQI reports, and will continue gathering CQI reports until 2000 wideband CQI reports have been gathered for each P-Cell and S-Cells. For each CSI report calculate the respective difference $CQI_{P\text{-}S1}$ = wideband $CQI_{Pcell}$ – wideband $CQI_{Scell1}$, the respective difference $CQI_{S1\text{-}S2}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell2}$ and the respective difference $CQI_{S1\text{-}S3}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell3}$ and the respective difference $CQI_{S1\text{-}S4}$ = wideband $CQI_{Scell1}$ – wideband $CQI_{Scell4}$.
7. If more than 1800 values of $CQI_{P\text{-}S1}$ are $\geq 2$, more than 1800 values of $CQI_{S1\text{-}S2}$ are $\geq 2$, more than 1800 values of $CQI_{S1\text{-}S3}$ are $\geq 2$ and more than 1800 values of $CQI_{S1\text{-}S4}$ are $\geq 2$, pass the UE. Otherwise fail the UE.

9.6.1.4.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.6.1.4.4.4.3-1: *RadioResourceConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | *PhysicalConfigDedicated - DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.4.4.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| } | | | |

**Table 9.6.1.4.4.4.3-3: *CQI-ReportPeriodic-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 38 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.4.4.4.3-4: *RadioResourceConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE { | | | |
| physicalConfigDedicatedSCell-r10 | *PhysicalConfigDedicated SCell-r10-DEFAULT* | | |
| } | | | |

**Table 9.6.1.4.4.4.3-5: *PhysicalConfigDedicatedSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicatedSCell-r10-DEFAULT ::= SEQUENCE { | | | |
| ul-Configuration-r10 | | | |
| ul-Configuration-r10 SEQUENCE { | | | |
| cqi-ReportConfigSCell-r10 | *CQI-ReportConfigSCell-r10-DEFAULT* | | |
| } | | | |
| } | | | |

**Table 9.6.1.4.4.4.3-6: *CQI-ReportConfigSCell-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfigSCell-r10 ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic-r10 | Not present | | |
| nomPDSCH-RS-EPRE-Offset-r10 | 0 | | |
| cqi-ReportPeriodicSCell-r10 | | | |
| | *CQI-ReportPeriodic-r10-DEFAULT* | | CQI_PERIODIC |
| pmi-RI-Report-r10 | Not present | | |
| } | | | |

**Table 9.6.1.4.4.4.3-7: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 43 | SCell1 | |
| | 48 | SCell2 | |
| | 53 | SCell3 | |
| | 58 | SCell4 | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| cqi-Mask-r9 | Not present | | |
| csi-ConfigIndex-r10 | Not present | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.6.1.4.4.4.3-8: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | PCell | |
| | sa2 | 2 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | TDD |
| specialSubframePatterns | ssp4 | PCell | |
| | ssp4 | 4 if SCell1 is TDD Cell<br>N/A if SCell1 is FDD Cell | TDD |
| } | | | |

#### 9.6.1.4.4.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.6.1.4.4.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

# 9.7 CSI reporting for UE DL category 0

The number of receiver antennas $N_{RX}$ assumed for the minimum performance requirement in this clause is 1.

## 9.7.1 CQI reporting definition under AWGN conditions

### 9.7.1.1 FDD and Half duplex FDD CQI reporting definition under AWGN conditions for UE category 0

#### 9.7.1.1.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

#### 9.7.1.1.2 Test applicability

This test applies to E-UTRA FDD UE release 12 and forward of UE category 0.

#### 9.7.1.1.3 Minimum conformance requirements

The following requirements apply to DL UE Category 0. For the parameters specified in Table 9.7.1.1.3-1 and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to TBD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

**Table 9.7.1.1.3-1: PUCCH 1-0 static test (FDD and half-duplex FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 1) | | | |
| SNR (Note 2) | | dB | 0 | 1 | 6 | 7 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 | -92 | -91 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 40 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 41 | | | |
| Note 1: Reference measurement channel RC.16 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1. | | | | | | |
| Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. | | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 9.7.1.1.

### 9.7.1.1.4 Test description

#### 9.7.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.7.1.1.3-1 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Table 9.7.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.7.1.1.4.3.

#### 9.7.1.1.4.2 Test procedure

Same test procedure as in clause 9.2.1.1.4.2 with the following exceptions:

- Instead of Table 9.2.1.1.3-1 → use Table 9.7.1.1.3-1.

#### 9.7.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.7.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.7.1.1.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 6 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

#### 9.7.1.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.7.1.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 9.7_1.1.1 FDD CQI reporting under AWGN conditions – PUCCH 1-0 for UE category 1bis

#### 9.7_1.1.1.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

#### 9.7_1.1.1.2 Test applicability

This test applies to E-UTRA FDD UE release 13 and forward of UE category 1bis.

#### 9.7_1.1.1.3 Minimum conformance requirements

The following requirements apply to UE DL Category 1bis. For the parameters specified in Table 9.7.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.4 FDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated

by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

**Table 9.7_1.1.1.3-1: PUCCH 1-0 static test**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 1) | | | |
| SNR (Note 2) | | dB | 0 | 1 | 6 | 7 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 | -92 | -91 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 6 | | | |

Note 1: Reference measurement channel RC.4 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.2 FDD as described in Annex A.5.1.2.
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

The normative reference for this requirement is TS 36.101 [2] clause 9.7.1.3.

## 9.7_1.1.1.4 Test description

### 9.7_1.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.7_1.1.1.3-1, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Table 9.7_1.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.7_1.1.1.4.3.

#### 9.7_1.1.1.4.2 Test procedure

Same test procedure as in clause 9.2.1.1.4.2 with the following exceptions:

- Instead of Table 9.2.1.1.3-1 → use Table 9.7_1.1.1.3-1.

#### 9.7_1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.7_1.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.7_1.1.1.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 6 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

### 9.7_1.1.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.7_1.1.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.7_1.1.2 TDD CQI reporting under AWGN conditions - PUCCH 1-0 for UE category 1bis

### 9.7_1.1.2.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

### 9.7_1.1.2.2 Test applicability

This test applies to E-UTRA TDD UE release 13 and forward of UE category 1bis.

### 9.7_1.1.2.3 Minimum conformance requirements

The following requirements apply to UE DL Category 1bis. For the parameters specified in Table 9.7.1.4-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.4 TDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

**Table 9.7_1.1.2.3-1: PUCCH 1-0 static test (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 1) | | | |
| SNR (Note 2) | | dB | 0 | 1 | 6 | 7 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 | -92 | -91 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: Reference measurement channel RC.4 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/OP.2 TDD as described in Annex A.5.2.1/A.5.2.2.
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

The normative reference for this requirement is TS 36.101 [2] clause 9.7.1.4.

### 9.7_1.1.2.4 Test description

#### 9.7_1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.7_1.1.2.3-1 as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to Table 9.7_1.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.7_1.1.2.4.3.

### 9.7_1.1.2.4.2 Test procedure

Same test procedure as in clause 9.2.1.2.4.2 with the following exceptions:

- Instead of Table 9.2.1.2.3-1 → use Table 9.7_1.1.2.3-1.

### 9.7_1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.7_1.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.7_1.1.2.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1C in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.7_1.1.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

#### 9.7_1.1.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.7_1.1.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 9.7_1.1.3 FDD CQI reporting under fading conditions - PUSCH 3-0 for UE category 1bis

#### 9.7_1.1.3.1 Test purpose

To verify that preferred sub-bands can be used for frequency-selective scheduling.

#### 9.7_1.1.3.2 Test applicability

This test applies to E-UTRA FDD UE release 13 and forward of UE category 1bis.

#### 9.7_1.1.3.3 Minimum conformance requirements

The following requirements apply to UE DL Category 1bis. For the parameters specified in Table 9.7_1.1.3.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.7_1.1.3.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band;

b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI.

**Table 9.7_1.1.3.3-1: Sub-band test for single antenna transmission (FDD)**

| Parameter | | Unit | Test 1 | Test 2 |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | |
| Transmission mode | | | 1 (port 0) | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| | $\sigma$ | dB | 0 | |

| SNR (Note 3) | dB | 8 | 9 | 13 | 14 |
|---|---|---|---|---|---|
| $\hat{I}_{or}^{(j)}$ | dB[mW/15kHz] | -90 | -89 | -85 | -84 |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Antenna configuration | | 1 x 1 | | | |
| Reporting interval | ms | 5 | | | |
| CQI delay | ms | 8 | | | |
| Reporting mode | | PUSCH 3-0 | | | |
| Sub-band size | RB | 6 (full size) | | | |
| Max number of HARQ transmissions | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.3 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.2 FDD as described in Annex A.5.1.2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

**Table 9.7_1.1.3.3-2: Minimum requirement (FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.15 | 1.15 |
| UE DL Category | 1bis | 1bis |

The normative reference for this requirement is TS 36.101 [2] clause 9.7.2.3.

## 9.7_1.1.3.4 Test description

### 9.7_1.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.7_1.1.3.3-1 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9(using only main UE Tx/Rx antenna).
2. The parameter settings for the cell are set up according to Table 9.7_1.1.3.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.7_1.1.3.4.3.

#### 9.7_1.1.3.4.2 Test procedure

Same test procedure as in clause 9.3.1.1.1.4.2 with the following exceptions:

- Instead of Table 9.3.1.1.1.3-1→ use Table 9.7_1.1.3.3-1.

#### 9.7_1.1.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.7_1.1.3.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.7_1.1.3.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm30 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |
| } | | | |

### 9.7_1.1.3.5 Test requirement

**Table 9.7_1.1.3.5-1: Test requirement (FDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.14 | 1.14 |
| BLER | 0.05 | 0.05 |

To pass the test, $\alpha$ and $\beta$ and $\gamma$ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.7_1.1.4 TDD CQI reporting under fading conditions - PUSCH 3-0 for UE category 1bis

### 9.7_1.1.4.1 Test purpose

To verify that preferred sub-bands can be used for frequency-selective scheduling.

### 9.7_1.1.4.2 Test applicability

This test applies to E-UTRA TDD UE release 13 and forward of UE category 1bis.

### 9.7_1.1.4.3 Minimum conformance requirements

The following requirements apply to UE DL Category 1bis. For the parameters specified in Table 9.7_1.1.4.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.7_1.1.4.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band;

b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each available downlink transmission instance for TDD.

**Table 9.7_1.1.4.3-1: Sub-band test for single antenna transmission (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $\sigma$ | dB | 0 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| SNR (Note 3) | | dB | 8 | 9 | 13 | 14 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -90 | -89 | -85 | -84 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Antenna configuration | | | 1 x 1 | | | |
| Reporting interval | | ms | 5 | | | |
| CQI delay | | ms | 10 or 11 | | | |
| Reporting mode | | | PUSCH 3-0 | | | |
| Sub-band size | | RB | 6 (full size) | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.3 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

**Table 9.7_1.1.4.3-2: Minimum requirement (TDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.15 | 1.15 |
| UE DL Category | 1bis | 1bis |

The normative reference for this requirement is TS 36.101 [2] clause 9.7.2.4.

## 9.7_1.1.4.4 Test description

### 9.7_1.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.7_1.1.4.3-1 as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9(using only main UE Tx/Rx antenna).
2. The parameter settings for the cell are set up according to Table 9.7_1.1.4.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.7_1.1.4.4.3.

### 9.7_1.1.4.4.2 Test procedure

Same test procedure as in clause 9.3.1.1.2.4.2 with the following exceptions:

- Instead of Table 9.3.1.1.2.3-1 → use Table 9.7_1.1.4.3-1.

### 9.7_1.1.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.7_1.1.4.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.7_1.1.4.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm30 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic | Not present | | |
| } | | | |
| } | | | |

**Table 9.7_1.1.4.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa2 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

### 9.7_1.1.4.5 Test requirement

**Table 9.7_1.1.4.5-1: Test requirement (TDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.14 | 1.14 |
| BLER | 0.05 | 0.05 |

To pass the test, $\alpha$ and $\beta$ and $\gamma$ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.7.1.2 TDD CQI reporting definition under AWGN conditions for UE category 0

### 9.7.1.2.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

### 9.7.1.2.2 Test applicability

This test applies to E-UTRA TDD UE release 12 and forward of UE category 0.

### 9.7.1.2.3 Minimum conformance requirements

The following requirements apply to DL UE Category 0. For the parameters specified in Table 9.7.1.2.3-1 and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.16 TDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

**Table 9.7.1.2.3-1: PUCCH 1-0 static test (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 1) | | | |
| SNR (Note 2) | | dB | 0 | 1 | 6 | 7 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 | -92 | -91 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: Reference measurement channel RC.16 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

The normative reference for this requirement is TS 36.101 [2] clause 9.7.1.2.

## 9.7.1.2.4 Test description

### 9.7.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.7.1.2.3-1 as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Table 9.7.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.7.1.2.4.3.

#### 9.7.1.2.4.2 Test procedure

Same test procedure as in clause 9.2.1.2.4.2 with the following exceptions:

- Instead of Table 9.2.1.2.3-1 → use Table 9.7.1.2.3-1.

#### 9.7.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.7.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.7.1.2.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1C in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.7.1.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

### 9.7.1.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.7.1.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.7_1.1.2 TDD CQI reporting under AWGN conditions - PUCCH 1-0 for UE category 1bis

### 9.7_1.1.2.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

### 9.7_1.1.2.2 Test applicability

This test applies to E-UTRA TDD UE release 13 and forward of UE category 1bis.

### 9.7_1.1.2.3 Minimum conformance requirements

The following requirements apply to UE DL Category 1bis. For the parameters specified in Table 9.7.1.4-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.4 TDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

**Table 9.7_1.1.2.3-1: PUCCH 1-0 static test (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 1) | | | |
| SNR (Note 2) | | dB | 0 | 1 | 6 | 7 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -98 | -97 | -92 | -91 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: Reference measurement channel RC.4 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/OP.2 TDD as described in Annex A.5.2.1/A.5.2.2.
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

The normative reference for this requirement is TS 36.101 [2] clause 9.7.1.4.

### 9.7_1.1.2.4 Test description

#### 9.7_1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.7_1.1.2.3-1 as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Table 9.7_1.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.7_1.1.2.4.3.

#### 9.7_1.1.2.4.2 Test procedure

Same test procedure as in clause 9.2.1.2.4.2 with the following exceptions:

- Instead of Table 9.2.1.2.3-1 → use Table 9.7_1.1.2.3-1.

#### 9.7_1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.7_1.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.7_1.1.2.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1C in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.7_1.1.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

### 9.7_1.1.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.7_1.1.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.7.2 CQI reporting under fading conditions

### 9.7.2.1 FDD and Half duplex FDD CQI reporting definition under fading conditions for UE category 0

#### 9.7.2.1.1 Test purpose

To verify that preferred sub-bands can be used for frequency-selective scheduling.

#### 9.7.2.1.2 Test applicability

This test applies to E-UTRA FDD UE release 12 and forward of UE category 0.

#### 9.7.2.1.3 Minimum conformance requirements

For the parameters specified in Table 9.7.2.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.7.2.1.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band;

b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD and in each available downlink transmission instance for half-duplex FDD.

**Table 9.7.2.1.3-1: Sub-band test for single antenna transmission (FDD and half-duplex FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $\sigma$ | dB | 0 | | | |
| SNR (Note 3) | | dB | 8 | 9 | 13 | 14 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -90 | -89 | -85 | -84 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Antenna configuration | | | 1 x 1 | | | |
| Reporting interval | | ms | 8 | | | |
| CQI delay | | ms | 8 | | | |
| Reporting mode | | | PUSCH 3-0 | | | |
| Sub-band size | | RB | 6 (full size) | | | |
| Max number of HARQ transmissions | | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.16 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

**Table 9.7.2.1.3-2: Minimum requirement (FDD and half-duplex FDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.1 | 1.1 |
| UE DL Category | 0 | 0 |

The normative reference for this requirement is TS 36.101 [2] clause 9.7.2.1.

### 9.7.2.1.4 Test description

#### 9.7.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.7.2.1.3-1 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9(using only main UE Tx/Rx antenna).
2. The parameter settings for the cell are set up according to Table 9.7.2.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.7.2.1.4.3.

### 9.7.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.7.2.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 8 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 8 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. Check if "2000*$\alpha$%/100 ≤ number of CQI reports with index 0 for each full-size subband ≤ 2000*$\beta$%/100". (2000= No of full-size subband reports, 100 because of %) If yes, continue with step5, otherwise goto step 7.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI value in an each TTI randomly selected full-size subband regardless of UE wideband and full-size subband CQI report. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 8 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.
6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the highest UE reported full-size subband CQI value in one full-size subband selected among the subbands in which UE reports the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 8 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput and (NACK /(ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / $t_{median}$) ≥ $\gamma$ and (NACK /(ACK + NACK))≥ 0.05 , pass the UE for this test and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.7.2.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.7.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.7.2.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.7.2.1.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 6 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

### 9.7.2.1.5 Test requirement

**Table 9.7.2.1.5-1: Test requirement (FDD and half-duplex FDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.09 | 1.09 |
| BLER | 0.05 | 0.05 |

To pass the test, $\alpha$ and $\beta$ and $\gamma$ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.7.2.2 TDD CQI reporting definition under fading conditions for UE category 0

### 9.7.2.2.1 Test purpose

To verify that preferred sub-bands can be used for frequency-selective scheduling.

### 9.7.2.2.2 Test applicability

This test applies to E-UTRA TDD UE release 12 and forward of UE category 0.

### 9.7.2.2.3 Minimum conformance requirements

For the parameters specified in Table 9.7.2.2.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.7.2.2.3-2 and by the following:

a) a sub-band differential CQI offset level of 0 shall be reported at least $\alpha$% of the time but less than $\beta$% for each sub-band;

b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each available downlink transmission instance for TDD.

**Table 9.7.2.2.3-1: Sub-band test for single antenna transmission (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | | | |
| Transmission mode | | | 1 (port 0) | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| SNR (Note 3) | | dB | 8 | 9 | 13 | 14 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -90 | -89 | -85 | -84 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 5$ Hz | | | |
| Antenna configuration | | | 1 x 1 | | | |
| Reporting interval | | ms | 5 | | | |
| CQI delay | | ms | 10 or 11 | | | |
| Reporting mode | | | PUSCH 3-0 | | | |
| Sub-band size | | RB | 6 (full size) | | | |
| Max number of HARQ transmissions | | | 1 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.16 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

**Table 9.7.2.2.3-2: Minimum requirement (TDD)**

| | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.1 | 1.1 |
| UE DL Category | 0 | 0 |

The normative reference for this requirement is TS 36.101 [2] clause 9.7.2.2.

## 9.7.2.2.4 Test description

### 9.7.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.7.2.2.3-1 as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9(using only main UE Tx/Rx antenna).
2. The parameter settings for the cell are set up according to Table 9.7.2.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.7.2.2.4.3.

### 9.7.2.2.4.2 Test procedure

Same test procedure as in clause 9.3.1.1.2.4.2 with the following exceptions:

- Instead of Table 9.3.1.1.2.3-1 → use Table 9.7.2.2.3-1.

### 9.7.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.7.2.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.7.2.2.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 6 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

#### 9.7.2.2.5 Test requirement

**Table 9.7.2.2.5-1: Test requirement (TDD)**

| Parameter | Test 1 | Test 2 |
|---|---|---|
| $\alpha$ [%] | 2 | 2 |
| $\beta$ [%] | 55 | 55 |
| $\gamma$ | 1.09 | 1.09 |
| BLER | 0.05 | 0.05 |

To pass the test, $\alpha$ and $\beta$ and $\gamma$ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

## 9.8 CSI reporting (UE supporting coverage enhancement)

The number of receiver antennas $N_{RX}$ assumed for the minimum performance requirement in this clause is 1.

The requirements of UE DL Category M1 in this sub-clause are applicable for UE DL Category M2 and UE DL Category 0.

### 9.8.1 CQI reporting definition under AWGN conditions

#### 9.8.1.1 FDD and Half duplex FDD CQI reporting definition under AWGN conditions for UE supporting coverage enhancement

##### 9.8.1.1.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

##### 9.8.1.1.2 Test applicability

This test applies to E-UTRA FDD and half-duplex FDD UE release 13 and forward of UE category M1, category M2 and category 0.

##### 9.8.1.1.3 Minimum conformance requirements

The following requirements apply to UE supporting coverage enhancement. For the parameters specified in Table 9.8.1.1.3-1 and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.23 FDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

**Table 9.8.1.1.3-1: PUCCH 1-0 static test (FDD and half-duplex FDD)**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 | |
| PDSCH transmission mode | | | 1 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| | σ | dB | 0 | |
| | δ | dB | 0 | |
| Propagation condition and antenna configuration | | | AWGN (1 x 1) | |
| SNR (Note 2) | | dB | 5 | 6 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -93 | -92 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Max number of HARQ transmissions | | | 1 | |
| Physical channel for CQI reporting | | | PUSCH (Note 4) | |
| PUCCH Report Type | | | 4 | |
| Reporting periodicity | | ms | $N_{pd}$ = 10 | |
| CQI delay | | ms | 10 | |
| *cqi-pmi-ConfigurationIndex* | | | 12 | |
| Frequency hopping | | | Disabled | |
| Frequency hopping interval (interval-FDD) | | | N/A | |
| Starting OFDM symbol (startSymbolBR) | | | 3 | |
| PDSCH repetition level | | | 1 | |
| M-PDCCH repetition level | | | 1 | |
| Beamforming Precoder for MPDCCH | | | No precoding | |
| Precoder update granularity for MPDCCH | | | N/A | |
| BL/CE DL subframe configuration (fdd-DownlinkOrTddSubframeBitmapBR) | | | 1111111111 | |

Note 1: Reference measurement channel RC.23 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD and two sided dynamic OCNG pattern OP.2 FDD as described in Annex A.5.1.1 and A.5.1.2.
Note 2: The minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 3: DC subcarrier puncturing shall be considered.
Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. MPDCCH DCI format 6-0A shall be transmitted in downlink SF#1 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5.

The normative reference for this requirement is TS 36.101 [2] clause 9.8.1.1.

## 9.8.1.1.4 Test description

### 9.8.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.8.1.1.3-1 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.18 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to Table 9.8.1.1.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 9.8.1.1.4.3.

#### 9.8.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.8.1.1.3-1.

2. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A with narrowband index $n_{RB}$ = 0 for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via MPDCCH DCI format 6-0A with narrowband index nRB = 0 and CQI request bit set to 0 to schedule UL RMC in subframe #1. Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 10 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. If Median CQI is not equal to 1 or 10 and 1800 or more of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ ( Median CQI + 1) then continue with step 5, otherwise go to step 8.

5. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A with narrowband index $n_{RB}$ = 0 for C_RNTI to transmit the DL RMC according to the wideband median-CQI value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via MPDCCH DCI format 6-0A with narrowband index nRB = 0 and CQI request bit set to 0 to schedule UL RMC in subframe #1. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A with narrowband index $n_{RB}$ = 0 for C_RNTI to transmit the DL RMC according to the wideband median-CQI+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via MPDCCH DCI format 6-0A with narrowband index nRB = 0 and CQI request bit set to 0 to schedule UL RMC in subframe #1. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) > 0.1

   then pass the UE for this test, otherwise go to step 8.

7. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A with narrowband index $n_{RB}$ = 0 for C_RNTI to transmit the DL RMC according to the wideband median-CQI-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via MPDCCH DCI format 6-0A with narrowband index nRB = 0 and CQI request bit set to 0 to schedule UL RMC in subframe #1. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

If the ratio (NACK /ACK + NACK) $\leq$ 0.1

then pass the UE for this test, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

#### 9.8.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the condition CEModeA and the following exceptions:

**Table 9.8.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.8.1.1.4.3-2: CQI-ReportConfig-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 12 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

### 9.8.1.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.8.1.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.8.1.2 TDD CQI reporting definition under AWGN conditions for UE supporting coverage enhancement

### 9.8.1.2.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

### 9.8.1.2.2 Test applicability

This test applies to E-UTRA TDD UE release 13 and forward of UE category M1, category M2 and category 0..

### 9.8.1.2.3 Minimum conformance requirements

The following requirements apply to UE supporting coverage enhancement. For the parameters specified in Table 9.8.1.2.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.23 TDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

**Table 9.8.1.2.3-1: PUCCH 1-0 static test (TDD)**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 | |
| PDSCH transmission mode | | | 1 | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| | σ | dB | 0 | |
| | δ | dB | 0 | |
| Propagation condition and antenna configuration | | | AWGN (1 x 1) | |
| SNR (Note 2) | | dB | 4 | 5 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -94 | -93 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Max number of HARQ transmissions | | | 1 | |
| Physical channel for CQI reporting | | | PUSCH (Note 3) | |
| PUCCH Report Type | | | 4 | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | |
| Frequency hopping | | | Disabled | |
| Frequency hopping interval (interval-TDD) | | | N/A | |
| Starting OFDM symbol (startSymbolLC) | | | 3 | |
| PDSCH repetition level | | | 1 | |
| ACK/NACK feedback mode | | | Multiplexing | |
| MPDCCH repetition level | | | 1 | |
| Beamforming Precoder for MPDCCH | | | No precoding | |
| Precoder update granularity for MPDCCH | | | N/A | |
| BL/CE DL subframe configuration (fdd-DownlinkOrTddSubframeBitmapBR) | | | 1011110111 | |

Note 1: Reference measurement channel RC.23 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD and two sided dynamic OCNG pattern OP.2 TDD as described in Annex A.5.2.1 and A.5.2.2.
Note 2: The minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. MPDCCH DCI format 6-0A shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.
Note 4: DC subcarrier puncturing shall be considered.

The normative reference for this requirement is TS 36.101 [2] clause 9.8.1.2.

### 9.8.1.2.4 Test description

#### 9.8.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.8.1.2.3-1 as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.18 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Table 9.8.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 9.8.1.2.4.3.

#### 9.8.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.8.1.2.3-1.
2. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via MPDCCH DCI format 6-0A with narrowband index nRB = 0 and CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2a). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. If Median CQI is not equal to 1 or 10 and 1800 or more of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ ( Median CQI + 1) then continue with step 5, otherwise go to step 8.
5. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via MPDCCH DCI format 6-0A with narrowband index nRB = 0 and CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2a). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.
6. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via MPDCCH DCI

format 6-0A with narrowband index nRB = 0 and CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2a). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK.*

If the ratio (NACK /ACK + NACK) > 0.1

then pass the UE for this test and go to step 9, otherwise go to step 8.

7. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via MPDCCH DCI format 6-0A with narrowband index nRB = 0 and CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2a). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) $\leq$ 0.1

   then pass the UE for this test, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

#### 9.8.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the condition CEModeA and the following exceptions:

**Table 9.8.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.8.1.2.4.3-2: CQI-ReportConfig-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1C in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.8.1.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.8.1.2.4.3-4: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| mpdcch-NumRepetition-r13 | r1 | | |

#### 9.8.1.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.8.1.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.8.2 UE-selected subband CQI

### 9.8.2.1 FDD and half-duplex FDD UE-selected subband CQI for UE supporting coverage enhancement

#### 9.8.2.1.1 Test purpose

To verify the increased relative throughput when transmitting on the UE-selected narrowband with the corresponding transport format compared to the case for which a fixed format is transmitted on any narrowband within the set of narrowbands in which MPDCCH is monitored of TS 36.213 [6].

#### 9.8.2.1.2 Test applicability

This test applies to E-UTRA FDD and half-duplex FDD UE release 13 and forward of UE category M1, category M2 and category 0.

#### 9.8.2.1.3 Minimum conformance requirements

The following requirements apply to UE supporting coverage enhancement. For the parameters specified in Table 9.8.2.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.8.2.1.3-2 and by the following:

The ratio of the throughput obtained when transmitting on the best narrowband reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected narrowband within the set of narrowbands in which MPDCCH is monitored shall be $\geq \gamma$;

The requirements only apply for narrowbands and the random scheduling across the narrowbands is done by selecting a new narrowband in each TTI for FDD and half-duplex FDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the narrowband size.

**Table 9.8.2.1.3-1: Sub-band test for single antenna transmission (FDD and half-duplex FDD)**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | |
| Transmission mode | | | 1 (port 0) | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| | σ | dB | 0 | |
| | δ | dB | 0 | |
| SNR (Note 3) | | dB | 5 | 6 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -93 | -92 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, *a* = 1, $f_D = 1$ Hz | |
| Reporting interval | | ms | 10 | |
| CQI delays for each narrowband | | ms | 11, 12, 13, 14 | |
| Reporting mode | | | PUSCH 2-0 | |
| Max number of HARQ transmissions | | | 1 | |
| Number of preferred subbands (*M*) | | | 1 | |
| Number of narrowbands | | | 4 | |
| Frequency hopping | | | Enabled | |
| Frequency hopping offset | | | 1 | |
| Starting OFDM symbol (startSymbolBR) | | | 3 | |
| Maximum number of MPDCCH repetition s (mpdcch-NumRepetition) | | | 4 | |
| MPDCCH repetition level (Note 6) | | | 1 | |
| PDSCH repetition level | | | 1 | |
| MPDCCH narrowband (mpdcch-Narrowband) | | | 7 (Note 5) | |
| MPDCCH hopping interval (interval-FDD) | | | 1 | |
| Start subframe configuration for MPDCCH (mpdcch-startSF-UESS) | | | 2.5 | |
| Beamforming Precoder for MPDCCH | | | No precoding | |
| Precoder update granularity for MPDCCH | | | N/A | |

| | | |
|---|---|---|
| BL/CE DL subframe configuration (fdd-DownlinkOrTddSubframeBitmapBR) | | 1111111111 |
| $R^{CSI}$ (csi-NumRepetitionCE) | Subframe | 1 |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported narrowband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: Reference measurement channel RC.25 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
Note 3: The minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level
Note 4: DC subcarrier puncturing shall be considered
Note 5: For RRC parameter setting, mpdcch-narrowband is set to 8.
Note 6: DCI format 6-1A is scheduled in the subframe k2 according to TS36.213 subclause 9.1.5.

**Table 9.8.2.1.3-2: Minimum requirement (FDD and half-duplex FDD)**

| | **Test 1** |
|---|---|
| $\gamma$ | 1.3 |
| UE DL Category | M1, ≥0 |

The normative reference for this requirement is TS 36.101 [2] clause 9.8.2.1.

### 9.8.2.1.4 Test description

#### 9.8.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.8.2.1.3-1 as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9 using only main UE Tx/Rx antenna.
2. The parameter settings for the cell are set up according to Table 9.8.2.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 9.8.2.1.4.3.

#### 9.8.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.8.2.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue

transmission of the PDSCH until 2000 wideband CQI reports and subband CQI reports for each narrowband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 10 ms to carry the PUSCH CQI feedback via PDCCH DCI format 6-0A with CQI request bit set to 1. In this process the SS collects wideband CQI reports every 10 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and narrowband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC on a randomly selected narrowband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each narrowband shall be selected in the equal probability The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 10 ms to carry the PUSCH CQI feedback via MPDCCH DCI format 6-0A with CQI request bit set to 1. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.

5. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC in one narrowband reported by the UE and with the corresponding TBS. Differential CQI offset level is selected from {1, 2, 3, 4}. Note that the SS shall send PDSCH in the same narrowband until next UE report is available. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 10 ms to carry the PUSCH CQI feedback via MPDCCH DCI format 6-0A with CQI request bit set to 1. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.
   If $t_{subband} / t_{median} \geq \gamma$, then pass the UE for this test, otherwise go to step 6.

6. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 5) for the other SNR point as appropriate. Otherwise fail the UE.

#### 9.8.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the condition CEModeA and the following exceptions:

**Table 9.8.2.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.8.2.1.4.3-2: CQI-ReportConfig-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm20 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | Not present | | |
| } | | | |
| } | | | |

**Table 9.8.2.1.4.3-3: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| EPDCCH-Config-r11 ::= SEQUENCE{ | | | |
| config-r11{ | | | |
| setup SEQUENCE { | | | |
| setConfigToAddModList-r11 SEQUENCE { | 1 entry | | |
| resourceBlockAssignment-r11[1] SEQUENCE{ | | | |
| resourceBlockAssignment-r11 | 1110 | | |
| } | | | |
| mpdcch-config-r13 CHOICE[1] { | | | |
| setup SEQUENCE { | | | |
| csi-NumRepetitionCE-r13 | sf1 | | |
| mpdcch-pdsch-HoppingConfig-r13 | on | | |
| mpdcch-StartSF-UESS-r13 CHOICE { | | | |
| fdd-r13 | v2dot5 | | |
| mpdcch-NumRepetition-r13 | r4 | | |
| mpdcch-Narrowband-r13 | 8 | | |
| } | | | |
| } | | | |

### 9.8.2.1.5 Test requirement

**Table 9.8.2.1.5-1: Test requirement (FDD and half-duplex FDD)**

| | **Test 1** |
|---|---|
| $\gamma$ | 1.29 |
| UE DL Category | M1, ≥0 |

## 9.8.2.2 TDD UE-selected subband CQI for UE supporting coverage enhancement

### 9.8.2.2.1 Test purpose

To verify the increased relative throughput when transmitting on the UE-selected subbands with the corresponding transport format compared to the case for which a fixed format is transmitted on any subband within the set of narrowbands in which MPDCCH is monitored of TS 36.213 [6].

### 9.8.2.2.2 Test applicability

This test applies to E-UTRA TDD UE release 13 and forward of UE category M1, category M2 and category 0..

### 9.8.2.2.3 Minimum conformance requirements

The following requirements apply to UE supporting coverage enhancement. For the parameters specified in Table 9.8.2.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.8.2.2-2 and by the following:

The ratio of the throughput obtained when transmitting on the best narrowband reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected narrowband within the set of narrowbands in which MPDCCH is monitored shall be $\geq \gamma$;

The requirements only apply for narrowbands and the random scheduling across the narrowbands is done by selecting a new narrowband in each available downlink transmission instance for TDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the $N_{\mathrm{PRB}}$ entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the narrowband size.

**Table 9.8.2.2.3-1: Sub-band test for single antenna transmission (TDD)**

| Parameter | | Unit | Test 1 | |
|---|---|---|---|---|
| Bandwidth | | MHz | 10 MHz | |
| Transmission mode | | | 1 (port 0) | |
| Downlink power allocation | $\rho_A$ | dB | 0 | |
| | $\rho_B$ | dB | 0 | |
| | σ | dB | 0 | |
| | δ | dB | 0 | |
| Uplink downlink configuration | | | 2 | |
| Special subframe configuration | | | 4 | |
| SNR (Note 3) | | dB | 5 | 6 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -93 | -92 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | | Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a$ = 1, $f_D = 1$ Hz | |
| Reporting interval | | ms | 20 | |
| CQI delay | | ms | 23, 24, 25, 28 | |
| Reporting mode | | | PUSCH 2-0 | |
| Max number of HARQ transmissions | | | 1 | |
| Number of preferred subbands (*M*) | | | 1 | |
| ACK/NACK feedback mode | | | Multiplexing | |
| Number of narrowbands | | | 4 | |
| Frequency hopping | | | Enabled | |
| Frequency hopping offset | | | 1 | |
| Starting OFDM symbol (startSymbolBR) | | | 3 | |
| Maximum number of MPDCCH repetitions (mpdcch-NumRepetition) | | | 4 | |
| PDSCH repetition level | | | 1 | |
| MPDCCH narrowband (mpdcch-Narrowband) | | | 7 (Note 5) | |
| MPDCCH hopping interval (interval-TDD) | | | 1 | |
| Start subframe configuration for MPDCCH (mpdcch-startSF-UESS) | | | 5 | |
| Beamforming Precoder for MPDCCH | | | No precoding | |
| Precoder update granularity for MPDCCH | | | N/A | |
| BL/CE DL subframe configuration (fdd-DownlinkOrTddSubframeBitmapBR) | | | 1011110111 | |
| RCSI (csi-NumRepetitionCE) | | Subframe | 1 | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

| | |
|---|---|
| Note 2: | Reference measurement channel RC.25 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2. |
| Note 3: | The minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. |
| Note 4: | DC subcarrier puncturing shall be considered |
| Note 5: | For RRC parameter setting, mpdcch-narrowband is set to 8. |
| Note 6: | DCI format 6-1A is scheduled in the subframe k2 according to TS36.213 subclause 9.1.5. |
| Note 7: | In the case CQI reports and HARQ-ACK collide, CQI reports and HARQ-ACK will be multiplexed. |

**Table 9.8.2.2.3-2: Minimum requirement (TDD)**

| | **Test 1** |
|---|---|
| $\gamma$ | 1.3 |
| UE DL Category | M1, ≥0 |

The normative reference for this requirement is TS 36.101 [2] clause 9.8.2.2.

## 9.8.2.2.4 Test description

### 9.8.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and MPDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz for tests defined in 9.8.2.2.3-1 as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.9 using only main UE Tx/Rx antenna.

2. The parameter settings for the cell are set up according to Table 9.8.2.2.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF-CE according to TS 36.508 [7] clause 5.2A.2AA. Message contents are defined in clause 9.8.2.2.4.3.

### 9.8.2.2.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.8.2.2.3-1 as appropriate.

2. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and subband CQI reports for each narrowband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in $12^{th}$ subframe every 20 ms to carry the PUSCH CQI feedback via PDCCH DCI format 6-0A with CQI request bit set to 1. In this process the SS collects wideband CQI reports every 20 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC on a randomly selected narrowband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each narrowband shall be selected in the equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in 12th subframe every 20 ms to carry the PUSCH CQI feedback via MPDCCH DCI format 6-0A with CQI request bit set to 1. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{median}$.

5. The SS shall transmit PDSCH via MPDCCH DCI format 6-1A for C_RNTI to transmit the DL RMC in one narrowband reported by the UE and with the corresponding TBS. Differential CQI offset level is selected from {1, 2, 3, 4}. Note that the SS shall send PDSCH in the same narrowband until next UE report is available. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in 12th subframe every 20 ms to carry the PUSCH CQI feedback via MPDCCH DCI format 6-0A with CQI request bit set to 1. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.
   If $t_{subband} / t_{median} \geq \gamma$, then pass the UE for this test, otherwise go to step 6.

6. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 5) for the other SNR point as appropriate. Otherwise fail the UE.

#### 9.8.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the condition CEModeA and the following exceptions:

**Table 9.8.2.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.8.2.2.4.3-2: CQI-ReportConfig-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm20 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | Not present | | |
| } | | | |
| } | | | |

**Table 9.8.2.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa2 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

**Table 9.8.2.2.4.3-4: EPDCCH-Config-r11-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| EPDCCH-Config-r11 ::= SEQUENCE{ | | | |
| config-r11{ | | | |
| setup SEQUENCE { | | | |
| setConfigToAddModList-r11 SEQUENCE { | 1 entry | | |
| resourceBlockAssignment-r11[1] SEQUENCE{ | | | |
| resourceBlockAssignment-r11 | 1110 | | |
| } | | | |
| mpdcch-config-r13 CHOICE[1] { | | | |
| setup SEQUENCE { | | | |
| csi-NumRepetitionCE-r13 | sf1 | | |
| mpdcch-pdsch-HoppingConfig-r13 | on | | |
| mpdcch-StartSF-UESS-r13 CHOICE { | | | |
| fdd-r13 | v5 | | |
| mpdcch-NumRepetition-r13 | r4 | | |
| mpdcch-Narrowband-r13 | 8 | | |
| } | | | |
| } | | | |

9.8.2.2.5 Test requirement

**Table 9.8.2.2.5-1: Test requirement (TDD)**

| | **Test 1** |
|---|---|
| $\gamma$ | 1.29 |
| UE DL Category | M1, ≥0 |

# 9.9 CSI reporting for 4Rx UE

## 9.9.1 CQI Reporting under AWGN conditions

The reporting accuracy of the channel quality indicator (CQI) under frequency non-selective conditions is determined by the reporting variance and the BLER performance using the transport format indicated by the reported CQI median. The purpose is to verify that the reported CQI values are in accordance with the CQI definition given in TS 36.213 [10]. To account for sensitivity of the input SNR the reporting definition is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

### 9.9.1.1 CQI reporting under AWGN conditions - PUCCH 1-0 with Rank 1 (Cell-Specific Reference Symbols)

#### 9.9.1.1.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 with Rank 1 1x4

##### 9.9.1.1.1.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

##### 9.9.1.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD release 10 and forward UEs that support 4 Rx antenna ports in any FDD RF band.

#### 9.9.1.1.1.3 Minimum conformance requirements

The following requirements apply to UE Category ≥1. For the parameters specified in Table 9.9.1.1.1.3-1, using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.1 FDD / RC.4 FDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

**Table 9.9.1.1.1.3-1: PUCCH 1-0 static test (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 4) | | | |
| SNR (Note 2) | | dB | -2 | -1 | 4 | 5 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -100 | -99 | -94 | -93 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 6 | | | |

Note 1: Reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1, except for category 1 UE use RC.4 FDD with two sided dynamic OCNG Pattern OP.2 FDD as described in Annex A.5.1.2.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

The normative reference for this requirement is TS 36.101 [2] clause 9.9.1.1.1.

#### 9.9.1.1.1.4 Test description

##### 9.9.1.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector(s) as shown in TS 36.508 [7] Annex A, Figure A.75.
2. The parameter settings for the cell are set up according to Table 9.9.1.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.1.1.1.4.3.

#### 9.9.1.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.9.1.1.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ ( Median CQI + 1) then continue with step 5, otherwise go to step 8.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) > 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

9. If both tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the table 9.9.1.1.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.9.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.1.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.9.1.1.1.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 6 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

#### 9.9.1.1.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.9.1.1.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 9.9.1.1.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 with Rank 1 1x4

#### 9.9.1.1.2.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based on wideband median CQI-1 and wideband median CQI or the transport format based on wideband median CQI and wideband median CQI +1.

#### 9.9.1.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD release 10 and forward UEs that support 4 Rx antenna ports in any TDD RF band.

#### 9.9.1.1.2.3 Minimum conformance requirements

The following requirements apply to UE Category ≥1. For the parameters specified in Table 9.9.1.1.2.3-1, using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.1/RC.4 TDD in Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

**Table 9.9.1.1.2.3-1: PUCCH 1-0 static test (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 1 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | AWGN (1 x 4) | | | |
| SNR (Note 2) | | dB | -2 | -1 | 4 | 5 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -100 | -99 | -94 | -93 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type | | | 4 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: Reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1, except for category 1 UE use RC.4 TDD with two sided dynamic OCNG Pattern OP.2 TDD as described in Annex A.5.2.2.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

The normative reference for this requirement is TS 36.101 [2] clause 9.9.1.1.2.

### 9.9.1.1.2.4 Test description

#### 9.9.1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.75.

2. The parameter settings for the cell are set up according to Table 9.9.1.1.2.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.1.1.2.4.3.

#### 9.9.1.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.9.1.1.2.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to CQI value 8 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ ( Median CQI + 1) then continue with step 5, otherwise go to step 8.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) > 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband median-CQI-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX cannot be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

9. If both tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the table 9.9.1.1.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.9.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.1.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.9.1.1.2.4.3-2: CQI-ReportConfig-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.2.1.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

### 9.9.1.1.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.9.1.1.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.9.1.2 CQI reporting under AWGN conditions - PUCCH 1-1 with Rank 2 (CSI Reference Symbols)

### 9.9.1.2.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1 with Rank 2 4x4

#### 9.9.1.2.1.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 – 1$ and median $CQI_1 – 1$ shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

#### 9.9.1.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD release 10 and forward UEs of Category 2 and onwards that support 4 Rx antenna ports in any FDD RF band. Applicability requires support for FGI bit 103.

#### 9.9.1.2.1.3 Minimum conformance requirements

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

The following requirements apply to UE Category ≥2. For the parameters specified in table 9.9.1.2.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

$$\text{wideband } CQI_1 = \text{wideband } CQI_0 – \text{Codeword 1 offset level}$$

The wideband $CQI_1$ shall be within the set {median $CQI_1$ -1, median $CQI_1$, median $CQI_1$ +1} for more than 90% of the time, where the resulting wideband values $CQI_1$ shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 – 1$ and median $CQI_1 – 1$ shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

**Table 9.9.1.2.1.3-1: PUCCH 1-1 static test (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 9 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | -3 | | | |
| | σ | dB | -3 | | | |
| Cell-specific reference signals | | | Antenna ports 0, 1 | | | |
| CSI reference signals | | | Antenna ports 15,…,18 | | | |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | | | |
| CSI reference signal configuration | | | 0 | | | |
| Propagation condition and antenna configuration | | | Clause B.1 (4 x 4) | | | |
| Beamforming Model | | | As specified in Section B.4.3 | | | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0100 0000 | | | |
| SNR (Note 2) | | dB | 5 | 6 | 11 | 12 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -93 | -92 | -87 | -86 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note3) | | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | | |
| Physical channel for RI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type for RI | | | 3 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| CQI delay | | ms | 8 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 2 | | | |
| *ri-ConfigIndex* | | | 1 | | | |

Note 1: Reference measurement channel RC.7 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.

The normative reference for this requirement is TS 36.101 [2] clause 9.9.1.2.1.

### 9.9.1.2.1.4 Test description

#### 9.9.1.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.74 without faders.

2. The parameter settings for the cell are set up according to Table 9.9.1.2.1.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.1.2.1.4.3.

#### 9.9.1.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.9.1.2.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing both according to CQI value 8 and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband and wideband spatial differential CQI reports respectively.

3. From each wideband CQI report, wideband $CQI_0$ is defined as Wideband CQI of codeword #0 and wideband $CQI_1$ is calculated according to clause 9.9.1.2.1.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median $CQI_0$ is based on the wideband $CQI_0$ and wideband median $CQI_1$ is based on the wideband $CQI_1$.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband $CQI_1$ values are in the range (Median $CQI_1$ - 1) ≤ Median CQI ≤ ( Median $CQI_1$ + 1) then continue with step 5, otherwise go to step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- $CQI_0$– 1 and the transport format of codeword #1 is according to the wideband median $CQI_1$– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≤ 0.1 for both codeword #0 and codeword #1

   then and go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-$CQI_0$ + 1 and the transport format of codeword #1 is according to the wideband median-$CQI_1$ + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≥ 0.1 for both codeword #0 and codeword #1

then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.9.1.2.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.9.1.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.1.2.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 9.9.1.2.1.4.3-2: *Void***

**Table 9.9.1.2.1.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0100 0000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.9.1.2.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.9.1.2.1.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 2 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.1.2.1.4.3-6: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.9.1.2.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.9.1.2.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 9.9.1.2.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 with Rank 2 8x4

#### 9.9.1.2.2.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 – 1$ and median $CQI_1 – 1$ shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

#### 9.9.1.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD release 10 and forward UEs of Category 2 and onwards that support 4 Rx antenna ports in any TDD RF band. Applicability requires support for FGI bit 104.

#### 9.9.1.2.2.3 Minimum conformance requirements

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

The following requirements apply to UE Category ≥2. For the parameters specified in table 9.9.1.2.2.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

$$\text{wideband } CQI_1 = \text{wideband } CQI_0 – \text{Codeword 1 offset level}$$

The wideband $CQI_1$ shall be within the set {median $CQI_1$ -1, median $CQI_1$, median $CQI_1$ +1} for more than 90% of the time, where the resulting wideband values $CQI_1$ shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 – 1$ and median $CQI_1 – 1$ shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

**Table 9.9.1.2.2.3-1: PUCCH 1-1 submode 1 static test (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 9 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | -6 | | | |
| | $\sigma$ | dB | -3 | | | |
| CRS reference signals | | | Antenna ports 0, 1 | | | |
| CSI reference signals | | | Antenna ports 15,…,22 | | | |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | | 5/ 3 | | | |
| CSI reference signal configuration | | | 0 | | | |
| Propagation condition and antenna configuration | | | Clause B.1 (8 x 4) | | | |
| Beamforming Model | | | As specified in Section B.4.3 | | | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 0020 0000 0000 0001 0000 | | | |
| SNR (Note 2) | | dB | 2 | 3 | 8 | 9 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -96 | -95 | -90 | -89 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type for CQI/second PMI | | | 2b | | | |
| Physical channel for RI reporting | | | PUSCH | | | |
| PUCCH Report Type for RI/ first PMI | | | 5 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| CQI delay | | ms | 10 or 11 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| *ri-ConfigIndex* | | | 805 (Note 4) | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: Reference measurement channel RC.7 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#7 and #2.

Note 4: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.

The normative reference for this requirement is TS 36.101 [2] clause 9.9.1.2.2.

### 9.9.1.2.2.4 Test description

#### 9.9.1.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.77 without faders.
2. The parameter settings for the cell are set up according to Table 9.9.1.2.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.1.2.2.4.3.

#### 9.9.1.2.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.9.1.2.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing both according to CQI value 8 and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband and wideband spatial differential CQI reports respectively.
3. From each wideband CQI report, wideband $CQI_0$ is defined as Wideband CQI of codeword #0 and wideband $CQI_1$ is calculated according to clause 9.9.1.2.2.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median $CQI_0$ is based on the wideband $CQI_0$ and wideband median $CQI_1$ is based on the wideband $CQI_1$.
4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband $CQI_1$ values are in the range (Median $CQI_1$ - 1) ≤ Median CQI ≤ ( Median $CQI_1$ + 1) then continue with step 5, otherwise go to step 7.
5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- $CQI_0$– 1 and the transport format of codeword #1 is according to the wideband median $CQI_1$– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then, and go to step 6, otherwise go to step 7.
6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-$CQI_0$ + 1 and the transport format of codeword #1 is according to the wideband median-$CQI_1$ + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule

UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK.* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

If the ratio (NACK /ACK + NACK) ≥ 0.1

then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.9.1.2.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.9.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.1.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 9.9.1.2.2.4.3-2: Void**

**Table 9.9.1.2.2.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 0020 0000 0000 0001 0000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.9.1.2.2.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.9.1.2.2.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | submode1 | | |
| } | | | |
| ri-ConfigIndex | 805 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.1.2.2.4.3-6: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.9.1.2.2.4.3-7: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | Multiplexing is selected as default to align with RAN4's assumptions in RF tests. | TDD |
| } | | | |

**Table 9.9.1.2.2.4.3-8: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an8 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 3 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -6 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

#### 9.9.1.2.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.9.1.2.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 9.9.1.3 CQI Reporting under AWGN conditions - PUCCH 1-1 (Cell-Specific Reference Symbols)

#### 9.9.1.3.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 4 4x4

##### 9.9.1.3.1.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 - 1$ and median $CQI_1 - 1$ shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

##### 9.9.1.3.1.2 Test applicability

This test applies to all types of E-UTRA FDD release 10 and forward UEs of Category 5 and onwards that support 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 4 in any FDD RF band.

#### 9.9.1.3.1.3 Minimum conformance requirements

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

The following requirements apply to UE Category ≥5. For the parameters specified in table 9.9.1.3.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

wideband $CQI_1$ = wideband $CQI_0$ – Codeword 1 offset level

The wideband $CQI_1$ shall be within the set {median $CQI_1$ -1, median $CQI_1$, median $CQI_1$ +1} for more than 90% of the time, where the resulting wideband values $CQI_1$ shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0$ – 1 and median $CQI_1$ – 1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0$ + 1 and median $CQI_1$ + 1 shall be greater than or equal to 0.1.

**Table 9.9.1.3.1.3-1: PUCCH 1-1 static test (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | -6 | | | |
| | $\rho_B$ | dB | -6 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | Clause B.1 (4 x 4) | | | |
| CodeBookSubsetRestriction bitmap | | | 0x0002 0000 0000 0000 | | | |
| SNR (Note 2) | | dB | 5 | 6 | 11 | 12 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -93 | -92 | -87 | -86 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI/PMI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | | |
| PUCCH Report Type for RI | | | 3 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 6 | | | |
| *ri-ConfigIndex* | | | 1 (Note 3) | | | |

Note 1: Reference measurement channel RC.21 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 3: It is intended to have UL collisions between RI reports and HARQ-ACK, since the RI reports shall not be used by the eNB in this test.

The normative reference for this requirement is TS 36.101 [2] clause 9.9.1.3.1.

#### 9.9.1.3.1.4 Test description

##### 9.9.1.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.74 without faders..
2. The parameter settings for the cell are set up according to Table 9.9.1.3.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.1.3.1.4.3.

##### 9.9.1.3.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.9.1.3.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing both according to CQI value 8 and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband and wideband spatial differential CQI reports respectively.
3. From each wideband CQI report, wideband $CQI_0$ is defined as Wideband CQI of codeword #0 and wideband $CQI_1$ is calculated according to clause 9.9.1.3.1.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median $CQI_0$ is based on the wideband $CQI_0$ and wideband median $CQI_1$ is based on the wideband $CQI_1$.
4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband $CQI_1$ values are in the range (Median $CQI_1$ - 1) ≤ Median CQI ≤ ( Median $CQI_1$ + 1) then continue with step 5, otherwise go to step 7.
5. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- $CQI_0$– 1 and the transport format of codeword #1 is according to the wideband median $CQI_1$– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≤ 0.1 for both codeword #0 and codeword #1

   then and go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-$CQI_0$ + 1 and the transport format of codeword #1 is according to the wideband median-$CQI_1$ + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≥ 0.1 for both codeword #0 and codeword #1

   then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.9.1.3.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.9.1.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.1.3.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| } | | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 0x0002 0000 0000 0000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.1.3.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 9.9.1.3.1.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 6 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

#### 9.9.1.3.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.9.1.3.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 9.9.1.3.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 4 4x4

#### 9.9.1.3.2.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective wideband median $CQI_0 – 1$ and wideband median $CQI_1 – 1$ shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective wideband median $CQI_0 + 1$ and wideband median $CQI_1 + 1$ shall be greater than or equal to 0.1.

#### 9.9.1.3.2.2 Test applicability

This test applies to all types of E-UTRA TDD release 10 and forward UEs of Category 5 and onwards that support 4 Rx antenna ports and 4-layer spatial multiplexing for PDSCH transmission mode 4 in any TDD RF band.

#### 9.9.1.3.2.3 Minimum conformance requirements

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

The following requirements apply to UE Category ≥5. For the parameters specified in table 9.9.1.3.2.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

$$\text{wideband } CQI_1 = \text{wideband } CQI_0 – \text{Codeword 1 offset level}$$

The wideband $CQI_1$ shall be within the set {median $CQI_1$ -1, median $CQI_1$, median $CQI_1$ +1} for more than 90% of the time, where the resulting wideband values $CQI_1$ shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 – 1$

and median $CQI_1 - 1$ shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

**Table 9.9.1.3.2.3-1: PUCCH 1-1 static test (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 4 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | -6 | | | |
| | $\rho_B$ | dB | -6 | | | |
| | σ | dB | 0 | | | |
| Propagation condition and antenna configuration | | | Clause B.1 (4x4) | | | |
| CodeBookSubsetRestriction bitmap | | | 0x0002 0000 0000 0000 | | | |
| SNR (Note 2) | | dB | 5 | 6 | 11 | 12 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -93 | -92 | -87 | -86 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type | | | 2 | | | |
| Reporting periodicity | | ms | $N_{pd} = 5$ | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| *ri-ConfigIndex* | | | 805 (Note 4) | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: Reference measurement channel RC.21 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

Note 4: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.

The normative reference for this requirement is TS 36.101 [2] clause 9.9.1.3.2.

### 9.9.1.3.2.4 Test description

#### 9.9.1.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.74 without faders.

2. The parameter settings for the cell are set up according to Table 9.9.1.3.2.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.1.3.2.4.3.

#### 9.9.1.3.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.9.1.3.2.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing both according to CQI value 8 and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband and wideband spatial differential CQI reports respectively.

3. From each wideband CQI report, wideband $CQI_0$ is defined as Wideband CQI of codeword #0 and wideband $CQI_1$ is calculated according to clause 9.9.1.3.2.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median $CQI_0$ is based on the wideband $CQI_0$ and wideband median $CQI_1$ is based on the wideband $CQI_1$.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband $CQI_1$ values are in the range (Median $CQI_1$ - 1) ≤ Median CQI ≤ ( Median $CQI_1$ + 1) then continue with step 5, otherwise go to step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- $CQI_0$– 1 and the transport format of codeword #1 is according to the wideband median $CQI_1$– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK ) ≤ 0.1

   then, and go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-$CQI_0$ + 1 and the transport format of codeword #1 is according to the wideband median-$CQI_1$ + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX

responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

If the ratio (NACK /ACK + NACK) ≥ 0.1

then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.9.1.3.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.9.1.3.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.1.3.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| } | | | |
| codebookSubsetRestriction CHOICE { | | | |
| n4TxAntenna-tm4 | 0x0002 0000 0000 0000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.1.3.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 9.9.1.3.2.4.3-3: CQI-ReportConfig-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 805 | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.1.3.2.4.3-4: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | Sa2 | | |
| specialSubframePatterns | Ssp4 | | |
| } | | | |

#### 9.9.1.3.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.9.1.3.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 9.9.1.4 CQI reporting under AWGN conditions - PUCCH 1-1 with Rank 3 (CSI Reference Symbols)

#### 9.9.1.4.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1 with Rank 3 4x4

##### 9.9.1.4.1.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 - 1$ and median $CQI_1 - 1$ shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

##### 9.9.1.4.1.2 Test applicability

This test applies to all types of E-UTRA FDD release 10 and forward UEs of Category 5 and onwards that support 4 Rx antenna ports in any FDD RF band. Applicability requires support for FGI bit 103.

##### 9.9.1.4.1.3 Minimum conformance requirements

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

The following requirements apply to UE Category ≥5. For the parameters specified in table 9.9.1.4.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

wideband $CQI_1$ = wideband $CQI_0$ – Codeword 1 offset level

The wideband $CQI_1$ shall be within the set {median $CQI_1$ -1, median $CQI_1$, median $CQI_1$ +1} for more than 90% of the time, where the resulting wideband values $CQI_1$ shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0$ – 1 and median $CQI_1$ – 1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0$ + 1 and median $CQI_1$ + 1 shall be greater than or equal to 0.1.

**Table 9.9.1.4.1.3-1: PUCCH 1-1 static test (FDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 9 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | -3 | | | |
| | σ | dB | -3 | | | |
| Cell-specific reference signals | | | Antenna ports 0, 1 | | | |
| CSI reference signals | | | Antenna ports 15,…,18 | | | |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | | 5/1 | | | |
| CSI reference signal configuration | | | 0 | | | |
| Propagation condition and antenna configuration | | | Clause B.1 (4 x 4) | | | |
| Beamforming Model | | | As specified in Section B.4.3 | | | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0020 0000 0000 | | | |
| SNR (Note 2) | | dB | 5 | 6 | 11 | 12 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -93 | -92 | -87 | -86 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note3) | | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | | |
| Physical channel for RI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type for RI | | | 3 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| CQI delay | | ms | 8 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 2 | | | |
| *ri-ConfigIndex* | | | 1 | | | |

Note 1: Reference measurement channel RC.22 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.

The normative reference for this requirement is TS 36.101 [2] clause 9.9.1.4.1.

#### 9.9.1.4.1.4 Test description

##### 9.9.1.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.74 without faders.

2. The parameter settings for the cell are set up according to Table 9.9.1.4.1.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.1.4.1.4.3.

##### 9.9.1.4.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.9.1.4.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing both according to CQI value 8 and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband and wideband spatial differential CQI reports respectively.

3. From each wideband CQI report, wideband $CQI_0$ is defined as Wideband CQI of codeword #0 and wideband $CQI_1$ is calculated according to clause 9.9.1.4.1.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median $CQI_0$ is based on the wideband $CQI_0$ and wideband median $CQI_1$ is based on the wideband $CQI_1$.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband $CQI_1$ values are in the range (Median $CQI_1$ - 1) ≤ Median CQI ≤ ( Median $CQI_1$ + 1) then continue with step 5, otherwise go to step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- $CQI_0$– 1 and the transport format of codeword #1 is according to the wideband median $CQI_1$– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of

responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

If the ratio (NACK /ACK + NACK) $\leq$ 0.1 for both codeword #0 and codeword #1

then and go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-$CQI_0$ + 1 and the transport format of codeword #1 is according to the wideband median-$CQI_1$ + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) $\geq$ 0.1 for both codeword #0 and codeword #1

   then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.9.1.4.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.9.1.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.1.4.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 9.9.1.4.1.4.3-2:** Void

**Table 9.9.1.4.1.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0020 0000 0000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.9.1.4.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.9.1.4.1.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 2 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.1.4.1.4.3-6: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

#### 9.9.1.4.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.9.1.4.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

### 9.9.1.4.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 with Rank 3 4x4

#### 9.9.1.4.2.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 - 1$ and median $CQI_1 - 1$ shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

#### 9.9.1.4.2.2 Test applicability

This test applies to all types of E-UTRA TDD release 10 and forward UEs of Category 5 and onwards that support 4 Rx antenna ports in any TDD RF band. Applicability requires support for FGI bit 103.

#### 9.9.1.4.2.3 Minimum conformance requirements

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

The following requirements apply to UE Category ≥5. For the parameters specified in table 9.9.1.4.2.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

wideband $CQI_1$ = wideband $CQI_0$ – Codeword 1 offset level

The wideband $CQI_1$ shall be within the set {median $CQI_1$ -1, median $CQI_1$, median $CQI_1$ +1} for more than 90% of the time, where the resulting wideband values $CQI_1$ shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0$ – 1 and median $CQI_1$ – 1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0$ + 1 and median $CQI_1$ + 1 shall be greater than or equal to 0.1.

**Table 9.9.1.4.2.3-1: PUCCH 1-1 submode 1 static test (TDD)**

| Parameter | | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 9 | | | |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | $P_C$ | dB | -3 | | | |
| | σ | dB | -3 | | | |
| CRS reference signals | | | Antenna ports 0, 1 | | | |
| CSI reference signals | | | Antenna ports 15,…,18 | | | |
| CSI-RS periodicity and subframe offset $T_{CSI\text{-}RS}$ / $\Delta_{CSI\text{-}RS}$ | | | 5/ 3 | | | |
| CSI reference signal configuration | | | 0 | | | |
| Propagation condition and antenna configuration | | | Clause B.1 (4 x 4) | | | |
| Beamforming Model | | | As specified in Section B.4.3 | | | |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0020 0000 0000 | | | |
| SNR (Note 2) | | dB | 5 | 6 | 11 | 12 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -93 | -92 | -87 | -86 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | | -98 | |
| Max number of HARQ transmissions | | | 1 | | | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type for CQI/second PMI | | | 2b | | | |
| Physical channel for RI reporting | | | PUSCH | | | |
| PUCCH Report Type for RI/ first PMI | | | 5 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| CQI delay | | ms | 10 or 11 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 3 | | | |
| *ri-ConfigIndex* | | | 805 (Note 4) | | | |
| ACK/NACK feedback mode | | | Multiplexing | | | |

Note 1: Reference measurement channel RC.22 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#7 and #2.

Note 4: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.

The normative reference for this requirement is TS 36.101 [2] clause 9.9.1.4.2.

#### 9.9.1.4.2.4 Test description

##### 9.9.1.4.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.74 without faders.
2. The parameter settings for the cell are set up according to Table 9.9.1.4.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.1.4.2.4.3.

##### 9.9.1.4.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.9.1.4.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing both according to CQI value 8 and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband and wideband spatial differential CQI reports respectively.
3. From each wideband CQI report, wideband $CQI_0$ is defined as Wideband CQI of codeword #0 and wideband $CQI_1$ is calculated according to clause 9.9.1.4.2.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median $CQI_0$ is based on the wideband $CQI_0$ and wideband median $CQI_1$ is based on the wideband $CQI_1$.
4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband $CQI_1$ values are in the range (Median $CQI_1$ - 1) ≤ Median CQI ≤ ( Median $CQI_1$ + 1) then continue with step 5, otherwise go to step 7.
5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- $CQI_0$– 1 and the transport format of codeword #1 is according to the wideband median $CQI_1$– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX

responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

If the ratio (NACK /ACK + NACK) $\leq$ 0.1

then, and go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-$CQI_0$ + 1 and the transport format of codeword #1 is according to the wideband median-$CQI_1$ + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK.* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) $\geq$ 0.1

   then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.9.1.4.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

#### 9.9.1.4.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.1.4.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 9.9.1.4.2.4.3-2:** Void

**Table 9.9.1.4.2.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0020 0000 0000 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.9.1.4.2.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.9.1.4.2.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 805 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.1.4.2.4.3-6: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.9.1.4.2.4.3-7: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | Multiplexing is selected as default to align with RAN4's assumptions in RF tests. | TDD |
| } | | | |

**Table 9.9.1.4.2.4.3-8: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an4 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 3 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -3 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

### 9.9.1.4.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.9.1.4.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

## 9.9.2 CQI Reporting under fading conditions

### 9.9.2.1 CQI Reporting under fading conditions - PUCCH 1-0 (Cell-Specific Reference Symbols) for Enhanced Performance Requirement Type A

#### 9.9.2.1.1 FDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A 1x4

##### 9.9.2.1.1.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality is based on the receiver of the enhanced Type A. Performance requirements are specified in terms of the relative increase of the throughput obtained when the transport format is that indicated by the reported CQI subject to an interference model compared to the case with a white Gaussian noise model, and a requirement on the minimum BLER of the transmitted transport formats indicated by the reported CQI subject to an interference model.

##### 9.9.2.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward that support enhanced receiver Type A and 4Rx antenna ports in any FDD RF band.

##### 9.9.2.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.9.2.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.9.2.1.1.3-2 and by the following

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;

b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

**Table 9.9.2.1.1.3-1: Fading test for single antenna (FDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 1 (port 0) | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -4 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | N/A |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (1 x 4) | (1 x 4) |
| DIP (Note 4) | dB | N/A | -0.41 |
| Reference measurement channel | | Note 2 | R.2 FDD |
| Reporting mode | | PUCCH 1-0 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 2 | N/A |
| CQI delay | ms | 8 | N/A |
| Physical channel for CQI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type | | 4 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 1 | N/A |
| Max number of HARQ transmissions | | 1 | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.1 FDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 and RC.4 FDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. The number of the CRS ports in both cells is the same. Interfering cell is fully loaded.

Note 6: Both cells are time-synchronous.

Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.

Note 8: SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

**Table 9.9.2.1.1.3-2: Minimum requirement (FDD)**

| | |
|---|---|
| $\gamma$ | 1.8 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.9.2.1.1.

#### 9.9.2.1.1.4 Test description

##### 9.9.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.78.
2. The parameter settings for the cell 1 are set up according to Table 9.9.2.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.2.1.1.4.3.

##### 9.9.2.1.1.4.2 Test procedure

1. Set the cell 1 and 2 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.9.2.1.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1,#3,#5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_interference}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
3. Deactivate i.e., stop transmitting anything from the cell 2 and set the cell 1 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.9.2.1.1.3-1 as appropriate.
4. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1,#3,#5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_gaussian_noise}}$.
5. If the ratio ($t_{\text{wideband_interference}} / t_{\text{wideband_gaussian_noise}}$) $\geq \gamma$ and ratio (NACK /(ACK + NACK)) calculated in step 2 is greater or equal to 0.02, then pass the UE for this test. Otherwise fail the UE.

##### 9.9.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.2.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.9.2.1.1.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 1 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

9.9.2.1.1.5 Test requirement

**Table 9.9.2.1.1.5-1: Test Parameters for Fading test with single antenna (FDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 1 (port 0) | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -3.97 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | N/A |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (1 x 4) | (1 x 4) |
| DIP (Note 4) | dB | N/A | -0.38 |
| Reference measurement channel | | Note 2 | R.2 FDD |
| Reporting mode | | PUCCH 1-0 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 2 | N/A |
| CQI delay | ms | 8 | N/A |
| Physical channel for CQI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type | | 4 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 1 | N/A |
| Max number of HARQ transmissions | | 1 | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.1 FDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 and RC.4 FDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. The number of the CRS ports in both cells is the same. Interfering cell is fully loaded.

Note 6: Both cells are time-synchronous.

Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.

Note 8: SINR corresponds to $\widehat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

**Table 9.9.2.1.1.5-2: Test requirement (FDD)**

| | |
|---|---|
| $\gamma$ | 1.79 |
| UE Category | ≥1 |

### 9.9.2.1.2 TDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A 1x4

#### 9.9.2.1.2.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality is based on the receiver of the enhanced Type A. Performance requirements are specified in terms of the relative increase of the throughput obtained when the transport format is that indicated by the reported CQI subject to an interference model compared to the case with a white Gaussian noise model, and a requirement on the minimum BLER of the transmitted transport formats indicated by the reported CQI subject to an interference model.

#### 9.9.2.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 11 and forward that support enhanced receiver Type A and 4Rx antenna ports in any TDD RF band.

#### 9.9.2.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.9.2.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.9.2.1.2.3-2 and by the following

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;

b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

**Table 9.9.2.1.2.3-1: Fading test for single antenna (TDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 1 (port 0) | |
| Uplink downlink configuration | | 2 | |
| Special subframe configuration | | 4 | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -4 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (1 x 4) | (1 x 4) |
| DIP (Note 4) | dB | N/A | -0.41 |
| Reference measurement channel | | Note 2 | R.2A TDD |
| Reporting mode | | PUCCH 1-0 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 5 | N/A |
| CQI delay | ms | 10 or 11 | N/A |
| Physical channel for CQI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type | | 4 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 3 | N/A |
| Max number of HARQ transmissions | | 1 | N/A |
| ACK/NACK feedback mode | | Multiplexing | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.1 TDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 and RC.4 TDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. The number of the CRS ports in both cells is the same. Interfering cell is fully loaded.

Note 6: Both cells are time-synchronous.

Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.

Note 8: SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1.

**Table 9.9.2.1.2.3-2: Minimum requirement (TDD)**

| | |
|---|---|
| $\gamma$ | 1.8 |
| UE Category | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 9.9.2.1.2.

#### 9.9.2.1.2.4 Test description

##### 9.9.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.78.
2. The parameter settings for the cell 1 are set up according to Table 9.9.2.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.2.1.2.4.3.

##### 9.9.2.1.2.4.2 Test procedure

1. Set the cell 1 and 2 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.9.2.1.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_interference}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
3. Deactivate i.e., stop transmitting anything from the cell 2 and set the cell 1 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.9.2.1.2.3-1 as appropriate.
4. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_gaussian_noise}}$.
5. If the ratio ($t_{\text{wideband_interference}} / t_{\text{wideband_gaussian_noise}}$) $\geq \gamma$ and ratio (NACK /(ACK + NACK)) calculated in step 2 is greater or equal to 0.02, then pass the UE for this test. Otherwise fail the UE.

##### 9.9.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.2.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| } | | | |

**Table 9.9.2.1.2.4.3-2: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 3 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | NULL | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.2.1.2.4.3-3: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

9.9.2.1.2.5 Test requirement

**Table 9.9.2.1.2.5-1: Test Parameters for Fading test with single antenna (TDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 1 (port 0) | |
| Uplink downlink configuration | | 2 | |
| Special subframe configuration | | 4 | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -3.97 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (1 x 4) | (1 x 4) |
| DIP (Note 4) | dB | N/A | -0.38 |
| Reference measurement channel | | Note 2 | R.2A TDD |
| Reporting mode | | PUCCH 1-0 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 5 | N/A |
| CQI delay | ms | 10 or 11 | N/A |
| Physical channel for CQI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type | | 4 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 3 | N/A |
| Max number of HARQ transmissions | | 1 | N/A |
| ACK/NACK feedback mode | | Multiplexing | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.1 TDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 and RC.4 TDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. The number of the CRS ports in both cells is the same. Interfering cell is fully loaded.

Note 6: Both cells are time-synchronous.

Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.

Note 8: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1.

**Table 9.9.2.1.2.5-2: Test requirement (TDD)**

| | |
|---|---|
| $\gamma$ | 1.79 |
| UE Category | ≥1 |

## 9.9.2.2 CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) for Enhanced Performance Requirement Type A

### 9.9.2.2.1 FDD CQI Reporting under fading conditions - PUCCH 1-1 - Enhanced Performance Requirement Type A 2x4

#### 9.9.2.2.1.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality is based on the receiver of the enhanced Type A. Performance requirements are specified in terms of the relative increase of the throughput obtained when the transport format is that indicated by the reported CQI subject to an interference model compared to the case with a white Gaussian noise model, and a requirement on the minimum BLER of the transmitted transport formats indicated by the reported CQI subject to an interference model.

#### 9.9.2.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward with category 2 or higher that support enhanced receiver Type A and 4Rx antenna ports in any FDD RF band. Applicability requires support for FGI bit 103.

#### 9.9.2.2.1.3 Minimum conformance requirements

For the parameters specified in Table 9.9.2.2.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.9.2.2.1.3-2 and by the following

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;

b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

**Table 9.9.2.2.1.3-1: Fading test for single antenna (FDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 9 | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -4 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | N/A |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (2 x 4) | (1 x 4) |
| Beamforming Model | | As specified in Section B.4.3 (Note 9, 10) | N/A |
| DIP (Note 4) | dB | N/A | -0.41 |
| Cell-specific reference signals | | Antenna ports 0,1 | Antenna port 0 |
| CSI reference signals | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset | | 5/1 | N/A |
| CSI-RS reference signal configuration | | 2 | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | Subframes / bitmap | N/A | 1 / 0010000000000000 |
| CodeBookSubsetRestriction bitmap | | 001111 | N/A |
| Reference measurement channel | | Note 2 | R.2 FDD |
| Reporting mode | | PUCCH 1-1 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 5 | N/A |
| CQI delay | ms | 8 | N/A |
| Physical channel for CQI/PMI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type for CQI/PMI | | 2 | N/A |
| PUCCH channel for RI reporting | | PUCCH Format 2 | N/A |
| PUCCH Report Type for RI | | 3 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 2 | N/A |
| *ri-ConfigIndex* | | 1 | N/A |
| Max number of HARQ transmissions | | 1 | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.11 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.

Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. Interfering cell is fully loaded.

| | |
|---|---|
| Note 6: | Both cells are time-synchronous. |
| Note 7: | Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present. |
| Note 8: | SINR corresponds to $\hat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1. |
| Note 9: | The precoder in clause B.4.3 follows UE recommended PMI. |
| Note 10: | If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). |

**Table 9.9.2.2.1.3-2: Minimum requirement (FDD)**

| | |
|---|---|
| $\gamma$ | 1.8 |
| UE Category | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.9.2.2.1.

### 9.9.2.2.1.4 Test description

#### 9.9.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.79.
2. The parameter settings for the cell 1 are set up according to Table 9.9.2.2.1.5-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.2.2.1.4.3.

#### 9.9.2.2.1.4.2 Test procedure

1. Set the cell 1 and 2 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.9.2.2.1.5-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_interference}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
3. Deactivate i.e., stop transmitting anything from the cell 2 and set the cell 1 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.9.2.2.1.5-1 as appropriate.

4. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_gaussian_noise}}$.

5. If the ratio ($t_{\text{wideband_interference}} / t_{\text{wideband_gaussian_noise}}$) $\geq \gamma$ in Table 9.9.2.2.1.5-2 and ratio (NACK /(ACK + NACK)) calculated in step 2 is greater or equal to 0.02, then pass the UE for this test. Otherwise fail the UE.

#### 9.9.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.2.2.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 9.9.2.2.1.4.3-2: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 001111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.9.2.2.1.4.3-3: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.9.2.2.1.4.3-4: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 2 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 1 | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.2.2.1.4.3-5: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 2 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.9.2.2.1.4.3-6: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

9.9.2.2.1.5 Test requirement

**Table 9.9.2.2.1.5-1: Test Parameters for fading test for single antenna (FDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 9 | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -3.97 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | N/A |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (2 x 4) | (1 x 4) |
| Beamforming Model | | As specified in Section B.4.3 (Note 9, 10) | N/A |
| DIP (Note 4) | dB | N/A | -0.38 |
| Cell-specific reference signals | | Antenna ports 0,1 | Antenna port 0 |
| CSI reference signals | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset | | 5/1 | N/A |
| CSI-RS reference signal configuration | | 2 | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | Subframes / bitmap | N/A | 1 / 0010000000000000 |
| CodeBookSubsetRestriction bitmap | | 001111 | N/A |
| Reference measurement channel | | Note 2 | R.2 FDD |
| Reporting mode | | PUCCH 1-1 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 5 | N/A |
| CQI delay | ms | 8 | N/A |
| Physical channel for CQI/PMI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type for CQI/PMI | | 2 | N/A |
| PUCCH channel for RI reporting | | PUCCH Format 2 | N/A |
| PUCCH Report Type for RI | | 3 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 2 | N/A |
| *ri-ConfigIndex* | | 1 | N/A |
| Max number of HARQ transmissions | | 1 | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.11 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.

Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}{}'$ is defined by its associated DIP value as

| | |
|---|---|
| | specified in clause B.5.1. |
| Note 5: | Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. Interfering cell is fully loaded. |
| Note 6: | Both cells are time-synchronous. |
| Note 7: | Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present. |
| Note 8: | SINR corresponds to $\widehat{E}_s / N_{oc}{}'$ of Cell 1 as defined in clause 8.1.1. |
| Note 9: | The precoder in clause B.4.3 follows UE recommended PMI. |
| Note 10: | If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). |

**Table 9.9.2.2.1.5-2: Test requirement (FDD)**

| | |
|---|---|
| $\gamma$ | 1.79 |
| UE Category | ≥2 |

## 9.9.2.2.2 TDD CQI Reporting under fading conditions - PUCCH 1-1 - Enhanced Performance Requirement Type A 2x4

### 9.9.2.2.2.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality is based on the receiver of the enhanced Type A. Performance requirements are specified in terms of the relative increase of the throughput obtained when the transport format is that indicated by the reported CQI subject to an interference model compared to the case with a white Gaussian noise model, and a requirement on the minimum BLER of the transmitted transport formats indicated by the reported CQI subject to an interference model.

### 9.9.2.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 11 and forward with category 2 or higher that support enhanced receiver Type A and 4Rx antenna ports in any TDD RF band. Applicability requires support for FGI bit 103.

### 9.9.2.2.2.3 Minimum conformance requirements

For the parameters specified in Table 9.9.2.2.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.9.2.2.2.3-2 and by the following

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;

b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

**Table 9.9.2.2.2.3-1: Fading test for single antenna (TDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 9 | |
| Uplink downlink configuration | | 2 | |
| Special subframe configuration | | 4 | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -4 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (2 x 4) | (1 x 4) |
| Beamforming Model | | As specified in Section B.4.3 (Note 10, 11) | N/A |
| DIP (Note 4) | dB | N/A | -0.41 |
| Cell-specific reference signals | | Antenna ports 0,1 | Antenna port 0 |
| CSI reference signals | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset | | 5/3 | N/A |
| CSI-RS reference signal configuration | | 2 | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | Subframes / bitmap | N/A | 3 / 0010000000000000 |
| CodeBookSubsetRestriction bitmap | | 001111 | N/A |
| Reference measurement channel | | Note 2 | R.2A TDD |
| Reporting mode | | PUCCH 1-1 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 5 | N/A |
| CQI delay | ms | 10 | N/A |
| Physical channel for CQI/PMI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type for CQI/PMI | | 2 | N/A |
| Physical channel for RI reporting | | PUCCH Format 2 | N/A |
| PUCCH Report Type for RI | | 3 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 3 | N/A |
| *ri-ConfigIndex* | | 805 (Note 9) | N/A |
| Max number of HARQ transmissions | | 1 | N/A |
| ACK/NACK feedback mode | | Multiplexing | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.11 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in

uplink subframe SF#2 and #7.
Note 4: The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1.
Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. Interfering cell is fully loaded.
Note 6: Both cells are time-synchronous.
Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.
Note 8: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1.
Note 9: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available.
Note 10: The precoder in clause B.4.3 follows UE recommended PMI.
Note 11: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

**Table 9.9.2.2.2.3-2: Minimum requirement (TDD)**

| $\gamma$ | 1.8 |
|---|---|
| UE Category | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.9.2.2.2.

### 9.9.2.2.2.4 Test description

#### 9.9.2.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.79.
2. The parameter settings for the cell 1 are set up according to Table 9.9.2.2.2.5-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.2.2.2.4.3.

#### 9.9.2.2.2.4.2 Test procedure

1. Set the cell 1 and 2 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.9.2.2.2.5-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_interference}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.

3. Deactivate i.e., stop transmitting anything from the cell 2 and set the cell 1 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.9.2.2.2.5-1 as appropriate.

4. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband_gaussian_noise}}$.

5. If the ratio ($t_{\text{wideband_interference}} / t_{\text{wideband_gaussian_noise}}$) $\geq \gamma$ in Table 9.9.2.2.2.5-2 and ratio (NACK /(ACK + NACK)) calculated in step 2 is greater or equal to 0.02, then pass the UE for this test. Otherwise fail the UE.

#### 9.9.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.2.2.2.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | Not present | | RBC |
| antennaInfo | Not present | | RBC |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

| Condition | Explanation |
|---|---|
| RBC | Used at configuration of a radio bearer combination during SRB2+DRB establishment |

**Table 9.9.2.2.2.4.3-2 *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.9.2.2.2.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 001111 | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.9.2.2.2.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.9.2.2.2.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 3 | | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 805 | | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.2.2.2.4.3-6: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 2 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 3 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.9.2.2.2.4.3-7: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa2 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

9.9.2.2.2.5 Test requirement

**Table 9.9.2.2.2.5-1: Test parameters for fading test for single antenna (TDD)**

| Parameter | Unit | Cell 1 | Cell 2 |
|---|---|---|---|
| Bandwidth | MHz | 10 MHz | |
| Transmission mode | | 9 | |
| Uplink downlink configuration | | 2 | |
| Special subframe configuration | | 4 | |
| Cyclic Prefix | | Normal | Normal |
| Cell ID | | 0 | 1 |
| SINR (Note 8) | dB | -3.97 | N/A |
| $N_{oc}^{(j)}$ | dB[mW/15kHz] | -98 | -98 |
| Propagation channel | | EPA5 | Static (Note 7) |
| Correlation and antenna configuration | | Low (2 x 4) | (1 x 4) |
| Beamforming Model | | As specified in Section B.4.3 (Note 9, 10) | N/A |
| DIP (Note 4) | dB | N/A | -0.38 |
| Cell-specific reference signals | | Antenna ports 0,1 | Antenna port 0 |
| CSI reference signals | | Antenna ports 15,16 | N/A |
| CSI-RS periodicity and subframe offset | | 5/3 | N/A |
| CSI-RS reference signal configuration | | 2 | N/A |
| Zero-power CSI-RS configuration $I_{CSI-RS}$ / *ZeroPowerCSI-RS* bitmap | Subframes / bitmap | N/A | 3 / 0010000000000000 |
| CodeBookSubsetRestriction bitmap | | 001111 | N/A |
| Reference measurement channel | | Note 2 | R.2A TDD |
| Reporting mode | | PUCCH 1-1 | N/A |
| Reporting periodicity | ms | $N_{pd}$ = 5 | N/A |
| CQI delay | ms | 10 | N/A |
| Physical channel for CQI/PMI reporting | | PUSCH (Note 3) | N/A |
| PUCCH Report Type for CQI/PMI | | 2 | N/A |
| Physical channel for RI reporting | | PUCCH Format 2 | N/A |
| PUCCH Report Type for RI | | 3 | N/A |
| *cqi-pmi-ConfigurationIndex* | | 3 | N/A |
| *ri-ConfigIndex* | | 805 (Note 9) | N/A |
| Max number of HARQ transmissions | | 1 | N/A |
| ACK/NACK feedback mode | | Multiplexing | N/A |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.11 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH

| | |
|---|---|
| | DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#2 and #7. |
| Note 4: | The respective received power spectral density of each interfering cell relative to $N_{oc}'$ is defined by its associated DIP value as specified in clause B.5.1. |
| Note 5: | Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. Interfering cell is fully loaded. |
| Note 6: | Both cells are time-synchronous. |
| Note 7: | Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present. |
| Note 8: | SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1. |
| Note 9: | RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available. |
| Note 10: | The precoder in clause B.4.3 follows UE recommended PMI. |
| Note 11: | If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). |

**Table 9.9.2.2.2.5-2: Test requirement (TDD)**

| | |
|---|---|
| $\gamma$ | 1.79 |
| UE Category | ≥2 |

## 9.9.3 Reporting of Precoding Matrix Indicator (PMI) for 4Rx UE

### 9.9.3.1 PMI Reporting – PUSCH 3-1 (Single PMI) (Cell-Specific Reference Symbols)

#### 9.9.3.1.1 TDD PMI Reporting – PUSCH 3-1 (Single PMI) 8x4

##### 9.9.3.1.1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

##### 9.9.3.1.1.2 Test applicability

This test applies to all types of E-UTRA TDD release 10 and forward UEs of Category 2 and onwards that support 4 Rx antenna ports in any TDD RF band. Applicability requires support for FGI bit 104.

##### 9.9.3.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.9.3.1.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.9.3.1.1.3-2.

**Table 9.9.3.1.1.3-1: PMI test for single-layer (TDD)**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Bandwidth | | MHz | 10 |
| Transmission mode | | | 9 |
| Uplink downlink configuration | | | 1 |
| Special subframe configuration | | | 4 |
| Propagation channel | | | EVA5 |
| Precoding granularity | | PRB | 50 |
| Antenna configuration | | | 8 x 4 |
| Correlation modelling | | | High, Cross polarized |
| Cell-specific reference signals | | | Antenna ports 0,1 |
| CSI reference signals | | | Antenna ports 15,…,22 |
| Beamforming model | | | Annex B.4.3 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/ 4 |
| CSI-RS reference signal configuration | | | 0 |
| CodeBookSubsetRestriction bitmap | | | 0x0000 0000 001F FFE0 0000 0000 FFFF |
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 |
| | Pc | dB | -6 |
| | σ | dB | -3 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 |
| Reporting mode | | | PUSCH 3-1 |
| Reporting interval | | ms | 5 |
| PMI delay (Note 2) | | ms | 10 |
| Measurement channel | | | R.45-2 |
| OCNG Pattern | | | OP.1 TDD |
| Max number of HARQ transmissions | | | 4 |
| Redundancy version coding sequence | | | {0,0,1,2} |
| ACK/NACK feedback mode | | | Multiplexing |

Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity).

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#3 and #8.

Note 4: Randomization of the principle beam direction shall be used as specified in B.2.3A.4

**Table 9.9.3.1.1.3-2: Minimum requirement (TDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 2.5 |
| UE Category | ≥2 |

The normative reference for this requirement is TS 36.101 [2] clause 9.9.3.1.1.

### 9.9.3.1.1.4 Test description

#### 9.9.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.77.
2. The parameter settings for the cell are set up according to Table 9.9.3.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.3.1.1.4.3.

#### 9.9.3.1.1.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.9.3.1.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 7.2.4-1 in TS 36.213 [10]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish $t_{rnd}$ and $SNR_{rnd}$ according to annex G.5.2.
3. Set SNR to $SNR_{rnd}$. The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure $t_{ue}$ according to Annex G.5.3.
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$ If the ratio (throughput / $t_{rnd}$ ) ≥ γ which is specified in table 9.9.3.1.1.5-1, then the test is pass. Otherwise, the test is fail.

#### 9.9.3.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.3.1.1.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig-r10 | *CQI-ReportConfig-r10-DEFAULT* | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE { | | | |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | |
| } | | | |

**Table 9.9.3.1.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.9.3.1.1.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | 0x0000 0000 001F FFE0 0000 0000 FFFF | | |
| ue-TransmitAntennaSelection CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.9.3.1.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | Not present | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.9.3.1.1.4.3-5: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Multiplexing | Multiplexing is selected as default to align with RAN4's assumptions in RF tests. | TDD |
| } | | | |

**Table 9.9.3.1.1.4.3-6: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.9.3.1.1.4.3-7: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an8 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | |
| resourceConfig-r10 | 0 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | -6 | Parameter: $P_c$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.9.3.1.1.5 Test requirement

**Table 9.9.3.1.1.5-1: Test requirement (TDD)**

| Parameter | Test 1 |
|---|---|
| $\gamma$ | 2.49 |
| UE Category | ≥2 |

# 9.9.4 Reporting of Rank Indicator (RI)

The purpose of this test for 4Rx UEs is to verify that the reported rank indicator accurately represents the channel rank. The accuracy of RI (CQI) reporting is determined by the relative increase of the throughput obtained when transmitting based on the reported rank compared to the case for which a fixed rank is used for transmission. Transmission mode 4 is used with the specified CodebookSubSetRestriction in section 9.9.4.1, transmission mode 9 is used with the specified CodebookSubSetRestriction in section 9.9.4.2.

For the fixed rank 1 transmission with 2 Tx ports the RI and PMI reporting is restricted to two single-layer precoders, For fixed rank 2 transmission with 2 Tx ports the RI and PMI reporting is restricted to one two-layer precoder. For the follow RI transmission for rank 1 and 2 and 2 Tx ports the RI and PMI reporting is restricted to select the union of these precoders.

For the fixed rank 2 transmission with 4 Tx ports the RI and PMI reporting is restricted to any 2 Layer precoder, for the follow RI transmission the RI and PMI reporting is not restricted at all.

Channels with low and high correlation are used to ensure that RI reporting reflects the channel condition.

## 9.9.4.1 RI Reporting– PUCCH 1-1 4x4

### 9.9.4.1.1 FDD RI Reporting– PUCCH 1-1 4x4

#### 9.9.4.1.1.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank.

#### 9.9.4.1.1.2 Test applicability

This test applies to E-UTRA FDD release 10 and forward UEs of Category 2 and onwards that support 4 Rx antenna ports in any FDD bands.

#### 9.9.4.1.1.3 Minimum conformance requirements

The minimum performance requirement in Table 9.9.4.1.1.3-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.9.4.1.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.9.4.1.1.3-2.

**Table 9.9.4.1.1.3-1: RI Test (FDD)**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 | Test 4 |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | | -6 |
| | $\rho_B$ | dB | -3 | | | -6 |
| | σ | dB | 0 | | | 3 |
| Propagation condition and antenna configuration | | | 2 x 4 EPA5 | | | 4 x 4 EPA5 |
| Cell-specific reference signals | | | Antenna ports 0, 1 | | | Antenna ports 0-3 |
| CodeBookSubsetRestriction bitmap | | | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | | | Note 6 |
| Antenna correlation | | | Low | Low | High | Low |
| RI configuration | | | Fixed RI=2 and follow RI | Fixed RI=1 and follow RI | Fixed RI=1 and follow RI | Fixed RI=2 and follow RI |
| SNR | | dB | -4 | 16 | 16 | 25 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 | -98 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -102 | -82 | -82 | -73 |
| Maximum number of HARQ transmissions | | | 1 | | | |
| Reporting mode | | | PUCCH 1-1 (Note 4) | | | |
| Physical channel for CQI/PMI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | | |
| Physical channel for RI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type for RI | | | 3 | | | |
| Reporting periodicity | | ms | $N_{pd}$= 5 | | | |
| PMI and CQI delay | | ms | 8 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 6 | | | |
| *ri-ConfigurationInd* | | | 1 (Note 5) | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.2 FDD / RC.21 FDD respectively for Test 1-3 / 4 according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between RI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic RI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

Note 4: The bit field for precoding information in DCI format 2 shall be mapped as:
- For reported RI = 1 and PMI = 0 >> precoding information bit field index = 1
- For reported RI = 1 and PMI = 1 >> precoding information bit field index = 2
- For reported RI = 2 and PMI = 0 >> precoding information bit field index = 0

Note 5: To avoid the ambiguity of TE behaviour when applying CQI and PMI during rank switching, RI reports are to be applied at the TE with one subframe delay in addition to Note 1 to align with CQI and PMI reports.

Note 6: The following precoders are allowed in Test 4:
"0x0000 0000 FFFF 0000" for RI=2
"0xFFFF FFFF FFFF FFFF" for UE reported RI

**Table 9.9.4.1.1.3-2: Minimum requirement (FDD)**

| | Test 1 | Test 2 | Test 3 | Test 4 |
|---|---|---|---|---|
| $\gamma_1$ | N/A | 1.05 | 0.9 | N/A |
| $\gamma_2$ | 1 | N/A | N/A | 1.1 |
| UE Category | ≥2 | ≥2 | ≥2 | ≥5 |

The normative reference for this requirement is TS 36.101 [2] clause 9.9.4.1.1.

#### 9.9.4.1.1.4 Test description

##### 9.9.4.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.76 for test 1-3 and Figure A.74 for test 4 ..
2. The parameter settings for the cell are set up according to Table 9.9.4.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.4.1.1.4.3.

##### 9.9.4.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.9.4.1.1.3-1 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and #8 (Table A.4.1-1). Measure the $t_{fix}$ according to annex G.5.3.
3. Propagation conditions are set according to Annex B.1.
4. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in every subframe (Table A.4.1-1).
5. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.9.4.1.1.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. Propagation conditions are set according to Table 9.9.4.1.1.3-1.
8. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and #8 (Table A.4.1-1). Measure $t_{reported}$ according to Annex G.5.3 If the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.9.4.1.1.5-1, then pass the UE for this test and go to step 9. Otherwise, fail the UE.
9. If all tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the Table 9.9.4.1.1.3-2 for the other Tests as appropriate. Otherwise pass the UE.

9.9.4.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.4.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE { | | | |
| physicalConfigDedicated | PhysicalConfigDedicated - DEFAULT using condition RBC | | |
| } | | | |

**Table 9.9.4.1.1.4.3-2: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | RBC |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| } | | | |
| codebookSubsetRestriction CHOICE { | | | |
| N4TxAntenna-tm4 | According to each test | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.4.1.1.4.3-3: *PDSCH-ConfigDedicated-DEFAULT for Test4***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 9.9.4.1.1.4.3-4: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | Not present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex | 0 | | |
| cqi-pmi-ConfigIndex | 6 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic CHOICE { | | | |
| widebandCQI | NULL | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.4.1.1.4.3-5: *RRCConnectionReconfiguration for Test 4***

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | Not present | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 9.9.4.1.1.5 Test requirement

**Table 9.9.4.1.1.5-1: Test requirement (FDD)**

| | **Test 1** | **Test 2** | **Test 3** | **Test 4** |
|---|---|---|---|---|
| $\gamma_1$ | N/A | 1.04 | 0.89 | N/A |
| $\gamma_2$ | 0.99 | N/A | N/A | 1.09 |
| UE Category | ≥2 | ≥2 | ≥2 | ≥5 |

## 9.9.4.1.2 TDD RI Reporting– PUSCH 3-1 4x4

### 9.9.4.1.2.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank.

### 9.9.4.1.2.2 Test applicability

This test applies to E-UTRA TDD release 10 and forward UEs of Category 2 and onwards that support 4 Rx antenna ports in any TDD bands.

### 9.9.4.1.2.3 Minimum conformance requirements

The minimum performance requirement in Table 9.9.4.1.1.3-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.9.4.1.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.9.4.1.2-2.

**Table 9.9.4.1.2.3-1: RI Test (TDD)**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 | Test 4 |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 4 | | | |
| Downlink power allocation | $\rho_A$ | dB | -3 | | | -6 |
| | $\rho_B$ | dB | -3 | | | -6 |
| | σ | dB | 0 | | | 3 |
| Uplink downlink configuration | | | 2 | | | |
| Special subframe configuration | | | 4 | | | |
| Propagation condition and antenna configuration | | | 2 x 4 EPA5 | | | 4 x 4 EPA5 |
| Cell-specific reference signals | | | Antenna ports 0, 1 | | | Antenna ports 0-3 |
| CodeBookSubsetRestriction bitmap | | | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | | | Note 4 |
| Antenna correlation | | | Low | Low | High | Low |
| RI configuration | | | Fixed RI=2 and follow RI | Fixed RI= 1 and follow RI | Fixed RI=1 and follow RI | Fixed RI=2 and follow RI |
| SNR | | dB | -4 | 16 | 16 | 25 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 | -98 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -102 | -82 | -82 | -73 |
| Maximum number of HARQ transmissions | | | 1 | | | |
| Reporting mode | | | PUSCH 3-1 (Note 3) | | | |
| Reporting interval | | ms | 5 | | | |
| PMI and CQI delay | | ms | 10 or 11 | | | |
| ACK/NACK feedback mode | | | Bundling | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel RC.2 TDD / RC.21 TDD respectively for Test 1-3 / 4 according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
Note 3: Reported wideband CQI and PMI are used and sub-band CQI is discarded.
Note 4: The following precoders are allowed in Test 4:
"0x0000 0000 FFFF 0000" for RI=2
"0xFFFF FFFF FFFF FFFF" for UE reported RI

**Table 9.9.4.1.2.3-2: Minimum requirement (TDD)**

| | Test 1 | Test 2 | Test 3 | Test 4 |
|---|---|---|---|---|
| $\gamma_1$ | N/A | 1.05 | 0.9 | N/A |
| $\gamma_2$ | 1 | N/A | N/A | 1.1 |
| UE Category | ≥2 | ≥2 | ≥2 | ≥5 |

The normative reference for this requirement is TS 36.101 [2] clause 9.9.4.1.2.

### 9.9.4.1.2.4 Test description

#### 9.9.4.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.76 for test 1-3 and Figure A.74 for test 4 .
2. The parameter settings for the cell are set up according to Table 9.9.4.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.4.1.2.4.3.

#### 9.9.4.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.9.4.1.2.3-1 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the $t_{fix}$ according to annex G.5.3
3. Propagation conditions are set according to Annex B.1.
4. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit to 0 to schedule UL RMC in subframe#2 and #7 (Table A.4.1-2).
5. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.9.4.1.2.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. Propagation conditions are set according to Table 9.9.4.1.2.3-1.
8. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure $t_{reported}$ according to Annex G.5.3
   If the ratio ( $t_{reported}$ / $t_{fix}$ ) satisfies the requirement in Table 9.9.4.1.2.5-1, then pass the UE for this test and go to step 9. Otherwise, fail the UE.
9. If all tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the Table 9.9.4.1.2.3-2 for the other Tests as appropriate. Otherwise pass the UE.

9.9.4.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.4.1.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 5.5.1.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportConfig | *CQI-ReportConfig-DEFAULT* | | |
| antennaInfo CHOICE { | | | |
| antennaInfoDedicated ::= SEQUENCE { | | | |
| transmissionMode | tm4 | | |
| } | | | |
| codebookSubsetRestriction CHOICE { | | | |
| N4TxAntenna-tm4 | According to each test | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.4.1.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT for Test 4***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB-6 | | |
| } | | | |

**Table 9.9.4.1.2.4.3-3: *CQI-ReportConfig-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm31 | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | Not Present | | |
| } | | | |
| } | | | |

**Table 9.9.4.1.2.4.3-4: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Bundling | Multiplexing is selected as default to align with RAN4's assumptions in RF tests | TDD |
| } | | | |

**Table 9.9.4.1.2.4.3-5: *RRCConnectionReconfiguration for Test 4***

| Derivation Path: 36.331 clause 6.2.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension SEQUENCE { | Not present | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| maxLayersMIMO-r10 | fourLayers | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

### 9.9.4.1.2.5 Test requirement

**Table 9.9.4.1.2.5-1: Test requirement (TDD)**

| | **Test 1** | **Test 2** | **Test 3** | **Test 4** |
|---|---|---|---|---|
| $\gamma_1$ | N/A | 1.04 | 0.89 | N/A |
| $\gamma_2$ | 0.99 | N/A | N/A | 1.09 |
| UE Category | ≥2 | ≥2 | ≥2 | ≥5 |

## 9.9.4.2 RI Reporting- PUCCH 1-1 for eDL-MIMO 4x4

### 9.9.4.2.1 FDD RI Reporting- PUCCH 1-1 for eDL-MIMO 4x4

#### 9.9.4.2.1.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank.

#### 9.9.4.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD release 10 and forward UEs of Category 2 and onwards that support 4 Rx antenna ports in any FDD bands. Applicability requires support for FGI bit 103.

#### 9.9.4.2.1.3 Minimum conformance requirements

The minimum performance requirement in Table 9.9.4.2.1.3-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.9.4.2.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.9.4.2.1.3-2.

**Table 9.9.4.2.1.3-1: RI Test (FDD)**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 | Test 4 |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 9 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | Pc | dB | 0 | | | -3 |
| | σ | dB | 0 | | | -3 |
| Propagation condition and antenna configuration | | | 2 x 4 EPA5 | | | 4 x 4 EPA5 |
| Cell-specific reference signals | | | Antenna ports 0 | | | |
| Beamforming Model | | | As specified in Section B.4.3 | | | |
| CSI reference signals | | | Antenna ports 15, 16 | | | Antenna ports 15-18 |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/1 | | | |
| CSI reference signal configuration | | | 6 | | | |
| CodeBookSubsetRestriction bitmap | | | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | | | Note 5 |
| Antenna correlation | | | Low | Low | High | Low |
| RI configuration | | | Fixed RI=2 and follow RI | Fixed RI=1 and follow RI | Fixed RI=1 and follow RI | Fixed RI=2 and follow RI |
| SNR | | dB | -4 | 16 | 16 | 25 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 | -98 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -102 | -82 | -82 | -73 |
| Maximum number of HARQ transmissions | | | 1 | | | |
| Reporting mode | | | PUCCH 1-1 | | | |
| Physical channel for CQI/PMI reporting | | | PUSCH (Note 3) | | | |
| PUCCH Report Type for CQI/PMI | | | 2 | | | |
| Physical channel for RI reporting | | | PUCCH Format 2 | | | |
| PUCCH Report Type for RI | | | 3 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| PMI and CQI delay | | ms | 8 | | | |
| *cqi-pmi-ConfigurationIndex* | | | 2 | | | |
| *ri-ConfigurationInd* | | | 1 (Note 4) | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.9 FDD / RC.9B FDD respectively for Test 1-3 / 4 according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.

Note 4: To avoid the ambiguity of TE behaviour when applying CQI and PMI during rank switching, RI reports are to be applied at the TE with one subframe delay in addition to Note 1 to align with CQI and PMI reports.

Note 5: The following precoders are allowed in Test 4:
"0x0000 0000 FFFF 0000" for RI=2
"0xFFFF FFFF FFFF FFFF" for UE reported RI

**Table 9.9.4.2.1.3-2: Minimum requirement (FDD)**

| | Test 1 | Test 2 | Test 3 | Test 4 |
|---|---|---|---|---|
| $\gamma_1$ | N/A | 1.05 | 0.9 | N/A |
| $\gamma_2$ | 1 | N/A | N/A | 1.1 |
| UE Category | ≥2 | ≥2 | ≥2 | ≥5 |

The normative reference for this requirement is TS 36.101 [2] clause 9.9.4.2.1.

### 9.9.4.2.1.4 Test description

#### 9.9.4.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.76 for test 1-3 and Figure A.74 for test 4 .
2. The parameter settings for the cell are set up according to Table 9.9.4.2.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.4.2.1.4.3.

#### 9.9.4.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.9.4.2.1.3-1 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4.1-1). Measure the $t_{fix}$ according to annex G.5.3.
3. Propagation conditions are set according to Annex B.1.
4. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in every subframe (Table A.4.1-1).
5. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.9.4.2.1.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. Propagation conditions are set according to Table 9.9.4.2.1.3-1.
8. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the

DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4.1-1). Measure $t_{reported}$ according to Annex G.5.3

If the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.9.4.2.1.5-1, then pass the UE for this test and go to step 9. Otherwise, fail the UE.

9. If all tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the Table 9.9.4.2.1.3-2 for the other Tests as appropriate. Otherwise pass the UE.

#### 9.9.4.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.4.2.1.4.3-1: PhysicalConfigDedicated-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

**Table 9.9.4.2.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.9.4.2.1.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | According to each test | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.9.4.2.1.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.9.4.2.1.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 2 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.4.2.1.4.3-6: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | Test 1, 2, 3 |
| | an4 | | Test 4 |
| resourceConfig-r10 | 6 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 1 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_C$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | Test 1, 2, 3 |
| | -3 | | Test 4 |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

#### 9.9.4.2.1.5 Test requirement

**Table 9.9.4.2.1.5-1: Test requirement (FDD) for eDL-MIMO**

| | Test 1 | Test 2 | Test 3 | Test 4 |
|---|---|---|---|---|
| $\gamma_1$ | N/A | 1.04 | 0.89 | N/A |
| $\gamma_2$ | 0.99 | N/A | N/A | 1.09 |
| UE Category | ≥2 | ≥2 | ≥2 | ≥5 |

### 9.9.4.2.2 TDD RI Reporting- PUCCH 1-1 for eDL-MIMO 4x4

#### 9.9.4.2.2.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank.

#### 9.9.4.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD release 10 and forward UEs of Category 2 and onwards that support 4 Rx antenna ports in any TDD bands. Applicability requires support for FGI bit 103.

#### 9.9.4.2.2.3 Minimum conformance requirements

The minimum performance requirement in Table 9.9.4.2.2.3-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.9.4.2.2.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.9.4.2.2.3-2.

**Table 9.9.4.2.2.3-1: RI Test (TDD)**

| Parameter | | Unit | Test 1 | Test 2 | Test 3 | Test 4 |
|---|---|---|---|---|---|---|
| Bandwidth | | MHz | 10 | | | |
| PDSCH transmission mode | | | 9 | | | |
| Downlink power allocation | $\rho_A$ | dB | 0 | | | |
| | $\rho_B$ | dB | 0 | | | |
| | Pc | dB | 0 | | | -3 |
| | σ | dB | 0 | | | -3 |
| Uplink downlink configuration | | | 1 | | | |
| Special subframe configuration | | | 4 | | | |
| Propagation condition and antenna configuration | | | 2 x 4 EPA5 | | | 4 x 4 EPA5 |
| Cell-specific reference signals | | | Antenna ports 0 | | | |
| CSI reference signals | | | Antenna ports 15, 16 | | | Antenna ports 15-18 |
| Beamforming Model | | | As specified in Section B.4.3 | | | |
| CSI reference signal configuration | | | 4 | | | |
| CSI-RS periodicity and subframe offset $T_{CSI-RS}$ / $\Delta_{CSI-RS}$ | | | 5/4 | | | |
| CodeBookSubsetRestriction bitmap | | | 000011 for fixed RI = 1<br>010000 for fixed RI = 2<br>010011 for UE reported RI | | | Note 4 |
| Antenna correlation | | | Low | Low | High | Low |
| RI configuration | | | Fixed RI=2 and follow RI | Fixed RI=1 and follow RI | Fixed RI=1 and follow RI | Fixed RI=2 and follow RI |
| SNR | | dB | -4 | 16 | 16 | 25 |
| $N_{oc}^{(j)}$ | | dB[mW/15kHz] | -98 | -98 | -98 | -98 |
| $\hat{I}_{or}^{(j)}$ | | dB[mW/15kHz] | -102 | -82 | -82 | -73 |
| Maximum number of HARQ transmissions | | | 1 | | | |
| Reporting mode | | | PUCCH 1-1 | | | |
| Physical channel for CQI/ PMI reporting | | | PUSCH (Note 3) | | | |
| PUCCH report type for CQI/ PMI | | | 2 | | | |
| Physical channel for RI reporting | | | PUCCH Format 2 | | | |
| Reporting periodicity | | ms | $N_{pd}$ = 5 | | | |
| PMI and CQI delay | | ms | 10 | | | |
| ACK/NACK feedback mode | | | Bundling | | | |
| *cqi-pmi-ConfigurationIndex* | | | 4 | | | |
| *ri-ConfigurationInd* | | | 1 | | | |

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.9 TDD / RC.9B TDD respectively for Test 1-3 / 4 according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#3 and #8.

Note 4: The following precoders are allowed in Test 4:
"0x0000 0000 FFFF 0000" for RI=2
"0xFFFF FFFF FFFF FFFF" for UE reported RI

**Table 9.9.4.2.2.3-2: Minimum requirement (TDD)**

| | Test 1 | Test 2 | Test 3 | Test 4 |
|---|---|---|---|---|
| $\gamma_1$ | N/A | 1.05 | 0.9 | N/A |
| $\gamma_2$ | 1 | N/A | N/A | 1.1 |
| UE Category | ≥2 | ≥2 | ≥2 | ≥5 |

The normative reference for this requirement is TS 36.101 [2] clause 9.9.4.2.2.

### 9.9.4.2.2.4 Test description

#### 9.9.4.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.76 for test 1-3 and Figure A.74 for test 4 .
2. The parameter settings for the cell are set up according to Table 9.9.4.2.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.9.4.2.2.4.3.

#### 9.9.4.2.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.9.4.2.2.3-1 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and #8 (Table A.4.1-2). Measure the $t_{fix}$ according to annex G.5.3
3. Propagation conditions are set according to Annex B.1.
4. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit to 0 to schedule UL RMC in subframe#3 and #8 (Table A.4.1-2).
5. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.9.4.2.2.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. Propagation conditions are set according to Table 9.9.4.2.2.3-1.
8. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL

RMC in subframe #3 and subframe #8 (Table A.4.1-2). Measure $t_{reported}$ according to Annex G.5.3

If the ratio ($t_{reported}$ / $t_{fix}$) satisfies the requirement in Table 9.9.4.2.2.5-1, then pass the UE for this test and go to step 9. Otherwise, fail the UE.

9. If all tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the Table 9.9.4.2.2.3-2 for the other Tests as appropriate. Otherwise pass the UE.

#### 9.9.4.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

**Table 9.9.4.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PhysicalConfigDedicated-DEFAULT::= SEQUENCE { | | | |
| antennaInfo | Not present | | |
| antennaInfo-r10 CHOICE{ | | | RBC |
| explicitValue-r10 | AntennaInfoDedicated-r10 | | |
| } | | | |
| cqi-ReportConfig-r10 | CQI-ReportConfig-r10-DEFAULT | | RBC |
| csi-RS-Config-r10 | CSI-RS-Config-r10 | | RBC |
| } | | | |

**Table 9.9.4.2.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT***

| Derivation Path: 36.508 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| p-a | dB0 | | |
| } | | | |

**Table 9.9.4.2.2.4.3-3: *AntennaInfoDedicated-r10***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| AntennaInfoDedicated-r10 ::= SEQUENCE { | | | |
| transmissionMode-r10 | tm9-v1020 | | |
| codebookSubsetRestriction-r10 | According to each test | | |
| ue-TransmitAntennaSelection CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

**Table 9.9.4.2.2.4.3-4: *CQI-ReportConfig-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportConfig-r10 ::= SEQUENCE { | | | |
| cqi-ReportAperiodic-r10 | Not Present | | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic-r10 | CQI-ReportPeriodic-r10-DEFAULT | | |
| pmi-RI-Report-r9 | setup | | |
| } | | | |

**Table 9.9.4.2.2.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT***

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CQI-ReportPeriodic-r10 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| cqi-PUCCH-ResourceIndex-r10 | 0 | | |
| cqi-PUCCH-ResourceIndexP1-r10 | Not present | | |
| cqi-pmi-ConfigIndex | 4 | (see Table 7.2.2-1A in TS 36.213) | |
| cqi-FormatIndicatorPeriodic-r10 CHOICE { | | | |
| widebandCQI-r10 SEQUENCE { | | | |
| csi-ReportMode-r10 | Not present | | |
| } | | | |
| ri-ConfigIndex | 1 | (see Table 7.2.2-1B in TS 36.213) | |
| simultaneousAckNackAndCQI | FALSE | | |
| } | | | |
| } | | | |
| } | | | |

**Table 9.9.4.2.2.4.3-6: PUCCH-ConfigDedicated-DEFAULT**

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| ackNackRepetition CHOICE { | | | |
| release | NULL | | |
| } | | | |
| tddAckNackFeedbackMode | Bundling | Multiplexing is selected as default to align with RAN4's assumptions in RF tests | TDD |
| } | | | |

**Table 9.9.4.2.2.4.3-7: TDD-Config-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa1 | | |
| specialSubframePatterns | ssp4 | | |
| } | | | |

**Table 9.9.4.2.2.4.3-8: *CSI-RS-Config***

| Derivation Path: 36.331 clause 6.3.2 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| CSI-RS-Config-r10 ::= SEQUENCE { | | | |
| csi-RS-r10 CHOICE{ | | | |
| setup SEQUENCE { | | | |
| antennaPortsCount-r10 | an2 | Parameter represents the number of antenna ports used for transmission of CSI reference signals | Test 1, 2, 3 |
| | an4 | | Test 4 |
| resourceConfig-r10 | 4 | Parameter: CSI reference signal configuration | |
| subframeConfig-r10 | 4 | $\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$ | |
| p-C-r10 | 0 | Parameter: $P_C$ which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback | Test 1, 2, 3 |
| | -3 | | Test 4 |
| } | | | |
| } | | | |
| zeroTxPowerCSI-RS-r10 CHOICE{ | | | |
| release | NULL | | |
| } | | | |
| } | | | |

9.9.4.2.2.5 Test requirement

**Table 9.9.4.2.2.5-1: Test requirement (TDD) for eDL-MIMO**

| | **Test 1** | **Test 2** | **Test 3** | **Test 4** |
|---|---|---|---|---|
| $\gamma_1$ | N/A | 1.04 | 0.89 | N/A |
| $\gamma_2$ | 0.99 | N/A | N/A | 1.09 |
| UE Category | ≥2 | ≥2 | ≥2 | ≥5 |

# 10 MBMS Performance

## 10.1 FDD MBMS performance (Fixed Reference Channel)

### 10.1.1 Test purpose

This test verifies the performance of FDD MBMS with a given SNR for which the average BLER remains below a given reference value.

### 10.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE supporting MBMS release 9 and forward.

## 10.1.3 Minimum conformance requirements

The parameters specified in Table 10.1.3-1 are valid for all FDD tests unless otherwise stated. For the requirements defined in this section, the difference between CRS EPRE and the MBSFN RS EPRE should be set to 0 dB as the UE demodulation performance might be different when this condition is not met (e.g. in scenarios where power offsets are present, such as scenarios when reserved cells are present).

**Table 10.1.3-1: Common Test Parameters (FDD)**

| Parameter | Unit | Value |
|---|---|---|
| Number of HARQ processes | Processes | None |
| Subcarrier spacing | kHz | 15 kHz |
| Allocated subframes per Radio Frame (Note 1) | | 6 subframes |
| Number of OFDM symbols for PDCCH | | 2 |
| Cyclic Prefix | | Extended |
| Note 1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331. | | |

The receive characteristic of MBMS is determined by the BLER. The requirement is valid for all RRC states for which the UE has capabilities for MBMS.

For the parameters specified in Table 10.1.3-1 and Table 10.1.3-2 and Annex A.3.8.1, the average downlink SNR shall be below the specified value for the BLER shown in Table 10.1.3-3.

**Table 10.1.3-2: Test Parameters for Testing**

| Parameter | | Unit | Test 1-4 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Note 1: $P_B = 0$ | | | |

**Table 10.1.3-3: Minimum performance**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation condition | Correlation Matrix and antenna | Reference value | | MBMS UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BLER (%) | SNR(dB) | |
| 1 | 10 MHz | R.37 FDD | OP.4 FDD | MBSFN channel model (Table B.2.6-1) | 1x2 low | 1 | 4.1 | ≥1 |
| 2 | 10 MHz | R.38 FDD | OP.4 FDD | | | | 11.0 | ≥1 |
| 3 | 10 MHz | R.39 FDD | OP.4 FDD | | | | 20.1 | ≥2 |
| | 5 MHz | R.39-1 FDD | OP.4 FDD | | | | 20.5 | 1 |

The normative reference for this requirement is TS 36.101 [2] clause 10.1.

## 10.1.4 Test description

### 10.1.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: As specified per test number in Table 10.1.3-3 as defined in TS 36.508 [7] clause 4.3.1.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 10.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents are defined in clause 10.1.4.3.
6. SS transmits *MBSFNAreaConfiguration* message. Message content is defined in clause 10.1.4.3.
7. Wait for a period equal to the MCCH modification period to make sure the UE has received the *MBSFNAreaConfiguration* message.
8. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode C is activated. Message contents are defined in clause 10.1.4.3.
9. SS is configured to include 10 MBMS packets in one TB.

### 10.1.4.2 Test procedure

1. Initialise the variables $M_{tot}$ and $M_{ok}$ as 0. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 10.1.5-1 as appropriate.
2. SS shall send MBMS Packets on the MTCH radio bearer for the test time specified in Table G.6.4-1. SS stores the number of the transmitted MBMS Packets on the MTCH in the current test iteration in the variable $M_{tot}$.
3. SS shall send a “UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST” message and wait for the UE to respond with a “UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE” reporting the received MBMS Packet counter value. Message contents are defined in clause 10.1.4.3. SS calculates the variable $M_{ok}$ as (current counter value - counter value at last test iteration).
4. SS shall compute the BLER as the following:

   The BLER = $(M_{tot} – M_{ok}) / M_{tot}$
5. Repeat steps from 1 to 4 for each subtest in Table 10.1.5-1 as appropriate.

### 10.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 4.4, 4.6 and 4.7A with following exceptions:

**Table 10.1.4.3-1: SystemInformationBlockType2: Additional FDD MBMS performance (Fixed Reference Channel)**

| Derivation Path: 36.508 table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2 ::= SEQUENCE { | | | |
| mbsfn-SubframeConfigList SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '111111' B | | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.1.4.3-2: MBSFNAreaConfiguration message: Additional FDD MBMS performance (Fixed Reference Channel)**

| Derivation Path: 36.508, Table 4.6.1-4A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MBSFNAreaConfiguration-r9 ::= SEQUENCE { | | | |
| commonSF-Alloc-r9 SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE { | | | |
| oneFrame | '111111' B | | |
| } | | | |
| } | | | |
| commonSF-AllocPeriod-r9 | rf8 | | |
| pmch-InfoList-r9 SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF SEQUENCE { | | | |
| pmch-Config-r9 SEQUENCE { | | | |
| sf-AllocEnd-r9 | 47 | 48 active subframes in 8 Radio-frames | |
| dataMCS-r9 | 4 | Test number 1 | R.37 FDD |
| | 12 | Test number 2 | R.38 FDD |
| | 20 | Test number 3 | R.39 FDD R.39-1 FDD |
| mch-SchedulingPeriod-r9 | rf8 | | |
| } | | | |
| … | | | |
| } | | | |

**Table 10.1.4.3-3: ACTIVATE TEST MODE: Additional FDD MBMS performance (Fixed Reference Channel)**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C |
|---|

**Table 10.1.4.3-4: CLOSE UE TEST LOOP: Additional FDD MBMS performance (Fixed Reference Channel)**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C |
|---|

**Table 10.1.4.3-5: SystemInformationBlockType13: Additional FDD MBMS performance (Fixed Reference Channel)**

| Derivation Path: 36.508 table 4.4.3.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType13 ::= SEQUENCE { | | | |
| mbsfn-AreaInfoList-r9 SEQUENCE (SIZE(1..maxMBSFN-Area)) OF SEQUENCE { | | | |
| mcch-Config-r9 SEQUENCE { | | | |
| mcch-RepetitionPeriod-r9 | rf32 | | |
| mcch-Offset-r9 | 0 | | |
| mcch-ModificationPeriod-r9 | rf512 | | |
| sf-AllocInfo-r9 | '100000' B | | |
| signallingMCS-r9 | n7 | Test number 1 | QPSK |
| | n13 | Test number 2 | 16QAM |
| | n19 | Test number 3 | 64QAM |
| } | | | |
| } | | | |
| notificationConfig-r9 SEQUENCE { | | | |
| notificationRepetitionCoeff-r9 | n4 | | |
| notificationOffset-r9 | 0 | | |
| notificationSF-Index-r9 | 1 | Subframe #1 | |
| } | | | |
| } | | | |

## 10.1.5 Test requirement

For the parameters specified in Table 10.1.3-1, Table 10.1.3-2, Annex A.3.8.1, and SNR in Table 10.1.5-1, the value for the BLER in step 4 shall be below the test limit in Annex G.6.3 for all subtests shown in Table 10.1.5-1.

**Table 10.1.5-1: Test requirement**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation condition | Correlation Matrix and antenna | Reference value | | MBMS UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BLER (%) | SNR(dB) | |
| 1 | 10 MHz | R.37 FDD | OP.4 FDD | MBSFN channel model (Table B.2.6-1) | 1x2 low | 1 | 5 | ≥1 |
| 2 | 10 MHz | R.38 FDD | OP.4 FDD | | | | 11.9 | ≥1 |
| 3 | 10 MHz | R.39 FDD | OP.4 FDD | | | | 21.0 | ≥2 |
| | 5 MHz | R.39-1 FDD | OP.4 FDD | | | | 21.4 | 1 |

# 10.1_1 FDD MBMS performance (Fixed Reference Channel) (Release 13 and forward)

## 10.1_1.1 Test purpose

Same test purpose as in clause 10.1.1.

## 10.1_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE supporting MBMS release 13 and forward.

## 10.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 10.1.3 with the following exceptions:

- Instead of Table 10.1.3-3 → use Table 10.1_1.3-1.

**Table 10.1._1.3-1: Minimum performance**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation condition | Correlation Matrix and antenna | Reference value | | MBMS UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BLER (%) | SNR(dB) | |
| 4 | 1.4 MHz | R.40 FDD | OP.4 FDD | MBSFN channel model (Table B.2.6-1) | 1x2 low | 1 | 6.6 | ≥1 |

## 10.1_1.4 Test description

### 10.1_1.4.1 Initial conditions

Same initial conditions as in clause 10.1.4.1 with the following exceptions:

- Instead of Table 10.1.3-3 → use Table 10.1_1.3-1.

### 10.1_1.4.2 Test procedure

Same test procedure as in clause 10.1_1.4.2 with the following exceptions:

- Instead of Table 10.1.5-1 → use Table 10.1_1.5-1.

### 10.1_1.4.3 Message contents

Same message contents as in clause 10.1.4.3 for Test number 1.

## 10.1_1.5 Test requirement

Same test requirements as in clause 10.1.5 with the following exceptions:

- Instead of Table 10.1.5-1 → use Table 10.1_1.5-1.

**Table 10.1_1.5-1: Test requirement**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation condition | Correlation Matrix and antenna | Reference value | | MBMS UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BLER (%) | SNR(dB) | |
| 4 | 1.4 MHz | R.40 FDD | OP.4 FDD | MBSFN channel model (Table B.2.6-1) | 1x2 low | 1 | 7.5 | ≥1 |

# 10.2 TDD MBMS performance (Fixed Reference Channel)

## 10.2.1 Test purpose

This test verifies the performance of TDD MBMS with a given SNR for which the average BLER remains below a given reference value.

## 10.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE supporting MBMS release 9 and forward.

## 10.2.3 Minimum conformance requirements

The parameters specified in Table 10.2.3-1 are valid for all TDD tests unless otherwise stated. For the requirements defined in this section, the difference between CRS EPRE and the MBSFN RS EPRE should be set to 0 dB as the UE demodulation performance might be different when this condition is not met (e.g. in scenarios where power offsets are present, such as scenarios when reserved cells are present).

**Table 10.2.3-1: Common Test Parameters (TDD)**

| Parameter | Unit | Value |
|---|---|---|
| Number of HARQ processes | Processes | None |
| Subcarrier spacing | kHz | 15 kHz |
| Allocated subframes per Radio Frame (Note 1) | | 5 subframes |
| Number of OFDM symbols for PDCCH | | 2 |
| Cyclic Prefix | | Extended |
| Note 1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS. | | |

The receive characteristic of MBMS is determined by the BLER. The requirement is valid for all RRC states for which the UE has capabilities for MBMS.

For the parameters specified in Table 10.2.3-1 and Table 10.2.3-2 and Annex A.3.8.2, the average downlink SNR shall be below the specified value for the BLER shown in Table 10.2.3-3.

**Table 10.2.3-2: Test Parameters for Testing**

| Parameter | | Unit | Test 1-4 |
|---|---|---|---|
| Downlink power allocation | $\rho_A$ | dB | 0 |
| | $\rho_B$ | dB | 0 (Note 1) |
| | σ | dB | 0 |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Note 1: $P_B = 0$. | | | |

**Table 10.2.3-3: Minimum performance**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation condition | Correlation Matrix and antenna | Reference value | | MBMS UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BLER (%) | SNR(dB) | |
| 1 | 10 MHz | R.37 TDD | OP.4 TDD | MBSFN channel model (Table B.2.6-1) | 1x2 low | 1 | 3.4 | ≥1 |
| 2 | 10 MHz | R.38 TDD | OP.4 TDD | | | | 11.1 | ≥1 |
| 3 | 10 MHz | R.39 TDD | OP.4 TDD | | | | 20.1 | ≥2 |
| | 5MHz | R.39-1 TDD | OP.4 TDD | | | | 20.5 | 1 |

The normative reference for this requirement is TS 36.101 [2] clause 10.2.

## 10.2.4 Test description

### 10.2.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: As specified per test number in Table 10.2.3-3 as defined in TS 36.508 [7] clause 4.3.1.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 10.2.3-1.
3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents are defined in clause 10.2.4.3.
6. SS transmits *MBSFNAreaConfiguration* message. Message content is defined in clause 10.2.4.3.
7. Wait for a period equal to the MCCH modification period to make sure the UE has received the *MBSFNAreaConfiguration* message.
8. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode C is activated. Message contents are defined in clause 10.2.4.3.
9. SS is configured to include 10 MBMS packets in one TB.

### 10.2.4.2 Test procedure

1. Initialise the variables $M_{tot}$ and $M_{ok}$ as 0. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 10.2.5-1 as appropriate.
2. SS shall send MBMS Packets on the MTCH radio bearer for the test time specified in Table G.6.4-1. SS stores the number of the transmitted MBMS Packets on the MTCH in the current test iteration in the variable $M_{tot}$.
3. SS shall send a “UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST” message and wait for the UE to respond with a “UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE” reporting the received MBMS Packet counter value. Message contents are defined in clause 10.2.4.3. SS calculates the variable $M_{ok}$ as (current counter value - counter value at last test iteration).
4. SS shall compute the BLER as the following:

   The BLER = $(M_{tot} – M_{ok}) / M_{tot}$
5. Repeat steps from 1 to 4 for each subtest in Table 10.2.5-1 as appropriate.

### 10.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 4.4, 4.6 and 4.7A with following exceptions:

**Table 10.2.4.3-1: SystemInformationBlockType2: Additional TDD MBMS performance (Fixed Reference Channel)**

| Derivation Path: 36.508 table 4.4.3.3-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType2 ::= SEQUENCE { | | | |
| mbsfn-SubframeConfigList SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE{ | | | |
| oneFrame | '111110' B | The last bit is not used | |
| } | | | |
| } | | | |
| } | | | |

**Table 10.2.4.3-2: MBSFNAreaConfiguration message: Additional TDD MBMS performance (Fixed Reference Channel)**

| Derivation Path: 36.508, Table 4.6.1-4A | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MBSFNAreaConfiguration-r9 ::= SEQUENCE { | | | |
| commonSF-Alloc-r9 SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE { | | | |
| radioframeAllocationPeriod | n1 | | |
| radioframeAllocationOffset | 0 | | |
| subframeAllocation CHOICE { | | | |
| oneFrame | '111110' B | The last bit is not used | |
| } | | | |
| } | | | |
| commonSF-AllocPeriod-r9 | rf8 | | |
| pmch-InfoList-r9 SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF SEQUENCE { | | | |
| pmch-Config-r9 SEQUENCE { | | | |
| sf-AllocEnd-r9 | 39 | 40 active subframes in 8 Radio-frames | |
| dataMCS-r9 | 4 | Test number 1 | R.37 TDD |
| | 12 | Test number 2 | R.38 TDD |
| | 20 | Test number 3 | R.39 TDD R.39-1 TDD |
| mch-SchedulingPeriod-r9 | rf8 | | |
| } | | | |
| } | | | |

**Table 10.2.4.3-3: ACTIVATE TEST MODE: Additional TDD MBMS performance (Fixed Reference Channel)**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C |
|---|

**Table 10.2.4.3-4: CLOSE UE TEST LOOP: Additional TDD MBMS performance (Fixed Reference Channel)**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C |
|---|

**Table 10.2.4.3-5: SystemInformationBlockType13: Additional TDD MBMS performance (Fixed Reference Channel)**

| Derivation Path: 36.508 table 4.4.3.3-13 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SystemInformationBlockType13 ::= SEQUENCE { | | | |
| mbsfn-AreaInfoList-r9 SEQUENCE (SIZE(1..maxMBSFN-Area)) OF SEQUENCE { | | | |
| mcch-Config-r9 SEQUENCE { | | | |
| mcch-RepetitionPeriod-r9 | rf32 | | |
| mcch-Offset-r9 | 0 | | |
| mcch-ModificationPeriod-r9 | rf512 | | |
| sf-AllocInfo-r9 | '100000' B | | |
| signallingMCS-r9 | n7 | Test number 1 | QPSK |
| | n13 | Test number 2 | 16QAM |
| | n19 | Test number 3 | 64QAM |
| } | | | |
| } | | | |
| notificationConfig-r9 SEQUENCE { | | | |
| notificationRepetitionCoeff-r9 | n4 | | |
| notificationOffset-r9 | 0 | | |
| notificationSF-Index-r9 | 1 | Subframe #3 | |
| } | | | |
| } | | | |

**Table 10.2.4.3-6: *TDD-Config-DEFAULT:* Additional TDD MBMS performance (Fixed Reference Channel)**

| Derivation Path: TS 36.508 Table 5.3.1-1 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| TDD-Config-DEFAULT ::= SEQUENCE { | | | |
| subframeAssignment | sa5 | | |
| } | | | |

**Table 10.2.4.3-7: *PUCCH-ConfigDedicated-DEFAULT:* Additional TDD MBMS performance (Fixed Reference Channel)**

| Derivation Path: 36.508 Table 4.6.3-9 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE { | | | |
| tddAckNackFeedbackMode | bundling | | |
| } | | | |

## 10.2.5 Test requirement

For the parameters specified in Table 10.2.3-1, Table 10.2.3-2, Annex A.3.8.2, and SNR in Table 10.2.5-1, the value for the BLER in step 4 shall be below the test limit in Annex G.6.3 for all subtests shown in Table 10.2.5-1.

**Table 10.2.5-1: Test requirement**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation condition | Correlation Matrix and antenna | Reference value | | MBMS UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BLER (%) | SNR(dB) | |
| 1 | 10 MHz | R.37 TDD | OP.4 TDD | MBSFN channel model (Table B.2.6-1) | 1x2 low | 1 | 4.3 | ≥1 |
| 2 | 10 MHz | R.38 TDD | OP.4 TDD | | | | 12 | ≥1 |
| 3 | 10 MHz | R.39 TDD | OP.4 TDD | | | | 21.0 | ≥2 |
| | 5MHz | R.39-1 TDD | OP.4 TDD | | | | 21.4 | 1 |

# 10.2_1 TDD MBMS performance (Fixed Reference Channel) (Release 13 and forward)

## 10.2.1 Test purpose

Same test purpose as in clause 10.2.1.

## 10.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE supporting MBMS release 13 and forward.

## 10.2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 10.2.3 with the following exceptions:

- Instead of Table 10.2.3-3 → use Table 10.2_1.3-1.

**Table 10.2_1.3-1: Minimum performance**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation condition | Correlation Matrix and antenna | Reference value | | MBMS UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BLER (%) | SNR(dB) | |
| 4 | 1.4 MHz | R.40 TDD | OP.4 TDD | MBSFN channel model (Table B.2.6-1) | 1x2 low | 1 | 5.8 | ≥1 |

The normative reference for this requirement is TS 36.101 [2] clause 10.2.

## 10.2.4 Test description

### 10.2.4.1 Initial conditions

Same initial conditions as in clause 10.2.4.1 with the following exceptions:

- Instead of Table 10.2.3-3 → use Table 10.2_1.3-1.

### 10.2_1.4.2 Test procedure

Same test procedure as in clause 10.2.4.2 with the following exceptions:

- Instead of Table 10.2.5-1 → use Table 10.2_1.5-1.

### 10.2.4.3 Message contents

Same message contents as in clause 10.2.4.3 for Test number 1.

## 10.2_1.5 Test requirement

Same test requirements as in clause 10.2.5 with the following exceptions:

- Instead of Table 10.2.5-1 → use Table 10.2_1.5-1.

**Table 10.2_1.5-1: Test requirement**

| Test number | Bandwidth | Reference Channel | OCNG Pattern | Propagation condition | Correlation Matrix and antenna | Reference value | | MBMS UE Category |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BLER (%) | SNR(dB) | |
| 4 | 1.4 MHz | R.40 TDD | OP.4 TDD | MBSFN channel model (Table B.2.6-1) | 1x2 low | 1 | 6.7 | ≥1 |

# 11 Performance Requirement (ProSe Direct Discovery)

This clause contains the performance requirements for the Sidelink physical channels specified for ProSe Direct Discovery.

## 11.1 General

### 11.1.1 Applicability of requirements

The requirements in this clause are applicable to UEs that support ProSe Direct Discovery. Some of the tests defined in this clause are applicable only to UEs that additionally support transmission and reception of Sidelink synchronization signal (indicated using *disc-SLSS*). The test case applicability is in according to table 11.1.1-1 depending on UE capability.

**Table 11.1.1-1: ProSe Direct Discovery test applicability**

| | ProSe Direct Discovery without support of SLSS | ProSe Direct Discovery with support of SLSS |
|---|---|---|
| **FDD** | 11.2.1, 11.3.1, 11.5.1 | 11.3.1, 11.4.1, 11.5.1 |
| **TDD** | 11.2.2, 11.3.2, 11.5.2 | 11.2.2, 11.3.2, 11.5.2 |

For maximum Sidelink Processes test specified in clause 11.5, the UE is required to only meet the test for the maximum channel bandwidth over the ProSe operating bands supported by the UE.

### 11.1.2 Reference DRX configuration

**Table 11.1.2-1: Reference DRX configuration**

| Parameter | Value | Comments |
|---|---|---|
| onDurationTimer | psf1 | |
| drx-InactivityTimer | psf1 | |
| drx-RetransmissionTimer | psf1 | |
| longDRX-CycleStartOffset | sf2560, 0 | |
| shortDRX | disabled | |
| NOTE 1: For further information see clause 6.3.2 in TS 36.331. | | |

# 11.2 Demodulation of PSDCH (single link performance)

The purpose of the requirements in this subclause is to verify the PSDCH demodulation performance with a single active PSDCH link under different operating scenarios and channel conditions.

The active cell(s), when present, are specified in the test parameters specific to the test.

## 11.2.1 FDD PSDCH Single Link Performance (ProSe Direct Discovery)

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Test time is FFS.
- Test system uncertainties and test tolerances is TBD
- Connection Diagram is FFS
- UL and DL RMC for cell1 is TBD

### 11.2.1.1 Test Purpose

This test verifies the PSDCH demodulation performance with a single PSDCH link with a given SNR for which the average BLER remains below a given reference value under different channel conditions.

### 11.2.1.2 Test Applicability

This test case applies to all types of E-UTRA FDD UE release 12 and forward which support ProSe Direct Discovery.

### 11.2.1.3 Minimum Conformance Requirements

The minimum requirements are specified in Table 11.2.1.3-2 with the test parameters specified in Table 11.2.1.3-1. The receiver UE under test is associated with Cell 1.

**Table 11.2.1.3-1: Test Parameters**

| Parameter | | | Unit | Test 1 |
|---|---|---|---|---|
| Discovery resource pool configuration | | | | As specified in Table A.7.1.1-1 (Configuration #1-FDD) |
| DRX configuration | | | | As specified in Table 11.1.2-1 |
| $N_{oc}$ at antenna port (NOTE 3) | | | dBm/15kHz | -98 |
| Active cell(s) | | | | Cell 1 (Serving cell) |
| Cell 1 | Cyclic prefix | | | Normal |
| | Cell ID | | | 0 |
| | Downlink power allocation | $\rho_A$ | dB | 0 |
| | | $\rho_B$ | dB | 0 (NOTE 1) |
| | | σ | dB | 0 |
| | OCNG Pattern (NOTE 2) | | | OP.1 FDD |
| | Propagation channel | | | AWGN |
| | Antenna configuration | | | 1x2 |
| | RSRP | | dBm/15kHz | -92 |
| Active Sidelink UE(s) | | | | Sidelink UE 1 |
| Sidelink UE 1 | Sidelink Transmissions | | | PSDCH |
| | PSDCH RB allocation | | | PRB pairs {2i..2i+1}, where i is chosen randomly uniformly from [0,11] in each discovery period. |
| | Time offset (NOTE 4) | | µs | +1 |
| | Frequency offset (NOTE 5) | | Hz | +200 |
| | Propagation Channel | | | EPA5 |
| | Antenna configuration | | | 1x2 Low |

NOTE 1: $P_B = 0$.
NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.
NOTE 3: Applicable to both DL channel and ProSe Direct Discovery Subframes on UL.
NOTE 4: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.
NOTE 5: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

**Table 11.2.1.3-2: Minimum performance**

| Test num. | Sidelink UE | Band-width | Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | BLER of PSDCH (%) | SNR (dB) |
| 1 | 1 | 5 MHz | D.1 FDD | 30 | 4.6 |

The normative reference for this requirement is TS 36.101 [2] clause 11.2.1

## 11.2.1.4 Test Description

### 11.2.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range for Cell1, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 11.2.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure TBD.

2. The parameter settings for the cell are set up according to Table 11.2.1.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents exceptions are defined in clause 11.2.1.4.3.

6. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is activated.

### 11.2.1.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table TBD. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table TBD. When the UE has no payload data to send, it transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of bandwidth, propagation condition, antenna configuration and the SNR for cell1 according to Table 11.2.1.3-1.

4. SS transmits PSDCH to transmit the SL RMC according to Table 11.2.1.3-2. Set the Sidelink signal level, bandwidth, propagation condition, antenna configuration and SNR according to Table 11.2.1.3-1 and Table 11.2.1.3-2.

5. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions are defined in clause 11.2.1.4.3.

6. The UE shall transmit RRCConnectionReconfigurationComplete message.

7. Initialise the variables $P_{tot}$ and $P_{ok}$ as 0.

8. SS shall send SL Discovery Packets (MAC padding bits) on the SL RMC for the test time [FFS]. SS stores the number of the transmitted Discovery Packets in the current test iteration in the variable $P_{tot}$.

9. SS shall send (on the available PDSCH) a “UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER REQUEST” message and wait for the UE to respond (on the available PUSCH) with a “UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER RESPONSE” reporting the received Sidelink direct discovery packet counter value.

10. SS calculates the variable $P_{ok}$ as (current counter value - counter value at last test iteration).

11. SS shall compute the BLER as following:

    $BLER = ((P_{tot} - P_{ok})/ P_{tot})* 100\%$

### 11.2.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

**Table 11.2.1.4.3-1: ACTIVATE TEST MODE: FDD PSDCH Single Link Performance for ProSe Direct Discovery**

| Derivation Path: 36.508[7], Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 11.2.1.4.3-2: CLOSE UE TEST LOOP: FDD PSDCH Single Link Performance for ProSe Direct Discovery**

| Derivation Path: 36.508[7], Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 11.2.1.4.3-3: *MAC-MainConfig-RBC*: DRX config for PSDCH Single Link Performance for ProSe Direct Discovery**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n5 | | |
| periodicBSR-Timer | sf2560 | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | sf2560 | | |
| } | | | |

### 11.2.1.5 Test Requirement

For the parameters specified in Table 11.2.1.3-1 and SNR in Table 11.2.1.5-1, the BLER obtained in step 11 shall be below the test limit in Annex TBD.

**Table 11.2.1.5-1: Test Requirements**

| Test num. | Sidelink UE | Band-width | Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | BLER of PSDCH (%) | SNR (dB) |
| 1 | 1 | 5 MHz | D.1 FDD | 30 | 4.6 + TT |

## 11.2.2 TDD PSDCH Single Link Performance (ProSe Direct Discovery)

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Test time is FFS.
- Test system uncertainties and test tolerances is TBD
- Connection Diagram is FFS
- UL and DL RMC for cell1 is TBD

### 11.2.2.1 Test Purpose

This test verifies the PSDCH demodulation performance with a single PSDCH link with a given SNR for which the average BLER remains below a given reference value under different channel conditions.

### 11.2.2.2 Test Applicability

This test case applies to all types of E-UTRA TDD UE release 12 and forward which support ProSe Direct Discovery.

### 11.2.2.3 Minimum Conformance Requirements

The minimum requirements are specified in Table 11.2.2.3-2 with the test parameters specified in Table 11.2.2.3-1. The receiver UE under test is associated with Cell 1.

**Table 11.2.2.3-1: Test Parameters**

| Parameter | | | Unit | Test 1 |
|---|---|---|---|---|
| Discovery resource pool configuration | | | | As specified in Table A.7.1.2-1 (Configuration #1-TDD) |
| DRX configuration | | | | As specified in Table 11.1.2-1 |
| $N_{oc}$ at antenna port (NOTE 5) | | | dBm/15kHz | -98 |
| Active cell(s) | | | | Cell 1 (Serving cell) |
| Cell 1 | Cyclic prefix | | | Normal |
| | Uplink downlink configuration (NOTE 3) | | | 0 |
| | Special subframe configuration (NOTE 4) | | | 4 |
| | Cell ID | | | 0 |
| | Downlink power allocation | $\rho_A$ | dB | 0 |
| | | $\rho_B$ | dB | 0 (NOTE 1) |
| | | σ | dB | 0 |
| | OCNG Pattern NOTE 2 | | | OP.1 TDD |
| | Propagation channel | | | AWGN |
| | Antenna configuration | | | 1x2 |
| | RSRP | | dBm/15kHz | -92 |
| Active Sidelink UE(s) | | | | Sidelink UE 1 |
| Sidelink UE 1 | Sidelink Transmissions | | | PSDCH |
| | RB allocation | | | PRB pairs {2i..2i+1}, where i is chosen randomly uniformly from [0,11] in each discovery period. |
| | Time offset (NOTE 6) | | µs | +1 |
| | Frequency offset (NOTE 7) | | Hz | +200 |
| | Propagation Channel | | | EPA5 |
| | Antenna configuration | | | 1x2 Low |

NOTE 1: $P_B = 0$.
NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.
NOTE 3: As specified in Table 4.2-2 in TS 36.211 [8].
NOTE 4: As specified in Table 4.2-1 in TS 36.211 [8].
NOTE 5: Applicable to both DL subframes and UL subframes configured for ProSe Direct Discovery.
NOTE 6: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.
NOTE 7: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

**Table 11.2.2.3-2: Minimum performance**

| Test num. | Sidelink UE | Band-width | Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | BLER of PSDCH (%) | SNR (dB) |
| 1 | 1 | 5 MHz | D.1 TDD | 30 | 4.6 |

The normative reference for this requirement is TS 36.101 [2] clause 11.2.2.

### 11.2.2.4 Test Description

#### 11.2.2.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range for Cell1, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 11.2.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure TBD.
2. The parameter settings for the cell are set up according to Table 11.2.2.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents exceptions are defined in clause 11.2.2.4.3.
6. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is activated.

### 11.2.2.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table TBD. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table TBD. When the UE has no payload data to send, it transmits uplink MAC padding bits on the UL RMC.
3. Set the parameters of bandwidth, propagation condition, antenna configuration and the SNR for cell1 according to Table 11.2.2.3-1.
4. SS transmits PSDCH to transmit the SL RMC according to Table 11.2.2.3-2. Set the Sidelink signal level, bandwidth, propagation condition, antenna configuration and SNR according to Table 11.2.2.3-1 and Table 11.2.2.3-2.
5. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions are defined in clause 11.2.2.4.3.
6. The UE shall transmit RRCConnectionReconfigurationComplete message.
7. Initialise the variables $P_{tot}$ and $P_{ok}$ as 0.
8. SS shall send SL Discovery Packets (MAC padding bits) on the SL RMC for the test time [FFS]. SS stores the number of the transmitted Discovery Packets in the current test iteration in the variable $P_{tot}$.
9. SS shall send (on the available PDSCH) a “UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER REQUEST” message and wait for the UE to respond (on the available PUSCH) with a “UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER RESPONSE” reporting the received Sidelink direct discovery packet counter value.
10. SS calculates the variable $P_{ok}$ as (current counter value - counter value at last test iteration).
11. SS shall compute the BLER as following:

    $BLER = ((P_{tot} - P_{ok})/ P_{tot})* 100\%$

### 11.2.2.4.3 Message Contents

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

**Table 11.2.2.4.3-1: ACTIVATE TEST MODE: TDD PSDCH Single Link Performance for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 11.2.2.4.3-2: CLOSE UE TEST LOOP: TDD PSDCH Single Link Performance for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 11.2.2.4.3-3: *MAC-MainConfig-RBC*: DRX config for PSDCH Single Link Performance for ProSe Direct Discovery**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n5 | | |
| periodicBSR-Timer | sf2560 | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | sf2560 | | |
| } | | | |

### 11.2.2.5 Test Requirement

For the parameters specified in Table 11.2.2.3-1 and SNR in Table 11.2.2.5-1, the BLER obtained in step 11 shall be below the test limit in Annex TBD.

**Table 11.2.2.5-1: Test Requirements**

| Test num. | Sidelink UE | Band-width | Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | BLER of PSDCH (%) | SNR (dB) |
| 1 | 1 | 5 MHz | D.1 TDD | 30 | 4.6 + TT |

## 11.3 Power imbalance performance with two links

The purpose of the requirements in this subclause is to check the demodulation performance when receiving PSDCH transmissions from two Sidelink UEs with power imbalance in one subframe.

### 11.3.1 FDD Power imbalance performance with two links

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Test system uncertainties and test tolerances is TBD

- Connection Diagram is FFS
- Test procedure is TBD
- Message contents are TBD

### 11.3.1.1 Test Purpose

This test verifies the PSDCH demodulation performance in the presence of two links which exhibit power imbalance in one subframe.

### 11.3.1.2 Test Applicability

This test case applies to all types of E-UTRA FDD UE release 12 and forward which support ProSe Direct Discovery.

### 11.3.1.3 Minimum Conformance Requirements

The minimum requirements are specified in Table 11.3.1.3-2 with the test parameters specified in Table 11.3.1.3-1. The receiver UE under test is associated with Cell 1. The Sidelink UE 1 and 2 are synchronized to Cell 1 and transmit PSDCH on adjacent RBs.

**Table 11.3.1.3-1: Test Parameters**

| Parameter | | | Unit | Test 1 |
|---|---|---|---|---|
| Discovery resource pool configuration | | | | As specified in Table A.7.1.1-1 (Configuration #1-FDD) |
| DRX configuration | | | | As specified in Table 11.1.2-1 |
| $N_{oc}$ at antenna port (NOTE 3) | | | dBm/15kHz | -98 |
| Active cell(s) | | | | Cell 1 (Serving cell) |
| Cell 1 | Cyclic prefix | | | Normal |
| | Cell ID | | | 0 |
| | Downlink power allocation | $\rho_A$ | dB | 0 |
| | | $\rho_B$ | dB | 0 (NOTE 1) |
| | | $\sigma$ | dB | 0 |
| | OCNG Pattern (NOTE 2) | | | OP.1 FDD |
| | Propagation channel | | | AWGN |
| | Antenna configuration | | | 1x2 |
| | RSRP | | dBm/15kHz | -92 |
| Active Sidelink UE(s) | | | | Sidelink UE 1, Sidelink UE 2 |
| Sidelink UE 1 | Sidelink Transmissions | | | PSDCH |
| | PSDCH RB allocation | | | PRB pairs {4..5} |
| | Time offset (NOTE 3) | | µs | 0 |
| | Frequency offset (NOTE 4) | | Hz | 0 |
| | Propagation Channel | | | AWGN |
| | Antenna configuration | | | 1x2 Low |
| Sidelink UE 2 | Sidelink Transmissions | | | PSDCH |
| | PSDCH RB allocation | | | PRB pairs {6..7} |
| | Time offset (w.r.t. Cell 1 DL) | | µs | 0 |
| | Frequency offset (w.r.t. Cell 1 UL) | | Hz | 0 |
| | Propagation Channel | | | AWGN |
| | Antenna configuration | | | 1x2 Low |

NOTE 1: $P_B = 0$.
NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.
NOTE 3: Applicable to both DL channel and ProSe Direct Discovery Subframes on UL.
NOTE 4: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.
NOTE 5: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

**Table 11.3.1.3-2: Minimum performance**

| Test num. | Band-width | Sidelink UE | Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | BLER of PSDCH (%) | SNR (dB) |
| 1 | 5 MHz | 1 | D.1 FDD | (NOTE 1) | 24.3 |
| | | 2 | D.1 FDD | 30 | 6.9 |
| NOTE 1: There is no BLER requirement for Sidelink UE 1. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 11.3.1

### 11.3.1.4 Test Description

TBD

### 11.3.1.5 Test Requirement

For the parameters specified in Table 11.3.1.3-1 and SNR in Table 11.3.1.5-1, the BLER obtained in step 11 shall be below the test limit in Annex TBD.

**Table 11.3.1.5-1: Test Requirements**

| Test num. | Band-width | Sidelink UE | Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | BLER of PSDCH (%) | SNR (dB) |
| 1 | 5 MHz | 1 | D.1 FDD | (NOTE 1) | 24.3+TT |
| | | 2 | D.1 FDD | 30 | 6.9+TT |
| NOTE 1: There is no BLER requirement for Sidelink UE 1. | | | | | |

## 11.3.2 TDD Power imbalance performance with two links

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Test system uncertainties and test tolerances is TBD
- Connection Diagram is FFS
- Test procedure is TBD

### 11.3.2.1 Test Purpose

This test verifies the PSDCH demodulation performance in the presence of two links which exhibit power imbalance in one subframe.

### 11.3.2.2 Test Applicability

This test case applies to all types of E-UTRA TDD UE release 12 and forward which support ProSe Direct Discovery.

### 11.3.2.3 Minimum Conformance Requirements

The minimum requirements are specified in Table 11.3.2.3-2 with the test parameters specified in Table 11.3.2.3-1. The receiver UE under test is associated with Cell 1. The Sidelink UE 1 and 2 are synchronized to Cell 1 and transmit PSDCH on adjacent RBs.

**Table 11.3.2.3-1: Test Parameters**

| Parameter | | | Unit | Test 1 |
|---|---|---|---|---|
| Discovery resource pool configuration | | | | As specified in Table A.7.1.2-1 (Configuration #1-TDD) |
| DRX configuration | | | | As specified in Table 11.1.2-1 |
| $N_{oc}$ at antenna port (NOTE 5) | | | dBm/15kHz | -98 |
| Active cell(s) | | | | Cell 1 (Serving cell) |
| Cell 1 | Cyclic prefix | | | Normal |
| | Uplink downlink configuration (NOTE 3) | | | 0 |
| | Special subframe configuration (NOTE 4) | | | 4 |
| | Cell ID | | | 0 |
| | Downlink power allocation | $\rho_A$ | dB | 0 |
| | | $\rho_B$ | dB | 0 (NOTE 1) |
| | | σ | dB | 0 |
| | OCNG Pattern NOTE 2 | | | OP.1 TDD |
| | Propagation channel | | | AWGN |
| | Antenna configuration | | | 1x2 |
| | RSRP | | dBm/15kHz | -92 |
| Active Sidelink UE(s) | | | | Sidelink UE 1, Sidelink UE 2 |
| Sidelink UE 1 | Sidelink Transmissions | | | PSDCH |
| | PSDCH RB allocation | | | PRB pairs {4..5} |
| | Time offset (NOTE 6) | | µs | 0 |
| | Frequency offset (NOTE 7) | | Hz | 0 |
| | Propagation Channel | | | AWGN |
| | Antenna configuration | | | 1x2 Low |
| Sidelink UE 2 | Sidelink Transmissions | | | PSDCH |
| | RB allocation | | | PRB pairs {6..7} |
| | Time offset (NOTE 6) | | µs | 0 |
| | Frequency offset (NOTE 7) | | Hz | 0 |
| | Propagation Channel | | | AWGN |
| | Antenna configuration | | | 1x2 Low |

NOTE 1: $P_B = 0$.
NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.
NOTE 3: As specified in Table 4.2-2 in TS 36.211 [4].
NOTE 4: As specified in Table 4.2-1 in TS 36.211 [4].
NOTE 5: Applicable to both DL subframes and UL subframes configured for ProSe Direct Discovery.
NOTE 6: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.
NOTE 7: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

**Table 11.3.2.3-2: Minimum performance**

| Test num. | Band-width | Sidelink UE | Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | BLER of PSDCH (%) | SNR (dB) |
| 1 | 5 MHz | 1 | D.1 TDD | (NOTE 1) | 24.3 |
| | | 2 | D.1 TDD | 30 | 6.9 |
| NOTE 1: There is no BLER requirement for Sidelink UE 1. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 11.3.2

## 11.3.2.4 Test Description

TBD

#### 11.3.2.5 Test Requirement

For the parameters specified in Table 11.3.2.3-1 and SNR in Table 11.3.2.5-1, the BLER obtained in step 11 shall be below the test limit in Annex TBD.

**Table 11.3.2.5-1: Test Requirements**

| Test num. | Band-width | Sidelink UE | Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | BLER of PSDCH (%) | SNR (dB) |
| 1 | 5 MHz | 1 | D.1 FDD | (NOTE 1) | 24.3+TT |
| | | 2 | D.1 FDD | 30 | 6.9+TT |
| NOTE 1: There is no BLER requirement for Sidelink UE 1. | | | | | |

## 11.4 Multiple timing reference test

The purpose of this test is to check the demodulation performance when receiving from two Sidelink UEs that follow different timing references and transmitting on different resources (non-overlapping in time).

### 11.4.1 FDD Multiple timing reference test

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- Test time is FFS.
- Test system uncertainties and test tolerances is TBD
- Connection Diagram is FFS
- Test procedure is TBD
- Message contents are TBD

#### 11.4.1.1 Test Purpose

This test verifies the demodulation performance when receiving from two Sidelink UEs that follow different timing references and transmitting on different resources (non-overlapping in time) with a given SNR for which the average BLER remains below a given reference value.

#### 11.4.1.2 Test Applicability

This test case applies to all types of E-UTRA FDD UE release 12 and forward which support ProSe Direct Discovery.

#### 11.4.1.3 Minimum Conformance Requirements

The test parameters are specified in Table 11.4.1-1. Sidelink UE 2 and the receiver UE under test are associated with Cell 1. Sidelink UE 1 and 3 are associated with another cell and use a different timing, and UE 1 acts as a synchronization reference. The minimum requirements are specified in Table 11.4.1-2.

**Table 11.4.1-1: Test Parameters**

| Parameter | | | Unit | Test 1 |
|---|---|---|---|---|
| Discovery resource pool configuration | | | | As specified in Table A.7.1.1-2 (Configuration #2-FDD) |
| DRX configuration | | | | As specified in Table 11.1.2-1 |
| $N_{oc}$ at antenna port (NOTE 3) | | | dBm/15kHz | -98 |
| Active cell(s) | | | | Cell 1 (Serving cell) |
| Cell 1 | Cyclic prefix | | | Normal |
| | Cell ID | | | 0 |
| | Downlink power allocation | $\rho_A$ | dB | 0 |
| | | $\rho_B$ | dB | 0 (NOTE 1) |
| | | σ | dB | 0 |
| | OCNG Pattern NOTE 2 | | | OP.1 FDD |
| | Propagation channel | | | AWGN |
| | Antenna configuration | | | 1x2 |
| | RSRP | | dBm/15kHz | -92 |
| Active Sidelink UE(s) | | | | Sidelink UEs 1, 2, 3 |
| Sidelink UE 1 | Sidelink Transmissions | | | SLSS |
| | networkControlledSyncTx | | | ON |
| | slssid | | | 30 |
| | Time offset (NOTE 4) | | µs | 3511 |
| | Frequency offset (NOTE 5) | | Hz | -100 |
| | Propagation channel | | | EPA5 |
| | Antenna configuration | | | 1x2 Low |
| | $\widehat{E}_s$ of SLSS at antenna port | | dBm/15kHz | -82 |
| Sidelink UE 2 | Sidelink Transmissions | | | PSDCH |
| | Resource pool used for transmissions | | | *discRxPool(0)* |
| | RB allocation | | | PRB pairs {2i..2i+1}, where i is chosen randomly uniformly from [0,11] in each discovery period. |
| | Time offset (NOTE 4) | | µs | +1 |
| | Frequency offset (NOTE 5) | | Hz | +200 |
| | Propagation Channel | | | EPA5 |
| | Antenna configuration | | | 1x2 Low |
| Sidelink UE 3 | Sidelink Transmissions | | | PSDCH |
| | Resource pool used for transmissions | | | *discRxPool(1)* |
| | RB allocation | | | PRB pairs {2i..2i+1}, where i is chosen randomly uniformly from [0,11] in each discovery period. |
| | Time offset (NOTE 4) | | µs | 3511 |
| | Frequency offset (NOTE 5) | | Hz | +300 |
| | Propagation Channel | | | EPA5 |
| | Antenna configuration | | | 1x2 Low |

NOTE 1: $P_B = 0$.
NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.
NOTE 3: Applicable to both DL channel and ProSe Direct Discovery Subframes on UL.
NOTE 4: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.
NOTE 5: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

**Table 11.4.1-2: Minimum performance**

| Test num. | Band-width | Sidelink UE | Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | BLER of PSDCH (%)[NOTE 1] | SNR (dB) |
| 1 | 5 MHz | 2 | D.1 FDD | 30 | 4.6 |
| | | 3 | D.1 FDD | 30 | 4.6 |
| NOTE 1: The BLER is measured after 5 D2D Discovery periods (1600 frames) of lead time during which the test UE detects and synchronizes to Sidelink UE 1 SLSS. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 11.4.1.

## 11.4.1.4 Test Description

### 11.4.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range for Cell1, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 11.4.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure TBD.
2. The parameter settings for the cell are set up according to Table 11.4.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents exceptions are defined in clause 11.4.1.4.3.
6. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is activated.

### 11.4.1.4.2 Test Procedure

TBD

### 11.4.1.4.3 Message Contents

TBD

## 11.4.1.5 Test Requirement

For the parameters specified in Table 11.4.1.3-1 and SNR in Table 11.4.1.5-1, the BLER obtained in step TBD shall be below the test limit in Annex TBD.

**Table 11.4.1-2: Minimum performance**

| Test num. | Band-width | Sidelink UE | Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | BLER of PSDCH (%)[NOTE 1] | SNR (dB) |
| 1 | 5 MHz | 2 | D.1 FDD | 30 | 4.6+TT |
| | | 3 | D.1 FDD | 30 | 4.6+TT |
| NOTE 1: The BLER is measured after 5 D2D Discovery periods (1600 frames) of lead time during which the test UE detects and synchronizes to Sidelink UE 1 SLSS. | | | | | |

# 11.5 Maximum Sidelink processes test

The purpose of this test is to verify the maximum number of Sidelink processes supported by the UE as reported using UE capability signalling (discSupportedProc).

The UE is required to meet only the test for the maximum channel bandwidth over the ProSe operating bands supported by the UE.

## 11.5.1 FDD maximum Sidelink processes test (ProSe Direct Discovery)

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Test time is FFS.
- Test system uncertainties and test tolerances is TBD
- Connection Diagram is FFS
- UL and DL RMC for cell1 is TBD

### 11.5.1.1 Test Purpose

This test verifies the UE's ability to support maximum number of Sidelink processes by verifying the percentage of the information bit throughput for a specified PSDCH Reference Measurement Channel (RMC) not falling below a specified value.

### 11.5.1.2 Test Applicability

This test case applies to all types of E-UTRA FDD UE release 12 and forward which support ProSe Direct Discovery.

### 11.5.1.3 Minimum Conformance Requirements

The test parameters are specified in Table 11.5.1.3-1. Multiple discovery resource pools are interleaved. Each Sidelink UE transmits in one of the resource pools with 3 retransmissions. The minimum requirements are specified in Table 11.5.1.3-2.

**Table 11.5.1.3-1: Test Parameters**

| Parameter | | | Unit | Test 1-7 |
|---|---|---|---|---|
| Discovery resource pool configuration | | | | As specified in Table A.7.1.1-3 (Configuration #3-FDD) with parameters $BW_{Channel}$, NPools = Number of configured resource pools (as specified in Table 11.5.1.3-2), and N = discSupportedProc |
| DRX configuration | | | | As specified in Table 11.1.2-1 |
| Active cell(s) | | | | Cell 1 (Serving cell) |
| Cell 1 | Cyclic prefix | | | Normal |
| | Cell ID | | | 0 |
| | Downlink power allocation | $\rho_A$ | dB | 0 |
| | | $\rho_B$ | dB | 0 (NOTE 1) |
| | | σ | dB | 0 |
| | OCNG Pattern NOTE 2 | | | OP.1 FDD |
| | Propagation channel | | | Static propagation condition<br>No external noise sources are applied |
| | Antenna configuration | | | 1x2 |
| | RSRP | | dBm/15kHz | -85 |
| Active Sidelink UE(s) | | | | Sidelink UE i, i = 0, …, discSupportedProc-1 |
| Sidelink UE i | Sidelink Transmissions | | | PSDCH (D.1 FDD) |
| | Resource pool index (NOTE 3) | | | $\left\lfloor \frac{i}{N_{MAX_SF}} \right\rfloor$ |
| | PSDCH RB allocation (NOTE 3) | | | PRB pairs {2*(i % $N_{MAX_SF}$), 2*(i % $N_{MAX_SF}$)+1} |
| | Time offset (NOTE 4) | | µs | 0 |
| | Frequency offset (NOTE 4) | | Hz | 0 |
| | Propagation Channel | | | Static propagation condition<br>No external noise sources are applied |
| | Antenna configuration | | | 1x2 Low |

NOTE 1: $P_B = 0$.
NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.
NOTE 3: $N_{MAX_SF}$ represents the maximum number of Sidelink UEs transmitting in one subframe. $N_{MAX_SF}$ = 12 (5 MHz), 25 (10MHz), 37 (15MHz), 50 (10MHz).
NOTE 4: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.
NOTE 5: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

**Table 11.5.1.3-2: Minimum performance**

| Test num. | Bandwidth | discSupportedProc | Number of configured resource pools | $\hat{E}_s$ at antenna port (dBm/15kHz) | Reference value for Sidelink UE i=0…discSupportedProc-1 |
|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) |
| 1 | 5 MHz | 50 | 5 | -85 | 95 |
| 2 | 10 MHz | 50 | 2 | -85 | 95 |
| 3 | 15 MHz | 50 | 2 | -85 | 95 |
| 4 | 20 MHz | 50 | 1 | -85 | 95 |
| 5 | 10 MHz | 400 | 16 | -85 | 95 |
| 6 | 15 MHz | 400 | 11 | -85 | 95 |
| 7 | 20 MHz | 400 | 8 | -85 | 95 |

The normative reference for this requirement is TS 36.101 [2] clause 11.5.1.

### 11.5.1.4 Test Description

#### 11.5.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range for Cell1, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: Select the test numbers in Table 11.5.1.3-2 corresponding to the max channel bandwidth among the UE supported ProSe operating bands as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure TBD without faders or AWGN source.
2. The parameter settings for the cell are set up according to Table 11.5.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents exceptions are defined in clause 11.5.1.4.3.
6. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is activated.

#### 11.5.1.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table TBD. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table TBD. When the UE has no payload data to send, it transmits uplink MAC padding bits on the UL RMC.
3. Set the parameters of bandwidth, propagation condition, antenna configuration and the SNR for cell1 according to Table 11.5.1.3-1.
4. SS transmits PSDCH on each active Sidelink UE as per with SL RMC according to Table 11.5.1.3-1. Set the Sidelink signal level, configured resource pools, bandwidth, antenna configuration according to Table 11.5.1.3-1 and Table 11.5.1.3-2.
5. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions are defined in clause 11.5.1.4.3.
6. The UE shall transmit RRCConnectionReconfigurationComplete message.
7. Initialise the variables $P_{tot}$ and $P_{ok}$ as 0.
8. SS shall send SL Discovery Packets (MAC padding bits) on the SL RMC for each of the active sidelink for the test time [FFS]. SS stores the number of the transmitted Discovery Packets per sidelink UE in the current test iteration in the variable $P_{tot}$.
9. SS shall send (on the available PDSCH) a “UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER REQUEST” message and wait for the UE to respond (on the available PUSCH) with a “UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER RESPONSE” reporting the received Sidelink direct discovery packet counter value.
10. SS calculates the variable $P_{ok}$ as (current counter value - counter value at last test iteration).

11. SS shall compute the fraction of maximum throughput as $100\%*(P_{ok} / P_{tot})$.

12. Repeat steps 1 to 11 for each subtest as applicable.

#### 11.5.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

**Table 11.5.1.4.3-1: ACTIVATE TEST MODE: FDD PSDCH Single Link Performance for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 11.5.1.4.3-2: CLOSE UE TEST LOOP: FDD PSDCH Single Link Performance for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 11.5.1.4.3-3: *MAC-MainConfig-RBC*: DRX config for PSDCH Single Link Performance for ProSe Direct Discovery**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n5 | | |
| periodicBSR-Timer | Sf2560 | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | Sf500 | | |
| } | | | |

### 11.5.1.5 Test Requirement

The fraction of the maximum throughput obtained per active sidelink UE shall meet or exceed the specified value in Table 11.5.1.5-1 for each test number as applicable.

**Table 11.5.1.5-1: Test Requirements**

| Test num. | Bandwidth | discSupportedProc | Number of configured resource pools | $\hat{E}_s$ at antenna port (dBm/15kHz) | Reference value for Sidelink UE i=0…discSupportedProc-1 |
|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) |
| 1 | 5 MHz | 50 | 5 | -85 | [95+TT] |
| 2 | 10 MHz | 50 | 2 | -85 | [95+TT] |
| 3 | 15 MHz | 50 | 2 | -85 | [95+TT] |
| 4 | 20 MHz | 50 | 1 | -85 | [95+TT] |
| 5 | 10 MHz | 400 | 16 | -85 | [95+TT] |
| 6 | 15 MHz | 400 | 11 | -85 | [95+TT] |
| 7 | 20 MHz | 400 | 8 | -85 | [95+TT] |

## 11.5.2 TDD maximum Sidelink processes test (ProSe Direct Discovery)

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Test time is FFS.
- Test system uncertainties and test tolerances is TBD
- Connection Diagram is FFS
- UL and DL RMC for cell1 is TBD

### 11.5.2.1 Test Purpose

This test verifies the UE's ability to support maximum number of Sidelink processes by verifying the percentage of the information bit throughput for a specified PSDCH Reference Measurement Channel (RMC) not falling below a specified value.

### 11.5.2.2 Test Applicability

This test case applies to all types of E-UTRA TDD UE release 12 and forward which support ProSe Direct Discovery.

### 11.5.2.3 Minimum Conformance Requirements

The test parameters are specified in Table 11.5.2.3-1. Multiple discovery resource pools are interleaved. Each Sidelink UE transmits in one of the resource pools with 3 retransmissions. The minimum requirements are specified in Table 11.5.1.3-2.

**Table 11.5.2.3-1: Test Parameters**

| Parameter | | | Unit | Test 1-7 |
|---|---|---|---|---|
| Discovery resource pool configuration | | | | As specified in Table A.7.1.2-2 (Configuration #2-TDD) with parameters $BW_{Channel}$, NPools = Number of configured resource pools (as specified in Table 11.5.2-2), and N = discSupportedProc |
| DRX configuration | | | | As specified in Table 11.1.2-1 |
| Active cell(s) | | | | Cell 1 (Serving cell) |
| Cell 1 | Cyclic prefix | | | Normal |
| | Uplink downlink configuration (NOTE 3) | | | 0 |
| | Special subframe configuration (NOTE 4) | | | 4 |
| | Cell ID | | | 0 |
| | Downlink power allocation | $\rho_A$ | dB | 0 |
| | | $\rho_B$ | dB | 0 (NOTE 1) |
| | | σ | dB | 0 |
| | OCNG Pattern NOTE 2 | | | OP.1 TDD |
| | Propagation channel | | | Static propagation condition<br>No external noise sources are applied |
| | Antenna configuration | | | 1x2 |
| | RSRP | | dBm/15kHz | -85 |
| Active Sidelink UE(s) | | | | Sidelink UE i, i = 0, …, discSupportedProc-1 |
| Sidelink UE i | Sidelink Transmissions | | | PSDCH (D.1 TDD) |
| | PSDCH Resource pool (NOTE 5) | | | $\left\lfloor \frac{i}{N_{MAX_SF}} \right\rfloor$ |
| | PSDCH RB allocation (NOTE 5) | | | PRB pairs {2*(i % $N_{MAX_SF}$),2*(i % $N_{MAX_SF}$)+1} |
| | Time offset (NOTE 6) | | µs | 0 |
| | Frequency offset (NOTE 7) | | Hz | 0 |
| | Propagation Channel | | | Static propagation condition<br>No external noise sources are applied |
| | Antenna configuration | | | 1x2 Low |

NOTE 1: $P_B = 0$.
NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.
NOTE 3: As specified in Table 4.2-2 in TS 36.211 [8].
NOTE 4: As specified in Table 4.2-1 in TS 36.211 [8].
NOTE 5: $N_{MAX_SF}$ represents the maximum number of Sidelink UEs transmitting in one subframe. $N_{MAX_SF}$ = 12 (5 MHz), 25 (10MHz), 37 (15MHz), 50 (10MHz).
NOTE 6: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.
NOTE 7: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

**Table 11.5.2.3-2: Minimum performance**

| Test num. | Bandwidth | discSupportedProc | Number of configured resource pools | $\hat{E}_s$ at antenna port (dBm/15kHz | Reference value |
|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) for Sidelink UE i=0…discSupportedProc-1 |
| 1 | 5 MHz | 50 | 5 | -85 | 95 |
| 2 | 10 MHz | 50 | 2 | -85 | 95 |
| 3 | 15 MHz | 50 | 2 | -85 | 95 |
| 4 | 20 MHz | 50 | 1 | -85 | 95 |
| 5 | 10 MHz | 400 | 16 | -85 | 95 |
| 6 | 15 MHz | 400 | 11 | -85 | 95 |
| 7 | 20 MHz | 400 | 8 | -85 | 95 |

## 11.5.2.4 Test Description

### 11.5.2.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range for Cell1, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: Select the test numbers in Table 11.5.1.3-2 corresponding to the max channel bandwidth among the UE supported ProSe operating bands as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure TBD without faders or AWGN source.
2. The parameter settings for the cell are set up according to Table 11.5.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 2A-RF according to TS 36.508 [7] clause 5.2A.1A. Message contents exceptions are defined in clause 11.5.1.4.3.
6. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode D is activated.

### 11.5.2.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table TBD. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table TBD. When the UE has no payload data to send, it transmits uplink MAC padding bits on the UL RMC.
3. Set the parameters of bandwidth, propagation condition, antenna configuration and the SNR for cell1 according to Table 11.5.1.3-1.
4. SS transmits PSDCH on each active Sidelink UE as per with SL RMC according to Table 11.5.1.3-1. Set the Sidelink signal level, configured resource pools, bandwidth, antenna configuration according to Table 11.5.1.3-1 and Table 11.5.1.3-2.

5. SS shall transmit an RRCConnectionReconfiguration message to configure DRX. Message contents exceptions are defined in clause 11.5.1.4.3.
6. The UE shall transmit RRCConnectionReconfigurationComplete message.
7. Initialise the variables $P_{tot}$ and $P_{ok}$ as 0.
8. SS shall send SL Discovery Packets (MAC padding bits) on the SL RMC for each of the active sidelink for the test time [FFS]. SS stores the number of the transmitted Discovery Packets per sidelink UE in the current test iteration in the variable $P_{tot}$.
9. SS shall send (on the available PDSCH) a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER REQUEST" message and wait for the UE to respond (on the available PUSCH) with a "UE TEST LOOP PROSE MODE D SIDELINK DIRECT DISCOVERY PACKET COUNTER RESPONSE" reporting the received Sidelink direct discovery packet counter value.
10. SS calculates the variable $P_{ok}$ as (current counter value - counter value at last test iteration).
11. SS shall compute the fraction of maximum throughput as $100\%*(P_{ok} / P_{tot})$.
12. Repeat steps 1 to 11 for each subtest as applicable.

### 11.5.2.4.3 Message Contents

Message contents are according to TS 36.508 [7] clauses TBD with following exceptions:

**Table 11.5.2.4.3-1: ACTIVATE TEST MODE: TDD PSDCH Single Link Performance for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE D |
|---|

**Table 11.5.2.4.3-2: CLOSE UE TEST LOOP: TDD PSDCH Single Link Performance for ProSe Direct Discovery**

| Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE D |
|---|

**Table 11.5.2.4.3-3: *MAC-MainConfig-RBC*: DRX config for PSDCH Single Link Performance for ProSe Direct Discovery**

| Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| ul-SCH-Config SEQUENCE { | | | |
| maxHARQ-Tx | n5 | | |
| periodicBSR-Timer | Sf2560 | | |
| retxBSR-Timer | sf2560 | | |
| ttiBundling | FALSE | | |
| } | | | |
| drx-Config CHOICE { | | | |
| Setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | psf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf2560 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |
| timeAlignmentTimerDedicated | Sf500 | | |
| } | | | |

### 11.5.2.5 Test Requirement

The fraction of the maximum throughput obtained per active sidelink UE shall meet or exceed the specified value in Table 11.5.2.5-1 for each test number as applicable.

**Table 11.5.2.5-1: Test Requirements**

| Test num. | Bandwidth | discSupportedProc | Number of configured resource pools | $\hat{E}_s$ at antenna port (dBm/15kHz | Reference value |
|---|---|---|---|---|---|
| | | | | | Fraction of maximum throughput (%) for Sidelink UE i=0…discSupportedProc-1 |
| 1 | 5 MHz | 50 | 5 | -85 | [95+TT] |
| 2 | 10 MHz | 50 | 2 | -85 | [95+TT] |
| 3 | 15 MHz | 50 | 2 | -85 | [95+TT] |
| 4 | 20 MHz | 50 | 1 | -85 | [95+TT] |
| 5 | 10 MHz | 400 | 16 | -85 | [95+TT] |
| 6 | 15 MHz | 400 | 11 | -85 | [95+TT] |
| 7 | 20 MHz | 400 | 8 | -85 | [95+TT] |

# 12 Performance requirement (ProSe Direct Communication)

This clause contains test method to measure the performance requirements for the Sidelink physical channels specified for ProSe Direct Communication in TS 36.211 [4].

## 12.1 General

### 12.1.1 Applicability of requirements

The requirements in this clause are applicable to UEs that support ProSe Direct Communication. Test cases defined for 5MHz channel bandwidth are applicable to UEs that support ProSe Direct Communication on only Band 31 or 72.

### 12.1.2 Reference DRX configuration

**Table 12.1.2-1: Reference DRX configuration**

| Parameter | Value | Comments |
|---|---|---|
| onDurationTimer | psf1 | |
| drx-InactivityTimer | psf1 | |
| drx-RetransmissionTimer | psf1 | |
| longDRX-CycleStartOffset | sf2560, 0 | |
| shortDRX | disabled | |
| NOTE 1: For further information see clause 6.3.2 in TS 36.331. | | |

## 12.2 Demodulation of PSSCH

This clause contains test method to measure the PSSCH demodulation performance with a single active PSSCH link.

### 12.2.1 FDD PSSCH Single Link Performance for ProSe Direct communication

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Test time is FFS.
- Test system uncertainties and test tolerances is TBD
- Connection Diagram is FFS
- Test procedure is TBD
- Message contents are TBD
- UL and DL RMC for cell1 is TBD

#### 12.2.1.1 Test Purpose

This test verifies the PSSCH demodulation performance with a single active PSSCH link with a given SNR for which the average BLER remains below a given reference value under different channel conditions.

#### 12.2.1.2 Test Applicability

This test case applies to all types of E-UTRA FDD UE release 12 and forward which support ProSe Direct Communication.

#### 12.2.1.3 Minimum Conformance Requirements

The minimum requirements are specified in Table 12.2.1.3-2 with the test parameters specified in Table 12.2.1.3-1. The receiver UE under test is associated with Cell 1.

**Table 12.2.1.3-1: Test Parameters**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Communication resource pool configuration | | | As specified in Table A.7.2.1-1 (Configuration #1-FDD) |
| DRX configuration | | | As specified in Table 12.1.2-1 |
| $N_{oc}$ at antenna port (NOTE 1) | | dBm/15 kHz | -98 |
| Active cell(s) | | | None |
| Sidelink UE 1 | Sidelink Transmissions | | SLSS + PSBCH |
| | networkControlledSyncTx | | ON |
| | slssid | | 30 |
| | inCoverage (in MIB-SL) | | TRUE |
| | syncOffsetIndicator | | Set same as syncOffsetIndicator1 in Configuration #1-FDD |
| | Propagation channel | | EPA5 |
| | Antenna configuration | | 1x2 Low |
| | $\widehat{E}_s$ at antenna port | dBm/15 kHz | -85 |
| Sidelink UE 2 | Sidelink Transmissions | | PSCCH + PSSCH |
| | PSCCH RMC | | 5MHz: CC.3 FDD<br>10 MHz: CC.4 FDD |
| | PSCCH subframe allocation | | As defined by TS 36.213 with $n_{PSCCH}$ chosen randomly (uniformly) in $[0, \lfloor M_{RB}^{PSCCH_RP} / 2 \rfloor L_{PSCCH} - 1]$ every sc-period |
| | PSCCH RB allocation | | |
| | $\widehat{E}_s$ of PSCCH at antenna port | dBm/15 kHz | -85 |
| | PSSCH RMC | | As specified in Table 12.2.1-2 |
| | PSSCH subframe allocation | | As per time repetition pattern specified in PSCCH |
| | PSSCH RB allocation | | First transmission: Chosen randomly (uniformly) among the allowed RBs as per TS36.213<br>HARQ retransmission: As per frequency hopping indicated in PSCCH and specified in TS36.213 |
| | Time offset (NOTE 2) | µs | +1 |
| | Frequency offset (NOTE 3) | Hz | +200 |
| | Propagation Channel | | EVA70 |
| | Antenna configuration | | 1x2 Low |

NOTE 1: Applicable to both DL channel and ProSe Direct Communication Subframes on UL.
NOTE 2: Time offset of Sidelink UE 2 receive signal timing with respect to Sidelink UE 1 receive signal timing at the tested UE.
NOTE 3: Frequency offset of Sidelink UE 2 with respect to Sidelink UE 1 transmit frequency.

**Table 11.2.1.3-2: Minimum performance**

| Test num. | Sidelink UE | Band-width | PSSCH Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | Fraction of maximum throughput (%) (NOTE 1) | SNR (dB) of PSSCH |
| 1 | 2 | 10 MHz | CD.1 FDD | 70 | -3.4 |
| | | 5 MHz | | 70 | -3.3 |

NOTE 1: The throughput is measured after 40 radio frames of lead time during which the test UE detects and synchronizes to Sidelink UE 1

The normative reference for this requirement is TS 36.101 [2] clause 12.2.1

#### 12.2.1.4 Test Description

##### 12.2.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range for Cell1, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 12.2.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure TBD.
2. The parameter settings for the cell are set up according to Table 12.2.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and UE test loop Mode E is activated on a EUTRA cell. Message contents are defined in clause 12.2.1.4.3.

##### 12.2.1.4.2 Test Procedure

TBD

##### 12.2.1.4.3 Message Contents

TBD

#### 12.2.1.5 Test Requirement

For the parameters specified in Table 12.2.1.3-1 and SNR in Table 12.2.1.5-1, the BLER obtained in step TBD shall be below the test limit in Annex TBD.

**Table 12.2.1.5-1: Test Requirements**

| Test num. | Sidelink UE | Band-width | PSSCH Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | Fraction of maximum throughput (%) (NOTE 1) | SNR (dB) of PSSCH |
| 1 | 2 | 10 MHz | CD.1 FDD | 70 | -3.4+TT |
| | | 5 MHz | | 70 | -3.3+TT |
| NOTE 1: The throughput is measured after 40 radio frames of lead time during which the test UE detects and synchronizes to Sidelink UE 1. | | | | | |

## 12.3 Demodulation of PSCCH (single link performance)

FFS

## 12.4 Demodulation of PSBCH (single link performance)

FFS

# 12.5 Power imbalance performance with two links

The purpose of this test is to check the demodulation performance when receiving PSSCH transmissions from two Sidelink UEs with power imbalance in one subframe.

## 12.5.1 FDD Power imbalance performance with two links

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Test time is FFS.
- Test system uncertainties and test tolerances is TBD
- Connection Diagram is FFS
- Test procedure is TBD
- Message contents are TBD

### 12.5.1.1 Test Purpose

This test verifies the PSSCH demodulation performance from two Sidelink UEs with power imbalance in one subframe

### 12.5.1.2 Test Applicability

This test case applies to all types of E-UTRA FDD UE release 12 and forward which support ProSe Direct Communication.

### 12.5.1.3 Minimum Conformance Requirements

The minimum requirements are specified in Table 12.5.1.3-2 with the test parameters specified in Table 12.5.1.3-1. The receiver UE under test is associated with Cell 1.

**Table 12.5.1.3-1: Test Parameters**

| Parameter | | | Unit | Test 1 |
|---|---|---|---|---|
| Communication resource pool configuration | | | | As specified in Table A.7.2.1-2 (Configuration #2-FDD) |
| DRX configuration | | | | As specified in Table 12.1.2-1 |
| $N_{oc}$ at antenna port (Note 3) | | | dBm/15kHz | -98 |
| Active cell(s) | | | | Cell 1 (Serving cell) |
| Cell 1 | Cyclic prefix | | | Normal |
| | Cell ID | | | 0 |
| | Downlink power allocation | $\rho_A$ | dB | 0 |
| | | $\rho_B$ | dB | 0 (NOTE 1) |
| | | σ | dB | 0 |
| | OCNG Pattern (Note 2) | | | OP.1 FDD |
| | Propagation channel | | | AWGN |
| | Antenna configuration | | | 1x2 |
| | RSRP | | dBm/15kHz | -92 |
| Active Sidelink UE(s) | | | | Sidelink UE 1, Sidelink UE 2 |
| Sidelink UE 1 | Sidelink Transmissions | | | PSCCH + PSSCH |
| | PSCCH RMC | | | 5 MHz: CC.1 FDD<br>10 MHz: CC.2 FDD |
| | PSCCH subframe allocation | | | $n_{PSCCH} = 0$ (as defined in TS 36.213) |
| | PSCCH RB allocation | | | |
| | $\widehat{E}_s$ of PSCCH at antenna port | | dBm/15kHz | -85 |
| | PSSCH RMC | | | As specified in Table 12.5.1-2 |
| | PSSCH subframe allocation | | | As per time repetition pattern specified in PSCCH |
| | PSSCH RB allocation | | | PRB pairs {4, 5} |
| | Time offset (NOTE 4) | | μs | 0 |
| | Frequency offset (NOTE 5) | | Hz | 0 |
| | Propagation Channel | | | AWGN |
| | Antenna configuration | | | 1x2 Low |
| Sidelink UE 2 | Sidelink Transmissions | | | PSCCH + PSSCH |
| | PSCCH RMC | | | 5 MHz: CC.1 FDD<br>10 MHz: CC.2 FDD |
| | PSCCH subframe allocation | | | $n_{PSCCH} = 2$ (as defined in TS 36.213) |
| | PSCCH RB allocation | | | |
| | $\widehat{E}_s$ of PSCCH at antenna port | | dBm/15kHz | -85 |
| | PSSCH RMC | | | As specified in Table 12.5.1-2 |
| | PSSCH subframe allocation | | | As per time repetition pattern specified in PSCCH |
| | PSSCH RB allocation | | | PRB pairs {6, 7} |
| | Time offset (NOTE 4) | | μs | 0 |
| | Frequency offset (NOTE 5) | | Hz | 0 |
| | Propagation Channel | | | AWGN |
| | Antenna configuration | | | 1x2 Low |

NOTE 1: $P_B = 0$.
NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.
NOTE 3: Applicable to both DL channel and ProSe Direct Communication Subframes on UL.
NOTE 4: The power of PSCCH is set high to ensure reliable reception of PSCCH.
NOTE 4: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.
NOTE 5: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

**Table 12.5.1.3-2: Minimum performance**

| Test num. | Band-width | Sidelink UE | PSSCH Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | Fraction of maximum throughput (%) | SNR (dB) of PSSCH |
| 1 | 5 / 10 MHz | 1 | CD.5 FDD | (NOTE 1) | 24.35 |
| | | 2 | CD.5 FDD | 70 | 2.4 |
| NOTE 1: There is no throughput requirement for Sidelink UE 1. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 12.5.1

## 12.5.1.4 Test Description

### 12.5.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range for Cell1, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 12.5.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure TBD.
2. The parameter settings for the cell are set up according to Table 12.5.1.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 12.5.1.4.3.

### 12.5.1.4.2 Test Procedure

TBD

### 12.5.1.4.3 Message Contents

TBD

## 12.5.1.5 Test Requirement

For the parameters specified in Table 12.5.1.3-1 and SNR in Table 12.5.1.5-1, the BLER obtained in step TBD shall be below the test limit in Annex TBD.

**Table 12.5.1.5-1: Test Requirements**

| Test num. | Band-width | Sidelink UE | PSSCH Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | Fraction of maximum throughput (%) | SNR (dB) of PSSCH |
| 1 | 5 / 10 MHz | 1 | CD.5 FDD | (NOTE 1) | 24.35+TT |
| | | 2 | CD.5 FDD | 70 | 2.4+TT |
| NOTE 1: There is no throughput requirement for Sidelink UE 1. | | | | | |

# 12.6 Multiple timing reference test

FFS

# 12.7 Maximum Sidelink processes test

The purpose of this test is to verify the maximum number of Sidelink processes and the maximum number of bits per TTI supported by the UE.

## 12.7.1 FDD Maximum Sidelink Processes for ProSe Direct communication

Editor's note: This test case is not complete. Following aspects are either missing or not yet determined:

- ProSe UE authentication is not handled in the test case and is still under investigation.
- Test time is FFS.
- Test system uncertainties and test tolerances is TBD
- Connection Diagram is FFS
- Test procedure is TBD
- Message contents are TBD
- UL and DL RMC for cell1 is TBD

### 12.7.1.1 Test Purpose

This test verifies the PSSCH demodulation performance with a single active PSSCH link with a given SNR for which the average BLER remains below a given reference value under different channel conditions.

### 12.7.1.2 Test Applicability

This test case applies to all types of E-UTRA FDD UE release 12 and forward which support ProSe Direct Communication.

### 12.7.1.3 Minimum Conformance Requirements

The minimum requirements are specified in Table 12.7.1.3-2 with the test parameters specified in Table 12.7.1.3-1. The receiver UE under test is associated with Cell 1.

**Table 12.7.1.3-1: Test Parameters**

| Parameter | | | Unit | Test 1 |
|---|---|---|---|---|
| Communication resource pool configuration | | | | As specified in Table A.7.2.1-4 (Configuration #4-FDD) |
| DRX configuration | | | | As specified in Table 12.1.2-1 |
| Active cell(s) | | | | Cell 1 (Serving cell) |
| Cell 1 | Cyclic prefix | | | Normal |
| | Cell ID | | | 0 |
| | Downlink power allocation | $\rho_A$ | dB | 0 |
| | | $\rho_B$ | dB | 0 (NOTE 1) |
| | | σ | dB | 0 |
| | OCNG Pattern (Note 2) | | | OP.1 FDD |
| | Propagation channel | | | Static propagation condition<br>No external noise sources are applied |
| | Antenna configuration | | | 1x2 |
| | RSRP | | dBm/15kHz | -85 |

| | | | |
|---|---|---|---|
| Active Sidelink UE(s) | | | Sidelink UE i, 0 ≤ i ≤ 15 |
| Sidelink UE i, 0 ≤ i ≤ 15 | Sidelink Transmissions | | PSCCH + PSSCH |
| | Resource pool | | *commRxPool(* $\lfloor \frac{i}{8} \rfloor$ *)* |
| | PSCCH RMC | | 5MHz: CC.1 FDD with $I_{TRP}$=i%8 (NOTE 3)<br>10 MHz: CC.2 FDD with $I_{TRP}$= i%8 (NOTE 3) |
| | PSCCH subframe allocation | | As defined by TS 36.213 with $n_{PSCCH}$ = i |
| | PSCCH RB allocation | | |
| | PSSCH RMC | | As specified in Table 12.7.1-2 |
| | PSSCH subframe allocation | | As per time repetition pattern specified in PSCCH |
| | PSSCH RB allocation | | Fully allocated |
| | Time offset (NOTE 4) | µs | 0 |
| | Frequency offset (NOTE 5) | Hz | 0 |
| | Propagation Channel | | Static propagation condition<br>No external noise sources are applied |
| | Antenna configuration | | 1x2 Low |

NOTE 1: $P_B = 0$.
NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.
NOTE 3: For $N_{TRP}$ = 8 (FDD) and *trpt-Subset* = 001, $I_{TRP}$ = 0 corresponds to a time repetition pattern of (1,0,0,0,0,0,0,0), $I_{TRP}$ = 1 corresponds to a time repetition pattern of (0,1,0,0,0,0,0,0), etc.
NOTE 4: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.
NOTE 5: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

**Table 12.7.1.3-2: Minimum performance**

| Test num. | Bandwidth | PSCCH Reference channel | $\hat{E}_s$ at antenna port (dBm/15kHz) | Reference value for Sidelink UE i=0…15 |
|---|---|---|---|---|
| | | | | Fraction of maximum throughput (%) |
| 1 | 10 MHz | CD.7 FDD | -85 | 95 |
| | 5 MHz | CD.6 FDD | -85 | 95 |

The normative reference for this requirement is TS 36.101 [2] clause 12.7.1

## 12.7.1.4 Test Description

### 12.7.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range for Cell1, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 11.2.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure TBD.

2. The parameter settings for the cell are set up according to Table 12.7.1.3-1.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and UE test loop Mode E is activated on a EUTRA cell. Message contents are defined in clause 11.2.1.4.3.

#### 12.7.1.4.2 Test Procedure

TBD

#### 12.7.1.4.3 Message Contents

TBD

### 12.7.1.5 Test Requirement

For the parameters specified in Table 12.7.1.3-1 and SNR in Table 12.7.1.5-1, the BLER obtained in step TBD shall be below the test limit in Annex TBD.

**Table 12.7.1.5-1: Test Requirements**

| Test num. | Bandwidth | PSCCH Reference channel | $\hat{E}_s$ at antenna port (dBm/15kHz) | Reference value for Sidelink UE i=0…15 |
|---|---|---|---|---|
| | | | | Fraction of maximum throughput (%) |
| 1 | 10 MHz | CD.7 FDD | -85+TT | 95 |
| | 5 MHz | CD.6 FDD | -85+TT | 95 |

# 13 FFS

# 14 Performance requirement (V2X Sidelink Communication)

This clause contains the performance requirements for the sidelink physical channels specified for V2X Sidelink Communication.

## 14.1 General

### 14.1.1 Applicability of requirements

The requirements in this clause are applicable to UEs that support V2X sidelink communication using Band 47.

When GNSS synchronization source is used, the details of the GNSS configuration are specified in TS 36.508 [7] subclause 4.11.

The test case applicability is in according to Table 14.1.1-1.

**Table 14.1.1-1: V2X test applicability**

| Tests / clause | Applicable if UE supports the following capability |
|---|---|
| 14.2<br>14.3<br>14.4<br>14.8 Test 1 | UE supporting V2X sidelink |
| 14.5 | UE with support of *slss-TxRx-r14* [5] |
| 14.6<br>14.9 | UE supporting concurrent operation band for V2X and E-UTRA |
| 14.7 | UE not supporting concurrent operation band for V2X and E-UTRA |
| 14.8 Test 2 | UE with support of *v2x-HighReception-r14* [5] |

# 14.2 Demodulation of PSSCH / Non-concurrent with E-UTRA uplink transmissions

## 14.2.1 Test Purpose

The purpose of the requirements in this subclause is to verify the PSSCH for V2X demodulation performance with a single active PSSCH link.

## 14.2.2 Test Applicability

This test case applies to all types of E-UTRA UE release 14 and forward which support V2X sidelink communication using Band 47, as specified in Table 14.1.1-1.

## 14.2.3 Minimum Conformance Requirements

The minimum requirements are specified in Table 14.2.3-2 with the test parameters specified in Table 14.2.3-1. In this test scenario, a GNSS simulator is used and Sidelink UE 1 transmits PSCCH and PSSCH.

**Table 14.2.3-1: Test Parameters**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Communication resource pool configuration | | | As specified in Table A.9-1 (Configuration #1-V2X) |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Active cell(s) | | | None |
| Sidelink UE 1 | Sidelink Transmissions | | PSCCH+PSSCH |
| | Timing offset (Note 1) | | CP/2-12Ts |
| | Frequency offset (Note 2) | Hz | +600 |
| | Synchronization | | GNSS |
| | Antenna configuration | | 1x2 Low |
| Note 1: Time offset of Sidelink UE receive signal with respect to GNSS reference timing.<br>Note 2: Frequency offset of Sidelink UE with respect to GNSS reference frequency. | | | |

**Table 14.2.3-2: Minimum performance**

| Test num. | Bandwidth | PSSCH Reference channel | Propagation condition | Reference value | |
|---|---|---|---|---|---|
| | | | | PSSCH BLER (%) | SNR (dB) of PSSCH |
| 1 | 20 MHz | CD.8 | EVA180 | 10 | 14.2 |
| 2 | 10 MHz | CD.9 | EVA2700 | | 5.4 |

The normative reference for this requirement is TS 36.101 [2] clause 14.2

## 14.2.4 Test Description

### 14.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Resource pool configuration for PSCCH and PSSCH reference measurement channels are set according to Table 14.2.3-1 and Annex A.9 as appropriate.

Configurations of the GNSS simulator are specified in TS 36.508 [7] Table 4.11.2-2 and the GNSS simulator is configured for Scenario #1: static in Geographical area #1. Geographical area #1 is also pre-configured in the UE.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2 (for operating band 47 use clause 4.3.1.2.15).

Channel Bandwidths to be tested: As specified per test number in Table 14.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.2 (for operating band 47 use clause 4.3.1.2.15).

1. Connect the SS, the faders, and the AWGN noise source to the UE antenna connectors, connect the SS COM port to the UE COM port, and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.96.

2. The parameter settings for the V2X sidelink transmission over PC5 interface are pre-configured according to TS 36.508 [7] clause 6.8.2. Message content exceptions are defined in clause 14.2.4.3.

3. Sidelink physical channels and signals are initially set up according to Table 14.2.3-1 and Annex A.9 as appropriate.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 5A-V2X in Receive Mode according to TS 36.508 [7] clause 4.5.9. Message contents are defined in clause 14.2.4.3.

6. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 14.2.4.2 Test procedure

1. Sidelink UE1 transmits PSSCH via PSCCH SCI format 1 for SL-V-RNTI, according to SL-V2X-Preconfiguration, to transmit the sidelink RMC according to Table 14.2.3-2. The sidelink UE1 transmits MAC padding bits on the sidelink RMC.

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 14.2.3-1 and 14.2.5-1 as appropriate.

3. Measure the average PSSCH BLER for a duration sufficient to achieve statistical significance according to the test method described in Annex G clause G.8. In order to measure the PSSCH BLER, the SS shall request the UE to report the counter of successful reception of sidelink PSSCH transmissions using AT cs ommandas specified in Annex G clause G.8.2 and 36.508 [7] clause 4.7I. The PSSCH BLER is calculated as specified in Annex G clause G.8.2. If the measured average PSSCH BLER is less than the reference value in Table 14.2.5-1 pass the UE. Otherwise fail the UE.

4. Repeat steps from 1 to 3 for each subtest in Table 14.2.3-2 as appropriate.

### 14.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.10 with the following exceptions.

**Table 14.2.4.3-1: SL-V2X-PreconfigCommPool-r14-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigCommPool-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-OffsetIndicator-r14 | 0 | | |
| sl-Subframe-r14 CHOICE { | | | |
| bs20-r14 | 11111111111111111111 | 0xFFFFF | BITMAP_6 |
| } | | | |
| adjacencyPSCCH-PSSCH-r14 | TRUE | BOOLEAN | |
| sizeSubchannel-r14 | n5 | 10MHz channel | BW10 |
| | n10 | 20MHz channel | BW20 |
| numSubchannel-r14 | n1 | | |
| startRB-Subchannel-r14 | 0 | | |
| startRB-PSCCH-Pool-r14 | Not present | | |
| dataTxParameters-r14 | -126 | INTEGER (-126..31) | p0-r12 |
| zoneID-r14 | Not present | INTEGER (0..7) | |
| threshS-RSSI-CBR-r14 | Not present | INTEGER (0..45) | |
| cbr-pssch-TxConfigList-r14 | Not present | | |
| resourceSelectionConfigP2X-r14 | Not present | | |
| syncAllowed-r14 | Not present | | |
| restrictResourceReservationPeriod-r14 | Not present | | |
| } | | | |

### 14.2.5 Test Requirements

For the parameters specified in Table 14.2.3-1 and SNR specified in Table 14.2.5-1, the average PSSCH BLER obtained in step 3 shall be below the reference value specified in Table 14.2.5-1. The PSSCH sidelink reference channels are defined in Annex A Table A.8.5-1.

**Table 14.2.5-1: Test Requirements**

| Test num. | Bandwidth | PSSCH Reference channel | Propagation condition | Reference value | |
|---|---|---|---|---|---|
| | | | | PSSCH BLER (%) | SNR (dB) of PSSCH |
| 1 | 20 MHz | CD.8 | EVA180 | 10 | 15.0 |
| 2 | 10 MHz | CD.9 | EVA2700 | | 6.2 |

## 14.3 Demodulation of PSCCH / Non-concurrent with E-UTRA uplink transmissions

### 14.3.1 Test Purpose

The purpose of the requirements in this subclause is to verify the PSCCH for V2X demodulation performance with a single active PSSCH link.

### 14.3.2 Test Applicability

This test case applies to all types of E-UTRA UE release 14 and forward which support V2X sidelink communication using Band 47, as specified in Table 14.1.1-1.

### 14.3.3 Minimum Conformance Requirements

The minimum requirements are specified in Table 14.3.3-2 with the test parameters specified in Table 14.3.3-1. In this test scenario, a GNSS simulator is used and Sidelink UE 1 transmits PSCCH and PSSCH.

**Table 14.3.3-1: Test Parameters**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Communication resource pool configuration | | | As specified in Table A.9-1 (Configuration #1-V2X) |
| $N_{oc}$ at antenna port | | dBm/15 kHz | -98 |
| Active cell(s) | | | None |
| Sidelink UE 1 | Sidelink Transmissions | | PSCCH+PSSCH |
| | Timing offset (Note 1) | | CP/2-12Ts |
| | Frequency offset (Note 2) | Hz | +600 |
| | Synchronization | | GNSS |
| | Antenna configuration | | 1x2 Low |
| | PSSCH RMC | | CD.9 |
| Note 1: Time offset of Sidelink UE receive signal with respect to GNSS reference timing.<br>Note 2: Frequency offset of Sidelink UE with respect to GNSS reference frequency.<br>Note 3: Cyclic shift for PSCCH DMRS is randomly selected between {0, 3, 6, 9} for each PSCCH transmission. | | | |

**Table 14.3.3-2: Minimum performance**

| Test number | Bandwidth | PSCCH Reference channel | Propagation condition | Reference value | |
|---|---|---|---|---|---|
| | | | | Probability of missed PSCCH (%) | SNR (dB) of PSCCH |
| 1 | 10 MHz | CC.8 | EVA1500 | 1 | 2.6 |

The normative reference for this requirement is TS 36.101 [2] clause 14.3.

## 14.3.4 Test Description

### 14.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Resource pool configuration for PSCCH and PSSCH reference measurement channels are set according to Table 14.3.3-1 and Annex A.9 as appropriate.

Configurations of the GNSS simulator are specified in TS 36.508 [7] Table 4.11.2-2 and the GNSS simulator is configured for Scenario #1: static in Geographical area #1. Geographical area #1 is also pre-configured in the UE.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2 (for operating band 47 use clause 4.3.1.2.15).

Channel Bandwidths to be tested: As specified per test number in Table 14.3.3-2 as defined in TS 36.508 [7] clause 4.3.1.2 (for operating band 47 use clause 4.3.1.2.15).

1. Connect the SS, the faders, and the AWGN noise source to the UE antenna connectors, connect the SS COM port to the UE COM port, and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.96.

2. The parameter settings for the V2X sidelink transmission over PC5 interface are pre-configured according to TS 36.508 [7] clause 6.8.2. Message content exceptions are defined in clause 14.3.4.3.

3. Sidelink physical channels and signals are initially set up according to Table 14.3.3-1 and Annex A.9 as appropriate.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 5A-V2X in Receive Mode according to TS 36.508 [7] clause 4.5.9. Message contents are defined in clause 14.3.4.3.

6. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

#### 14.3.4.2 Test procedure

1. Sidelink UE1 transmits PSSCH via PSCCH SCI format 1 for SL-V-RNTI, according to SL-V2X-Preconfiguration, to transmit the sidelink RMC according to Table 14.3.3-2. The sidelink UE1 transmits MAC padding bits on the sidelink RMC.

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 14.3.3-1 and 14.3.5-1 as appropriate.

3. Measure the probability of PSCCH miss-detection for a duration sufficient to achieve statistical significance according to the test method described in Annex G clause G.8. In order to measure the probability of PSCCH miss-detection, the SS shall request the UE to report the counter of successful reception of sidelink PSCCH transmissions using AT commands as specified in Annex G clause G.8.2 and 36.508 [7] clause 4.7I. The probability of PSCCH miss-detection is calculated as specified in Annex G clause G.8.2. If the measured probability of PSCCH miss-detection is less than the reference value in Table 14.3.5-1 pass the UE. Otherwise fail the UE.

#### 14.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.10 with the following exceptions.

**Table 14.3.4.3-1: SL-V2X-PreconfigCommPool-r14-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigCommPool-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-OffsetIndicator-r14 | 0 | | |
| sl-Subframe-r14 CHOICE { | | | |
| bs20-r14 | 11111111111111111111 | 0xFFFFF | BITMAP_6 |
| } | | | |
| adjacencyPSCCH-PSSCH-r14 | TRUE | BOOLEAN | |
| sizeSubchannel-r14 | n5 | 10MHz channel | BW10 |
| numSubchannel-r14 | n1 | | |
| startRB-Subchannel-r14 | 0 | | |
| startRB-PSCCH-Pool-r14 | Not present | | |
| dataTxParameters-r14 | -126 | INTEGER (-126..31) | p0-r12 |
| zoneID-r14 | Not present | INTEGER (0..7) | |
| threshS-RSSI-CBR-r14 | Not present | INTEGER (0..45) | |
| cbr-pssch-TxConfigList-r14 | Not present | | |
| resourceSelectionConfigP2X-r14 | Not present | | |
| syncAllowed-r14 | Not present | | |
| restrictResourceReservationPeriod-r14 | Not present | | |
| } | | | |

### 14.3.5 Test Requirements

For the parameters specified in Table 14.3.3-1 and SNR specified in Table 14.3.5-1, the average probability of PSCCH miss-detection obtained in step 3 shall be below the reference value specified in Table 14.3.5-1. The PSCCH sidelink reference channels are defined in Annex A Table A.8.4-1.

**Table 14.3.5-1: Test Requirements**

| Test number | Bandwidth | PSCCH Reference channel | Propagation condition | Reference value | |
|---|---|---|---|---|---|
| | | | | Probability of missed PSCCH (%) | SNR (dB) of PSCCH |
| 1 | 10 MHz | CC.8 | EVA1500 | 1 | 3.4 |

# 14.4 Power imbalance performance with two links / Non-concurrent with E-UTRA uplink transmissions

## 14.4.1 Test Purpose

The purpose of this test is to check the demodulation performance when receiving PSSCH transmissions from two Sidelink UEs with power imbalance in one subframe.

## 14.4.2 Test Applicability

This test case applies to all types of UEs which support V2X sidelink communication using Band 47, as specified in Table 14.1.1-1.

## 14.4.3 Minimum Conformance Requirements

The minimum requirements are specified in Table 14.4.3-2 with the test parameters specified in Table 14.4.3-1. The Sidelink UE 1 and 2 are synchronized to the GNSS synchronization reference.

**Table 14.4.3-1: Test Parameters**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Communication resource pool configuration | | | As specified in Table A.9-2 (Configuration #2-V2X) |
| $N_{oc}$ at antenna port | | dBm/15kHz | -98 |
| Active cell(s) | | | None |
| Active Sidelink UE(s) | | | Sidelink UE 1, Sidelink UE 2 |
| Sidelink UE 1 | Sidelink Transmissions | | PSCCH + PSSCH |
| | PSCCH RB allocation | | PRB pairs {5, 6} |
| | PSSCH RMC | | As specified in Table 14.4.3-2 |
| | PSSCH RB allocation | | PRB pairs {7, 8, 9} |
| | Time offset (Note 1) | µs | 0 |
| | Frequency offset (Note 2) | Hz | 0 |
| | Propagation Channel | | AWGN |
| | Antenna configuration | | 1x2 |
| Sidelink UE 2 | Sidelink Transmissions | | PSCCH + PSSCH |
| | PSCCH RB allocation | | PRB pairs {20, 21} |
| | PSSCH RMC | | As specified in Table 14.4.3-2 |
| | PSSCH RB allocation | | PRB pairs {22, 23, 24} |
| | Time offset (Note 1) | µs | 0 |
| | Frequency offset (Note 2) | Hz | 0 |
| | Propagation Channel | | AWGN |
| | Antenna configuration | | 1x2 |
| Note 1: Time offset of Sidelink UE receive signal with respect to GNSS reference timing.<br>Note 2: Frequency offset of Sidelink UE with respect to GNSS reference frequency. | | | |

**Table 14.4.3-2: Minimum performance**

| Test number | Bandwidth | Sidelink UE | PSSCH Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | PSSCH BLER (%) | SNR (dB) of PSSCH |
| 1 | 20MHz | 1 | CD.10 | (Note 1) | 30.35 |
| | | 2 | CD.10 | 10 | 13.3 |
| Note 1: There is no throughput requirement for Sidelink UE 1. | | | | | |

The normative reference for this requirement is TS 36.101 [2] clause 14.4

## 14.4.4 Test Description

### 14.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Resource pool configuration for PSCCH and PSSCH reference measurement channels are set according to Table 14.4.3-1 and Annex A.9 as appropriate.

Configurations of the GNSS simulator are specified in TS 36.508 [7] Table 4.11.2-2 and the GNSS simulator is configured for Scenario #1: static in Geographical area #1. Geographical area #1 is also pre-configured in the UE.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2 (for operating band 47 use clause 4.3.1.2.15).

Channel Bandwidths to be tested: As specified per test number in Table 14.4.3-2 as defined in TS 36.508 [7] clause 4.3.1.2 (for operating band 47 use clause 4.3.1.2.15).

1. Connect the SS and the AWGN noise source to the UE antenna connectors, connect the SS COM port to the UE COM port, and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.98.

2. The parameter settings for the V2X sidelink transmission over PC5 interface are pre-configured according to TS 36.508 [7] clause 6.8.2. Message content exceptions are defined in clause 14.4.4.3.

3. Sidelink physical channels and signals are initially set up according to Table 14.4.3-1 and Annex A.9 as appropriate.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 5A-V2X in Receive Mode according to TS 36.508 [7] clause 4.5.9. Message contents are defined in clause 14.4.4.3.

6. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 14.4.4.2 Test procedure

1. Sidelink UE1 and sidelink UE2 transmit PSSCH via PSCCH SCI format 1 for SL-V-RNTI, according to SL-V2X-Preconfiguration, to transmit their respective sidelink RMC according to Table 14.4.3-2. Both sidelink UE1 and sidelink UE2 transmit MAC padding bits on their respective sidelink RMC.

2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR for each sidelink UE according to Tables 14.4.3-1 and 14.4.5-1 as appropriate.

3. Measure the average PSSCH BLER of sidelink UE2 for a duration sufficient to achieve statistical significance according to Annex G clause G.8. In order to measure the PSSCH BLER, the SS shall request the UE to report the counter of successful reception of sidelink UE2 PSSCH transmissions using AT commands as specified in Annex G clause G.8.2 and 36.508 [7] clause 4.7I. The PSSCH BLER of sidelink UE2 is calculated as specified

in Annex G clause G.8.2. If the measured average PSSCH BLER of sidelink UE2 is less than the reference value in Table 14.4.5-1 pass the UE. Otherwise fail the UE.

#### 14.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.10 with the following exceptions.

**Table 14.4.4.3-1: SL-V2X-PreconfigCommPool-r14-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigCommPool-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-OffsetIndicator-r14 | 0 | | |
| sl-Subframe-r14 CHOICE { | | | |
| bs20-r14 | 11111111111111111111 | 0xFFFFF | BITMAP_6 |
| } | | | |
| adjacencyPSCCH-PSSCH-r14 | TRUE | BOOLEAN | |
| sizeSubchannel-r14 | n5 | 20MHz channel | BW20 |
| numSubchannel-r14 | n10 | | |
| startRB-Subchannel-r14 | 0 | | |
| startRB-PSCCH-Pool-r14 | Not present | | |
| dataTxParameters-r14 | -126 | INTEGER (-126..31) | P0-SL-r12 |
| zoneID-r14 | Not present | INTEGER (0..7) | |
| threshS-RSSI-CBR-r14 | Not present | INTEGER (0..45) | |
| cbr-pssch-TxConfigList-r14 | Not present | | |
| resourceSelectionConfigP2X-r14 | Not present | | |
| syncAllowed-r14 | Not present | | |
| restrictResourceReservationPeriod-r14 | Not present | | |
| } | | | |

### 14.4.5 Test Requirements

For the parameters specified in Table 14.4.3-1 and SNR specified in Table 14.4.5-1, the average PSSCH BLER of sidelink UE2 obtained in step 3 shall be below the reference value specified in Table 14.4.5-1. The PSSCH sidelink reference channels are defined in Annex A Table A.8.5-1.

**Table 14.4.5-1: Test Requirements**

| Test number | Bandwidth | Sidelink UE | PSSCH Reference channel | Reference value | |
|---|---|---|---|---|---|
| | | | | PSSCH BLER (%) | SNR (dB) of PSSCH |
| 1 | 20MHz | 1 | CD.10 | (Note 1) | 30.95 |
| | | 2 | CD.10 | 10 | 13.9 |
| Note 1: There is no throughput requirement for Sidelink UE 1. | | | | | |

## 14.5 to 14.7

## 14.8 PSCCH/PSSCH decoding capability test / Non-concurrent with E-UTRA uplink transmissions

### 14.8.1 Test Purpose

The purpose of this test is to verify the maximum number of Sidelink processes and the maximum number of bits per TTI supported by the UE.

## 14.8.2 Test Applicability

This test case applies to all types of E-UTRA UE release 14 and forward which support V2X sidelink communication using Band 47, as specified in Table 14.1.1-1. In addition, Test 2 requires support of *v2x-HighReception-r14*.

## 14.8.3 Minimum Conformance Requirements

The minimum requirements are specified in Table 14.8.3-3 with the test parameters specified in Table 14.8.3-1 and Table 14.8.3-2 according to UE capability.

**Table 14.8.3-1: Test Parameters**

| Parameter | | Unit | Test 1 |
|---|---|---|---|
| Communication resource pool configuration | | | As specified in Table A.9-5 (Configuration #5-V2X) |
| Active cell(s) | | | None |
| Sidelink UE i, 0 ≤ i ≤ 9 | Sidelink Transmissions | | PSCCH + PSSCH |
| | Timing offset (Note 1) | μs | 0 |
| | Frequency offset (Note 2) | Hz | 0 |
| | Synchronization source | | GNSS |
| | Propagation Channel | | Static propagation condition<br>No external noise sources are applied |
| | Antenna configuration | | 1x2 |
| | PSSCH RMC | | CD.12 |
| Note 1: Time offset of Sidelink UE receive signal with respect to GNSS reference timing.<br>Note 2: Frequency offset of Sidelink UE with respect to GNSS reference frequency.<br>Note 3: Cyclic shift for PSCCH DMRS is randomly selected between {0, 3, 6, 9} for each PSCCH transmission. | | | |

**Table 14.8.3-2: Test Parameters**

| Parameter | | Unit | Test 2 |
|---|---|---|---|
| Communication resource pool configuration | | | As specified in Table A.9-5 (Configuration #5-V2X) |
| Active cell(s) | | | None |
| Sidelink UE i, 0 ≤ i ≤ 19 | Sidelink Transmissions | | PSCCH + PSSCH |
| | Timing offset (Note 1) | μs | 0 |
| | Frequency offset (Note 2) | Hz | 0 |
| | Synchronization source | | GNSS |
| | Propagation Channel | | Static propagation condition<br>No external noise sources are applied |
| | Antenna configuration | | 1x2 |
| | PSSCH RMC | | CD.10 |
| Note 1: Time offset of Sidelink UE receive signal with respect to GNSS reference timing.<br>Note 2: Frequency offset of Sidelink UE with respect to GNSS reference frequency.<br>Note 3: Cyclic shift for PSCCH DMRS is randomly selected between {0, 3, 6, 9} for each PSCCH transmission. | | | |

**Table 14.8.3-3: Minimum performance**

| Test number | Bandwidth | PSCCH Reference channel | $\hat{E}_S$ at antenna port (dBm/15kHz) | Reference value |
|---|---|---|---|---|
| | | | | Probability of missed PSCCH (%) |
| 1 | 20 MHz | CC.8 | -85 | 1 |
| 2 | 20 MHz | CC.8 | -85 | 1 |

The normative reference for this requirement is TS 36.101 [2] clause 14.8

## 14.8.4 Test Description

### 14.8.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Resource pool configuration for PSCCH and PSSCH reference measurement channels are set according to Table 14.8.3-1 for Test 1, 14.8.3-2 for Test 2, and Annex A.9 as appropriate.

Configuration of the GNSS simulator is specified in TS36.508 [7] Table 4.11.2-2 and the GNSS simulator is configured for Scenario #1: static in Geographical area #1. Geographical area #1 is also pre-configured in the UE..

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2 (for operating band 47 use clause 4.3.1.2.15).

Channel Bandwidths to be tested: As specified per test number in Table 14.8.3-3 as defined in TS 36.508 [7] clause 4.3.1.2 (for operating band 47 use clause 4.3.1.2.15).

1. Connect the SS to the UE antenna connectors, connect the SS COM port to the UE COM port, and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 36.508 [7] Annex A, Figure A.97.
2. The parameter settings for the V2X sidelink transmission over PC5 interface are pre-configured according to TS 36.508 [7] clause 6.8.2. Message content exceptions are defined in clause 14.8.4.3.
3. Sidelink physical channels and signals are initially set up according to Table 14.8.3-1 for Test 1, Table 14.8.3-2 for Test 2, and Annex A.9 as appropriate.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 5A-V2X in Receive Mode according to TS 36.508 [7] clause 4.5.9. Message contents are defined in clause 14.8.4.3.
6. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

### 14.8.4.2 Test procedure

1. For each sidelink UE *i* (for Test 1, $0 \leq i \leq 9$; for Test 2, $0 \leq i \leq 19$), the sidelink UE *i* transmits PSSCH via PSCCH SCI format 1 for SL-V-RNTI, according to SL-V2X-Preconfiguration, to transmit the sidelink RMC according to Table 14.8.3-3, for Test 1 and Test 2, respectively. Each sidelink UE *i* transmits MAC padding bits on the sidelink RMC.
2. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 14.8.3-1, for Test 1, Table 14.8.3-2, for Test 2, and Table 14.8.5-1 as appropriate. For each Test, all sidelink UEs use the same test parameters.
3. For the combined *i* subchannels, measure the probability of PSCCH miss-detection for a duration sufficient to achieve statistical significance according to the test method described in Annex G clause G.8. In order to measure the probability of PSCCH miss-detection, the SS shall request the UE to report the counter of successful reception of sidelink PSCCH transmissions using AT commands as specified in Annex G clause G.8.2 and 36.508 [7] clause 4.7I. The probability of PSCCH miss-detection is calculated as specified in Annex G clause G.8.2. If the measured probability of PSCCH miss-detection is less than the reference value in Table 14.8.5-1 pass the UE. Otherwise fail the UE.

### 14.8.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.10 with the following exceptions.

**Table 14.8.4.3-1: SL-V2X-PreconfigCommPool-r14-DEFAULT**

| Derivation Path: 36.508 clause 4.6.3 | | | |
|---|---|---|---|
| **Information Element** | **Value/remark** | **Comment** | **Condition** |
| SL-V2X-PreconfigCommPool-r14-DEFAULT ::= SEQUENCE { | | | |
| sl-OffsetIndicator-r14 | 0 | | |
| sl-Subframe-r14 CHOICE { | | | |
| bs20-r14 | 11111111111111111111 | 0xFFFFF | BITMAP_6 |
| } | | | |
| adjacencyPSCCH-PSSCH-r14 | TRUE | BOOLEAN | |
| sizeSubchannel-r14 | n10 | UE without support of *v2x-HighReception-r14* | Test 1 |
| | n5 | UE with support of *v2x-HighReception-r14* | Test 2 |
| numSubchannel-r14 | n10 | UE without support of *v2x-HighReception-r14* | Test 1 |
| | n20 | UE with support of *v2x-HighReception-r14* | Test 2 |
| startRB-Subchannel-r14 | 0 | | |
| startRB-PSCCH-Pool-r14 | Not present | | |
| dataTxParameters-r14 | -126 | INTEGER (-126..31) | p0-r12 |
| zoneID-r14 | Not present | INTEGER (0..7) | |
| threshS-RSSI-CBR-r14 | Not present | INTEGER (0..45) | |
| cbr-pssch-TxConfigList-r14 | Not present | | |
| resourceSelectionConfigP2X-r14 | Not present | | |
| syncAllowed-r14 | Not present | | |
| restrictResourceReservationPeriod-r14 | Not present | | |
| } | | | |

## 14.8.5 Test Requirement

For the parameters specified in Tables 14.8.3-1 and 14.8.3-2 for Test 1 and Test 2, respectively, and for the $\hat{E}_S$ specified in Table 14.8.5-1, the average probability of PSCCH miss-detection obtained in step 3 shall be below the reference value specified in Table 14.8.5-1. The PSSCH sidelink reference channels are defined in Annex A.8.4-1.

**Table 14.8.5-1: Test Requirements**

| **Test number** | **Bandwidth** | **PSCCH Reference channel** | **$\hat{E}_S$ at antenna port (dBm/15kHz)** | **Reference value** |
|---|---|---|---|---|
| | | | | **Probability of missed PSCCH (%)** |
| 1 | 20 MHz | CC.8 | -85 | 1 |
| 2 | 20 MHz | CC.8 | -85 | 1 |

# Annex A (normative): Measurement Channels

## A.1 General

A schematic overview of the encoding process for the reference measurement channels is provided in Figure A-1.

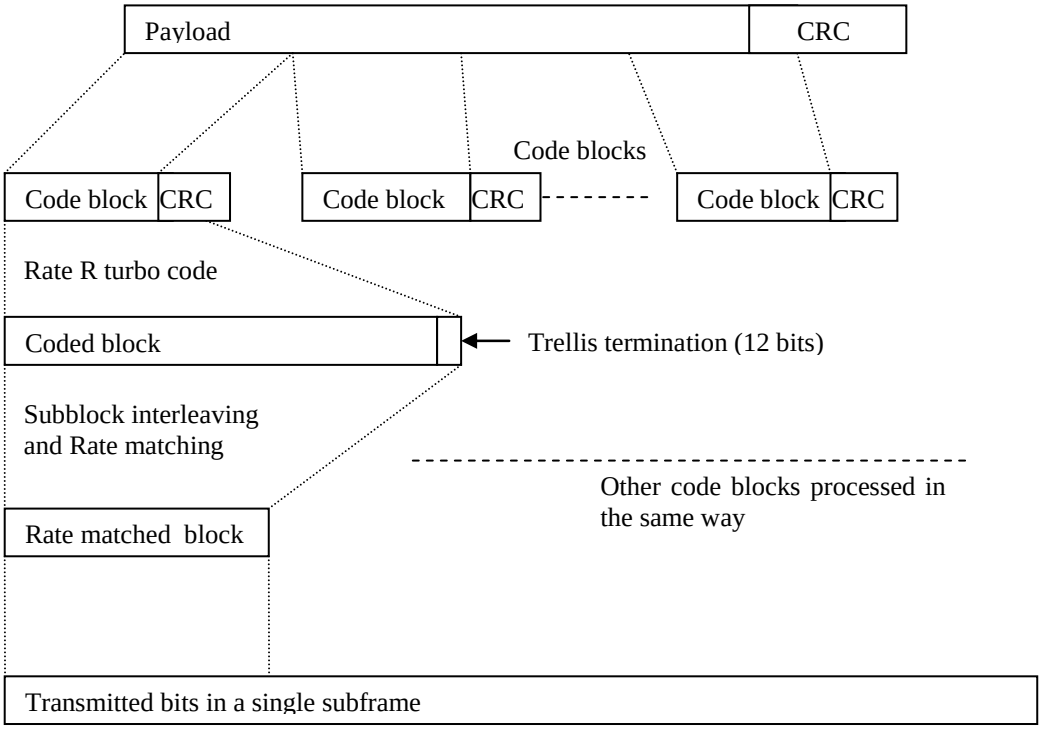



**Figure A-1: Schematic overview of the encoding process**

The throughput values defined in the measurement channels specified in Annex A, are calculated and are valid per data stream (codeword). For multi-stream (more than one codeword) transmissions, the throughput referenced in the minimum requirements is the sum of throughputs of all data streams (codewords).

The UE category entry in the definition of the reference measurement channels in Annex A is only informative and reveals the UE categories, which can support the corresponding measurement channel. Whether the measurement channel is used for testing a certain UE category or not is specified in the individual test cases.

Rate matching process in Figure A-1 is dependent on the parameter “Total number of Soft Channel bits” which has been defined for each UE category in TS 36.306 [15] clause 4.1. The SS shall use the Soft Channel bits size according to the UE category.

# A.2 UL reference measurement channels

## A.2.1 General

### A.2.1.1 Applicability and common parameters

The following sections define the UL signal applicable to the Transmitter Characteristics (clause 6) and for the Receiver Characteristics (clause 7) where the UL signal is relevant.

The Reference channels in this section assume transmission of PUSCH and Demodulation Reference signal only. The following conditions apply:

- 1 HARQ transmission
- Cyclic Prefix normal
- PUSCH hopping off
- Link adaptation off
- Demodulation Reference signal as per TS 36.211 [8] clause 5.5.2.1.2.

Where ACK/NACK is transmitted, it is assumed to be multiplexed on PUSCH as per TS 36.212 [9] subclause 5.2.2.6.

- ACK/NACK 1 bit
- ACK/NACK mapping adjacent to Demodulation Reference symbol
- ACK/NACK resources punctured into data
- Max number of resources for ACK/NACK: 4 SC-FDMA symbols per subframe
- No CQI transmitted, no RI transmitted

### A.2.1.2 Determination of payload size

The algorithm for determining the payload size A is as follows; given a desired coding rate R and radio block allocation $N_{RB}$:

1. Calculate the number of channel bits $N_{ch}$ that can be transmitted during the first transmission of a given sub-frame.
2. Find *A* such that the resulting coding rate is as close to *R* as possible, that is,

$$\min\left|R-(A+24*(N_{CB}+1))/N_{ch}\right|, \textit{ where } N_{CB}=\begin{cases}0, \textit{if } C=1\\ C, \textit{if } C>1\end{cases},$$

   subject to

   a) A is a valid TB size according to clause 7.1.7 of TS 36.213 [10] assuming an allocation of $N_{RB}$ resource blocks.

   b) *C* is the number of Code Blocks calculated according to section 5.1.2 of TS 36.212 [9].

   c) For RMC-s, which at the nominal target coding rate do not cover all the possible UE categories for the given modulation, reduce the target coding rate gradually (within the same modulation), until the maximal possible number of UE categories is covered.

3. If there is more than one *A* that minimises the equation above, then the larger value is chosen per default and the chosen code rate should not exceed 0.93.

### A.2.1.3 Overview of UL reference measurement channels

In Table A.2.1.3-1 are listed the UL reference measurement channels specified in annexes A.2.2 and A.2.3 of this release of TS 36.521-1. This table is informative and serves only to a better overview. The reference for the concrete reference measurement channels and corresponding implementation's parameters as to be used for testing are annexes A.2.2 and A.2.3 as appropriate.

**Table A.2.1.3-1: Overview of UL reference measurement channels**

| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
|---|---|---|---|---|---|---|---|---|---|
| **FDD, Full RB allocation, QPSK** | | | | | | | | | |
| FDD | Table A.2.2.1.1-1 | | 1.4 | QPSK | 1/3 | 6 | | ≥ 1 | |
| FDD | Table A.2.2.1.1-1 | | 3 | QPSK | 1/3 | 15 | | ≥ 1 | |
| FDD | Table A.2.2.1.1-1 | | 5 | QPSK | 1/3 | 25 | | ≥ 1 | |
| FDD | Table A.2.2.1.1-1 | | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.2.2.1.1-1 | | 15 | QPSK | 1/5 | 75 | | ≥ 1 | |
| FDD | Table A.2.2.1.1-1 | | 20 | QPSK | 1/6 | 100 | | ≥ 1 | |
| FDD / HD-FDD | Table A.2.2.1.1-1a | | 1.4 | QPSK | 1/3 | 6 | | 0 | |
| FDD / HD-FDD | Table A.2.2.1.1-1b | | 1.4 | QPSK | 1/3 | 6 | | M1 | |
| FDD / HD-FDD | Table A.2.2.1.1-1b | | 3 | QPSK | 1/3 | 6 | | M1 | |
| FDD / HD-FDD | Table A.2.2.1.1-1b | | 5 | QPSK | 1/3 | 6 | | M1 | |
| FDD / HD-FDD | Table A.2.2.1.1-1b | | 10 | QPSK | 1/3 | 6 | | M1 | |
| FDD / HD-FDD | Table A.2.2.1.1-1b | | 15 | QPSK | 1/3 | 6 | | M1 | |
| FDD / HD-FDD | Table A.2.2.1.1-1b | | 20 | QPSK | 1/3 | 6 | | M1 | |
| FDD / HD-FDD | Table A.2.2.1.1-1a | | 3 | QPSK | 1/5 | 15 | | 0 | |
| FDD / HD-FDD | Table A.2.2.1.1-1a | | 5 | QPSK | 1/8 | 25 | | 0 | |
| FDD / HD-FDD | Table A.2.2.1.1-1a | | 10 | QPSK | [1/10] | [36] | | 0 | |
| FDD / HD-FDD | Table A.2.2.1.1-1a | | 15 | QPSK | [1/10] | [36] | | 0 | |
| FDD / HD-FDD | Table A.2.2.1.1-1a | | 20 | QPSK | [1/10] | [36] | | 0 | |
| FDD / HD-FDD | Table A.2.2.1.1-1c | | 1.4 | QPSK | 1/3 | 6 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.1-1c | | 3 | QPSK | 1/3 | 12 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.1-1c | | 5 | QPSK | 1/3 | 24 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.1-1c | | 10 | QPSK | 1/3 | 24 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.1-1c | | 15 | QPSK | 1/3 | 24 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.1-1c | | 20 | QPSK | 1/3 | 24 | | M2 | UE UL category M2 |
| **FDD, Full RB allocation, 16-QAM** | | | | | | | | | |
| FDD | Table A.2.2.1.2-1 | | 1.4 | 16QAM | 3/4 | 6 | | ≥ 1 | |
| FDD | Table A.2.2.1.2-1 | | 3 | 16QAM | 1/2 | 15 | | ≥ 1 | |
| FDD | Table A.2.2.1.2-1 | | 5 | 16QAM | 1/3 | 25 | | ≥ 1 | |
| FDD | Table A.2.2.1.2-1 | | 10 | 16QAM | 3/4 | 50 | | ≥ 2 | |
| FDD | Table A.2.2.1.2-1 | | 15 | 16QAM | 1/2 | 75 | | ≥ 2 | |
| FDD | Table A.2.2.1.2-1 | | 20 | 16QAM | 1/3 | 100 | | ≥ 2 | |
| FDD / HD-FDD | Table A.2.2.1.2-1a | | 1.4 | 16QAM | 1/3 | 5 | | 0 | |
| FDD / HD-FDD | Table A.2.2.1.2-1a | | 3 | 16QAM | 1/3 | 5 | | 0 | |
| FDD / HD-FDD | Table A.2.2.1.2-1a | | 5 | 16QAM | 1/3 | 5 | | 0 | |
| FDD / HD-FDD | Table A.2.2.1.2-1a | | 10 | 16QAM | 1/3 | 5 | | 0 | |
| FDD / HD-FDD | Table A.2.2.1.2-1a | | 15 | 16QAM | 1/3 | 5 | | 0 | |
| FDD / HD-FDD | Table A.2.2.1.2-1a | | 20 | 16QAM | 1/3 | 5 | | 0 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| FDD / HD-FDD | Table A.2.2.1.2-1b | | 1.4 | 16QAM | 1/3 | 5 | | M1 | |
| FDD / HD-FDD | Table A.2.2.1.2-1b | | 3 | 16QAM | 1/3 | 5 | | M1 | |
| FDD / HD-FDD | Table A.2.2.1.2-1b | | 5 | 16QAM | 1/3 | 5 | | M1 | |
| FDD / HD-FDD | Table A.2.2.1.2-1b | | 10 | 16QAM | 1/3 | 5 | | M1 | |
| FDD / HD-FDD | Table A.2.2.1.2-1b | | 15 | 16QAM | 1/3 | 5 | | M1 | |
| FDD / HD-FDD | Table A.2.2.1.2-1b | | 20 | 16QAM | 1/3 | 5 | | M1 | |
| FDD / HD-FDD | Table A.2.2.1.2-1c | | 1.4 | 16QAM | 1/3 | 6 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.2-1c | | 3 | 16QAM | 1/3 | 12 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.2-1c | | 5 | 16QAM | 1/3 | 24 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.2-1c | | 10 | 16QAM | 1/3 | 24 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.2-1c | | 15 | 16QAM | 1/3 | 24 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.1.2-1c | | 20 | 16QAM | 1/3 | 24 | | M2 | UE UL category M2 |
| **FDD, Full RB allocation, 64-QAM** | | | | | | | | | |
| FDD | Table A.2.2.1.3-1 | | 1.4 | 64QAM | 3/4 | 6 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.1.3-1 | | 3 | 64QAM | 3/4 | 15 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.1.3-1 | | 5 | 64QAM | 3/4 | 25 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.1.3-1 | | 10 | 64QAM | 3/4 | 50 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.1.3-1 | | 15 | 64QAM | 3/4 | 75 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.1.3-1 | | 20 | 64QAM | 3/4 | 100 | | 5,8 | UL category 5, 8, 13, 14 |
| **FDD, Full RB allocation, 256-QAM** | | | | | | | | | |
| FDD | Table A.2.2.1.4-1 | | 1.4 | 256QAM | 3/4 | 6 | | ≥15 | |
| FDD | Table A.2.2.1.4-1 | | 3 | 256QAM | 3/4 | 15 | | ≥15 | |
| FDD | Table A.2.2.1.4-1 | | 5 | 256QAM | 3/4 | 25 | | ≥15 | |
| FDD | Table A.2.2.1.4-1 | | 10 | 256QAM | 3/4 | 50 | | ≥15 | |
| FDD | Table A.2.2.1.4-1 | | 15 | 256QAM | 3/4 | 75 | | ≥15 | |
| FDD | Table A.2.2.1.4-1 | | 20 | 256QAM | 3/4 | 100 | | ≥15 | |
| **FDD, Partial RB allocation, QPSK** | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| FDD | Table A.2.2.2.1-1 | | 1.4 - 20 | QPSK | 1/3 | 1 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 1.4 - 20 | QPSK | 1/3 | 2 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 1.4 - 20 | QPSK | 1/3 | 3 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 1.4 - 20 | QPSK | 1/3 | 4 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 1.4 - 20 | QPSK | 1/3 | 5 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 3 - 20 | QPSK | 1/3 | 6 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 3 - 20 | QPSK | 1/3 | 8 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 3 - 20 | QPSK | 1/3 | 9 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 3 - 20 | QPSK | 1/3 | 10 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 3 - 20 | QPSK | 1/3 | 12 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 5 - 20 | QPSK | 1/3 | 15 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 5 - 20 | QPSK | 1/3 | 16 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 5 - 20 | QPSK | 1/3 | 18 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 5 - 20 | QPSK | 1/3 | 20 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 5 - 20 | QPSK | 1/3 | 24 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 10 - 20 | QPSK | 1/3 | 25 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 10 - 20 | QPSK | 1/3 | 27 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 10 - 20 | QPSK | 1/3 | 30 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 10 - 20 | QPSK | 1/3 | 32 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 10 - 20 | QPSK | 1/3 | 36 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 10 - 20 | QPSK | 1/3 | 40 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 10 - 20 | QPSK | 1/3 | 45 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 10 - 20 | QPSK | 1/3 | 48 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 15 - 20 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 15 - 20 | QPSK | 1/3 | 54 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 15 - 20 | QPSK | 1/4 | 60 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 15 - 20 | QPSK | 1/4 | 64 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 15 - 20 | QPSK | 1/4 | 72 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 20 | QPSK | 1/5 | 75 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 20 | QPSK | 1/5 | 80 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 20 | QPSK | 1/5 | 81 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 20 | QPSK | 1/6 | 90 | | ≥ 1 | |
| FDD | Table A.2.2.2.1-1 | | 20 | QPSK | 1/6 | 96 | | ≥ 1 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 1.4 - 20 | QPSK | 1/3 | 1 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 1.4 - 20 | QPSK | 1/3 | 2 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 1.4 - 20 | QPSK | 1/3 | 3 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 1.4 - 20 | QPSK | 1/3 | 4 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 1.4 - 20 | QPSK | 1/3 | 5 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 3-20 | QPSK | 1/3 | 6 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 3-20 | QPSK | 1/3 | 8 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 3-20 | QPSK | 1/3 | 9 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 3-20 | QPSK | 1/3 | 10 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 3-20 | QPSK | 1/4 | 12 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 5-20 | QPSK | 1/5 | 15 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 5-20 | QPSK | 1/5 | 16 | | 0 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 5-20 | QPSK | 1/6 | 18 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 5-20 | QPSK | 1/6 | 20 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 5-20 | QPSK | 1/8 | 24 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 10-20 | QPSK | 1/8 | 25 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 10-20 | QPSK | 1/8 | 27 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1a | | 10-20 | QPSK | 1/10 | 30 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.1-1b | | 1.4-20 | QPSK | 1/3 | 1 | | M1 | |
| FDD / HD-FDD | Table A.2.2.2.1-1b | | 1.4-20 | QPSK | 1/3 | 2 | | M1 | |
| FDD / HD-FDD | Table A.2.2.2.1-1b | | 1.4-20 | QPSK | 1/3 | 3 | | M1 | |
| FDD / HD-FDD | Table A.2.2.2.1-1b | | 1.4-20 | QPSK | 1/3 | 4 | | M1 | |
| FDD / HD-FDD | Table A.2.2.2.1-1b | | 1.4-20 | QPSK | 1/3 | 5 | | M1 | |
| FDD / HD-FDD | Table A.2.2.2.1-1b | | 1.4-20 | QPSK | 1/3 | 6 | | M1 | |
| FDD / HD-FDD | Table A.2.2.2.1-1c | | 1.4-20 | QPSK | 1/3 | 1 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c | | 1.4-20 | QPSK | 1/3 | 2 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c | | 1.4-20 | QPSK | 1/3 | 3 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c | | 1.4-20 | QPSK | 1/3 | 4 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c | | 1.4-20 | QPSK | 1/3 | 5 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c | | 3-20 | QPSK | 1/3 | 6 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c | | 3-20 | QPSK | 1/3 | 9 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c | | 3-20 | QPSK | 1/3 | 12 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c | | 5-20 | QPSK | 1/3 | 15 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c | | 5-20 | QPSK | 1/3 | 18 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.1-1c | | 5-20 | QPSK | 1/3 | 21 | | M2 | UE UL category M2 |
| **FDD, Partial RB allocation, 16-QAM** | | | | | | | | | |
| FDD | Table A.2.2.2.2-1 | | 1.4 - 20 | 16QAM | 3/4 | 1 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 1.4 - 20 | 16QAM | 3/4 | 2 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 1.4 - 20 | 16QAM | 3/4 | 3 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 1.4 - 20 | 16QAM | 3/4 | 4 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 1.4 - 20 | 16QAM | 3/4 | 5 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 3 - 20 | 16QAM | 3/4 | 6 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 3 - 20 | 16QAM | 3/4 | 8 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 3 - 20 | 16QAM | 3/4 | 9 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 3 - 20 | 16QAM | 3/4 | 10 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 3 - 20 | 16QAM | 3/4 | 12 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 5 - 20 | 16QAM | 1/2 | 15 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 5 - 20 | 16QAM | 1/2 | 16 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 5 - 20 | 16QAM | 1/2 | 18 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 5 - 20 | 16QAM | 1/3 | 20 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 5 - 20 | 16QAM | 1/3 | 24 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 10 - 20 | 16QAM | 1/3 | 25 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 10 - 20 | 16QAM | 1/3 | 27 | | ≥ 1 | |
| FDD | Table A.2.2.2.2-1 | | 10 - 20 | 16QAM | 3/4 | 30 | | ≥ 2 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| FDD | Table A.2.2.2.2-1 | | 10 - 20 | 16QAM | 3/4 | 32 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 10 - 20 | 16QAM | 3/4 | 36 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 10 - 20 | 16QAM | 3/4 | 40 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 10 - 20 | 16QAM | 3/4 | 45 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 10 - 20 | 16QAM | 3/4 | 48 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 15 - 20 | 16QAM | 3/4 | 50 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 15 - 20 | 16QAM | 3/4 | 54 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 15 - 20 | 16QAM | 2/3 | 60 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 15 - 20 | 16QAM | 2/3 | 64 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 15 - 20 | 16QAM | 1/2 | 72 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 20 | 16QAM | 1/2 | 75 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 20 | 16QAM | 1/2 | 80 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 20 | 16QAM | 1/2 | 81 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 20 | 16QAM | 2/5 | 90 | | ≥ 2 | |
| FDD | Table A.2.2.2.2-1 | | 20 | 16QAM | 2/5 | 96 | | ≥ 2 | |
| FDD / HD-FDD | Table A.2.2.2.2-1a | | 1.4 - 20 | 16QAM | 3/4 | 1 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.2-1a | | 1.4 - 20 | 16QAM | 3/4 | 2 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.2-1a | | 1.4 - 20 | 16QAM | 2/5 | 4 | | 0 | |
| FDD / HD-FDD | Table A.2.2.2.2-1b | | 1.4-20 | 16QAM | 1/2 | 1 | | M1 | |
| FDD / HD-FDD | Table A.2.2.2.2-1b | | 1.4-20 | 16QAM | 1/2 | 2 | | M1 | |
| FDD / HD-FDD | Table A.2.2.2.2-1b | | 1.4-20 | 16QAM | 1/2 | 3 | | M1 | |
| FDD / HD-FDD | Table A.2.2.2.2-1b | | 1.4-20 | 16QAM | 2/5 | 4 | | M1 | |
| FDD / HD-FDD | Table A.2.2.2.2-1c | | 1.4 - 20 | 16QAM | 1/2 | 1 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c | | 1.4 - 20 | 16QAM | 1/2 | 2 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c | | 1.4 - 20 | 16QAM | 1/2 | 3 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c | | 1.4 - 20 | 16QAM | 1/2 | 4 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c | | 1.4 - 20 | 16QAM | 1/2 | 5 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c | | 3 - 20 | 16QAM | 1/2 | 6 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c | | 3 - 20 | 16QAM | 1/2 | 9 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c | | 3 - 20 | 16QAM | 1/2 | 12 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c | | 5 - 20 | 16QAM | 1/2 | 15 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c | | 5 - 20 | 16QAM | 1/2 | 18 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c | | 5 - 20 | 16QAM | 1/2 | 21 | | M2 | UE UL category M2 |
| FDD / HD-FDD | Table A.2.2.2.2-1c | | 5 - 20 | 16QAM | 1/2 | 24 | | M2 | UE UL category M2 |
| **FDD, Partial RB allocation, 64-QAM** | | | | | | | | | |
| FDD | Table A.2.2.2.3-1 | | 1.4 - 20 | 64QAM | 3/4 | 1 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 1.4 - 20 | 64QAM | 3/4 | 2 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 1.4 - 20 | 64QAM | 3/4 | 3 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 1.4 - 20 | 64QAM | 3/4 | 4 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 1.4 - 20 | 64QAM | 3/4 | 5 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 3 - 20 | 64QAM | 3/4 | 6 | | 5,8 | UL category 5, 8, 13, 14 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| FDD | Table A.2.2.2.3-1 | | 3 - 20 | 64QAM | 3/4 | 8 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 3 - 20 | 64QAM | 3/4 | 9 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 3 - 20 | 64QAM | 3/4 | 10 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 3 - 20 | 64QAM | 3/4 | 12 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 5 - 20 | 64QAM | 3/4 | 15 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 5 - 20 | 64QAM | 3/4 | 16 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 5 - 20 | 64QAM | 3/4 | 18 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 5 - 20 | 64QAM | 3/4 | 20 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 5 - 20 | 64QAM | 3/4 | 24 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 25 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 27 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 30 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 32 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 36 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 40 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 45 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 48 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 15 - 20 | 64QAM | 3/4 | 50 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 15 - 20 | 64QAM | 3/4 | 54 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 15 - 20 | 64QAM | 3/4 | 60 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 15 - 20 | 64QAM | 3/4 | 64 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 15 - 20 | 64QAM | 3/4 | 72 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 20 | 64QAM | 3/4 | 75 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 20 | 64QAM | 3/4 | 80 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 20 | 64QAM | 3/4 | 81 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 20 | 64QAM | 2/3 | 90 | | 5,8 | UL category 5, 8, 13, 14 |
| FDD | Table A.2.2.2.3-1 | | 20 | 64QAM | 3/4 | 96 | | 5,8 | UL category 5, 8, 13, 14 |
| **FDD, Partial RB allocation, 256-QAM** | | | | | | | | | |
| FDD | Table A.2.2.2.4-1 | | 1.4 - 20 | 256QAM | 3/4 | 1 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 1.4 - 20 | 256QAM | 3/4 | 2 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 1.4 - 20 | 256QAM | 3/4 | 3 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 1.4 - 20 | 256QAM | 3/4 | 4 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 1.4 - 20 | 256QAM | 3/4 | 5 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 3-20 | 256QAM | 3/4 | 6 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 3-20 | 256QAM | 3/4 | 8 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 3-20 | 256QAM | 3/4 | 9 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 3-20 | 256QAM | 3/4 | 10 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 3-20 | 256QAM | 3/4 | 12 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 5-20 | 256QAM | 3/4 | 15 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 5-20 | 256QAM | 3/4 | 16 | | ≥ 15 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| FDD | Table A.2.2.2.4-1 | | 5-20 | 256QAM | 3/4 | 18 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 5-20 | 256QAM | 3/4 | 20 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 5-20 | 256QAM | 3/4 | 24 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 10-20 | 256QAM | 3/4 | 25 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 10-20 | 256QAM | 3/4 | 27 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 10-20 | 256QAM | 3/4 | 30 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 10-20 | 256QAM | 3/4 | 32 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 10-20 | 256QAM | 3/4 | 36 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 10-20 | 256QAM | 3/4 | 40 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 10-20 | 256QAM | 3/4 | 45 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 10-20 | 256QAM | 3/4 | 48 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 15 - 20 | 256QAM | 3/4 | 50 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 15 - 20 | 256QAM | 3/4 | 54 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 15 - 20 | 256QAM | 3/4 | 60 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 15 - 20 | 256QAM | 3/4 | 64 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 15 - 20 | 256QAM | 3/4 | 72 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 20 | 256QAM | 3/4 | 75 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 20 | 256QAM | 3/4 | 80 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 20 | 256QAM | 3/4 | 81 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 20 | 256QAM | 3/4 | 90 | | ≥ 15 | |
| FDD | Table A.2.2.2.4-1 | | 20 | 256QAM | 3/4 | 96 | | ≥ 15 | |
| **FDD, Sustained data rate** | | | | | | | | | |
| FDD | Table A.2.2.3-1 | R.1-1 FDD | 10 | QPSK | 0.31 | 40 | | ≥ 1 | |
| FDD | Table A.2.2.3-1 | R.1-2 FDD | 10 | QPSK | 0.31 | 40 | | ≥ 1 | |
| FDD | Table A.2.2.3-1 | R.1-3 FDD | 20 | QPSK | 0.31 | 90 | | ≥ 2 | |
| FDD | Table A.2.2.3-1 | R.1-3A FDD | 10 | QPSK | 0.31 | 40 | | ≥ 1 | |
| FDD | Table A.2.2.3-1 | R.1-4 FDD | 20 | QPSK | 0.31 | 40 | | ≥ 2 | |
| FDD | Table A.2.2.3-1 | R.1-4B FDD | 15 | QPSK | 0.31 | 60 | | ≥ 1 | |
| **TDD, Full RB allocation, QPSK** | | | | | | | | | |
| TDD | Table A.2.3.1.1-1 | | 1.4 | QPSK | 1/3 | 6 | | ≥ 1 | |
| TDD | Table A.2.3.1.1-1 | | 3 | QPSK | 1/3 | 15 | | ≥ 1 | |
| TDD | Table A.2.3.1.1-1 | | 5 | QPSK | 1/3 | 25 | | ≥ 1 | |
| TDD | Table A.2.3.1.1-1 | | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| TDD | Table A.2.3.1.1-1 | | 15 | QPSK | 1/5 | 75 | | ≥ 1 | |
| TDD | Table A.2.3.1.1-1 | | 20 | QPSK | 1/6 | 100 | | ≥ 1 | |
| TDD | Table A.2.3.1.1-1A | | 1.4 | QPSK | 1/3 | 6 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.1-1A | | 3 | QPSK | 1/3 | 15 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.1-1A | | 5 | QPSK | 1/3 | 25 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.1-1A | | 10 | QPSK | 1/3 | 50 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.1-1A | | 15 | QPSK | 1/5 | 75 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.1-1A | | 20 | QPSK | 1/6 | 100 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.1-1a | | 1.4 | QPSK | 1/3 | 6 | | 0 | |
| TDD | Table A.2.3.1.1-1a | | 3 | QPSK | 1/5 | 15 | | 0 | |
| TDD | Table A.2.3.1.1-1a | | 5 | QPSK | 1/8 | 25 | | 0 | |
| TDD | Table A.2.3.1.1-1a | | 10 | QPSK | [1/10] | [36] | | 0 | |
| TDD | Table A.2.3.1.1-1a | | 15 | QPSK | [1/10] | [36] | | 0 | |
| TDD | Table A.2.3.1.1-1a | | 20 | QPSK | [1/10] | [36] | | 0 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.2.3.1.1-1b | | 1.4 | QPSK | 1/3 | 6 | | M1 | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b | | 3 | QPSK | 1/3 | 6 | | M1 | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b | | 5 | QPSK | 1/3 | 6 | | M1 | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b | | 10 | QPSK | 1/3 | 6 | | M1 | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b | | 15 | QPSK | 1/3 | 6 | | M1 | UE UL category M1 |
| TDD | Table A.2.3.1.1-1b | | 20 | QPSK | 1/3 | 6 | | M1 | UE UL category M1 |
| TDD | Table A.2.3.1.1-1c | | 1.4 | QPSK | 1/3 | 6 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c | | 3 | QPSK | 1/3 | 12 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c | | 5 | QPSK | 1/3 | 24 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c | | 10 | QPSK | 1/3 | 24 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c | | 15 | QPSK | 1/3 | 24 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.1.1-1c | | 20 | QPSK | 1/3 | 24 | | M2 | UE UL category M2 |
| **TDD, Full RB allocation, 16-QAM** | | | | | | | | | |
| TDD | Table A.2.3.1.2-1 | | 1.4 | 16QAM | 3/4 | 6 | | ≥ 1 | |
| TDD | Table A.2.3.1.2-1 | | 3 | 16QAM | 1/2 | 15 | | ≥ 1 | |
| TDD | Table A.2.3.1.2-1 | | 5 | 16QAM | 1/3 | 25 | | ≥ 1 | |
| TDD | Table A.2.3.1.2-1 | | 10 | 16QAM | 3/4 | 50 | | ≥ 2 | |
| TDD | Table A.2.3.1.2-1 | | 15 | 16QAM | 1/2 | 75 | | ≥ 2 | |
| TDD | Table A.2.3.1.2-1 | | 20 | 16QAM | 1/3 | 100 | | ≥ 2 | |
| TDD | Table A.2.3.1.2-1 | | 20 | 16QAM | 1/3 | 100 | | ≥ 2 | |
| TDD | Table A.2.3.1.2-1A | | 1.4 | 16QAM | 3/4 | 6 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.2-1A | | 3 | 16QAM | 1/2 | 15 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.2-1A | | 5 | 16QAM | 1/3 | 25 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.2-1A | | 10 | 16QAM | 3/4 | 50 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.2-1A | | 15 | 16QAM | 1/2 | 75 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.2-1A | | 20 | 16QAM | 1/3 | 100 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.1.2-1a | | 1.4 | 16QAM | 1/3 | 5 | | 0 | |
| TDD | Table A.2.3.1.2-1a | | 3 | 16QAM | 1/3 | 5 | | 0 | |
| TDD | Table A.2.3.1.2-1a | | 5 | 16QAM | 1/3 | 5 | | 0 | |
| TDD | Table A.2.3.1.2-1a | | 10 | 16QAM | 1/3 | 5 | | 0 | |
| TDD | Table A.2.3.1.2-1a | | 15 | 16QAM | 1/3 | 5 | | 0 | |
| TDD | Table A.2.3.1.2-1a | | 20 | 16QAM | 1/3 | 5 | | 0 | |
| TDD | Table A.2.3.1.2-1b | | 1.4 | 16QAM | 1/3 | 5 | | M1 | UE UL category M1 |
| TDD | Table A.2.3.1.2-1b | | 3 | 16QAM | 1/3 | 5 | | M1 | UE UL category M1 |
| TDD | Table A.2.3.1.2-1b | | 5 | 16QAM | 1/3 | 5 | | M1 | UE UL category M1 |
| TDD | Table A.2.3.1.2-1b | | 10 | 16QAM | 1/3 | 5 | | M1 | UE UL category M1 |
| TDD | Table A.2.3.1.2-1b | | 15 | 16QAM | 1/3 | 5 | | M1 | UE UL category M1 |
| TDD | Table A.2.3.1.2-1b | | 20 | 16QAM | 1/3 | 5 | | M1 | UE UL category M1 |
| TDD | Table A.2.3.1.2-1c | | 1.4 | 16QAM | 1/3 | 6 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.1.2-1c | | 3 | 16QAM | 1/3 | 12 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.1.2-1c | | 5 | 16QAM | 1/3 | 24 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.1.2-1c | | 10 | 16QAM | 1/3 | 24 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.1.2-1c | | 15 | 16QAM | 1/3 | 24 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.1.2-1c | | 20 | 16QAM | 1/3 | 24 | | M2 | UE UL category M2 |
| **TDD, Full RB allocation, 64-QAM** | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.2.3.1.3-1 | | 1.4 | 64QAM | 3/4 | 6 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.1.3-1 | | 3 | 64QAM | 3/4 | 15 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.1.3-1 | | 5 | 64QAM | 3/4 | 25 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.1.3-1 | | 10 | 64QAM | 3/4 | 50 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.1.3-1 | | 15 | 64QAM | 3/4 | 75 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.1.3-1 | | 20 | 64QAM | 3/4 | 100 | | 5,8 | UL category 5, 8, 13, 14 |
| **TDD, Full RB allocation, 256-QAM** | | | | | | | | | |
| TDD | Table A.2.3.1.4-1 | | 1.4 | 256QAM | 3/4 | 6 | | ≥15 | |
| TDD | Table A.2.3.1.4-1 | | 3 | 256QAM | 3/4 | 15 | | ≥15 | |
| TDD | Table A.2.3.1.4-1 | | 5 | 256QAM | 3/4 | 25 | | ≥15 | |
| TDD | Table A.2.3.1.4-1 | | 10 | 256QAM | 3/4 | 50 | | ≥15 | |
| TDD | Table A.2.3.1.4-1 | | 15 | 256QAM | 3/4 | 75 | | ≥15 | |
| TDD | Table A.2.3.1.4-1 | | 20 | 256QAM | 3/4 | 100 | | ≥15 | |
| **TDD, Partial RB allocation, QPSK** | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.2.3.2.1-1 | | 1.4 - 20 | QPSK | 1/3 | 1 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 1.4 - 20 | QPSK | 1/3 | 2 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 1.4 - 20 | QPSK | 1/3 | 3 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 1.4 - 20 | QPSK | 1/3 | 4 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 1.4 - 20 | QPSK | 1/3 | 5 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 3 - 20 | QPSK | 1/3 | 6 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 3 - 20 | QPSK | 1/3 | 8 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 3 - 20 | QPSK | 1/3 | 9 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 3 - 20 | QPSK | 1/3 | 10 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 3 - 20 | QPSK | 1/3 | 12 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 5 - 20 | QPSK | 1/3 | 15 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 5 - 20 | QPSK | 1/3 | 16 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 5 - 20 | QPSK | 1/3 | 18 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 5 - 20 | QPSK | 1/3 | 20 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 5 - 20 | QPSK | 1/3 | 24 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 10 - 20 | QPSK | 1/3 | 25 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 10 - 20 | QPSK | 1/3 | 27 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 10 - 20 | QPSK | 1/3 | 30 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 10 - 20 | QPSK | 1/3 | 32 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 10 - 20 | QPSK | 1/3 | 36 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 10 - 20 | QPSK | 1/3 | 40 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 10 - 20 | QPSK | 1/3 | 45 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 10 - 20 | QPSK | 1/3 | 48 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 15 - 20 | QPSK | 1/3 | 50 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 15 - 20 | QPSK | 1/3 | 54 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 15 - 20 | QPSK | 1/4 | 60 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 15 - 20 | QPSK | 1/4 | 64 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 15 - 20 | QPSK | 1/4 | 72 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 20 | QPSK | 1/5 | 75 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 20 | QPSK | 1/5 | 80 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 20 | QPSK | 1/5 | 81 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 20 | QPSK | 1/6 | 90 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1 | | 20 | QPSK | 1/6 | 96 | | ≥ 1 | |
| TDD | Table A.2.3.2.1-1A | | 1.4 - 20 | QPSK | 1/3 | 1 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 1.4 - 20 | QPSK | 1/3 | 2 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 1.4 - 20 | QPSK | 1/3 | 3 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 1.4 - 20 | QPSK | 1/3 | 4 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 1.4 - 20 | QPSK | 1/3 | 5 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 3 - 20 | QPSK | 1/3 | 6 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 3 - 20 | QPSK | 1/3 | 8 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 3 - 20 | QPSK | 1/3 | 9 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 3 - 20 | QPSK | 1/3 | 10 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 3 - 20 | QPSK | 1/3 | 12 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 5 - 20 | QPSK | 1/3 | 15 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 5 - 20 | QPSK | 1/3 | 16 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 5 - 20 | QPSK | 1/3 | 18 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 5 - 20 | QPSK | 1/3 | 20 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 5 - 20 | QPSK | 1/3 | 24 | | ≥ 1 | UL-DL configuration 0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.2.3.2.1-1A | | 10 - 20 | QPSK | 1/3 | 25 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 10 - 20 | QPSK | 1/3 | 27 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 10 - 20 | QPSK | 1/3 | 30 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 10 - 20 | QPSK | 1/3 | 32 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 10 - 20 | QPSK | 1/3 | 36 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 10 - 20 | QPSK | 1/3 | 40 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 10 - 20 | QPSK | 1/3 | 45 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 10 - 20 | QPSK | 1/3 | 48 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 15 - 20 | QPSK | 1/3 | 50 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 15 - 20 | QPSK | 1/3 | 54 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 15 - 20 | QPSK | 1/4 | 60 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 15 - 20 | QPSK | 1/4 | 64 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 15 - 20 | QPSK | 1/4 | 72 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 20 | QPSK | 1/5 | 75 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 20 | QPSK | 1/5 | 80 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 20 | QPSK | 1/5 | 81 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 20 | QPSK | 1/6 | 90 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1A | | 20 | QPSK | 1/6 | 96 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.1-1a | | 1.4 - 20 | QPSK | 1/3 | 1 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 1.4 - 20 | QPSK | 1/3 | 2 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 1.4 - 20 | QPSK | 1/3 | 3 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 1.4 - 20 | QPSK | 1/3 | 4 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 1.4 - 20 | QPSK | 1/3 | 5 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 3-20 | QPSK | 1/3 | 6 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 3-20 | QPSK | 1/3 | 8 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 3-20 | QPSK | 1/3 | 9 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 3-20 | QPSK | 1/3 | 10 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 3-20 | QPSK | 1/4 | 12 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 5-20 | QPSK | 1/5 | 15 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 5-20 | QPSK | 1/5 | 16 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 5-20 | QPSK | 1/6 | 18 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 5-20 | QPSK | 1/6 | 20 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 5-20 | QPSK | 1/8 | 24 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 10-20 | QPSK | 1/8 | 25 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 10-20 | QPSK | 1/8 | 27 | | 0 | |
| TDD | Table A.2.3.2.1-1a | | 10-20 | QPSK | 1/10 | 30 | | 0 | |
| TDD | Table A.2.3.2.1-1b | | 1.4-20 | QPSK | 1/3 | 1 | | M1 | |
| TDD | Table A.2.3.2.1-1b | | 1.4-20 | QPSK | 1/3 | 2 | | M1 | |
| TDD | Table A.2.3.2.1-1b | | 1.4-20 | QPSK | 1/3 | 3 | | M1 | |
| TDD | Table A.2.3.2.1-1b | | 1.4-20 | QPSK | 1/3 | 4 | | M1 | |
| TDD | Table A.2.3.2.1-1b | | 1.4-20 | QPSK | 1/3 | 5 | | M1 | |
| TDD | Table A.2.3.2.1-1b | | 3-20 | QPSK | 1/3 | 6 | | M1 | |
| TDD | Table A.2.3.2.1-1c | | 1.4-20 | QPSK | 1/3 | 1 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c | | 1.4-20 | QPSK | 1/3 | 2 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c | | 1.4-20 | QPSK | 1/3 | 3 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c | | 1.4-20 | QPSK | 1/3 | 4 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c | | 1.4-20 | QPSK | 1/3 | 5 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c | | 3-20 | QPSK | 1/3 | 6 | | M2 | UE UL category M2 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.2.3.2.1-1c | | 3-20 | QPSK | 1/3 | 9 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c | | 3-20 | QPSK | 1/3 | 12 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c | | 5-20 | QPSK | 1/3 | 15 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c | | 5-20 | QPSK | 1/3 | 18 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.1-1c | | 5-20 | QPSK | 1/3 | 21 | | M2 | UE UL category M2 |
| **TDD, Partial RB allocation, 16-QAM** | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.2.3.2.2-1 | | 1.4 - 20 | 16QAM | 3/4 | 1 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 1.4 - 20 | 16QAM | 3/4 | 2 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 1.4 - 20 | 16QAM | 3/4 | 3 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 1.4 - 20 | 16QAM | 3/4 | 4 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 1.4 - 20 | 16QAM | 3/4 | 5 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 3 - 20 | 16QAM | 3/4 | 6 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 3 - 20 | 16QAM | 3/4 | 8 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 3 - 20 | 16QAM | 3/4 | 9 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 3 - 20 | 16QAM | 3/4 | 10 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 3 - 20 | 16QAM | 3/4 | 12 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 5 - 20 | 16QAM | 1/2 | 15 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 5 - 20 | 16QAM | 1/2 | 16 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 5 - 20 | 16QAM | 1/2 | 18 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 5 - 20 | 16QAM | 1/3 | 20 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 5 - 20 | 16QAM | 1/3 | 24 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 10 - 20 | 16QAM | 1/3 | 25 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 10 - 20 | 16QAM | 1/3 | 27 | | ≥ 1 | |
| TDD | Table A.2.3.2.2-1 | | 10 - 20 | 16QAM | 3/4 | 30 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 10 - 20 | 16QAM | 3/4 | 32 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 10 - 20 | 16QAM | 3/4 | 36 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 10 - 20 | 16QAM | 3/4 | 40 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 10 - 20 | 16QAM | 3/4 | 45 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 10 - 20 | 16QAM | 3/4 | 48 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 15 - 20 | 16QAM | 3/4 | 50 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 15 - 20 | 16QAM | 3/4 | 54 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 15 - 20 | 16QAM | 2/3 | 60 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 15 - 20 | 16QAM | 2/3 | 64 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 15 - 20 | 16QAM | 1/2 | 72 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 20 | 16QAM | 1/2 | 75 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 20 | 16QAM | 1/2 | 80 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 20 | 16QAM | 1/2 | 81 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 20 | 16QAM | 2/5 | 90 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1 | | 20 | 16QAM | 2/5 | 96 | | ≥ 2 | |
| TDD | Table A.2.3.2.2-1A | | 1.4 - 20 | 16QAM | 3/4 | 1 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 1.4 - 20 | 16QAM | 3/4 | 2 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 1.4 - 20 | 16QAM | 3/4 | 3 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 1.4 - 20 | 16QAM | 3/4 | 4 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 1.4 - 20 | 16QAM | 3/4 | 5 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 3 - 20 | 16QAM | 3/4 | 6 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 3 - 20 | 16QAM | 3/4 | 8 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 3 - 20 | 16QAM | 3/4 | 9 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 3 - 20 | 16QAM | 3/4 | 10 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 3 - 20 | 16QAM | 3/4 | 12 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 5 - 20 | 16QAM | 1/2 | 15 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 5 - 20 | 16QAM | 1/2 | 16 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 5 - 20 | 16QAM | 1/2 | 18 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 5 - 20 | 16QAM | 1/3 | 20 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 5 - 20 | 16QAM | 1/3 | 24 | | ≥ 1 | UL-DL configuration 0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.2.3.2.2-1A | | 10 - 20 | 16QAM | 1/3 | 25 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 10 - 20 | 16QAM | 1/3 | 27 | | ≥ 1 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 10 - 20 | 16QAM | 3/4 | 30 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 10 - 20 | 16QAM | 3/4 | 32 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 10 - 20 | 16QAM | 3/4 | 36 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 10 - 20 | 16QAM | 3/4 | 40 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 10 - 20 | 16QAM | 3/4 | 45 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 10 - 20 | 16QAM | 3/4 | 48 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 15 - 20 | 16QAM | 3/4 | 50 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 15 - 20 | 16QAM | 3/4 | 54 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 15 - 20 | 16QAM | 2/3 | 60 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 15 - 20 | 16QAM | 2/3 | 64 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 15 - 20 | 16QAM | 1/2 | 72 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 20 | 16QAM | 1/2 | 75 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 20 | 16QAM | 1/2 | 80 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 20 | 16QAM | 1/2 | 81 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 20 | 16QAM | 2/5 | 90 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1A | | 20 | 16QAM | 2/5 | 96 | | ≥ 2 | UL-DL configuration 0 |
| TDD | Table A.2.3.2.2-1a | | 1.4 - 20 | 16QAM | 3/4 | 1 | | 0 | |
| TDD | Table A.2.3.2.2-1a | | 1.4 - 20 | 16QAM | 3/4 | 2 | | 0 | |
| TDD | Table A.2.3.2.2-1a | | 1.4 - 20 | 16QAM | 2/5 | 4 | | 0 | |
| TDD | Table A.2.3.2.2-1b | | 1.4-20 | 16QAM | 1/2 | 1 | | M1 | |
| TDD | Table A.2.3.2.2-1b | | 1.4-20 | 16QAM | 1/2 | 2 | | M1 | |
| TDD | Table A.2.3.2.2-1b | | 1.4-20 | 16QAM | 1/2 | 3 | | M1 | |
| TDD | Table A.2.3.2.2-1b | | 1.4-20 | 16QAM | 2/5 | 4 | | M1 | |
| TDD | Table A.2.3.2.2-1c | | 1.4 - 20 | 16QAM | 1/2 | 1 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c | | 1.4 - 20 | 16QAM | 1/2 | 2 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c | | 1.4 - 20 | 16QAM | 1/2 | 3 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c | | 1.4 - 20 | 16QAM | 1/2 | 4 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c | | 1.4 - 20 | 16QAM | 1/2 | 5 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c | | 3 - 20 | 16QAM | 1/2 | 6 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c | | 3 - 20 | 16QAM | 1/2 | 9 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c | | 3 - 20 | 16QAM | 1/2 | 12 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c | | 5 - 20 | 16QAM | 1/2 | 15 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c | | 5 - 20 | 16QAM | 1/2 | 18 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c | | 5 - 20 | 16QAM | 1/2 | 21 | | M2 | UE UL category M2 |
| TDD | Table A.2.3.2.2-1c | | 5 - 20 | 16QAM | 1/2 | 24 | | M2 | UE UL category M2 |
| **TDD, Partial RB allocation, 64-QAM** | | | | | | | | | |
| TDD | Table A.2.3.2.3-1 | | 1.4 - 20 | 64QAM | 3/4 | 1 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 1.4 - 20 | 64QAM | 3/4 | 2 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 1.4 - 20 | 64QAM | 3/4 | 3 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 1.4 - 20 | 64QAM | 3/4 | 4 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 1.4 - 20 | 64QAM | 3/4 | 5 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 3 - 20 | 64QAM | 3/4 | 6 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 3 - 20 | 64QAM | 3/4 | 8 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 3 - 20 | 64QAM | 3/4 | 9 | | 5,8 | UL category 5, 8, 13, 14 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.2.3.2.3-1 | | 3 - 20 | 64QAM | 3/4 | 10 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 3 - 20 | 64QAM | 3/4 | 12 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 5 - 20 | 64QAM | 3/4 | 15 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 5 - 20 | 64QAM | 3/4 | 16 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 5 - 20 | 64QAM | 3/4 | 18 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 5 - 20 | 64QAM | 3/4 | 20 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 5 - 20 | 64QAM | 3/4 | 24 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 25 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 27 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 30 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 32 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 36 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 40 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 45 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 10 - 20 | 64QAM | 3/4 | 48 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 15 - 20 | 64QAM | 3/4 | 50 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 15 - 20 | 64QAM | 3/4 | 54 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 15 - 20 | 64QAM | 3/4 | 60 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 15 - 20 | 64QAM | 3/4 | 64 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 15 - 20 | 64QAM | 3/4 | 72 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 20 | 64QAM | 3/4 | 75 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 20 | 64QAM | 3/4 | 80 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 20 | 64QAM | 3/4 | 81 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 20 | 64QAM | 2/3 | 90 | | 5,8 | UL category 5, 8, 13, 14 |
| TDD | Table A.2.3.2.3-1 | | 20 | 64QAM | 3/4 | 96 | | 5,8 | UL category 5, 8, 13, 14 |
| **TDD, Partial RB allocation, 256-QAM** | | | | | | | | | |
| TDD | Table A.2.3.2.4-1 | | 1.4 - 20 | 256QAM | 3/4 | 1 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 1.4 - 20 | 256QAM | 3/4 | 2 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 1.4 - 20 | 256QAM | 3/4 | 3 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 1.4 - 20 | 256QAM | 3/4 | 4 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 1.4 - 20 | 256QAM | 3/4 | 5 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 3-20 | 256QAM | 3/4 | 6 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 3-20 | 256QAM | 3/4 | 8 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 3-20 | 256QAM | 3/4 | 9 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 3-20 | 256QAM | 3/4 | 10 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 3-20 | 256QAM | 3/4 | 12 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 5-20 | 256QAM | 3/4 | 15 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 5-20 | 256QAM | 3/4 | 16 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 5-20 | 256QAM | 3/4 | 18 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 5-20 | 256QAM | 3/4 | 20 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 5-20 | 256QAM | 3/4 | 24 | | ≥ 15 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.2.3.2.4-1 | | 10-20 | 256QAM | 3/4 | 25 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 10-20 | 256QAM | 3/4 | 27 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 10-20 | 256QAM | 3/4 | 30 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 10-20 | 256QAM | 3/4 | 32 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 10-20 | 256QAM | 3/4 | 36 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 10-20 | 256QAM | 3/4 | 40 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 10-20 | 256QAM | 3/4 | 45 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 10-20 | 256QAM | 3/4 | 48 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 15 - 20 | 256QAM | 3/4 | 50 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 15 - 20 | 256QAM | 3/4 | 54 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 15 - 20 | 256QAM | 3/4 | 60 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 15 - 20 | 256QAM | 3/4 | 64 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 15 - 20 | 256QAM | 3/4 | 72 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 20 | 256QAM | 3/4 | 75 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 20 | 256QAM | 3/4 | 80 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 20 | 256QAM | 3/4 | 81 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 20 | 256QAM | 3/4 | 90 | | ≥ 15 | |
| TDD | Table A.2.3.2.4-1 | | 20 | 256QAM | 3/4 | 96 | | ≥ 15 | |
| **TDD, Sustained data rate** | | | | | | | | | |
| TDD | Table A.2.3.3-1 | R.1-1 TDD | 10 | QPSK | 0.43 | 40 | | ≥ 1 | |
| TDD | Table A.2.3.3-1 | R.1-2 TDD | 10 | QPSK | 0.61 | 40 | | ≥ 2 | |
| TDD | Table A.2.3.3-1 | R.1-3 TDD | 20 | QPSK | 0.49 | 90 | | ≥ 2 | |
| TDD | Table A.2.3.3-1 | R.1-3B TDD | 15 | QPSK | 0.42 | 60 | | ≥ 2 | |
| TDD | Table A.2.3.3-1 | R.1-4 TDD | 20 | QPSK | 0.49 | 90 | | ≥ 2 | |

## A.2.2 Reference measurement channels for FDD

### A.2.2.1 Full RB allocation

#### A.2.2.1.1 QPSK

**Table A.2.2.1.1-1: Reference Channels for QPSK with full RB allocation**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | **MHz** | **1.4** | **3** | **5** | **10** | **15** | **20** |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/5 | 1/6 |
| Payload size | Bits | 600 | 1544 | 2216 | 5160 | 4392 | 4584 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame (Note 1) | Bits | 1728 | 4320 | 7200 | 14400 | 21600 | 28800 |
| Total symbols per Sub-Frame | | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | |

**Table A.2.2.1.1-1a: Reference Channels for QPSK with full/maximum RB allocation for UE category 0**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | [36] | [36] | [36] |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding rate | | 1/3 | 1/5 | 1/8 | [1/10] | [1/10] | [1/10] |
| Payload size | Bits | 600 | 872 | 904 | [1000] | [1000] | [1000] |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 1728 | 4320 | 7200 | [10368] | [10368] | [10368] |
| Total symbols per Sub-Frame | | 864 | 2160 | 3600 | [5184] | [5184] | [5184] |
| UE Category | | 0 | 0 | 0 | 0 | 0 | 0 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).<br>NOTE 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th, 6th, 12th, 13th, 14th, 20th, 21st, 22nd, 28th, 29th, 30th, 36th, 37th, and 38th subframes every 40ms. Information bit payload is available if uplink subframe is scheduled. | | | | | | | |

**Table A.2.2.1.1-1b: Reference Channels for QPSK with full/maximum RB allocation for UE category M1**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 6 | 6 | 6 | 6 | 6 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size | Bits | 600 | 600 | 600 | 600 | 600 | 600 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 1728 | 1728 | 1728 | 1728 | 1728 | 1728 |
| Total symbols per Sub-Frame | | 864 | 864 | 864 | 864 | 864 | 864 |
| UE Category | | M1 | M1 | M1 | M1 | M1 | M1 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>NOTE 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6th subframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD UE, the uplink subframes are scheduled at the 5th, 6th, and 7th subframes every 10ms for the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled. $N_{abs}^{PUSCH}$ is total number of absolute subframes a PUSCH with repetition spans [4].<br>NOTE 3: For HD-FDD UE with $N_{abs}^{PUSCH} > 1$, MPDCCH are scheduled at 0th DL subframe every $N_{abs}^{PUSCH}$ +5 subframes (starting from the 0th subframe). The associated PUSCH is scheduled at the 4th to ( $N_{abs}^{PUSCH}$ +3)-th UL subframes every $N_{abs}^{PUSCH}$ +5 subframes. Information bit payload is available if uplink subframe is scheduled. | | | | | | | |

**Table A.2.2.1.1-1c: Reference Channels for QPSK with full/maximum RB allocation for UE UL category M2**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 12 | 24 | 24 | 24 | 24 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size | Bits | 600 | 1224 | 2472 | 2472 | 2472 | 2472 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (NOTE 1) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 1728 | 3456 | 6912 | 6912 | 6912 | 6912 |
| Total symbols per Sub-Frame | | 864 | 1728 | 3456 | 3456 | 3456 | 3456 |
| UE UL Category | | M2 | M2 | M2 | M2 | M2 | M2 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).<br>NOTE 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6th subframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD UE, the uplink subframes are scheduled at the 5th, 6th and 7th subframes every 10ms for the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled. | | | | | | | |

## A.2.2.1.2 16-QAM

**Table A.2.2.1.2-1: Reference Channels for 16-QAM with full RB allocation**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | **MHz** | **1.4** | **3** | **5** | **10** | **15** | **20** |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate | | 3/4 | 1/2 | 1/3 | 3/4 | 1/2 | 1/3 |
| Payload size | Bits | 2600 | 4264 | 4968 | 21384 | 21384 | 19848 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | 1 | 1 | 1 | 4 | 4 | 4 |
| Total number of bits per Sub-Frame | Bits | 3456 | 8640 | 14400 | 28800 | 43200 | 57600 |
| Total symbols per Sub-Frame | | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | |

**Table A.2.2.1.2-1a: Reference Channels for 16-QAM with maximum RB allocation for UE category 0**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 5 | 5 | 5 | 5 | 5 | 5 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size | Bits | 872 | 872 | 872 | 872 | 872 | 872 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 2880 | 2880 | 2880 | 2880 | 2880 | 2880 |
| Total symbols per Sub-Frame | | 720 | 720 | 720 | 720 | 720 | 720 |
| UE Category | | 0 | 0 | 0 | 0 | 0 | 0 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).<br>NOTE 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th, 6th, 12th, 13th, 14th, 20th, 21st, 22nd, 28th, 29th, 30th, 36th, 37th, and 38th subframes every 40ms. Information bit payload is available if uplink subframe is scheduled. | | | | | | | |

**Table A.2.2.1.2-1b: Reference Channels for 16-QAM with maximum RB allocation for UE category M1**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 5 | 5 | 5 | 5 | 5 | 5 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size | Bits | 872 | 872 | 872 | 872 | 872 | 872 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 2880 | 2880 | 2880 | 2880 | 2880 | 2880 |
| Total symbols per Sub-Frame | | 720 | 720 | 720 | 720 | 720 | 720 |
| UE Category | | M1 | M1 | M1 | M1 | M1 | M1 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>NOTE 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6th subframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD UE, the uplink subframes are scheduled at the 5th, 6th, and 7th subframes every 10ms for the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled. | | | | | | | |

**Table A.2.2.1.2-1c: Reference Channels for 16-QAM with maximum RB allocation for UE UL category M2**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 12 | 24 | 24 | 24 | 24 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size | Bits | 1032 | 2088 | 4264 | 4264 | 4264 | 4264 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 3456 | 6912 | 13824 | 13824 | 13824 | 13824 |
| Total symbols per Sub-Frame | | 864 | 1728 | 3456 | 3456 | 3456 | 3456 |
| UE Category | | M2 | M2 | M2 | M2 | M2 | M2 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).<br>NOTE 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6th subframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD UE, the uplink subframes are scheduled at the 5th, 6th and 7th subframes every 10ms for the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled. | | | | | | | |

### A.2.2.1.3 64-QAM

**Table A.2.2.1.3-1: Reference Channels for 64-QAM with full RB allocation**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding rate | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Payload size | Bits | 3752 | 9528 | 15840 | 31704 | 46888 | 63776 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | 1 | 2 | 3 | 6 | 8 | 11 |
| Total number of bits per Sub-Frame | Bits | 5184 | 12960 | 21600 | 43200 | 64800 | 86400 |
| Total symbols per Sub-Frame | | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE Category (Note 2) | | 5,8 | 5,8 | 5,8 | 5,8 | 5,8 | 5,8 |
| UE UL Category (Note 2) | | 5, 8, 13, 14 | 5, 8, 13, 14 | 5, 8, 13, 14 | 5, 8, 13, 14 | 5, 8, 13, 14 | 5, 8, 13, 14 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note2: If UE does not report UE UL category, then the applicability of reference channel is determined by UE category. If UE reports UE UL category, then the applicability of reference channel is determined by UE UL category. | | | | | | | |

### A.2.2.1.4 256 QAM

**Table A.2.2.1.4-1: Reference Channels for 256 QAM with full RB allocation**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM |
| Target Coding rate | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Payload size | Bits | 5160 | 12960 | 21384 | 42368 | 63776 | 84760 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | 1 | 3 | 4 | 8 | 11 | 15 |
| Total number of bits per Sub-Frame | Bits | 6912 | 17280 | 28800 | 57600 | 86400 | 115200 |
| Total symbols per Sub-Frame | | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE UL Category | | ≥ 15 | ≥ 15 | ≥ 15 | ≥ 15 | ≥ 15 | ≥ 15 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | |

## A.2.2.2 Partial RB allocation

For each channel bandwidth, various partial RB allocations are specified. The number of allocated RBs is chosen according to values specified in the Tx and Rx requirements. The single allocated RB case is included.

The allocated RBs are contiguous and start from one end of the channel bandwidth. A single allocated RB is at one end of the channel bandwidth.

### A.2.2.2.1 QPSK

**Table A.2.2.2.1-1: Reference Channels for QPSK with partial RB allocation**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | Bits | Bits | | Bits | | |
| | 1.4 - 20 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | ≥ 1 |
| | 1.4 - 20 | 2 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | ≥ 1 |
| | 1.4 - 20 | 3 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | ≥ 1 |
| | 1.4 - 20 | 4 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | ≥ 1 |
| | 1.4 - 20 | 5 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | ≥ 1 |
| | 3-20 | 6 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | ≥ 1 |
| | 3-20 | 8 | 12 | QPSK | 1/3 | 808 | 24 | 1 | 2304 | 1152 | ≥ 1 |
| | 3-20 | 9 | 12 | QPSK | 1/3 | 776 | 24 | 1 | 2592 | 1296 | ≥ 1 |
| | 3-20 | 10 | 12 | QPSK | 1/3 | 872 | 24 | 1 | 2880 | 1440 | ≥ 1 |
| | 3-20 | 12 | 12 | QPSK | 1/3 | 1224 | 24 | 1 | 3456 | 1728 | ≥ 1 |
| | 5-20 | 15 | 12 | QPSK | 1/3 | 1320 | 24 | 1 | 4320 | 2160 | ≥ 1 |
| | 5-20 | 16 | 12 | QPSK | 1/3 | 1384 | 24 | 1 | 4608 | 2304 | ≥ 1 |
| | 5-20 | 18 | 12 | QPSK | 1/3 | 1864 | 24 | 1 | 5184 | 2592 | ≥ 1 |
| | 5-20 | 20 | 12 | QPSK | 1/3 | 1736 | 24 | 1 | 5760 | 2880 | ≥ 1 |
| | 5-20 | 24 | 12 | QPSK | 1/3 | 2472 | 24 | 1 | 6912 | 3456 | ≥ 1 |
| | 10-20 | 25 | 12 | QPSK | 1/3 | 2216 | 24 | 1 | 7200 | 3600 | ≥ 1 |
| | 10-20 | 27 | 12 | QPSK | 1/3 | 2792 | 24 | 1 | 7776 | 3888 | ≥ 1 |
| | 10-20 | 30 | 12 | QPSK | 1/3 | 2664 | 24 | 1 | 8640 | 4320 | ≥ 1 |
| | 10-20 | 32 | 12 | QPSK | 1/3 | 2792 | 24 | 1 | 9216 | 4608 | ≥ 1 |
| | 10-20 | 36 | 12 | QPSK | 1/3 | 3752 | 24 | 1 | 10368 | 5184 | ≥ 1 |
| | 10-20 | 40 | 12 | QPSK | 1/3 | 4136 | 24 | 1 | 11520 | 5760 | ≥ 1 |
| | 10-20 | 45 | 12 | QPSK | 1/3 | 4008 | 24 | 1 | 12960 | 6480 | ≥ 1 |
| | 10-20 | 48 | 12 | QPSK | 1/3 | 4264 | 24 | 1 | 13824 | 6912 | ≥ 1 |
| | 15 - 20 | 50 | 12 | QPSK | 1/3 | 5160 | 24 | 1 | 14400 | 7200 | ≥ 1 |
| | 15 - 20 | 54 | 12 | QPSK | 1/3 | 4776 | 24 | 1 | 15552 | 7776 | ≥ 1 |
| | 15 - 20 | 60 | 12 | QPSK | 1/4 | 4264 | 24 | 1 | 17280 | 8640 | ≥ 1 |
| | 15 - 20 | 64 | 12 | QPSK | 1/4 | 4584 | 24 | 1 | 18432 | 9216 | ≥ 1 |
| | 15 - 20 | 72 | 12 | QPSK | 1/4 | 5160 | 24 | 1 | 20736 | 10368 | ≥ 1 |
| | 20 | 75 | 12 | QPSK | 1/5 | 4392 | 24 | 1 | 21600 | 10800 | ≥ 1 |
| | 20 | 80 | 12 | QPSK | 1/5 | 4776 | 24 | 1 | 23040 | 11520 | ≥ 1 |
| | 20 | 81 | 12 | QPSK | 1/5 | 4776 | 24 | 1 | 23328 | 11664 | ≥ 1 |
| | 20 | 90 | 12 | QPSK | 1/6 | 4008 | 24 | 1 | 25920 | 12960 | ≥ 1 |
| | 20 | 96 | 12 | QPSK | 1/6 | 4264 | 24 | 1 | 27648 | 13824 | ≥ 1 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | |

**Table A.2.2.2.1-1a: Reference Channels for QPSK with partial RB allocation for UE category 0**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Trans-port block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | Bits | Bits | | Bits | | |
| | 1.4 - 20 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | 0 |
| | 1.4 - 20 | 2 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | 0 |
| | 1.4 - 20 | 3 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | 0 |
| | 1.4 - 20 | 4 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | 0 |
| | 1.4 - 20 | 5 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | 0 |
| | 3-20 | 6 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | 0 |
| | 3-20 | 8 | 12 | QPSK | 1/3 | 808 | 24 | 1 | 2304 | 1152 | 0 |
| | 3-20 | 9 | 12 | QPSK | 1/3 | 776 | 24 | 1 | 2592 | 1296 | 0 |
| | 3-20 | 10 | 12 | QPSK | 1/3 | 872 | 24 | 1 | 2880 | 1440 | 0 |
| | 3-20 | 12 | 12 | QPSK | 1/4 | 840 | 24 | 1 | 3456 | 1728 | 0 |
| | 5-20 | 15 | 12 | QPSK | 1/5 | 872 | 24 | 1 | 4320 | 2160 | 0 |
| | 5-20 | 16 | 12 | QPSK | 1/5 | 904 | 24 | 1 | 4608 | 2304 | 0 |
| | 5-20 | 18 | 12 | QPSK | 1/6 | 776 | 24 | 1 | 5184 | 2592 | 0 |
| | 5-20 | 20 | 12 | QPSK | 1/6 | 872 | 24 | 1 | 5760 | 2880 | 0 |
| | 5-20 | 24 | 12 | QPSK | 1/8 | 872 | 24 | 1 | 6912 | 3456 | 0 |
| | 10-20 | 25 | 12 | QPSK | 1/8 | 904 | 24 | 1 | 7200 | 3600 | 0 |
| | 10-20 | 27 | 12 | QPSK | 1/8 | 968 | 24 | 1 | 7776 | 3888 | 0 |
| | 10-20 | 30 | 12 | QPSK | 1/10 | 808 | 24 | 1 | 8640 | 4320 | 0 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th, 6th, 12th, 13th, 14th, 20th, 21st, 22nd, 28th, 29th, 30th, 36th, 37th, and 38th subframes every 40ms. Information bit payload is available if uplink subframe is scheduled.

**Table A.2.2.2.1-1b: Reference Channels for QK with partial RB allocation for UE category M1**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Trans-port block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | Bits | Bits | | Bits | | |
| | 1.4 - 20 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | M1 |
| | 1.4 - 20 | 2 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | M1 |
| | 1.4 - 20 | 3 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | M1 |
| | 1.4 - 20 | 4 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | M1 |
| | 1.4 - 20 | 5 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | M1 |
| | 3-20 | 6 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | M1 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6thsubframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD UE, the uplink subframes are scheduled at the 5th, 6th, and 7th subframes every 10ms for the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled.

**Table A.2.2.2.1-1c: Reference Channels for QPSK with partial RB allocation for UE UL category M2**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Trans-port block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | Bits | Bits | | Bits | | |
| | 1.4 - 20 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | M2 |
| | 1.4 - 20 | 2 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | M2 |
| | 1.4 - 20 | 3 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | M2 |
| | 1.4 - 20 | 4 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | M2 |
| | 1.4 - 20 | 5 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | M2 |
| | 3-20 | 6 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | M2 |
| | 3-20 | 9 | 12 | QPSK | 1/3 | 776 | 24 | 1 | 2592 | 1296 | M2 |
| | 3-20 | 12 | 12 | QPSK | 1/3 | 1032 | 24 | 1 | 3456 | 1728 | M2 |
| | 5-20 | 15 | 12 | QPSK | 1/3 | 1320 | 24 | 1 | 4320 | 2160 | M2 |
| | 5-20 | 18 | 12 | QPSK | 1/3 | 1864 | 24 | 1 | 5184 | 2592 | M2 |
| | 5-20 | 21 | 12 | QPSK | 1/3 | 2216 | 24 | 1 | 6068 | 3024 | M2 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6th subframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD UE, the uplink subframes are scheduled at the 5th, 6th and 7th subframes every 10ms for the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled.

### A.2.2.2.2 16-QAM

**Table A.2.2.2.2-1: Reference Channels for 16-QAM with partial RB allocation**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | Bits | Bits | | Bits | | |
| | 1.4 - 20 | 1 | 12 | 16QAM | 3/4 | 408 | 24 | 1 | 576 | 144 | ≥ 1 |
| | 1.4 - 20 | 2 | 12 | 16QAM | 3/4 | 840 | 24 | 1 | 1152 | 288 | ≥ 1 |
| | 1.4 - 20 | 3 | 12 | 16QAM | 3/4 | 1288 | 24 | 1 | 1728 | 432 | ≥ 1 |
| | 1.4 - 20 | 4 | 12 | 16QAM | 3/4 | 1736 | 24 | 1 | 2304 | 576 | ≥ 1 |
| | 1.4 - 20 | 5 | 12 | 16QAM | 3/4 | 2152 | 24 | 1 | 2880 | 720 | ≥ 1 |
| | 3-20 | 6 | 12 | 16QAM | 3/4 | 2600 | 24 | 1 | 3456 | 864 | ≥ 1 |
| | 3-20 | 8 | 12 | 16QAM | 3/4 | 3496 | 24 | 1 | 4608 | 1152 | ≥ 1 |
| | 3-20 | 9 | 12 | 16QAM | 3/4 | 3880 | 24 | 1 | 5184 | 1296 | ≥ 1 |
| | 3-20 | 10 | 12 | 16QAM | 3/4 | 4264 | 24 | 1 | 5760 | 1440 | ≥ 1 |
| | 3-20 | 12 | 12 | 16QAM | 3/4 | 5160 | 24 | 1 | 6912 | 1728 | ≥ 1 |
| | 5-20 | 15 | 12 | 16QAM | 1/2 | 4264 | 24 | 1 | 8640 | 2160 | ≥ 1 |
| | 5-20 | 16 | 12 | 16QAM | 1/2 | 4584 | 24 | 1 | 9216 | 2304 | ≥ 1 |
| | 5-20 | 18 | 12 | 16QAM | 1/2 | 5160 | 24 | 1 | 10368 | 2592 | ≥ 1 |
| | 5-20 | 20 | 12 | 16QAM | 1/3 | 4008 | 24 | 1 | 11520 | 2880 | ≥ 1 |
| | 5-20 | 24 | 12 | 16QAM | 1/3 | 4776 | 24 | 1 | 13824 | 3456 | ≥ 1 |
| | 10-20 | 25 | 12 | 16QAM | 1/3 | 4968 | 24 | 1 | 14400 | 3600 | ≥ 1 |
| | 10-20 | 27 | 12 | 16QAM | 1/3 | 4776 | 24 | 1 | 15552 | 3888 | ≥ 1 |
| | 10-20 | 30 | 12 | 16QAM | 3/4 | 12960 | 24 | 3 | 17280 | 4320 | ≥ 2 |
| | 10-20 | 32 | 12 | 16QAM | 3/4 | 13536 | 24 | 3 | 18432 | 4608 | ≥ 2 |
| | 10-20 | 36 | 12 | 16QAM | 3/4 | 15264 | 24 | 3 | 20736 | 5184 | ≥ 2 |
| | 10-20 | 40 | 12 | 16QAM | 3/4 | 16992 | 24 | 3 | 23040 | 5760 | ≥ 2 |
| | 10-20 | 45 | 12 | 16QAM | 3/4 | 19080 | 24 | 4 | 25920 | 6480 | ≥ 2 |
| | 10-20 | 48 | 12 | 16QAM | 3/4 | 20616 | 24 | 4 | 27648 | 6912 | ≥ 2 |
| | 15 - 20 | 50 | 12 | 16QAM | 3/4 | 21384 | 24 | 4 | 28800 | 7200 | ≥ 2 |
| | 15 - 20 | 54 | 12 | 16QAM | 3/4 | 22920 | 24 | 4 | 31104 | 7776 | ≥ 2 |
| | 15 - 20 | 60 | 12 | 16QAM | 2/3 | 23688 | 24 | 4 | 34560 | 8640 | ≥ 2 |
| | 15 - 20 | 64 | 12 | 16QA | 2/3 | 25456 | 24 | 4 | 36864 | 9216 | ≥ 2 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | M | | | | | | | |
| | 15 - 20 | 72 | 12 | 16QAM | 1/2 | 20616 | 24 | 4 | 41472 | 10368 | ≥ 2 |
| | 20 | 75 | 12 | 16QAM | 1/2 | 21384 | 24 | 4 | 43200 | 10800 | ≥ 2 |
| | 20 | 80 | 12 | 16QAM | 1/2 | 22920 | 24 | 4 | 46080 | 11520 | ≥ 2 |
| | 20 | 81 | 12 | 16QAM | 1/2 | 22920 | 24 | 4 | 46656 | 11664 | ≥ 2 |
| | 20 | 90 | 12 | 16QAM | 2/5 | 20616 | 24 | 4 | 51840 | 12960 | ≥ 2 |
| | 20 | 96 | 12 | 16QAM | 2/5 | 22152 | 24 | 4 | 55296 | 13824 | ≥ 2 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | |

**Table A.2.2.2.2-1a: Reference Channels for 16-QAM with partial RB allocation for UE category 0**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit** | **MHz** | | | | | **Bits** | **Bits** | | **Bits** | | |
| | 1.4 - 20 | 1 | 12 | 16QAM | 3/4 | 408 | 24 | 1 | 576 | 144 | 0 |
| | 1.4 - 20 | 2 | 12 | 16QAM | 3/4 | 840 | 24 | 1 | 1152 | 288 | 0 |
| | 1.4 - 20 | 4 | 12 | 16QAM | 2/5 | 904 | 24 | 1 | 2304 | 576 | 0 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).<br>Note 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th, 6th, 12th, 13th, 14th, 20th, 21st, 22nd, 28th, 29th, 30th, 36th, 37th, and 38th subframes every 40ms. Information bit payload is available if uplink subframe is scheduled. | | | | | | | | | | | |

**Table A.2.2.2.2-1b: Reference Channels for 16-QAM with partial RB allocation for UE category M1**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit** | **MHz** | | | | | **Bits** | **Bits** | | **Bits** | | |
| | 1.4 - 20 | 1 | 12 | 16QAM | 1/2 | 256 | 24 | 1 | 576 | 144 | M1 |
| | 1.4 - 20 | 2 | 12 | 16QAM | 1/2 | 552 | 24 | 1 | 1152 | 288 | M1 |
| | 1.4 - 20 | 3 | 12 | 16QAM | 1/2 | 840 | 24 | 1 | 1728 | 432 | M1 |
| | 1.4 - 20 | 4 | 12 | 16QAM | 2/5 | 904 | 24 | 1 | 2304 | 576 | M1 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).<br>Note 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6thsubframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD UE, the uplink subframes are scheduled at the 5th, 6th, and 7th subframes every 10ms for the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled. | | | | | | | | | | | |

**Table A.2.2.2.2-1c: Reference Channels for 16-QAM with partial RB allocation for UE UL category M2**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit** | **MHz** | | | | | **Bits** | **Bits** | | **Bits** | | |
| | 1.4 - 20 | 1 | 12 | 16QAM | 1/2 | 256 | 24 | 1 | 576 | 144 | M2 |
| | 1.4 - 20 | 2 | 12 | 16QAM | 1/2 | 552 | 24 | 1 | 1152 | 288 | M2 |
| | 1.4 - 20 | 3 | 12 | 16QAM | 1/2 | 840 | 24 | 1 | 1728 | 432 | M2 |
| | 1.4 - 20 | 4 | 12 | 16QAM | 1/2 | 1128 | 24 | 1 | 2304 | 576 | M2 |
| | 1.4 - 20 | 5 | 12 | 16QAM | 1/2 | 1416 | 24 | 1 | 2880 | 720 | M2 |
| | 3 - 20 | 6 | 12 | 16QAM | 1/2 | 1736 | 24 | 1 | 3456 | 864 | M2 |
| | 3 - 20 | 9 | 12 | 16QAM | 1/2 | 2600 | 24 | 1 | 5184 | 1296 | M2 |
| | 3 - 20 | 12 | 12 | 16QAM | 1/2 | 3496 | 24 | 1 | 6912 | 1728 | M2 |
| | 5 - 20 | 15 | 12 | 16QAM | 1/2 | 4264 | 24 | 1 | 8640 | 2160 | M2 |
| | 5 - 20 | 18 | 12 | 16QAM | 1/2 | 5160 | 24 | 1 | 10368 | 2592 | M2 |
| | 5 - 20 | 21 | 12 | 16QAM | 1/2 | 5992 | 24 | 1 | 12096 | 3024 | M2 |
| | 5 - 20 | 24 | 12 | 16QAM | 1/2 | 6968 | 24 | 2 | 13824 | 3456 | M2 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th and 6th subframes every 10ms for the channel bandwidth 5MHz/10MHz/15MHz/20MHz. For HD-FDD , the uplink subframes are scheduled at the 5th, 6th, and 7th subframes every 10msfor the channel bandwidth 1.4MHz/3MHz. Information bit payload is available if uplink subframe is scheduled.

### A.2.2.2.3 64-QAM

**Table A.2.2.2.3-1: Reference Channels for 64-QAM with partial RB allocation**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Trans-port block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category (Note 2) | UE UL Category (Note 2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | Bits | Bits | | Bits | | | |
| | 1.4 - 20 | 1 | 12 | 64QAM | 3/4 | 616 | 24 | 1 | 864 | 144 | 5,8 | 5, 8, 13, 14 |
| | 1.4 - 20 | 2 | 12 | 64QAM | 3/4 | 1256 | 24 | 1 | 1728 | 288 | 5,8 | 5, 8, 13, 14 |
| | 1.4 - 20 | 3 | 12 | 64QAM | 3/4 | 1864 | 24 | 1 | 2592 | 432 | 5,8 | 5, 8, 13, 14 |
| | 1.4 - 20 | 4 | 12 | 64QAM | 3/4 | 2536 | 24 | 1 | 3456 | 576 | 5,8 | 5, 8, 13, 14 |
| | 1.4 - 20 | 5 | 12 | 64QAM | 3/4 | 3112 | 24 | 1 | 4320 | 720 | 5,8 | 5, 8, 13, 14 |
| | 3-20 | 6 | 12 | 64QAM | 3/4 | 3752 | 24 | 1 | 5184 | 864 | 5,8 | 5, 8, 13, 14 |
| | 3-20 | 8 | 12 | 64QAM | 3/4 | 5160 | 24 | 1 | 6912 | 1152 | 5,8 | 5, 8, 13, 14 |
| | 3-20 | 9 | 12 | 64QAM | 3/4 | 5736 | 24 | 1 | 7776 | 1296 | 5,8 | 5, 8, 13, 14 |
| | 3-20 | 10 | 12 | 64QAM | 3/4 | 6200 | 24 | 2 | 8640 | 1440 | 5,8 | 5, 8, 13, 14 |
| | 3-20 | 12 | 12 | 64QAM | 3/4 | 7480 | 24 | 2 | 10368 | 1728 | 5,8 | 5, 8, 13, 14 |
| | 5-20 | 15 | 12 | 64QAM | 3/4 | 9528 | 24 | 2 | 12960 | 2160 | 5,8 | 5, 8, 13, 14 |
| | 5-20 | 16 | 12 | 64QAM | 3/4 | 10296 | 24 | 2 | 13824 | 2304 | 5,8 | 5, 8, 13, 14 |
| | 5-20 | 18 | 12 | 64QAM | 3/4 | 11448 | 24 | 2 | 15552 | 2592 | 5,8 | 5, 8, 13, 14 |
| | 5-20 | 20 | 12 | 64QAM | 3/4 | 12576 | 24 | 3 | 17280 | 2880 | 5,8 | 5, 8, 13, 14 |
| | 5-20 | 24 | 12 | 64QAM | 3/4 | 15264 | 24 | 3 | 20736 | 3456 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 25 | 12 | 64QAM | 3/4 | 15840 | 24 | 3 | 21600 | 3600 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 27 | 12 | 64QAM | 3/4 | 16992 | 24 | 3 | 23328 | 3888 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 30 | 12 | 64QAM | 3/4 | 19080 | 24 | 4 | 25920 | 4320 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 32 | 12 | 64QAM | 3/4 | 20616 | 24 | 4 | 27648 | 4608 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 36 | 12 | 64QAM | 3/4 | 22920 | 24 | 4 | 31104 | 5184 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 40 | 12 | 64QAM | 3/4 | 25456 | 24 | 5 | 34560 | 5760 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 45 | 12 | 64QAM | 3/4 | 28336 | 24 | 5 | 38880 | 6480 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 48 | 12 | 64QAM | 3/4 | 30576 | 24 | 5 | 41472 | 6912 | 5,8 | 5, 8, 13, 14 |
| | 15 - 20 | 50 | 12 | 64QAM | 3/4 | 31704 | 24 | 6 | 43200 | 7200 | 5,8 | 5, 8, 13, 14 |
| | 15 - 20 | 54 | 12 | 64QAM | 3/4 | 34008 | 24 | 6 | 46656 | 7776 | 5,8 | 5, 8, 13, 14 |
| | 15 - 20 | 60 | 12 | 64QAM | 3/4 | 37888 | 24 | 7 | 51840 | 8640 | 5,8 | 5, 8, 13, 14 |
| | 15 - 20 | 64 | 12 | 64QAM | 3/4 | 40576 | 24 | 7 | 55296 | 9216 | 5,8 | 5, 8, 13, 14 |
| | 15 - 20 | 72 | 12 | 64QAM | 3/4 | 45352 | 24 | 8 | 62208 | 10368 | 5,8 | 5, 8, 13, 14 |
| | 20 | 75 | 12 | 64QAM | 3/4 | 46888 | 24 | 8 | 64800 | 10800 | 5,8 | 5, 8, 13, 14 |
| | 20 | 80 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 69120 | 11520 | 5,8 | 5, 8, 13, 14 |
| | 20 | 81 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 69984 | 11664 | 5,8 | 5, 8, 13, 14 |
| | 20 | 90 | 12 | 64QAM | 2/3 | 51024 | 24 | 9 | 77760 | 12960 | 5,8 | 5, 8, 13, |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 14 |
| | 20 | 96 | 12 | 64QAM | 3/4 | 61664 | 24 | 11 | 82944 | 13824 | 5,8 | 5, 8, 13, 14 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | | |
| Note2： If UE does not report UE UL category, then the applicability of reference channel is determined by UE category. If UE reports UE UL category, then the applicability of reference channel is determined by UE UL category. | | | | | | | | | | | | |

### A.2.2.2.4 256 QAM

**Table A.2.2.2.4-1: Reference Channels for 256 QAM with partial RB allocation**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE UL Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | Bits | Bits | | Bits | | |
| | 1.4 - 20 | 1 | 12 | 256QAM | 3/4 | 840 | 24 | 1 | 1152 | 144 | ≥ 15 |
| | 1.4 - 20 | 2 | 12 | 256QAM | 3/4 | 1672 | 24 | 1 | 2304 | 288 | ≥ 15 |
| | 1.4 - 20 | 3 | 12 | 256QAM | 3/4 | 2536 | 24 | 1 | 3456 | 432 | ≥ 15 |
| | 1.4 - 20 | 4 | 12 | 256QAM | 3/4 | 3368 | 24 | 1 | 4608 | 576 | ≥ 15 |
| | 1.4 - 20 | 5 | 12 | 256QAM | 3/4 | 4264 | 24 | 1 | 5760 | 720 | ≥ 15 |
| | 3-20 | 6 | 12 | 256QAM | 3/4 | 5160 | 24 | 1 | 6912 | 864 | ≥ 15 |
| | 3-20 | 8 | 12 | 256QAM | 3/4 | 6712 | 24 | 2 | 9216 | 1152 | ≥ 15 |
| | 3-20 | 9 | 12 | 256QAM | 3/4 | 7736 | 24 | 2 | 10368 | 1296 | ≥ 15 |
| | 3-20 | 10 | 12 | 256QAM | 3/4 | 8504 | 24 | 2 | 11520 | 1440 | ≥ 15 |
| | 3-20 | 12 | 12 | 256QAM | 3/4 | 10296 | 24 | 2 | 13824 | 1728 | ≥ 15 |
| | 5-20 | 15 | 12 | 256QAM | 3/4 | 12960 | 24 | 3 | 17280 | 2160 | ≥ 15 |
| | 5-20 | 16 | 12 | 256QAM | 3/4 | 13536 | 24 | 3 | 18432 | 2304 | ≥ 15 |
| | 5-20 | 18 | 12 | 256QAM | 3/4 | 15264 | 24 | 3 | 20736 | 2592 | ≥ 15 |
| | 5-20 | 20 | 12 | 256QAM | 3/4 | 16992 | 24 | 3 | 23040 | 2880 | ≥ 15 |
| | 5-20 | 24 | 12 | 256QAM | 3/4 | 20616 | 24 | 4 | 27648 | 3456 | ≥ 15 |
| | 10-20 | 25 | 12 | 256QAM | 3/4 | 21384 | 24 | 4 | 28800 | 3600 | ≥ 15 |
| | 10-20 | 27 | 12 | 256QAM | 3/4 | 22920 | 24 | 4 | 31104 | 3888 | ≥ 15 |
| | 10-20 | 30 | 12 | 256QAM | 3/4 | 25456 | 24 | 5 | 34560 | 4320 | ≥ 15 |
| | 10-20 | 32 | 12 | 256QAM | 3/4 | 27376 | 24 | 5 | 36864 | 4608 | ≥ 15 |
| | 10-20 | 36 | 12 | 256QAM | 3/4 | 30576 | 24 | 6 | 41472 | 5184 | ≥ 15 |
| | 10-20 | 40 | 12 | 256QAM | 3/4 | 34008 | 24 | 6 | 46080 | 5760 | ≥ 15 |
| | 10-20 | 45 | 12 | 256QAM | 3/4 | 37888 | 24 | 7 | 51840 | 6480 | ≥ 15 |
| | 10-20 | 48 | 12 | 256QAM | 3/4 | 40576 | 24 | 8 | 55296 | 6912 | ≥ 15 |
| | 15 - 20 | 50 | 12 | 256QAM | 3/4 | 42368 | 24 | 8 | 57600 | 7200 | ≥ 15 |
| | 15 - 20 | 54 | 12 | 256QAM | 3/4 | 46888 | 24 | 8 | 62208 | 7776 | ≥ 15 |
| | 15 - 20 | 60 | 12 | 256QAM | 3/4 | 51024 | 24 | 9 | 69120 | 8640 | ≥ 15 |
| | 15 - 20 | 64 | 12 | 256QAM | 3/4 | 55056 | 24 | 9 | 73728 | 9216 | ≥ 15 |
| | 15 - 20 | 72 | 12 | 256QAM | 3/4 | 61664 | 24 | 11 | 82944 | 10368 | ≥ 15 |
| | 20 | 75 | 12 | 256QAM | 3/4 | 63776 | 24 | 11 | 86400 | 10800 | ≥ 15 |
| | 20 | 80 | 12 | 256QAM | 3/4 | 68808 | 24 | 12 | 92160 | 11520 | ≥ 15 |
| | 20 | 81 | 12 | 256QAM | 3/4 | 68808 | 24 | 12 | 93312 | 11664 | ≥ 15 |
| | 20 | 90 | 12 | 256QAM | 3/4 | 76208 | 24 | 13 | 103680 | 12960 | ≥ 15 |
| | 20 | 96 | 12 | 256QAM | 3/4 | 81176 | 24 | 14 | 110592 | 13824 | ≥ 15 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | | | | | |

### A.2.2.3 Reference measurement channels for sustained downlink data rate provided by lower layers

**Table A.2.2.3-1: Uplink Reference Channels for sustained data-rate test (FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference Channel | | R.1-1 FDD | R.1-2 FDD | R.1-3 FDD | R.1-3A FDD | R.1-4 FDD | R.1-4B FDD |
| Channel Bandwidth | MHz | 10 | 10 | 20 | 10 | 20 | 15 |
| Allocated Resource Blocks | | 40 (Note 2) | 40 (Note 2) | 90 (Note 3) | 40(Note 2) | 90 (Note 3) | 60 (Note 4) |
| Allocated Sub-Frames per Radio-Frame | | 10 | 10 | 10 | 10 | 10 | 10 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Coding Rate | | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 |
| Information Bit Payload per Sub-Frame | Bits | 3496 | 3496 | 7992 | 3496 | 7992 | 5352 |
| Number of Code Blocks per Sub-Frame (Note 1) | | 1 | 1 | 2 | 1 | 2 | 2 |
| Modulation Symbols per Sub-Frame | | 5760 | 5760 | 12960 | 5760 | 12960 | 5760 |
| Binary Channel Bits per Sub-Frame | | 11520 | 11520 | 25920 | 11520 | 25920 | 17260 |
| Max Throughput over 1 Radio-Frame | Mbps | 3.496 | 3.496 | 7.992 | 3.496 | 7.992 | 5.352 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 2 | ≥ 1 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note 2: RB-s 5-44 allocated with PUSCH.<br>Note 3: RB-s 5-94 allocated with PUSCH.<br>Note 4: RB-s 7-66 allocated with PUSCH. | | | | | | | |

## A.2.3 Reference measurement channels for TDD

For TDD the measurement channel is based on DL/UL configuration ratio of 2DL:2UL or 1DL:4UL. 2DL:2UL is the default and used unless explicitly specified in test case.

## A.2.3.1 Full RB allocation

### A.2.3.1.1 QPSK

**Table A.2.3.1.1-1: Reference Channels for QPSK with full RB allocation**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (Note 2) | | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/5 | 1/6 |
| Payload size | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 600 | 1544 | 2216 | 5160 | 4392 | 4584 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 1728 | 4320 | 7200 | 14400 | 21600 | 28800 |
| Total symbols per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | |

**Table A.2.3.1.1-1A: Reference Channels for QPSK with full RB allocation, UL-DL configuration 0**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (Note 2) | | 0 | 0 | 0 | 0 | 0 | 0 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/5 | 1/6 |
| Payload size | | | | | | | |
| For Sub-Frame 2,3,4,7,8,9 | Bits | 600 | 1544 | 2216 | 5160 | 4392 | 4584 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,4,7,8,9 | Bits | 1728 | 4320 | 7200 | 14400 | 21600 | 28800 |
| Total symbols per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,4,7,8,9 | | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | |

**Table A.2.3.1.1-1a: Reference Channels for QPSK with full/maximum RB allocation for UE UL category 0**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | [36] | [36] | [36] |
| Uplink-Downlink Configuration (Note 2) | | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding rate | | 1/3 | 1/5 | 1/8 | [1/10] | [1/10] | [1/10] |
| Payload size | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 600 | 872 | 904 | [1000] | [1000] | [1000] |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 1728 | 4320 | 7200 | [10368] | [10368] | [10368] |
| Total symbols per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 864 | 2160 | 3600 | [5184] | [5184] | [5184] |
| UE Category | | 0 | 0 | 0 | 0 | 0 | 0 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>NOTE 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | |

**Table A.2.3.1.1-1b: Reference Channels for QPSK with full/maximum RB allocation for UE UL category M1**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 6 | 6 | 6 | 6 | 6 |
| Uplink-Downlink Configuration (Note 2) | | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 600 | 600 | 600 | 600 | 600 | 600 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 1728 | 1728 | 1728 | 1728 | 1728 | 1728 |
| Total symbols per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 864 | 864 | 864 | 864 | 864 | 864 |
| UE Category | | M1 | M1 | M1 | M1 | M1 | M1 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>NOTE 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | |

**Table A.2.3.1.1-1c: Reference Channels for QPSK with full/maximum RB allocation for UE UL category M2**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 12 | 24 | 24 | 24 | 24 |
| Uplink-Downlink Configuration (Note 2) | | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 600 | 1224 | 2472 | 2472 | 2472 | 2472 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 1728 | 3456 | 6912 | 6912 | 6912 | 6912 |
| Total symbols per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 864 | 1728 | 3456 | 3456 | 3456 | 3456 |
| UE UL Category | | M2 | M2 | M2 | M2 | M2 | M2 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>NOTE 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | |

## A.2.3.1.2 16-QAM

**Table A.2.3.1.2-1: Reference Channels for 16-QAM with full RB allocation**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (Note 2) | | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate | | 3/4 | 1/2 | 1/3 | 3/4 | 1/2 | 1/3 |
| Payload size | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 2600 | 4264 | 4968 | 21384 | 21384 | 19848 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks - C | | 1 | 1 | 1 | 4 | 4 | 4 |
| Total number of bits per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 3456 | 8640 | 14400 | 28800 | 43200 | 57600 |
| Total symbols per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | |

**Table A.2.3.1.2-1A: Reference Channels for 16-QAM with full RB allocation, UL-DL configuration 0**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (Note 2) | | 0 | 0 | 0 | 0 | 0 | 0 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate | | 3/4 | 1/2 | 1/3 | 3/4 | 1/2 | 1/3 |
| Payload size | | | | | | | |
| For Sub-Frame 2,3,4,7,8,9 | Bits | 2600 | 4264 | 4968 | 21384 | 21384 | 19848 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks - C | | 1 | 1 | 1 | 4 | 4 | 4 |
| Total number of bits per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,4,7,8,9 | Bits | 3456 | 8640 | 14400 | 28800 | 43200 | 57600 |
| Total symbols per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,4,7,8,9 | | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | |

**Table A.2.3.1.2-1a: Reference Channels for 16-QAM with maximum RB allocation for UE UL category 0**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 5 | 5 | 5 | 5 | 5 | 5 |
| Uplink-Downlink Configuration (Note 2) | | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 872 | 872 | 872 | 872 | 872 | 872 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 2880 | 2880 | 2880 | 2880 | 2880 | 2880 |
| Total symbols per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 720 | 720 | 720 | 720 | 720 | 720 |
| UE Category | | 0 | 0 | 0 | 0 | 0 | 0 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>NOTE 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | |

**Table A.2.3.1.2-1b: Reference Channels for 16-QAM with maximum RB allocation for UE UL category M1**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 5 | 5 | 5 | 5 | 5 | 5 |
| Uplink-Downlink Configuration (Note 2) | | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 872 | 872 | 872 | 872 | 872 | 872 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 2880 | 2880 | 2880 | 2880 | 2880 | 2880 |
| Total symbols per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 720 | 720 | 720 | 720 | 720 | 720 |
| UE Category | | M1 | M1 | M1 | M1 | M1 | M1 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>NOTE 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | |

**Table A.2.3.1.2-1c: Reference Channels for 16-QAM with maximum RB allocation for UE UL category M2**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 12 | 24 | 24 | 24 | 24 |
| Uplink-Downlink Configuration (Note 2) | | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Payload size | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 1032 | 2088 | 4264 | 4264 | 4264 | 4264 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 3456 | 6912 | 13824 | 13824 | 13824 | 13824 |
| Total symbols per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 864 | 1728 | 3456 | 3456 | 3456 | 3456 |
| UE Category | | M2 | M2 | M2 | M2 | M2 | M2 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>NOTE 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | |

### A.2.3.1.3 64-QAM

**Table A.2.3.1.3-1 Reference Channels for 64-QAM with full RB allocation**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (Note 2) | | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding rate | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Payload size | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 3752 | 9528 | 15840 | 31704 | 46888 | 63776 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 1 | 2 | 3 | 6 | 8 | 11 |
| Total number of bits per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 5184 | 12960 | 21600 | 43200 | 64800 | 86400 |
| Total symbols per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE Category (Note 3) | | 5,8 | 5,8 | 5,8 | 5,8 | 5,8 | 5,8 |
| UE UL Category (Note 3) | | 5, 8, 13, 14 | 5, 8, 13, 14 | 5, 8, 13, 14 | 5, 8, 13, 14 | 5, 8, 13, 14 | 5, 8, 13, 14 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 2: As per Table 4.2-2 in TS 36.211 [8]
Note 3: If UE does not report UE UL category, then the applicability of reference channel is determined by UE category. If UE reports UE UL category, then the applicability of reference channel is determined by UE UL category.

### A.2.3.1.4 256 QAM

**Table A.2.3.1.4-1: Reference Channels for 256 QAM with full RB allocation**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (Note 2) | | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM |
| Target Coding rate | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Payload size | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 5160 | 12960 | 21384 | 42368 | 63776 | 84760 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 1 | 3 | 4 | 8 | 11 | 15 |
| Total number of bits per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | Bits | 6912 | 17280 | 28800 | 57600 | 86400 | 115200 |
| Total symbols per Sub-Frame | | | | | | | |
| For Sub-Frame 2,3,7,8 | | 864 | 2160 | 3600 | 7200 | 10800 | 14400 |
| UE UL Category | | ≥ 15 | ≥ 15 | ≥ 15 | ≥ 15 | ≥ 15 | ≥ 15 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 2: As per Table 4.2-2 in TS 36.211 [8]

## A.2.3.2 Partial RB allocation

For each channel bandwidth, various partial RB allocations are specified. The number of allocated RBs is chosen according to values specified in the Tx and Rx requirements. The single allocated RB case is included.

The allocated RBs are contiguous and start from one end of the channel bandwidth. A single allocated RB is at one end of the channel bandwidth.

### A.2.3.2.1 QPSK

**Table A.2.3.2.1-1: Reference Channels for QPSK with partial RB allocation**

| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | | Bits | Bits | | Bits | | |
| | 1.4-20 | 1 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | ≥ 1 |
| | 1.4-20 | 2 | 1 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | ≥ 1 |
| | 1.4-20 | 3 | 1 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | ≥ 1 |
| | 1.4-20 | 4 | 1 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | ≥ 1 |
| | 1.4-20 | 5 | 1 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | ≥ 1 |
| | 3-20 | 6 | 1 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | ≥ 1 |
| | 3-20 | 8 | 1 | 12 | QPSK | 1/3 | 808 | 24 | 1 | 2304 | 1152 | ≥ 1 |
| | 3-20 | 9 | 1 | 12 | QPSK | 1/3 | 776 | 24 | 1 | 2592 | 1296 | ≥ 1 |
| | 3-20 | 10 | 1 | 12 | QPSK | 1/3 | 872 | 24 | 1 | 2880 | 1440 | ≥ 1 |
| | 3-20 | 12 | 1 | 12 | QPSK | 1/3 | 1224 | 24 | 1 | 3456 | 1728 | ≥ 1 |
| | 5-20 | 15 | 1 | 12 | QPSK | 1/3 | 1320 | 24 | 1 | 4320 | 2160 | ≥ 1 |
| | 5-20 | 16 | 1 | 12 | QPSK | 1/3 | 1384 | 24 | 1 | 4608 | 2304 | ≥ 1 |
| | 5-20 | 18 | 1 | 12 | QPSK | 1/3 | 1864 | 24 | 1 | 5184 | 2592 | ≥ 1 |
| | 5-20 | 20 | 1 | 12 | QPSK | 1/3 | 1736 | 24 | 1 | 5760 | 2880 | ≥ 1 |
| | 5-20 | 24 | 1 | 12 | QPSK | 1/3 | 2472 | 24 | 1 | 6912 | 3456 | ≥ 1 |
| | 10-20 | 25 | 1 | 12 | QPSK | 1/3 | 2216 | 24 | 1 | 7200 | 3600 | ≥ 1 |
| | 10-20 | 27 | 1 | 12 | QPSK | 1/3 | 2792 | 24 | 1 | 7776 | 3888 | ≥ 1 |
| | 10-20 | 30 | 1 | 12 | QPSK | 1/3 | 2664 | 24 | 1 | 8640 | 4320 | ≥ 1 |
| | 10-20 | 32 | 1 | 12 | QPSK | 1/3 | 2792 | 24 | 1 | 9216 | 4608 | ≥ 1 |
| | 10-20 | 36 | 1 | 12 | QPSK | 1/3 | 3752 | 24 | 1 | 10368 | 5184 | ≥ 1 |
| | 10-20 | 40 | 1 | 12 | QPSK | 1/3 | 4136 | 24 | 1 | 11520 | 5760 | ≥ 1 |
| | 10-20 | 45 | 1 | 12 | QPSK | 1/3 | 4008 | 24 | 1 | 12960 | 6480 | ≥ 1 |
| | 10-20 | 48 | 1 | 12 | QPSK | 1/3 | 4264 | 24 | 1 | 13824 | 6912 | ≥ 1 |
| | 15-20 | 50 | 1 | 12 | QPSK | 1/3 | 5160 | 24 | 1 | 14400 | 7200 | ≥ 1 |
| | 15-20 | 54 | 1 | 12 | QPSK | 1/3 | 4776 | 24 | 1 | 15552 | 7776 | ≥ 1 |
| | 15-20 | 60 | 1 | 12 | QPSK | 1/4 | 4264 | 24 | 1 | 17280 | 8640 | ≥ 1 |
| | 15-20 | 64 | 1 | 12 | QPSK | 1/4 | 4584 | 24 | 1 | 18432 | 9216 | ≥ 1 |
| | 15-20 | 72 | 1 | 12 | QPSK | 1/4 | 5160 | 24 | 1 | 20736 | 10368 | ≥ 1 |
| | 20 | 75 | 1 | 12 | QPSK | 1/5 | 4392 | 24 | 1 | 21600 | 10800 | ≥ 1 |
| | 20 | 80 | 1 | 12 | QPSK | 1/5 | 4776 | 24 | 1 | 23040 | 11520 | ≥ 1 |
| | 20 | 81 | 1 | 12 | QPSK | 1/5 | 4776 | 24 | 1 | 23328 | 11664 | ≥ 1 |
| | 20 | 90 | 1 | 12 | QPSK | 1/6 | 4008 | 24 | 1 | 25920 | 12960 | ≥ 1 |
| | 20 | 96 | 1 | 12 | QPSK | 1/6 | 4264 | 24 | 1 | 27648 | 13824 | ≥ 1 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 2: As per Table 4.2-2 in TS 36.211 [8]

**Table A.2.3.2.1-1A: Reference Channels for QPSK with partial RB allocation, UL-DL configuration 0**

| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 3, 4, 7, 8, 9 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 4, 7, 8, 9 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 4, 7, 8, 9 | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit** | **MHz** | | | | | | **Bits** | **Bits** | | **Bits** | | |
| | 1.4-20 | 1 | 0 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | ≥ 1 |
| | 1.4-20 | 2 | 0 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | ≥ 1 |
| | 1.4-20 | 3 | 0 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | ≥ 1 |
| | 1.4-20 | 4 | 0 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | ≥ 1 |
| | 1.4-20 | 5 | 0 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | ≥ 1 |
| | 3-20 | 6 | 0 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | ≥ 1 |
| | 3-20 | 8 | 0 | 12 | QPSK | 1/3 | 808 | 24 | 1 | 2304 | 1152 | ≥ 1 |
| | 3-20 | 9 | 0 | 12 | QPSK | 1/3 | 776 | 24 | 1 | 2592 | 1296 | ≥ 1 |
| | 3-20 | 10 | 0 | 12 | QPSK | 1/3 | 872 | 24 | 1 | 2880 | 1440 | ≥ 1 |
| | 3-20 | 12 | 0 | 12 | QPSK | 1/3 | 1224 | 24 | 1 | 3456 | 1728 | ≥ 1 |
| | 5-20 | 15 | 0 | 12 | QPSK | 1/3 | 1320 | 24 | 1 | 4320 | 2160 | ≥ 1 |
| | 5-20 | 16 | 0 | 12 | QPSK | 1/3 | 1384 | 24 | 1 | 4608 | 2304 | ≥ 1 |
| | 5-20 | 18 | 0 | 12 | QPSK | 1/3 | 1864 | 24 | 1 | 5184 | 2592 | ≥ 1 |
| | 5-20 | 20 | 0 | 12 | QPSK | 1/3 | 1736 | 24 | 1 | 5760 | 2880 | ≥ 1 |
| | 5-20 | 24 | 0 | 12 | QPSK | 1/3 | 2472 | 24 | 1 | 6912 | 3456 | ≥ 1 |
| | 10-20 | 25 | 0 | 12 | QPSK | 1/3 | 2216 | 24 | 1 | 7200 | 3600 | ≥ 1 |
| | 10-20 | 27 | 0 | 12 | QPSK | 1/3 | 2792 | 24 | 1 | 7776 | 3888 | ≥ 1 |
| | 10-20 | 30 | 0 | 12 | QPSK | 1/3 | 2664 | 24 | 1 | 8640 | 4320 | ≥ 1 |
| | 10-20 | 32 | 0 | 12 | QPSK | 1/3 | 2792 | 24 | 1 | 9216 | 4608 | ≥ 1 |
| | 10-20 | 36 | 0 | 12 | QPSK | 1/3 | 3752 | 24 | 1 | 10368 | 5184 | ≥ 1 |
| | 10-20 | 40 | 0 | 12 | QPSK | 1/3 | 4136 | 24 | 1 | 11520 | 5760 | ≥ 1 |
| | 10-20 | 45 | 0 | 12 | QPSK | 1/3 | 4008 | 24 | 1 | 12960 | 6480 | ≥ 1 |
| | 10-20 | 48 | 0 | 12 | QPSK | 1/3 | 4264 | 24 | 1 | 13824 | 6912 | ≥ 1 |
| | 15-20 | 50 | 0 | 12 | QPSK | 1/3 | 5160 | 24 | 1 | 14400 | 7200 | ≥ 1 |
| | 15-20 | 54 | 0 | 12 | QPSK | 1/3 | 4776 | 24 | 1 | 15552 | 7776 | ≥ 1 |
| | 15-20 | 60 | 0 | 12 | QPSK | 1/4 | 4264 | 24 | 1 | 17280 | 8640 | ≥ 1 |
| | 15-20 | 64 | 0 | 12 | QPSK | 1/4 | 4584 | 24 | 1 | 18432 | 9216 | ≥ 1 |
| | 15-20 | 72 | 0 | 12 | QPSK | 1/4 | 5160 | 24 | 1 | 20736 | 10368 | ≥ 1 |
| | 20 | 75 | 0 | 12 | QPSK | 1/5 | 4392 | 24 | 1 | 21600 | 10800 | ≥ 1 |
| | 20 | 80 | 0 | 12 | QPSK | 1/5 | 4776 | 24 | 1 | 23040 | 11520 | ≥ 1 |
| | 20 | 81 | 0 | 12 | QPSK | 1/5 | 4776 | 24 | 1 | 23328 | 11664 | ≥ 1 |
| | 20 | 90 | 0 | 12 | QPSK | 1/6 | 4008 | 24 | 1 | 25920 | 12960 | ≥ 1 |
| | 20 | 96 | 0 | 12 | QPSK | 1/6 | 4264 | 24 | 1 | 27648 | 13824 | ≥ 1 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 2: As per Table 4.2-2 in TS 36.211 [8]

**Table A.2.3.2.1-1a: Reference Channels for QPSK with partial RB allocation for UE category 0**

| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | | Bits | Bits | | Bits | | |
| | 1.4 - 20 | 1 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | 0 |
| | 1.4 - 20 | 2 | 1 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | 0 |
| | 1.4 - 20 | 3 | 1 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | 0 |
| | 1.4 - 20 | 4 | 1 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | 0 |
| | 1.4 - 20 | 5 | 1 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | 0 |
| | 3-20 | 6 | 1 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | 0 |
| | 3-20 | 8 | 1 | 12 | QPSK | 1/3 | 808 | 24 | 1 | 2304 | 1152 | 0 |
| | 3-20 | 9 | 1 | 12 | QPSK | 1/3 | 776 | 24 | 1 | 2592 | 1296 | 0 |
| | 3-20 | 10 | 1 | 12 | QPSK | 1/3 | 872 | 24 | 1 | 2880 | 1440 | 0 |
| | 3-20 | 12 | 1 | 12 | QPSK | 1/4 | 840 | 24 | 1 | 3456 | 1728 | 0 |
| | 5-20 | 15 | 1 | 12 | QPSK | 1/5 | 872 | 24 | 1 | 4320 | 2160 | 0 |
| | 5-20 | 16 | 1 | 12 | QPSK | 1/5 | 904 | 24 | 1 | 4608 | 2304 | 0 |
| | 5-20 | 18 | 1 | 12 | QPSK | 1/6 | 776 | 24 | 1 | 5184 | 2592 | 0 |
| | 5-20 | 20 | 1 | 12 | QPSK | 1/6 | 872 | 24 | 1 | 5760 | 2880 | 0 |
| | 5-20 | 24 | 1 | 12 | QPSK | 1/8 | 872 | 24 | 1 | 6912 | 3456 | 0 |
| | 10-20 | 25 | 1 | 12 | QPSK | 1/8 | 904 | 24 | 1 | 7200 | 3600 | 0 |
| | 10-20 | 27 | 1 | 12 | QPSK | 1/8 | 968 | 24 | 1 | 7776 | 3888 | 0 |
| | 10-20 | 30 | 1 | 12 | QPSK | 1/10 | 808 | 24 | 1 | 8640 | 4320 | 0 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 2: As per Table 4.2-2 in TS 36.211 [8]

**Table A.2.3.2.1-1b: Reference Channels for QPSK with partial RB allocation for UE category M1**

| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | | Bits | Bits | | Bits | | |
| | 1.4 - 20 | 1 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | M1 |
| | 1.4 - 20 | 2 | 1 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | M1 |
| | 1.4 - 20 | 3 | 1 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | M1 |
| | 1.4 - 20 | 4 | 1 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | M1 |
| | 1.4 - 20 | 5 | 1 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | M1 |
| | 3-20 | 6 | 1 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | M1 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 2: As per Table 4.2-2 in TS 36.211 [8]

**Table A.2.3.2.1-1c: Reference Channels for QPSK with partial RB allocation for UE UL category M2**

| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit** | **MHz** | | | | | | **Bits** | **Bits** | | **Bits** | | |
| | 1.4 - 20 | 1 | 1 | 12 | QPSK | 1/3 | 72 | 24 | 1 | 288 | 144 | M2 |
| | 1.4 - 20 | 2 | 1 | 12 | QPSK | 1/3 | 176 | 24 | 1 | 576 | 288 | M2 |
| | 1.4 - 20 | 3 | 1 | 12 | QPSK | 1/3 | 256 | 24 | 1 | 864 | 432 | M2 |
| | 1.4 - 20 | 4 | 1 | 12 | QPSK | 1/3 | 392 | 24 | 1 | 1152 | 576 | M2 |
| | 1.4 - 20 | 5 | 1 | 12 | QPSK | 1/3 | 424 | 24 | 1 | 1440 | 720 | M2 |
| | 3-20 | 6 | 1 | 12 | QPSK | 1/3 | 600 | 24 | 1 | 1728 | 864 | M2 |
| | 3-20 | 9 | 1 | 12 | QPSK | 1/3 | 776 | 24 | 1 | 2592 | 1296 | M2 |
| | 3-20 | 12 | 1 | 12 | QPSK | 1/3 | 1032 | 24 | 1 | 3456 | 1728 | M2 |
| | 5-20 | 15 | 1 | 12 | QPSK | 1/3 | 1320 | 24 | 1 | 4320 | 2160 | M2 |
| | 5-20 | 18 | 1 | 12 | QPSK | 1/3 | 1864 | 24 | 1 | 5184 | 2592 | M2 |
| | 5-20 | 21 | 1 | 12 | QPSK | 1/3 | 2216 | 24 | 1 | 6068 | 3024 | M2 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 2: As per Table 4.2-2 in TS 36.211 [8].

### A.2.3.2.2 16-QAM

**Table A.2.3.2.2-1: Reference Channels for 16-QAM with partial RB allocation**

| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | | Bits | Bits | | Bits | | |
| | 1.4-20 | 1 | 1 | 12 | 16QAM | 3/4 | 408 | 24 | 1 | 576 | 144 | ≥ 1 |
| | 1.4-20 | 2 | 1 | 12 | 16QAM | 3/4 | 840 | 24 | 1 | 1152 | 288 | ≥ 1 |
| | 1.4-20 | 3 | 1 | 12 | 16QAM | 3/4 | 1288 | 24 | 1 | 1728 | 432 | ≥ 1 |
| | 1.4-20 | 4 | 1 | 12 | 16QAM | 3/4 | 1736 | 24 | 1 | 2304 | 576 | ≥ 1 |
| | 1.4-20 | 5 | 1 | 12 | 16QAM | 3/4 | 2152 | 24 | 1 | 2880 | 720 | ≥ 1 |
| | 3-20 | 6 | 1 | 12 | 16QAM | 3/4 | 2600 | 24 | 1 | 3456 | 864 | ≥ 1 |
| | 3-20 | 8 | 1 | 12 | 16QAM | 3/4 | 3496 | 24 | 1 | 4608 | 1152 | ≥ 1 |
| | 3-20 | 9 | 1 | 12 | 16QAM | 3/4 | 3880 | 24 | 1 | 5184 | 1296 | ≥ 1 |
| | 3-20 | 10 | 1 | 12 | 16QAM | 3/4 | 4264 | 24 | 1 | 5760 | 1440 | ≥ 1 |
| | 3-20 | 12 | 1 | 12 | 16QAM | 3/4 | 5160 | 24 | 1 | 6912 | 1728 | ≥ 1 |
| | 5-20 | 15 | 1 | 12 | 16QAM | 1/2 | 4264 | 24 | 1 | 8640 | 2160 | ≥ 1 |
| | 5-20 | 16 | 1 | 12 | 16QAM | 1/2 | 4584 | 24 | 1 | 9216 | 2304 | ≥ 1 |
| | 5-20 | 18 | 1 | 12 | 16QAM | 1/2 | 5160 | 24 | 1 | 10368 | 2592 | ≥ 1 |
| | 5-20 | 20 | 1 | 12 | 16QAM | 1/3 | 4008 | 24 | 1 | 11520 | 2880 | ≥ 1 |
| | 5-20 | 24 | 1 | 12 | 16QAM | 1/3 | 4776 | 24 | 1 | 13824 | 3456 | ≥ 1 |
| | 10-20 | 25 | 1 | 12 | 16QAM | 1/3 | 4968 | 24 | 1 | 14400 | 3600 | ≥ 1 |
| | 10-20 | 27 | 1 | 12 | 16QAM | 1/3 | 4776 | 24 | 1 | 15552 | 3888 | ≥ 1 |
| | 10-20 | 30 | 1 | 12 | 16QAM | 3/4 | 12960 | 24 | 3 | 17280 | 4320 | ≥ 2 |
| | 10-20 | 32 | 1 | 12 | 16QAM | 3/4 | 13536 | 24 | 3 | 18432 | 4608 | ≥ 2 |
| | 10-20 | 36 | 1 | 12 | 16QAM | 3/4 | 15264 | 24 | 3 | 20736 | 5184 | ≥ 2 |
| | 10-20 | 40 | 1 | 12 | 16QAM | 3/4 | 16992 | 24 | 3 | 23040 | 5760 | ≥ 2 |
| | 10-20 | 45 | 1 | 12 | 16QAM | 3/4 | 19080 | 24 | 4 | 25920 | 6480 | ≥ 2 |
| | 10-20 | 48 | 1 | 12 | 16QAM | 3/4 | 20616 | 24 | 4 | 27648 | 6912 | ≥ 2 |
| | 15-20 | 50 | 1 | 12 | 16QAM | 3/4 | 21384 | 24 | 4 | 28800 | 7200 | ≥ 2 |
| | 15-20 | 54 | 1 | 12 | 16QAM | 3/4 | 22920 | 24 | 4 | 31104 | 7776 | ≥ 2 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15-20 | 60 | 1 | 12 | 16QAM | 2/3 | 23688 | 24 | 4 | 34560 | 8640 | ≥ 2 |
| | 15-20 | 64 | 1 | 12 | 16QAM | 2/3 | 25456 | 24 | 4 | 36864 | 9216 | ≥ 2 |
| | 15-20 | 72 | 1 | 12 | 16QAM | 1/2 | 20616 | 24 | 4 | 41472 | 10368 | ≥ 2 |
| | 20 | 75 | 1 | 12 | 16QAM | 1/2 | 21384 | 24 | 4 | 43200 | 10800 | ≥ 2 |
| | 20 | 80 | 1 | 12 | 16QAM | 1/2 | 22920 | 24 | 4 | 46080 | 11520 | ≥ 2 |
| | 20 | 81 | 1 | 12 | 16QAM | 1/2 | 22920 | 24 | 4 | 46656 | 11664 | ≥ 2 |
| | 20 | 90 | 1 | 12 | 16QAM | 2/5 | 20616 | 24 | 4 | 51840 | 12960 | ≥ 2 |
| | 20 | 96 | 1 | 12 | 16QAM | 2/5 | 22152 | 24 | 4 | 55296 | 13824 | ≥ 2 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | | | | | | |

**Table A.2.3.2.2-1A: Reference Channels for 16-QAM with partial RB allocation, UL-DL configuration 0**

| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 3, 4, 7, 8, 9 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 4, 7, 8, 9 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 4, 7, 8, 9 | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | | Bits | Bits | | Bits | | |
| | 1.4-20 | 1 | 0 | 12 | 16QAM | 3/4 | 408 | 24 | 1 | 576 | 144 | ≥ 1 |
| | 1.4-20 | 2 | 0 | 12 | 16QAM | 3/4 | 840 | 24 | 1 | 1152 | 288 | ≥ 1 |
| | 1.4-20 | 3 | 0 | 12 | 16QAM | 3/4 | 1288 | 24 | 1 | 1728 | 432 | ≥ 1 |
| | 1.4-20 | 4 | 0 | 12 | 16QAM | 3/4 | 1736 | 24 | 1 | 2304 | 576 | ≥ 1 |
| | 1.4-20 | 5 | 0 | 12 | 16QAM | 3/4 | 2152 | 24 | 1 | 2880 | 720 | ≥ 1 |
| | 3-20 | 6 | 0 | 12 | 16QAM | 3/4 | 2600 | 24 | 1 | 3456 | 864 | ≥ 1 |
| | 3-20 | 8 | 0 | 12 | 16QAM | 3/4 | 3496 | 24 | 1 | 4608 | 1152 | ≥ 1 |
| | 3-20 | 9 | 0 | 12 | 16QAM | 3/4 | 3880 | 24 | 1 | 5184 | 1296 | ≥ 1 |
| | 3-20 | 10 | 0 | 12 | 16QAM | 3/4 | 4264 | 24 | 1 | 5760 | 1440 | ≥ 1 |
| | 3-20 | 12 | 0 | 12 | 16QAM | 3/4 | 5160 | 24 | 1 | 6912 | 1728 | ≥ 1 |
| | 5-20 | 15 | 0 | 12 | 16QAM | 1/2 | 4264 | 24 | 1 | 8640 | 2160 | ≥ 1 |
| | 5-20 | 16 | 0 | 12 | 16QAM | 1/2 | 4584 | 24 | 1 | 9216 | 2304 | ≥ 1 |
| | 5-20 | 18 | 0 | 12 | 16QAM | 1/2 | 5160 | 24 | 1 | 10368 | 2592 | ≥ 1 |
| | 5-20 | 20 | 0 | 12 | 16QAM | 1/3 | 4008 | 24 | 1 | 11520 | 2880 | ≥ 1 |
| | 5-20 | 24 | 0 | 12 | 16QAM | 1/3 | 4776 | 24 | 1 | 13824 | 3456 | ≥ 1 |
| | 10-20 | 25 | 0 | 12 | 16QAM | 1/3 | 4968 | 24 | 1 | 14400 | 3600 | ≥ 1 |
| | 10-20 | 27 | 0 | 12 | 16QAM | 1/3 | 4776 | 24 | 1 | 15552 | 3888 | ≥ 1 |
| | 10-20 | 30 | 0 | 12 | 16QAM | 3/4 | 12960 | 24 | 3 | 17280 | 4320 | ≥ 2 |
| | 10-20 | 32 | 0 | 12 | 16QAM | 3/4 | 13536 | 24 | 3 | 18432 | 4608 | ≥ 2 |
| | 10-20 | 36 | 0 | 12 | 16QAM | 3/4 | 15264 | 24 | 3 | 20736 | 5184 | ≥ 2 |
| | 10-20 | 40 | 0 | 12 | 16QAM | 3/4 | 16992 | 24 | 3 | 23040 | 5760 | ≥ 2 |
| | 10-20 | 45 | 0 | 12 | 16QAM | 3/4 | 19080 | 24 | 4 | 25920 | 6480 | ≥ 2 |
| | 10-20 | 48 | 0 | 12 | 16QAM | 3/4 | 20616 | 24 | 4 | 27648 | 6912 | ≥ 2 |
| | 15-20 | 50 | 0 | 12 | 16QAM | 3/4 | 21384 | 24 | 4 | 28800 | 7200 | ≥ 2 |
| | 15-20 | 54 | 0 | 12 | 16QAM | 3/4 | 22920 | 24 | 4 | 31104 | 7776 | ≥ 2 |
| | 15-20 | 60 | 0 | 12 | 16QA | 2/3 | 23688 | 24 | 4 | 34560 | 8640 | ≥ 2 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | M | | | | | | | |
| | 15-20 | 64 | 0 | 12 | 16QAM | 2/3 | 25456 | 24 | 4 | 36864 | 9216 | ≥ 2 |
| | 15-20 | 72 | 0 | 12 | 16QAM | 1/2 | 20616 | 24 | 4 | 41472 | 10368 | ≥ 2 |
| | 20 | 75 | 0 | 12 | 16QAM | 1/2 | 21384 | 24 | 4 | 43200 | 10800 | ≥ 2 |
| | 20 | 80 | 0 | 12 | 16QAM | 1/2 | 22920 | 24 | 4 | 46080 | 11520 | ≥ 2 |
| | 20 | 81 | 0 | 12 | 16QAM | 1/2 | 22920 | 24 | 4 | 46656 | 11664 | ≥ 2 |
| | 20 | 90 | 0 | 12 | 16QAM | 2/5 | 20616 | 24 | 4 | 51840 | 12960 | ≥ 2 |
| | 20 | 96 | 0 | 12 | 16QAM | 2/5 | 22152 | 24 | 4 | 55296 | 13824 | ≥ 2 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | | | | | | |

**Table A.2.3.2.2-1a: Reference Channels for 16QAM with partial RB allocation UE category 0**

| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | | Bits | Bits | | Bits | | |
| | 1.4 - 20 | 1 | 1 | 12 | 16QAM | 3/4 | 408 | 24 | 1 | 576 | 144 | 0 |
| | 1.4 - 20 | 2 | | 12 | 16QAM | 3/4 | 840 | 24 | 1 | 1152 | 288 | 0 |
| | 1.4 - 20 | 4 | | 12 | 16QAM | 2/5 | 904 | 24 | 1 | 2304 | 576 | 0 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | | | | | | |

**Table A.2.3.2.2-1b: Reference Channels for 16QAM with partial RB allocation UE category M1**

| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | | Bits | Bits | | Bits | | |
| | 1.4 - 20 | 1 | 1 | 12 | 16QAM | 1/2 | 256 | 24 | 1 | 576 | 144 | M1 |
| | 1.4 - 20 | 2 | 1 | 12 | 16QAM | 1/2 | 552 | 24 | 1 | 1152 | 288 | M1 |
| | 1.4 - 20 | 3 | 1 | 12 | 16QAM | 1/2 | 840 | 24 | 1 | 1728 | 432 | M1 |
| | 1.4 - 20 | 4 | 1 | 12 | 16QAM | 2/5 | 904 | 24 | 1 | 2304 | 576 | M1 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note 2: As per Table 4.2-2 in TS 36.211 [8] | | | | | | | | | | | | |

**Table A.2.3.2.2-1c: Reference Channels for 16QAM with partial RB allocation UE UL category M2**

| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size for Sub-Frame 2, 3, 7, 8 | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame for Sub-Frame 2, 3, 7, 8 | Total symbols per Sub-Frame for Sub-Frame 2, 3, 7, 8 | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | | Bits | Bits | | Bits | | |
| | 1.4 - 20 | 1 | 1 | 12 | 16QAM | 1/2 | 256 | 24 | 1 | 576 | 144 | M2 |
| | 1.4 - 20 | 2 | 1 | 12 | 16QAM | 1/2 | 552 | 24 | 1 | 1152 | 288 | M2 |
| | 1.4 - 20 | 3 | 1 | 12 | 16QAM | 1/2 | 840 | 24 | 1 | 1728 | 432 | M2 |
| | 1.4 - 20 | 4 | 1 | 12 | 16QAM | 1/2 | 1128 | 24 | 1 | 2304 | 576 | M2 |
| | 1.4 - 20 | 5 | 1 | 12 | 16QAM | 1/2 | 1416 | 24 | 1 | 2880 | 720 | M2 |
| | 3 - 20 | 6 | 1 | 12 | 16QAM | 1/2 | 1736 | 24 | 1 | 3456 | 864 | M2 |
| | 3 - 20 | 9 | 1 | 12 | 16QAM | 1/2 | 2600 | 24 | 1 | 5184 | 1296 | M2 |
| | 3 - 20 | 12 | 1 | 12 | 16QAM | 1/2 | 3496 | 24 | 1 | 6912 | 1728 | M2 |
| | 5 - 20 | 15 | 1 | 12 | 16QAM | 1/2 | 4264 | 24 | 1 | 8640 | 2160 | M2 |
| | 5 - 20 | 18 | 1 | 12 | 16QAM | 1/2 | 5160 | 24 | 1 | 10368 | 2592 | M2 |
| | 5 - 20 | 21 | 1 | 12 | 16QAM | 1/2 | 5992 | 24 | 1 | 12096 | 3024 | M2 |
| | 5 - 20 | 24 | 1 | 12 | 16QAM | 1/2 | 6968 | 24 | 2 | 13824 | 3456 | M2 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 2: As per Table 4.2-2 in TS 36.211 [8].

### A.2.3.2.3 64-QAM

**Table A.2.3.2.3-1: Reference Channels for 64-QAM with partial RB allocation**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Trans-port block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category (Note 3) | UE UL Category (Note 3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | Bits | Bits | | Bits | | | |
| | 1.4 - 20 | 1 | 12 | 64QAM | 3/4 | 616 | 24 | 1 | 864 | 144 | 5,8 | 5, 8, 13, 14 |
| | 1.4 - 20 | 2 | 12 | 64QAM | 3/4 | 1256 | 24 | 1 | 1728 | 288 | 5,8 | 5, 8, 13, 14 |
| | 1.4 - 20 | 3 | 12 | 64QAM | 3/4 | 1864 | 24 | 1 | 2592 | 432 | 5,8 | 5, 8, 13, 14 |
| | 1.4 - 20 | 4 | 12 | 64QAM | 3/4 | 2536 | 24 | 1 | 3456 | 576 | 5,8 | 5, 8, 13, 14 |
| | 1.4 - 20 | 5 | 12 | 64QAM | 3/4 | 3112 | 24 | 1 | 4320 | 720 | 5,8 | 5, 8, 13, 14 |
| | 3-20 | 6 | 12 | 64QAM | 3/4 | 3752 | 24 | 1 | 5184 | 864 | 5,8 | 5, 8, 13, 14 |
| | 3-20 | 8 | 12 | 64QAM | 3/4 | 5160 | 24 | 1 | 6912 | 1152 | 5,8 | 5, 8, 13, 14 |
| | 3-20 | 9 | 12 | 64QAM | 3/4 | 5736 | 24 | 1 | 7776 | 1296 | 5,8 | 5, 8, 13, 14 |
| | 3-20 | 10 | 12 | 64QAM | 3/4 | 6200 | 24 | 2 | 8640 | 1440 | 5,8 | 5, 8, 13, 14 |
| | 3-20 | 12 | 12 | 64QAM | 3/4 | 7480 | 24 | 2 | 10368 | 1728 | 5,8 | 5, 8, 13, 14 |
| | 5-20 | 15 | 12 | 64QAM | 3/4 | 9528 | 24 | 2 | 12960 | 2160 | 5,8 | 5, 8, 13, 14 |
| | 5-20 | 16 | 12 | 64QAM | 3/4 | 10296 | 24 | 2 | 13824 | 2304 | 5,8 | 5, 8, 13, 14 |
| | 5-20 | 18 | 12 | 64QAM | 3/4 | 11448 | 24 | 2 | 15552 | 2592 | 5,8 | 5, 8, 13, 14 |
| | 5-20 | 20 | 12 | 64QAM | 3/4 | 12576 | 24 | 3 | 17280 | 2880 | 5,8 | 5, 8, 13, 14 |
| | 5-20 | 24 | 12 | 64QAM | 3/4 | 15264 | 24 | 3 | 20736 | 3456 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 25 | 12 | 64QAM | 3/4 | 15840 | 24 | 3 | 21600 | 3600 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 27 | 12 | 64QAM | 3/4 | 16992 | 24 | 3 | 23328 | 3888 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 30 | 12 | 64QAM | 3/4 | 19080 | 24 | 4 | 25920 | 4320 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 32 | 12 | 64QAM | 3/4 | 20616 | 24 | 4 | 27648 | 4608 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 36 | 12 | 64QAM | 3/4 | 22920 | 24 | 4 | 31104 | 5184 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 40 | 12 | 64QAM | 3/4 | 25456 | 24 | 5 | 34560 | 5760 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 45 | 12 | 64QAM | 3/4 | 28336 | 24 | 5 | 38880 | 6480 | 5,8 | 5, 8, 13, 14 |
| | 10-20 | 48 | 12 | 64QAM | 3/4 | 30576 | 24 | 5 | 41472 | 6912 | 5,8 | 5, 8, 13, 14 |
| | 15 - 20 | 50 | 12 | 64QAM | 3/4 | 31704 | 24 | 6 | 43200 | 7200 | 5,8 | 5, 8, 13, 14 |
| | 15 - 20 | 54 | 12 | 64QAM | 3/4 | 34008 | 24 | 6 | 46656 | 7776 | 5,8 | 5, 8, 13, 14 |
| | 15 - 20 | 60 | 12 | 64QAM | 3/4 | 37888 | 24 | 7 | 51840 | 8640 | 5,8 | 5, 8, 13, 14 |
| | 15 - 20 | 64 | 12 | 64QAM | 3/4 | 40576 | 24 | 7 | 55296 | 9216 | 5,8 | 5, 8, 13, 14 |
| | 15 - 20 | 72 | 12 | 64QAM | 3/4 | 45352 | 24 | 8 | 62208 | 10368 | 5,8 | 5, 8, 13, 14 |
| | 20 | 75 | 12 | 64QAM | 3/4 | 46888 | 24 | 8 | 64800 | 10800 | 5,8 | 5, 8, 13, 14 |
| | 20 | 80 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 69120 | 11520 | 5,8 | 5, 8, 13, 14 |
| | 20 | 81 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 69984 | 11664 | 5,8 | 5, 8, 13, 14 |
| | 20 | 90 | 12 | 64QAM | 2/3 | 51024 | 24 | 9 | 77760 | 12960 | 5,8 | 5, 8, 13, |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 14 |
| | 20 | 96 | 12 | 64QAM | 3/4 | 61664 | 24 | 11 | 82944 | 13824 | 5,8 | 5, 8, 13, 14 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 2: As per Table 4.2-2 in TS 36.211 [8].
Note 3: If UE does not report UE UL category, then the applicability of reference channel is determined by UE category. If UE reports UE UL category, then the applicability of reference channel is determined by UE UL category.

### A.2.3.2.4 256 QAM

**Table A.2.3.2.4-1: Reference Channels for 256 QAM with partial RB allocation**

| Parameter | Ch BW | Allocated RBs | UDL Configuration (Note 2) | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Trans-port block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE UL Category |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit** | **MHz** | | | | | | **Bits** | **Bits** | | **Bits** | | |
| | 1.4 - 20 | 1 | 1 | 12 | 256QAM | 3/4 | 840 | 24 | 1 | 1152 | 144 | ≥ 15 |
| | 1.4 - 20 | 2 | 1 | 12 | 256QAM | 3/4 | 1672 | 24 | 1 | 2304 | 288 | ≥ 15 |
| | 1.4 - 20 | 3 | 1 | 12 | 256QAM | 3/4 | 2536 | 24 | 1 | 3456 | 432 | ≥ 15 |
| | 1.4 - 20 | 4 | 1 | 12 | 256QAM | 3/4 | 3368 | 24 | 1 | 4608 | 576 | ≥ 15 |
| | 1.4 - 20 | 5 | 1 | 12 | 256QAM | 3/4 | 4264 | 24 | 1 | 5760 | 720 | ≥ 15 |
| | 3-20 | 6 | 1 | 12 | 256QAM | 3/4 | 5160 | 24 | 1 | 6912 | 864 | ≥ 15 |
| | 3-20 | 8 | 1 | 12 | 256QAM | 3/4 | 6712 | 24 | 2 | 9216 | 1152 | ≥ 15 |
| | 3-20 | 9 | 1 | 12 | 256QAM | 3/4 | 7736 | 24 | 2 | 10368 | 1296 | ≥ 15 |
| | 3-20 | 10 | 1 | 12 | 256QAM | 3/4 | 8504 | 24 | 2 | 11520 | 1440 | ≥ 15 |
| | 3-20 | 12 | 1 | 12 | 256QAM | 3/4 | 10296 | 24 | 2 | 13824 | 1728 | ≥ 15 |
| | 5-20 | 15 | 1 | 12 | 256QAM | 3/4 | 12960 | 24 | 3 | 17280 | 2160 | ≥ 15 |
| | 5-20 | 16 | 1 | 12 | 256QAM | 3/4 | 13536 | 24 | 3 | 18432 | 2304 | ≥ 15 |
| | 5-20 | 18 | 1 | 12 | 256QAM | 3/4 | 15264 | 24 | 3 | 20736 | 2592 | ≥ 15 |
| | 5-20 | 20 | 1 | 12 | 256QAM | 3/4 | 16992 | 24 | 3 | 23040 | 2880 | ≥ 15 |
| | 5-20 | 24 | 1 | 12 | 256QAM | 3/4 | 20616 | 24 | 4 | 27648 | 3456 | ≥ 15 |
| | 10-20 | 25 | 1 | 12 | 256QAM | 3/4 | 21384 | 24 | 4 | 28800 | 3600 | ≥ 15 |
| | 10-20 | 27 | 1 | 12 | 256QAM | 3/4 | 22920 | 24 | 4 | 31104 | 3888 | ≥ 15 |
| | 10-20 | 30 | 1 | 12 | 256QAM | 3/4 | 25456 | 24 | 5 | 34560 | 4320 | ≥ 15 |
| | 10-20 | 32 | 1 | 12 | 256QAM | 3/4 | 27376 | 24 | 5 | 36864 | 4608 | ≥ 15 |
| | 10-20 | 36 | 1 | 12 | 256QAM | 3/4 | 30576 | 24 | 6 | 41472 | 5184 | ≥ 15 |
| | 10-20 | 40 | 1 | 12 | 256QAM | 3/4 | 34008 | 24 | 6 | 46080 | 5760 | ≥ 15 |
| | 10-20 | 45 | 1 | 12 | 256QAM | 3/4 | 37888 | 24 | 7 | 51840 | 6480 | ≥ 15 |
| | 10-20 | 48 | 1 | 12 | 256QAM | 3/4 | 40576 | 24 | 8 | 55296 | 6912 | ≥ 15 |
| | 15 - 20 | 50 | 1 | 12 | 256QAM | 3/4 | 42368 | 24 | 8 | 57600 | 7200 | ≥ 15 |
| | 15 - 20 | 54 | 1 | 12 | 256QAM | 3/4 | 46888 | 24 | 8 | 62208 | 7776 | ≥ 15 |
| | 15 - 20 | 60 | 1 | 12 | 256QAM | 3/4 | 51024 | 24 | 9 | 69120 | 8640 | ≥ 15 |
| | 15 - 20 | 64 | 1 | 12 | 256QAM | 3/4 | 55056 | 24 | 9 | 73728 | 9216 | ≥ 15 |
| | 15 - 20 | 72 | 1 | 12 | 256QAM | 3/4 | 61664 | 24 | 11 | 82944 | 10368 | ≥ 15 |
| | 20 | 75 | 1 | 12 | 256QAM | 3/4 | 63776 | 24 | 11 | 86400 | 10800 | ≥ 15 |
| | 20 | 80 | 1 | 12 | 256QAM | 3/4 | 68808 | 24 | 12 | 92160 | 11520 | ≥ 15 |
| | 20 | 81 | 1 | 12 | 256QAM | 3/4 | 68808 | 24 | 12 | 93312 | 11664 | ≥ 15 |
| | 20 | 90 | 1 | 12 | 256QAM | 3/4 | 76208 | 24 | 13 | 103680 | 12960 | ≥ 15 |
| | 20 | 96 | 1 | 12 | 256QAM | 3/4 | 81176 | 24 | 14 | 110592 | 13824 | ≥ 15 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 2: As per Table 4.2-2 in TS 36.211 [8]

### A.2.3.3 Reference measurement channels for sustained downlink data rate provided by lower layers

**Table A.2.3.3-1: Uplink Reference Channels for sustained data-rate test (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference Channel | | R.1-1 TDD | R.1-2 TDD | R.1-3 TDD | R.1-3B TDD | R.1-4 TDD | R.1-5 TDD |
| Channel Bandwidth | MHz | 10 | 10 | 20 | 15 | 20 | 10 |
| Uplink-Downlink Configuration (Note 2) | | 5 | 5 | 5 | 1 | 1 | 1 |
| Allocated Resource Blocks | | 40 (Note 3) | 40 (Note 3) | 90 (Note 5) | 60 (Note 4) | 90 (Note 5) | 40 (Note 3) |
| Allocated Sub-Frames per Radio-Frame | | 1 | 1 | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | 12 | 12 | 12 | 12 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Coding Rate | | | | | | | |
| For Sub-Frame 2 | | 0.43 | 0.61 | 0.49 | 0.42 | 0.49 | 0.61 |
| For Sub-Frame 3,7,8 | | n/a | n/a | n/a | 0.42 | 0.49 | 0.61 |
| Information Bit Payload per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 2 | | 4968 | 6968 | 12576 | 7224 | 12576 | 6968 |
| For Sub-Frame 3,7,8 | | 0 | 0 | 0 | 7224 | 12576 | 6968 |
| Number of Code Blocks per Sub-Frame (Note 1) | | | | | | | |
| For Sub-Frame 2 | | 1 | 2 | 3 | 2 | 3 | 2 |
| For Sub-Frame 3,7,8 | | 0 | 0 | 0 | 2 | 3 | 2 |
| Modulation Symbols per Sub-Frame | | | | | | | |
| For Sub-Frame 2 | | 5760 | 5760 | 12960 | 8640 | 10240 | 5760 |
| For Sub-Frame 3,7,8 | | 0 | 0 | 0 | 8640 | 10240 | 5760 |
| Binary Channel Bits per Sub-Frame | | | | | | | |
| For Sub-Frame 2 | | 11520 | 11520 | 25920 | 17280 | 25920 | 11520 |
| For Sub-Frame 3,7,8 | | n/a | n/a | n/a | 17280 | 25920 | 11520 |
| Max Throughput over 1 Radio-Frame | Mbps | 0.4968 | 0.6968 | 1.2576 | 2.8896 | 5.0304 | 2.7872 |
| UE Category | | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 2: As per Table 4.2-2 in TS 36.211 [8]
Note 3: RB-s 5-44 allocated with PUSCH.
Note 4: RB-s 7-66 allocated with PUSCH.
Note 5: RB-s 5-94 allocated with PUSCH.

## A.2.4 Reference measurement channels for category NB1

**Table A.2.4-1 Reference Channels for category NB1**

| Parameter | Value | | | | | | |
|---|---|---|---|---|---|---|---|
| Sub-carrier spacing (kHz) | 3.75 | 3.75 | 15 | 15 | 15 | 15 | 15 |
| Number of tone | 1 | 1 | 1 | 1 | 3 | 6 | 12 |
| Modulation | π/2 BPSK | π/4 QPSK | π/2 BPSK | π/4 QPSK | QPSK | QPSK | QPSK |
| Number of NPUSCH repetition | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| IMCS / ITBS | 0 / 0 | 3 / 3 | 0 / 0 | 3 / 3 | 5 / 5 | 5 / 5 | 5 / 5 |
| Payload size (bits) | 32 | 40 | 32 | 40 | 72 | 72 | 72 |
| Allocated resource unit | 2 | 1 | 2 | 1 | 1 | 1 | 1 |
| Code rate (target) | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Code rate (effective) | 0.29 | 0.33 | 0.29 | 0.33 | 0.33 | 0.33 | 0.33 |
| Transport block CRC (bits) | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| Code block CRC size (bits) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of code blocks - C | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per resource unit | 96 | 192 | 96 | 192 | 288 | 288 | 288 |
| Total symbols per resource unit | 96 | 96 | 96 | 96 | 144 | 144 | 144 |
| Tx time (ms) | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).<br>NOTE 2: Parameters related to NPUSCH format 1 scheduling are defined in Table A.2.4-2.<br>NOTE 3: NPDCCH is not transmitted in the subframes used for transmission of SI messages.<br>NOTE 4: SI messages transmission should be prioritized over NPDCCH transmission in case of collision. NPDCCH transmission is postponed until the next NB-IoT downlink subframe in case NPDCCH transmission occurs in a non NB-IoT downlink subframe, where an NB-IoT downlink subframe is a subframe that does not contain NPSS/NSSS/NPBCH/SIB1-NB transmission. | | | | | | | |

Following NOTEs are included in TS 36.521-1 as an addition to TS 36.101, to define examples of UL scheduling patterns based on Table A.2.4-1 and Table A.2.4-2. Overall period of UL scheduling pattern corresponds with Si-periodicity and it consists of two different patterns with dependencies on SI transmission.

- One pattern applies for period containing SI messages transmission. This pattern has a period with same duration as SI windows length (time period where SI messages are transmitted).
- Another pattern for period where there is no transmission of SI messages. This pattern is repeated during SI periodicity.

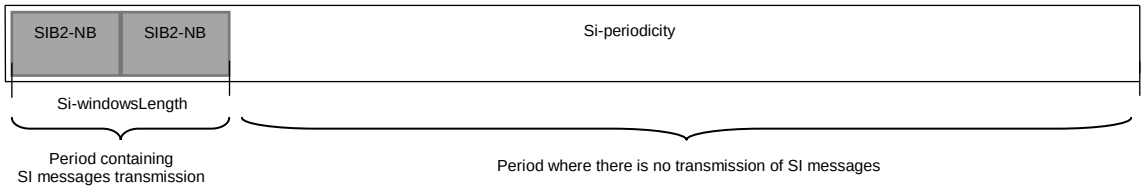



**Figure A.2.4-1: NPDCCH scheduling based on SI transmission**

NOTE 1: For 3.75kHz, 1 tone, and π/2 BPSK modulation. NPDCCH transmission is scheduled at the 18th subframe (starting from the 0th subframe) every 80ms and its corresponding NPUSCH format 1 is scheduled 9 subframes after NPDCCH transmission. NPUSCH format 1 transmission has a duration of 64 consecutive ms. This pattern applies for both periods containing and not containing SI messages transmission.

NOTE 2: For 3.75kHz, 1 tone, and π/4 QPSK modulation. NPDCCH transmissions are scheduled at the 18th, 66th and 114th subframe (starting from the 0th subframe) every 160ms for periods containing SI messages transmission and at the 2nd, 51th, 98th, 146th and 194th subframe (starting from the 0th subframe) every 240ms for periods where there is no transmission of SI messages. The corresponding NPUSCH format 1 are scheduled 9 subframes after each NPDCCH transmission. NPUSCH format 1 transmission has a duration of 32 consecutive ms.

NOTE 3: For 15kHz, 1 tone, and π/2 BPSK modulation. NPDCCH transmissions are scheduled at the 18th, 51th, 98th and 131th subframe (starting from the 0th subframe) every 160ms for periods containing SI messages transmission and at the 2nd, 34th, 66th, 98th and 131th subframe (starting from the 0th subframe) every 160ms for periods where there is no transmission of SI messages. The corresponding NPUSCH format 1 are scheduled 9 subframes after each NPDCCH transmission. NPUSCH format 1 transmission has a duration of 16 consecutive ms.

NOTE 4: For 15kHz, 1 tone, and π/4 QPSK modulation. NPDCCH transmissions are scheduled at the 18th, 42th, 66th, 98th, 122th and 146th subframe (starting from the 0th subframe) every 160ms for periods containing SI messages transmission and at the 11th, 34th, 58th, 82th and 106th subframe (starting from the 0th subframe) every 120ms for periods where there is no transmission of SI messages. The corresponding NPUSCH format 1 are scheduled 9 subframes after each NPDCCH transmission. NPUSCH format 1 transmission has a duration of 8 consecutive ms.

NOTE 5: For 15kHz, 3 tones, and QPSK modulation. NPDCCH transmissions are scheduled at the 18th, 34th, 51th, 74th, 98th, 114th, 131th and 154th subframe (starting from the 0th subframe) every 160ms for periods containing SI messages transmission and at the 11th and 34th subframe (starting from the 0th subframe) every 40ms for periods where there is no transmission of SI messages. The corresponding NPUSCH format 1 are scheduled 9 subframes after each NPDCCH transmission. NPUSCH format 1 transmission has a duration of 4 consecutive ms.

NOTE 6: For 15kHz, 6 tones, and QPSK modulation. NPDCCH transmissions are scheduled at the 18th, 34th, 51th, 66th, 98th, 114th, 131th and 146th subframe (starting from the 0th subframe) every 160ms for periods containing SI messages transmission and at the 2nd, 18th, 34th, 51th and 66th subframe (starting from the 0th subframe) every 80ms for periods where there is no transmission of SI messages. The corresponding NPUSCH format 1 are scheduled 9 subframes after each NPDCCH transmission. NPUSCH format 1 transmission has a duration of 2 consecutive ms.

NOTE 7: For 15kHz, 12 tones, and QPSK modulation. NPDCCH transmissions are scheduled at the 18th, 34th, 51th, 66th, 98th, 114th, 131th and 146th subframe (starting from the 0th subframe) every 160ms for periods containing SI messages transmission and at the 2nd, 18th, 34th, 51th and 66th subframe (starting from the 0th subframe) every 80ms for periods where there is no transmission of SI messages. The corresponding NPUSCH format 1 are scheduled 9 subframes after each NPDCCH transmission. NPUSCH format 1 transmission has a duration of 1 ms.

**Table A.2.4-2: NPDCCH configuration for NPUSCH format 1 scheduling**

| Parameter | Unit | Value |
|---|---|---|
| DCI format | | DCI format N0 |
| NPDCCH format | | 1 |
| Scheduling delay ( $I_{\text{Delay}}$ ) | | 0 |
| DCI subframe repetition number | | 00 |
| $R_{\max}$ (*npdcch-NumRepetitions*) | | 1 |
| G (*NPDCCH-startSF-USS*) | | 8 |
| $\alpha_{offset}$ (*npdcch-Offset-USS*) | | 1/4 |

# A.2.5 Reference measurement channels for LAA

## A.2.5.1 Full RB allocation

### A.2.5.1.1 QPSK

**Table A.2.2.1.1-1: Reference Channels for QPSK with full RB allocation**

| Parameter | Unit | Value | |
|---|---|---|---|
| Channel bandwidth | MHz | 10 | 20 |
| Allocated resource blocks | | 50 | 100 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 |
| Modulation | | QPSK | QPSK |
| Target Coding rate | | 1/3 | 1/6 |
| Payload size | Bits | 5160 | 4584 |
| Transport block CRC | Bits | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | 1 | 1 |
| Total number of bits per Sub-Frame | Bits | 14400 | 28800 |
| Total symbols per Sub-Frame | | 7200 | 14400 |
| UE Category | | ≥ 1 | ≥ 1 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | |

### A.2.5.1.2 16QAM

**Table A.2.5.1.2-1: Reference Channels for 16QAM with full RB allocation**

| Parameter | Unit | Value | |
|---|---|---|---|
| Channel bandwidth | MHz | 10 | 20 |
| Allocated resource blocks | | 50 | 100 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 |
| Modulation | | 16QAM | 16QAM |
| Target Coding rate | | 3/4 | 1/3 |
| Payload size | Bits | 21384 | 19848 |
| Transport block CRC | Bits | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | 4 | 4 |
| Total number of bits per Sub-Frame | Bits | 28800 | 57600 |
| Total symbols per Sub-Frame | | 7200 | 14400 |
| UE Category | | ≥ 2 | ≥ 2 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | |

### A.2.5.1.3 64QAM

**Table A.2.5.1.3-1: Reference Channels for 64QAM with full RB allocation**

| Parameter | Unit | Value | |
|---|---|---|---|
| Channel bandwidth | MHz | 10 | 20 |
| Allocated resource blocks | | 50 | 100 |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 |
| Modulation | | 64QAM | 64QAM |
| Target Coding rate | | 3/4 | 3/4 |
| Payload size | Bits | 31704 | 63776 |
| Transport block CRC | Bits | 24 | 24 |
| Number of code blocks per Sub-Frame (Note 1) | | 8 | 11 |
| Total number of bits per Sub-Frame | Bits | 43200 | 86400 |
| Total symbols per Sub-Frame | | 7200 | 14400 |
| UE Category (Note 2) | | 5,8 | 5,8 |
| UE UL Category (Note 2) | | 5,8,13, 14 | 5,8,13, 14 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note 2: If UE does not report UE UL category, then the applicability of reference channel is determined by UE category. If UE reports UE UL category, then the applicability of reference channel is determined by UE UL category. | | | |

## A.2.5.2 Partial RB allocation

For each channel bandwidth, various partial RB allocations are specified. The number of allocated RBs is chosen according to values specified in the Tx and Rx requirements.

### A.2.5.2.1 QPSK

**Table A.2.5.2.1-1: Reference Channels for QPSK with partial RB allocation**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | Bits | Bits | | Bits | | |
| | 10 - 20 | 10 | 12 | QPSK | 1/3 | 872 | 24 | 1 | 2880 | 1440 | ≥ 1 |
| | 10 - 20 | 20 | 12 | QPSK | 1/3 | 1736 | 24 | 1 | 5760 | 2880 | ≥ 1 |
| | 10 - 20 | 30 | 12 | QPSK | 1/3 | 2664 | 24 | 1 | 8640 | 4320 | ≥ 1 |
| | 10 - 20 | 40 | 12 | QPSK | 1/3 | 4136 | 24 | 1 | 11520 | 5760 | ≥ 1 |
| | 20 | 50 | 12 | QPSK | 1/3 | 5160 | 24 | 1 | 14400 | 7200 | ≥ 1 |
| | 20 | 60 | 12 | QPSK | 1/4 | 4264 | 24 | 1 | 17280 | 8640 | ≥ 1 |
| | 20 | 70 | 12 | QPSK | 1/4 | 4968 | 24 | 1 | 20160 | 10080 | ≥ 1 |
| | 20 | 80 | 12 | QPSK | 1/5 | 4776 | 24 | 1 | 23040 | 11520 | ≥ 1 |
| | 20 | 90 | 12 | QPSK | 1/6 | 4008 | 24 | 1 | 25920 | 12960 | ≥ 1 |
| Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note 2: For the channel bandwidth of 10Mhz, the allocated RBs are distributed over the channel bandwidth at the RB index = {N, N+5, N+10, …, N+45 for N = 0, …, $N_{Interlace}$-1 } where $N_{Interlace}$ is 1, …, 4 for the allocated RBs of 10, …, 40, respectively.<br>Note 3: For the channel bandwidth of 20Mhz, the allocated RBs are distributed over the channel bandwidth at the RB index = {N, N+10, N+20, …, N+90 for N = 0, …, $N_{Interlace}$-1 } where $N_{Interlace}$ is 1, .., 9 for the allocated RBs of 10, …, 90, respectively. | | | | | | | | | | | |

### A.2.5.2.2 16QAM

**Table A.2.5.2.2-1: Reference Channels for 16QAM with partial RB allocation**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | Bits | Bits | | Bits | | |
| | 10 - 20 | 10 | 12 | 16QAM | 3/4 | 4264 | 24 | 1 | 5760 | 1440 | ≥ 2 |
| | 10 - 20 | 20 | 12 | 16QAM | 1/3 | 4008 | 24 | 1 | 11520 | 2880 | ≥ 2 |
| | 10 - 20 | 30 | 12 | 16QAM | 3/4 | 12960 | 24 | 3 | 17280 | 4320 | ≥ 2 |
| | 10 - 20 | 40 | 12 | 16QAM | 3/4 | 16992 | 24 | 3 | 23040 | 5760 | ≥ 2 |
| | 20 | 50 | 12 | 16QAM | 3/4 | 21384 | 24 | 4 | 28800 | 7200 | ≥ 2 |
| | 20 | 60 | 12 | 16QAM | 2/3 | 23688 | 24 | 4 | 34560 | 8640 | ≥ 2 |
| | 20 | 70 | 12 | 16QAM | 1/2 | 19848 | 24 | 4 | 40320 | 10080 | ≥ 2 |
| | 20 | 80 | 12 | 16QAM | 1/2 | 22920 | 24 | 4 | 46080 | 11520 | ≥ 2 |
| | 20 | 90 | 12 | 16QAM | 2/5 | 20616 | 24 | 4 | 51840 | 12960 | ≥ 2 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 2: For the channel bandwidth of 10Mhz, the allocated RBs are distributed over the channel bandwidth at the RB index = {N, N+5, N+10, …, N+45 for N = 0, …, $N_{Interlace}$-1 } where $N_{Interlace}$ is 1, …, 4 for the allocated RBs of 10, …, 40, respectively.

Note 3: For the channel bandwidth of 20Mhz, the allocated RBs are distributed over the channel bandwidth at the RB index = {N, N+10, N+20, …, N+90 for N = 0, …, $N_{Interlace}$-1 } where $N_{Interlace}$ is 1, .., 9 for the allocated RBs of 10, …, 90, respectively.

### A.2.5.2.3 64QAM

**Table A.2.5.2.3-1: Reference Channels for 64QAM with partial RB allocation**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category (Note 2) | UE UL Category (Note 2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | Bits | Bits | | Bits | | | |
| | 10 - 20 | 10 | 12 | 64QAM | 3/4 | 6200 | 24 | 2 | 8640 | 1440 | 5,8 | 5, 8, 13, 14 |
| | 10 - 20 | 20 | 12 | 64QAM | 3/4 | 12576 | 24 | 3 | 17280 | 2880 | 5,8 | 5, 8, 13, 14 |
| | 10 - 20 | 30 | 12 | 64QAM | 3/4 | 19080 | 24 | 4 | 25920 | 4320 | 5,8 | 5, 8, 13, 14 |
| | 10 - 20 | 40 | 12 | 64QAM | 3/4 | 25456 | 24 | 5 | 34560 | 5760 | 5,8 | 5, 8, 13, 14 |
| | 20 | 50 | 12 | 64QAM | 3/4 | 31704 | 24 | 6 | 43200 | 7200 | 5,8 | 5, 8, 13, 14 |
| | 20 | 60 | 12 | 64QAM | 3/4 | 37888 | 24 | 7 | 51840 | 8640 | 5,8 | 5, 8, 13, 14 |
| | 20 | 70 | 12 | 64QAM | 3/4 | 43816 | 24 | 4 | 60480 | 10080 | 5,8 | 5, 8, 13, 14 |
| | 20 | 80 | 12 | 64QAM | 3/4 | 51024 | 24 | 9 | 69120 | 11520 | 5,8 | 5, 8, 13, 14 |
| | 20 | 90 | 12 | 64QAM | 2/3 | 51024 | 24 | 9 | 77760 | 12960 | 5,8 | 5, 8, 13, 14 |

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 2: If UE does not report UE UL category, then the applicability of reference channel is determined by UE category. If UE reports UE UL category, then the applicability of reference channel is determined by UE UL category

Note 3: For the channel bandwidth of 10Mhz, the allocated RBs are distributed over the channel bandwidth at the RB index = {N, N+5, N+10, …, N+45 for N = 0, …, $N_{Interlace}$-1 } where $N_{Interlace}$ is 1, …, 4 for the allocated RBs of 10, …, 40, respectively.

Note 4: For the channel bandwidth of 20Mhz, the allocated RBs are distributed over the channel bandwidth at the RB index = {N, N+10, N+20, …, N+90 for N = 0, …, $N_{Interlace}$-1 } where $N_{Interlace}$ is 1, .., 9 for the allocated RBs of 10, …, 90, respectively.

# A.3 DL reference measurement channels

## A.3.1 General

The number of available channel bits varies across the sub-frames due to PBCH and PSS/SSS overhead. The payload size per sub-frame is varied in order to keep the code rate constant throughout a frame.

No user data is scheduled on subframes #5 in order to facilitate the transmission of system information blocks (SIB).

The algorithm for determining the payload size $A$ is as follows; given a desired coding rate $R$ and radio block allocation $N_{RB}$

1. Calculate the number of channel bits $N_{ch}$ that can be transmitted during the first transmission of a given sub-frame.
2. Find $A$ such that the resulting coding rate is as close to $R$ as possible, that is,

$$\min\left|R-(A+24*(N_{CB}+1))/N_{ch}\right|, \text{ where } N_{CB}=\begin{cases}0, \text{if } C=1\\ C, \text{if } C>1\end{cases},$$

subject to

a) A is a valid TB size (according to TS 36.213 [10] clause 7.1.7) assuming an allocation of $N_{RB}$ resource blocks

b) $C$ is the number of Code Blocks calculated according to section 5.1.2 of TS 36.212 [9].

3. If there is more than one $A$ that minimizes the equation above, then the larger value is chosen per default and the chosen code rate should not exceed 0.93.
4. For TDD, the measurement channel is based on DL/UL configuration ratio of 2DL+DwPTS (12 OFDM symbol): 2UL.

### A.3.1.1 Overview of DL reference measurement channels

In Table A.3.1.1-1 are listed the DL reference measurement channels specified in annexes A.3.2 to A.3.10 of this release of TS 36.521-1. This table is informative and serves only to a better overview. The reference for the concrete reference measurement channels and corresponding implementation's parameters as to be used for testing are annexes A.3.2 to A.3.10 as appropriate.

**Table A.3.1.1-1: Overview of DL reference measurement channels**

| Duplex | Table | Name | BW | Mod | TCR | RB | RB Offset | UE Categ | Notes |
|---|---|---|---|---|---|---|---|---|---|
| **FDD, Receiver requirements** | | | | | | | | | |
| FDD | Table A.3.2-1 | | 1.4 | QPSK | 1/3 | 6 | | ≥ 1 | |
| FDD | Table A.3.2-1 | | 3 | QPSK | 1/3 | 15 | | ≥ 1 | |
| FDD | Table A.3.2-1 | | 5 | QPSK | 1/3 | 25 | | ≥ 1 | |
| FDD | Table A.3.2-1 | | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.3.2-1 | | 15 | QPSK | 1/3 | 75 | | ≥ 1 | |
| FDD | Table A.3.2-1 | | 20 | QPSK | 1/3 | 100 | | ≥ 1 | |
| FDD / HD-FDD | Table A.3.2-1a | | 1.4 | QPSK | 1/3 | 6 | | 0 | |
| FDD / HD-FDD | Table A.3.2-1a | | 3 | QPSK | 1/3 | 14 | | 0 | |
| FDD / HD-FDD | Table A.3.2-1a | | 5 | QPSK | 1/3 | 14 | | 0 | |
| FDD / HD-FDD | Table A.3.2-1a | | 10 | QPSK | 1/3 | 14 | | 0 | |
| FDD / HD-FDD | Table A.3.2-1a | | 15 | QPSK | 1/3 | 14 | | 0 | |
| FDD / HD-FDD | Table A.3.2-1a | | 20 | QPSK | 1/3 | 14 | | 0 | |
| FDD / HD-FDD | Table A.3.2-1b | | 1.4 | QPSK | 1/3 | 4 | | M1 | |
| FDD / HD-FDD | Table A.3.2-1b | | 3 | QPSK | 1/3 | 4 | | M1 | |
| FDD / HD-FDD | Table A.3.2-1b | | 5 | QPSK | 1/3 | 4 | | M1 | |
| FDD / HD-FDD | Table A.3.2-1b | | 10 | QPSK | 1/3 | 4 | | M1 | |
| FDD / HD-FDD | Table A.3.2-1b | | 15 | QPSK | 1/3 | 4 | | M1 | |
| FDD / HD-FDD | Table A.3.2-1b | | 20 | QPSK | 1/3 | 4 | | M1 | |
| HD-FDD | Table A.3.2-1c | | 0.2 | QPSK | 1/3 | | | NB1 | |
| HD-FDD | Table A.3.2-1d | | 0.2 | QPSK | 1/3 | | | NB1 | |
| FDD / HD-FDD | Table A.3.2-1h | | 1.4 | QPSK | 1/3 | 4 | | M2 | |
| FDD / HD-FDD | Table A.3.2-1h | | 3 | QPSK | 1/3 | 8 | | M2 | |
| FDD / HD-FDD | Table A.3.2-1h | | 5 | QPSK | 1/3 | 16 | | M2 | |
| FDD / HD-FDD | Table A.3.2-1h | | 10 | QPSK | 1/3 | 16 | | M2 | |
| FDD / HD-FDD | Table A.3.2-1h | | 15 | QPSK | 1/3 | 16 | | M2 | |
| FDD / HD-FDD | Table A.3.2-1h | | 20 | QPSK | 1/3 | 16 | | M2 | |
| **TDD, Receiver requirements** | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.3.2-2 | | 1.4 | QPSK | 1/3 | 6 | | ≥ 1 | |
| TDD | Table A.3.2-2 | | 3 | QPSK | 1/3 | 15 | | ≥ 1 | |
| TDD | Table A.3.2-2 | | 5 | QPSK | 1/3 | 25 | | ≥ 1 | |
| TDD | Table A.3.2-2 | | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| TDD | Table A.3.2-2 | | 15 | QPSK | 1/3 | 75 | | ≥ 1 | |
| TDD | Table A.3.2-2 | | 20 | QPSK | 1/3 | 100 | | ≥ 1 | |
| TDD | Table A.3.2-2a | | 1.4 | QPSK | 1/3 | 6 | | 0 | |
| TDD | Table A.3.2-2a | | 3 | QPSK | 1/3 | 14 | | 0 | |
| TDD | Table A.3.2-2a | | 5 | QPSK | 1/3 | 14 | | 0 | |
| TDD | Table A.3.2-2a | | 10 | QPSK | 1/3 | 14 | | 0 | |
| TDD | Table A.3.2-2a | | 15 | QPSK | 1/3 | 14 | | 0 | |
| TDD | Table A.3.2-2a | | 20 | QPSK | 1/3 | 14 | | 0 | |
| TDD | Table A.3.2-2b | | 1.4 | QPSK | 1/3 | 4 | | M1 | |
| TDD | Table A.3.2-2b | | 3 | QPSK | 1/3 | 4 | | M1 | |
| TDD | Table A.3.2-2b | | 5 | QPSK | 1/3 | 4 | | M1 | |
| TDD | Table A.3.2-2b | | 10 | QPSK | 1/3 | 4 | | M1 | |
| TDD | Table A.3.2-2b | | 15 | QPSK | 1/3 | 4 | | M1 | |
| TDD | Table A.3.2-2b | | 20 | QPSK | 1/3 | 4 | | M1 | |
| TDD | Table A.3.2-2c | | 20 | QPSK | 1/3 | 100 | | ≥ 1 | |
| TDD | Table A.3.2-2d | | 1.4 | QPSK | 1/3 | 4 | | M2 | |
| TDD | Table A.3.2-2d | | 3 | QPSK | 1/3 | 8 | | M2 | |
| TDD | Table A.3.2-2d | | 5 | QPSK | 1/3 | 16 | | M2 | |
| TDD | Table A.3.2-2d | | 10 | QPSK | 1/3 | 16 | | M2 | |
| TDD | Table A.3.2-2d | | 15 | QPSK | 1/3 | 16 | | M2 | |
| TDD | Table A.3.2-2d | | 20 | QPSK | 1/3 | 16 | | M2 | |
| **FDD, Receiver requirements, Maximum input level for UE Categories 3-5** | | | | | | | | | |
| FDD | Table A.3.2-3 | | 1.4 | 64QAM | 3/4 | 6 | | - | |
| FDD | Table A.3.2-3 | | 3 | 64QAM | 3/4 | 15 | | - | |
| FDD | Table A.3.2-3 | | 5 | 64QAM | 3/4 | 25 | | - | |
| FDD | Table A.3.2-3 | | 10 | 64QAM | 3/4 | 50 | | - | |
| FDD | Table A.3.2-3 | | 15 | 64QAM | 3/4 | 75 | | - | |
| FDD | Table A.3.2-3 | | 20 | 64QAM | 3/4 | 100 | | - | |
| **FDD, Receiver requirements, Maximum input level for UE Categories 1** | | | | | | | | | |
| FDD | Table A.3.2-3a | | 1.4 | 64QAM | 3/4 | 6 | | - | |
| FDD | Table A.3.2-3a | | 3 | 64QAM | 3/4 | 15 | | - | |
| FDD | Table A.3.2-3a | | 5 | 64QAM | 3/4 | 18 | | - | |
| FDD | Table A.3.2-3a | | 10 | 64QAM | 3/4 | 17 | | - | |
| FDD | Table A.3.2-3a | | 15 | 64QAM | 3/4 | 17 | | - | |
| FDD | Table A.3.2-3a | | 20 | 64QAM | 3/4 | 17 | | - | |
| **FDD, Receiver requirements, Maximum input level for UE Categories 2** | | | | | | | | | |
| FDD | Table A.3.2-3b | | 1.4 | 64QAM | 3/4 | 6 | | - | |
| FDD | Table A.3.2-3b | | 3 | 64QAM | 3/4 | 15 | | - | |
| FDD | Table A.3.2-3b | | 5 | 64QAM | 3/4 | 25 | | - | |
| FDD | Table A.3.2-3b | | 10 | 64QAM | 3/4 | 50 | | - | |
| FDD | Table A.3.2-3b | | 15 | 64QAM | 3/4 | 75 | | - | |
| FDD | Table A.3.2-3b | | 20 | 64QAM | 3/4 | 83 | | - | |
| **FDD, Receiver requirements, Maximum input level for UE Categories 0** | | | | | | | | | |
| FDD | Table A.3.2-3c | | 1.4 | 64QAM | 3/4 | 2 | | - | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| FDD | Table A.3.2-3c | | 3 | 64QAM | 3/4 | 2 | | - | |
| FDD | Table A.3.2-3c | | 5 | 64QAM | 3/4 | 2 | | - | |
| FDD | Table A.3.2-3c | | 10 | 64QAM | 3/4 | 2 | | - | |
| FDD | Table A.3.2-3c | | 15 | 64QAM | 3/4 | 2 | | - | |
| FDD | Table A.3.2-3c | | 20 | 64QAM | 3/4 | 2 | | - | |
| **FDD, Receiver requirements, Maximum input level for UE Categories M1** | | | | | | | | | |
| FDD/HD-FDD | Table A.3.2-3d | | 1.4 | 16QAM | 3/5 | 2 | | - | |
| FDD/HD-FDD | Table A.3.2-3d | | 3 | 16QAM | 3/5 | 2 | | - | |
| FDD/HD-FDD | Table A.3.2-3d | | 5 | 16QAM | 3/5 | 2 | | - | |
| FDD/HD-FDD | Table A.3.2-3d | | 10 | 16QAM | 3/5 | 2 | | - | |
| FDD/HD-FDD | Table A.3.2-3d | | 15 | 16QAM | 3/5 | 2 | | - | |
| FDD/HD-FDD | Table A.3.2-3d | | 20 | 16QAM | 3/5 | 2 | | - | |
| **FDD, Receiver requirements, Maximum input level for UE Categories M2** | | | | | | | | | |
| FDD/HD-FDD | Table A.3.2-3e | | 1.4 | 16QAM | 3/5 | 2 | | - | |
| FDD/HD-FDD | Table A.3.2-3e | | 3 | 16QAM | 3/5 | 8 | | - | |
| FDD/HD-FDD | Table A.3.2-3e | | 5 | 16QAM | 1/2 | 15 | | - | |
| FDD/HD-FDD | Table A.3.2-3e | | 10 | 16QAM | 1/2 | 15 | | - | |
| FDD/HD-FDD | Table A.3.2-3e | | 15 | 16QAM | 1/2 | 15 | | - | |
| FDD/HD-FDD | Table A.3.2-3e | | 20 | 16QAM | 1/2 | 15 | | - | |
| **TDD, Receiver requirements, Maximum input level for UE Categories 3-5** | | | | | | | | | |
| TDD | Table A.3.2-4 | | 1.4 | 64QAM | 3/4 | 6 | | - | |
| TDD | Table A.3.2-4 | | 3 | 64QAM | 3/4 | 15 | | - | |
| TDD | Table A.3.2-4 | | 5 | 64QAM | 3/4 | 25 | | - | |
| TDD | Table A.3.2-4 | | 10 | 64QAM | 3/4 | 50 | | - | |
| TDD | Table A.3.2-4 | | 15 | 64QAM | 3/4 | 75 | | - | |
| TDD | Table A.3.2-4 | | 20 | 64QAM | 3/4 | 100 | | - | |
| TDD | Table A.3.2-4d | | 20 | 64QAM | 3/4 | 100 | | ≥ 3 | |
| **TDD, Receiver requirements, Maximum input level for UE Categories 1** | | | | | | | | | |
| TDD | Table A.3.2-4a | | 1.4 | 64QAM | 3/4 | 6 | | - | |
| TDD | Table A.3.2-4a | | 3 | 64QAM | 3/4 | 15 | | - | |
| TDD | Table A.3.2-4a | | 5 | 64QAM | 3/4 | 18 | | - | |
| TDD | Table A.3.2-4a | | 10 | 64QAM | 3/4 | 17 | | - | |
| TDD | Table A.3.2-4a | | 15 | 64QAM | 3/4 | 17 | | - | |
| TDD | Table A.3.2-4a | | 20 | 64QAM | 3/4 | 17 | | - | |
| **TDD, Receiver requirements, Maximum input level for UE Categories 2** | | | | | | | | | |
| TDD | Table A.3.2-4b | | 1.4 | 64QAM | 3/4 | 6 | | - | |
| TDD | Table A.3.2-4b | | 3 | 64QAM | 3/4 | 15 | | - | |
| TDD | Table A.3.2-4b | | 5 | 64QAM | 3/4 | 25 | | - | |
| TDD | Table A.3.2-4b | | 10 | 64QAM | 3/4 | 50 | | - | |
| TDD | Table A.3.2-4b | | 15 | 64QAM | 3/4 | 75 | | - | |
| TDD | Table A.3.2-4b | | 20 | 64QAM | 3/4 | 83 | | - | |
| **TDD, Receiver requirements, Maximum input level for UE DL Categories 0** | | | | | | | | | |
| TDD | Table A.3.2-4c | | 1.4 | 64QAM | 3/4 | 2 | | - | |
| TDD | Table A.3.2-4c | | 3 | 64QAM | 3/4 | 2 | | - | |
| TDD | Table A.3.2-4c | | 5 | 64QAM | 3/4 | 2 | | - | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.3.2-4c | | 10 | 64QAM | 3/4 | 2 | | - | |
| TDD | Table A.3.2-4c | | 15 | 64QAM | 3/4 | 2 | | - | |
| TDD | Table A.3.2-4c | | 20 | 64QAM | 3/4 | 2 | | - | |
| **TDD, Receiver requirements, Maximum input level for UE Categories M1** | | | | | | | | | |
| TDD | Table A.3.2-4e | | 1.4 | 16QAM | 3/5 | 2 | | - | |
| TDD | Table A.3.2-4e | | 3 | 16QAM | 3/5 | 2 | | - | |
| TDD | Table A.3.2-4e | | 5 | 16QAM | 3/5 | 2 | | - | |
| TDD | Table A.3.2-4e | | 10 | 16QAM | 3/5 | 2 | | - | |
| TDD | Table A.3.2-4e | | 15 | 16QAM | 3/5 | 2 | | - | |
| TDD | Table A.3.2-4e | | 20 | 16QAM | 3/5 | 2 | | - | |
| **TDD, Receiver requirements, Maximum input level for UE Categories M2** | | | | | | | | | |
| TDD | Table A.3.2-4f | | 1.4 | 16QAM | 3/5 | 2 | | - | |
| TDD | Table A.3.2-4f | | 3 | 16QAM | 3/5 | 8 | | - | |
| TDD | Table A.3.2-4f | | 5 | 16QAM | 1/2 | 15 | | - | |
| TDD | Table A.3.2-4f | | 10 | 16QAM | 1/2 | 15 | | - | |
| TDD | Table A.3.2-4f | | 15 | 16QAM | 1/2 | 15 | | - | |
| TDD | Table A.3.2-4f | | 20 | 16QAM | 1/2 | 15 | | - | |
| **FDD, Receiver requirements, Maximum input level for UE Categories 11/12/13/14/15** | | | | | | | | | |
| FDD | Table A.3.2-5 | | 1.4 | 256QAM | 4/5 | 6 | | - | |
| FDD | Table A.3.2-5 | | 3 | 256QAM | 4/5 | 15 | | - | |
| FDD | Table A.3.2-5 | | 5 | 256QAM | 4/5 | 25 | | - | |
| FDD | Table A.3.2-5 | | 10 | 256QAM | 4/5 | 50 | | - | |
| FDD | Table A.3.2-5 | | 15 | 256QAM | 4/5 | 75 | | - | |
| FDD | Table A.3.2-5 | | 20 | 256QAM | 4/5 | 100 | | - | |
| **TDD, Receiver requirements, Maximum input level for UE Categories 11/12/13/14/15** | | | | | | | | | |
| TDD | Table A.3.2-6 | | 1.4 | 256QAM | 4/5 | 6 | | - | |
| TDD | Table A.3.2-6 | | 3 | 256QAM | 4/5 | 15 | | - | |
| TDD | Table A.3.2-6 | | 5 | 256QAM | 4/5 | 25 | | - | |
| TDD | Table A.3.2-6 | | 10 | 256QAM | 4/5 | 50 | | - | |
| TDD | Table A.3.2-6 | | 15 | 256QAM | 4/5 | 75 | | - | |
| TDD | Table A.3.2-6 | | 20 | 256QAM | 4/5 | 100 | | - | |
| TDD | Table A.3.2-7 | | 20 | 256QAM | 4/5 | 100 | | ≥ 11 | |
| **FDD, Transmitter requirements** | | | | | | | | | |
| FDD | Table A.3.2A-1 | | 1.4 | QPSK | 1/8-1/3 | 3 | | ≥ 1 | |
| FDD | Table A.3.2A-1 | | 3 | QPSK | 1/3 | 4 | | ≥ 1 | |
| FDD | Table A.3.2A-1 | | 5 | QPSK | 1/3 | 8 | | ≥ 1 | |
| FDD | Table A.3.2A-1 | | 10 | QPSK | 1/3 | 16 | | ≥ 1 | |
| FDD | Table A.3.2A-1 | | 15 | QPSK | 1/3 | 25 | | ≥ 1 | |
| FDD | Table A.3.2A-1 | | 20 | QPSK | 1/3 | 30 | | ≥ 1 | |
| FDD | Table A.3.2A-1a | | 1.4 | QPSK | 1/3 | 4 | | M1 | |
| FDD | Table A.3.2A-1a | | 3 | QPSK | 1/3 | 4 | | M1 | |
| FDD | Table A.3.2A-1a | | 5 | QPSK | 1/3 | 4 | | M1 | |
| FDD | Table A.3.2A-1a | | 10 | QPSK | 1/3 | 4 | | M1 | |
| FDD | Table A.3.2A-1a | | 15 | QPSK | 1/3 | 4 | | M1 | |
| FDD | Table A.3.2A-1a | | 20 | QPSK | 1/3 | 4 | | M1 | |
| **TDD, Transmitter requirements** | | | | | | | | | |
| TDD | Table A.3.2A-2 | | 1.4 | QPSK | 1/8-1/3 | 3 | | ≥ 1 | |
| TDD | Table A.3.2A-2 | | 3 | QPSK | 1/3 | 4 | | ≥ 1 | |

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|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.3.2A-2 | | 5 | QPSK | 1/3 | 8 | | ≥ 1 | |
| TDD | Table A.3.2A-2 | | 10 | QPSK | 1/3 | 16 | | ≥ 1 | |
| TDD | Table A.3.2A-2 | | 15 | QPSK | 1/3 | 25 | | ≥ 1 | |
| TDD | Table A.3.2A-2 | | 20 | QPSK | 1/3 | 30 | | ≥ 1 | |
| TDD | Table A.3.2A-3a | | 1.4 | QPSK | 1/8-1/3 | 4 | | M1 | |
| TDD | Table A.3.2A-3a | | 3 | QPSK | 1/3 | 4 | | M1 | |
| TDD | Table A.3.2A-3a | | 5 | QPSK | 1/3 | 4 | | M1 | |
| TDD | Table A.3.2A-3a | | 10 | QPSK | 1/3 | 4 | | M1 | |
| TDD | Table A.3.2A-3a | | 15 | QPSK | 1/3 | 4 | | M1 | |
| TDD | Table A.3.2A-3a | | 20 | QPSK | 1/3 | 4 | | M1 | |
| **FDD, PDSCH Performance, Single-antenna transmission (CRS)** | | | | | | | | | |
| FDD | Table A.3.3.1-1 | R.4 FDD | 1.4 | QPSK | 1/3 | 6 | | ≥ 1 | |
| FDD | Table A.3.3.1-1 | R.42 FDD | 20 | QPSK | 1/3 | 100 | | ≥ 1 | |
| FDD | Table A.3.3.1-1 | R.42-1 FDD | 3 | QPSK | 1/3 | 15 | | ≥ 1 | |
| FDD | Table A.3.3.1-1 | R.42-2 FDD | 5 | QPSK | 1/3 | 25 | | ≥ 1 | |
| FDD | Table A.3.3.1-1 | R.42-3 FDD | 15 | QPSK | 1/3 | 75 | | ≥ 1 | |
| FDD | Table A.3.3.1-1 | R.2 FDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.1-2 | R.3-1 FDD | 5 | 16QAM | 1/2 | 25 | | ≥ 1 | |
| FDD | Table A.3.3.1-2 | R.3 FDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.1-3 | R.5 FDD | 3 | 64QAM | 3/4 | 15 | | ≥ 1 | |
| FDD | Table A.3.3.1-3 | R.6 FDD | 5 | 64QAM | 3/4 | 25 | | ≥ 2 | |
| FDD | Table A.3.3.1-3 | R.7 FDD | 10 | 64QAM | 3/4 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.1-3 | R.8 FDD | 15 | 64QAM | 3/4 | 75 | | ≥ 2 | |
| FDD | Table A.3.3.1-3 | R.9 FDD | 20 | 64QAM | 3/4 | 100 | | ≥ 3 | |
| FDD | Table A.3.3.1-3a | R.6-1 FDD | 5 | 64QAM | 3/4 | 18 | | ≥ 1 | |
| FDD | Table A.3.3.1-3a | R.7-1 FDD | 10 | 64QAM | 3/4 | 17 | | ≥ 1 | |
| FDD | Table A.3.3.1-3a | R.8-1 FDD | 15 | 64QAM | 3/4 | 17 | | ≥ 1 | |
| FDD | Table A.3.3.1-3a | R.9-1 FDD | 20 | 64QAM | 3/4 | 17 | | ≥ 1 | |
| FDD | Table A.3.3.1-3a | R.9-2 FDD | 20 | 64QAM | 3/4 | 83 | | ≥ 2 | |
| FDD | Table A.3.3.1-6 | R.41 FDD | 10 | QPSK | 1/10 | 50 | | ≥ 1 | |
| **FDD, PDSCH Performance, Single-antenna transmission (CRS), Single PRB (Channel edge)** | | | | | | | | | |
| FDD | Table A.3.3.1-4 | R.0 FDD | 3 | 16QAM | 1/2 | 1 | | ≥ 1 | |
| FDD | Table A.3.3.1-4 | R.1 FDD | 10 / 20 | 16QAM | 1/2 | 1 | | ≥ 1 | |
| **FDD, PDSCH Performance, Single-antenna transmission (CRS), Single PRB (MBSFN Configuration)** | | | | | | | | | |
| FDD | Table A.3.3.1-5 | R.29 FDD | 10 | 16QAM | 1/2 | 1 | | ≥ 1 | |
| **FDD, Pcell PDSCH Performance, CA with power imbalance** | | | | | | | | | |
| FDD | Table A.3.3.1-7 | R.49 FDD | 20 | 64QAM | 0.84-0.87 | 100 | | ≥ 5 | |
| FDD | Table A.3.3.1-7 | R.49-1 FDD | 10 | 64QAM | 0.84 - 0.87 | 50 | | ≥2 | |
| FDD | Table A.3.3.1-7 | R.49-2 FDD | 5 | 64QAM | 0.84 - 0.86 | 25 | | ≥2 | |
| **FDD, PDSCH Performance, Multi-antenna transmission (CRS), Two antenna ports** | | | | | | | | | |
| FDD | Table A.3.3.2.1-1 | R.10 FDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.2.1-1 | R.10-2 FDD | 5 | QPSK | 1/3 | 25 | | ≥ 1 | |
| FDD | Table A.3.3.2.1-1 | R.11 FDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.2.1-1 | R.11-1 FDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| FDD | Table A.3.3.2.1-1 | R.11-2 FDD | 5 | 16QAM | 1/2 | 25 | | ≥ 1 | |
| FDD | Table A.3.3.2.1-1 | R.11-3 FDD | 10 | 16QAM | 1/2 | 40 | | ≥ 1 | |
| FDD | Table A.3.3.2.1-1 | R.11-4 FDD | 10 | QPSK | 1/2 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.2.1-1 | R.30 FDD | 20 | 16QAM | 1/2 | 100 | | ≥ 2 | |
| FDD | Table A.3.3.2.1-1 | R.30-1 FDD | 15 | 16QAM | 1/2 | 75 | | ≥ 2 | |
| FDD | Table A.3.3.2.1-1 | R.35 FDD | 10 | 64QAM | 1/2 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.2.1-1 | R.35-1 FDD | 20 | 64QAM | 0.39 | 100 | | ≥ 2 | |
| FDD | Table A.3.3.2.1-1 | R.35-2 FDD | 15 | 64QAM | 0.39 | 75 | | ≥ 2 | |
| FDD | Table A.3.3.2.1-1 | R.35-3 FDD | 10 | 64QAM | 0.39 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.2.1-2 | R.35-4 FDD | 10 | 64QAM | 0.47 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.2.1-2 | R.46 FDD | 10 | QPSK | | 50 | | ≥ 1 | |
| FDD | Table A.3.3.2.1-2 | R.47 FDD | 10 | 16QAM | | 50 | | ≥ 1 | |
| FDD | Table A.3.3.2.1-2 | R.11-5 FDD | 1.4 | 16QAM | 1/2 | 6 | | ≥ 1 | |
| FDD | Table A.3.3.2.1-2 | R.11-6 FDD | 3 | 16QAM | 1/2 | 15 | | ≥ 1 | |
| FDD | Table A.3.3.2.1-2 | R.11-7 FDD | 15 | 16QAM | 1/2 | 75 | | ≥ 2 | |
| FDD | Table A.3.3.2.1-2 | R.11-8 FDD | 10 | QPSK | 3/5 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.2.1-2 | R.11-9 FDD | 10 | QPSK | 0.58 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.2.1-2 | R.11-10 FDD | 10 | QPSK | 0.67 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.2.1-2 | R.65 FDD | 10 | 256QAM | 0.55 | 50 | | 11-12 | |
| FDD | Table A.3.3.2.1-2 | R.10-2 FDD | 5 | QPSK | 1/3 | 25 | | ≥ 1 | |
| FDD | Table A.3.3.2.1-3 | R.62 FDD | 10 | 16QAM | 1/2 | 3 | | 0 | |
| FDD | Table A.3.3.2.1-3 | R.63 FDD | 10 | 64QAM | 1/2 | 1 | | 0 | |
| FDD | Table A.3.3.2.1-4 | R.79 FDD | 10 | 16QAM | 1/2 | 3 | | M1, ≥ 0 | |
| FDD | Table A.3.3.2.1-5 | R.81 FDD | 10 | QPSK | 1/10 | 6 | | M1, ≥ 0 | |
| FDD | Table A.3.3.2.1-6 | R.87 FDD | 10 | 64QAM | 0.39 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.2.1-8 | R.90 FDD | 10 | QPSK | 1/3 | 18 | | M2 | |
| FDD | Table A.3.3.2.1-8 | R.91 FDD | 10 | QPSK | 1/10 | 18 | | M2 | |
| **FDD, PDSCH Performance, Multi-antenna transmission (CRS), Four antenna ports** | | | | | | | | | |
| FDD | Table A.3.3.2.2-1 | R.12 FDD | 1.4 | QPSK | 1/3 | 6 | | ≥ 1 | |
| FDD | Table A.3.3.2.2-1 | R.13 FDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.2.2-1 | R.14 FDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.2.2-1 | R.14-1 FDD | 10 | 16QAM | 1/2 | 6 | | ≥ 1 | |
| FDD | Table A.3.3.2.2-1 | R.14-2 FDD | 10 | 16QAM | 1/2 | 3 | | ≥ 1 | |
| FDD | Table A.3.3.2.2-1 | R.14-3 FDD | 20 | 16QAM | 1/2 | 100 | | ≥ 1 | |
| FDD | Table A.3.3.2.2-1 | R.36 FDD | 10 | 64QAM | 1/2 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.2.2-1 | R.14-4 FDD | 1.4 | 16QAM | 1/2 | 6 | | ≥ 1 | |
| FDD | Table A.3.3.2.2-1 | R.14-5 FDD | 3 | 16QAM | 1/2 | 15 | | ≥ 1 | |
| FDD | Table A.3.3.2.2-1 | R.14-6 FDD | 5 | 16QAM | 1/2 | 25 | | ≥ 1 | |
| FDD | Table A.3.3.2.2-1 | R.14-7 FDD | 15 | 16QAM | 1/2 | 75 | | ≥ 2 | |
| FDD | Table A.3.3.2.2-1 | R.72 FDD | 10 | 256QAM | 0.62 | 50 | | ≥ 11 | |
| FDD | Table A.3.3.2.2-1 | R.73 FDD | 10 | 64QAM | 0.43 | 50 | | ≥ 5 | |
| FDD | Table A.3.3.2.2-1 | R.74 FDD | 10 | 64QAM | 1/2 | 50 | | ≥ 5 | |
| **FDD, PDSCH Performance (UE specific RS) without CSI-RS** | | | | | | | | | |
| FDD | Table A.3.3.3.0-1 | R.70 FDD | 10 | QPSK | 0.65 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.3.0-1 | R.71 FDD | 10 | 16QAM | 0.6 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.3.0-2 | R.80 FDD | 10 | QPSK | 1/3 | 6 | | M1, ≥ 0 | |
| **FDD, PDSCH Performance (UE specific RS) Two antenna ports (CSI-RS)** | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| FDD | Table A.3.3.3.1-1 | R.51 FDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.3.1-1 | R.51-1 FDD | 10 | 16QAM | 0.54 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.3.1-1 | R.76 FDD | 10 | QPSK | | 50 | | ≥ 2 | |
| **FDD, PDSCH Performance (UE specific RS) Two antenna ports (CSI-RS, non Quasi Co-located)** | | | | | | | | | |
| FDD | Table A.3.3.3.1-2 | R.52 FDD | 10 | 64QAM | 1/2 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.3.1-2 | R.53 FDD | 10 | 64QAM | 1/2 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.3.1-2 | R.54 FDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| **FDD, PDSCH Performance (UE specific RS) Four antenna ports (CSI-RS)** | | | | | | | | | |
| FDD | Table A.3.3.3.2-1 | R.43 FDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.3.2-1 | R.43-1 FDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.3.2-1 | R.43-2 FDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.3.2-1 | R.50 FDD | 10 | 64QAM | 1/2 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.3.2-1 | R.48 FDD | 10 | QPSK | | 50 | | ≥ 1 | |
| FDD | Table A.3.3.3.2-1 | R.66 FDD | 10 | 256QAM | 0.77 | 50 | | 11-12 | |
| FDD | Table A.3.3.3.2-2 | R.44 FDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.3.2-2 | R.45 FDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| FDD | Table A.3.3.3.2-2 | R.45-1 FDD | 10 | 16QAM | 1/2 | 39 | | ≥ 1 | |
| FDD | Table A.3.3.3.2-1 | R.48 FDD | 10 | QPSK | | 50 | | ≥ 1 | |
| FDD | Table A.3.3.3.2-2 | R.60 FDD | 10 | QPSK | 1/2 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.3.2-3 | R.64 FDD | 10 | QPSK | 1/3 | 6 | | 0 | |
| FDD | Table A.3.3.3.2-1 | R.66 FDD | 10 | 256QAM | 0.77 | 50 | | 11-15 | |
| FDD | Table A.3.3.3.2-1 | R.69 FDD | 10 | QPSK | 0.74-0.8 | 50 | | ≥ 1 | |
| FDD | Table A.3.3.3.2-1 | R.75 FDD | 10 | 16QAM | 0.57 | 50 | | ≥ 5 | |
| **TDD, PDSCH Performance, Single-antenna transmission (CRS)** | | | | | | | | | |
| TDD | Table A.3.4.1-1 | R.4 TDD | 1.4 | QPSK | 1/3 | 6 | | ≥ 1 | |
| TDD | Table A.3.4.1-1 | R.42 TDD | 20 | QPSK | 1/3 | 100 | | ≥ 1 | |
| TDD | Table A.3.4.1-1 | R.2 TDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.1-1 | R.2A TDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.1-1 | R.42-1 TDD | 3 | QPSK | 1/3 | 15 | | ≥ 1 | |
| TDD | Table A.3.4.1-1 | R.42-2 TDD | 5 | QPSK | 1/3 | 25 | | ≥ 1 | |
| TDD | Table A.3.4.1-1 | R.42-3 TDD | 15 | QPSK | 1/3 | 75 | | ≥ 1 | |
| TDD | Table A.3.4.1-2 | R.3-1 TDD | 5 | 16QAM | 1/2 | 25 | | ≥ 1 | |
| TDD | Table A.3.4.1-2 | R.3 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.1-3 | R.5 TDD | 3 | 64QAM | 3/4 | 15 | | ≥ 1 | |
| TDD | Table A.3.4.1-3 | R.6 TDD | 5 | 64QAM | 3/4 | 25 | | ≥ 2 | |
| TDD | Table A.3.4.1-3 | R.7 TDD | 10 | 64QAM | 3/4 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.1-3 | R.8 TDD | 15 | 64QAM | 3/4 | 75 | | ≥ 2 | |
| TDD | Table A.3.4.1-3 | R.9 TDD | 20 | 64QAM | 3/4 | 100 | | ≥ 3 | |
| TDD | Table A.3.4.1-3a | R.6-1 TDD | 5 | 64QAM | 3/4 | 18 | | ≥ 1 | |
| TDD | Table A.3.4.1-3a | R.7-1 TDD | 10 | 64QAM | 3/4 | 17 | | ≥ 1 | |
| TDD | Table A.3.4.1-3a | R.8-1 TDD | 15 | 64QAM | 3/4 | 17 | | ≥ 1 | |
| TDD | Table A.3.4.1-3a | R.9-1 TDD | 20 | 64QAM | 3/4 | 17 | | ≥ 1 | |
| TDD | Table A.3.4.1-3a | R.9-2 TDD | 20 | 64QAM | 3/4 | 83 | | ≥ 2 | |
| TDD | Table A.3.4.1-6 | R.41 TDD | 10 | QPSK | 1/10 | 50 | | ≥ 1 | |
| **TDD, PDSCH Performance, Single-antenna transmission (CRS), Single PRB (Channel edge)** | | | | | | | | | |
| TDD | Table A.3.4.1-4 | R.0 TDD | 3 | 16QAM | 1/2 | 1 | | ≥ 1 | |
| TDD | Table A.3.4.1-4 | R.1 TDD | 10/ | 16QAM | 1/2 | 1 | | ≥ 1 | |

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|---|---|---|---|---|---|---|---|---|---|
| | | | 20 | | | | | | |
| **TDD, PDSCH Performance, Single-antenna transmission (CRS), Single PRB (MBSFN Configuration)** | | | | | | | | | |
| TDD | Table A.3.4.1-5 | R.29 TDD | 10 | 16QAM | 1/2 | 1 | | ≥ 1 | |
| **TDD, PDSCH Performance: Carrier aggregation with power imbalance** | | | | | | | | | |
| TDD | Table A.3.4.1-7 | R.49 TDD | 20 | 64QAM | 0.81-087 | 100 | | ≥ 5 | |
| TDD | Table A.3.4.1-7 | R.49-1 TDD | 15 | 64QAM | 0.80-0.86 | 75 | | ≥ 3 | |
| **TDD, PDSCH Performance, Multi-antenna transmission (CRS), Two antenna ports** | | | | | | | | | |
| TDD | Table A.3.4.2.1-1 | R.10 TDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.2.1-1 | R.11 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.2.1-1 | R.11-1 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.2.1-1 | R.11-2 TDD | 5 | 16QAM | 1/2 | 25 | | ≥ 1 | |
| TDD | Table A.3.4.2.1-1 | R.11-3 TDD | 10 | 16QAM | 1/2 | 40 | | ≥ 1 | |
| TDD | Table A.3.4.2.1-1 | R.11-4 TDD | 10 | QPSK | 1/2 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.2.1-1 | R.30 TDD | 20 | 16QAM | 1/2 | 100 | | ≥ 2 | |
| TDD | Table A.3.4.2.1-1 | R.30-1 TDD | 20 | 16QAM | 1/2 | 100 | | ≥ 2 | |
| TDD | Table A.3.4.2.1-1 | R.30-2 TDD | 20 | 16QAM | 1/2 | 100 | | ≥ 2 | |
| TDD | Table A.3.4.2.1-1 | R.35 TDD | 10 | 64QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.2.1-1 | R.35-1 TDD | 20 | 64QAM | 0.39 | 100 | | ≥ 2 | |
| TDD | Table A.3.4.2.1-2 | R.35-2 TDD | 10 | 64QAM | 0.47 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.2.1-2 | R.46 TDD | 10 | QPSK | 0.39 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.2.1-2 | R.47 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.2.1-2 | R.11-5 TDD | 1.4 | 16QAM | 1/2 | 6 | | ≥ 1 | |
| TDD | Table A.3.4.2.1-2 | R.11-6 TDD | 3 | 16QAM | 1/2 | 15 | | ≥ 1 | |
| TDD | Table A.3.4.2.1-2 | R.11-7 TDD | 5 | 16QAM | 1/2 | 25 | | ≥ 1 | |
| TDD | Table A.3.4.2.1-2 | R.11-8 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.2.1-2 | R.11-9 TDD | 15 | 16QAM | 1/2 | 75 | | ≥ 2 | |
| TDD | Table A.3.4.2.1-2 | R.11-10 TDD | 10 | QPSK | 3/5 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.2.1-2 | R.11-11 TDD | 10 | QPSK | 0.48-0.58 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.2.1-2 | R.11-12 TDD | 10 | QPSK | 0.54-0.66 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.2.1-3 | R.62 TDD | 10 | 16QAM | 1/2 | 3 | | 0 | |
| TDD | Table A.3.4.2.1-3 | R.63 TDD | 10 | 64QAM | 1/2 | 1 | | 0 | |
| TDD | Table A.3.4.2.1-4 | R.65 TDD | 20 | 256QAM | 0.6 | 100 | | 11-12 | |
| TDD | Table A.3.4.2.1-5 | R.67 TDD | 10 | 16QAM | 0.4 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.2.1-6 | R.79 TDD | 10 | 16QAM | ½ | 3 | | M1, ≥ 0 | |
| TDD | Table A.3.4.2.1-7 | R.81 TDD | 10 | QPSK | 1/10 | 6 | | M1, ≥ 0 | |
| TDD | Table A.3.4.2.1-8 | R.87 TDD | 10 | 64QAM | 0.39 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.2.1-10 | R.90 TDD | 10 | QPSK | 1/3 | 18 | | M2 | |
| TDD | Table A.3.4.2.1-10 | R.91 TDD | 10 | QPSK | 1/10 | 18 | | M2 | |
| **TDD, PDSCH Performance, Multi-antenna transmission (CRS), Four antenna ports** | | | | | | | | | |
| TDD | Table A.3.4.2.2-1 | R.12 TDD | 1.4 | QPSK | 1/3 | 6 | | ≥ 1 | |
| TDD | Table A.3.4.2.2-1 | R.13 TDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.2.2-1 | R.14 TDD | 10 | 16QAM | ½ | 50 | | ≥ 2 | |
| TDD | Table A.3.4.2.2-1 | R.14-1 TDD | 10 | 16QAM | 1/2 | 6 | | ≥ 1 | |
| TDD | Table A.3.4.2.2-1 | R.14-2 TDD | 10 | 16QAM | 1/2 | 3 | | ≥ 1 | |
| TDD | Table A.3.4.2.2-1 | R.43 TDD | 20 | 16QAM | 1/2 | 100 | | ≥ 2 | |
| TDD | Table A.3.4.2.2-1 | R.36 TDD | 10 | 64QAM | 1/2 | 50 | | ≥ 2 | |

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|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.3.4.2.2-1 | R.43-1 TDD | 1.4 | 16QAM | 1/2 | 6 | | ≥ 1 | |
| TDD | Table A.3.4.2.2-1 | R.43-2 TDD | 3 | 16QAM | 1/2 | 15 | | ≥ 1 | |
| TDD | Table A.3.4.2.2-1 | R.43-3 TDD | 5 | 16QAM | 1/2 | 25 | | ≥ 1 | |
| TDD | Table A.3.4.2.2-1 | R.43-4 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.2.2-1 | R.43-5 TDD | 15 | 16QAM | 1/2 | 75 | | ≥ 2 | |
| TDD | Table A.3.4.2.2-1 | R.72 TDD | 10 | 256QAM | 0.62 | 50 | | ≥ 11 | |
| TDD | Table A.3.4.2.2-1 | R.73 TDD | 10 | 64QAM | 0.44 | 50 | | ≥ 5 | |
| TDD | Table A.3.4.2.2-1 | R.74 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 5 | |
| **TDD, PDSCH Performance, Single antenna port (DRS)** | | | | | | | | | |
| TDD | Table A.3.4.3.1-1 | R.25 TDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.3.1-1 | R.26 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.3.1-1 | R.26-1 TDD | 5 | 16QAM | 1/2 | 25 | | ≥ 1 | |
| TDD | Table A.3.4.3.1-1 | R.27 TDD | 10 | 64QAM | 3/4 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.3.1-1 | R.27-1 TDD | 10 | 64QAM | 3/4 | 18 | | ≥ 1 | |
| TDD | Table A.3.4.3.1-1 | R.28 TDD | 10 | 16QAM | 1/2 | 1 | | ≥ 1 | |
| TDD | Table A.3.4.3.1-2 | R.80 TDD | 10 | QPSK | 1/3 | 6 | | M1, ≥ 0 | |
| **TDD, PDSCH Performance, Two antenna ports (DRS)** | | | | | | | | | |
| TDD | Table A.3.4.3.2-1 | R.31 TDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.3.2-1 | R.32 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.3.2-1 | R.32-1 TDD | 5 | 16QAM | 1/2 | [25] | | ≥ 1 | |
| TDD | Table A.3.4.3.2-1 | R.33 TDD | 10 | 64QAM | 3/4 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.3.2-1 | R.33-1 TDD | 10 | 64QAM | 3/4 | [18] | | ≥ 1 | |
| TDD | Table A.3.4.3.2-1 | R.34 TDD | 10 | 64QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.3.2 | R.70 TDD | 10 | QPSK | 0.54-0.65 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.3.2 | R.71 TDD | 10 | 16QAM | 0.5-0.6 | 50 | | ≥ 2 | |
| **TDD, PDSCH Performance (UE specific RS) Two antenna ports (CSI-RS)** | | | | | | | | | |
| TDD | Table A.3.4.3.3-1 | R.51 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.3.3-1 | R.51-1 TDD | 10 | 16QAM | 0.57 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.3.3-1 | R.76 TDD | 10 | QPSK | | 50 | | ≥ 2 | |
| **TDD, PDSCH Performance (UE specific RS) Two antenna ports (CSI-RS, non Quasi Co-located)** | | | | | | | | | |
| TDD | Table A.3.4.3.3-2 | R.52 TDD | 10 | 64QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.3.3-2 | R.52 TDD | 10 | 64QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.3.3-2 | R.52 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| **TDD, PDSCH Performance (UE specific RS) Four antenna ports (CSI-RS)** | | | | | | | | | |
| TDD | Table A.3.4.3.4-1 | R.44 TDD | 10 | 64QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.3.4-1 | R.48 TDD | 10 | QPSK | | 50 | | ≥ 1 | |
| TDD | Table A.3.4.3.4-1 | R.66 TDD | 20 | 256QAM | | 100 | | 11-12 | |
| TDD | Table A.3.4.3.4-2 | R.60 TDD | 10 | QPSK | 1/2 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.3.4-2 | R.61 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.3.4-2 | R.61-1 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.3.4-3 | R.64 TDD | 10 | QPSK | 1/3 | 6 | | 0 | |
| TDD | Table A.3.4.3.4-1 | R.69 TDD | 10 | QPSK | 0.61-0.8 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.3.4-1 | R.75 TDD | 10 | 16QAM | 0.57 | 50 | | ≥ 5 | |
| **TDD, PDSCH Performance (UE specific RS) Eight antenna ports (CSI-RS)** | | | | | | | | | |
| TDD | Table A.3.4.3.5-1 | R.50 TDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| TDD | Table A.3.4.3.5-2 | R.45 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 2 | |
| TDD | Table A.3.4.3.5-2 | R.45-1 TDD | 10 | 16QAM | 1/2 | 39 | | ≥ 1 | |

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|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.3.4.3.5-2 | R.45-2 TDD | 10 | 64QAM | | 50 | | ≥ 2 | |
| **FDD, PDCCH / PCFICH Performance** | | | | | | | | | |
| FDD | Table A.3.5.1-1 | R.15 FDD | 10 | PDCCH | | | | | |
| FDD | Table A.3.5.1-1 | R.15-1 FDD | 10 | PDCCH | | | | | |
| FDD | Table A.3.5.1-1 | R.15-2 FDD | 10 | PDCCH | | | | | |
| FDD | Table A.3.5.1-1 | R.16 FDD | 1.4 | PDCCH | | | | | |
| FDD | Table A.3.5.1-1 | R.17 FDD | 10 | PDCCH | | | | | |
| FDD | Table A.3.5.1-1A | R.16_1 FDD | 10 | PDCCH | | | | | |
| FDD | Table A.3.5.1-1A | R.17_1 FDD | 5 | PDCCH | | | | | |
| FDD | Table A.3.5.1-2 | | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.3.5.1-2 | | 1.4 | QPSK | 1/3 | 6 | | ≥ 1 | |
| FDD | Table A.3.5.1-2 | | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.3.5.1-2 | | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.3.5.1-2 | | 5 | QPSK | 1/3 | 25 | | ≥ 1 | |
| FDD | Table A.3.5.1-2A | | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| **TDD, PDCCH / PCFICH Performance** | | | | | | | | | |
| TDD | Table A.3.5.2-1 | R.15 TDD | 10 | PDCCH | | | | | |
| TDD | Table A.3.5.2-1 | R.15-1 TDD | 10 | PDCCH | | | | | |
| TDD | Table A.3.5.2-1 | R.15-2 TDD | 10 | PDCCH | | | | | |
| TDD | Table A.3.5.2-1 | R.16 TDD | 1.4 | PDCCH | | | | | |
| TDD | Table A.3.5.2-1 | R.17 TDD | 10 | PDCCH | | | | | |
| TDD | Table A.3.5.2-1A | R.16_1 TDD | 10 | PDCCH | | | | | |
| TDD | Table A.3.5.2-1A | R.17_1 TDD | 5 | PDCCH | | | | | |
| TDD | Table A.3.5.2-2 | | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| TDD | Table A.3.5.2-2 | | 1.4 | QPSK | 1/3 | 6 | | ≥ 1 | |
| TDD | Table A.3.5.2-2 | | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| TDD | Table A.3.5.2-2 | | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| TDD | Table A.3.5.2-2 | | 5 | QPSK | 1/3 | 25 | | ≥ 1 | |
| TDD | Table A.3.5.2-2A | | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| **FDD / TDD, PHICH Performance** | | | | | | | | | |
| FDD / TDD | Table A.3.6-1 | R.18 | 10 | PHICH | | | | | |
| FDD / TDD | Table A.3.6-1 | R.19A | 1.4 | PHICH | | | | | |
| FDD / TDD | Table A.3.6.1 | R.19-1 | 5 | PHICH | | | | | |
| FDD / TDD | Table A.3.6-1 | R.20A | 10 | PHICH | | | | | |
| FDD / TDD | Table A.3.6-1 | R.24 | 10 | PHICH | | | | | |
| FDD / TDD | Table A.3.6-1A | R.19 | 10 | PHICH | | | | | |
| FDD / TDD | Table A.3.6-1A | R.20 | 5 | PHICH | | | | | |
| **FDD, PMCH Performance** | | | | | | | | | |
| FDD | Table A.3.8.1-1 | R.40 FDD | 1.4 | QPSK | 1/3 | 6 | | ≥ 1 | |
| FDD | Table A.3.8.1-1 | R.37 FDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |
| FDD | Table A.3.8.1-2 | R.38 FDD | 10 | 16QAM | 1/2 | 50 | | ≥ 1 | |
| FDD | Table A.3.8.1-3 | R.39-1 FDD | 5 | 64QAM | 2/3 | 25 | | ≥ 1 | |
| FDD | Table A.3.8.1-3 | R.39 FDD | 10 | 64QAM | 2/3 | 50 | | ≥ 2 | |
| **TDD, PMCH Performance** | | | | | | | | | |
| TDD | Table A.3.8.2-1 | R.40 TDD | 1.4 | QPSK | 1/3 | 6 | | ≥ 1 | |
| TDD | Table A.3.8.2-1 | R.37 TDD | 10 | QPSK | 1/3 | 50 | | ≥ 1 | |

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|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.3.8.2-2 | R.38 TDD | 10 | 16QAM | 1/2 | 50 | | ≥ 1 | |
| TDD | Table A.3.8.2-3 | R.39-1 TDD | 5 | 64QAM | 2/3 | 25 | | ≥ 1 | |
| TDD | Table A.3.8.2-3 | R.39 TDD | 10 | 64QAM | 2/3 | 50 | | ≥ 2 | |
| **FDD, Sustained data rate (CRS)** | | | | | | | | | |
| FDD | Table A.3.9.1-1 | R.31-1 FDD | 10 | 64QAM | 0.40 | | | ≥ 1 | |
| FDD | Table A.3.9.1-2 | R.31-1A FDD | 20 | 64QAM | 0.41 | | | ≥ 1 | |
| FDD | Table A.3.9.1-1 | R.31-2 FDD | 10 | 64QAM | 0.59-0.64 | | | ≥ 2 | |
| FDD | Table A.3.9.1-1 | R.31-3 FDD | 20 | 64QAM | 0.59-0.62 | | | ≥ 2 | |
| FDD | Table A.3.9.1-1 | R.31-3A FDD | 10 | 64QAM | 0.85-0.90 | | | ≥ 2 | |
| FDD | Table A.3.9.1-1 | R.31-3C FDD | 15 | 64QAM | 0.87-0.91 | | | ≥ 3 | |
| FDD | Table A.3.9.1-1 | R.31-4 FDD | 20 | 64QAM | 0.87-0.90 | | | ≥ 3 | |
| FDD | Table A.3.9.1-1 | R.31-4B FDD | 15 | 64QAM | 0.85-0.88 | | | ≥ 4 | |
| FDD | Table A.3.9.1-1 | R.31-5 FDD | 15 | 64QAM | 0.85-0.91 | | | ≥ 3 | |
| FDD | Table A.3.9.1-2 | R.31-6 FDD | 5 | 64QAM | 0.83-0.85 | | | ≥ 2 | |
| FDD | Table A.3.9.1-2 | R.31-7 FDD | 10 | 64QAM | 0.78-0.83 | | | ≥ 6 | |
| FDD | Table A.3.9.1-2 | R.31-8 FDD | 15 | 64QAM | 0.77-0.80 | | | ≥ 6 | |
| FDD | Table A.3.9.1-2 | R.31-9 FDD | 20 | 64QAM | 0.79-0.81 | | | ≥ 6 | |
| FDD | Table A.3.9.1-2 | R.31-10 FDD | 5 | 64QAM | 0.78-0.85 | | | ≥ 6 | |
| FDD | Table A.3.9.1-3 | R.68 FDD | 20 | 256QAM | 0.74-0.85 | | | 11-12 | |
| FDD | Table A.3.9.1-3 | R.68-1 FDD | 15 | 256QAM | 0.74-0.88 | | | 11-12 | |
| FDD | Table A.3.9.1-3 | R.68-2 FDD | 10 | 256QAM | 0.74-0.85 | | | 11-12 | |
| FDD | Table A.3.9.1-3 | R.68-3 FDD | 5 | 256QAM | 0.77-0.85 | | | 11-12 | |
| FDD | Table A.3.9.1-3 | R.68-4 FDD | 10 | 256QAM | 0.78-0.83 | | | 11-12 | |
| FDD | Table A.3.9.1-3 | R.68-5 FDD | 15 | 256QAM | 0.79-0.82 | | | 11-12 | |
| FDD | Table A.3.9.1-3 | R.68-6 FDD | 20 | 256QAM | 0.78-0.80 | | | 11-12 | |
| FDD | Table A.3.9.1-3 | R.68-7 FDD | 5 | 256QAM | 0.77-0.85 | | | 11-12 | |
| **TDD, Sustained data rate (CRS)** | | | | | | | | | |
| TDD | Table A.3.9.2-1 | R.31-1 TDD | 10 | 64QAM | 0.40 | | | ≥ 1 | |
| TDD | Table A.3.9.2-1 | R.31-1A TDD | 20 | 64QAM | 0.41 | | | ≥ 1 | |
| TDD | Table A.3.9.2-1 | R.31-2 TDD | 10 | 64QAM | 0.59-0.64 | | | ≥ 2 | |
| TDD | Table A.3.9.2-1 | R.31-3 TDD | 20 | 64QAM | 0.59-0.62 | | | ≥ 2 | |
| TDD | Table A.3.9.2-1 | R.31-3A TDD | 15 | 64QAM | 0.87-0.90 | | | ≥ 2 | |
| TDD | Table A.3.9.2-1 | R.31-4 TDD | 20 | 64QAM | 0.87-0.90 | | | ≥ 3 | |
| TDD | Table A.3.9.2-1 | R.31-4A TDD | 20 | 64QAM | 0.87-0.90 | | | ≥ 3 | |
| TDD | Table A.3.9.2-1 | R.31-5 TDD | 15 | 64QAM | 0.87-0.88 | | | ≥ 3 | |
| TDD | Table A.3.9.2-1A | R.31-6 TDD | 10 | 64QAM | 0.85-0.90 | | | ≥ 2 | |
| TDD | Table A.3.9.2-1A | R.31-7 TDD | 10 | 64QAM | 0.78-0.82 | | | ≥ 6 | |
| TDD | Table A.3.9.2-1A | R.31-8 TDD | 15 | 64QAM | 0.77-0.79 | | | ≥ 6 | |
| TDD | Table A.3.9.2-1A | R.31-9 TDD | 20 | 64QAM | 0.79-0.81 | | | ≥ 6 | |
| TDD | Table A.3.9.2-2 | R.68 TDD | 20 | 256QAM | 0.74- | | | 11- | |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | 0.85 | | | 12 | |
| TDD | Table A.3.9.2-2 | R.68-1 TDD | 15 | 256QAM | 0.76-0.88 | | | 11-12 | |
| TDD | Table A.3.9.2-2 | R.68-2 TDD | 10 | 256QAM | 0.74-0.85 | | | 11-12 | |
| TDD | Table A.3.9.2-2 | R.68-3 TDD | 20 | 256QAM | 0.74-0.85 | | | 11-12 | |
| TDD | Table A.3.9.2-2 | R.68-4 TDD | 15 | 256QAM | 0.76-0.88 | | | 11-12 | |
| TDD | Table A.3.9.2-3 | R.68-5 TDD | 10 | 256QAM | 0.78-0.82 | | | 11-12 | |
| TDD | Table A.3.9.2-3 | R.68-6 TDD | 15 | 256QAM | 0.79-0.82 | | | 11-12 | |
| TDD | Table A.3.9.2-3 | R.68-7 TDD | 20 | 256QAM | 0.78-0.80 | | | 11-12 | |
| **FDD, Sustained data rate test with EPDCCH scheduling (CRS)** | | | | | | | | | |
| FDD | Table A.3.9.3-1 | R.31E-1 FDD | 10 | 64QAM | 0.40-0.41 | | | ≥ 1 | |
| FDD | Table A.3.9.3-1 | R.31E-2 FDD | 10 | 64QAM | 0.59-0.66 | | | ≥ 2 | |
| FDD | Table A.3.9.3-1 | R.31E-3 FDD | 20 | 64QAM | 0.59-0.63 | | | ≥ 2 | |
| FDD | Table A.3.9.3-1 | R.31E-3A FDD | 10 | 64QAM | 0.85-0.92 | | | ≥ 2 | |
| FDD | Table A.3.9.3-1 | R.31E-3C FDD | 15 | 64QAM | 0.87-0.92 | | | ≥ 3 | |
| FDD | Table A.3.9.3-1 | R.31E-4 FDD | 20 | 64QAM | 0.87-0.91 | | | ≥ 3 | |
| FDD | Table A.3.9.3-1 | R.31E-4B FDD | 15 | 64QAM | 0.85-0.90 | | | ≥4 | |
| **TDD, Sustained data rate test with EPDCCH scheduling (CRS)** | | | | | | | | | |
| TDD | Table A.3.9.4-1 | R.31E-1 TDD | 10 | 64QAM | 0.40-0.41 | | | ≥ 1 | |
| TDD | Table A.3.9.4-1 | R.31E-2 TDD | 10 | 64QAM | 0.59-0.65 | | | ≥ 2 | |
| TDD | Table A.3.9.4-1 | R.31E-3 TDD | 20 | 64QAM | 0.59-0.63 | | | ≥ 2 | |
| TDD | Table A.3.9.4-1 | R.31E-3A TDD | 15 | 64QAM | 0.87-0.92 | | | ≥ 2 | |
| TDD | Table A.3.9.4-1 | R.31E-4 TDD | 20 | 64QAM | 0.87-0.90 | | | ≥ 3 | |
| **FDD, EPDCCH Performance** | | | | | | | | | |
| FDD | Table A.3.10.1-1 | R.55 FDD | 10 | EPDCCH | | | | | |
| FDD | Table A.3.10.1-1 | R.56 FDD | 10 | EPDCCH | | | | | |
| FDD | Table A.3.10.1-1 | R.57 FDD | 10 | EPDCCH | | | | | |
| FDD | Table A.3.10.1-1 | R.58 FDD | 10 | EPDCCH | | | | | |
| FDD | Table A.3.10.1-1 | R.59 FDD | 10 | EPDCCH | | | | | |
| **TDD, EPDCCH Performance** | | | | | | | | | |
| TDD | Table A.3.10.2-1 | R.55 TDD | 10 | EPDCCH | | | | | |
| TDD | Table A.3.10.2-1 | R.56 TDD | 10 | EPDCCH | | x | | | |
| TDD | Table A.3.10.2-1 | R.57 TDD | 10 | EPDCCH | | | | | |
| TDD | Table A.3.10.2-1 | R.58 TDD | 10 | EPDCCH | | | | | |
| TDD | Table A.3.10.2-1 | R.59 TDD | 10 | EPDCCH | | | | | |
| **FDD, MPDCCH performance** | | | | | | | | | |
| FDD | Table A.3.11.1-1 | R.82 FDD | 10 | MPDCCH | | | | | |
| FDD | Table A.3.11.1-1 | R.83 FDD | 10 | MPDCCH | | | | | |
| **TDD, MPDCCH performance** | | | | | | | | | |
| TDD | Table A.3.11.2-1 | R.82 TDD | 10 | MPDCCH | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TDD | Table A.3.11.2-1 | R.83 TDD | 10 | MPDCCH | | | | | |
| **LAA, Multi-Antenna Transmission PDSCH Performance** | | | | | | | | | |
| FDD | Table A.3.15.1.1-1 | R.1 FS3 | 20 | 64 QAM | 6/10 | 100 | | ≥ 5 | |
| FDD | Table A.3.15.2.1-1 | R.2 FS3 | 20 | 16QAM | 1/2 | 100 | | ≥ 5 | |

## A.3.2 Reference measurement channel for receiver characteristics

Unless otherwise stated, Tables A.3.2-1, A.3.2-1a, A.3.2-1b, A.3.2-2, A.3.2-2a and A.3.2-2b are applicable for measurements on the Receiver Characteristics (clause 7) with the exception of subclause 7.4 (Maximum input level).

Unless otherwise stated, Tables A.3.2-3, A.3.2-3a, A.3.2-3b, A.3.2-4, A.3.2-4a and A.3.2-4b are applicable for subclause 7.4 (Maximum input level).

Unless otherwise stated, Tables A.3.2-1, A.3.2-1a, A.3.2-1b, A.3.2-2, A.3.2-2a and A.3.2-2b also apply for the modulated interferer used in Clauses 7.5, 7.6 and 7.8 with test specific bandwidths.

For transmissions in TDD Band 46, Table A.3.2-2c is applicable for measurements of Receiver Characteristics (clause 7) except for the Maximum Input Level (clause 7.4A) for which Table A.3.2-4d and Table A.3.2-7 apply. For these measurements, the discovery signals measurement timing configuration (DMTC) periodicity shall be set at *dmtc-Periodicity* = 40 ms with an offset *dmtc-Offset* = 0 for the channel and the DRS shall be transmitted in the first subframe of each DMTC occasion. Furthermore, no PBCH is transmitted and the PDSCH is also scheduled in subframe #5.

**Table A.3.2-1: Fixed Reference Channel for Receiver Requirements (FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame | | 9 | 9 | 9 | 9 | 9 | 9 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 408 | 1320 | 2216 | 4392 | 6712 | 8760 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 152 | 872 | 1800 | 4392 | 6712 | 8760 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1 | 1 | 1 | 1 | 2 | 2 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 1 | 1 | 1 | 1 | 2 | 2 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1368 | 3780 | 6300 | 13800 | 20700 | 27600 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 528 | 2940 | 5460 | 12960 | 19860 | 26760 |
| Max. Throughput averaged over 1 frame | kbps | 341.6 | 1143.2 | 1952.8 | 3952.8 | 6040.8 | 7884 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz<br>Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | |

**Table A.3.2-1a: Fixed Reference Channel for Receiver Requirements for UE Category 0 (FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 14 | 14 | 14 | 14 | 14 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame | | 9 | 9 | 9 | 9 | 9 | 9 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Number of HARQ Processes | Processes | [8] | [8] | [8] | [8] | [8] | [8] |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 408 | 1000 | 1000 | 1000 | 1000 | 1000 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 (Note 3) | Bits | 152 | 840 | 840 | 904 | 904 | 904 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 1 | 1 | 1 | 1 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1368 | 3528 | 3528 | 3864 | 3864 | 3864 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 (Note 3) | Bits | 528 | 2688 | 2688 | 3024 | 3024 | 3024 |
| Max. Throughput averaged over 1 frame | kbps | 341.6 | 884 | 884 | 890.4 | 890.4 | 890.4 |
| UE DL Category | | 0 | 0 | 0 | 0 | 0 | 0 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz.
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: For Sub-Frame 0, it is assumed the 6PRBs are allocated in the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.
Note 4: For HD-FDD UE, the downlink subframes are scheduled at the 0th, 1st, 2nd, 8th, 9th, 10th, 16th, 17th, 18th, 24th, 25th, 26th, 32nd, 33rd, 34th subframes every 40ms. Information bit payload is available if downlink subframe is scheduled.

**Table A.3.2-1b: Fixed Reference Channel for Receiver Requirements (FDD) for UE Category M1**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 4 | 4 | 4 | 4 | 4 | 4 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame | | 2 | 2 | 8 | 8 | 8 | 8 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 3, 8 | Bits | 256 | 256 | 256 | 328 | 328 | 328 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | 256 | 328 | 328 | 328 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame | | | | | | | |
| For Sub-Frames 3, 8 | Bits | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | 1 | 1 | 1 | 1 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 3, 8 | Bits | 912 | 1008 | 1008 | 1104 | 1104 | 1104 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | 1008 | 1104 | 1104 | 1104 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame for FDD | kbps | 51.2 | 51.2 | 204.8 | 262.4 | 262.2 | 262.4 |
| Max. Throughput averaged over 1 frames for HD-FDD | kbps | 25.6 | 25.6 | 76.8 | 98.4 | 98.4 | 98.4 |
| UE DL Category | | M1 | M1 | M1 | M1 | M1 | M1 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz

Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].

Note 3: The scheduled narrowband other than 1.4MHz and 3MHz channel BW avoids the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.

Note 4: For HD-FDD UE, PDSCH are scheduled at the 3rd subframe every 1 radio frame for 1.4MHz and 3MHz channel BW. For other channel BW, PDSCH are scheduled at the 0th, 1st, and 2nd subframes every 1 radio frame. Information bit payload is available if downlink subframe is scheduled. The corresponding M-PDCCH is scheduled 2 subframes before the corresponding PDSCH transmission.

Note 5: 2 resource blocks allocated to M-PDCCH

**Table A.3.2-1c: Fixed Reference Channel for Receiver Requirements (HD-FDD) without repetition – for CAT-NB1**

| Parameter | Unit | Value |
|---|---|---|
| Channel bandwidth | MHz | 0.2 |
| Number of subcarriers | | 12 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/3 |
| Number of HARQ Processes | Processes | 1 |
| Maximum number of HARQ transmissions | | 1 |
| Transport block size | Bits | 88 |
| Number of Sub-Frames per transport block | | 1 |
| Transport block CRC | Bits | 24 |
| Binary Channel Bits Per Sub-Frame | Bits | 320 |
| LTE CRS port | | N/A |
| Number of NRS ports | | 1 |
| Number of NPDSCH repetitions | | 0 |
| UE DL Category | | NB1 |
| Note 1: NB-IoT in stand-alone mode has been considered here<br>Note 2: Reference signal, Synchronization signals and NPBCH allocated as per TS 36.211 [8].<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note 4: Parameters related to NPDSCH scheduling are defined in Table A.3.2-1e to Table A.3.2-1g.<br>Note 5: NPDCCH and information bit payload are not transmitted in the subframes used for transmission of SI messages.<br>Note 6: SI messages transmission should be prioritized over NPDCCH transmission in case of collision. NPDCCH transmission is postponed until the next NB-IoT downlink subframe in case NPDCCH transmission occurs in a non NB-IoT downlink subframe, where an NB-IoT downlink subframe is a subframe that does not contain NPSS/NSSS/NPBCH/SIB1-NB transmission. | | |

**Table A.3.2-1ca Example scheduling pattern with SI periodicity of 64 radio frames for Receiver Requirements (HD-FDD) without repetition – for CAT-NB1**

| Subframe th from the 0th subframe | NPDCCH | NPDSCH | NPUSCH |
|---|---|---|---|
| | 18, 42, 66, 98, 122, 146, 171, 194, 218, 242, 266, 291, 314, 338, 362, 386, 411, 434, 458, 482, 506, 531, 554, 578, 602, 626 | +5 from corresponding NPDCCH | +13 and +14 from corresponding NPDSCH. NPUSCH transmission occupies 2 subframes |

**Table A.3.2-1d: Fixed Reference Channel for Receiver Requirements (HD-FDD) with repetition – for CAT-NB1**

| Parameter | Unit | Value |
|---|---|---|
| Channel bandwidth | MHz | 0.2 |
| Number of subcarriers | | 12 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/3 |
| Number of HARQ Processes | Processes | 1 |
| Maximum number of HARQ transmissions | | 1 |
| Transport block size | Bits | 88 |
| Number of Sub-Frames per transport block | | 1 |
| Transport block CRC | Bits | 24 |
| Binary Channel Bits Per Sub-Frame | Bits | 320 |
| LTE CRS port | | N/A |
| Number of NRS ports | | 1 |
| Number of NPDSCH repetitions | | TBD |
| UE DL Category | | NB1 |
| Note 1: NB-IoT in stand-alone mode has been considered here<br>Note 2: Reference signal, Synchronization signals and NPBCH allocated as per TS 36.211 [8].<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)<br>Note 4: Parameters related to NPDSCH scheduling are defined in Table A.3.2-1e to Table A.3.2-1g. | | |

**Table A.3.2-1e: General configuration for CAT-NB1**

| Parameter | Unit | Value |
|---|---|---|
| NB-IoT downlink subframe bitmap for anchor carrier *(downlinkBitmap)* | | Not configured |
| NB-IoT downlink subframe bitmap for non-anchor carrier *(downlinkBitmapNonAnchor)* | | Not configured |
| Downlink gap configuration for anchor carrier *(dl-Gap)* | | Not configured |
| Downlink gap configuration for non-anchor carrier *(dl-GapNonAnchor)* | | Not configured |

**Table A.3.2-1f: NPDCCH configuration for NPDSCH scheduling**

| Parameter | Unit | Value |
|---|---|---|
| DCI format | | DCI format N1 |
| NPDCCH format | | 1 |
| Scheduling delay ( $I_{\text{Delay}}$ ) | | 0 |
| DCI subframe repetition number | | 00 |
| $R_{\max}$ (*npdcch-NumRepetitions*) | | 1 |
| G (*NPDCCH-startSF-USS*) | | 8 |
| $\alpha_{offset}$ (*npdcch-Offset-USS*) | | 1/4 |

**Table A.3.2-1g: NPUSCH format 2 configurations for NPDSCH scheduling**

| Parameter | Unit | Value |
|---|---|---|
| Scheduling delay ($I_{\text{Delay}}$) | | 0 |
| $N_{\text{Rep}}^{AN}$ (*ack-NACK-NumRepetitions*) | | 1 |
| ACK/NACK resource field | | 0 |

**Table A.3.2-1h: Fixed Reference Channel for Receiver Requirements (FDD and HD-FDD) – for CAT-M2**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks (Note 6) | | 4 | 8 | 16 | 16 | 16 | 16 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame (Note 4) | | 2 | 2 | 8 | 8 | 8 | 8 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 3,8 | Bits | 256 | 680 | 1384 | 1384 | 1384 | 1384 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | N/A | N/A | 1384 | 1384 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame | | | | | | | |
| For Sub-Frames 3,8 | Bits | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | 1 | 1 | 1 | 1 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 3,8 | Bits | 912 | 2016 | 4032 | 4416 | 4416 | 4416 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | N/A | N/A | 4416 | 4416 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame for FDD | kbps | 51.2 | 136.0 | 276.8 | 276.8 | 1107.2 | 1107.2 |
| Max. Throughput averaged over 1 frames for HD-FDD | kbps | 25.6 | 68.0 | 138.4 | 138.4 | 415.2 | 415.2 |
| UE DL Category | | M2 | M2 | M2 | M2 | M2 | M2 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: The scheduled wideband other than 1.4MHz/3MHz/5MHz/15MHz channel bandwidth avoids the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.
Note 4: For HD-FDD UE, PDSCH are scheduled at the 3rd subframe every 1 radio frame for 1.4MHz/3MHz/5MHz/10MHz channel bandwidth. For other channel bandwidth, PDSCH are scheduled at the 0th, 1st and 2nd subframes every 1 radio frame. Information bit payload is available if downlink subframe is scheduled. The corresponding MPDCCH is scheduled 2 subframes before the corresponding PDSCH transmission.
Note 5: 2 resource blocks allocated to MPDCCH.
Note 6: 4 resource blocks in each narrowband allocated to PDSCH.

**Table A.3.2-2: Fixed Reference Channel for Receiver Requirements (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel Bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (Note 6) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 3 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Number of HARQ Processes | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Maximum number of HARQ transmission | | 1 | 1 | 1 | 1 | 1 | 1 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 4, 9 | | 408 | 1320 | 2216 | 4392 | 6712 | 8760 |
| For Sub-Frame 1, 6 | | n/a | 968 | 1544 | 3240 | 4968 | 6712 |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | 208 | 1064 | 1800 | 4392 | 6712 | 8760 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frame 4, 9 | | 1 | 1 | 1 | 1 | 2 | 2 |
| For Sub-Frame 1, 6 | | n/a | 1 | 1 | 1 | 1 | 2 |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | 1 | 1 | 1 | 1 | 2 | 2 |
| Binary Channel Bits Per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 4, 9 | | 1368 | 3780 | 6300 | 13800 | 20700 | 27600 |
| For Sub-Frame 1, 6 | | n/a | 3276 | 5556 | 11256 | 16956 | 22656 |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | 672 | 3084 | 5604 | 13104 | 20004 | 26904 |
| Max. Throughput averaged over 1 frame | kbps | 102.4 | 564 | 932 | 1965.6 | 3007.2 | 3970.4 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: For 1.4MHz, no data shall be scheduled on special subframes (1&6) to avoid problems with insufficient PDCCH performance
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: As per Table 4.2-2 in TS 36.211 [8]

**Table A.3.2-2a: Fixed Reference Channel for Receiver Requirements for UE Category 0 (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel Bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 14 | 14 | 14 | 14 | 14 |
| Uplink-Downlink Configuration (Note 5) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 3 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Number of HARQ Processes | Processes | [7] | [7] | [7] | [7] | [7] | [7] |
| Maximum number of HARQ transmission | | 1 | 1 | 1 | 1 | 1 | 1 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 4, 9 | | 408 | 1000 | 1000 | 1000 | 1000 | 1000 |
| For Sub-Frame 1, 6 | | N/A | 872 | 872 | 872 | 872 | 872 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 208 | 1000 | 1000 | 1000 | 1000 | 1000 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frame 4, 9 | | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 1, 6 | | N/A | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 1 | 1 | 1 | 1 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 4, 9 | | 1368 | 3528 | 3528 | 3864 | 3864 | 3864 |
| For Sub-Frame 1, 6 | | N/A | 3048 | 3048 | 3048 | 3048 | 3048 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 672 | 2832 | 2832 | 3168 | 3168 | 3168 |
| Max. Throughput averaged over 1 frame | kbps | 102.4 | 474.4 | 474.4 | 474.4 | 474.4 | 474.4 |
| UE DL Category | | 0 | 0 | 0 | 0 | 0 | 0 |

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: As per Table 4.2-2 in TS 36.211 [8]

**Table A.3.2-2b: Fixed Reference Channel for Receiver Requirements for UE category M1 (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel Bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 4 | 4 | 4 | 4 | 4 | 4 |
| Uplink-Downlink Configuration (Note 5) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D) | | 3 | 3 | 3 | 3 | 3 | 3 |
| Number of HARQ Processes | Processes | [7] | [7] | [7] | [7] | [7] | [7] |
| Maximum number of HARQ transmission | | 1 | 1 | 1 | 1 | 1 | 1 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 4, 9 | | 256 | 256 | 256 | 328 | 328 | 328 |
| For Sub-Frame 1, 6 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 256 | 256 | 256 | 328 | 328 | 328 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frame 4, 9 | | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 1, 6 | | N/A | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 1 | 1 | 1 | 1 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 4, 9 | | 912 | 1008 | 1008 | 1104 | 1104 | 1104 |
| For Sub-Frame 1, 6 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 912 | 1008 | 1008 | 1104 | 1104 | 1104 |
| Max. Throughput averaged over 1 frame | kbps | 76.8 | 76.8 | 76.8 | 98.4 | 98.4 | 98.4 |
| UE DL Category | | M1 | M1 | M1 | M1 | M1 | M1 |

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: No data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: As per Table 4.2-2 in TS 36.211 [8]
Note 6: For Sub-Frame 0, the scheduled narrowband avoids the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.
Note 7: 2 resource blocks allocated to M-PDCCH

**Table A.3.2-2c Fixed Reference Channel for Receiver Requirements (TDD Band 46)**

| Parameter | Unit | Value |
|---|---|---|
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks | | 100 |
| Uplink-Downlink Configuration | | N/A |
| Subcarriers per resource block | | 12 |
| Allocated subframes per Radio Frame (D) | | 8 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/3 |
| Number of HARQ Processes | Processes | N/A |
| Maximum number of HARQ transmissions | | N/A |
| Information Bit Payload per Sub-Frame | | |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 8760 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 8760 |
| Transport block CRC | Bits | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) | | |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 2 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 2 |
| Binary Channel Bits Per Sub-Frame | | |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 27600 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 27312 |
| Max. Throughput averaged over 1 frame | kbps | 7008 |
| UE Category | | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH.<br>Note 2: Reference signal and Synchronization signals allocated as per TS 36.211 [8].<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | |

**Table A.3.2-2d: Fixed Reference Channel for Receiver Requirements (TDD) – for CAT-M2**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel Bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks (Note 8) | | 4 | 8 | 16 | 16 | 16 | 16 |
| Uplink-Downlink Configuration (Note 5) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D) | | 3 | 3 | 3 | 3 | 3 | 3 |
| Number of HARQ Processes | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Maximum number of HARQ transmission | | 1 | 1 | 1 | 1 | 1 | 1 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 4, 9 | | 256 | 680 | 1384 | 1384 | 1384 | 1384 |
| For Sub-Frame 1, 6 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 256 | 680 | 1384 | 1384 | 1384 | 1384 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frame 4, 9 | | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 1, 6 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 1 | 1 | 1 | 1 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 4, 9 | | 912 | 2016 | 4032 | 4416 | 4416 | 4416 |
| For Sub-Frame 1, 6 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 912 | 2016 | 4032 | 4416 | 4416 | 4416 |
| Max. Throughput averaged over 1 frame | kbps | 76.8 | 204.0 | 415.2 | 415.2 | 415.2 | 415.2 |
| UE DL Category | | M2 | M2 | M2 | M2 | M2 | M2 |

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: No data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: As per Table 4.2-2 in TS 36.211 [8]
Note 6: For Sub-Frame 0, the scheduled narrowband avoids the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.
Note 7: 2 resource blocks allocated to MPDCCH
Note 8: 4 resource blocks in each narrowband allocated to PDSCH.

**Table A.3.2-3: Fixed Reference Channel for Maximum input level for UE Categories 3-8 (FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame | | 8 | 9 | 9 | 9 | 9 | 9 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 2984 | 8504 | 14112 | 30576 | 46888 | 61664 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | n/a | 6456 | 12576 | 28336 | 45352 | 61664 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | 1 | 2 | 3 | 5 | 8 | 11 |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | n/a | 2 | 3 | 5 | 8 | 11 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 4104 | 11340 | 18900 | 41400 | 62100 | 82800 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | n/a | 8820 | 16380 | 38880 | 59580 | 80280 |
| Max. Throughput averaged over 1 frame | kbps | 2387.2 | 7448.8 | 12547 | 27294 | 42046 | 55498 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

**Table A.3.2-3a: Fixed Reference Channel for Maximum input level for UE Category 1 (FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 18 | 17 | 17 | 17 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame | | 8 | 9 | 9 | 9 | 9 | 9 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 2984 | 8504 | 10296 | 10296 | 10296 | 10296 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | n/a | 6456 | 8248 | 10296 | 10296 | 10296 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | 1 | 2 | 2 | 2 | 2 | 2 |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | n/a | 2 | 2 | 2 | 2 | 2 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 4104 | 11340 | 13608 | 14076 | 14076 | 14076 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | n/a | 8820 | 11088 | 14076 | 14076 | 14076 |
| Max. Throughput averaged over 1 frame | kbps | 2387.2 | 7448.8 | 9079.6 | 9266.4 | 9266.4 | 9266.4 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

**Table A.3.2-3b: Fixed Reference Channel for Maximum input level for UE Category 2 (FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 83 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame | | 8 | 9 | 9 | 9 | 9 | 9 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 2984 | 8504 | 14112 | 30576 | 46888 | 51024 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | n/a | 6456 | 12576 | 28336 | 45352 | 51024 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | 1 | 2 | 3 | 5 | 8 | 9 |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | n/a | 2 | 3 | 5 | 8 | 9 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 4104 | 11340 | 18900 | 41400 | 62100 | 68724 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | n/a | 8820 | 16380 | 38880 | 59580 | 66204 |
| Max. Throughput averaged over 1 frame | kbps | 2387.2 | 7448.8 | 12547 | 27294 | 42046 | 45922 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz

Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

**Table A.3.2-3c: Fixed Reference Channel for Maximum input level for UE DL Category 0 (FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 2 | 2 | 2 | 2 | 2 | 2 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame | | 8 | 9 | 9 | 9 | 9 | 9 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Number of HARQ Processes | Processes | [8] | [8] | [8] | [8] | [8] | [8] |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 (Note 3) | Bits | N/A | 1000 | 1000 | 1000 | 1000 | 1000 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | N/A | 1 | 1 | 1 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1368 | 1512 | 1512 | 1656 | 1656 | 1656 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 (Note 3) | Bits | N/A | 1512 | 1512 | 1656 | 1656 | 1656 |
| Max. Throughput averaged over 1 frame | kbps | 800 | 900 | 900 | 900 | 900 | 900 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz.

Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].

Note 3: For Sub-Frame 0, it is assumed that the allocated 2PRBs are scheduled on the RBs other than the centre 6PRBs as most of the symbols are occupied by PBCH and synchronization signals.

**Table A.3.2-3d: Fixed Reference Channel for Maximum input level for UE DL Category M1 (FDD and HD-FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 2 | 2 | 2 | 2 | 2 | 2 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame (Note 6) | | 2 | 2 | 8 | 8 | 8 | 8 |
| Modulation | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate | | 3/5 | 3/5 | 3/5 | 3/5 | 3/5 | 3/5 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 3,8 | Bits | 552 | 552 | 552 | 552 | 552 | 552 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | 552 | 552 | 552 | 552 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame | | | | | | | |
| For Sub-Frames 3, 8 | | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 0,1,2,5,7,9 | | N/A | N/A | 1 | 1 | 1 | 1 |
| For Sub-Frame 4 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 832 | 832 | 832 | 832 | 832 | 832 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 (Note 3) | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame for FDD | kbps | 110.4 | 110.4 | 441.6 | 441.6 | 441.6 | 441.6 |
| Max. Throughput averaged over 1 frame for HD-FDD | | 55.2 | 55.2 | 165.6 | 165.6 | 165.6 | 165.6 |

Note 1: 4 symbols allocated to PDCCH for all channel bandwidths.
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: The scheduled narrowband other than 1.4MHz and 3MHz channel bandwidth avoids the centre of the channel where some Res of the same PRBs are occupied by PBCH and synchronization signals.
Note 4: For HD-FDD UE, PDSCH are scheduled at the 3rd subframe every 1 radio frame for 1.4MHz and 3MHz channel bandwidth. For other channel bandwidth, PDSCH are scheduled at the 0th, 1st, and 2nd subframes every 1 radio frame. Information bit payload is available if downlink subframe is scheduled. The corresponding MPDCCH is scheduled 2 subframes before the corresponding PDSCH transmission.
Note 5: 2 resource blocks allocated to MPDCCH.

**Table A.3.2-3e: Fixed Reference Channel for Maximum input level for UE DL Category M2 (FDD and HD-FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks (Note 6) | | 2 | 8 | 15 | 15 | 15 | 15 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame (Note 4) | | 2 | 2 | 8 | 8 | 8 | 8 |
| Modulation | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate | | 3/5 | 3/5 | 1/2 | 1/2 | 1/2 | 1/2 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 3, 8 | Bits | 552 | 2280 | 4008 | 4008 | 4008 | 4008 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | N/A | N/A | 4008 | 4008 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame | | | | | | | |
| For Sub-Frames 3, 8 | | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 0,1,2,5,7,9 | | N/A | N/A | 1 | 1 | 1 | 1 |
| For Sub-Frame 4 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 3, 8 | Bits | 912 | 4032 | 7560 | 7560 | 7560 | 7560 |
| For Sub-Frames 0,1,2,5,7,9 | | N/A | N/A | N/A | N/A | 7560 | 7560 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame for FDD | kbps | 110.4 | 456.0 | 801.6 | 801.6 | 3206.4 | 3206.4 |
| Max. Throughput averaged over 1 frame for HD-FDD | | 55.2 | 228.0 | 400.8 | 400.8 | 1202.4 | 1202.4 |

Note 1: 4 symbols allocated to PDCCH for 1.4MHz channel bandwidth. 3 symbols allocated to all other channel bandwidths.
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: The scheduled wideband other than 1.4MHz/3MHz/5MHz/10MHz/ channel bandwidth avoids the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.
Note 4: For HD-FDD UE, PDSCH are scheduled at the 3rd subframe every 1 radio frame for 1.4MHz/3MHz/5MHz/10MHz channel bandwidth. For other channel bandwidth, PDSCH are scheduled at the 0th, 1st, and 2nd subframes every 1 radio frame. Information bit payload is available if downlink subframe is scheduled. The corresponding MPDCCH is scheduled 2 subframes before the corresponding PDSCH transmission.
Note 5: 2 resource blocks allocated to MPDCCH.
Note 6: 2 resource blocks allocated to PDSCH for 1.4MHz channel bandwidth. 2 narrowbands and 4 resource blocks in each narrowband allocated to PDSCH for 3MHz channel bandwidth. For 5MHz/10MHz/15MHz/20MHz channel bandwidth, configure 3 narrowbands and 5 resource blocks in each narrowband allocated to PDSCH.

**Table A.3.2-4: Fixed Reference Channel for Maximum input level for UE Categories 3-8 (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (Note 6) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame | | 2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Number of HARQ Processes | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 2984 | 8504 | 14112 | 30576 | 46888 | 61664 |
| For Sub-Frames 1,6 | Bits | n/a | 6968 | 11448 | 23688 | 35160 | 46888 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | n/a | 6968 | 12576 | 30576 | 45352 | 61664 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frames 4,9 | | 1 | 2 | 3 | 5 | 8 | 11 |
| For Sub-Frames 1,6 | | n/a | 2 | 2 | 4 | 6 | 8 |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | n/a | 2 | 3 | 5 | 8 | 11 |
| Binary Channel Bits per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 4104 | 11340 | 18900 | 41400 | 62100 | 82800 |
| For Sub-Frames 1,6 | | n/a | 9828 | 16668 | 33768 | 50868 | 67968 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | n/a | 9252 | 16812 | 39312 | 60012 | 80712 |
| Max. Throughput averaged over 1 frame | kbps | 596.8 | 3791.2 | 6369.6 | 13910 | 20945 | 27877 |

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.

Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance

Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 5: As per Table 4.2-2 in TS 36.211 [8]

**Table A.3.2-4a: Fixed Reference Channel for Maximum input level for UE Category 1 (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 18 | 17 | 17 | 17 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (Note 5) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame | | 2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Number of HARQ Processes | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 2984 | 8504 | 10296 | 10296 | 10296 | 10296 |
| For Sub-Frames 1,6 | Bits | n/a | 6968 | 8248 | 7480 | 7480 | 7480 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | n/a | 6968 | 8248 | 10296 | 10296 | 10296 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frames 4,9 | | 1 | 2 | 2 | 2 | 2 | 2 |
| For Sub-Frames 1,6 | | n/a | 2 | 2 | 2 | 2 | 2 |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | n/a | 2 | 2 | 2 | 2 | 2 |
| Binary Channel Bits per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 4104 | 11340 | 13608 | 14076 | 14076 | 14076 |
| For Sub-Frames 1,6 | | n/a | 9828 | 11880 | 11628 | 11628 | 11628 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | n/a | 9252 | 11520 | 14076 | 14076 | 14076 |
| Max. Throughput averaged over 1 frame | kbps | 596.8 | 3791.2 | 4533.6 | 4584.8 | 4584.8 | 4584.8 |

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.

Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance

Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 5: As per Table 4.2-2 in TS 36.211 [8]

**Table A.3.2-4b: Fixed Reference Channel for Maximum input level for UE Category 2 (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 83 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (Note 5) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame | | 2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Number of HARQ Processes | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 2984 | 8504 | 14112 | 30576 | 46888 | 51024 |
| For Sub-Frames 1,6 | Bits | n/a | 6968 | 11448 | 23688 | 35160 | 39232 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | n/a | 6968 | 12576 | 30576 | 45352 | 51024 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frames 4,9 | | 1 | 2 | 3 | 5 | 8 | 9 |
| For Sub-Frames 1,6 | | n/a | 2 | 3 | 5 | 7 | 7 |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | n/a | 2 | 3 | 5 | 8 | 9 |
| Binary Channel Bits per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 4104 | 11340 | 18900 | 41400 | 62100 | 68724 |
| For Sub-Frames 1,6 | | n/a | 9828 | 16668 | 33768 | 50868 | 56340 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | n/a | 9252 | 16380 | 39312 | 60012 | 66636 |
| Max. Throughput averaged over 1 frame | kbps | 596.8 | 3791.2 | 6369.6 | 13910 | 20945 | 23154 |

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 5: As per Table 4.2-2 in TS 36.211 [8]

**Table A.3.2-4c: Fixed Reference Channel for Maximum input level for UE DL Category 0 (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 2 | 2 | 2 | 2 | 2 | 2 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (Note 5) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame | | 2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Number of HARQ Processes | Processes | [7] | [7] | [7] | [7] | [7] | [7] |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| For Sub-Frames 1,6 | Bits | N/A | 712 | 712 | 712 | 712 | 712 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 1000 | 1000 | 1000 | 1000 | 1000 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frames 4,9 | | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 1,6 | | N/A | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | N/A | 1 | 1 | 1 | 1 | 1 |
| Binary Channel Bits per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 1368 | 1512 | 1512 | 1656 | 1656 | 1656 |
| For Sub-Frames 1,6 | | N/A | 1224 | 1224 | 1368 | 1368 | 1368 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 1512 | 1512 | 1656 | 1656 | 1656 |
| Max. Throughput averaged over 1 frame | kbps | 200 | 442.4 | 442.4 | 442.4 | 442.4 | 442.4 |

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.

Note 2: For 1.4MHz, no data shall be scheduled on special subframes (1&6) to avoid problems with insufficient PDCCH performance.

Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 5: As per Table 4.2-2 in TS 36.211 [8].

**Table A.3.2-4d: Fixed Reference Channel for Maximum input level for UE Categories ≥ 3 (TDD Band 46)**

| Parameter | Unit | Value |
|---|---|---|
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks | | 100 |
| Uplink-Downlink Configuration | | N/A |
| Subcarriers per resource block | | 12 |
| Allocated subframes per Radio Frame (D) | | 8 |
| Modulation | | 64QAM |
| Target Coding Rate | | 3/4 |
| Number of HARQ Processes | Processes | N/A |
| Maximum number of HARQ transmissions | | N/A |
| Information Bit Payload per Sub-Frame | | |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 61664 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 61664 |
| Transport block CRC | Bits | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) | | |
| For Sub-Frames 3,4,6,7,8,9 | | 11 |
| For Sub-Frame 1,2 | | N/A |
| For Sub-Frame 0,5 | | 11 |
| Binary Channel Bits Per Sub-Frame | | |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 82800 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 81936 |
| Max. Throughput averaged over 1 frame | kbps | 49331.2 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz.<br>Note 2: Reference signal, Synchronization signals allocated as per TS 36.211 [8].<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | |

**Table A.3.2-4e: Fixed Reference Channel for Maximum input level for UE DL Category M1 (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 2 | 2 | 2 | 2 | 2 | 2 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (Note 5) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame | | 2 | 2 | 2 | 2 | 2 | 2 |
| Modulation | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate | | 3/5 | 3/5 | 3/5 | 3/5 | 3/5 | 3/5 |
| Number of HARQ Processes | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 552 | 552 | 552 | 552 | 552 | 552 |
| For Sub-Frames 1,6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frames 4,9 | | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 1,6 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 912 | 912 | 912 | 912 | 912 | 912 |
| For Sub-Frames 1,6 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame | kbps | 110.4 | 110.4 | 110.4 | 110.4 | 110.4 | 110.4 |

Note 1: For normal subframes (0,4,5,9), 4 symbols allocated to PDCCH for all channel bandwidths. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance.
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: As per Table 4.2-2 in TS 36.211 [8].
Note 6: 2 resource blocks allocated to MPDCCH.

**Table A.3.2-4f: Fixed Reference Channel for Maximum input level for UE DL Category M2 (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks (Note 7) | | 2 | 8 | 15 | 15 | 15 | 15 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (Note 5) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame | | 2 | 2 | 2 | 2 | 2 | 2 |
| Modulation | | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Target Coding Rate | | 3/5 | 3/5 | 1/2 | 1/2 | 1/2 | 1/2 |
| Number of HARQ Processes | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 552 | 2280 | 4008 | 4008 | 4008 | 4008 |
| For Sub-Frames 1,6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frames 4,9 | | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 1,6 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 912 | 4032 | 7560 | 7560 | 7560 | 7560 |
| For Sub-Frames 1,6 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame | kbps | 110.4 | 456.0 | 801.6 | 801.6 | 801.6 | 801.6 |

Note 1: For normal subframes(0,4,5,9), 4 symbols allocated to PDCCH for 1.4MHz channel bandwidth, and 3 symbols allocated for all other channel bandwidths. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance.
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: As per Table 4.2-2 in TS 36.211 [8].
Note 6: 2 resource blocks allocated to MPDCCH.
Note 7: 2 resource blocks allocated to PDSCH for 1.4MHz channel bandwidth. 2 narrowbands and 4 resource blocks in each narrowband allocated to PDSCH for 3MHz channel bandwidth. For 5MHz/10MHz/15MHz/20MHz channel bandwidth, configure 3 narrowbands and 5 resource blocks in each narrowband allocated to PDSCH.

**Table A.3.2-5: Fixed Reference Channel for Maximum input level for UE Categories 11/12 and UE DL categories ≥11 (FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame | | 8 | 9 | 9 | 9 | 9 | 9 |
| Modulation | | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM |
| Target Coding Rate | | 4/5 | 4/5 | 4/5 | 4/5 | 4/5 | 4/5 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 4392 | 12216 | 19848 | 42368 | 63776 | 84760 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 9912 | 17568 | 40576 | 63776 | 84760 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | 1 | 2 | 4 | 7 | 11 | 14 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | N/A | 2 | 3 | 7 | 11 | 14 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 5472 | 15120 | 25200 | 55200 | 82800 | 110400 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 12210 | 22290 | 51840 | 79440 | 107040 |
| Max. Throughput averaged over 1 frame | kbps | 3513.6 | 10764 | 17635.2 | 37952 | 57398.4 | 76284 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz.
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

**Table A.3.2-6: Fixed Reference Channel for Maximum input level for UE Categories 11/12 and UE DL categories ≥11 (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | 15 | 25 | 50 | 75 | 100 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Uplink-Downlink Configuration (Note 5) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame | | 2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation | | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM |
| Target Coding Rate | | 4/5 | 4/5 | 4/5 | 4/5 | 4/5 | 4/5 |
| Number of HARQ Processes | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 4392 | 12216 | 19848 | 42368 | 63776 | 84760 |
| For Sub-Frames 1,6 | Bits | N/A | 10680 | 17568 | 36696 | 55056 | 75376 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 9912 | 17568 | 42368 | 63776 | 84760 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frames 4,9 | | 1 | 2 | 4 | 7 | 11 | 14 |
| For Sub-Frames 1,6 | | N/A | 2 | 3 | 6 | 9 | 13 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | N/A | 2 | 3 | 7 | 11 | 14 |
| Binary Channel Bits per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 5472 | 15120 | 25200 | 55200 | 82800 | 110400 |
| For Sub-Frames 1,6 | | N/A | 13104 | 22224 | 45024 | 67824 | 90624 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 12336 | 22416 | 52416 | 80016 | 107616 |
| Max. Throughput averaged over 1 frame | kbps | 878.4 | 5570.4 | 9240 | 20049.6 | 30144 | 40503.2 |

Note 1: For normal subframes (0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.

Note 2: For 1.4MHz, no data shall be scheduled on special subframes (1&6) to avoid problems with insufficient PDCCH performance.

Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 5: As per Table 4.2-2 in TS 36.211 [8].

**Table A.3.2-7: Fixed Reference Channel for Maximum input level for UE Categories 11/12 and UE DL categories ≥ 11 (TDD Band 46)**

| Parameter | Unit | Value |
|---|---|---|
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks | | 100 |
| Uplink-Downlink Configuration | | N/A |
| Subcarriers per resource block | | 12 |
| Allocated subframes per Radio Frame (D) | | 8 |
| Modulation | | 256QAM |
| Target Coding Rate | | 4/5 |
| Number of HARQ Processes | Processes | N/A |
| Maximum number of HARQ transmissions | | N/A |
| Information Bit Payload per Sub-Frame | | |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 84760 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 84760 |
| Transport block CRC | Bits | 24 |
| Number of Code Blocks per Sub-Frame (Note 3) | | |
| For Sub-Frames 3,4,6,7,8,9 | | 14 |
| For Sub-Frame 1,2 | | N/A |
| For Sub-Frame 0,5 | | 14 |
| Binary Channel Bits Per Sub-Frame | | |
| For Sub-Frames 3,4,6,7,8,9 | Bits | 110400 |
| For Sub-Frame 1,2 | Bits | N/A |
| For Sub-Frame 0,5 | Bits | 109248 |
| Max. Throughput averaged over 1 frame | kbps | 67808 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz.<br>Note 2: Reference signal, Synchronization signals allocated as per TS 36.211 [8].<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | |

# A.3.2A Downlink Reference measurement channel for TX characteristics

Tables A.3.2A-1 and A.3.2A-2 describes the reference measurement channels to be used on the downlink during Transmitter Characteristics (clause 6) for FDD and TDD respectively. The number of allocated resource blocks have been defined (partial allocation) to allow the transmission of PBCH, PSS/SSS and system information mapped on PDSCH.

For TDD the measurement channel is based on DL/UL configuration ratio of 2DL:2UL or 1DL:4UL. 2DL:2UL is the default and used unless explicitly specified in test case.

**Table A.3.2A-1: Fixed DL PDSCH Dedicated Reference Channel for TX Requirements (FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 3 | 4 | 8 | 16 | 25 | 30 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame | | 10 | 10 | 10 | 10 | 10 | 10 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | (Note 4) | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Number of HARQ Processes | Processes | 8 | 8 | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 | Bits | 88 | 328 | 680 | 1384 | 2216 | 2664 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame | | 1 | 1 | 1 | 1 | 1 | 1 |
| Code block CRC size | Bits | 0 | 0 | 0 | 0 | 0 | 0 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1, 2, 3, 4, 6, 7, 8, 9 | Bits | 684 | 1008 | 2016 | 4416 | 6900 | 8280 |
| For Sub-Frames 5 | | 540 | 1008 | 2016 | 4416 | 6900 | 8280 |
| For Sub-Frames 0 | | 264 | 1008 | 2016 | 4416 | 6900 | 8280 |
| Max. Throughput averaged over 1 frame | kbps | 88 | 328 | 680 | 1384 | 2216 | 2664 |
| UE-Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz

Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]

Note 3: The PDSCH shall be assigned to the UE under test with a set of allocated localized virtual resource blocks starting from one end of the channel.

Note 4: To ensure constant transport block size in 1.4MHz, the code rate for subframes varies approx. within {1/8-1/3}

**Table A.3.2A-1a: Fixed DL PDSCH Dedicated Reference Channel for TX Requirements (FDD) for UE Category M1**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 4 | 4 | 4 | 4 | 4 | 4 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame | | 2 | 2 | 8 | 8 | 8 | 8 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Number of HARQ Processes | Processes | [8] | [8] | [8] | [8] | [8] | [8] |
| Maximum number of HARQ transmissions | | 1 | 1 | 1 | 1 | 1 | 1 |
| Information Bit Payload per Sub-Frame | | | | | | | |
| For Sub-Frames 3, 8 | Bits | 256 | 256 | 256 | 328 | 328 | 328 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | 256 | 328 | 328 | 328 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame | | | | | | | |
| For Sub-Frames 3, 8 | Bits | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | 1 | 1 | 1 | 1 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 3, 8 | Bits | 912 | 1008 | 1008 | 1104 | 1104 | 1104 |
| For Sub-Frames 0,1,2,5,7,9 | Bits | N/A | N/A | 1008 | 1104 | 1104 | 1104 |
| For Sub-Frame 4 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame for FDD | kbps | 51.2 | 51.2 | 204.8 | 204.8 | 204.8 | 204.8 |
| Max. Throughput averaged over 1 frames for HD-FDD | kbps | 25.6 | 25.6 | 76.8 | 76.8 | 76.8 | 76.8 |
| UE DL Category | | M1 | M1 | M1 | M1 | M1 | M1 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz

Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].

Note 3: The scheduled narrowband other than 1.4MHz and 3MHz channel BW avoids the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.

Note 4: For HD-FDD UE, PDSCH are scheduled at the [3rd] subframe every 1 radio frame for 1.4MHz and 3MHz channel BW. For other channel BW, PDSCH are scheduled at the 0th, 1st, and 2th subframes every 1 radio frame. Information bit payload is available if downlink subframe is scheduled. The corresponding M-PDCCH is scheduled 2 subframes before the corresponding PDSCH transmission.

Note 5: 2 resource blocks allocated to M-PDCCH

**Table A.3.2A-2: Fixed DL PDSCH Dedicated Reference Channel for TX Requirements (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel Bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 3 | 4 | 8 | 16 | 25 | 30 |
| Uplink-Downlink Configuration (Note 6) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 4 | 4 | 4 | 4 | 4 | 4 |
| Number of HARQ Processes | Processes | 7 | 7 | 7 | 7 | 7 | 7 |
| Maximum number of HARQ transmission | | 1 | 1 | 1 | 1 | 1 | 1 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target coding rate | | (Note 5) | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 1, 6 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0, 4, 5, 9 | | 88 | 328 | 680 | 1384 | 2216 | 2664 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks | | 1 | 1 | 1 | 1 | 1 | 1 |
| Code block CRC size | | 0 | 0 | 0 | 0 | 0 | 0 |
| Binary Channel Bits Per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 1, 6 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 4, 9 | | 684 | 1008 | 2016 | 4416 | 6900 | 8280 |
| For Sub-Frame 0 | | 336 | 1008 | 2016 | 4416 | 6900 | 8280 |
| For Sub-Frame 5 | | 612 | 1008 | 2016 | 4416 | 6900 | 8280 |
| Max. Throughput averaged over one frame | kbps | 35.2 | 131.2 | 272 | 553.6 | 886.4 | 1065.6 |
| UE-Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |

Note 1: For normal subframes (0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: For simplicity, no data shall be scheduled on special subframes (1&6).
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: The PDSCH shall be assigned to the UE under test with a set of allocated localized virtual resource blocks starting from one end of the channel.
Note 5: To ensure constant transport block size in 1.4MHz, the code rate for subframes varies approx. within {1/8-1/3}.
Note 6: As per Table 4.2-2 in TS 36.211 [8]

**Table A.3.2A-3: Fixed DL PDSCH Dedicated Reference Channel for TX Requirements (TDD) for UL-DL configuration 0**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel Bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 3 | 4 | 8 | 16 | 25 | 30 |
| Uplink-Downlink Configuration (Note 6) | | 0 | 0 | 0 | 0 | 0 | 0 |
| Allocated subframes per Radio Frame (D+S) | | 2 | 2 | 2 | 2 | 2 | 2 |
| Number of HARQ Processes | Processes | 4 | 4 | 4 | 4 | 4 | 4 |
| Maximum number of HARQ transmission | | 1 | 1 | 1 | 1 | 1 | 1 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target coding rate | | (Note 5) | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 1, 6 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0, 5 | | 88 | 328 | 680 | 1384 | 2216 | 2664 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks | | 1 | 1 | 1 | 1 | 1 | 1 |
| Code block CRC size | | 0 | 0 | 0 | 0 | 0 | 0 |
| Binary Channel Bits Per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 1, 6 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 4, 9 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | 336 | 1008 | 2016 | 4416 | 6900 | 8280 |
| For Sub-Frame 5 | | 612 | 1008 | 2016 | 4416 | 6900 | 8280 |
| Max. Throughput averaged over one frame | kbps | 17.6 | 65.6 | 136 | 276.8 | 443.2 | 532.8 |
| UE-Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |

Note 1: For normal subframes (0,5), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: For simplicity, no data shall be scheduled on special subframes (1&6).
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: The PDSCH shall be assigned to the UE under test with a set of allocated localized virtual resource blocks starting from one end of the channel.
Note 5: To ensure constant transport block size in 1.4MHz, the code rate for subframes varies approx. within {1/8-1/3}.
Note 6: As per Table 4.2-2 in TS 36.211 [8]

**Table A.3.2A-3a: Fixed DL PDSCH Dedicated Reference Channel for TX Requirements (TDD) for UE category M1 (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel Bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 4 | 4 | 4 | 4 | 4 | 4 |
| Uplink-Downlink Configuration (Note 5) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D) | | 3 | 3 | 3 | 3 | 3 | 3 |
| Number of HARQ Processes | Processes | [7] | [7] | [7] | [7] | [7] | [7] |
| Maximum number of HARQ transmission | | 1 | 1 | 1 | 1 | 1 | 1 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target coding rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 4, 9 | | 256 | 256 | 256 | 328 | 328 | 328 |
| For Sub-Frame 1, 6 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 256 | 256 | 256 | 328 | 328 | 328 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frame 4, 9 | | 1 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 1, 6 | | N/A | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 1 | 1 | 1 | 1 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 4, 9 | | 912 | 1008 | 1008 | 1104 | 1104 | 1104 |
| For Sub-Frame 1, 6 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 912 | 1008 | 1008 | 1104 | 1104 | 1104 |
| Max. Throughput averaged over 1 frame | kbps | 76.8 | 76.8 | 76.8 | 98.4 | 98.4 | 98.4 |
| UE DL Category | | M1 | M1 | M1 | M1 | M1 | M1 |

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: No data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: As per Table 4.2-2 in TS 36.211 [8]
Note 6: For Sub-Frame 0, the scheduled narrowband avoids the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.
Note 7: 2 resource blocks allocated to M-PDCCH

## A.3.2B Downlink Reference measurement channel for ProSe testing

Tables A.3.2B-1 and A.3.2B-2 describes the reference measurement channels to be used on the downlink during ProSe testing for FDD and TDD respectively. The number of allocated resource blocks have been defined (partial allocation) to allow the transmission of PBCH, PSS/SSS and system information mapped on PDSCH.

**Table A.3.2B-1: Fixed DL PDSCH Dedicated Reference Channel for ProSe testing (FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | 8 | 16 | 25 | 30 |
| Subcarriers per resource block | | | | 12 | 12 | 12 | 12 |
| Allocated subframes per Radio Frame | | | | 10 | 10 | 10 | 10 |
| Modulation | | | | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | | | 1/3 | 1/3 | 1/3 | 1/3 |
| Number of HARQ Processes | Processes | | | 8 | 8 | 8 | 8 |
| Maximum number of HARQ transmissions | | | | 1 | 1 | 1 | 1 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 | Bits | | | 680 | 1384 | 2216 | 2664 |
| Transport block CRC | Bits | | | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Sub-Frame | | | | 1 | 1 | 1 | 1 |
| Code block CRC size | Bits | | | 0 | 0 | 0 | 0 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1, 2, 3, 4, 6, 7, 8, 9 | Bits | | | 2016 | 4416 | 6900 | 8280 |
| For Sub-Frames 5 | | | | 2016 | 4416 | 6900 | 8280 |
| For Sub-Frames 0 | | | | 2016 | 4416 | 6900 | 8280 |
| Max. Throughput averaged over 1 frame | kbps | | | 680 | 1384 | 2216 | 2664 |
| UE-Category | | | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz.<br>Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].<br>Note 3: The PDSCH shall be assigned to the UE under test with a set of allocated localized virtual resource blocks starting from one end of the channel. | | | | | | | |

**Table A.3.2B-1: Fixed DL PDSCH Dedicated Reference Channel for ProSe testing (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel Bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | 8 | 16 | 25 | 30 |
| Uplink-Downlink Configuration (Note 5) | | | | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | | | 4 | 4 | 4 | 4 |
| Number of HARQ Processes | Processes | | | 7 | 7 | 7 | 7 |
| Maximum number of HARQ transmission | | | | 1 | 1 | 1 | 1 |
| Modulation | | | | QPSK | QPSK | QPSK | QPSK |
| Target coding rate | | | | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 1, 6 | | | | n/a | n/a | n/a | n/a |
| For Sub-Frame 0, 4, 5, 9 | | | | 680 | 1384 | 2216 | 2664 |
| Transport block CRC | Bits | | | 24 | 24 | 24 | 24 |
| Number of Code Blocks | | | | 1 | 1 | 1 | 1 |
| Code block CRC size | | | | 0 | 0 | 0 | 0 |
| Binary Channel Bits Per Sub-Frame | Bits | | | | | | |
| For Sub-Frame 1, 6 | | | | n/a | n/a | n/a | n/a |
| For Sub-Frame 4, 9 | | | | 2016 | 4416 | 6900 | 8280 |
| For Sub-Frame 0 | | | | 2016 | 4416 | 6900 | 8280 |
| For Sub-Frame 5 | | | | 2016 | 4416 | 6900 | 8280 |
| Max. Throughput averaged over one frame | kbps | | | 272 | 553.6 | 886.4 | 1065.6 |
| UE-Category | | | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: For normal subframes (0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.<br>Note 2: For simplicity, no data shall be scheduled on special subframes (1&6).<br>Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].<br>Note 4: The PDSCH shall be assigned to the UE under test with a set of allocated localized virtual resource blocks starting from one end of the channel.<br>Note 5: As per Table 4.2-2 in TS 36.211 [8]. | | | | | | | |

## A.3.3 Reference measurement channel for PDSCH performance requirements (FDD)

### A.3.3.1 Single-antenna transmission (Common Reference Symbols)

**Table A.3.3.1-1: Fixed Reference Channel QPSK R=1/3**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | R.4 FDD | R.42 FDD | R.42-1 FDD | R.42-2 FDD | R.42-3 FDD | R.2 FDD |
| Channel bandwidth | MHz | 1.4 | 20 | 3 | 5 | 15 | 10 |
| Allocated resource blocks (Note 4) | | 6 | 100 | 15 | 25 | 75 | 50 |
| Allocated subframes per Radio Frame | | 9 | 9 | 9 | 9 | 9 | 9 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload (Note 4) | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 408 | 8760 | 1320 | 2216 | 6712 | 4392 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 152 | 8760 | 1064 | 1800 | 6712 | 4392 |
| Number of Code Blocks (Notes 3 and 4) | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | 1 | 2 | 1 | 1 | 2 | 1 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 1 | 2 | 1 | 1 | 2 | 1 |
| Binary Channel Bits (Note 4) | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1368 | 27600 | 3780 | 6300 | 20700 | 13800 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 528 | 26760 | 2940 | 5460 | 19860 | 12960 |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 0.342 | 7.884 | 1.162 | 1.953 | 6.041 | 3.953 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 4: Given per component carrier per codeword.

**Table A.3.3.1-2: Fixed Reference Channel 16QAM R=1/2**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | | | R.3-1 FDD | R.3 FDD | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | 25 | 50 | | |
| Allocated subframes per Radio Frame | | | | 9 | 9 | | |
| Modulation | | | | 16QAM | 16QAM | | |
| Target Coding Rate | | | | 1/2 | 1/2 | | |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | | | 6456 | 14112 | | |
| For Sub-Frame 5 | Bits | | | n/a | n/a | | |
| For Sub-Frame 0 | Bits | | | 5736 | 12960 | | |
| Number of Code Blocks per Sub-Frame (see Note 3) | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | | | 2 | 3 | | |
| For Sub-Frame 5 | | | | n/a | n/a | | |
| For Sub-Frame 0 | | | | 1 | 3 | | |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | | | 12600 | 27600 | | |
| For Sub-Frame 5 | Bits | | | n/a | n/a | | |
| For Sub-Frame 0 | Bits | | | 10920 | 25920 | | |
| Max. Throughput averaged over 1 frame | Mbps | | | 5.738 | 12.586 | | |
| UE Category | | | | ≥ 1 | ≥ 2 | | |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

**Table A.3.3.1-3: Fixed Reference Channel 64QAM R=3/4**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | | R.5 FDD | R.6 FDD | R.7 FDD | R.8 FDD | R.9 FDD |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | 15 | 25 | 50 | 75 | 100 |
| Allocated subframes per Radio Frame | | | 9 | 9 | 9 | 9 | 9 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | | 8504 | 14112 | 30576 | 46888 | 61664 |
| For Sub-Frame 5 | Bits | | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | | 6456 | 12576 | 28336 | 45352 | 61664 |
| Number of Code Blocks per Sub-Frame (see Note 3) | | | 2 | 3 | 5 | 8 | 11 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | | 11340 | 18900 | 41400 | 62100 | 82800 |
| For Sub-Frame 5 | Bits | | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | | 8820 | 16380 | 38880 | 59580 | 80280 |
| Max. Throughput averaged over 1 frame | Mbps | | 7.449 | 12.547 | 27.294 | 42.046 | 55.498 |
| UE Category | | | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 3 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

**Table A.3.3.1-3a: Fixed Reference Channel 64QAM R=3/4**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | | R.6-1 FDD | R.7-1 FDD | R.8-1 FDD | R.9-1 FDD | R.9-2 FDD |
| Channel bandwidth | MHz | | 5 | 10 | 15 | 20 | 20 |
| Allocated resource blocks (Note 3) | | | 18 | 17 | 17 | 17 | 83 |
| Allocated subframes per Radio Frame | | | 9 | 9 | 9 | 9 | 9 |
| Modulation | | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | | 10296 | 10296 | 10296 | 10296 | 51024 |
| For Sub-Frame 5 | Bits | | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | | 8248 | 10296 | 10296 | 10296 | 51024 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | | 2 | 2 | 2 | 2 | 9 |
| For Sub-Frame 5 | | | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | | 2 | 2 | 2 | 2 | 9 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | | 13608 | 14076 | 14076 | 14076 | 68724 |
| For Sub-Frame 5 | Bits | | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | | 11088 | 14076 | 14076 | 14076 | 66204 |
| Max. Throughput averaged over 1 frame | Mbps | | | 9.266 | 9.266 | 9.266 | 45.922 |
| UE Category | | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: Localized allocation started from RB #0 is applied.
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

**Table A.3.3.1-4: Fixed Reference Channel Single PRB (Channel Edge)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | | R.0 FDD | | R.1 FDD | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10/20 | 15 | 20 |
| Allocated resource blocks | | | 1 | | 1 | | |
| Allocated subframes per Radio Frame | | | 9 | | 9 | | |
| Modulation | | | 16QAM | | 16QAM | | |
| Target Coding Rate | | | 1/2 | | 1/2 | | |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | | 224 | | 256 | | |
| For Sub-Frame 5 | Bits | | n/a | | n/a | | |
| For Sub-Frame 0 | Bits | | 224 | | 256 | | |
| Number of Code Blocks per Sub-Frame (see Note 3) | | | 1 | | 1 | | |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | | 504 | | 552 | | |
| For Sub-Frame 5 | Bits | | n/a | | n/a | | |
| For Sub-Frame 0 | Bits | | 504 | | 552 | | |
| Max. Throughput averaged over 1 frame | Mbps | | 0.202 | | 0.230 | | |
| UE Category | | | ≥ 1 | | ≥ 1 | | |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

**Table A.3.3.1-5: Fixed Reference Channel Single PRB (MBSFN Configuration)**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.29 FDD (MBSFN) |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks | | 1 |
| MBSFN Configuration (Note 3) | | 111111 |
| Allocated subframes per Radio Frame | | 3 |
| Modulation | | 16QAM |
| Target Coding Rate | | 1/2 |
| Information Bit Payload | | |
| For Sub-Frames 4,9 | Bits | 256 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 256 |
| For Sub-Frame 1,2,3,6,7,8 | Bits | 0 (MBSFN) |
| Number of Code Blocks per Sub-Frame (see Note 4) | | 1 |
| For Sub-Frames 4,9 | | 1 |
| For Sub-Frame 5 | | n/a |
| For Sub-Frame 0 | | 1 |
| For Sub-Frame 1,2,3,6,7,8 | | 0 (MBSFN) |
| Binary Channel Bits Per Sub-Frame | | |
| For Sub-Frames 4,9 | Bits | 552 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 552 |
| For Sub-Frame 1,2,3,6,7,8 | Bits | 0 (MBSFN) |
| Max. Throughput averaged over 1 frame | kbps | 76.8 |
| UE Category | | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]<br>Note 3: MBSFN Subframe Allocation as defined in [5], one frame with 6 bits is chosen for MBSFN subframe allocation<br>Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit | | |

**Table A.3.3.1-6: Fixed Reference Channel QPSK R=1/10**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | | | | R.41 FDD | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks (Note 3) | | | | | 50 | | |
| Allocated subframes per Radio Frame | | | | | 9 | | |
| Modulation | | | | | QPSK | | |
| Target Coding Rate | | | | | 1/10 | | |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | | | | 1384 | | |
| For Sub-Frame 5 | Bits | | | | N/A | | |
| For Sub-Frame 0 | Bits | | | | 1384 | | |
| Number of Code Blocks per Sub-Frame (Note 3) | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | | | | 1 | | |
| For Sub-Frame 5 | | | | | N/A | | |
| For Sub-Frame 0 | | | | | 1 | | |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | | | | 13800 | | |
| For Sub-Frame 5 | Bits | | | | N/A | | |
| For Sub-Frame 0 | Bits | | | | 12960 | | |
| Max. Throughput averaged over 1 frame | Mbps | | | | 1.246 | | |
| UE Category | | | | | ≥ 1 | | |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | | | | |

**Table A.3.3.1-7: PCell Fixed Reference Channel for CA demodulation with power imbalance**

| Parameter | Unit | Value | | |
|---|---|---|---|---|
| Reference channel | | R.49 FDD | R.49-1 FDD | R.49-2 FDD |
| Channel bandwidth | MHz | 20 | 10 | 5 |
| Allocated resource blocks | | 100 | 50 | 25 |
| Allocated subframes per Radio Frame | | 9 | 9 | 9 |
| Modulation | | 64QAM | 64QAM | 64QAM |
| Coding Rate | | | | |
| For Sub-Frame 1,2,3,4,6,7,8,9, | | 0.84 | 0.84 | 0.84 |
| For Sub-Frame 5 | | N/A | N/A | N/A |
| For Sub-Frame 0 | | 0.87 | 0.87 | 0.86 |
| Information Bit Payload | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 63776 | 31704 | 15840 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |
| For Sub-Frame 0 | | 63776 | 30576 | 14112 |
| Number of Code Blocks per Sub-Frame (Note 3) | | | | |
| For Sub-Frames 0,1,2,3,4,6,7,8,9 | Code Blocks | 11 | 6 | 3 |
| For Sub-Frame 5 | Code Blocks | N/A | N/A | N/A |
| Binary Channel Bits Per Sub-Frame | | | 5 | 3 |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 75600 | | |
| For Sub-Frame 5 | Bits | N/A | 37800 | 18900 |
| For Sub-Frame 0 | Bits | 73080 | N/A | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 57.398 | 35280 | 16380 |
| UE Category | | ≥5 | ≥2 | ≥2 |
| Note 1: 3 symbols allocated to PDCCH.<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | |

## A.3.3.2 Multi-antenna transmission (Common Reference Symbols)

### A.3.3.2.1 Two antenna ports

**Table A.3.3.2.1-1: Fixed Reference Channel two antenna ports**

| Parameter | Unit | Value | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| eference annel | | R.10 FDD | R.10-2 FDD | R.11 FDD | R.11-1 FDD | R.11-2 FDD | R.11-3 FDD Note 5 | R.11-4 FDD | R.30 FDD | R.30-1 FDD | R.35 FDD | R.35-1 FDD | R.35-2 FDD | R.35 FD |
| annel ndwidth | MHz | 10 | 5 | 10 | 10 | 5 | 10 | 10 | 20 | 15 | 10 | 20 | 15 | 10 |
| ocated source blocks ote 4) | | 50 | 25 | 50 | 50 | 25 | 40 | 50 | 100 | 75 | 50 | 100 | 75 | 50 |
| ocated bframes per dio Frame | | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 8 | 9 | 8 | 8 | 8 |
| odulation | | QPSK | QPSK | 16QAM | 16QAM | 16QAM | 16QAM | QPSK | 16QAM | 16QAM | 64QAM | 64QAM | 64QAM | 64QM |
| rget Coding te | | 1/3 | 1/3 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 0.39 | 0.39 | 0.3 |
| ormation Bit yload (Note 4) | | | | | | | | | | | | | | |
| or Sub-Frames ,3,4,6,7,8,9 | Bits | 4392 | 1800 | 12960 | 12960 | 5736 | 10296 | 6968 | 25456 | 19080 | 19848 | 30576 | 22920 | 152 |
| or Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/ |
| or Sub-Frame 0 | Bits | 4392 | 1800 | 12960 | N/A | 4968 | 10296 | 6968 | 25456 | N/A | 18336 | N/A | N/A | N/ |
| mber of Code ocks otes 3 and 4) | | | | | | | | | | | | | | |
| or Sub-Frames ,3,4,6,7,8,9 | Bits | 1 | 1 | 3 | 3 | 1 | 2 | 2 | 5 | 4 | 4 | 5 | 4 | 3 |
| or Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/ |
| or Sub-Frame 0 | Bits | 1 | 1 | 3 | N/A | 1 | 2 | 2 | 5 | N/A | 3 | N/A | N/A | N/ |
| nary Channel s (Note 4) | | | | | | | | | | | | | | |
| or Sub-Frames ,3,4,6,7,8,9 | Bits | 13200 | 6000 | 26400 | 26400 | 12000 | 21120 | 13200 | 52800 | 39600 | 39600 | 79200 | 59400 | 396 |
| or Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/ |
| or Sub-Frame 0 | Bits | 12384 | 5184 | 24768 | N/A | 10368 | 19488 | 12384 | 51168 | N/A | 37152 | N/A | N/A | N/ |
| ax. Throughput eraged over 1 me (Note 4) | Mbps | 3.953 | 1.620 | 11.664 | 10.368 | 5.086 | 9.266 | 6.271 | 22.910 | 15.264 | 17.712 | 24.461 | 18.336 | 12.2 |
| E Category | | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 |

te 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.
te 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
te 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bi
te 4: Given per component carrier per codeword.
te 5: For R.11-3 resource blocks of RB6–RB45 are allocated.

**Table A.3.3.2.1-2: Fixed Reference Channel two antenna ports**

| Parameter | Unit | Value | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.46 FDD | R.47 FDD | R.35-4 FDD | R.11-5 FDD | R.11-6 FDD | R.11-7 FDD | R.11-8 FDD | R.11- 9 FDD | R.11 10 F |
| Channel bandwidth | MHz | 10 | 10 | 10 | 1.4 | 3 | 15 | 10 | 10 | 10 |
| Allocated resource blocks (Note 4) | | 50 | 50 | 50 | 6 | 15 | 75 | 50 | 50 | 50 |
| Allocated subframes per Radio Frame | | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 8 | 8 |
| Allocated number of PDCCH symbols | | 2 | 2 | 2 | 4 | 3 | 2 | 2 | 3 | 3 |
| Modulation | | QPSK | 16QAM | 64QAM | 16QAM | 16QAM | 16QAM | QPSK | QPSK | QPS |
| Target Coding Rate | | | | 0.47 | 1/2 | 1/2 | 1/2 | 3/5 | 0.58 | 0.67 |
| Information Bit Payload (Note 4) | | | | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 5160 | 8760 | 18336 | 1352 | 3368 | 19080 | 7992 | 6968 | 799 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 5160 | 8760 | 16416 | N/A | 2664 | 19080 | 6968 | N/A | N/A |
| Number of Code Blocks (Notes 3 and 4) | | | | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1 | 2 | 3 | 1 | 1 | 4 | 2 | 2 | 2 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 1 | 2 | 3 | 1 | 1 | 4 | 2 | N/A | N/A |
| Binary Channel Bits (Note 4) | | | | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 13200 | 26400 | 39600 | 2592 | 7200 | 39600 | 13200 | 12000 | 120 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 12384 | 24768 | 37152 | N/A | 5568 | 37968 | 12384 | N/A | N/A |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 4.644 | 7.884 | 16.310 | 1.082 | 2.961 | 17.172 | 7.0904 | 5.5744 | 6.39 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 1 | ≥ 1 |
| UE DL Category | | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | | |

Note 1: Void
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (other
Note 4: Given per component carrier per codeword.

**Table A.3.3.2.1-3: Fixed Reference Channel two antenna ports for UE category 0**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | R.62 FDD | R.63 FDD |
| Channel bandwidth | MHz | 10 | 10 |
| Allocated resource blocks (Note 4) | | 3 | 1 |
| Allocated DL subframes per 4 Radio Frames (Note 3) | | 15 | 15 |
| Modulation | | 16QAM | 64QAM |
| Target Coding Rate | | 1/2 | 1/2 |
| Information Bit Payload | | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 744 | 408 |
| Number of Code Blocks | | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Code blocks | 1 | 1 |
| Binary Channel Bits | | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 1584 | 792 |
| Max. Throughput averaged over 4 frames | Mbps | 0.279 | 0.153 |
| UE DL Category | | 0 | 0 |

Note 1: 2 symbols allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: The downlink subframes are scheduled at the 0th, 1st, 2nd, 8th, 9th, 10th, 16th, 17th, 18th, 24th, 25th, 26th, 32nd, 33rd, 34th subframes every 40ms. Information bit payload is available if downlink subframe is scheduled.
Note 4: Allocated PRB positions start from {9, 10, …, 9+N-1}, where N is the number of allocated resource blocks.

**Table A.3.3.2.1-4: Fixed Reference Channel two antenna ports for UE category M1**

| Parameter | Unit | Values |
|---|---|---|
| Reference channel | | R.79 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) | | 3 |
| Allocated DL subframes per Radio Frames (Note 3) | | 2 |
| Modulation | | 16QAM |
| Target Coding Rate | | 1/2 |
| Information Bit Payload | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 744 |
| Number of Code Blocks | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Code blocks | 1 |
| Binary Channel Bits | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 1584 |
| Max. Throughput averaged over 1 frame | Mbps | 0.149 |
| UE DL Category | | M1, ≥ 0 |

Note 1: 2 symbols allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: The downlink subframes are scheduled at the 0th and 1st subframes every 10ms. Information bit payload is available if downlink subframe is scheduled (starting from 0th subframe). The corresponding MPDCCH is scheduled 2 subframes before the corresponding PDSCH transmissions.
Note 4: Allocated PRB positions for PDSCH are {3, 4, 5} within the assigned narrowband. Allocated PRB positions for MPDCCH are {0, 1} within the assigned narrowband.

**Table A.3.3.2.1-5: Fixed Reference Channel two antenna ports for UE category M1**

| Parameter | Unit | Values |
|---|---|---|
| Reference channel | | R.81 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) | | 6 |
| Allocated DL subframes per Y subframes (Note 3) | | 64 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/10 |
| Information Bit Payload | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 152 |
| Number of Code Blocks | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Code blocks | 1 |
| Binary Channel Bits | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 1584 |
| Max. Throughput | kbps | 0.950 |
| UE DL Category | | M1, ≥ 0 |

Note 1: 2 symbols allocated to PDCCH
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: The downlink subframes are scheduled at the 65th to 128th subframes every 160 ms. Information bit payload is available at the 65th to 128th subframes with repetition. (Starting from the 0th subframe)
Note 4: Allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband.
Note 5: MPDCCH are scheduled at the 0th to 63rd subframes with repetition. The allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband. (Starting from the 0th subframe)

**Table A.3.3.2.1-6: Fixed Reference Channel two antenna ports**

| Parameter | Unit | Values | |
|---|---|---|---|
| Reference channel | | R.87 FDD | R.84 FDD |
| Channel bandwidth | MHz | 10 | 10 |
| Allocated resource blocks (Note 4) | | 50 | 39 |
| Allocated number of PDCCH symbols | | 2 | 2 |
| Allocated subframes per Radio subframes | | 8 | 9 |
| Modulation | | 64QAM | 16QAM |
| Target Coding Rate | | 0.39 | 1/2 |
| Information Bit Payload (Note 4) | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 15264 | 9912 |
| For Sub-Frames 5 | Bits | N/A | N/A |
| For Sub-Frames 0 | | N/A | 9912 |
| Number of Code Blocks(Notes 3 and 4) | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | 3 | 2 |
| For Sub-Frames 5 | | N/A | N/A |
| For Sub-Frames 0 | | N/A | 2 |
| Binary Channel Bits (Note 4) | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 39600 | 20592 |
| For Sub-Frames 5 | | N/A | N/A |
| For Sub-Frames 0 | | N/A | 20592 |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 12.211 | 8.9208 |
| UE Category | | ≥ 1 | 1bis |
| UE DL Category | | ≥6 | N/A |

NOTE 1: Void.
NOTE 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
NOTE 4: Given per component carrier per codeword.
NOTE 5: For R.84 FDD, 39 RBs are allocated on RB 0-20 and 30-47.

**Table A.3.3.2.1-7: Fixed Reference Channel two antenna ports**

| Parameter | Unit | Value | | | |
|---|---|---|---|---|---|
| Reference channel | | R.47-1 FDD | R.47-2 FDD | R.47-3 FDD | |
| Channel bandwidth | MHz | 5 | 15 | 20 | |
| Allocated resource blocks (Note 4) | | 25 | 75 | 100 | |
| Allocated number of PDCCH symbols | | 2 | 2 | 2 | |
| Allocated subframes per Radio Frame | | 9 | 9 | 9 | |
| Modulation | | 16QAM | 16QAM | 16QAM | |
| Target Coding Rate | | | | | |
| Information Bit Payload (Note 4) | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 4008 | 12960 | 17568 | |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | |
| For Sub-Frame 0 | Bits | 3496 | 12960 | 17568 | |
| Number of Code Blocks | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 1 | 3 | 3 | |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | |
| For Sub-Frame 0 | Bits | 1 | 3 | 3 | |
| Binary Channel Bits (Note 3) | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 12000 | 39600 | 52800 | |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | |
| For Sub-Frame 0 | Bits | 10368 | 37968 | 51168 | |
| Max. Throughput averaged over 1 frame (Note 3) | Mbps | 3.556 | 11.664 | 15.811 2 | |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 | |
| UE DL Category | | ≥ 6 | ≥ 6 | ≥ 6 | |

Note 1: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 3: Given per component carrier per codeword.

**Table A.3.3.2.1-8: Fixed Reference Channel two antenna ports**

| Parameter | Unit | Values | | | |
|---|---|---|---|---|---|
| Reference channel | | R.90 FDD | R.91 FDD | R.92-1 FDD | R.92-2 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 |
| Allocated resource blocks | | 18 (Note 7) | 18 (Note 7) | 36 (Note 8) | 36 (Note 8) |
| Allocated DL subframes | | Note 3 | Note 4 | Note 5 | Note 6 |
| Modulation | | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/10 | 1/2 | 1/2 |
| Information Bit Payload | | | | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 1544 | 488 | 4392 | 4392 |
| Number of Code Blocks | | | | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Code blocks | 1 | 1 | 1 | 1 |
| Binary Channel Bits | | | | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 4752 | 4752 | 9504 | 9504 |
| Max. Throughput averaged over one period | kbps | 48.25 | 3.8125 | 219.6 | 439.2 |
| UE DL Category | | M2 | M2 | ≥ 1 | ≥ 1 |

Note 1: 2 symbols allocated to PDCCH
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: The downlink subframes are scheduled at the 0th to 24th subframes every period=32 ms. Information bit payload is available at the 17th to 24th subframes with repetition. MPDCCH are scheduled at the 0th to 15th subframes with repetition. (Starting from the 0th subframe)
Note 4: The downlink subframes are scheduled at the 0th to 96th subframes every period=128 ms. Information bit payload is available at the 65th to 96th subframes with repetition. MPDCCH are scheduled at the 0th to 63rd subframes with repetition. (Starting from the 0th subframe)
Note 5: The downlink subframes are scheduled at the 0th to 12th subframes every period= 20 ms. Information bit payload is available at the 9th to 12th subframes with repetition. MPDCCH are scheduled at the 0th to 7th subframes with repetition. (Starting from the 0th subframe)
Note 6: The downlink subframes are scheduled at the 0th to 4th subframes every period=10 ms. Information bit payload is available at the 3rd to 4th subframes with repetition. MPDCCH are scheduled at the 0th to 1st subframes with repetition. (Starting from the 0th subframe)
Note 7: Allocated PRB positions are {0, 1, …, 17} within the assigned wideband
Note 8: Allocated PRB positions are {1, 2, 3, …, 18, 31, 32, …, 48}
Note 9: Allocated PRB positions for MPDCCH are {0, 1, 2, 3, 4, 5} within the scheduled narrowband

### A.3.3.2.2 Four antenna ports

**Table A.3.3.2.2-1: Fixed Reference Channel four antenna ports**

| ımeter | Unit | Value | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| annel | | R.12 FDD | R.13 FDD | R.14 FDD | R.14-1 FDD | R.14-2 FDD | R.14-3 FDD | R.36 FDD | R.14-4 FDD | R.14-5 FDD | R.14-6 FDD | R.14- FDD |
| ılwidth | MHz | 1.4 | 10 | 10 | 10 | 10 | 20 | 10 | 1.4 | 3 | 5 | 15 |
| ɔurce blocks | | 6 | 50 | 50 | 6 | 3 | 100 | 50 | 6 | 15 | 25 | 75 |
| frames per | | 9 | 9 | 9 | 8 | 8 | 9 | 9 | 8 | 9 | 9 | 9 |
| | | QPSK | QPSK | 16QA M | 16QAM | 16QAM | 16QAM | 64QA M | 16QAM | 16QAM | 16QAM | 16QA |
| ŋ Rate | | 1/3 | 1/3 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| it Payload (Note | | | | | | | | | | | | |
| mes ə | Bits | 408 | 4392 | 12960 | 1544 | 744 | 25456 | 18336 | 1192 | 3368 | 5736 | 1908 |
| me 5 | Bits | N/A | N/A | N/A | N/A | N/A | n/a | N/A | N/A | N/A | N/A | N/A |
| me 0 | Bits | 152 | 3624 | 11448 | N/A | N/A | 22920 | 18336 | N/A | 2664 | 4968 | 1908 |
| ɔde Blocks 4) | | | | | | | | | | | | |
| mes ə | | 1 | 1 | 3 | 1 | 1 | 5 | 3 | 1 | 1 | 1 | 4 |
| me 5 | | N/A | N/A | N/A | N/A | N/A | n/a | N/A | N/A | N/A | N/A | N/A |
| me 0 | | 1 | 1 | 2 | N/A | N/A | 4 | 3 | N/A | 1 | 1 | 4 |
| el Bits (Note 4) | | | | | | | | | | | | |
| mes ə | Bits | 1248 | 12800 | 25600 | 3072 | 1536 | 51200 | 38400 | 2496 | 6960 | 11600 | 3840 |
| me 5 | Bits | N/A | N/A | N/A | N/A | N/A | n/a | N/A | N/A | N/A | N/A | N/A |
| me 0 | Bits | 480 | 12032 | 24064 | N/A | N/A | 49664 | 36096 | N/A | 5424 | 10064 | 3686 |
| ıput averaged (Note 4) | Mbps | 0.342 | 3.876 | 11.513 | 1.235 | 0.595 | 22.656 | 16.502 | 0.954 | 2.961 | 5.086 | 17.17 |
| | | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 |

ymbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols al CCH for 1.4 MHz.
ference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
nore than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
ven per component carrier per codeword.

**Table A.3.3.2.2-2: Fixed Reference Channel four antenna ports**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| channel | | R.72 FDD | R.72-1 FDD | R.72-2 FDD | R.72-3 FDD | R.73 FDD | R.73-1 FDD | R.74 FDD |
| ndwidth | MHz | 10 | 5 | 15 | 20 | 10 | 10 | 10 |
| esource blocks (Note 4) | | 50 | 25 | 75 | 100 | 50 | 50 | 50 |
| ubframes per Radio | | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| | | 256QAM | 256QAM | 256QAM | 256QAM | 64QAM | 16QAM | 16QAM |
| ing Rate | | 0.62 | 0.69 | 0.61 | 0.62 | 0.43 | 1/2 | 1/2 |
| Bit Payload (Note 4) | | | | | | | | |
| rames 1,2,3,4,6,7,8,9 | Bits | 31704 | 15840 | 46888 | 63776 | 16416 (CW0) 32856 (CW1) | 12960 (CW0) 25456 (CW1) | 25456 |
| rame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| rame 0 | Bits | 31704 | 15840 | 46888 | 63776 | 15264 (CW0) 30576 (CW1) | 11448 (CW0) 22920 (CW1) | 22920 |
| Code Blocks d 4) | | | | | | | | |
| rames 1,2,3,4,6,7,8,9 | | 6 | 3 | 8 | 11 | 3 (CW0) 6 (CW1) | 3 (CW0) 5 (CW1) | 5 |
| rame 5 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| rame 0 | | 6 | 3 | 8 | 11 | 3 (CW0) 5 (CW1) | 2 (CW0) 4 (CW1) | 5 |
| nnel Bits (Note 4) | | | | | | | | |
| rames 1,2,3,4,6,7,8,9 | Bits | 51200 | 23200 | 76800 | 102400 | 38400 (CW0) 76800 (CW1) | 25600 (CW0) 51200 (CW1) | 51200 |
| rame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| rame 0 | Bits | 48128 | 20128 | 73728 | 99328 | 36096 (CW0) 72192 (CW1) | 24064 (CW0) 48128 (CW1) | 48128 |
| ghput averaged over 1 e 4) | Mbps | 28.534 | 14.256 | 42.1992 | 57.3984 | 14.659 (CW0) 29.342 (CW1) | 11.513 (CW0) 22.657 (CW1) | 22.657 |
| y | | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 5 | ≥ 5 | ≥ 5 |

2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols o PDCCH for 1.4 MHz.
Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
f more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Given per component carrier per codeword.
For R.85 FDD, 24 RBs are allocated on RB 0-20 and 30-32.

**Table A.3.3.2.2-3: Fixed Reference Channel four antenna ports**

| Parameter | Unit | | Value | | |
|---|---|---|---|---|---|
| Reference channel | | | R.74-1 FDD | R.74-2 FDD | R.74-3 FDD |
| Channel bandwidth | MHz | | 5 | 15 | 20 |
| Allocated resource blocks (Note 4) | | | 25 | 75 | 100 |
| Allocated subframes per Radio Frame | | | 9 | 9 | 9 |
| Modulation | | | 16QAM | 16QAM | 16QAM |
| Target Coding Rate | | | 1/2 | 1/2 | 1/2 |
| Information Bit Payload (Note 4) | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | | 11448 | 37888 | 51024 |
| For Sub-Frame 5 | Bits | | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | | 9912 | 37888 | 51024 |
| Number of Code Blocks (Notes 3 and 4) | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | | 2 | 7 | 9 |
| For Sub-Frame 5 | | | N/A | N/A | N/A |
| For Sub-Frame 0 | | | 2 | 7 | 9 |
| Binary Channel Bits (Note 4) | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | | 23200 | 76800 | 102400 |
| For Sub-Frame 5 | Bits | | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | | 20128 | 73728 | 99328 |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | | 10.1496 | 34.0992 | 45.9216 |
| UE Category | | | ≥ 5 | ≥ 5 | ≥ 5 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).<br>Note 4: Given per component carrier per codeword. | | | | | |

## A.3.3.3 Reference Measurement Channel for UE-Specific Reference Symbols

### A.3.3.3.0 Two antenna ports (no CSI-RS)

The reference measurement channels in Table A.3.3.3.0-1 apply with two CRS antenna ports and without CSI-RS.

**Table A.3.3.3.0-1: Fixed Reference Channel without CSI-RS**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | R.70 FDD | R.71 FDD |
| Channel bandwidth | MHz | 10 | 10 |
| Allocated resource blocks | | 50 | 50 |
| Allocated subframes per Radio Frame | | 10 | 10 |
| Modulation | | QPSK | 16QAM |
| Target Coding Rate | | 0.65 | 0.6 |
| Information Bit Payload | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 6968 | 12960 |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A |
| Number of Code Blocks per Sub-Frame (Note 4) | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | 2 | 3 |
| For Sub-Frame 5 | | N/A | N/A |
| For Sub-Frame 0 | | N/A | N/A |
| Binary Channel Bits Per Sub-Frame | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 10800 | 21600 |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 5.5744 | 10.368 |
| UE Category | | ≥ 1 | ≥ 2 |
| Note 1: 3 symbols allocated to PDCCH.<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | |

**Table A.3.3.3.0-2: Fixed Reference Channel without CSI-RS for UE category M1**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.80 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) | | 6 |
| Allocated DL subframes per 32 subframes (Note 3) | | 8 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/3 |
| Information Bit Payload | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 504 |
| Number of Code Blocks | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Code blocks | 1 |
| Binary Channel Bits | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 1440 |
| Max. Throughput | kbps | 15.75 |
| UE DL Category | | M1, ≥ 0 |
| Note 1: 2 symbols allocated to PDCCH<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]<br>Note 3: The downlink subframes are scheduled at the 9th to 16th subframes every 32 ms. Information bit payload is available from the 9th to 16th subframes with repetition. (Starting from the 0th subframe)<br>Note 4: Allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband.<br>Note 5: MPDCCH are scheduled at the 0th to 7th subframes with repetition. The allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband. (Starting from the 0th subframe) | | |

### A.3.3.3.1 Two antenna port (CSI-RS)

The reference measurement channels in Table A.3.3.3.1-1 apply for verifying demodulation performance for UE-specific reference symbols with two cell-specific antenna ports and two CSI-RS antenna ports.

**Table A.3.3.3.1-1: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | R.51 FDD | R.51-1 FDD | R.76 FDD | R.51-2 FDD | R.51-3 FDD | R.51-4 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 5 | 15 | 20 |
| Allocated resource blocks | | 50 (Note 3) | 50 (Note 3) | 50 (Note 3) | 25 (Note 5) | 75 (Note 6) | 100 (Note 7) |
| Allocated subframes per Radio Frame | | 9 | 9 | 9 | 9 | 9 | 9 |
| Modulation | | 16QAM | 16QAM | QPSK | 16QAM | 16QAM | 16QAM |
| Target Coding Rate | | 1/2 | 0.54 | | 1/2 | 1/2 | 1/2 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 1,4,6,9 | Bits | 11448 | 12960 | 6200 | 5736 | 16992 | 22920 |
| For Sub-Frames 2,3,7,8 | Bits | 11448 | 12960 | 6200 | 5736 | 16992 | 22920 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 9528 | 10680 | 4968 | 3880 | 14112 | 19848 |
| Number of Code Blocks (Note 4) | | | | | | | |
| For Sub-Frames 1,4,6,9 | Code blocks | 2 | 3 | 2 | 1 | 3 | 4 |
| For Sub-Frames 2,3,7,8 | Code blocks | 2 | 3 | 2 | 1 | 3 | 4 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 2 | 2 | 1 | 1 | 3 | 4 |
| Binary Channel Bits | | | | | | | |
| For Sub-Frames 1,4,6,9 | Bits | 24000 | 24000 | 12000 | 10800 | 36000 | 48000 |
| For Sub-Frames 2,7 | | 23600 | 23600 | 11800 | 10600 | 35400 | 47200 |
| For Sub-Frames 3,8 | | 23200 | 23200 | 12000 | 10400 | 34800 | 46400 |
| For Sub-Frame 5 | Bits | N/A | N/A | n/a | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 19680 | 19680 | 9840 | 6912 | 30240 | 42240 |
| Max. Throughput averaged over 1 frame | Mbps | 10.1112 | 11.436 | 5.4568 | 4.9768 | 15.0048 | 20.3208 |
| UE Category | | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 |

Note 1: 2 symbols allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

The reference measurement channels in Table A3.3.3.1-2 apply for verifying demodulation performance for UE-specific reference symbols with two cell specific antenna ports and two CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS in same subframe.

**Table A.3.3.3.1-2: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS**

| Parameter | Unit | Value | | |
|---|---|---|---|---|
| Reference channel | | R.52 FDD | R.53 FDD | R.54 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 |
| Allocated resource blocks | | 50 (Note 3) | 50 (Note 3) | 50 (Note 3) |
| Allocated subframes per Radio Frame | | 9 | 9 | 9 |
| Modulation | | 64QAM | 64QAM | 16QAM |
| Target Coding Rate | | 1/2 | 1/2 | 1/2 |
| Information Bit Payload | | | | |
| For Sub-Frames 1,3,4,6,8,9 | Bits | 18336 | 18336 | 11448 |
| For Sub-Frames 2,7 | Bits | 16416 | 16416 | 11448 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 14688 | 14688 | 9528 |
| Number of Code Blocks (Note 4) | | | | |
| For Sub-Frames 1,3,4,6,8,9 | Code blocks | 3 | 3 | 2 |
| For Sub-Frames 2, 7 | Code blocks | 3 | 3 | 2 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 3 | 3 | 2 |
| Binary Channel Bits | | | | |
| For Sub-Frames 1,3,4,6,8,9 | Bits | 36000 | 36000 | 24000 |
| For Sub-Frames 2,7 | | 34200 | 33600 | 22800 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 29520 | 29520 | 19680 |
| Max. Throughput averaged over 1 frame | Mbps | 15.7536 | 15.7536 | 10.1112 |

Note 1: 2 symbols allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

**Table A.3.3.3.1-3: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.76-1 FDD | R.76-2 FDD | R.76-3 FDD | R.76-4 FDD | R.76-5 FDD | R.76-6 FDD | R.76-7 FDD |
| Channel bandwidth | MHz | 5 | 15 | 20 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 25 (Note 5) | 75 (Note 6) | 100 (Note 7) | 25 (Note 5) | 50 (Note 3) | 75 (Note 6) | 100 (Note 7) |
| Allocated subframes per Radio Frame | | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | | | | | | | |
| Information Bit Payload | | | | | | | | |
| For Sub-Frames 1,4,6,9 | Bits | 2600 | 9144 | 12216 | 3496 | 7992 | 11832 | 15840 |
| For Sub-Frames 2,3,7,8 | Bits | 2600 | 9144 | 12216 | 3496 | 7992 | 11832 | 15840 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 1736 | 7736 | 10680 | 2344 | 6456 | 9912 | 14112 |
| Number of Code Blocks (Note 4) | | | | | | | | |
| For Sub-Frames 1,4,6,9 | Code blocks | 1 | 2 | 2 | 1 | 2 | 2 | 3 |
| For Sub-Frames 2,3,7,8 | Code blocks | 1 | 2 | 2 | 1 | 2 | 2 | 3 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 1 | 2 | 2 | 1 | 2 | 2 | 3 |
| Binary Channel Bits | | | | | | | | |
| For Sub-Frames 1,4,6,9 | Bits | 5400 | 18000 | 24000 | 5400 | 12000 | 18000 | 24000 |
| For Sub-Frames 2,7 | | 5300 | 17700 | 23600 | 5300 | 11800 | 17700 | 23600 |
| For Sub-Frames 3,8 | | 5200 | 17400 | 23200 | 5200 | 12000 | 17400 | 23200 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 3456 | 15120 | 21120 | 3456 | 9840 | 15120 | 21120 |
| Max. Throughput averaged over 1 frame | Mbps | 2.2536 | 8.0888 | 10.8408 | 3.0312 | 7.0392 | 10.4568 | 14.0832 |
| UE Category | | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: 25 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 17 resource blocks (RB0–RB9 and RB18–RB24) are allocated in sub-frame 0.
Note 6: 75 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 63 resource blocks (RB0–R31 and RB44–RB74) are allocated in sub-frame 0.
Note 7: 100 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 88 resource blocks (RB0–RB43 and RB56–RB99) are allocated in sub-frame 0.
Note 8: Given per component carrier per codeword.

### A.3.3.3.2 Four antenna ports (CSI-RS)

The reference measurement channels in Table A.3.3.3.2-1 apply for verifying demodulation performance for UE-specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

**Table A.3.3.3.2-1: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ference channel | | R.43 FDD | R.43-1 FDD | R.43-2 FDD | R.50 FDD | R.48 FDD | R.66 FDD | R.75 FD |
| annel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| ocated resource blocks | | 50 (Note 3) | 50 (Note 3) | 50 (Note 5) | 50 (Note 3) | 50 (Note 3) | 50 (Note 3) | 50 (Not 3) |
| ocated subframes per Radio Frame | | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| dulation | | QPSK | QPSK | QPSK | 64QAM | QPSK | 256QAM | 16QAM |
| rget Coding Rate | | 1/3 | 1/3 | 1/3 | 1/2 | | 0.77 | 0.57 |
| ormation Bit Payload | | | | | | | | |
| or Sub-Frames 1,4,6,9 | Bits | 3624 | 3624 | 3624 | 18336 | 6200 | 36696 | 25456 |
| or Sub-Frames 2,3,7,8 | Bits | 3624 | 3624 | 3624 | 16416 | 6200 | 35160 | 25456 |
| or Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| or Sub-Frame 0 | Bits | 2984 | 2984 | 3368 | 14688 | 4968 | 30576 | 21384 |
| mber of Code Blocks (Note 4) | | | | | | | | |
| or Sub-Frames 1,4,6,9 | Code blocks | 1 | 1 | 1 | 3 | 2 | 6 | 5 |
| or Sub-Frames 2,3,7,8 | Code blocks | 1 | 1 | 1 | 3 | 2 | 6 | 5 |
| or Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| or Sub-Frame 0 | Bits | 1 | 1 | 1 | 3 | 1 | 5 | 4 |
| ıary Channel Bits | | | | | | | | |
| r Sub-Frames 1,6 | Bits | 12000 | 13200 | 13200 | 36000 | 12000 | 48000 | 43200 |
| or Sub-Frames 4,9 | Bits | 12000 | 12000 | 12000 | 36000 | 12000 | 48000 | 43200 |
| or Sub-Frames 2,7 | Bits | 11600 | 12800 | 12800 | 34800 | 11600 | 46400 | 41600 |
| or Sub-Frames 3,8 | Bits | 11600 | 12800 | 12800 | 34800 | 12000 | 46400 | 41600 |
| or Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| or Sub-Frame 0 | Bits | 9840 | 9840 | 10560 | 29520 | 9840 | 39360 | 35424 |
| ıx. Throughput averaged over 1 me | Mbps | 3.1976 | 3.1976 | 3.236 | 15.3696 | 5.4568 | 31.800 | 22.503 |
| Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 1 | 11-12 | ≥ 5 |
| DL Category | | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 11 | ≥ 6 |

te 1: 2 symbols allocated to PDCCH.
te 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
te 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated sub-frame 0.
te 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit
te 5: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 47 resource blocks (RB0–RB23 and RB27–RB49) are allocated sub-frame 0. In sub-frame 0, PDSCH is rate matched around RB22, RB23 and RB27.

The reference measurement channels in Table A.3.3.3.2-2 apply for verifying FDD PMI accuracy measurement with two CRS antenna ports and four CSI-RS antenna ports.

**Table A.3.3.3.2-2: Fixed Reference Channel for four antenna ports (CSI-RS)**

| Parameter | Unit | Value | | | |
|---|---|---|---|---|---|
| Reference channel | | R.44 FDD | R.45 FDD | R.45-1 FDD | R.60 FDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 |
| Allocated resource blocks | | 50[3] | 50[3] | 39 | 50[3] |
| Allocated subframes per Radio Frame | | 10 | 10 | 10 | 10 |
| Modulation | | QPSK | 16QAM | 16QAM | QPSK |
| Target Coding Rate | | 1/3 | 1/2 | 1/2 | 1/2 |
| Information Bit Payload | | | | | |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 3624 | 11448 | 8760 | 6200 |
| For Sub-Frames (CSI-RS subframe) | Bits | 3624 | 11448 | 8760 | 6200 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | n/a | n/a | n/a | N/A |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | N/A |
| For Sub-Frame 0 | Bits | 2984 | 9528 | 8760 | N/A |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | |
| For Sub-Frames (Non CSI-RS subframe) | | 1 | 2 | 2 | 2 |
| For Sub-Frames (CSI-RS subframe) | | 1 | 2 | 2 | 2 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | n/a | n/a | n/a | N/A |
| For Sub-Frame 5 | | n/a | n/a | n/a | N/A |
| For Sub-Frame 0 | | 1 | 2 | 2 | N/A |
| Binary Channel Bits Per Sub-Frame | | | | | |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 12000 | 24000 | 18720 | 12000 |
| For Sub-Frames (CSI-RS subframe) | Bits | 11600 | 23200 | 18096 | 11600 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | n/a | n/a | n/a | N/A |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | N/A |
| For Sub-Frame 0 | Bits | 9840 | 19680 | 18720 | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 3.1976 | 10.1112 | 7.884 | 4.96 |
| UE Category | | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: For R.44, R.45 and R.60, 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0-RB20 and RB30-RB49) are allocated in sub-frame 0. For R.45-1, 39 resource blocks are allocated in all subframes (RB0–RB20 and RB30–RB47).
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

**Table A.3.3.3.2-3: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.64 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) | | 6 |
| Allocated subframes per 4 Radio Frames | | 15 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/3 |
| Information Bit Payload | | |
| For Sub-Frames 0,1,4,5,6,9 (Note 3) | Bits | 504 |
| For Sub-Frames 2,3,7,8 (Note 3) | Bits | 504 |
| Number of Code Blocks | | |
| For Sub-Frames 0,1,4,5,6,9 | Code blocks | 1 |
| For Sub-Frames 2,3,7,8 | Code blocks | 1 |
| Binary Channel Bits | | |
| For Sub-Frames 0,1,4,5,6,9 | Bits | 1440 |
| For Sub-Frames 2,3,7,8 | Bits | 1392 |
| Max. Throughput averaged over 4 frames | Mbps | 0.189 |
| UE DL Category | | 0 |
| Note 1: 2 symbols allocated to PDCCH.<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].<br>Note 3: The downlink subframes are scheduled at the 0th, 1st, 2nd, 8th, 9th, 10th, 16th, 17th, 18th, 24th, 25th, 26th, 32nd, 33rd, 34th subframes every 40ms. Information bit payload is available if downlink subframe is scheduled.<br>Note 4: Allocated PRB positions start from {9, 10, …, 9+N-1}, where N is the number of allocated resource blocks. | | |

The reference measurement channels in Table A.3.3.3.2-4 apply with two CRS antenna ports and four CSI-RS antenna ports.

**Table A.3.3.3.2-4: Fixed Reference Channel for four antenna ports (CSI-RS)**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.69 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks | | 50 |
| Allocated subframes per Radio Frame | | 10 |
| Modulation | | QPSK |
| Target Coding Rate | | |
| For Sub-Frames 2,3,4,6,7,8,9 | | 0.74 |
| For Sub-Frame 1 | | 0.8 |
| Information Bit Payload | | |
| For Sub-Frames 2,3,4,6,7,8,9 | Bits | 7992 |
| For Sub-Frame 1 | Bits | 7992 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | N/A |
| Number of Code Blocks per Sub-Frame (Note 4) | | |
| For Sub-Frames 2,3,4,6,7,8,9 | | 2 |
| For Sub-Frame 1 | | 2 |
| For Sub-Frame 5 | | N/A |
| For Sub-Frame 0 | | N/A |
| Binary Channel Bits Per Sub-Frame | | |
| For Sub-Frames 2,3,4,6,7,8,9 | Bits | 10800 |
| For Sub-Frame 1 | Bits | 10000 |
| 2 For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 6.3936 |
| UE Category | | ≥ 1 |
| Note 1: 3 symbols allocated to PDCCH.<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | |

## A.3.3.3.3 Twelve antenna port (CSI-RS)

The reference measurement channels in Table A.3.3.3.3-1 apply for verifying PMI accuracy performance for UE-specific reference symbols with two cell-specific antenna ports and twelve CSI-RS antenna ports.

**Table A.3.3.3.3-1: Fixed Reference Channel for CDM-multiplexed DM RS with twelve CSI-RS antenna ports**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.77 FDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks | | 50 (Note 3) |
| Allocated subframes per Radio Frame | | 9 |
| Modulation | | 64QAM |
| Target Coding Rate | | 1/2 |
| Information Bit Payload | | |
| For Sub-Frames (Non CSI-RS subframe) | Bits | 18336 |
| For Sub-Frames (CSI-RS subframe) | Bits | 16416 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | | 14688 |
| Number of Code Blocks per Sub-Frame | Code blocks | |
| For Sub-Frames (Non CSI-RS subframe) | Code blocks | 3 |
| For Sub-Frames (CSI-RS subframe) | Bits | 3 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 | | N/A |
| For Sub-Frame 0 | Bits | 3 |
| Binary Channel Bits Per Sub-Frame | | |
| For Sub-Frames (Non CSI-RS subframe) | | 36000 |
| For Sub-Frames (CSI-RS subframe) | Bits | 32400 |
| For Sub-Frames (ZeroPowerCSI-RS subframe) | Bits | N/A |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 29520 |
| Max. Throughput averaged over 1 frame | Mbps | 15.7536 |
| UE Category | | ≥ 2 |
| Note 1: 2 symbols allocated to PDCCH.<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].<br>Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.<br>Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | |

# A.3.4 Reference measurement channel for PDSCH performance requirements (TDD)

## A.3.4.1 Single-antenna transmission (Common Reference Symbols)

**Table A.3.4.1-1: Fixed Reference Channel QPSK R=1/3**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.4 TDD | R.42 TDD | R.2A TDD | R.2 TDD | R.42-1 TDD | R.42-2 TDD | R.42-3 TDD |
| Channel bandwidth | MHz | 1.4 | 20 | 10 | 10 | 3 | 5 | 15 |
| Allocated resource blocks (Note 6) | | 6 | 100 | 50 | 50 | 15 | 25 | 75 |
| Uplink-Downlink Configuration (Note 4) | | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 3 | 3+2 | 5+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload (Note 6) | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 408 | 8760 | 4392 | 4392 | 1320 | 2216 | 6712 |
| For Sub-Frames 1,6 | Bits | N/A | 7736 | 3240 | 3240 | 1128 | 1864 | 5992 |
| For Sub-Frames 3,8 | Bits | N/A | N/A | 4392 | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 208 | 8760 | 4392 | 4392 | 1064 | 1800 | 6712 |
| Number of Code Blocks (Notes 5 and 6) | | | | | | | | |
| For Sub-Frames 4,9 | | 1 | 2 | 1 | 1 | 1 | 1 | 2 |
| For Sub-Frames 1,6 | | N/A | 2 | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frames 3,8 | | N/A | N/A | 1 | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 1 | 2 | 1 | 1 | 1 | 1 | 2 |
| Binary Channel Bits (Note 6) | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 1368 | 27600 | 13800 | 13800 | 3780 | 6300 | 20700 |
| For Sub-Frames 1,6 | Bits | N/A | 22656 | 11256 | 11256 | 3276 | 5556 | 16956 |
| For Sub-Frames 3,8 | | N/A | N/A | 13800 | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 672 | 26904 | 13104 | 13104 | 3084 | 5604 | 20004 |
| Max. Throughput averaged over 1 frame (Note 6) | Mbps | 0.102 | 4.175 | 2.844 | 1.966 | 0.596 | 0.996 | 3.212 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.
Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 4: As per Table 4.2-2 in TS 36.211 [8].
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 6: Given per component carrier per codeword.

**Table A.3.4.1-2: Fixed Reference Channel 16QAM R=1/2**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | | | R.3-1 TDD | R.3 TDD | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | 25 | 50 | | |
| Uplink-Downlink Configuration (Note 3) | | | | 1 | 1 | | |
| Allocated subframes per Radio Frame (D+S) | | | | 3+2 | 3+2 | | |
| Modulation | | | | 16QAM | 16QAM | | |
| Target Coding Rate | | | | 1/2 | 1/2 | | |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 4,9 | Bits | | | 6456 | 14112 | | |
| For Sub-Frames 1,6 | Bits | | | 5160 | 11448 | | |
| For Sub-Frame 5 | Bits | | | n/a | n/a | | |
| For Sub-Frame 0 | Bits | | | 5736 | 12960 | | |
| Number of Code Blocks per Sub-Frame (see Note 4) | | | | | | | |
| For Sub-Frames 4,9 | | | | 2 | 3 | | |
| For Sub-Frames 1,6 | | | | 1 | 2 | | |
| For Sub-Frame 5 | | | | n/a | n/a | | |
| For Sub-Frame 0 | | | | 1 | 3 | | |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | | | 12600 | 27600 | | |
| For Sub-Frames 1,6 | Bits | | | 11112 | 22512 | | |
| For Sub-Frame 5 | Bits | | | n/a | n/a | | |
| For Sub-Frame 0 | Bits | | | 11208 | 26208 | | |
| Max. Throughput averaged over 1 frame | Mbps | | | 2.897 | 6.408 | | |
| UE Category | | | | ≥ 1 | ≥ 2 | | |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: As per Table 4.2-2 in TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

**Table A.3.4.1-3: Fixed Reference Channel 64QAM R=3/4**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | | R.5 TDD | R.6 TDD | R.7 TDD | R.8 TDD | R.9 TDD |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | 15 | 25 | 50 | 75 | 100 |
| Uplink-Downlink Configuration (Note 3) | | | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 4,9 | Bits | | 8504 | 14112 | 30576 | 46888 | 61664 |
| For Sub-Frames 1,6 | Bits | | 6968 | 11448 | 23688 | 35160 | 46888 |
| For Sub-Frame 5 | Bits | | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | | 6968 | 12576 | 30576 | 45352 | 61664 |
| Number of Code Blocks per Sub-Frame (see Note 4) | | | | | | | |
| For Sub-Frames 4,9 | | | 2 | 3 | 5 | 8 | 11 |
| For Sub-Frames 1,6 | | | 2 | 2 | 4 | 6 | 8 |
| For Sub-Frame 5 | | | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | | 2 | 3 | 5 | 8 | 11 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | | 11340 | 18900 | 41400 | 62100 | 82800 |
| For Sub-Frames 1,6 | Bits | | 9828 | 16668 | 33768 | 50868 | 67968 |
| For Sub-Frame 5 | Bits | | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | | 9252 | 16812 | 39312 | 60012 | 80712 |
| Max. Throughput averaged over 1 frame | Mbps | | 3.791 | 6.370 | 13.910 | 20.945 | 27.877 |
| UE Category | | | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 3 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: As per Table 4.2-2 TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

**Table A.3.4.1-3a: Fixed Reference Channel 64QAM R=3/4**

| Parameter | Unit | | Value | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | | R.6-1 TDD | R.7-1 TDD | R.8-1 TDD | R.9-1 TDD | R.9-2 TDD |
| Channel bandwidth | MHz | | 5 | 10 | 15 | 20 | 20 |
| Allocated resource blocks (Note 3) | | | 18 | 17 | 17 | 17 | 83 |
| Uplink-Downlink Configuration (Note 4) | | | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation | | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 4,9 | Bits | | 10296 | 10296 | 10296 | 10296 | 51024 |
| For Sub-Frames 1,6 | Bits | | 8248 | 7480 | 7480 | 7480 | 39232 |
| For Sub-Frame 5 | Bits | | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | | 8248 | 10296 | 10296 | 10296 | 51024 |
| Number of Code Blocks per Sub-Frame (Note 5) | | | | | | | |
| For Sub-Frames 4,9 | | | 2 | 2 | 2 | 2 | 9 |
| For Sub-Frames 1,6 | | | 2 | 2 | 2 | 2 | 7 |
| For Sub-Frame 5 | | | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | | 2 | 2 | 2 | 2 | 9 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | | 13608 | 14076 | 14076 | 14076 | 68724 |
| For Sub-Frames 1,6 | Bits | | 11880 | 11628 | 11628 | 11628 | 56340 |
| For Sub-Frame 5 | Bits | | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | | 11520 | 14076 | 14076 | 14076 | 66636 |
| Max. Throughput averaged over 1 frame | Mbps | | 4.534 | 4.585 | 4.585 | 4.585 | 23.154 |
| UE Category | | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: Localized allocation started from RB #0 is applied.
Note 4: As per Table 4.2-2 TS 36.211 [8]
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

**Table A.3.4.1-4: Fixed Reference Channel Single PRB**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | | R.0 TDD | | R.1 TDD | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10/20 | 15 | 20 |
| Allocated resource blocks | | | 1 | | 1 | | |
| Uplink-Downlink Configuration (Note 3) | | | 1 | | 1 | | |
| Allocated subframes per Radio Frame (D+S) | | | 3+2 | | 3+2 | | |
| Modulation | | | 16QAM | | 16QAM | | |
| Target Coding Rate | | | 1/2 | | 1/2 | | |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 4,9 | Bits | | 224 | | 256 | | |
| For Sub-Frames 1,6 | Bits | | 208 | | 208 | | |
| For Sub-Frame 5 | Bits | | n/a | | n/a | | |
| For Sub-Frame 0 | Bits | | 224 | | 256 | | |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frames 4,9 | | | 1 | | 1 | | |
| For Sub-Frames 1,6 | | | 1 | | 1 | | |
| For Sub-Frame 5 | | | n/a | | n/a | | |
| For Sub-Frame 0 | | | 1 | | 1 | | |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | | 504 | | 552 | | |
| For Sub-Frames 1,6 | Bits | | 456 | | 456 | | |
| For Sub-Frame 5 | Bits | | n/a | | n/a | | |
| For Sub-Frame 0 | Bits | | 504 | | 552 | | |
| Max. Throughput averaged over 1 frame | Mbps | | 0.109 | | 0.118 | | |
| UE Category | | | ≥ 1 | | ≥ 1 | | |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: As per Table 4.2-2 in TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

**Table A.3.4.1-5: Fixed Reference Channel Single PRB (MBSFN Configuration)**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.29 TDD (MBSFN) |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks | | 1 |
| MBSFN Configuration | | 010010 |
| Uplink-Downlink Configuration (Note 4) | | 1 |
| Allocated subframes per Radio Frame (D+S) | | 1+2 |
| Modulation | | 16QAM |
| Target Coding Rate | | 1/2 |
| Information Bit Payload | | |
| For Sub-Frames 4,9 | Bits | 0 (MBSFN) |
| For Sub-Frames 1,6 | Bits | 208 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 256 |
| Number of Code Blocks per Sub-Frame (Note 4) | | |
| For Sub-Frames 4,9 | Bits | 0 (MBSFN) |
| For Sub-Frames 1,6 | Bits | 1 |
| For Sub-Frame 5 | Bits | n/a |
| Binary Channel Bits Per Sub-Frame | | |
| For Sub-Frames 4,9 | Bits | 0 (MBSFN) |
| For Sub-Frames 1,6 | Bits | 456 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 552 |
| Max. Throughput averaged over 1 frame | kbps | 67.2 |
| UE Category | | ≥ 1 |

Note 1: 2 symbols allocated to PDCCH
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: MBSFN Subframe Allocation as defined in [5], one frame with 6 bits is chosen for MBSFN subframe allocation
Note 4: As per Table 4.2-2 in TS 36.211 [8]
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

**Table A.3.4.1-7: Fixed Reference Channel for CA demodulation with power imbalance**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | R.49 TDD | R.49-1 TDD |
| Channel bandwidth | MHz | 20 | 15 |
| Allocated resource blocks | | 100 | 75 |
| Uplink-Downlink Configuration (Note 1) | | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 3+2 | 3+2 |
| Modulation | | 64QAM | 64QAM |
| Number of OFDM symbols for PDCCH per component carrier | | | |
| For Sub-Frames 0,4,5,9 | OFDM symbols | 3 | 3 |
| For Sub-Frames 1,6 | OFDM symbols | 2 | 2 |
| Target Coding Rate | | | |
| For Sub-Frames 4,9 | | 0.84 | 0.83 |
| For Sub-Frames 1,6 | | 0.81 | 0.80 |
| For Sub-Frames 5 | | N/A | N/A |
| For Sub-Frames 0 | | 0.87 | 0.86 |
| Information Bit Payload | | | |
| For Sub-Frames 0, 4, 9 | Bits | 63776 | 46888 |
| For Sub-Frame 1,6 | Bits | 55056 | 40576 |
| For Sub-Frame 5 | Bits | N/A | N/A |
| Number of Code Blocks per Sub-Frame (Note 2) | | | |
| For Sub-Frames 0, 4, 9 | Code Blocks | 11 | 8 |
| For Sub-Frame 1,6 | Code Blocks | 9 | 7 |
| For Sub-Frame 5 | Code Blocks | N/A | N/A |
| Binary Channel Bits Per Sub-Frame | | | |
| For Sub-Frames 4,9 | Bits | 75600 | 56700 |
| For Sub-Frame 1,6 | Bits | 67968 | 50868 |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | 73512 | 54612 |
| Max. Throughput averaged over 1 frame | Mbps | 30.144 | 22.182 |
| UE Category | | ≥5 | ≥ 3 |
| Note 1: Reference signal, synchronization signals and PBC allocated as per TS 36.211 [8]. | | | |
| Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | |

## A.3.4.2 Multi-antenna transmission (Common Reference Symbols)

### A.3.4.2.1 Two antenna ports

**Table A.3.4.2.1-1: Fixed Reference Channel two antenna ports**

| Parameter | Unit | Value | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.10 TDD | R.11 TDD | R.11-1 TDD | R.11-2 TDD | R.11-3 TDD (Note 6) | R.11-4 TDD | R.30 TDD | R.30-1 TDD | R.30-2 TDD | R.35 TDD | R.35-1 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 5 | 10 | 10 | 20 | 20 | 20 | 10 | 20 |
| Allocated resource blocks | | 50 | 50 | 50 | 25 | 40 | 50 | 100 | 100 | 100 | 50 | 100 |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 3+2 | 3+2 | 2+2 | 3+2 | 3+2 | 2 | 3+2 | +2 | 2 | 2+2 | 2 |
| Modulation | | QPSK | 16QAM | 16QAM | 16QAM | 16QAM | QPSK | 16QAM | 16QAM | 16QAM | 64QAM | 64QAM |
| Target Coding Rate | | 1/3 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 0.39 |
| Information Bit Payload (Note 5) | | | | | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 4392 | 12960 | 12960 | 5736 | 10296 | 6968 | 25456 | 25456 | 25456 | 19848 | 30576 |
| For Sub-Frames 1,6 | | 3240 | 9528 | 9528 | 5160 | 9144 | n/a | 22920 | 21384 | n/a | 15840 | n/a |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 4392 | 12960 | n/a | 4968 | 10296 | n/a | 25456 | n/a | n/a | n/a | n/a |
| Number of Code Blocks per Sub-Frame (Note 4 and 5) | | | | | | | | | | | | |
| For Sub-Frames 4,9 | | 1 | 3 | 3 | 1 | 2 | 2 | 5 | 5 | 5 | 4 | 5 |
| For Sub-Frames 1,6 | | 1 | 2 | 2 | 1 | 2 | n/a | 4 | 4 | n/a | 3 | n/a |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | 1 | 3 | n/a | 1 | 2 | n/a | 5 | n/a | n/a | n/a | n/a |
| Binary Channel Bits Per Sub-Frame(Note 5) | | | | | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 13200 | 26400 | 26400 | 12000 | 21120 | 13200 | 52800 | 52800 | 52800 | 39600 | 79200 |
| For Sub-Frames 1,6 | | 10656 | 21312 | 21312 | 10512 | 16992 | 10656 | 42912 | 42912 | n/a | 31968 | n/a |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 12528 | 25056 | n/a | 10656 | 19776 | 12528 | 51456 | n/a | n/a | n/a | n/a |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 1.966 | 5.794 | 4.498 | 2.676 | 4.918 | 1.39 | 12.221 | 9.368 | 5.091 | 7.138 | 6.115 |
| UE Category | | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: Given per component carrier per codeword.
Note 6: For R.11-3 resource blocks of RB6–RB45 are allocated.

**Table A.3.4.2.1-2: Fixed Reference Channel two antenna ports**

| Parameter | Unit | Value | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.46 TDD | R.47 TDD | R.35-2 TDD | R.11-5 TDD | R.11-6 TDD | R.11-7 TDD | R.11-8 TDD | R.11-9 TDD | R.11-10 TDD | R.11-11 TDD | R.11-12 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 1.4 | 3 | 5 | 10 | 15 | 10 | 10 | 10 |
| Allocated resource blocks (Note 5) | | 50 | 50 | 50 | 6 | 15 | 25 | 50 | 75 | 50 | 50 | 50 |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated number of PDCCH symbols in normal subframes | | 2 | 2 | 2 | 4 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |
| Allocated number of PDCCH symbols in special subframes | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Allocated subframes per Radio Frame (D+S) | | 3+2 | 3+2 | 2+2 | 2+2 | 2+2 | 2+2 | 2+2 | 2+2 | 3+2 | 2+2 | 2+2 |
| Modulation | | QPSK | 16QAM | 64QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | QPSK | QPSK | QPSK |
| Target Coding Rate | | | | 0.47 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 3/5 | | |
| For Sub-Frames 4,9 | | | | | | | | | | | 0.58 | 0.66 |
| For Sub-Frames 1,6 | | | | | | | | | | | 0.48 | 0.54 |
| Information Bit Payload (Note 5) | | | | | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 5160 | 8760 | 18336 | 1352 | 3368 | 5736 | 12960 | 19080 | 7992 | 6968 | 7992 |
| For Sub-Frames 1,6 | | 3880 | 7480 | 14688 | 1128 | 3112 | 5160 | 10680 | 15840 | 5736 | 5160 | 5736 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 5160 | 8760 | N/A | N/A | N/A | N/A | N/A | N/A | 7992 | N/A | N/A |
| Number of Code Blocks (Notes 4 and 5) | | | | | | | | | | | | |
| For Sub-Frames 4,9 | | 1 | 2 | 3 | 1 | 1 | 1 | 3 | 4 | 2 | 2 | 2 |
| For Sub-Frames 1,6 | | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 3 | 1 | 1 | 1 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 1 | 2 | N/A | N/A | N/A | N/A | N/A | N/A | 2 | N/A | N/A |
| Binary Channel Bits (Note 5) | | | | | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 13200 | 26400 | 39600 | 2592 | 7200 | 12000 | 26400 | 39600 | 13200 | 12000 | 12000 |
| For Sub-Frames 1,6 | | 10656 | 21312 | 31968 | 2304 | 6192 | 10512 | 21312 | 32112 | 10656 | 10656 | 10656 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 12528 | 25056 | N/A | N/A | N/A | N/A | N/A | N/A | 12528 | N/A | N/A |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 2.324 | 4.124 | 6.604 | 0.496 | 1.296 | 2.179 | 4.498 | 6.984 | 3.5448 | 2.4256 | 2.7456 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 1 | ≥ 1 |

Note 1: Void.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: Given per component carrier per codeword.

**Table A.3.4.2.1-3: Fixed Reference Channel two antenna ports for UE category 0**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | R.62 TDD | R.63 TDD |
| Channel bandwidth | MHz | 10 | 10 |
| Allocated resource blocks (Note 4) | | 3 | 1 |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 4+2 | 4+2 |
| Modulation | | 16QAM | 64QAM |
| Target Coding Rate | | 1/2 | 1/2 |
| Information Bit Payload | | | |
| For Sub-Frames 0,4,5,9 | Bits | 744 | 408 |
| For Sub-Frames 1,6 | Bits | 440 | 280 |
| Number of Code Blocks | | | |
| For Sub-Frames 0,4,5,9 | Code blocks | 1 | 1 |
| For Sub-Frames 1,6 | Code blocks | 1 | 1 |
| Binary Channel Bits | | | |
| For Sub-Frames 0,4,5,9 | Bits | 1584 | 792 |
| For Sub-Frames 1,6 | | 1296 | 648 |
| Max. Throughput averaged over 1 frame | Mbps | 0.3856 | 0.2192 |
| UE DL Category | | 0 | 0 |
| Note 1: 2 symbols allocated to PDCCH.<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].<br>Note 3: As per Table 4.2-2 in TS 36.211 [8].<br>Note 4: Allocated PRB positions start from {9, 10, …, 9+N-1}, where N is the number of allocated resource blocks. | | | |

**Table A.3.4.2.1-4: Fixed Reference Channel two antenna ports**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | R.65 TDD | |
| Channel bandwidth | MHz | 20 | |
| Allocated resource blocks (Note 5) | | 100 | |
| Uplink-Downlink Configuration (Note 3) | | 1 | |
| Allocated subframes per Radio Frame (D+S) | | 2+2 | |
| Modulation | | 256QAM | |
| Target Coding Rate | | | |
| Information Bit Payload (Note 5) | | | |
| For Sub-Frames 4,9 | Bits | 63776 | |
| For Sub-Frames 1,6 | | 46888 | |
| For Sub-Frame 5 | Bits | N/A | |
| For Sub-Frame 0 | Bits | N/A | |
| Number of Code Blocks (Notes 4 and 5) | | | |
| For Sub-Frames 4,9 | | 11 | |
| For Sub-Frames 1,6 | | 9 | |
| For Sub-Frame 5 | | N/A | |
| For Sub-Frame 0 | | N/A | |
| Binary Channel Bits (Note 5) | | | |
| For Sub-Frames 4,9 | Bits | 115200 | |
| For Sub-Frames 1,6 | | 95424 | |
| For Sub-Frame 5 | Bits | N/A | |
| For Sub-Frame 0 | Bits | N/A | |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 22.133 | |
| UE Category | | 11-12 | |
| UE DL Category | | ≥ 11 | |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH. For 256QAM reference channel 1 symbol is allocated.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: Given per component carrier per codeword

**Table A.3.4.2.1-5: Fixed Reference Channel two antenna ports when *EIMTA-MainConfigServCell-r12* is configured**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.67 TDD | | | | | | |
| Channel bandwidth | MHz | 10 | | | | | | |
| Allocated resource blocks (Note 5) | | 50 | | | | | | |
| Modulation | | 16QAM | | | | | | |
| Target Coding Rate | | 0.4 | | | | | | |
| Dynamic Uplink-Downlink Configuration (Note 3) | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Allocated subframes per Radio Frame (D+S) | | 1+2 | 3+2 | 5+2 | 5+1 | 6+1 | 7+1 | 2+2 |
| Information Bit Payload (Note 5) | | | | | | | | |
| For Sub-Frame 0 | Bits | 9912 | 9912 | 9912 | 9912 | 9912 | 9912 | 9912 |
| For Sub-Frame 1 | Bits | 7480 | 7480 | 7480 | 7480 | 7480 | 7480 | 7480 |
| For Sub-Frame 2 | Bits | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 3 | Bits | NA | NA | 9912 | NA | NA | 9912 | NA |
| For Sub-Frame 4 | Bits | NA | 9912 | 9912 | NA | 9912 | 9912 | NA |
| For Sub-Frame 5 | Bits | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 6 | Bits | 7480 | 7480 | 7480 | 9912 | 9912 | 9912 | 7480 |
| For Sub-Frame 7 | Bits | NA | NA | NA | 9912 | 9912 | 9912 | NA |
| For Sub-Frame 8 | Bits | NA | NA | 9912 | 9912 | 9912 | 9912 | NA |
| For Sub-Frame 9 | Bits | NA | 9912 | 9912 | 9912 | 9912 | 9912 | 9912 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Number of Code Blocks (Notes 4 and 5) | | | | | | | | |
| For Sub-Frame 0 | | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| For Sub-Frame 1 | | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| For Sub-Frame 2 | | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 3 | | NA | NA | 2 | NA | NA | 2 | NA |
| For Sub-Frame 4 | | NA | 2 | 2 | NA | 2 | 2 | NA |
| For Sub-Frame 5 | | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 6 | | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| For Sub-Frame 7 | | NA | NA | NA | 2 | 2 | 2 | NA |
| For Sub-Frame 8 | | NA | NA | 2 | 2 | 2 | 2 | NA |
| For Sub-Frame 9 | | NA | 2 | 2 | 2 | 2 | 2 | 2 |
| Binary Channel Bits (Note 5) | | | | | | | | |
| For Sub-Frame 0 | Bits | 25056 | 25056 | 25056 | 25056 | 25056 | 25056 | 25056 |
| For Sub-Frame 1 | Bits | 21312 | 21312 | 21312 | 21312 | 21312 | 21312 | 21312 |
| For Sub-Frame 2 | Bits | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 3 | Bits | NA | NA | 26400 | NA | NA | 26400 | NA |
| For Sub-Frame 4 | Bits | NA | 26400 | 26400 | NA | 26400 | 26400 | NA |
| For Sub-Frame 5 | Bits | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 6 | Bits | 21312 | 21312 | 21312 | 26112 | 26112 | 26112 | 21312 |
| For Sub-Frame 7 | Bits | NA | NA | NA | 26400 | 26400 | 26400 | NA |
| For Sub-Frame 8 | Bits | NA | NA | 26400 | 26400 | 26400 | 26400 | NA |
| For Sub-Frame 9 | Bits | NA | 26400 | 26400 | 26400 | 26400 | 26400 | 26400 |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 2.49 | 4.47 | 6.45 | 5.70 | 6.70 | 7.69 | 3.48 |
| Max. Throughput averaged over 1 frame and over all dynamic UL-DL configurations (Note 5) | Mbps | 5.28 | | | | | | |
| UE Category | | ≥ 1 | | | | | | |

Note 1: 2 OFDM symbols are allocated to PDCCH in all subframes
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: Given per component carrier per codeword.

**Table A.3.4.2.1-6: Fixed Reference Channel two antenna ports**

| Parameter | Unit | Values |
|---|---|---|
| Reference channel | | R.79 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) | | 3 |
| Allocated subframes per Radio Frame (D+S) | | 4+2 |
| Modulation | | 16QAM |
| Target Coding Rate | | 1/2 |
| Information Bit Payload | | |
| For Sub-Frames 0,4,5,9 | Bits | 744 |
| For Sub-Frames 1,6 | Bits | 440 |
| Number of Code Blocks | | |
| For Sub-Frames 0,4,5,9 | Code blocks | 1 |
| For Sub-Frames 0,4,5,9 | Code blocks | 1 |
| Binary Channel Bits | | |
| For Sub-Frames 0,4,5,9 | Bits | 1584 |
| For Sub-Frames 1,6 | Bits | 1296 |
| Max. Throughput averaged over 1 frames | Mbps | 0.3856 |
| UE DL Category | | M1, ≥ 0 |

Note 1: 2 symbols allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: Allocated PRB positions for PDSCH are {3, 4, 5} within the assigned narrowband. Allocated PRB positions for MPDCCH are {0, 1} within the assigned narrowband.

**Table A.3.4.2.1-7: Fixed Reference Channel two antenna ports for UE category M1**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.81 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) | | 6 |
| Uplink-Downlink Configuration (Note 3) | | 1 |
| Allocated subframes per Radio Frame (D+S) | | 4+2 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/10 |
| Information Bit Payload | | |
| For Sub-Frames 0,4,5,9 | Bits | 152 |
| For Sub-Frames 1,6 | Bits | N/A |
| Number of Code Blocks | | |
| For Sub-Frames 0,4,5,9 | Code blocks | 1 |
| For Sub-Frames 1,6 | Code blocs | N/A |
| Binary Channel Bits | | |
| For Sub-Frames 0,4,5,9 | Bits | 1584 |
| For Sub-Frames 1,6 | | N/A |
| Max. Throughput averaged over 384 sub-frame | kbps | 0.396 |
| UE DL Category | | M1, ≥ 0 |

Note 1: 2 symbols allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: Allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband.
Note 5: MPDCCH are scheduled at the 0th to 63rd BL/CE DL subframes with repetition every 384 ms. The allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband. The associated PDSCH is scheduled at the 65th to 128th BL/CE DL subframes with repetition every 384ms. (starting from the 0th subframe). If it is not the BL/CE DL subframes, MPDCCH/PDSCH transmission is postponed until the next BL/CE DL subframe. Note the DL subframes in the TDD uplink-downlink configuration are considered as the BL/CE DL subframes.

**Table A.3.4.2.1-8: Fixed Reference Channel two antenna ports**

| Parameter | Unit | Values |
|---|---|---|
| Reference channel | | R.87 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) | | 50 |
| Uplink-Downlink Configuration (Note 2) | | 1 |
| Allocated number of PDCCH symbols | | 2 |
| Allocated subframes per Radio Frame (D+S) | | 2+2 |
| Modulation | | 64QAM |
| Target Coding Rate | | |
| For Sub-Frames 4,9 | | 0.39 |
| For Sub-Frames 1,6 | | 0.36 |
| Information Bit Payload (Note 4) | | |
| For Sub-Frames 4,9 | Bits | 15264 |
| For Sub-Frames 1,6 | Bits | 11448 |
| For Sub-Frames 0,5 | Bits | N/A |
| Number of Code Blocks(Notes 3 and 4) | | |
| For Sub-Frames 4,9 | | 3 |
| For Sub-Frames 1,6 | | 2 |
| For Sub-Frames 0,5 | | N/A |
| Binary Channel Bits (Note 4) | | |
| For Sub-Frames 4,9 | Bits | 39600 |
| For Sub-Frames 1,6 | | 31968 |
| For Sub-Frames 0,5 | | N/A |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 5.342 |
| UE Category | | ≥ 1 |

NOTE 1: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
NOTE 2: As per Table 4.2-2 in TS 36.211 [8].
NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
NOTE 4: Given per component carrier per codeword.

**Table A.3.4.2.1-9: Fixed Reference Channel two antenna ports**

| Parameter | Unit | Value | | |
|---|---|---|---|---|
| Reference channel | | R.47-1 TDD | R.47-2 TDD | R.47-3 TDD |
| Channel bandwidth | MHz | 5 | 15 | 20 |
| Allocated resource blocks | | 25 | 75 | 100 |
| Uplink-Downlink Configuration (Note 2) | | 1 | 1 | 1 |
| Allocated number of PDCCH symbols in normal subframes | | 2 | 2 | 2 |
| Allocated number of PDCCH symbols in special subframes | | 2 | 2 | 2 |
| Allocated subframes per Radio Frame (D+S) | | 3+2 | 3+2 | 3+2 |
| Modulation | | 16QAM | 16QAM | 16QAM |
| Target Coding Rate | | | | |
| For Sub-Frames 4,9 | | | | |
| For Sub-Frames 1,6 | | | | |
| Information Bit Payload (Note 4) | | | | |
| For Sub-Frames 4,9 | Bits | 4008 | 12960 | 17568 |
| For Sub-Frames 1,6 | | 3624 | 9912 | 15264 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 3496 | 12960 | 17568 |
| Number of Code Blocks (Notes 3 and 4) | | | | |
| For Sub-Frames 4,9 | | 1 | 3 | 3 |
| For Sub-Frames 1,6 | | 1 | 2 | 3 |
| For Sub-Frame 5 | | N/A | N/A | N/A |
| For Sub-Frame 0 | | 2 | 3 | 3 |
| Binary Channel Bits (Note 4) | | | | |
| For Sub-Frames 4,9 | Bits | 12000 | 39680 | 52800 |
| For Sub-Frames 1,6 | | 10512 | 32112 | 42912 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 10656 | 38256 | 51456 |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 1.876 | 5.874 | 8.3232 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 |

Note 1: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 2: As per Table 4.2-2 in TS 36.211 [8].
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 4: Given per component carrier per codeword

**Table A.3.4.2.1-10: Fixed Reference Channel two antenna ports**

| Parameter | Unit | Value | | | |
|---|---|---|---|---|---|
| Reference channel | | R.90 TDD | R.91 TDD | R.92-1 TDD | R.92-2 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 |
| Allocated resource blocks | | 18 (Note 9) | 18 (Note 9) | 36 (Note 10) | 36 (Note 10) |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 | 1 |
| Allocated PDSCH subframes | | (Note 4) | (Note 5) | (Note 6) | (Note 7) |
| Modulation | | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/10 | 1/2 | 1/2 |
| Information Bit Payload | | | | | |
| For Sub-Frames 0,4,5,9 | Bits | 1544 | 488 | 4392 | 4392 |
| For Sub-Frames 1,6 | Bits | N/A | N/A | N/A | N/A |
| Number of Code Blocks | | | | | |
| For Sub-Frames 0,4,5,9 | Code blocks | 1 | 1 | 1 | 1 |
| For Sub-Frames 1,6 | Code blocks | N/A | N/A | N/A | N/A |
| Binary Channel Bits | | | | | |
| For Sub-Frames 0,4,5,9 | Bits | 4752 | 4752 | 9504 | 9504 |
| For Sub-Frames 1,6 | | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over one period | kbps | 19.3 | 1.90625 | 137.25 | 219.6 |
| UE DL Category | | M2 | M2 | ≥ 1 | ≥ 1 |

Note 1: 2 symbols allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: MPDCCH are scheduled at the 0th to 15th BL/CE DL subframes with repetition every period=80ms. The associated PDSCH is scheduled at the 17th to 24th BL/CE DL subframes with repetition every period=80ms (starting from the 0th subframe).
Note 5: MPDCCH are scheduled at the 0th to 31st BL/CE DL subframes with repetition every period= 256ms. The associated PDSCH is scheduled at the 33rd to 64th BL/CE DL subframes with repetition every period=256ms (starting from the 0th subframe).
Note 6: MPDCCH are scheduled at the 0th to 3rd BL/CE DL subframes with repetition every period=32ms. The associated PDSCH is scheduled at the 5th to 8th BL/CE DL subframes with repetition every period=32ms (starting from the 0th subframe).
Note 7: MPDCCH are scheduled at the 0th to 1st BL/CE DL subframes with repetition every period=20ms. The associated PDSCH is scheduled at the 2nd to 3rd BL/CE DL subframes with repetition every period=20ms (starting from the 0th subframe).
Note 8: If it is not the BL/CE DL subframes, MPDCCH/PDSCH transmission is postponed until the next BL/CE DL subframe. Note the DL subframes in the TDD uplink-downlink configuration are considered as the BL/CE DL subframes.
Note 9: Allocated PRB positions are {0, 1, …, 17} within the assigned wideband.
Note 10: Allocated PRB positions are {1, 2, 3, …, 18, 31, 32, …, 48}.
Note 11: Allocated PRB positions for MPDCCH are {0, 1, 2, 3, 4, 5} within the scheduled narrowband.

### A.3.4.2.2 Four antenna ports

**Table A.3.4.2.2-1: Fixed Reference Channel four antenna ports**

| Parameter | Unit | Value | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.12 TDD | R.13 TDD | R.14 TDD | R.14-1 TDD | R.14-2 TDD | R.43 TDD | R.36 TDD | R.43-1 TDD | R.43-2 TDD | R.43-3 TDD | R.43-4 TDD | R.43-5 TDD | R.36-1 TDD |
| Channel bandwidth | MHz | 1.4 | 10 | 10 | 10 | 10 | 20 | 10 | 1.4 | 3 | 5 | 10 | 15 | 10 |
| Allocated resource blocks (Note 6) | | 6 | 50 | 50 | 6 | 3 | 100 | 50 | 6 | 15 | 25 | 50 | 75 | 50 |
| Uplink-Downlink Configuration (Note 4) | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 3 | 3+2 | 2+2 | 2 | 2 | 2+2 | 2+2 | 2 | 2+2 | 2+2 | 2+2 | 2+2 | 2+2 |
| Modulation | | QPSK | QPSK | 16QAM | 16QAM | 16QAM | 16QAM | 64QAM | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM | 64QAM |
| Target Coding Rate | | 1/3 | 1/3 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | ½ | ½ | 0.55 |
| Information Bit Payload (Note 6) | | | | | | | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 408 | 4392 | 12960 | 1544 | 744 | 25456 | 18336 | 1192 | 3368 | 5736 | 12960 | 19080 | 21384 |
| For Sub-Frames 1,6 | Bits | N/A | 3240 | 9528 | N/A | N/A | 21384 | 15840 | N/A | 2856 | 5160 | 10680 | 15840 | 16992 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 208 | 4392 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Number of Code Blocks (Notes 5 and 6) | | | | | | | | | | | | | | |
| For Sub-Frames 4,9 | | 1 | 1 | 3 | 1 | 1 | 5 | 3 | 1 | 1 | 1 | 3 | 4 | 4 |
| For Sub-Frames 1,6 | | N/A | 1 | 2 | N/A | N/A | 4 | 3 | N/A | 1 | 1 | 2 | 3 | 3 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 1 | 1 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits (Note 6) | | | | | | | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 1248 | 12800 | 25600 | 3072 | 1536 | 51200 | 38400 | 2496 | 6960 | 11600 | 25600 | 38400 | 38400 |
| For Sub-Frames 1,6 | | N/A | 10256 | 20512 | N/A | N/A | 41312 | 30768 | N/A | 5952 | 10112 | 20512 | 30912 | 30768 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 624 | 12176 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame (Note 6) | Mbps | 0.102 | 1.966 | 4.498 | 0.309 | 0.149 | 9.368 | 6.835 | 0.238 | 1.245 | 2.179 | 4.728 | 6.984 | 7.675 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.

Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.

Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].

Note 4: As per Table 4.2-2 in TS 36.211 [8].
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 6: Given per component carrier per codeword.

**Table A.3.4.2.2-2: Fixed Reference Channel four antenna ports**

| Parameter | Unit | Value | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.72 TDD | R.72-1 TDD | R.72-2 TDD | R.72-3 TDD | R.73 TDD | R.73-1 TDD | R.74 TDD | R.85 TDD |
| Channel bandwidth | MHz | 10 | 5 | 15 | 20 | 10 | 10 | 10 | 10 |
| Allocated resource blocks (Note 6) | | 50 | 25 | 75 | 100 | 50 | 50 | 50 | 24 |
| Uplink-Downlink Configuration (Note 4) | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 2+2 | 2+2 | 2+2 | 2+2 | 2+2 | 2+2 | 2+2 | 3+2 |
| Modulation | | 256QAM | 256QAM | 256QAM | 256QAM | 64QAM | 16QAM | 16QAM | 64QAM |
| Target Coding Rate | | 0.60 | 0.62 | 0.59 | 0.60 | 0.44 | 1/2 | 1/2 | 1/2 |
| Information Bit Payload (Note 6) | | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 31704 | 15840 | 46888 | 63776 | 16416 (CW0) 32856 (CW1) | 12960 (CW0) 25456 (CW1) | 25456 | 10296 |
| For Sub-Frames 1,6 | Bits | 23688 | 11448 | 35160 | 46888 | 12216 (CW0) 24496 (CW1) | 9528 (CW0) 19080 (CW1) | 19080 | 8248 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 10296 |
| Number of Code Blocks (Notes 5 and 6) | | | | | | | | | |
| For Sub-Frames 4,9 | | 6 | 3 | 8 | 11 | 3 (CW0) 6 (CW1) | 3 (CW0) 5 (CW1) | 5 | 2 |
| For Sub-Frames 1,6 | | 4 | 2 | 6 | 8 | 2 (CW0) 4 (CW1) | 2 (CW0) 4 (CW1) | 4 | 2 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 2 |
| Binary Channel Bits (Note 6) | | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 51200 | 23200 | 76800 | 102400 | 38400 (CW0) 76800 (CW1) | 25600 (CW0) 51200 (CW1) | 51200 | 18432 |
| For Sub-Frames 1,6 | | 41024 | 20224 | 61824 | 82624 | 30768 (CW0) 61536 (CW1) | 21312 (CW0) 42624 (CW1) | 41024 | 14976 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 18432 |
| Max. Throughput averaged over | Mbps | 11.0784 | 5.4576 | 16.4096 | 22.1328 | 5.726 (CW0) 11.470 | 4.498 (CW0) 8.907 | 8.907 | 4.7384 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 frame (Note 6) | | | | | | (CW1) | (CW1) | | |
| UE Category | | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 5 | ≥ 5 | ≥ 5 | 1bis |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.
Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 4: As per Table 4.2-2 in TS 36.211 [8].
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 6: Given per component carrier per codeword.
Note 7: For R.85 TDD, 24 RBs are allocated on RB 0-20 and 30-32.

**Table A.3.4.2.2-3: Fixed Reference Channel four antenna ports**

| Parameter | Unit | Value | | | |
|---|---|---|---|---|---|
| Reference channel | | | R.74-1 TDD | R.74-2 TDD | R.74-3 TDD |
| Channel bandwidth | MHz | | 5 | 15 | 20 |
| Allocated resource blocks (Note 6) | | | 25 | 75 | 100 |
| Uplink-Downlink Configuration (Note 4) | | | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | | 2+2 | 2+2 | 2+2 |
| Modulation | | | 16QAM | 16QAM | 16QAM |
| Target Coding Rate | | | 1/2 | **1/2** | 1/2 |
| Information Bit Payload (Note 6) | | | | | |
| For Sub-Frames 4,9 | Bits | | 11448 | 37888 | 51024 |
| For Sub-Frames 1,6 | Bits | | 10296 | 31704 | 42368 |
| For Sub-Frame 0,5 | Bits | | N/A | N/A | N/A |
| Number of Code Blocks | | | | | |
| For Sub-Frames 4,9 | | | 2 | 7 | 9 |
| For Sub-Frames 1,6 | | | 2 | 5 | 7 |
| For Sub-Frame 0,5 | | | N/A | N/A | N/A |
| Binary Channel Bits | | | | | |
| For Sub-Frames 4,9 | Bits | | 23200 | 76800 | 102400 |
| For Sub-Frames 1,6 | | | 20224 | 61824 | 82624 |
| For Sub-Frame 0,5 | Bits | | N/A | N/A | N/A |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | | 4.3488 | 13.9184 | 18.6784 |
| UE Category | | | ≥ 5 | ≥ 5 | ≥ 5 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: Given per component carrier per codeword.

## A.3.4.3 Reference Measurement Channels for UE-Specific Reference Symbols

### A.3.4.3.1 Single antenna port (Cell Specific)

The reference measurement channels in Table A.3.4.3.1-1 apply for verifying demodulation performance for UE-specific reference symbols with one cell-specific antenna port.

**Table A.3.4.3.1-1: Fixed Reference Channel for DRS**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | R.25 TDD | R.26 TDD | R.26-1 TDD | R.27 TDD | R.27-1 TDD | R.28 TDD |
| Channel bandwidth | MHz | 10 | 10 | 5 | 10 | 10 | 10 |
| Allocated resource blocks | | 50 [4] | 50 [4] | 25 [4] | 50 [4] | 18 [6] | 1 |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation | | QPSK | 16QAM | 16QAM | 64QAM | 64QAM | 16QAM |
| Target Coding Rate | | 1/3 | 1/2 | 1/2 | 3/4 | 3/4 | 1/2 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 4,9 | Bits | 4392 | 12960 | 5736 | 28336 | 10296 | 224 |
| For Sub-Frames 1,6 | Bits | 3240 | 9528 | 4584 | 22920 | 8248 | 176 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 2984 | 9528 | 3880 | 22152 | 10296 | 224 |
| Number of Code Blocks per Sub-Frame (see Note 5) | | | | | | | |
| For Sub-Frames 4,9 | | 1 | 3 | 1 | 5 | 2 | 1 |
| For Sub-Frames 1,6 | | 1 | 2 | 1 | 4 | 2 | 1 |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | 1 | 2 | 1 | 4 | 2 | 1 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 12600 | 25200 | 11400 | 37800 | 13608 | 504 |
| For Sub-Frames 1,6 | Bits | 10356 | 20712 | 10212 | 31068 | 11340 | 420 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 10332 | 20664 | 7752 | 30996 | 13608 | 504 |
| Max. Throughput averaged over 1 frame | Mbps | 1.825 | 5.450 | 2.452 | 12.466 | 4.738 | 0.102 |
| UE Category | | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 1 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: as per Table 4.2-2 in TS 36.211 [8].
Note 4: For R.25, R.26 and R.27, 50 resource blocks are allocated in sub-frames 1, 4, 6, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0. For R.26-1, 25 resource blocks are allocated in sub-frames 1, 4, 6, 9 and 17 resource blocks (RB0–RB7 and RB16–RB24) are allocated in sub-frame 0.
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 6: Localized allocation started from RB #0 is applied.

**Table A.3.4.3.1-2: Fixed Reference Channel for DRS for UE category M1**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.80 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) | | 6 |
| Uplink-Downlink Configuration (Note 3) | | 1 |
| Allocated subframes per Radio Frame (D+S) | | 4+2 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/3 |
| Information Bit Payload | | |
| For Sub-Frames 4,9 | Bits | 504 |
| For Sub-Frames 1,6 | | N/A |
| For Sub-Frames 0,5 | Bits | 504 |
| Number of Code Blocks per Sub-Frame | | |
| For Sub-Frames 4,9 | Code blocks | 1 |
| For Sub-Frames 1,6 | Code blocks | N/A |
| For Sub-Frames 0,5 | Code blocks | 1 |
| Binary Channel Bits Per Sub-Frame | | |
| For Sub-Frames 4,9 | Bits | 1440 |
| For Sub-Frames 1,6 | | N/A |
| For Sub-Frames 0,5 | Bits | 1440 |
| Max. Throughput averaged over 48 sub-frame | kbps | 10.50 |
| UE DL Category | | M1, ≥ 0 |

Note 1: 2 symbols allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
Note 3: as per Table 4.2-2 in TS 36.211 [4].
Note 4: Allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband.
Note 5: MPDCCH are scheduled at the 0th to 7th BL/CE DL subframes with repetition every 48ms. The allocated PRB positions are {0, 1, 2, 3, 4, 5} within the assigned narrowband. The associated PDSCH is scheduled at the 9th to 16th BL/CE DL subframes every 48ms. (starting from the 0th subframe). If it is not BL/CE DL subframes, MPDCCH/PDSCH transmission is postponed until the next BL/CE DL subframe. Note the DL subframes in the TDD uplink-downlink configuration are considered as the BL/CE DL subframes.

### A.3.4.3.2 Two antenna ports (Cell Specific)

The reference measurement channels in Table A.3.4.3.2-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports.

**Table A.3.4.3.2-1: Fixed Reference Channel for CDM-multiplexed DM RS**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | R.31 TDD | R.32 TDD | R.32-1 TDD | R.33 TDD | R.33-1 TDD | R.34 TDD |
| Channel bandwidth | MHz | 10 | 10 | 5 | 10 | 10 | 10 |
| Allocated resource blocks | | 50[4] | 50[4] | 25[4] | 50[4] | 18[6] | 50[4] |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation | | QPSK | 16QAM | 16QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | 1/3 | 1/2 | 1/2 | 3/4 | 3/4 | 1/2 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 4,9 | Bits | 3624 | 11448 | 5736 | 27376 | 9528 | 18336 |
| For Sub-Frames 1,6 | | 2664 | 7736 | 3112 | 16992 | 7480 | 11832 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 2984 | 9528 | 3496 | 22152 | 9528 | 14688 |
| Number of Code Blocks per Sub-Frame (Note 5) | | | | | | | |
| For Sub-Frames 4,9 | | 1 | 2 | 1 | 5 | 2 | 3 |
| For Sub-Frames 1,6 | | 1 | 2 | 1 | 3 | 2 | 2 |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | 1 | 2 | 1 | 4 | 2 | 3 |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frames 4,9 | Bits | 12000 | 24000 | 10800 | 36000 | 12960 | 36000 |
| For Sub-Frames 1,6 | | 7872 | 15744 | 6528 | 23616 | 10368 | 23616 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 9840 | 19680 | 7344 | 29520 | 12960 | 29520 |
| Max. Throughput averaged over 1 frame | Mbps | 1.556 | 4.79 | 2.119 | 11.089 | 4.354 | 7.502 |
| UE Category | | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 2 | ≥ 1 | ≥ 2 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: as per Table 4.2-2 in TS 36.211 [8].
Note 4: For R.31, R.32, R.33 and R.34, 50 resource blocks are allocated in sub-frames 4, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6. For R.32-1, 25 resource blocks are allocated in sub-frames 4, 9 and 17 resource blocks (RB0–RB7 and RB16–RB24) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6.
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 6: Localized allocation started from RB#0 is applied.

The reference measurement channels in Table A.3.4.3.2-2 apply with two CRS antenna ports.

**Table A.3.4.3.2-2: Fixed Reference Channel for CDM-multiplexed DM RS**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | R.70 TDD | R.71 TDD |
| Channel bandwidth | MHz | 10 | 10 |
| Allocated resource blocks | | 50 (Note 4) | 50 (Note 4) |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 2+2 | 2+2 |
| Modulation | | QPSK | 16QAM |
| Target Coding Rate | | | |
| For Sub-Frames 4,9 | | 0.65 | 0.6 |
| For Sub-Frames 1,6 | | 0.54 | 0.5 |
| Information Bit Payload | | | |
| For Sub-Frames 4,9 | Bits | 6968 | 12960 |
| For Sub-Frames 1,6 | Bits | 4264 | 7736 |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A |
| Number of Code Blocks per Sub-Frame (Note 5) | | | |
| For Sub-Frames 4,9 | | 2 | 3 |
| For Sub-Frames 1,6 | | 1 | 2 |
| For Sub-Frame 5 | | N/A | N/A |
| For Sub-Frame 0 | | N/A | N/A |
| Binary Channel Bits Per Sub-Frame | | | |
| For Sub-Frames 4,9 | Bits | 10800 | 21600 |
| For Sub-Frames 1,6 | Bits | 7872 | 15744 |
| For Sub-Frame 5 | Bits | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 2.2464 | 4.1392 |
| UE Category | | ≥ 1 | ≥ 2 |

Note 1: 3 symbols allocated to PDCCH in normal subframes and 2 symbols allocated to PDCCH in special subframes.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: For R.63, and R.64, 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in the DwPTS portion of sub-frames 1,6.
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

### A.3.4.3.3 Two antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.3-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and two CSI-RS antenna ports.

**Table A.3.4.3.3-1: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | R.51 TDD | R.51-1 TDD | R.76 TDD | R.51-2 TDD | R.51-3 TDD | R.51-4 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 | 5 | 15 | 20 |
| Allocated resource blocks | | 50 (Note 5) | 50 (Note 5) | 50 (Note 5) | 25 (Note 6) | 75 (Note 7) | 100 (Note 8) |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation | | 16QAM | 16QAM | QPSK | 16QAM | 16QAM | 16QAM |
| Target Coding Rate | | 1/2 | 0.57 | | 1/2 | 1/2 | 1/2 |
| Information Bit Payload | | | | | | | |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 11448 | N/A | 6200 | NA | NA | NA |
| For Sub-Frame 4,9 | Bits | 11448 | 12960 | 6200 | 4968 | 16992 | 22920 |
| For Sub-Frames 1,6 | Bits | 7736 | 9144 | 4264 | 3112 | 12216 | 16992 |
| For Sub-Frame 5 | Bits | N/A | N/A | n/a | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 9528 | 10680 | 4968 | 3496 | 14112 | 19848 |
| Number of Code Blocks (Note 4) | | | | | | | |
| For Sub-Frames 4, 9 (non CSI-RS subframe) | Code blocks | 2 | N/A | 2 | N/A | N/A | N/A |
| For Sub-Frames 4,9 | Code blocks | 2 | 3 | 2 | 1 | 3 | 4 |
| For Sub-Frames 1,6 | Code blocks | 2 | 2 | 1 | 1 | 3 | 3 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Code blocks | 2 | 2 | 1 | 1 | 3 | 4 |
| Binary Channel Bits | | | | | | | |
| For Sub-Frames 4, 9 (non CSI-RS subframe) | Bits | 24000 | N/A | 11800 | NA | NA | NA |
| For Sub-Frames 4,9 | | 22800 | 22800 | 11800 | 10200 | 34200 | 45600 |
| For Sub-Frames 1,6 | | 15744 | 15744 | 7872 | 6144 | 24192 | 33792 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 19680 | 19680 | 9840 | 6912 | 30240 | 42240 |
| Max. Throughput averaged over 1 frame | Mbps | 4.7896 | 5.4888 | 2.5896 | 1.9656 | 7.2528 | 99.672 |
| UE Category | | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 |

Note 1: 2 symbols allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
Note 3: as per Table 4.2-2 in TS 36.211 [4].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.

The reference measurement channels in Table A3.4.3.3-2 apply for verifying demodulation performance for UE-specific reference symbols with two cell specific antenna ports and two CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS in same subframe.

**Table A.3.4.3.3-2: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS**

| Parameter | Unit | Value | | |
|---|---|---|---|---|
| Reference channel | | R.52 TDD | R.53 TDD | R.54 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 |
| Allocated resource blocks | | 50 (Note 5) | 50 (Note 5) | 50 (Note 5) |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 3+2 | 3+2 | 3+2 |
| Modulation | | 64QAM | 64QAM | 16QAM |
| Target Coding Rate | | 1/2 | 1/2 | 1/2 |
| Information Bit Payload | | | | |
| For Sub-Frame 4,9 | Bits | 16416 | 16416 | 11448 |
| For Sub-Frames 1,6 | Bits | 11832 | 11832 | 7736 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 14688 | 14688 | 9528 |
| Number of Code Blocks (Note 4) | | | | |
| For Sub-Frames 4,9 | Code blocks | 3 | 3 | 2 |
| For Sub-Frames 1,6 | Code blocks | 2 | 2 | 2 |
| For Sub-Frame 5 | | n/a | n/a | n/a |
| For Sub-Frame 0 | Code blocks | 3 | 3 | 2 |
| Binary Channel Bits | | | | |
| For Sub-Frames 4,9 | | 34200 | 33600 | 22800 |
| For Sub-Frames 1,6 | | 23616 | 23616 | 15744 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 29520 | 29520 | 19680 |
| Max. Throughput averaged over 1 frame | Mbps | 7.1184 | 7.1184 | 4.7896 |
| UE Category | | ≥ 2 | ≥ 2 | ≥ 2 |

Note 1: 2 symbols allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: as per Table 4.2-2 in TS 36.211 [8].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: 50 resource blocks are allocated in sub-frames 4, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6.

**Table A.3.4.3.3-3: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.76-1 TDD | R.76-2 TDD | R.76-3 TDD | R.76-4 TDD | R.76-5 TDD | R.76-6 TDD | R.76-7 TDD |
| Channel bandwidth | MHz | 5 | 15 | 20 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 25 (Note 6) | 75 (Note 7) | 100 (Note 8) | 25 (Note 6) | 50 (Note 5) | 75 (Note 7) | 100 (Note 8) |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | | | | | | | |
| Information Bit Payload | | | | | | | | |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | NA | NA | NA | NA | NA | NA | NA |
| For Sub-Frame 4,9 | Bits | 2600 | 9144 | 12216 | 3496 | 7992 | 11832 | 15840 |
| For Sub-Frames 1,6 | Bits | 1480 | 5736 | 7992 | 1864 | 4776 | 7480 | 10296 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 1736 | 7736 | 10680 | 2344 | 6456 | 9912 | 14112 |
| Number of Code Blocks (Note 4) | | | | | | | | |
| For Sub-Frames 4, 9 (non CSI-RS subframe) | Code blocks | NA | NA | NA | NA | 2 | NA | NA |
| For Sub-Frames 4,9 | Code blocks | 1 | 2 | 2 | 1 | 2 | 2 | 3 |
| For Sub-Frames 1,6 | Code blocks | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Code blocks | 1 | 2 | 2 | 1 | 2 | 2 | 3 |
| Binary Channel Bits | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 5100 | 17100 | 22800 | 5100 | 11800 | 17100 | 22800 |
| For Sub-Frames 1,6 | Bits | 3072 | 12096 | 16896 | 3072 | 7872 | 12096 | 16896 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 3456 | 15120 | 21120 | 3456 | 9840 | 15120 | 21120 |
| Max. Throughput averaged over 1 frame | Mbps | 0.9896 | 3.7496 | 5.1096 | 1.3064 | 3.1992 | 4.8536 | 6.6384 |
| UE Category | | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 2 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
Note 3: as per Table 4.2-2 in TS 36.211 [4].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.
Note 6: 25 resource blocks are allocated in sub-frames 4,9 and 17 resource blocks (RB0–RB9 and RB18–RB24) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.
Note 7: 75 resource blocks are allocated in sub-frames 4,9 and 63 resource blocks (RB0–R31 and RB44–RB74) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.
Note 8: 100 resource blocks are allocated in sub-frames 4,9 and 88 resource blocks (RB0–RB43 and RB56–RB99) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.
Note 9: Given per component carrier per codeword.

### A.3.4.3.4 Four antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.4-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

**Table A.3.4.3.4-1: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports**

| Parameter | Unit | Value | | | |
|---|---|---|---|---|---|
| Reference channel | | R.44 TDD | R.48 TDD | R.66 TDD | R.75 TDD |
| Channel bandwidth | MHz | 10 | 10 | 20 | 10 |
| Allocated resource blocks | | 50 (Note 4) | 50 (Note 4) | 100 | 50 (Note 4) |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 | |
| Allocated subframes per Radio Frame (D+S) | | 3+2 | 3+2 | 3+2 | 3+2 |
| Modulation | | 64QAM | QPSK | 256QAM | 16QAM |
| Target Coding Rate | | ½ | | | 0.57 |
| Information Bit Payload | | | | | |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 18336 | N/A | N/A | N/A |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 16416 | 6200 | 71112 | 25456 |
| For Sub-Frames 1,6 | | 11832 | 4264 | 48936 | 16992 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 14688 | 4968 | 66592 | 21384 |
| Number of Code Blocks per Sub-Frame (Note 5) | | | | | |
| For Sub-Frames 4,9 (non CSI-RS subframe) | | 3 | 2 | N/A | N/A |
| For Sub-Frames 4,9 (CSI-RS subframe) | | 3 | 2 | 12 | 5 |
| For Sub-Frames 1,6 | | 2 | 1 | 8 | 3 |
| For Sub-Frame 5 | | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 3 | 1 | 11 | 4 |
| Binary Channel Bits Per Sub-Frame | | | | | |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 36000 | 12000 | N/A | N/A |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 33600 | 11600 | 89600 | 40000 |
| For Sub-Frames 1,6 | | 23616 | 7872 | 67584 | 27552 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 29520 | 9840 | 84480 | 35424 |
| Max. Throughput averaged over 1 frame | Mbps | 7.1184 | 2.5896 | 30.669 | 10.628 |
| UE Category | | ≥ 2 | ≥ 1 | 11-12 | ≥ 5 |
| UE DL Category | | ≥ 6 | ≥ 6 | ≥ 11 | ≥ 6 |

Note 1: 2 symbols allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
Note 3: as per Table 4.2-2 in TS 36.211 [4].
Note 4: For R.44,R.48 and R.75, 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6. For R.66, 100 resource blocks are allocated in sub-frames 4, 9 and 88 resource blocks (RB0–RB43 and RB56–RB99) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

The reference measurement channels in Table A.3.4.3.4-2 apply for verifying TDD PMI accuracy measurement with two CRS antenna ports and four CSI-RS antenna ports.

**Table A.3.4.3.4-2: Fixed Reference Channel for four antenna ports (CSI-RS)**

| Parameter | Unit | Value | | |
|---|---|---|---|---|
| Reference channel | | R.60 TDD | R.61 TDD | R.61-1 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 |
| Allocated resource blocks | | 50[4] | 50[4] | 39[5] |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 4+2 | 4+2 | 4+2 |
| Allocated subframes per Radio Frame | | 10 | 10 | 10 |
| Modulation | | QPSK | 16QAM | 16QAM |
| Target Coding Rate | | 1/2 | 1/2 | 1/2 |
| Information Bit Payload | | | | |
| For Sub-Frames 4 and 9 (Non CSI-RS subframe) | Bits | N/A | N/A | N/A |
| For Sub-Frames 4 and 9 (CSI-RS subframe) | Bits | 6200 | 11448 | 8760 |
| For Sub-Frames 1,6 | Bits | N/A | 7736 | 7480 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 9528 | 8760 |
| Number of Code Blocks per Sub-Frame (Note 6) | | | | |
| For Sub-Frames 4 and 9 (Non CSI-RS subframe) | | N/A | N/A | N/A |
| For Sub-Frames 4 and 9 (CSI-RS subframe) | | 2 | 2 | 2 |
| For Sub-Frames 1,6 | | N/A | 2 | 2 |
| For Sub-Frame 5 | | N/A | N/A | N/A |
| For Sub-Frame 0 | | N/A | 2 | 2 |
| Binary Channel Bits Per Sub-Frame | | | | |
| For Sub-Frames 4 and 9 (Non CSI-RS subframe) | Bits | N/A | N/A | N/A |
| For Sub-Frames 4 and 9 (CSI-RS subframe) | Bits | 11600 | 23200 | 18096 |
| For Sub-Frames 1,6 | Bits | N/A | 15744 | 14976 |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | N/A | 19680 | 18720 |
| Max. Throughput averaged over 1 frame | Mbps | 1.24 | 4.7896 | 4.1240 |
| UE Category | | ≥ 1 | ≥ 2 | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH. | | | | |
| Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]. | | | | |
| Note 3: As per Table 4.2-2 in TS 36.211 [4]. | | | | |
| Note 4: For R. 60 and R.61, 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6. | | | | |
| Note 5: For R. 61-1, 39 resource blocks (RB0–RB20 and RB30–RB47) are allocated in sub-frame 0, 1, 4, 6 and 9. | | | | |
| Note 6: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | |
| Note 7: Localized allocation started from RB #0 is applied. | | | | |

The reference measurement channels in Table A.3.4.3.4-3 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

**Table A.3.4.3.4-3: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.64 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) | | 6 |
| Uplink-Downlink Configuration (Note 3) | | 1 |
| Allocated subframes per Radio Frame (D+S) | | 4+2 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/3 |
| Information Bit Payload | | |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 504 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 504 |
| For Sub-Frames 1,6 | | 256 |
| For Sub-Frames 0,5 | Bits | 504 |
| Number of Code Blocks per Sub-Frame | | |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Code blocks | 1 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Code blocks | 1 |
| For Sub-Frames 1,6 | Code blocks | 1 |
| For Sub-Frames 0,5 | Code blocks | 1 |
| Binary Channel Bits Per Sub-Frame | | |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 1440 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 1352 |
| For Sub-Frames 1,6 | | 1152 |
| For Sub-Frames 0,5 | Bits | 1440 |
| Max. Throughput averaged over 1 frame | Mbps | 0.2528 |
| UE DL Category | | 0 |
| Note 1: 2 symbols allocated to PDCCH.<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].<br>Note 3: as per Table 4.2-2 in TS 36.211 [8].<br>Note 4: Allocated PRB positions start from {9, 10, …, 9+N-1}, where N is the number of allocated resource blocks. | | |

The reference measurement channels in Table A.3.4.3.4-4 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

**Table A.3.4.3.4-4: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.69 |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks | | 50 (Note 4) |
| Uplink-Downlink Configuration (Note 3) | | 1 |
| Allocated subframes per Radio Frame (D+S) | | 2+2 |
| Modulation | | QPSK |
| Target Coding Rate | | |
| For Sub-Frame 4(CSI-RS subframe) | | 0.8 |
| For Sub-Frame 9 (non CSI-RS subframe) | | 0.74 |
| For Sub-Frames 1,6 | | 0.61 |
| Information Bit Payload | | |
| For Sub-Frame 4(CSI-RS subframe) | Bits | 7992 |
| For Sub-Frame 9 (non CSI-RS subframe) | Bits | 7992 |
| For Sub-Frames 1,6 | Bits | 4776 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | N/A |
| Number of Code Blocks per Sub-Frame (Note 5) | | |
| For Sub-Frame 4(CSI-RS subframe) | | 2 |
| For Sub-Frame 9 (non CSI-RS subframe) | | 2 |
| For Sub-Frames 1,6 | | 1 |
| For Sub-Frame 5 | | N/A |
| For Sub-Frame 0 | | N/A |
| Binary Channel Bits Per Sub-Frame | | |
| For Sub-Frame 4(CSI-RS subframe) | Bits | 10000 |
| For Sub-Frame 9 (non CSI-RS subframe) | Bits | 10800 |
| For Sub-Frames 1,6 | Bits | 7872 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | N/A |
| Max. Throughput averaged over 1 frame | Mbps | 2.5536 |
| UE Category | | ≥ 1 |

Note 1: 3 symbols allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in the DwPTS portion of sub-frames 1,6.
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

## A.3.4.3.5 Eight antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.5-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and eight CSI-RS antenna ports.

**Table A.3.4.3.5-1: Fixed Reference Channel for CDM-multiplexed DM RS with eight CSI-RS antenna ports**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.50 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks | | 50 (Note 4) |
| Uplink-Downlink Configuration (Note 3) | | 1 |
| Allocated subframes per Radio Frame (D+S) | | 3+2 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/3 |
| Information Bit Payload | | |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 3624 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 3624 |
| For Sub-Frames 1,6 | | 2664 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 2984 |
| Number of Code Blocks per Sub-Frame (Note 5) | | |
| For Sub-Frames 4,9 (non CSI-RS subframe) | | 1 |
| For Sub-Frames 4,9 (CSI-RS subframe) | | 1 |
| For Sub-Frames 1,6 | | 1 |
| For Sub-Frame 5 | | n/a |
| For Sub-Frame 0 | | 1 |
| Binary Channel Bits Per Sub-Frame | | |
| For Sub-Frames 4,9 (non CSI-RS subframe) | Bits | 12000 |
| For Sub-Frames 4,9 (CSI-RS subframe) | Bits | 10400 |
| For Sub-Frames 1,6 | | 7872 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | Bits | 9840 |
| Max. Throughput averaged over 1 frame | Mbps | 1.556 |
| UE Category | | ≥ 1 |

Note 1: 2 symbols allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: as per Table 4.2-2 in TS 36.211 [8].
Note 4: 50 resource blocks are allocated in sub-frames 4, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6.
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

The reference measurement channels in Table A.3.4.3.5-2 apply for verifying TDD PMI accuracy measurement with two CRS antenna ports and eight CSI-RS antenna ports.

**Table A.3.4.3.5-2: Fixed Reference Channel for eight antenna ports (CSI-RS)**

| Parameter | Unit | Value | | |
|---|---|---|---|---|
| Reference channel | | R.45 TDD | R.45-1 TDD | R.45-2 TDD |
| Channel bandwidth | MHz | 10 | 10 | 10 |
| Allocated resource blocks | | 50[4] | 39 | 50[4] |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 |
| Allocated subframes per Radio Frame (D+S) | | 4+2 | 4+2 | 4+2 |
| Allocated subframes per Radio Frame | | 5 | 5 | 10 |
| Modulation | | 16QAM | 16QAM | 64QAM |
| Target Coding Rate | | 1/2 | 1/2 | |
| Information Bit Payload | | | | |
| For Sub-Frames 4 and 9 (Non CSI-RS subframe) | Bits | N/A | N/A | N/A |
| For Sub-Frames 4 and 9 (CSI-RS subframe) | Bits | 11448 | 8760 | [18336] |
| For Sub-Frames 1,6 | Bits | 7736 | 7480 | [11832] |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 9528 | 8760 | [14688] |
| Number of Code Blocks per Sub-Frame (Note 5) | | | | |
| For Sub-Frames 4 and 9 (Non CSI-RS subframe) | | N/A | N/A | N/A |
| For Sub-Frames 4 and 9 (CSI-RS subframe) | | 2 | 2 | |
| For Sub-Frames 1,6 | | 2 | 2 | |
| For Sub-Frame 5 | | N/A | N/A | |
| For Sub-Frame 0 | | 2 | 2 | |
| Binary Channel Bits Per Sub-Frame | | | | |
| For Sub-Frames 4 and 9 (Non CSI-RS subframe) | Bits | N/A | N/A | |
| For Sub-Frames 4 and 9 (CSI-RS subframe) | Bits | 22400 | 17472 | [33600] |
| For Sub-Frames 1,6 | Bits | 15744 | 14976 | [23616] |
| For Sub-Frame 5 | Bits | N/A | N/A | N/A |
| For Sub-Frame 0 | Bits | 19680 | 18720 | [29520] |
| Max. Throughput averaged over 1 frame | Mbps | 4.7896 | 4.1240 | 7.3296 |
| UE Category | | ≥ 2 | ≥ 1 | ≥ 2 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
Note 3: As per Table 4.2-2 in TS 36.211 [4].
Note 4: For R.45 and R.45-2, 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6. For R.45-1, 39 resource blocks are allocated in sub-frames 0,4,9 and the DwPTS portion of sub-frames 1,6 (RB0–RB20 and RB30–RB47).
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 6: Localized allocation started from RB #0 is applied.

### A.3.4.3.6 Twelve antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.6-1 apply for verifying TDD PMI accuracy measurement with two CRS antenna ports and twelve CSI-RS antenna ports.

**Table A.3.4.3.6-1: Fixed Reference Channel for twelve antenna ports (CSI-RS)**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.77 TDD |
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks | | 50[4] |
| Uplink-Downlink Configuration (Note 3) | | 1 |
| Allocated subframes per Radio Frame (D+S) | | 3+2 |
| Allocated subframes per Radio Frame | | 10 |
| Modulation | | 64QAM |
| Target Coding Rate | | 1/2 |
| Information Bit Payload | | |
| For Sub-Frames 4 and 9 (Non CSI-RS subframe) | Bits | N/A |
| For Sub-Frames 4 and 9 (CSI-RS subframe) | Bits | 16416 |
| For Sub-Frames 1,6 | Bits | 11832 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 14688 |
| Number of Code Blocks per Sub-Frame (Note 5) | | |
| For Sub-Frames 4 and 9 (Non CSI-RS subframe) | | N/A |
| For Sub-Frames 4 and 9 (CSI-RS subframe) | | 3 |
| For Sub-Frames 1,6 | | 2 |
| For Sub-Frame 5 | | N/A |
| For Sub-Frame 0 | | 3 |
| Binary Channel Bits Per Sub-Frame | | |
| For Sub-Frames 4 and 9 (Non CSI-RS subframe) | Bits | N/A |
| For Sub-Frames 4 and 9 (CSI-RS subframe) | Bits | 32400 |
| For Sub-Frames 1,6 | Bits | 23616 |
| For Sub-Frame 5 | Bits | N/A |
| For Sub-Frame 0 | Bits | 29520 |
| Max. Throughput averaged over 1 frame | Mbps | 7.1184 |
| UE Category | | ≥ 2 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].

Note 3: As per Table 4.2-2 in TS 36.211 [8].

Note 4: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.

Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 6: Localized allocation started from RB #0 is applied.

## A.3.5 Reference measurement channels for PDCCH/PCFICH performance requirements

### A.3.5.1 FDD

**Table A.3.5.1-1: Reference Channel FDD**

| Parameter | Unit | Value | | | | |
|---|---|---|---|---|---|---|
| Reference channel | | R.15 FDD | R.15-1 FDD | R.15-2 FDD | R.16 FDD | R.17 FDD |
| Number of transmitter antennas | | 1 | 2 | 2 | 2 | 4 |
| Channel bandwidth | MHz | 10 | 10 | 10 | 1.4 | 10 |
| Number of OFDM symbols for PDCCH | symbols | 2 | 3 | 2 | 2 | 2 |
| Aggregation level | CCE | 8 | 8 | 8 | 2 | 4 |
| DCI Format | | Format 1 | Format 1 | Format 1 | Format 2 | Format 2 |
| Cell ID | | 0 | 0 | 0 | 0 | 0 |
| Payload (without CRC) | Bits | 31 | 31 | 31 | 31 | 46 |

**Table A.3.5.1-1A: Reference Channel FDD**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | R.16_1 FDD | R.17_1 FDD |
| Number of transmitter antennas | | 2 | 4 |
| Channel bandwidth | MHz | 10 | 5 |
| Number of OFDM symbols for PDCCH | symbols | 2 | 2 |
| Aggregation level | CCE | 4 | 2 |
| DCI Format | | Format 2 | Format 2 |
| Cell ID | | 0 | 0 |
| Payload (without CRC) | Bits | 43 | 42 |

**Table A.3.5.1-2: Additional PDSCH Reference Channel FDD**

| Parameter | Unit | Value | | | | |
|---|---|---|---|---|---|---|
| Number of transmitter antennas | | 1 | 2 | 2 | 4 | 4 |
| Channel bandwidth | MHz | 10 | 1.4 | 10 | 10 | 5 |
| Allocated Resource Blocks | | 50 | 6 | 50 | 50 | 25 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 4392 | 504 | 4392 | 4392 | 2216 |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 4392 | 256 | 4392 | 3624 | 1800 |
| Number of Code Blocks per Sub-Frame | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 5 | | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | 1 | 1 | 1 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 13800 | 1584 | 13200 | 12800 | 6400 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | 12960 | 768 | 12384 | 12032 | 5632 |
| Max. Throughput averaged over 1 frame | Mbps | 3.953 | 0.429 | 3.953 | 3.876 | 1.953 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH for all BW. | | | | | | |

**Table A.3.5.1-2A: Additional PDSCH Reference Channel FDD**

| Parameter | Unit | Value |
|---|---|---|
| Number of transmitter antennas | | 2 |
| Channel bandwidth | MHz | 10 |
| Allocated Resource Blocks | | 50 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/3 |
| Information Bit Payload | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 3624 |
| For Sub-Frame 5 | | n/a |
| For Sub-Frame0 | Bits | 3624 |
| Number of Code Blocks per Sub-Frame | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | 1 |
| For Sub-Frame 5 | | n/a |
| For Sub-Frame 0 | | 1 |
| Binary Channel Bits Per Sub-Frame | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 12000 |
| For Sub-Frame 5 | Bits | n/a |
| For Sub-Frame 0 | | 11184 |
| Max. Throughput averaged over 1 frame | Mbps | 3.262 |
| UE Category | | ≥ 1 |
| Note 1: 3 symbols allocated to PDCCH for all BW. | | |

## A.3.5.2 TDD

**Table A.3.5.2-1: Reference Channel TDD**

| Parameter | Unit | Value | | | | |
|---|---|---|---|---|---|---|
| Reference channel | | R.15 TDD | R.15-1 TDD | R.15-2 TDD | R.16 TDD | R.17 TDD |
| Number of transmitter antennas | | 1 | 2 | 2 | 2 | 4 |
| Channel bandwidth | MHz | 10 | 10 | 10 | 1.4 | 10 |
| Number of OFDM symbols for PDCCH | symbols | 2 | 3 | 2 | 2 | 2 |
| Aggregation level | CCE | 8 | 8 | 8 | 2 | 4 |
| DCI Format | | Format 1 | Format 1 | Format 1 | Format 2 | Format 2 |
| Cell ID | | 0 | 0 | 0 | 0 | 0 |
| Payload (without CRC) | Bits | 34 | 34 | 34 | 34 | 49 |
| | | | | | | |

**Table A.3.5.2-1A: Reference Channel TDD**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | R.16_1 TDD | R.17_1 TDD |
| Number if transmitter antennas | | 2 | 4 |
| Channel bandwidth | MHz | 10 | 5 |
| Number of OFDM symbols for PDCCH | symbols | 2 | 2 |
| Aggregation level | CCE | 4 | 2 |
| DCI Format | | Format 2 | Format 2 |
| Cell ID | | 0 | 0 |
| Payload (without CRC) | Bits | 46 | 45 |

**Table A.3.5.2-2: Additional PDSCH Reference Channel TDD**

| Parameter | Unit | Value | | | | |
|---|---|---|---|---|---|---|
| Number of transmitter antennas | | 1 | 2 | 2 | 4 | 4 |
| Channel bandwidth | MHz | 10 | 1.4 | 10 | 10 | 5 |
| Uplink-Downlink Configuration (Note 2) | | 0 | 0 | 0 | 0 | 0 |
| Allocated Resource Blocks | | 50 | 6 | 50 | 50 | 25 |
| Modulation | | QPSK | QPSK | QPSK | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| Information Bit Payload | | | | | | |
| For Sub-Frame 1,6 | Bits | 3240 | 328 | 3240 | 3240 | 1544 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 4392 | 256 | 4392 | 4392 | 1800 |
| Number of Code Blocks per Sub-Frame | | | | | | |
| For Sub-Frame 1,6 | | 1 | 1 | 1 | 1 | 1 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | | 1 | 1 | 1 | 1 | 1 |
| Binary Channel Bits Per Sub-Frame | | | | | | |
| For Sub-Frame 1,6 | Bits | 11256 | 1152 | 10656 | 10256 | 5056 |
| For Sub-Frame 5 | Bits | n/a | n/a | n/a | n/a | n/a |
| For Sub-Frame 0 | Bits | 13104 | 936 | 12528 | 12176 | 5776 |
| Max. Throughput averaged over 1 frame | Mbps | 1.087 | 0.091 | 1.087 | 1.164 | 0.489 |
| UE Category | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH for all BW.<br>Note 2: As per Table 4.2-2 in TS 36.211 [8]. | | | | | | |

**Table A.3.5.2-2A: Additional PDSCH Reference Channel TDD**

| Parameter | Unit | Value | |
|---|---|---|---|
| Number of transmitter antennas | | 2 | 2 |
| Channel bandwidth | MHz | 10<br>(Note 1) | 10<br>(Note 2) |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 |
| Special subframe configuration | | 4 | 4 |
| Allocated Resource Blocks | | 50 | 50 |
| Modulation | | QPSK | QPSK |
| Target Coding Rate | | 1/3 | 1/3 |
| Information Bit Payload | | | |
| For Sub-Frame 4,9 | Bits | 4392 | 3624 |
| For Sub-Frame 1,6 | Bits | 3240 | 3240 |
| For Sub-Frame 5 | Bits | n/a | n/a |
| For Sub-Frame 0 | Bits | 4392 | 3624 |
| Number of Code Blocks per Sub-Frame | | | |
| For Sub-Frame 4,9 | | 1 | 1 |
| For Sub-Frame 1,6 | | 1 | 1 |
| For Sub-Frame 5 | | n/a | n/a |
| For Sub-Frame 0 | | 1 | 1 |
| Binary Channel Bits Per Sub-Frame | | | |
| For Sub-Frame 4,9 | Bits | 13200 | 12000 |
| For Sub-Frame 1,6 | Bits | 10656 | 10656 |
| For Sub-Frame 5 | Bits | n/a | n/a |
| For Sub-Frame 0 | Bits | 12528 | 11328 |
| Max. Throughput averaged over 1 frame | Mbps | 1.9656 | 1.7352 |
| UE Category | | ≥ 1 | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH.<br>Note 2: 3 symbols allocated to PDCCH.<br>Note 3: As per Table 4.2-2 in TS 36.211 [8]. | | | |

## A.3.5.3 LAA

**Table A.3.5.3-1: Reference Channel for FS3 with FDD primary cell**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.3 FS3 |
| Number of transmitter antennas | | 2 |
| Channel bandwidth | MHz | 20 |
| Number of OFDM symbols for PDCCH | symbols | 2 |
| Aggregation level | CCE | 4 |
| DCI Format | | Format 2A |
| Cell ID | | 0 |
| Payload (without CRC) | Bits | 48 |

**Table A.3.5.3-2: Reference Channel for FS3 with TDD primary cell**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.4 FS3 |
| Number of transmitter antennas | | 2 |
| Channel bandwidth | MHz | 20 |
| Number of OFDM symbols for PDCCH | symbols | 2 |
| Aggregation level | CCE | 4 |
| DCI Format | | Format 2A |
| Cell ID | | 0 |
| Payload (without CRC) | Bits | 51 |

**Table A.3.5.3-3: Additional PDSCH Reference Channel for FS3**

| Parameter | Unit | Value |
|---|---|---|
| Number of transmitter antennas | | 2 |
| Channel bandwidth | MHz | 20 |
| Allocated Resource Blocks | | 100 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/3 |
| Information Bit Payload (Note 2) | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | {8760,2664,5352,6712,3624} |
| For Sub-Frame 5 | Bits | {8760,2664,5352,6712,3624} |
| For Sub-Frame 0 | Bits | {8760,2664,5352,6712,3624} |
| Number of Code Blocks (Note 2) | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | | {2,1,1,2,1} |
| For Sub-Frame 5 | | {2,1,1,2,1} |
| For Sub-Frame 0 | | {2,1,1,2,1} |
| Binary Channel Bits (Note 2) | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | {26400,8800,15200,21600,11200} |
| For Sub-Frame 5 | Bits | {26112,8800,15200,21312,11200} |
| For Sub-Frame 0 | Bits | {26112,8800,15200,21312,11200} |
| UE Category | | ≥ 1 |
| Note 1: 2 symbols allocated to PDCCH.<br>Note 2: For {a1,a2,a3,a4,a5}, a1, a2, a3, a4 and a5 stand for the setup when the number of OFDM symbols is 14, 6, 9, 12, 7, respectively. | | |

## A.3.6 Reference measurement channels for PHICH performance requirements

**Table A.3.6-1: Reference Channel FDD/TDD**

| Parameter | Unit | | Value | | | |
|---|---|---|---|---|---|---|
| Reference channel | | R.18 | R.19A | R.19-1 | R.20A | R.24 |
| Number of transmitter antennas | | 1 | 2 | 2 | 4 | 1 |
| Channel bandwidth | MHz | 10 | 1.4 | 5 | 10 | 10 |
| User roles (Note 1) | | [W I1 I2] | [W I1 I2] | W I1 I2 | [W I1 I2] | [W I1] |
| Resource allocation (Note 2) | | [(0,0) (0,1) (0,4)] | [(0,0) (0,1) (0,4)] | (0,0) (0,1) (0,4) | [(0,0) (0,1) (0,4)] | [(0,0) (0,1)] |
| Power offsets (Note 3) | dB | [-4 0 -3] | [-4 0 -3] | -4 0 -3 | [-4 0 -3] | [+3 0] |
| Payload (Note 4) | | [A R R] | [A R R] | A R R | [A R R] | [A R] |

Note 1: W=wanted user, I1=interfering user 1, I2=interfering user 2.
Note 2: The resource allocation per user is given as (N_group_PHICH, N_seq_PHICH).
Note 3: The power offsets (per user) represent the difference of the power of BPSK modulated symbol per PHICH relative to the first interfering user.
Note 4: A=fixed ACK, R=random ACK/NACK.

**Table A.3.6-1A: Reference Channel FDD/TDD**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | R.19 | R.20 |
| Number of transmitter antennas | | 2 | 4 |
| Channel bandwidth | MHz | 10 | 5 |
| User roles (Note 1) | | W I1 I2 | W I1 I2 |
| Resource allocation (Note 2) | | (0,0) (0,1) (0,4) | (0,0) (0,1) (0,4) |
| Power offsets (Note 3) | dB | -4 0 -3 | -4 0 -3 |
| Payload (Note 4) | | A R R | A R R |

Note 1: W=wanted user, I1=interfering user 1, I2=interfering user 2.
Note 2: The resource allocation per user is given as (N_group_PHICH, N_seq_PHICH).
Note 3: The power offsets (per user) represent the difference of the power of BPSK modulated symbol per PHICH relative to the first interfering user.
Note 4: A=fixed ACK, R=random ACK/NACK.

# A.3.7 [FFS]

# A.3.8 Reference measurement channels for MBMS performance requirements

## A.3.8.1 FDD

**Table A.3.8.1-1: Fixed Reference Channel QPSK R=1/3**

| Parameter | PMCH | | | | | | |
|---|---|---|---|---|---|---|---|
| | Unit | Value | | | | | |
| Reference channel | | R.40 FDD | | | R.37 FDD | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | | | 50 | | |
| Allocated subframes per Radio Frame (Note 1) | | 6 | | | 6 | | |
| Modulation | | QPSK | | | QPSK | | |
| Target Coding Rate | | 1/3 | | | 1/3 | | |
| Information Bit Payload (Note 2) | | | | | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 408 | | | 3624 | | |
| For Sub-Frames 0,4,5,9 | Bits | n/a | | | n/a | | |
| Number of Code Blocks per Subframe (Note 3) | | 1 | | | 1 | | |
| Binary Channel Bits Per Subframe | | | | | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 1224 | | | 10200 | | |
| For Sub-Frames 0,4,5,9 | Bits | n/a | | | n/a | | |
| MBMS UE Category | | ≥ 1 | | | ≥ 1 | | |
| Note 1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331.<br>Note 2: 2 OFDM symbols are reserved for PDCCH; and reference signal allocated as per TS 36.211.<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | | | | |

**Table A.3.8.1-2: Fixed Reference Channel 16QAM R=1/2**

| Parameter | PMCH | | | | | | |
|---|---|---|---|---|---|---|---|
| | Unit | Value | | | | | |
| Reference channel | | | | | R.38 FDD | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | | 50 | | |
| Allocated subframes per Radio Frame (Note 1) | | | | | 6 | | |
| Modulation | | | | | 16QAM | | |
| Target Coding Rate | | | | | 1/2 | | |
| Information Bit Payload (Note 2) | | | | | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | | | | 9912 | | |
| For Sub-Frames 0,4,5,9 | Bits | | | | n/a | | |
| Number of Code Blocks per Subframe (Note 3) | | | | | 2 | | |
| Binary Channel Bits Per Subframe | | | | | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | | | | 20400 | | |
| For Sub-Frames 0,4,5,9 | Bits | | | | n/a | | |
| MBMS UE Category | | | | | ≥ 1 | | |
| Note 1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331.<br>Note 2: 2 OFDM symbols are reserved for PDCCH; and reference signal allocated as per TS 36.211.<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | | | | |

**Table A.3.8.1-3: Fixed Reference Channel 64QAM R=2/3**

| Parameter | PMCH | | | | | | |
|---|---|---|---|---|---|---|---|
| | Unit | Value | | | | | |
| Reference channel | | | | R.39-1 FDD | R.39 FDD | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | 25 | 50 | | |
| Allocated subframes per Radio Frame(Note1) | | | | 6 | 6 | | |
| Modulation | | | | 64QAM | 64QAM | | |
| Target Coding Rate | | | | 2/3 | 2/3 | | |
| Information Bit Payload (Note 2) | | | | | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | | | 9912 | 19848 | | |
| For Sub-Frames 0,4,5,9 | Bits | | | n/a | n/a | | |
| Number of Code Blocks per Sub-Frame (Note 3) | | | | 2 | 4 | | |
| Binary Channel Bits Per Subframe | | | | | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | | | 15300 | 30600 | | |
| For Sub-Frames 0,4,5,9 | Bits | | | n/a | n/a | | |
| MBMS UE Category | | | | ≥ 1 | ≥ 2 | | |
| Note 1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331.<br>Note 2: 2 OFDM symbols are reserved for PDCCH; and reference signal allocated as per TS 36.211.<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | | | | |

## A.3.8.2 TDD

**Table A.3.8.2-1: Fixed Reference Channel QPSK R=1/3**

| Parameter | PMCH | | | | | | |
|---|---|---|---|---|---|---|---|
| | Unit | Value | | | | | |
| Reference channel | | R.40 TDD | | | R.37 TDD | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | 6 | | | 50 | | |
| Uplink-Downlink Configuration(Note 1) | | 5 | | | 5 | | |
| Allocated subframes per Radio Frame | | 5 | | | 5 | | |
| Modulation | | QPSK | | | QPSK | | |
| Target Coding Rate | | 1/3 | | | 1/3 | | |
| Information Bit Payload (Note 2) | | | | | | | |
| For Sub-Frames 3,4,7,8,9 | Bits | 408 | | | 3624 | | |
| For Sub-Frames 0,1,2,5,6 | Bits | n/a | | | n/a | | |
| Number of Code Blocks per Subframe (Note 3) | | 1 | | | 1 | | |
| Binary Channel Bits Per Subframe | | | | | | | |
| For Sub-Frames 3,4,7,8,9 | Bits | 1224 | | | 10200 | | |
| For Sub-Frames 0,1,2,5,6 | Bits | n/a | | | n/a | | |
| MBMS UE Category | | ≥ 1 | | | ≥ 1 | | |
| Note 1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS.<br>Note 2: 2 OFDM symbols are reserved for PDCCH; reference signal allocated as per TS 36.211.<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | | | | |

**Table A.3.8.2-2: Fixed Reference Channel 16QAM R=1/2**

| Parameter | PMCH | | | | | | |
|---|---|---|---|---|---|---|---|
| | Unit | Value | | | | | |
| Reference channel | | | | | R.38 TDD | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | | 50 | | |
| Uplink-Downlink Configuration(Note 1) | | | | | 5 | | |
| Allocated subframes per Radio Frame | | | | | 5 | | |
| Modulation | | | | | 16QAM | | |
| Target Coding Rate | | | | | 1/2 | | |
| Information Bit Payload (Note 2) | | | | | | | |
| For Sub-Frames 3,4,7,8,9 | Bits | | | | 9912 | | |
| For Sub-Frames 0,1,2,5,6 | Bits | | | | n/a | | |
| Number of Code Blocks per Subframe (Note 3) | | | | | 2 | | |
| Binary Channel Bits Per Subframe | | | | | | | |
| For Sub-Frames 3,4,7,8,9 | Bits | | | | 20400 | | |
| For Sub-Frames 0,1,2,5,6 | Bits | | | | n/a | | |
| MBMS UE Category | | | | | ≥ 1 | | |
| Note 1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS.<br>Note 2: 2 OFDM symbols are reserved for PDCCH; reference signal allocated as per TS 36.211.<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | | | | |

**Table A.3.8.2-3: Fixed Reference Channel 64QAM R=2/3**

| Parameter | PMCH | | | | | | |
|---|---|---|---|---|---|---|---|
| | Unit | Value | | | | | |
| Reference channel | | | | R.39-1 TDD | R.39 TDD | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | 25 | 50 | | |
| Uplink-Downlink Configuration(Note 1) | | | | 5 | 5 | | |
| Allocated subframes per Radio Frame | | | | 5 | 5 | | |
| Modulation | | | | 64QAM | 64QAM | | |
| Target Coding Rate | | | | 2/3 | 2/3 | | |
| Information Bit Payload (Note 2) | | | | | | | |
| For Sub-Frames 3,4,7,8,9 | Bits | | | 9912 | 19848 | | |
| For Sub-Frames 0,1,2,5,6 | Bits | | | n/a | n/a | | |
| Number of Code Blocks per Sub-Frame (Note 3) | | | | 2 | 4 | | |
| Binary Channel Bits Per Subframe | | | | | | | |
| For Sub-Frames 3,4,7,8,9 | Bits | | | 15300 | 30600 | | |
| For Sub-Frames 0,1,2,5,6 | Bits | | | n/a | n/a | | |
| MBMS UE Category | | | | ≥ 1 | ≥ 2 | | |
| Note 1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS.<br>Note 2: 2 OFDM symbols are reserved for PDCCH; reference signal allocated as per TS 36.211.<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | | | | |

# A.3.9 Reference measurement channels for sustained downlink data rate provided by lower layers

## A.3.9.1 FDD

**Table A.3.9.1-1: Fixed Reference Channel for sustained data-rate test (FDD 64QAM)**

| Parameter | Unit | Value | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.31-1 FDD | R.31-2 FDD | R.31-3 FDD | R.31-3A FDD | R.31-3C FDD | R.31-4 FDD | R.31-4B FDD | R.31-5 FDD |
| Channel bandwidth | MHz | 10 | 10 | 20 | 10 | 15 | 20 | 15 | 15 |
| Allocated resource blocks (Note 8) | | Note 5 | Note 6 | Note 7 | Note 6 | Note 10 | Note 7 | Note 11 | Note 9 |
| Allocated subframes per Radio Frame | | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Coding Rate | | | | | | | | | |
| For Sub-Frame 1,2,3,4,6,7,8,9, | | 0.40 | 0.59 | 0.59 | 0.85 | 0.87 | 0.88 | 0.85 | 0.85 |
| For Sub-Frame 5 | | 0.40 | 0.64 | 0.62 | 0.89 | 0.88 | 0.87 | 0.87 | 0.91 |
| For Sub-Frame 0 | | 0.40 | 0.63 | 0.61 | 0.90 | 0.91 | 0.90 | 0.88 | 0.88 |
| Information Bit Payload (Note 8) | | | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 10296 | 25456 | 51024 | 36696 | 51024 | 75376 | 55056 | 55056 |
| For Sub-Frame 5 | Bits | 10296 | 25456 | 51024 | 35160 | 51024 | 71112 | 52752 | 52752 |
| For Sub-Frame 0 | Bits | 10296 | 25456 | 51024 | 36696 | 51024 | 75376 | 55056 | 55056 |
| Number of Code Blocks (Notes 3 and 8) | | | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 2 | 5 | 9 | 6 | 9 | 13 | 9 | 9 |
| For Sub-Frame 5 | Bits | 2 | 5 | 9 | 6 | 9 | 12 | 9 | 9 |
| For Sub-Frame 0 | Bits | 2 | 5 | 9 | 6 | 9 | 13 | 9 | 9 |
| Binary Channel Bits (Note 8) | | | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 26100 | 43200 | 86400 | 43200 | 58752 | 86400 | 64800 | 64800 |
| For Sub-Frame 5 | Bits | 26100 | 39744 | 82080 | 39744 | 57888 | 82080 | 60480 | 60480 |
| For Sub-Frame 0 | Bits | 26100 | 40752 | 83952 | 40752 | 56304 | 83952 | 62352 | 62352 |
| Number of layers | | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Max. Throughput averaged over 1 frame (Note 8) | Mbps | 10.296 | 25.456 | 51.024 | 36.542 | 51.024 | 74.950 | 54.826 | 54.826 |
| UE Categories | | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 3 | ≥ 3 | ≥ 4 | ≥ 3 |

Note 1: 1 symbol allocated to PDCCH for all tests.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 4: Resource blocks $n_{PRB}$ = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.
Note 5: Resource blocks $n_{PRB}$ = 6..14,30..49 are allocated for the user data in all sub-frames.
Note 6: Resource blocks $n_{PRB}$ = 3..49 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.
Note 7: Resource blocks $n_{PRB}$ = 4..99 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9.
Note 8: Given per component carrier per codeword.
Note 9: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.
Note 10: Resource blocks $n_{PRB}$ = 4..71 are allocated for the user data in sub-frames 0,1,2,3,4,5,6,7,8,9.
Note 11: Resource blocks $n_{PRB}$ = 4..74 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.

**Table A.3.9.1-2: Fixed Reference Channel for sustained data-rate test (FDD 64QAM)**

| Parameter | Unit | Value | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.31-6 FDD | R.31-7 FDD | R.31-8 FDD | R.31-9 FDD | R.31-10 FDD | R.31-1A FDD | | |
| Channel bandwidth | MHz | 5 | 10 | 15 | 20 | 5 | 20 | | |
| Allocated resource blocks (Note 5) | | Note 4 | Note 7 | Note 8 | Note 9 | Note 4 | Note 10 | | |
| Allocated subframes per Radio Frame | | 9/10 | 10 | 10 | 10 | 9 | 10 | | |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | | |
| Coding Rate | | | | | | | | | |
| For Sub-Frame 1,2,3,4,6,7,8,9, | | 0.85 | 0.78 | 0.77 | 0.79 | 0.78 | 0.41 | | |
| For Sub-Frame 5 | | N/A/0.83 | 0.80 | 0.79 | 0.81 | N/A | 0.41 | | |
| For Sub-Frame 0 | | 0.83 | 0.83 | 0.8 | 0.81 | 0.85 | 0.41 | | |
| Information Bit Payload (Note 5) | | | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 18336 | 63776 | 93800 | 128496 | 31704 | 10296 | | |
| For Sub-Frame 5 | Bits | N/A | 59256 | 90816 | 124464 | N/A | 10296 | | |
| For Sub-Frame 0 | Bits | 15840 | 63776 | 93800 | 128496 | 30576 | 10296 | | |
| Number of Code Blocks (Notes 3 and 5) | | | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 3 | 11 | 16 | 21 | 6 | 2 | | |
| For Sub-Frame 5 | Bits | N/A/3 | 10 | 15 | 21 | N/A | 2 | | |
| For Sub-Frame 0 | Bits | 3 | 11 | 16 | 21 | 5 | 2 | | |
| Binary Channel Bits (Note 5) | | | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 21600 | 81600 | 122400 | 163200 | 40800 | 25200 | | |
| For Sub-Frame 5 | Bits | N/A/19008 | 74976 | 114144 | 154944 | N/A | 25200 | | |
| For Sub-Frame 0 | Bits | 19152 | 76992 | 117792 | 158592 | 36192 | 25200 | | |
| Number of layers | | 2 | 4 | 4 | 4 | 4 | 1 | | |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 17.837 | 63.324 | 93.502 | 128.093 | 28.421 | 10.296 | | |
| UE Categories | | ≥ 2 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 1 | | |

Note 1: 1 symbol allocated to PDCCH for all tests.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 4: Resource blocks $n_{PRB}$ = 0..24 in sub-frames 0,1,2,3,4,6,7,8,9.
Note 5: Given per component carrier per codeword.
Note 6: Ng=1/6.
Note 7: Resource blocks $n_{PRB}$ = 3..49 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.
Note 8: Resource blocks $n_{PRB}$ = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.
Note 9: Resource blocks $n_{PRB}$ = 4..99 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9.

**Table A.3.9.1-3: Fixed Reference Channel for sustained data-rate test (FDD 256QAM)**

| Parameter | Unit | Value | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.68 FDD | R.68-1 FDD | R.68-2 FDD | R.68-3 FDD | R.68-4 FDD | R.68-5 FDD | R.68-6 FDD | R.68-7 FDD |
| Channel bandwidth | MHz | 20 | 15 | 10 | 5 | 10 | 15 | 20 | 5 |
| Allocated resource blocks (Note 4) | | Note 5 | Note 6 | Note 7 | Note 8 | Note 7 | Note 6 | Note 5 | Note 8 |
| Allocated subframes per Radio Frame | | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Modulation | | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM |
| Coding Rate | | | | | | | | | |
| For Sub-Frames 3,4,8,9 | | 0.85 | 0.88 | 0.85 | 0.85 | 0.78 | 0.79 | 0.78 | 0.85 |
| For Sub-Frames 1,2,6,7 | | 0.74 | 0.74 | 0.74 | 0.77 | 0.78 | 0.79 | 0.78 | 0.77 |
| For Sub-Frame 5 | | 0.75 | 0.77 | 0.77 | 0.79 | 0.82 | 0.82 | 0.786 | 0.79 |
| For Sub-Frame 0 | | 0.76 | 0.77 | 0.78 | 0.84 | 0.83 | 0.82 | 0.80 | 0.84 |
| Information Bit Payload (Note 4) | | | | | | | | | |
| For Sub-Frames 3,4,8,9 | Bits | 97896 | 75376 | 48936 | 24496 | 84760 | 128496 | 169544 | 42368 |
| For Sub-Frames 1,2,6,7 | | 84760 | 63776 | 42368 | 21384 | 84760 | 128496 | 169544 | 42368 |
| For Sub-Frame 5 | Bits | 81176 | 61664 | 40576 | 19848 | 81176 | 124464 | 161760 | 39232 |
| For Sub-Frame 0 | Bits | 84760 | 63776 | 42368 | 21384 | 84760 | 128496 | 169544 | 39232 |
| Number of Code Blocks (Notes 3 and 4) | | | | | | | | | |
| For Sub-Frames 3,4,8,9 | Bits | 16 | 13 | 8 | 4 | 14 | 21 | 28 | 7 |
| For Sub-Frames 1,2,6,7 | | 14 | 11 | 7 | 4 | 14 | 21 | 28 | 7 |
| For Sub-Frame 5 | Bits | 14 | 11 | 7 | 4 | 14 | 21 | 27 | 7 |
| For Sub-Frame 0 | Bits | 14 | 11 | 7 | 4 | 14 | 21 | 28 | 7 |
| Binary Channel Bits (Note 4) | | | | | | | | | |
| For Sub-Frames 3,4,8,9 | Bits | 115200 | 86400 | 57600 | 28800 | 108800 | 163200 | 217600 | 54400 |
| For Sub-Frames 1,2,6,7 | | 115200 | 86400 | 57600 | 28800 | 108800 | 163200 | 217600 | 54400 |
| For Sub-Frame 5 | Bits | 109440 | 80640 | 52992 | 25344 | 99968 | 152192 | 206592 | 47744 |
| For Sub-Frame 0 | Bits | 111936 | 83136 | 54336 | 25536 | 102656 | 157056 | 211456 | 48256 |
| Number of layers | | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| Max. Throughput averaged over 1 frame (Note 4) | Mbps | 89.656 | 68.205 | 44.816 | 22.475 | 84.4016 | 128.093 | 168.766 | 41.741 |
| UE Categories | | 11-12 | 11-12 | 11-12 | 11-12 | 11-12 | 11-12 | 11-12 | 11-12 |
| UE DL Categories | | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 11 | 13-14 | 13-14 | 13-14 | 13-14 |

Note 1: 1 symbol allocated to PDCCH for all tests.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 4: Given per component carrier per codeword.
Note 5: Resource blocks $n_{PRB}$ = 4..99 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9.
Note 6: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.
Note 7: Resource blocks $n_{PRB}$ = 3..49 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.
Note 8: Resource blocks $n_{PRB}$ = 2..24 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..24 in sub-frames 0,1,2,3,4,6,7,8,9.

## A.3.9.2 TDD

**Table A.3.9.2-1: Fixed Reference Channel for sustained data-rate test (TDD 64QAM)**

| Parameter | Unit | Value | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.31-1 TDD | R.31-2 TDD | R.31-3 TDD | R.31-3A TDD | R.31-4 TDD | R.31-4A TDD | R.31-5 TDD | R.31-5A TDD | R.31-6 TDD |
| Channel bandwidth | MHz | 10 | 10 | 20 | 15 | 20 | 20 | 15 | 15 | 10 |
| Allocated resource blocks | | Note 6 | Note 7 | Note 8 | Note 9 | Note 8 | Note 8 | Note 11 | Note 11 | Note 7 |
| Uplink-Downlink Configuration (Note 3) | | 5 | 5 | 5 | 1 | 1 | 2 | 1 | 2 | 1 |
| Number of HARQ Processes per component carrier | Processes | 15 | 15 | 15 | 7 | 7 | 10 | 7 | 10 | 7 |
| Allocated subframes per Radio Frame (D+S) | | 8+1 | 8+1 | 8+1 | 4 | 4 | 6+2 | 4 | 6+2 | 4 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Target Coding Rate | | | | | | | | | | |
| For Sub-Frames 4,9 | | 0.40 | 0.59 | 0.59 | 0.87 | 0.88 | 0.88 | 0.85 | 0.85 | 0.85 |
| For Sub-Frames 3,8 | | 0.40 | 0.59 | 0.59 | N/A | N/A | 0.88 | N/A | 0.85 | N/A |
| For Sub-Frame 7 | | 0.40 | 0.59 | 0.59 | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 0 | | 0.40 | 0.62 | 0.61 | 0.90 | 0.90 | 0.90 | 0.88 | 0.88 | 0.90 |
| For Sub-Frames 1 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 5 | | 0.40 | 0.64 | 0.62 | 0.88 | 0.87 | 0.87 | 0.87 | 0.87 | 0.88 |
| For Sub-Frames 6 | | 0.40 | 0.60 | 0.60 | N/A | N/A | N/A | N/A | N/A | N/A |
| Information Bit Payload | | | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 10296 | 25456 | 51024 | 51024 | 75376 | 75376 | 55056 | 55056 | 36696 |
| For Sub-Frames 3,8 | Bits | 10296 | 25456 | 51024 | 0 | 0 | 75376 | 0 | 55056 | 0 |
| For Sub-Frame 7 | Bits | 10296 | 25456 | 51024 | 0 | 0 | N/A | 0 | N/A | 0 |
| For Sub-Frame 0 | Bits | 10296 | 25456 | 51024 | 51024 | 75376 | 75376 | 55056 | 55056 | 36696 |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frame 5 | Bits | 10296 | 25456 | 51024 | 51024 | 71112 | 71112 | 52752 | 52752 | 35160 |
| For Sub-Frame 6 | Bits | 10296 | 25456 | 51024 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | | | | |
| For Sub-Frames 4,9 | | 2 | 5 | 9 | 9 | 13 | 13 | 9 | 9 | 6 |
| For Sub-Frames 3,8 | | 2 | 5 | 9 | N/A | N/A | 13 | N/A | 9 | N/A |
| For Sub-Frame 7 | | 2 | 5 | 9 | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 0 | | 2 | 5 | 9 | 9 | 13 | 13 | 9 | 9 | 6 |
| For Sub-Frame 1 | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | | 2 | 5 | 9 | 9 | 12 | 12 | 9 | 9 | 6 |
| For Sub-Frame 6 | Bits | 2 | 5 | 9 | n/a | N/A | N/A | N/A | N/A | N/A |
| Binary Channel Bits Per Sub-Frame | | | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 26100 | 43200 | 86400 | 58752 | 86400 | 86400 | 64800 | 64800 | 43200 |
| For Sub-Frames 3,8 | Bits | 26100 | 43200 | 86400 | 0 | 0 | 86400 | 0 | 64800 | 0 |
| For Sub-Frame 7 | Bits | 26100 | 43200 | 86400 | 0 | 0 | 86400 | 0 | 64800 | 0 |
| For Sub-Frame 0 | Bits | 26100 | 41184 | 84384 | 56736 | 84384 | 84384 | 62784 | 62784 | 41184 |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| For Sub-Frame 5 | Bits | 26100 | 40176 | 82512 | 58320 | 82512 | 82512 | 60912 | 60912 | 40176 |
| For Sub-Frame 6 | Bits | 26100 | 42768 | 85968 | N/A | N/A | 0 | N/A | 0 | N/A |
| Number of layers | | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Max. Throughput averaged over 1 frame (Note 10) | Mbps | 8.237 | 20.365 | 40.819 | 20.409 | 29.724 | 52.337 | 25.330 | 38.309 | 14.525 |
| UE Category | | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 3 | ≥ 3 | ≥ 3 | ≥ 3 | ≥ 2 |

Note 1: 1 symbol allocated to PDCCH for all tests.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: Resource blocks $n_{PRB}$ = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.
Note 6: Resource blocks $n_{PRB}$ = 6..14,30..49 are allocated for the user data in all subframes.
Note 7: Resource blocks $n_{PRB}$ = 3..49 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..49 in the available downlink sub-frames according to uplink downlink configurations used .

| | |
|---|---|
| Note 8: | Resource blocks $n_{PRB}$ = 4..99 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..99 in sub-frames 0,3,4,6,7,8,9. |
| Note 9: | Resource blocks $n_{PRB}$ = 4..71 are allocated for the user data in all sub-frames |
| Note10: | Given per component carrier per codeword. |
| Note11: | Resource blocks $n_{PRB}$ = 4..74 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..74 in other downlink sub-frames. |

**Table A.3.9.2-1A: Fixed Reference Channel for sustained data-rate test (TDD 64QAM)**

| Parameter | Unit | Value | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.31-7 TDD | R.31-8 TDD | R.31-9 TDD | R.31-1A TDD | | | | |
| Channel bandwidth | MHz | 10 | 15 | 20 | 20 | | | | |
| Allocated resource blocks | | Note 7 | Note 11 | Note 12 | Note 13 | | | | |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 | 5 | | | | |
| Number of HARQ Processes per component carrier | Processes | 7 | 7 | 7 | 15 | | | | |
| Allocated subframes per Radio Frame (D+S) | | 4 | 4 | 4 | 8+1 | | | | |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | | | | |
| Target Coding Rate | | | | | | | | | |
| For Sub-Frames 4,9 | | 0.78 | 0.77 | 0.79 | 0.41 | | | | |
| For Sub-Frames 3,8 | | N/A | N/A | N/A | 0.41 | | | | |
| For Sub-Frame 7 | | N/A | N/A | N/A | 0.41 | | | | |
| For Sub-Frames 0 | | 0.82 | 0.79 | 0.81 | 0.41 | | | | |
| For Sub-Frames 1 | | N/A | N/A | N/A | N/A | | | | |
| For Sub-Frames 5 | | 0.79 | 0.79 | 0.80 | 0.41 | | | | |
| For Sub-Frames 6 | | N/A | N/A | N/A | 0.41 | | | | |
| Information Bit Payload | | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 63776 | 93800 | 128496 | 10296 | | | | |
| For Sub-Frames 3,8 | Bits | 0 | 0 | 0 | 10296 | | | | |
| For Sub-Frame 7 | Bits | 0 | 0 | 0 | 10296 | | | | |
| For Sub-Frame 0 | Bits | 63776 | 93800 | 128496 | 10296 | | | | |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | | | | |
| For Sub-Frame 5 | Bits | 59256 | 90816 | 124464 | 10296 | | | | |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | 10296 | | | | |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | | | |
| For Sub-Frames 4,9 | | 11 | 16 | 21 | 2 | | | | |
| For Sub-Frames 3,8 | | N/A | N/A | N/A | 2 | | | | |
| For Sub-Frame 7 | | N/A | N/A | N/A | 2 | | | | |
| For Sub-Frame 0 | | 11 | 16 | 21 | 2 | | | | |
| For Sub-Frame 1 | | N/A | N/A | N/A | N/A | | | | |
| For Sub-Frame 5 | | 10 | 15 | 21 | 2 | | | | |
| For Sub-Frame 6 | Bits | N/A | N/A | N/A | 2 | | | | |
| Binary Channel Bits Per Sub-Frame | | | | | | | | | |
| For Sub-Frames 4,9 | Bits | 81600 | 122400 | 163200 | 25200 | | | | |
| For Sub-Frames 3,8 | Bits | 0 | 0 | 0 | 25200 | | | | |
| For Sub-Frame 7 | Bits | 0 | 0 | 0 | 25200 | | | | |
| For Sub-Frame 0 | Bits | 77856 | 118656 | 159456 | 25200 | | | | |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | | | | |
| For Sub-Frame 5 | Bits | 75840 | 115008 | 155808 | 25200 | | | | |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | 25200 | | | | |
| Number of layers | | 4 | 4 | 4 | 1 | | | | |
| Max. Throughput averaged over 1 frame (Note 10) | Mbps | 25.058 | 37.222 | 50.996 | 8.237 | | | | |
| UE Category | | ≥ 6 | ≥ 6 | ≥ 6 | ≥ 1 | | | | |

Note 1: 1 symbol allocated to PDCCH for all tests.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
Note 3: As per Table 4.2-2 in TS 36.211 [4].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: Resource blocks $n_{PRB}$ = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.
Note 6: Resource blocks $n_{PRB}$ = 6..14,30..49 are allocated for the user data in all subframes.
Note 7: Resource blocks $n_{PRB}$ = 3..49 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..49 in the available downlink sub-frames according to uplink downlink configurations used .
Note 8: Resource blocks $n_{PRB}$ = 4..99 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..99 in sub-frames 0,3,4,6,7,8,9.

| | |
|---|---|
| Note 9: | Resource blocks $n_{PRB}$ = 4..71 are allocated for the user data in all sub-frames |
| Note10: | Given per component carrier per codeword. |
| Note11: | Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in other downlink sub-frames. |
| Note 12: | Resource blocks nPRB = 4..99 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..99 in other downlink sub-frames. |

**Table A.3.9.2-2: Fixed Reference Channel for sustained data-rate test (TDD 256QAM)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | R.68 TDD | R.68-1 TDD | R.68-2 TDD | R.68-3 TDD | R.68-4 TDD | |
| Channel bandwidth | MHz | 20 | 15 | 10 | 20 | 15 | |
| Allocated resource blocks | PRB | Note 6 | Note 7 | Note 8 | Note 6 | Note 7 | |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 | [2] | [2] | |
| Number of HARQ Processes per component carrier | Processes | 7 | 7 | 7 | [10] | [10] | |
| Allocated subframes per Radio Frame (D+S) | | 4+2 | 4+2 | 4+2 | [6+2] | [6+2] | |
| Modulation | | 256QAM | 256QAM | 256QAM | 256QAM | 256QAM | |
| Target Coding Rate | | | | | | | |
| For Sub-Frame 0 | | 0.76 | 0.77 | 0.78 | 0.76 | 0.77 | |
| For Sub-Frame 1 | | N/A | N/A | N/A | N/A | N/A | |
| For Sub-Frames 3 | | N/A | N/A | N/A | 0.74 | 0.79 | |
| For Sub-Frames 4 | | 0.74 | 0.79 | 0.74 | 0.74 | 0.79 | |
| For Sub-Frame 5 | | 0.74 | 0.76 | 0.76 | 0.74 | 0.76 | |
| For Sub-Frame 6 | | N/A | N/A | N/A | [N/A] | [N/A] | |
| For Sub-Frame 7 | | N/A | N/A | N/A | [N/A] | [N/A] | |
| For Sub-Frames 8 | | N/A | N/A | N/A | 0.85 | 0.88 | |
| For Sub-Frames 9 | | 0.85 | 0.88 | 0.85 | 0.85 | 0.88 | |
| Information Bit Payload | | | | | | | |
| For Sub-Frame 0 | Bits | 84760 | 63776 | 42368 | 84760 | 63776 | |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 | |
| For Sub-Frames 3 | Bits | N/A | N/A | N/A | 84760 | 63776 | |
| For Sub-Frames 4 | Bits | 84760 | 63776 | 42368 | 84760 | 63776 | |
| For Sub-Frame 5 | Bits | 81176 | 61664 | 40576 | 81176 | 61664 | |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | [0] | [0] | |
| For Sub-Frame 7 | | N/A | N/A | N/A | [N/A] | [N/A] | |
| For Sub-Frames 8 | Bits | N/A | N/A | N/A | 97896 | 75376 | |
| For Sub-Frames 9 | Bits | 97896 | 75376 | 48936 | 97896 | 75376 | |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frame 0 | | 14 | 11 | 7 | 14 | 11 | |
| For Sub-Frame 1 | | N/A | N/A | N/A | N/A | N/A | |
| For Sub-Frames 3 | | N/A | N/A | N/A | 14 | 11 | |
| For Sub-Frames 4 | | 14 | 11 | 7 | 14 | 11 | |
| For Sub-Frame 5 | | 14 | 11 | 7 | 14 | 11 | |
| For Sub-Frame 6 | | N/A | N/A | N/A | [N/A] | [11] | |
| For Sub-Frame 7 | | N/A | N/A | N/A | [N/A] | [11] | |
| For Sub-Frames 8 | | N/A | N/A | N/A | 16 | 13 | |
| For Sub-Frames 9 | | 16 | 13 | 8 | 16 | 13 | |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frame 0 | Bits | 112512 | 83712 | 54912 | 112512 | 83712 | |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | 0 | 0 | |
| For Sub-Frames 3 | Bits | N/A | N/A | N/A | 115200 | 86400 | |
| For Sub-Frames 4 | Bits | 115200 | 86400 | 57600 | 115200 | 86400 | |
| For Sub-Frame 5 | | 110016 | 81216 | 53568 | 110016 | 81216 | |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | [0] | [0] | |
| For Sub-Frame 7 | | N/A | N/A | N/A | [N/A] | [N/A] | |
| For Sub-Frames 8 | Bits | N/A | N/A | N/A | 115200 | 86400 | |
| For Sub-Frames 9 | Bits | 115200 | 86400 | 57600 | 115200 | 86400 | |
| Number of layers | | 2 | 2 | 2 | 2 | 2 | |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 34.859 | 26.459 | 17.425 | [53.125] | [40.374] | |
| UE Categories | | 11-12 | 11-12 | 11-12 | 11-12 | 11-12 | |
| UE DL Categories | | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 11 | ≥ 11 | |

Note 1: 1 symbol allocated to PDCCH for all tests.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
Note 3: As per Table 4.2-2 in TS 36.211 [4].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: Given per component carrier per codeword.
Note 6: Resource blocks $n_{PRB}$ = 4..99 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..99 in other

downlink sub-frames.

Note 7: Resource blocks $n_{PRB}$ = 4..74 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..74 in other downlink sub-frames.

Note 8: Resource blocks $n_{PRB}$ = 3..49 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..49 in the available downlink sub-frames according to uplink downlink configurations used.

**Table A.3.9.2-3: Fixed Reference Channel for sustained data-rate test (TDD 256QAM)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | R.68-5 TDD | R.68-6 TDD | R.68-7 TDD | | | |
| Channel bandwidth | MHz | 10 | 15 | 20 | | | |
| Allocated resource blocks | PRB | Note 8 | Note 7 | Note 6 | | | |
| Uplink-Downlink Configuration (Note 3) | | 1 | 1 | 1 | | | |
| Number of HARQ Processes per component carrier | Processes | 7 | 7 | 7 | | | |
| Allocated subframes per Radio Frame (D+S) | | 4+2 | 4+2 | 4+2 | | | |
| Modulation | | 256QAM | 256QAM | 256QAM | | | |
| Target Coding Rate | | | | | | | |
| For Sub-Frame 0 | | 0.82 | 0.82 | 0.80 | | | |
| For Sub-Frame 1 | | N/A | N/A | N/A | | | |
| For Sub-Frames 3 | | N/A | N/A | N/A | | | |
| For Sub-Frames 4 | | 0.78 | 0.79 | 0.78 | | | |
| For Sub-Frame 5 | | 0.81 | 0.82 | 0.78 | | | |
| For Sub-Frame 6 | | N/A | N/A | N/A | | | |
| For Sub-Frame 7 | | N/A | N/A | N/A | | | |
| For Sub-Frames 8 | | N/A | N/A | N/A | | | |
| For Sub-Frames 9 | | 0.78 | 0.79 | 0.78 | | | |
| Information Bit Payload | | | | | | | |
| For Sub-Frame 0 | Bits | 84760 | 128496 | 169544 | | | |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | | | |
| For Sub-Frames 3 | Bits | N/A | N/A | N/A | | | |
| For Sub-Frames 4 | Bits | 84760 | 128496 | 169544 | | | |
| For Sub-Frame 5 | Bits | 81176 | 124464 | 161760 | | | |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | | | |
| For Sub-Frame 7 | | N/A | N/A | N/A | | | |
| For Sub-Frames 8 | Bits | N/A | N/A | N/A | | | |
| For Sub-Frames 9 | Bits | 84760 | 128496 | 169544 | | | |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | | |
| For Sub-Frame 0 | | 14 | 21 | 28 | | | |
| For Sub-Frame 1 | | 0 | 0 | 0 | | | |
| For Sub-Frames 3 | | N/A | N/A | N/A | | | |
| For Sub-Frames 4 | | 14 | 21 | 28 | | | |
| For Sub-Frame 5 | | 14 | 21 | 27 | | | |
| For Sub-Frame 6 | | 0 | 0 | 0 | | | |
| For Sub-Frame 7 | | N/A | N/A | N/A | | | |
| For Sub-Frames 8 | | N/A | N/A | N/A | | | |
| For Sub-Frames 9 | | 14 | 21 | 28 | | | |
| Binary Channel Bits Per Sub-Frame | | | | | | | |
| For Sub-Frame 0 | Bits | 103808 | 158208 | 212608 | | | |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | | | |
| For Sub-Frames 3 | Bits | N/A | N/A | N/A | | | |
| For Sub-Frames 4 | Bits | 108800 | 163200 | 217600 | | | |
| For Sub-Frame 5 | | 101120 | 153344 | 207744 | | | |
| For Sub-Frame 6 | Bits | 0 | 0 | 0 | | | |
| For Sub-Frame 7 | | N/A | N/A | N/A | | | |
| For Sub-Frames 8 | Bits | N/A | N/A | N/A | | | |
| For Sub-Frames 9 | Bits | 108800 | 163200 | 217600 | | | |
| Number of layers | | 4 | 4 | 4 | | | |
| Max. Throughput averaged over 1 frame (Note 5) | Mbps | 33.546 | 50.995 | 67.039 | | | |
| UE Categories | | 11-12 | 11-12 | 11-12 | | | |
| UE DL Categories | | 13-14 | 13-14 | 13-14 | | | |

Note 1: 1 symbol allocated to PDCCH for all tests.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
Note 3: As per Table 4.2-2 in TS 36.211 [4].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: Given per component carrier per codeword.
Note 6: Resource blocks $n_{PRB}$ = 4..99 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..99 in other

downlink sub-frames.
Note 7: Resource blocks $n_{PRB}$ = 4..74 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..74 in other downlink sub-frames.
Note 8: Resource blocks $n_{PRB}$ = 3..49 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..49 in the available downlink sub-frames according to uplink downlink configurations used.

## A.3.9.3 FDD (EPDCCH scheduling)

**Table A.3.9.3-1: Fixed Reference Channel for sustained data-rate test with EPDCCH scheduling (FDD)**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | R.31E-1 FDD | R.31E-2 FDD | R.31E-3 FDD | R.31E-3A FDD | R.31E-3C FDD | R.31E-4 FDD | R.31E-4B FDD |
| Channel bandwidth | MHz | 10 | 10 | 20 | 10 | 15 | 20 | 15 |
| Allocated resource blocks (Note 8) | | Note 5 | Note 6 | Note 7 | Note 6 | Note 9 | Note 7 | Note 10 |
| Allocated subframes per Radio Frame | | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Modulation | | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM | 64QAM |
| Coding Rate (subframes with PDCCH USS monitoring) | | | | | | | | |
| For Sub-Frame 1,2,3,4,6,7,8,9, | | 0.3972 | 0.5926 | 0.5933 | 0.8533 | 0.8725 | 0.8763 | 0.8533 |
| For Sub-Frame 5 | | 0.3972 | 0.6441 | 0.6246 | 0.8889 | 0.8855 | 0.8702 | 0.8762 |
| For Sub-Frame 0 | | 0.3972 | 0.6282 | 0.6106 | 0.9046 | 0.9105 | 0.9018 | 0.8868 |
| Coding Rate (subframes with EPDCCH USS monitoring) | | | | | | | | |
| For Sub-Frame 1,2,3,4,6,7,8,9, | | 0.4114 | 0.6047 | 0.5993 | 0.8707 | 0.8855 | 0.8851 | 0.8649 |
| For Sub-Frame 5 | | 0.4114 | 0.6584 | 0.6312 | 0.9086 | 0.8990 | 0.8794 | 0.8889 |
| For Sub-Frame 0 | | 0.4114 | 0.6418 | 0.6170 | 0.9242 | 0.9246 | 0.9112 | 0.8993 |
| Information Bit Payload (Note 8) | | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 10296 | 25456 | 51024 | 36696 | 51024 | 75376 | 55056 |
| For Sub-Frame 5 | Bits | 10296 | 25456 | 51024 | 35160 | 51024 | 71112 | 52752 |
| For Sub-Frame 0 | Bits | 10296 | 25456 | 51024 | 36696 | 51024 | 75376 | 55056 |
| Number of Code Blocks (Notes 3 and 8) | | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 2 | 5 | 9 | 6 | 9 | 13 | 9 |
| For Sub-Frame 5 | Bits | 2 | 5 | 9 | 6 | 9 | 12 | 9 |
| For Sub-Frame 0 | Bits | 2 | 5 | 9 | 6 | 9 | 13 | 9 |
| Binary Channel Bits (Note 8) (subframes with PDCCH USS monitoring) | | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 26100 | 43200 | 86400 | 43200 | 58752 | 86400 | 64800 |
| For Sub-Frame 5 | Bits | 26100 | 39744 | 82080 | 39744 | 57888 | 82080 | 60480 |
| For Sub-Frame 0 | Bits | 26100 | 40752 | 83952 | 40752 | 56304 | 83952 | 62352 |
| Binary Channel Bits (Note 8) (subframes with EPDCCH USS monitoring) | | | | | | | | |
| For Sub-Frames 1,2,3,4,6,7,8,9 | Bits | 25200 | 42336 | 85536 | 42336 | 57888 | 85536 | 63936 |
| For Sub-Frame 5 | Bits | 25200 | 38880 | 81216 | 38880 | 57024 | 81216 | 59616 |
| For Sub-Frame 0 | Bits | 25200 | 39888 | 83088 | 39888 | 55440 | 83088 | 61488 |
| Number of layers | | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| Max. Throughput averaged over 1 frame (Note 8) | Mbps | 10.296 | 25.456 | 51.024 | 36.542 | 51.024 | 74.950 | 54.826 |
| UE Categories | | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 3 | ≥ 3 | ≥ 4 |

Note 1: 1 symbol allocated to PDCCH for all tests.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211.
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 4: Resource blocks $n_{PRB}$ = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.
Note 5: Resource blocks $n_{PRB}$ = 6..14,30..49 are allocated for the user data in all sub-frames.
Note 6: Resource blocks $n_{PRB}$ = 3..49 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.
Note 7: Resource blocks $n_{PRB}$ = 4..99 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9.
Note 8: Given per component carrier per codeword.
Note 9: Resource blocks $n_{PRB}$ = 4..71 are allocated for the user data in sub-frames 0,1,2,3,4,5,6,7,8,9.
Note 10: Resource blocks $n_{PRB}$ = 4..74 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.

## A.3.9.4 TDD (EPDCCH scheduling)

**Table A.3.9.4-1: Fixed Reference Channel for sustained data-rate with EPDCCH scheduling (TDD)**

| Parameter | Unit | Value | | | | |
|---|---|---|---|---|---|---|
| Reference channel | | R.31E-1 TDD | R.31E-2 TDD | R.31E-3 TDD | R.31E-3A TDD | R.31E-4 TDD |
| Channel bandwidth | MHz | 10 | 10 | 20 | 15 | 20 |
| Allocated resource blocks | | Note 6 | Note 7 | Note 8 | Note 9 | Note 8 |
| Uplink-Downlink Configuration (Note 3) | | 5 | 5 | 5 | 1 | 1 |
| Number of HARQ Processes per component carrier | Processes | 15 | 15 | 15 | 7 | 7 |
| Allocated subframes per Radio Frame (D+S) | | 8+1 | 8+1 | 8+1 | 4 | 4 |
| Coding Rate (subframes with PDCCH USS monitoring) | | | | | | |
| For Sub-Frames 4,9 | | 0.3972 | 0.5926 | 0.5933 | 0.8725 | 0.8763 |
| For Sub-Frames 3,7,8 | | 0.3972 | 0.5926 | 0.5933 | N/A | N/A |
| For Sub-Frames 1 | | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 5 | | 0.3972 | 0.6372 | 0.6213 | 0.8790 | 0.8656 |
| For Sub-Frames 6 | | 0.3972 | 0.5986 | 0.5963 | N/A | N/A |
| For Sub-Frames 0 | | 0.3972 | 0.6216 | 0.6075 | 0.9036 | 0.8972 |
| Coding Rate (subframes with EPDCCH USS monitoring) | | | | | | |
| For Sub-Frames 4,9 | | 0.4114 | 0.6047 | 0.5993 | 0.8856 | 0.8851 |
| For Sub-Frames 3,7,8 | | 0.4114 | 0.6047 | 0.5993 | N/A | N/A |
| For Sub-Frames 1 | | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frames 5 | | 0.4114 | 0.6512 | 0.6279 | 0.8922 | 0.8748 |
| For Sub-Frames 6 | | 0.4114 | 0.6109 | 0.6024 | N/A | N/A |
| For Sub-Frames 0 | | 0.4114 | 0.6349 | 0.6138 | 0.9175 | 0.9065 |
| Information Bit Payload | | | | | | |
| For Sub-Frames 4,9 | Bits | 10296 | 25456 | 51024 | 51024 | 75376 |
| For Sub-Frames 3,7,8 | Bits | 10296 | 25456 | 51024 | N/A | N/A |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | N/A | N/A |
| For Sub-Frame 5 | Bits | 10296 | 25456 | 51024 | 51024 | 71112 |
| For Sub-Frame 6 | Bits | 10296 | 25456 | 51024 | N/A | N/A |
| For Sub-Frame 0 | Bits | 10296 | 25456 | 51024 | 51024 | 75376 |
| Number of Code Blocks per Sub-Frame (Note 4) | | | | | | |
| For Sub-Frames 4,9 | | 2 | 5 | 9 | 9 | 13 |
| For Sub-Frames 3,7,8 | | 2 | 5 | 9 | N/A | N/A |
| For Sub-Frame 1 | | N/A | N/A | N/A | N/A | N/A |
| For Sub-Frame 5 | | 2 | 5 | 9 | 9 | 12 |
| For Sub-Frame 6 | Bits | 2 | 5 | 9 | N/A | N/A |
| For Sub-Frame 0 | | 2 | 5 | 9 | 9 | 13 |
| Binary Channel Bits per Sub-Frame | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| (subframes with PDCCH USS monitoring) | | | | | | |
| For Sub-Frames 4,9 | Bits | 26100 | 43200 | 86400 | 58752 | 86400 |
| For Sub-Frames 3,7,8 | Bits | 26100 | 43200 | 86400 | N/A | N/A |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | N/A | N/A |
| For Sub-Frame 5 | Bits | 26100 | 40176 | 82512 | 58320 | 82512 |
| For Sub-Frame 6 | Bits | 26100 | 42768 | 85968 | N/A | N/A |
| For Sub-Frame 0 | Bits | 26100 | 41184 | 84384 | 56736 | 84384 |
| Binary Channel Bits per Sub-Frame (subframes with EPDCCH USS monitoring) | | | | | | |
| For Sub-Frames 4,9 | Bits | 25200 | 42336 | 85536 | 57888 | 85536 |
| For Sub-Frames 3,7,8 | Bits | 25200 | 42336 | 85536 | N/A | N/A |
| For Sub-Frame 1 | Bits | 0 | 0 | 0 | N/A | N/A |
| For Sub-Frame 5 | Bits | 25200 | 39312 | 81648 | 57456 | 81648 |
| For Sub-Frame 6 | Bits | 25200 | 41904 | 85104 | N/A | N/A |
| For Sub-Frame 0 | Bits | 25200 | 40320 | 83520 | 55872 | 83520 |
| Number of layers | | 1 | 2 | 2 | 2 | 2 |
| Max. Throughput averaged over 1 frame (Note 10) | Mbps | 8.237 | 20.365 | 40.819 | 20.409 | 29.724 |
| UE Category | | ≥ 1 | ≥ 2 | ≥ 2 | ≥ 2 | ≥ 3 |

Note 1: 1 symbol allocated to PDCCH for all tests.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: Resource blocks $n_{PRB}$ = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.
Note 6: Resource blocks $n_{PRB}$ = 6..14,30..49 are allocated for the user data in all subframes.
Note 7: Resource blocks $n_{PRB}$ = 3..49 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..49 in sub-frames 0,3,4,6,7,8,9.
Note 8: Resource blocks $n_{PRB}$ = 4..99 are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB}$ = 0..99 in sub-frames 0,3,4,6,7,8,9.
Note 9: Resource blocks $n_{PRB}$ = 4..71 are allocated for the user data in all sub-frames
Note10: Given per component carrier per codeword.

## A.3.10 Reference Measurement Channels for EPDCCH performance requirements

### A.3.10.1 FDD

**Table A.3.10.1-1: Reference Channel FDD**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | R.55 FDD | R.56 FDD | R.57 FDD | R.58 FDD | R.59 FDD | |
| Number of transmitter antennas | | 2 | 2 | 2 | 2 | 2 | |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 | |
| Number of OFDM symbols for PDCCH | symbols | 2 | 2 | 1 | 1 | 1 | |
| Aggregation level | ECCE | 4 | 16 | 2 | 8 | 2 | |
| DCI Format | | 2A | 2A | 2C | 2C | 2D | |

### A.3.10.2 TDD

**Table A.3.10.2-1: Reference Channel TDD**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | R.55 TDD | R.56 TDD | R.57 TDD | R.58 TDD | R.59 TDD | |
| Number of transmitter antennas | | 2 | 2 | 2 | 2 | 2 | |
| Channel bandwidth | MHz | 10 | 10 | 10 | 10 | 10 | |
| Number of OFDM symbols for PDCCH | symbols | 2 | 2 | 1 | 1 | 1 | |
| Aggregation level | CCE | 4 | 16 | 2 | 8 | 2 | |
| DCI Format | | 2A | 2A | 2C | 2C | 2D | |

## A.3.11 Reference Measurement Channels for MPDCCH performance requirements

### A.3.11.1 FDD and half-duplex FDD

**Table A.3.11.1-1: Reference Channel FDD and half-duplex FDD**

| Parameter | Unit | Value | Value |
|---|---|---|---|
| Reference channel | | R.82 FDD | R.83 FDD |
| Number of transmitter antennas | | 2 | 2 |
| Channel bandwidth | MHz | 10 | 10 |
| OFDM starting symbol (startSymbolLC) | symbols | 2 | 2 |
| Aggregation level | ECCE | 16 | 24 |
| DCI Format | | 6-1A | 6-1B |
| Payload (without CRC) | Bits | 29 | 18 |
| PRB allocation | | 8-th ~11-th PRB | As specified in Test |

**Table A.3.11.1-2: Additional PDSCH Reference Channel FDD and half-duplex FDD for R.82 FDD**

| Parameter | Unit | Values |
|---|---|---|
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) | | 4 |
| Allocated DL subframes per 96 subframes (Note 3) | | 32 |
| Modulation | | QPSK |
| Target Coding Rate | | 1/2 |
| Information Bit Payload | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 472 |
| Number of Code Blocks | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Code blocks | 1 |
| Binary Channel Bits | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 1056 |
| Max. Throughput | kbps | 4.92 |
| UE DL Category | | M1, ≥ 0 |

Note 1: 2 symbols allocated to PDCCH
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]
Note 3: The downlink subframes are scheduled at the 33th to 64th subframes every 96ms. Information bit payload is available at the 33th to 64th subframes with repetition. (Starting from the 0th subframe)
Note 4: Allocated PRB positions are {1, 2, 3, 4} within the assigned narrowband.
Note 5: MPDCCH are scheduled at the 0th to 31th subframes with repetition. The allocated PRB positions are {1, 2, 3, 4} within the assigned narrowband. (Starting from the 0th subframe)

**Table A.3.11.1-3: Additional PDSCH Reference Channel FDD and half-duplex FDD for R.83 FDD**

| Parameter | Unit | Values |
|---|---|---|
| Channel bandwidth | MHz | 10 |
| Allocated resource blocks (Note 4) | | 4 |
| Allocated DL subframes per 192 subframes (Note 3) | | 64 |
| Modulation | | QPSK |
| Target Coding Rate | | ½ |
| Information Bit Payload | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 472 |
| Number of Code Blocks | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Code blocks | 1 |
| Binary Channel Bits | | |
| For Sub-Frames 0,1,2,3,4,5,6,7,8,9 | Bits | 1056 |
| Max. Throughput | kbps | 2.46 |
| UE DL Category | | M1, ≥ 0 |
| Note 1: 2 symbols allocated to PDCCH<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]<br>Note 3: For RMC R.83 FDD, the downlink subframes are scheduled at the 65th to 128th subframes every 192ms. Information bit payload is available at the 65th to 128th subframes with repetition. (Starting from the 0th subframe)<br>Note 4: Allocated PRB positions are {1, 2, 3, 4} within the assigned narrowband.<br>Note 5: MPDCCH are scheduled at the 0th to 63th subframes with repetition for RMC R.83 FDD. The allocated PRB positions are {1, 2, 3, 4} within the assigned narrowband. (Starting from the 0th subframe) | | |

## A.3.11.2 TDD

**Table A.3.11.2-1: Reference Channel TDD**

| Parameter | Unit | Value | Value |
|---|---|---|---|
| Reference channel | | R.82 TDD | R.83 TDD |
| Number of transmitter antennas | | 2 | 2 |
| Channel bandwidth | MHz | 10 | 10 |
| OFDM starting symbol (startSymbolLC) | symbols | 2 | 2 |
| Aggregation level | ECCE | 16 | 24 |
| DCI Format | | 6-1A | 6-1B |
| Payload (without CRC) | Bits | 32 | 18 |
| PRB allocation | | 8-th ~11-th PRB | As specified in Test |

**Table A.3.11.2-2: Additional PDSCH Reference Channel TDD for R.82 TDD**

| Parameter | Unit | Values |
|---|---|---|
| Channel bandwidth | MHz | 10 |
| Uplink-Downlink Configuration | | 0 |
| Allocated resource blocks (Note 4) | | 4 |
| Allocated DL subframes per 160 subframes (Note 3) | | 16 |
| Modulation | | QPSK |
| Target Coding Rate | | ½ |
| Information Bit Payload | | |
| For Sub-Frames 0,5 | Bits | 472 |
| Number of Code Blocks | | |
| For Sub-Frames 0,5 | Code blocks | 1 |
| Binary Channel Bits | | |
| For Sub-Frames 0,5 | Bits | 1056 |
| Max. Throughput | kbps | 2.95 |
| UE DL Category | | M1, ≥ 0 |
| Note 1: 2 symbols allocated to PDCCH<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]<br>Note 3: The PDSCH subframes are scheduled at the 16th to 31th downlink subframes with repetition every 160ms. (Starting from the 0th subframe)<br>Note 4: Allocated PRB positions are {1, 2, 3, 4} within the assigned narrowband.<br>Note 5: MPDCCH are scheduled at the 0th to 15th downlink subframes with repetition. The allocated PRB positions are {1, 2, 3, 4} within the assigned narrowband. (Starting from the 0th subframe) | | |

**Table A.3.11.2-3: Additional PDSCH Reference Channel TDD for R.83 TDD**

| Parameter | Unit | Values |
|---|---|---|
| Channel bandwidth | MHz | 10 |
| Uplink-Downlink Configuration | | 0 |
| Allocated resource blocks (Note 4) | | 4 |
| Allocated DL subframes per 320 subframes (Note 3) | | 32 |
| Modulation | | QPSK |
| Target Coding Rate | | ½ |
| Information Bit Payload | | |
| For Sub-Frames 0,5 | Bits | 472 |
| Number of Code Blocks | | |
| For Sub-Frames 0,5 | Code blocks | 1 |
| Binary Channel Bits | | |
| For Sub-Frames 0,5 | Bits | 1056 |
| Max. Throughput | kbps | 1.475 |
| UE DL Category | | M1, ≥ 0 |
| Note 1: 2 symbols allocated to PDCCH<br>Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]<br>Note 3: The PDSCH subframes are scheduled at the 32th to 63th downlink subframes with repetition every 320ms. (Starting from the 0th subframe)<br>Note 4: Allocated PRB positions are {1, 2, 3, 4} within the assigned narrowband.<br>Note 5: MPDCCH are scheduled at the 0th to 31th downlink subframes with repetition. The allocated PRB positions are {1, 2, 3, 4} within the assigned narrowband. (Starting from the 0th subframe) | | |

## A.3.12 Reference measurement channels for NPDSCH performance requirements

Editor's note: The note 2 in Table A.3.12.1.2-1 and note 1 in Table A.3.12.2.1-1 are still under discussion with RAN4.

# A.3.12.1 In-band

## A.3.12.1.2 Two-antenna transmission

**Table A.3.12.1.2-1: NPDSCH Reference Channel with 2 TX Antennas**

| Parameter | Unit | Value | Value |
|---|---|---|---|
| Reference channel | | R.NB.5 FDD | R.NB.5-1 FDD |
| Carrier Type | | Anchor | Non-anchor |
| Channel bandwidth | KHz | 200 | 200 |
| Allocated subframes per Radio Frame | | Note 2 | 10 |
| Modulation | | QPSK | QPSK |
| $I_{TBS}/I_{SF}$ | | 4/0 | 4/0 |
| Target Coding Rate | | 1/3 | 1/3 |
| Coding Rate | | 0.4 | 0.4 |
| Information Bit Payload | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 56 | 56 |
| For Sub-Frame 0,5 | Bits | N/A | 56 |
| For Sub-Frame 4,9 | Bits | Note 3 | 56 |
| Number of Code Blocks | | | |
| For Sub-Frames 1,2,3,6,7,8 and 9(if NB-SSS is not present) | | 1 | 1 |
| For Sub-Frame 0,5 | Bits | N/A | 1 |
| For Sub-Frame 4,9 | Bits | Note 4 | 1 |
| Binary Channel Bits | | | |
| For Sub-Frames 1,2,3,6,7,8 and 9(if NB-SSS is not present) | Bits | 200 | 200 |
| For Sub-Frame 0,5 | Bits | N/A | 200 |
| For Sub-Frame 4,9 | Bits | Note 5 | 200 |
| Max. Throughput averaged over 2 frame for 1 repetition (Note 6) | Mbps | 36.4kb/s | 56kb/s |
| UE Category | | NB1, NB2 | NB1, NB2 |

Note 1: For in-band, the first 3 symbols are used for LTE PDCCH and the number of LTE CRS ports is 4

Note 2: 6 when $n_f$ mod 2 = 0, otherwise 8. $n_f$ is specified in TS36.211 [4].

Note 3: N/A when $n_f$ mod 2 = 0, otherwise 56.

Note 4: N/A when $n_f$ mod 2 = 0, otherwise 1.

Note 5: N/A when $n_f$ mod 2 = 0, otherwise 200.

Note 6: For repetition number N, the maximum throughput averaged over 1 frame equals to (Max. Throughput averaged over 1 frame for 1 repetition) / N.

# A.3.12.2 Standalone/Guard-band

## A.3.12.2.1 Single-antenna transmission

**Table A.3.12.2.1-1: NPDSCH Reference Channel with 1Tx Antenna for UE Category NB1 and NB2**

| Parameter | Unit | Value | Value |
|---|---|---|---|
| Reference channel | | R.NB.6 FDD | R.NB.6-1 FDD |
| Carrier Type | | Anchor | Non-anchor |
| Channel bandwidth | KHz | 200 | 200 |
| Allocated subframes per Radio Frame | | Note 1 | Note 1 |
| Modulation | | QPSK | QPSK |
| $I_{TBS}/I_{SF}$ | | 9/3 | 6/3 |
| Target Coding Rate | | 1/2 | 1/3 |
| Coding Rate | | 0.5 | 0.33 |
| Information Bit Payload | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 616 | 392 |
| For Sub-Frame 0,5 | Bits | N/A | 392 |
| For Sub-Frame 4,9 | Bits | Note 2 | 392 |
| Number of Code Blocks | | | |
| For Sub-Frames 1,2,3,6,7,8 | | 1 | 1 |
| For Sub-Frame 0,5 | Bits | N/A | 1 |
| For Sub-Frame 4,9 | Bits | Note 3 | 1 |
| Binary Channel Bits | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 320 | 320 |
| For Sub-Frame 0,5 | Bits | N/A | 320 |
| For Sub-Frame 4,9 | Bits | Note 4 | 320 |
| Max. Average Throughput | Bps | Note 5 | Note 5 |
| UE Category | | NB1,NB2 | NB1,NB2 |

Note 1: It shall depend on the specific NPDSCH scheduling.

Note 2: N/A when $n_f$ mod 2 = 0, otherwise 616.

Note 3: N/A when $n_f$ mod 2 = 0, otherwise 1.

Note 4: N/A when $n_f$ mod 2 = 0, otherwise 320.

Note 5: Maximum Average Throughput equals to sum of TB(i) divided by sum of T(i), where TB(i) is the TB size of NPDSCH over $i^{th}$ NPDSCH scheduling period, and T(i) is the total time consisting of NPDCCH transmission duration, NPDCCH to NPDSCH scheduling delay, NPDSCH transmission duration, NPDSCH to NPUSCH format 2 scheduling delay, NPUSCH format 2 transmission duration, possible delay between NPUSCH format 2 and NPDCCH for next NPDSCH scheduling and subframes used for NPSS/NSSS/NPBCH/NB-SIB1/NB-SIB2 transmission during the $i^{th}$ NPDSCH scheduling period.

**Table A.3.12.2.1-2: NPDSCH Reference Channel with 1Tx Antenna for UE Category NB2**

| Parameter | Unit | Value | Value |
|---|---|---|---|
| Reference channel | | R.NB.7 FDD | |
| Carrier Type | | Non-anchor | |
| Channel bandwidth | KHz | 200 | |
| Allocated subframes per Radio Frame | | Note 1 | |
| Modulation | | QPSK | |
| $I_{TBS}/I_{SF}$ | | 9/5 | |
| Target Coding Rate | | 1/2 | |
| Coding Rate | | 0.5 | |
| Information Bit Payload | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 936 | |
| For Sub-Frame 0,5 | Bits | 936 | |
| For Sub-Frame 4,9 | Bits | 936 | |
| Number of Code Blocks | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 1 | |
| For Sub-Frame 0,5 | Bits | 1 | |
| For Sub-Frame 4,9 | Bits | 1 | |
| Binary Channel Bits | | | |
| For Sub-Frames 1,2,3,6,7,8 | Bits | 320 | |
| For Sub-Frame 0,5 | Bits | 320 | |
| For Sub-Frame 4,9 | Bits | 320 | |
| Max. Average Throughput | Bps | Note 2 | |
| UE Category | | NB2 | |
| Note 1: It shall depend on the specific NPDSCH scheduling.<br>Note 2: Maximum Average Throughput equals to sum of TB(i) divided by sum of T(i), where TB(i) is the TB size of NPDSCH over $i^{th}$ NPDSCH scheduling period, and T(i) is the total time consisting of NPDCCH transmission duration, NPDCCH to NPDSCH scheduling delay, NPDSCH transmission duration, NPDSCH to NPUSCH format 2 scheduling delay, NPUSCH format 2 transmission duration, possible delay between NPUSCH format 2 and NPDCCH for next NPDSCH scheduling and subframes used for NPSS/NSSS/NPBCH/NB-SIB1/NB-SIB2 transmission during the $i^{th}$ NPDSCH scheduling period. | | | |

# A.3.13 Reference measurement channels for NPDCCH performance requirements

## A.3.13.1 Half-duplex FDD

**Table A.3.13.1-1 Reference Channel for Category NB1 UE**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | R.NB.3 FDD | R.NB.4 FDD |
| Number of NRS ports | | 1 | 2 |
| Channel bandwidth | MHz | 0.2 | 0.2 |
| Aggregation level | NCCE | 2 | 2 |
| DCI Format | | N1 | N1 |
| Payload (without CRC) | Bits | 23 | 23 |

## A.3.14 Reference measurement channels for NPBCH performance requirements for Cat NB1 UEs

**Table A.3.14-1: Reference Channel for Category NB1 UE**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | R.NB.1 | R.NB.2 |
| Number of transmitter antennas | | 1 | 2 |
| Channel bandwidth | KHz | 200 | 200 |
| Modulation | | QPSK | QPSK |
| Target coding rate | | 50/1600 | 50/1600 |
| Payload (without CRC) | Bits | 34 | 34 |

## A.3.15 Reference Measurement Channels for LAA SCell with frame structure Type-3

### A.3.15.1 Multi-antenna transmission (Common Reference Symbols)

#### A.3.15.1.1 Four antenna ports

**Table A.3.15.1.1-1: Reference Channel with four CRS ports**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.1 FS3 |
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks (Note 4) | | 100 |
| Allocated subframes per Radio Frame | | 10 |
| Modulation | | 64QAM |
| Target Coding Rate | | 0.6 |
| Information Bit Payload (Note 4) | | |
| For Sub-Frames 1,4,6,9 | Bits | {46888,15840,24496,37888,19848} |
| For Sub-Frames 2, 7 | | {46888,15840,24496,37888,19848} |
| For Sub-Frames 3, 8 | | {46888,15840,24496,37888,19848} |
| For Sub-Frame 5 | Bits | {46888,15840,24496,37888,19848} |
| For Sub-Frame 0 | Bits | {46888,15840,24496,37888,19848} |
| Number of Code Blocks | | |
| (Notes 3 and 4) | | |
| For Sub-Frames 1,4,6,,9 | | {8,3,4,7,4} |
| For Sub-Frames 2,7 | | {8,3,4,7,4} |
| For Sub-Frames 3, 8 | | {8,3,4,7,4} |
| For Sub-Frame 5 | | {8,3,4,7,4} |
| For Sub-Frame 0 | | {8,3,4,7,4} |
| Binary Channel Bits (Note 4) | | |
| For Sub-Frames 1,4,6,9 | Bits | {76800,26400,43200,62400,33600} |
| For Sub-Frames 2, 7 | | {76800,26400,43200,62400,33600} |
| For Sub-Frames 3, 8 | | {76800,26400,43200,62400,33600} |
| For Sub-Frame 5 | Bits | {75936,26400,43200,61536,33600} |
| For Sub-Frame 0 (Note 5) | Bits | {75936,26400,43200,61536,33600} |
| UE Category | | ≥ 5 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 4: Given per component carrier per codeword.
Note 5: For {a1,a2,a3,a4,a5}, a1, a2, a3, a4 and a5 stand for the setup when the number of OFDM symbols is 14, 6, 9, 12, 7, respectively.

## A.3.15.2 Reference Measurement Channel for UE-Specific Reference Symbols

### A.3.15.2.1 Two antenna ports (CSI-RS)

The reference measurement channels in Table A.3.15.2.1-1 apply for verifying demodulation performance for UE-specific reference symbols with two cell-specific antenna ports and two CSI-RS antenna ports for LAA SCell.

**Table A.3.15.2.1-1: Reference Channel with two CRS ports**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | R.2 FS3 |
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks (Note 4) | | 100 |
| Allocated subframes per Radio Frame | | 10 |
| Modulation | | 16QAM |
| Target Coding Rate | | 1/2 |
| Information Bit Payload (Note 4) | | |
| For Sub-Frames 1,4,6,9 | Bits | {22920,7480,12960,19080,10296} |
| For Sub-Frames 2, 7 | | {22920,7480,12960,19080,10296} |
| For Sub-Frames 3, 8 | | {22920,7480,12960,19080,10296} |
| For Sub-Frame 5 | Bits | {19848, 6712, 11448, 16992, 9144} |
| For Sub-Frame 0 | Bits | {19848, 6712, 11448, 16992, 9144} |
| Number of Code Blocks | | |
| (Notes 3 and 4) | | |
| For Sub-Frames 1,4,6,9 | | {4,2,3,4,2} |
| For Sub-Frames 2,7 | | {4,2,3,4,2} |
| For Sub-Frames 3, 8 | | {4, 2, 3, 4, 2} |
| For Sub-Frame 5 | | {4, 2, 2, 3, 2} |
| For Sub-Frame 0 | | {4, 2, 2, 3, 2} |
| Binary Channel Bits (Note 4) | | |
| For Sub-Frames 1,4,6,9 | Bits | {48000,15200,25600,38400,20000} |
| For Sub-Frames 2, 7 | | {47200,15200,25600,38400,20000} |
| For Sub-Frames 3, 8 | | {46400,15200,25600,38400,20000} |
| For Sub-Frame 5 | Bits | {42240,13376,22528,33792,17600} |
| For Sub-Frame 0 (Note 5) (Note 6) | Bits | {42240,13376,22528,33792,17600} |
| UE Category | | ≥ 5 |

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 4: Given per component carrier per codeword.
Note 5: For TM9, 100 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 88 resource blocks (RB0-RB43,RB56-RB99) are allocated in subframe 0 and subframe 5
Note 6: For {a1,a2,a3,a4,a5}, a1, a2, a3, a4 and a5 stand for the setup when the number of OFDM symbols is 14, 6, 9, 12, 7, respectively

**Table A.3.15-2: Void**

# A.4 CQI reference measurement channels

This section defines the DL signal applicable to the reporting of channel quality information (Clause 9.2, 9.3 and 9.5).

In Table A.4-1 are specified the reference channels. Table A.4-13 specifies the mapping of CQI index to modulation coding scheme, which complies with the CQI definition specified in Section 7.2.3 of [10].

**Table A.4-0: Void**

**Table A.4-1: CSI reference measurement channels**

| RMC Name | Duplex | CH-BW | Alloc. RB-s | UL/DL Config | Alloc. SF-s | MCS Scheme | Nr. HARQ Proc. | Max. nr HARQ Trans. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| **1 CRS Port** | | | | | | | | | |
| RC.1 FDD | FDD | 10 | 50 | - | | MCS.1 | 8 | 1 | |
| RC.1A FDD | FDD | 10 | 50 | | | MCS.1A | 8 | 1 | |
| RC.1 TDD | TDD | 10 | 50 | Note 3 | | MCS.1 | 10 | 1 | |
| RC.1A TDD | TDD | 20 | 100 | Note 3 | | MCS.1B | 10 | 1 | |
| RC.3 FDD | FDD | 10 | 6 | - | | MCS.10 | 8 | 1 | |
| RC.3 TDD | TDD | 10 | 6 | Note 3 | | MCS.10 | 10 or 7 (Note 9) | 1 | |
| RC.4 FDD | FDD | 10 | 15 | - | | MCS.15 | 8 | 1 | Note 6 |
| RC.4 TDD | TDD | 10 | 15 | Note 3 | | MCS.15 | 10 | 1 | Note 6 |
| RC.5 FDD | FDD | 10 | 3 | - | | MCS.17 | 8 | 1 | |
| RC.5 TDD | TDD | 10 | 3 | Note 3 | | MCS.17 | 10 | 1 | |
| RC.14 FDD | FDD | 5 | 25 | - | | MCS.14 | 8 | 1 | |
| RC.15 FDD | FDD | 5 | 15 | - | | MCS.15 | 8 | 1 | Note 6 |
| RC.16 FDD | FDD/HD-FDD | 10 | 2 | | | MCS.20 | 8 | 1 | Note 8,10 |
| RC.16 TDD | TDD | 10 | 2 | Note 3 | | MCS.20 | 10 | 1 | Note 8 |
| RC.23 FDD | FDD/HD-FDD | 10 | 3 | | | MCS.28 | 8 | 1 | Note 12, 13 |
| RC.23 TDD | TDD | 10 | 3 | | | MCS.28 | 10 | 1 | Note 12 |
| RC.25 FDD | FDD/HD-FDD | 10 | 3 | | | MCS.28 | 8 | 1 | Note 12, 14 |
| RC.25 TDD | TDD | 10 | 3 | | | MCS.28 | 10 | 1 | Note 12, 15 |
| **2 CRS Ports** | | | | | | | | | |
| RC.2 FDD | FDD | 10 | 50 | - | | MCS.2 | 8 | 1 | |
| RC.2A FDD | FDD | 20 | 100 | | | MCS.2A | 8 | 1 | |
| RC.2 TDD | TDD | 10 | 50 | Note 3 | | MCS.2 | 10 or 7 (Note 9) | 1 | |
| RC.4A FDD | FDD | 20 | 15 | | | MCS.16 | 8 | 1 | Note 6 |
| RC.6 FDD | FDD | 10 | 15 | - | | MCS.16 | 8 | 1 | Note 6 |
| RC.6 TDD | TDD | 10 | 15 | Note 3 | | MCS.16 | 7 | 1 | Note 6 |
| **4 CRS Ports** | | | | | | | | | |
| RC.17 FDD | FDD | 10 | 50 | - | | MCS.18 | 8 | 1 | |
| RC.17 TDD | TDD | 10 | 50 | Note 3 | | MCS.18 | 7 | 1 | |
| RC.21 FDD | FDD | 10 | 50 | - | | MCS.26 | 8 | 1 | |
| RC.21 TDD | TDD | 10 | 50 | Note 3 | | MCS.26 | 7 | 1 | |
| **1 CRS Port + CSI-RS** | | | | | | | | | |
| RC.8 FDD | FDD | 10 | 6 | - | Non CSI-RS | MCS.11 | 8 | 1 | |
| | | | | | 2 CSI-RS | MCS.12 | | | |
| RC.8A FDD | FDD | 10 | 6 | - | Non CSI-RS | MCS.11A | 8 | 1 | |
| | | | | | 2 CSI-RS | MCS.12A | | | |
| RC.8 TDD | TDD | 10 | 6 | Note 3 | Non | MCS.11 | 10 | 1 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | CSI-RS | | | | |
| | | | | | 2 CSI-RS | MCS.12 | | | |
| RC.8A TDD | TDD | 20 | 8 | Note 3 | Non CSI-RS | MCS.11B | 10 | 1 | |
| | | | | | 2 CSI-RS | MCS.12B | | | |
| RC.9 FDD | FDD | 10 | 50 | - | Non CSI-RS | MCS.3 | 8 | 1 | |
| | | | | | 2 CSI-RS | MCS.4 | | | |
| RC.9A FDD | FDD | 20 | 100 | - | Non CSI-RS | MCS.3A | 8 | 1 | |
| | | | | | 2 CSI-RS | MCS.4A | | | |
| RC.9B FDD | FDD | 10 | 50 | - | Non CSI-RS, rank 1/2 | MCS.3 | 8 | 1 | |
| | | | | | Non CSI-RS, rank 3/4 | MCS.30 | | | |
| | | | | | 4 CSI-RS, rank 1/2 | MCS.29 | | | |
| | | | | | 4 CSI-RS, rank 3/4 | MCS.31 | | | |
| RC.9 TDD | TDD | 10 | 50 | Note 3 | Non CSI-RS | MCS.3 | 7 | 1 | |
| | | | | | 2 CSI-RS | MCS.4 | | | |
| RC.9B TDD | TDD | 10 | 50 | Note 3 | Non CSI-RS, rank 1/2 | MCS.3 | 7 | 1 | |
| | | | | | Non CSI-RS, rank 3/4 | MCS.30 | | | |
| | | | | | 4 CSI-RS, rank 1/2 | MCS.29 | | | |
| | | | | | 4 CSI-RS, rank 3/4 | MCS.31 | | | |
| **2 CRS Port + CSI-RS** | | | | | | | | | |
| RC.7 FDD | FDD | 10 | 50 | - | Non CSI-RS | MCS.5 | 8 | 1 | |
| | | | | | 4 CSI-RS | MCS.7 | | | |
| RC.7 TDD | TDD | 10 | 50 | Note 3 | Non CSI-RS | MCS.5 | 10 | 1 | |
| | | | | | 8 CSI-RS | MCS.8 | | | |
| RC.11 FDD | FDD | 10 | 50 | - | Non CSI-RS | MCS.5 | 8 | 1 | |
| | | | | | 2 CSI-RS | MCS.6 | | | |
| RC.11 TDD | TDD | 10 | 50 | Note 3 | Non CSI-RS | MCS.5 | 10 | 1 | |
| | | | | | 2 CSI-RS | MCS.6 | | | |
| RC.18 FDD | FDD | 10 | 6 | - | Non CSI-RS | MCS.13 | 8 | 1 | |
| | | | | | 4 CSI-RS | MCS.19 | | | |
| RC.18 TDD | TDD | 10 | 6 | Note 3 | Non CSI-RS | MCS.13 | 7 | 1 | |
| | | | | | 4 CSI-RS | MCS.19 | | | |
| RC.17 TDD | TDD | 10 | 6 | Note 3 | 4 ZP-CSI-RS | MCS.21 | 10 | 1 | |
| RC.18 TDD | TDD | 10 | 6 | Note 3 | 4 ZP-CSI-RS | MCS.22 | 10 | 1 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| RC.19 TDD | TDD | 10 | 41 | Note 3 | 4 ZP-CSI-RS | MCS.23 | 10 | 1 | Note 11 |
| RC.20 TDD | TDD | 10 | 50 | Note 3 | Non CSI-RS | MCS.24 | 10 | 1 | |
| | | | | | 2 CSI-RS, 4 ZP-CSI-RS | MCS.25 | | | |
| RC.22 FDD | FDD | 10 | 50 | - | Non CSI-RS | MCS.5 | 8 | 1 | |
| | | | | | 4 CSI-RS | MCS.27 | | | |
| RC.22 TDD | TDD | 10 | 50 | Note 3 | Non CSI-RS | MCS.5 | 10 | 1 | |
| | | | | | 4 CSI-RS | MCS.27 | | | |
| **1 CRS Port + CSI-RS + CSI-IM** | | | | | | | | | |
| RC.13 FDD | FDD | 10 | 50 | - | Non CSI-RS/IM | MCS.3 | 8 | 1 | |
| | | | | | CSI-RS/IM | N/A | | | |
| RC.13 TDD | TDD | 10 | 50 | Note 3 | Non CSI-RS/IM | MCS.3 | 10 | 1 | |
| | | | | | CSI-RS/IM | N/A | | | |
| **2 CRS Port + CSI-RS + CSI-IM** | | | | | | | | | |
| RC.10 FDD | FDD | 10 | 50 | - | Non CSI-RS | MCS.5 | 8 | 1 | |
| | | | | | 4 CSI-RS, 1 CSI process | MCS.8 | | | |
| RC.10 TDD | TDD | 10 | 50 | Note 3 | Non CSI-RS | MCS.5 | 10 | 1 | |
| | | | | | 8 CSI-RS, 1 CSI process | MCS.9 | | | |
| RC.12 FDD | FDD | 10 | 6 | - | Non CSI-RS/IM | MCS.13 | 8 | 1 | |
| | | | | | CSI-RS/IM | N/A | | | |
| RC.12 TDD | TDD | 10 | 6 | Note 3 | Non CSI-RS/IM | MCS.13 | 10 | 1 | |
| | | | | | CSI-RS/IM | N/A | | | |

Note 1: 3 symbols allocated to PDCCH.
Note 2: For FDD only subframes 1, 2, 3, 4, 6, 7, 8 and 9 are allocated to avoid PBCH and synchronization signal overhead.
Note 3: TDD UL-DL configuration as specified in the individual tests.
Note 4: For TDD when UL-DL configuration 1 is used only subframes 4 and 9 are allocated to avoid PBCH and synchronization signal overhead.
Note 5: For TDD when UL-DL configuration 2 is used only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead.
Note 6: Centred within the Transmission Bandwidth Configuration (Figure 5.4.2-1).
Note 7: Only subframes 2, 3, 4, 7, 8 and 9 are allocated to avoid PBCH and synchronization signal overhead.
Note 8: Allocate PDSCH on 5th and 6th PRBs within a subband.
Note 9: The number of HARQ processes is 10 for TDD UL/DL configuration 2 and 7 for TDD UL/DL configuration 1.
Note 10: The downlink subframes are scheduled at the 1st, 2nd, 8th, 9th, 16th, 17th, 18th, 24th, 26th, 32nd, 33rd, 34th subframes every 40ms. Information bit payload is available if downlink subframe is scheduled (starting from 0th subframe).
Note 11: 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in subframe 0 and 5 in RC.19 TDD.
Note 12: Allocate PDSCH on 3th, 4th and 5th PRBs within a narrowband. Allocate MPDCCH on the 0th and 1st PRBs within a narrowband.
Note 13: The PDSCH subframes are scheduled at the 0th and 1st subframes every 10ms. Information bit payload is available if downlink subframe is scheduled (starting from 0th subframe). MPDCCH subframes are scheduled at the 8th and 9th subframes every 10ms.
Note 14: The downlink subframes are scheduled at the 0th to 4th subframes every 20ms. Information bit payload is scheduled at the 4th subframe (starting from 0th subframe). MPDCCH and Information bit payload are not scheduled in the radio frames where systemInformation1-BR is scheduled, and

| |
|---|
| $N_{\text{PDSCH}}^{\text{SIB1-BR}}$ = 4 with the set of frames and subframes for SIB1-BR defined in TS 36.211 [16] Table 6.4.1-2. |
| Note 15: Information bit payload is scheduled at the 8th subframe every 20ms (starting from 0th subframe). |

**Table A.4-1a to Table A.4-1d: Void**

**Table A.4-2a to Table A.4-2d: Void**

**Table A.4-3a to Table A.4-3k: Void**

**Table A.4-4a/5a/6a/6b: Void**

**Table A.4-2 to Table A.4.12: Void**

**Table A.4-13: Mapping of CQI Index to Modulation coding scheme (MCS)**

| CQI Index | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Target Coding Rate | | | OOR | 0.0762 | 0.1172 | 0.1885 | 0.3008 | 0.4385 | 0.5879 | 0.3691 | 0.4785 | 0.6016 | 0.4551 | 0.5537 | 0.6504 | 0.7539 | 0.8525 | 0.9258 | |
| Modulation | | | OOR | QPSK | | | | | | 16QAM | | | 64QAM | | | | | | |
| MCS Scheme | PRB | Available RE-s | Imcs | | | | | | | | | | | | | | | | |
| MCS.1 | 50 | 6300 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 16 | 18 | 21 | 23 | 25 | 27 | 27 | |
| MCS.2 | 50 | 6000 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 27 | |
| MCS.2A | 100 | 12000 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 27 | |
| MCS.3 | 50 | 5700 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 10 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 26 | |
| MCS.3A | 100 | 11400 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 26 | |
| MCS.4 | 50 | 5600 | DTX | 0 | 0 | 2 | 4 | 6 | 7 | 10 | 12 | 14 | 17 | 19 | 21 | 23 | 25 | 26 | |
| MCS4A | 100 | 11200 | DTX | 0 | 0 | 2 | 4 | 6 | 7 | 10 | 12 | 14 | 17 | 19 | 21 | 23 | 25 | 26 | |
| MCS.5 | 50 | 5400 | DTX | 0 | 0 | 2 | 3 | 5 | 7 | 10 | 12 | 14 | 17 | 19 | 21 | 23 | 24 | 25 | |
| MCS.6 | 50 | 5300 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 17 | 19 | 21 | 22 | 24 | 25 | |
| MCS.7 | 50 | 5200 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 17 | 18 | 20 | 22 | 24 | 25 | |
| MCS.8 | 50 | 5000 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 13 | 17 | 18 | 20 | 22 | 23 | 24 | |
| MCS.9 | 50 | 4800 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 13 | 17 | 18 | 20 | 22 | 23 | 24 | |
| MCS.10 | 6 | 756 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 16 | 19 | 21 | 23 | 25 | 27 | 27 | |
| MCS.11 | 6 | 684 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 14 | 17 | 20 | 21 | 23 | 25 | 27 | |
| MCS.12 | 6 | 672 | DTX | 0 | 0 | 1 | 4 | 6 | 8 | 10 | 12 | 14 | 17 | 19 | 21 | 23 | 25 | 26 | |
| MCS.13 | 6 | 648 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 27 | |
| MCS.14 | 25 | 3150 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 16 | 18 | 21 | 23 | 25 | 27 | 27 | |
| MCS.15 | 15 | 1890 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 16 | 18 | 21 | 23 | 25 | 27 | 27 | |
| MCS.16 | 15 | 1800 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 27 | |
| MCS.17 | 3 | 378 | DTX | 0 | 1 | 2 | 5 | 7 | 9 | 12 | 13 | 16 | 19 | 21 | 23 | 25 | 27 | 27 | |
| MCS.18 | 50 | 5800 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 17 | 20 | 22 | 23 | 26 | 27 | |
| MCS.19 | 6 | 624 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 17 | 18 | 20 | 22 | 24 | 25 | |
| MCS.20 | 2 | 252 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 16 | 19 | 21 | 23 | 23 | 23 | 23 | |
| MCS.21 | 6 | 696 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 21 | 24 | 25 | 27 | |
| MCS.22 | 6 | 624 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 15 | 19 | 20 | 22 | 24 | 24 | |
| MCS.23 | 41 | 4264 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 15 | 18 | 20 | 22 | 24 | 24 | |
| MCS.24 | 50 | 5400 | DTX | 0 | 0 | 2 | 3 | 5 | 7 | 10 | 12 | 14 | 15 | 19 | 21 | 23 | 24 | 25 | |
| MCS.25 | 50 | 5100 | DTX | 0 | 0 | 1 | 3 | 5 | 7 | 8 | 12 | 13 | 15 | 18 | 20 | 22 | 23 | 24 | |
| MCS.26 | 50 | 5800 | DTX | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 27 | |
| MCS.27 CW0 | 50 | 4600 | DTX | 0 | 0 | 1 | 3 | 5 | 6 | 10 | 11 | 13 | 17 | 18 | 19 | 21 | 23 | 23 | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CW1 | 50 | 4600 | DTX | 0 | 0 | 1 | 3 | 5 | 6 | 10 | 11 | 13 | 17 | 18 | 19 | 21 | 22 | 23 |
| MCS 29 | | 50 | 5500 | DTX | 0 | 0 | 2 | 3 | 5 | 7 | 10 | 12 | 14 | 15 | 19 | 21 | 23 | 24 | 25 |

Note 1: Mapping between Imcs and TBS according to Tables 7.1.7.1-1 and 7.1.7.2.1-1 in TS 36.213 [6].
Note 2: 3 symbols allocated to PDCCH.
Note 3: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall b used for potential retransmissions.

**Table A.4-14: Mapping of CQI Index to Modulation coding scheme (Modulation and TBS index Table 2 and 4-bit CQI Table 2 are used)**

| CQI Index | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Target Coding Rate | | | OOR | 0.0762 | 0.1885 | 0.4385 | 0.3691 | 0.4785 | 0.6016 | 0.4551 | 0.5537 | 0.6504 | 0.7539 | 0.6394 | 0.6943 | 0.7783 | |
| Modulation | | | OOR | QPSK | | | 16QAM | | | 64QAM | | | | 256QAM | | | |
| MCS Scheme | PRB | Available RE-s | Imcs | | | | | | | | | | | | | | |
| MCS.1A | 50 | 6300 | DTX | 0 | 1 | 3 | 5 | 7 | 10 | 11 | 14 | 16 | 18 | 20 | 22 | 24 | |
| MCS.1B | 100 | 12600 | DTX | 0 | 1 | 3 | 5 | 7 | 10 | 11 | 14 | 15 | 18 | 20 | 22 | 24 | |

Note 1: Mapping between Imcs and TBS according to Tables 7.1.7.1-1 and 7.1.7.2.1-1 in TS 36.213 [6].
Note 2: 3 symbols allocated to PDCCH.
Note 3: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for poten

**Table A.4-15: Mapping of CQI Index to Modulation coding scheme (Modulation and TBS index Table 2 and 4-bit CQI Table 2 are used)**

| CQI Index | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Target Coding Rate | | | OOR | 0.0762 | 0.1885 | 0.4385 | 0.3691 | 0.4785 | 0.6016 | 0.6826 | 0.5537 | 0.6504 | 0.7539 | 0.8525 | 0.6943 | 0.7783 | |
| Modulation | | | OOR | QPSK | | | 16QAM | | | | 64QAM | | | | 256QA | | |
| MCS Scheme | PRB | Available RE-s | Imcs | | | | | | | | | | | | | | |
| MCS.11A | 6 | 684 | DTX | 0 | 1 | 3 | 5 | 7 | 8 | 10 | 13 | 14 | 16 | 18 | 20 | 22 | |
| MCS.12A | 6 | 672 | DTX | 0 | 1 | 3 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | |
| MCS.11B | 8 | 912 | DTX | 0 | 1 | 3 | 5 | 7 | 9 | 10 | 13 | 14 | 16 | 18 | 19 | 22 | |
| MCS.12B | 8 | 896 | DTX | 0 | 1 | 3 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 19 | 22 | |

Note 1: Mapping between Imcs and TBS according to Tables 7.1.7.1-1 and 7.1.7.2.1-1 in TS 36.213 [6].
Note 2: 3 symbols allocated to PDCCH.
Note 3: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for poten

**Table A.4-16: Mapping of CQI Index to Modulation coding scheme (Modulation and TBS index Table 3)**

| CQI Index | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Target Coding Rate | | | OOR | 0.0391 | 0.0762 | 0.1172 | 0.1885 | 0.3008 | 0.4385 | 0.5879 | 0.3691 | 0.4785 | 0.6015 | Reserved | Reserved | |
| Modulation | | | OOR | QPSK | | | | | | | 16QAM | | | | | |
| MCS Scheme | PRB | Available RE-s | Imcs | | | | | | | | | | | | | |
| MCS.28 | 3 | 378 | DTX | 0 | 0 | 0 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | N/A | N/A | N/A |
| Note 1: Mapping between Imcs and TBS according to Tables 7.1.7.1-1 and 7.1.7.2.1-1 in TS 36.213 [6]. | | | | | | | | | | | | | | | | |
| Note 2: startSymbolBR = 3 | | | | | | | | | | | | | | | | |

# A.4.1 Additional CSI reference measurement channels

This section defines additional reference measurement channels for CSI testing, required to run the test properly according to the test parameters.

**Table A.4.1-1: Uplink reference channels for transmitting CSI reports on PUSCH when being in a PUCCH reporting mode (FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 10 | | | | | |
| Allocated resource blocks | | 6 | | | | | |
| DFT-OFDM Symbols per Sub-Frame | | 12 | | | | | |
| Modulation | | QPSK | | | | | |
| Target Coding rate | | 1/3 | | | | | |
| Allocated Sub-Frames | | Note 1 | | | | | |
| Payload size | Bits | 600 | | | | | |
| Transport block CRC | Bits | 24 | | | | | |
| Number of code blocks per Sub-Frame (Note 2) | | 1 | | | | | |
| Total number of bits per Sub-Frame | Bits | 1728 | | | | | |
| Total symbols per Sub-Frame | | 864 | | | | | |
| UE Category | | ≥ 1 | | | | | |
| Note 1: All subframes, if not other specified. In case of allocation of only certain subframes, as specified in the test case, the remaining subframes are not allocated with data. All the allocation details specified in the reference channel are valid only for the allocated subframes. | | | | | | | |
| Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) | | | | | | | |

**Table A.4.1-1a: Uplink reference channels for transmitting CSI reports on PUSCH when being in a PUCCH reporting mode for UE category M1 (FDD/HD-FDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 10 | | | | | |
| Allocated resource blocks | | 6 | | | | | |
| DFT-OFDM Symbols per Sub-Frame | | 12 | | | | | |
| Modulation | | QPSK | | | | | |
| Target Coding rate | | 1/3 | | | | | |
| Allocated Sub-Frames | | Note 1 | | | | | |
| Payload size | Bits | 600 | | | | | |
| Transport block CRC | Bits | 24 | | | | | |
| Number of code blocks per Sub-Frame (Note 2) | | 1 | | | | | |
| Total number of bits per Sub-Frame | Bits | 1728 | | | | | |
| Total symbols per Sub-Frame | | 864 | | | | | |
| UE Category | | M1 | | | | | |

Note 1: All subframes, if not other specified. In case of allocation of only certain subframes, as specified in the test case, the remaining subframes are not allocated with data. All the allocation details specified in the reference channel are valid only for the allocated subframes.

Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

**Table A.4.1-2: Uplink reference channels for transmitting CSI reports on PUSCH when being in a PUCCH reporting mode (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 10 | 10 | | | | |
| Allocated resource blocks | | 6 | 6 | | | | |
| Uplink-Downlink Configuration (Note 1) | | 1 | 2 | | | | |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | | | | |
| Modulation | | QPSK | QPSK | | | | |
| Target Coding rate | | 1/3 | 1/3 | | | | |
| Allocated Sub-Frames | | Note 2 | Note 2 | | | | |
| Payload size | Bits | 600 | 600 | | | | |
| Transport block CRC | Bits | 24 | 24 | | | | |
| Number of code blocks per Sub-Frame (Note 3) | | 1 | 1 | | | | |
| Total number of bits per Sub-Frame | Bits | 1728 | 1728 | | | | |
| Total symbols per Sub-Frame | | 864 | 864 | | | | |
| UE Category | | ≥ 1 | ≥ 1 | | | | |

Note 1: As per Table 4.2-2 in TS 36.211 [4].

Note 2: All uplink subframes, if not other specified. In case of allocation of only certain uplink subframes, as specified in the test case, the remaining uplink subframes are not allocated with data. All the allocation details specified in the reference channel are valid only for the allocated uplink subframes.

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

**Table A.4.1-2a: Uplink reference channels for transmitting CSI reports on PUSCH when being in a PUCCH reporting mode for UE category M1 (TDD)**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 10 | 10 | | | | |
| Allocated resource blocks | | 6 | 6 | | | | |
| Uplink-Downlink Configuration (Note 1) | | 1 | 2 | | | | |
| DFT-OFDM Symbols per Sub-Frame | | 12 | 12 | | | | |
| Modulation | | QPSK | QPSK | | | | |
| Target Coding rate | | 1/3 | 1/3 | | | | |
| Allocated Sub-Frames | | Note 2 | Note 2 | | | | |
| Payload size | Bits | 600 | 600 | | | | |
| Transport block CRC | Bits | 24 | 24 | | | | |
| Number of code blocks per Sub-Frame (Note 3) | | 1 | 1 | | | | |
| Total number of bits per Sub-Frame | Bits | 1728 | 1728 | | | | |
| Total symbols per Sub-Frame | | 864 | 864 | | | | |
| UE Category | | ≥ 1 | ≥ 1 | | | | |
| Note 1: As per Table 4.2-2 in TS 36.211 [4].<br>Note 2: All uplink subframes, if not other specified. In case of allocation of only certain uplink subframes, as specified in the test case, the remaining uplink subframes are not allocated with data. All the allocation details specified in the reference channel are valid only for the allocated uplink subframes.<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | | | | |

# A.5 OFDMA Channel Noise Generator (OCNG)

## A.5.1 OCNG Patterns for FDD

The following OCNG patterns are used for modelling allocations to virtual UEs (which are not under test). The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG_RA and OCNG_RB which together with a relative power level ( $\gamma$ ) specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:

$$\gamma_i = PDSCH_i_RA / OCNG_RA = PDSCH_i_RB / OCNG_RB,$$

where $\gamma_i$ denotes the relative power level of the *i:th* virtual UE. The parameter settings of OCNG_RA, OCNG_RB, and the set of relative power levels $\gamma$ are chosen such that when also taking allocations to the UE under test into account, as given by a PDSCH reference channel, a transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

Moreover the OCNG pattern is accompanied by a PCFICH/PDCCH/PHICH reference channel which specifies the control region. For any aggregation and PHICH allocation, the PDCCH and any unused PHICH groups are padded with resource element groups with a power level given respectively by PDCCH_RA/RB and PHICH_RA/RB as specified in the test case such that a total power spectral density in the control region that is constant on an OFDM symbol basis is targeted.

### A.5.1.1 OCNG FDD pattern 1: One sided dynamic OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided).

**Table A.5.1.1-1: OP.1 FDD: One sided dynamic OCNG FDD Pattern**

| Relative power level $\gamma_{PRB}$ [dB] | | | PDSCH Data |
|---|---|---|---|
| Subframe | | | |
| 0 | 5 | 1 – 4, 6 – 9 | |
| Allocation | | | |
| First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | |
| 0 | 0 | 0 | Note 1 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter $\gamma_{PRB}$ applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

## A.5.1.2 OCNG FDD pattern 2: Two sided dynamic OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in two parts by the allocated area – two sided), starts with PRB 0 and ends with PRB $N_{RB}-1$.

**Table A.5.1.2-1: OP.2 FDD: Two sided dynamic OCNG FDD Pattern**

| Relative power level $\gamma_{PRB}$ [dB] | | | PDSCH Data |
|---|---|---|---|
| Subframe | | | |
| 0 | 5 | 1 – 4, 6 – 9 | |
| Allocation | | | |
| 0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB}-1$) | 0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB}-1$) | 0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB}-1$) | |
| 0 | 0 | 0 | Note 1 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter $\gamma_{PRB}$ applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

### A.5.1.3 OCNG FDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz

**Table A.5.1.3-1: OP.3 FDD: OCNG FDD Pattern 3**

| Allocation $n_{PRB}$ | Relative power level $\gamma_{PRB}$ [dB] | | | | PDSCH Data | PMCH Data |
|---|---|---|---|---|---|---|
| | Subframe | | | | | |
| | 0 | 5 | 4, 9 | 1 – 3, 6 – 8 | | |
| 1 – 49 | 0 | 0 (Allocation: all empty PRB-s) | 0 | N/A | Note 1 | N/A |
| 0 – 49 | N/A | N/A | N/A | 0 | N/A | Note 2 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH subframes shall contain cell-specific Reference Signals only in the first symbol of the first time slot. The parameter $\gamma_{PRB}$ is used to scale the power of PMCH.

Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

N/A: Not Applicable

### A.5.1.4 OCNG FDD pattern 4: One sided dynamic OCNG FDD pattern for MBMS transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided) and MBMS performance is tested.

**Table A.5.1.4-1: OP.4 FDD: One sided dynamic OCNG FDD Pattern for MBMS transmission**

| Allocation $n_{PRB}$ | Relative power level $\gamma_{PRB}$ [dB] | | | PDSCH Data | PMCH Data |
|---|---|---|---|---|---|
| | Subframe | | | | |
| | 0, 4, 9 | 5 | 1 – 3, 6 – 8 | | |

| | | | | | |
|---|---|---|---|---|---|
| First unallocated PRB<br>–<br>Last unallocated PRB | 0 | 0<br>(Allocation: all empty PRB-s) | N/A | Note 1 | N/A |
| First unallocated PRB<br>–<br>Last unallocated PRB | N/A | N/A | N/A | N/A | Note 2 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH subframes shall contain cell-specific Reference Signals only in the first symbol of the first time slot. The parameter $\gamma_{PRB}$ is used to scale the power of PMCH.

Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

N/A: Not Applicable

## A.5.1.5 OCNG FDD pattern 5: One sided dynamic 16QAM modulated OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of DL sub-frames, when the unallocated area is continuous in the frequency domain (one sided).

**Table A.5.1.5-1: OP.5 FDD: One sided dynamic 16QAM modulated OCNG FDD Pattern**

| **Relative power level $\gamma_{PRB}$ [dB]** | | | **PDSCH Data** |
|---|---|---|---|
| **Subframe** | | | |
| 0 | 5 | 1 – 4, 6 – 9 | |
| **Allocation** | | | |
| First unallocated PRB<br>–<br>Last unallocated PRB | First unallocated PRB<br>–<br>Last unallocated PRB | First unallocated PRB<br>–<br>Last unallocated PRB | |
| 0 | 0 | 0 | Note 1 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 3 (Large Delay CDD). The parameter $\gamma_{PRB}$ applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

## A.5.1.6 OCNG FDD pattern 6: dynamic OCNG FDD pattern when user data is in 2 non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in two parts by the first allocated block). The second allocated block ends with PRB $N_{RB}-1$.

**Table A.5.1.6-1: OP.6 FDD: OCNG FDD Pattern when user data is in 2 non-contiguous blocks**

| **Relative power level $\gamma_{PRB}$ [dB]** | | | **PDSCH Data** |
|---|---|---|---|
| **Subframe** | | | |
| 0 | 5 | 1 – 4, 6 – 9 | |
| **Allocation** | | | |
| 0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) | 0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) | 0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) | |
| 0 | 0 | 0 | Note 1 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter $\gamma_{PRB}$ applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

## A.5.1.7 OCNG FDD pattern 7: dynamic OCNG FDD pattern when user data is in multiple non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data, EPDCCH or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in multiple parts by the *M* allocated blocks for data transmission). The *m*-th allocated block starts with RPB $N_{Start,m}$ and ends with PRB $N_{End,m}-1$, where *m* = 1, …, *M*. The system bandwidth starts with RPB 0 and ends with $N_{RB}-1$.

**Table A.5.1.7-1: OP.7 FDD: OCNG FDD Pattern when user data is in multiple non-contiguous blocks**

| Relative power level $\gamma_{PRB}$ [dB] | | | PDSCH Data |
|---|---|---|---|
| Subframe | | | |
| 0 | 5 | 1 – 4, 6 – 9 | |
| Allocation | | | |
| 0 – (PRB $N_{Start,1}-1$)<br>…<br>(PRB $N_{End,(m-1)}$) – (PRB $N_{Start,m}-1$)<br>…<br>(PRB $N_{End,M}$) – (PRB $N_{RB}-1$) | 0 – (PRB $N_{Start,1}-1$)<br>…<br>(PRB $N_{End,(m-1)}$) – (PRB $N_{Start,m}-1$)<br>…<br>(PRB $N_{End,M}$) – (PRB $N_{RB}-1$) | 0 – (PRB $N_{Start,1}-1$)<br>…<br>(PRB $N_{End,(m-1)}$) – (PRB $N_{Start,m}-1$)<br>…<br>(PRB $N_{End,M}$) – (PRB $N_{RB}-1$) | |
| 0 | 0 | 0 | Note 1 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter $\gamma_{PRB}$ applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213 [10].

## A.5.1.8 OCNG FDD pattern 8: One sided dynamic OCNG FDD pattern for TM10 transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided).

**Table A.5.1.8-1: OP.8 FDD: One sided dynamic OCNG FDD Pattern**

| Relative power level $\gamma_{PRB}$ [dB] | | | PDSCH Data |
|---|---|---|---|
| Subframe | | | |
| 0 | 5 | 1 – 4, 6 – 9 | |
| Allocation | | | |
| First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | |
| 0 | 0 | 0 | Note 1,2,3 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: The OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode10. The transmit power is equal between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213 [10].

Note 3: The detailed test set-up for TM10 transmission i.e. PMI configuration is specified to each test case.

# A.5.2 OCNG Patterns for TDD

The following OCNG patterns are used for modelling allocations to virtual UEs (which are not under test). The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG_RA and OCNG_RB which together with a relative power level ( $\gamma$ ) specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:

$$\gamma_i = PDSCH_i_RA / OCNG_RA = PDSCH_i_RB / OCNG_RB,$$

where $\gamma_i$ denotes the relative power level of the *i:th* virtual UE. The parameter settings of OCNG_RA, OCNG_RB, and the set of relative power levels $\gamma$ are chosen such that when also taking allocations to the UE under test into account, as given by a PDSCH reference channel, a transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

Moreover the OCNG pattern is accompanied by a PCFICH/PDCCH/PHICH reference channel which specifies the control region. For any aggregation and PHICH allocation, the PDCCH and any unused PHICH groups are padded with resource element groups with a power level given respectively by PDCCH_RA/RB and PHICH_RA/RB as specified in the test case such that a total power spectral density in the control region that is constant on an OFDM symbol basis is targeted.

## A.5.2.1 OCNG TDD pattern 1: One sided dynamic OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is continuous in frequency domain (one sided).

**Table A.5.2.1-1: OP.1 TDD: One sided dynamic OCNG TDD Pattern**

| **Relative power level $\gamma_{PRB}$ [dB]** | | | | **PDSCH Data** |
|---|---|---|---|---|
| **Subframe (only if available for DL)** | | | | |
| 0 | 5 | 3, 4, 7, 8, 9 and 6 (as normal subframe) Note 2 | 1 and 6 (as special subframe) Note 2 | |
| **Allocation** | | | | |
| First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | |
| 0 | 0 | 0 | 0 | **Note 1** |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211.

Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter $\gamma_{PRB}$ applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

## A.5.2.2 OCNG TDD pattern 2: Two sided dynamic OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is discontinuous in frequency domain (divided in two parts by the allocated area – two sided), starts with PRB 0 and ends with PRB $N_{RB} - 1$.

**Table A.5.2.2-1: OP.2 TDD: Two sided dynamic OCNG TDD Pattern**

| Relative power level $\gamma_{PRB}$ [dB] | | | | PDSCH Data |
|---|---|---|---|---|
| Subframe (only if available for DL) | | | | |
| 0 | 5 | 3, 4, 6, 7, 8, 9 (6 as normal subframe) Note 2 | 1,6 (6 as special subframe) Note 2 | |
| Allocation | | | | |
| 0 – (First allocated PRB-1) and (Last allocated PRB+1) – ( $N_{RB}-1$) | 0 – (First allocated PRB-1) and (Last allocated PRB+1) – ( $N_{RB}-1$) | 0 – (First allocated PRB-1) and (Last allocated PRB+1) – ( $N_{RB}-1$) | 0 – (First allocated PRB-1) and (Last allocated PRB+1) – ( $N_{RB}-1$) | |
| 0 | 0 | 0 | 0 | Note 1 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211.

Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter $\gamma_{PRB}$ applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

## A.5.2.3 OCNG TDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz

**Table A.5.2.3-1: OP.3 TDD: OCNG TDD Pattern 3 for 5ms downlink-to-uplink switch-point periodicity**

| Allocation $n_{PRB}$ | Relative power level $\gamma_{PRB}$ [dB] | | | | PDSCH Data | PMCH Data |
|---|---|---|---|---|---|---|
| | Subframe | | | | | |
| | 0 | 5 | 4, 9 Note 2 | 1, 6 | | |
| 1 – 49 | 0 | 0 (Allocation: all empty PRB-s) | N/A | 0 | Note 1 | N/A |
| 0 – 49 | N/A | N/A | 0 | N/A | N/A | Note 3 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211.

Note 3: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH symbols shall not contain cell-specific Reference Signals

Note 4: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

N/A: Not Applicable

## A.5.2.4 OCNG TDD pattern 4: One sided dynamic OCNG TDD pattern for MBMS transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided) and MBMS performance is tested.

**Table A.5.2.4-1: OP.4 TDD: One sided dynamic OCNG TDD Pattern for MBMS transmission**

| **Allocation** $n_{PRB}$ | **Relative power level** $\gamma_{PRB}$ **[dB]** | | | | **PDSCH Data** | **PMCH Data** |
|---|---|---|---|---|---|---|
| | **Subframe (only for DL)** | | | | | |
| | 0 and 6 (as normal subframe) | 1 (as special subframe) | 5 | 3, 4, 7 – 9 | | |
| First unallocated PRB – Last unallocated PRB | 0 | 0 (Allocation: all empty PRB-s of DwPTS) | 0 (Allocation: all empty PRB-s) | N/A | Note 1 | N/A |
| First unallocated PRB – Last unallocated PRB | N/A | N/A | N/A | N/A | N/A | Note2 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH symbols shall not contain cell-specific Reference Signals.

Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

N/A Not Applicable

## A.5.2.5 OCNG TDD pattern 5: One sided dynamic 16QAM modulated OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the sub-frames available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is continuous in frequency domain (one sided).

**Table A.5.2.5-1: OP.5 TDD: One sided dynamic 16QAM modulated OCNG TDD Pattern**

| Relative power level $\gamma_{PRB}$ [dB] | | | | PDSCH Data |
|---|---|---|---|---|
| Subframe (only if available for DL) | | | | |
| 0 | 5 | 3, 4, 7, 8, 9 and 6 (as normal subframe) Note 2 | 1 and 6 (as special subframe) Note 2 | |
| Allocation | | | | |
| First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | |
| 0 | 0 | 0 | 0 | Note 1 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211

Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 3 (Large Delay CDD). The parameter $\gamma_{PRB}$ applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

## A.5.2.6 OCNG TDD pattern 6: dynamic OCNG TDD pattern when user data is in 2 non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is discontinuous in frequency domain (divided in two parts by the first allocated block). The second allocated block ends with PRB $N_{RB}-1$.

**Table A.5.2.6-1: OP.6 TDD: OCNG TDD Pattern when user data is in 2 non-contiguous blocks**

| Relative power level $\gamma_{PRB}$ [dB] | | | | PDSCH Data |
|---|---|---|---|---|
| Subframe (only if available for DL) | | | | |
| 0 | 5 | 3, 4, 6, 7, 8, 9 (6 as normal subframe) Note 2 | 1,6 (6 as special subframe) Note 2 | |
| Allocation | | | | |
| 0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) | 0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) | 0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) | 0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1) | |
| 0 | 0 | 0 | 0 | Note 1 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211

Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter $\gamma_{PRB}$ applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

## A.5.2.7 OCNG TDD pattern 7: dynamic OCNG TDD pattern when user data is in multiple non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data, EPDCCH or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in multiple parts by the *M* allocated blocks for data transmission). The *m*-th allocated block starts with RPB $N_{Start,m}$ and ends with PRB $N_{End,m}-1$, where $m = 1, \ldots, M$. The system bandwidth starts with RPB 0 and ends with $N_{RB}-1$.

**Table A.5.2.7-1: OP.7 TDD: OCNG TDD Pattern when user data is in multiple non-contiguous blocks**

| Relative power level $\gamma_{PRB}$ [dB] | | | | PDSCH Data |
|---|---|---|---|---|
| Subframe (only if available for DL) | | | | |
| **0** | **5** | **3, 4, 6, 7, 8, 9 (6 as normal subframe)** Note 2 | **1,6 (6 as special subframe)** Note 2 | |
| **Allocation** | | | | |
| 0 – (PRB $N_{Start,1}-1$) … (PRB $N_{End,(m-1)}$) – (PRB $N_{Start,m}-1$) … (PRB $N_{End,M}$) – (PRB $N_{RB}-1$) | 0 – (PRB $N_{Start,1}-1$) … (PRB $N_{End,(m-1)}$) – (PRB $N_{Start,m}-1$) … (PRB $N_{End,M}$) – (PRB $N_{RB}-1$) | 0 – (PRB $N_{Start,1}-1$) … (PRB $N_{End,(m-1)}$) – (PRB $N_{Start,m}-1$) … (PRB $N_{End,M}$) – (PRB $N_{RB}-1$) | 0 – (PRB $N_{Start,1}-1$) … (PRB $N_{End,(m-1)}$) – (PRB $N_{Start,m}-1$) … (PRB $N_{End,M}$) – (PRB $N_{RB}-1$) | |
| 0 | 0 | 0 | 0 | Note 1 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211 [8].

Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter $\gamma_{PRB}$ applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213 [10].

## A.5.2.8 OCNG TDD pattern 8: One sided dynamic OCNG TDD pattern for TM10 transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided).

**Table A.5.2.8-1: OP.8 TDD: One sided dynamic OCNG TDD Pattern**

| Relative power level $\gamma_{PRB}$ [dB] | | | PDSCH Data |
|---|---|---|---|
| Subframe | | | |
| 0 | 5 | 1 – 4, 6 – 9 | |
| Allocation | | | |
| First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | |
| 0 | 0 | 0 | Note 1,2,3 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: The OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode10. The transmit power is equal between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213 [10].

Note 3: The detailed test set-up for TM10 transmission i.e. PMI configuration is specified to each test case.

# A.5.3 OCNG Patterns for Narrowband IoT

The following OCNG patterns are used for modelling allocations to virtual narrowband IoT UEs (which are not under test). The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG_RA and OCNG_RB which together with a relative power level ( $\gamma$ ) specifies the NPDSCH EPRE-to-NRS EPRE ratios in OFDM symbols with and without Narrowband reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:

$$\gamma_i = NPDSCH_i_RA / OCNG_RA = NPDSCH_i_RB / OCNG_RB,$$

where $\gamma_i$ denotes the relative power level of the *i:th* virtual UE. The parameter settings of OCNG_RA, OCNG_RB, and the set of relative power levels $\gamma$ are chosen such that when also taking allocations to the UE under test into account, as given by a NPDSCH or NPDCCH reference channel, a transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

## A.5.3.1 Narrowband IoT OCNG pattern 1

**Table A.5.3.1-1: NB.OP.1 FDD: OCNG FDD Pattern 1**

| Bandwidth | Relative power level $\gamma$ [dB] | NPDCCH and corresponding NPDSCH Data |
|---|---|---|
| | Subframe | |
| | Unused subframes | |

| | | |
|---|---|---|
| 200KHz | 0 | Note 2 |

Note 1: These subframes are assigned to an arbitrary number of virtual UEs with one NPDSCH per virtual UE with corresponding NPDCCH; the data transmitted over the OCNG NPDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma$ is used to scale the power of NPDSCH and NPDCCH.

Note 2: Subframes and/or REs available for narrowband IOT DL transmission depend on the in-band, guard band or standalone mode indicated in MIB, and scheduling delay between NPDCCH, NPDSCH, NPUSCH format 2 and NPDCCH specified in test cases.

Note 3: If two or more transmit antennas with NRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with NRS according to transmit diversity scheme. The parameter $\gamma$ applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with NRS used in the test.

## A.5.4 OCNG Patterns for frame structure type

The following OCNG patterns are used for modelling allocations to virtual UEs (which are not under test). The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG_RA and OCNG_RB which together with a relative power level ( $\gamma$ ) specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:

$$\gamma_i = PDSCH_i_RA / OCNG_RA = PDSCH_i_RB / OCNG_RB,$$

where $\gamma_i$ denotes the relative power level of the *i:th* virtual UE. The parameter settings of OCNG_RA, OCNG_RB, and the set of relative power levels $\gamma$ are chosen such that when also taking allocations to the UE under test into account, as given by a PDSCH reference channel, a constant transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

Moreover the OCNG pattern is accompanied by a PDCCH reference channel which specifies the control region. For any aggregation the PDCCH are padded with resource element groups with a power level given respectively by PDCCH_RA/RB as specified in the test case such that a total power spectral density in the control region that is constant on an OFDM symbol basis is targeted.

For the performance requirements of UE with the CA capability, the OCNG patterns apply for each LAA Scell.

### A.5.4.1 OCNG FS3 pattern 1: One sided dynamic OCNG frame structure type 3 pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided).

**Table A.5.4.1-1: OP.1 FS3: One sided dynamic OCNG frame structure type 3 Pattern**

| **Relative power level $\gamma_{PRB}$ [dB]** | | | **PDSCH Data** |
|---|---|---|---|
| **Subframe** | | | |
| 0 | 5 | 1 – 4, 6 – 9 | |
| **Allocation** | | | |
| First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | First unallocated PRB – Last unallocated PRB | |
| 0 | 0 | 0 | Note 1 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter $\gamma_{PRB}$ applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213[10].

Note 3: Subframes available for DL transmission and Occupied OFDM symbols in each subframe depend on the downlink burst transmission pattern and its corresponding configuration

## A.5.4.2 OCNG FS3 pattern 2: Two sided dynamic OCNG frame structure 3 pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in two parts by the allocated area – two sided), starts with PRB 0 and ends with PRB $N_{RB}-1$.

**Table A.5.4.2-1: OP.2 FS3: Two sided dynamic OCNG frame structure type 3 Pattern**

| **Relative power level $\gamma_{PRB}$ [dB]** | | | **PDSCH Data** |
|---|---|---|---|
| **Subframe** | | | |
| 0 | 5 | 1 – 4, 6 – 9 | |
| **Allocation** | | | |
| 0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB}-1$) | 0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB}-1$) | 0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB}-1$) | |
| 0 | 0 | 0 | Note 1 |

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter $\gamma_{PRB}$ is used to scale the power of PDSCH.

Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter $\gamma_{PRB}$ applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

Note 3: Subframes available for DL transmission and Occupied OFDM symbols in each subframe depend on the downlink burst transmission pattern and its corresponding configuration.

# A.6 Sidelink reference measurement channels

## A.6.1 General

The algorithm for determining the payload size $A$ is as follows; given a desired coding rate $R$ and radio block allocation $N_{RB}$

1. Calculate the number of channel bits $N_{ch}$ that can be transmitted during the first transmission of a given sub-frame.

2. Find $A$ such that the resulting coding rate is as close to $R$ as possible, that is,

$$\min\left|R-(A+24*(N_{CB}+1))/N_{ch}\right|, \text{ where } N_{CB}=\begin{cases}0, \text{if } C=1\\ C, \text{if } C>1\end{cases},$$

subject to

a) A is a valid TB size according to section 7.1.7 of TS 36.213 [10] assuming an allocation of $N_{RB}$ resource blocks.

b) $C$ is the number of Code Blocks calculated according to section 5.1.2 of TS 36.212 [9].

3. If there is more than one $A$ that minimizes the equation above, then the larger value is chosen per default and the chosen code rate should not exceed 0.93.

## A.6.2 Reference measurement channel for receiver characteristics

For ProSe Direct Discovery, Table A.6.2-1 is applicable for measurements on the Receiver Characteristics (clause 7) including the requirements of subclause 7.4D (Maximum input level).

For ProSe Direct Communication, Table A.6.2-2 is applicable for measurements on the Receiver Characteristics (clause 7) with the exception of subclause 7.4D (Maximum input level). Tables A.6.2-3, A.6.2-4, are applicable for subclause 7.4D (Maximum input level).

**Table A.6.2-1: Fixed Reference measurement channel for ProSe Direct Discovery receiver requirements and maximum input level**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | 2 | 2 | 2 | 2 |
| Subcarriers per resource block | | | | 12 | 12 | 12 | 12 |
| Allocated subframes per Discovery period | | | | 1 | 1 | 1 | 1 |
| DFT-OFDM Symbols per subframe (see note) | | | | 11 | 11 | 11 | 11 |
| Modulation | | | | QPSK | QPSK | QPSK | QPSK |
| Transport Block Size | | | | 232 | 232 | 232 | 232 |
| Transport block CRC | Bits | | | 24 | 24 | 24 | 24 |
| Maximum number of HARQ transmissions | | | | 1 | 1 | 1 | 1 |
| Binary Channel Bits (see note) | Bits | | | 528 | 528 | 528 | 528 |
| Max. Throughput averaged over 1 Discovery period of 320ms | kbps | | | 0.725 | 0.725 | 0.725 | 0.725 |
| UE Category | | | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| NOTE1: PSDCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.<br>NOTE2: Throughput is 232 bits per Discovery period. The discovery period is configured as 320ms in the test. | | | | | | | |

**Table A.6.2-2: Fixed Reference measurement channel for ProSe Direct Communication receiver requirements**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | 25 | 50 | | |
| Subcarriers per resource block | | | | 12 | 12 | | |
| Packets per SA period | | | | 1 | 1 | | |
| Modulation | | | | QPSK | QPSK | | |
| Transport Block Size | | | | 2216 | 4392 | | |
| Transport block CRC | Bits | | | 24 | 24 | | |
| Maximum number of HARQ transmissions | | | | 4 | 4 | | |
| Binary Channel Bits | Bits | | | 7200 | 14400 | | |
| Max. Throughput averaged over 1 SA period of 40ms | kbps | | | 55.4 | 109.8 | | |
| UE Category | | | | ≥ 1 | ≥ 1 | | |
| NOTE 1: For PSSCH transmission, the last symbol shall be punctured as per TS 36.211.<br>NOTE 2: Throughput (in kbps) will depend on SA period configuration | | | | | | | |

**Table A.6.2-3: Fixed Reference measurement channel for ProSe Direct Communication for maximum input power for UE categories 2-8**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | 25 | 50 | | |
| Subcarriers per resource block | | | | 12 | 12 | | |
| Packets per SA period | | | | 1 | 1 | | |
| Modulation | | | | 16QAM | 16QAM | | |
| Transport Block Size | | | | 9912 | 18336 | | |
| Transport block CRC | Bits | | | 24 | 24 | | |
| Maximum number of HARQ transmissions | | | | 4 | 4 | | |
| Binary Channel Bits | Bits | | | 14400 | 28800 | | |
| Max. Throughput averaged over 1 SA period of 40ms | kbps | | | 247.8 | 458.4 | | |
| NOTE 1: For PSSCH transmission, the last symbol shall be punctured as per TS 36.211.<br>NOTE 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).<br>NOTE 3: Throughput (in kbps) will depend on SA period configuration | | | | | | | |

**Table A.6.2-4: Fixed Reference measurement channel for ProSe Direct Communication for maximum input power for UE category 1**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | 25 | 24 | | |
| Subcarriers per resource block | | | | 12 | 12 | | |
| Packets per SA period | | | | 1 | 1 | | |
| Modulation | | | | 16QAM | 16QAM | | |
| Transport Block Size | | | | 9912 | 10296 | | |
| Transport block CRC | Bits | | | 24 | 24 | | |
| Maximum number of HARQ transmissions | | | | 4 | 4 | | |
| Binary Channel Bits | Bits | | | 14400 | 13824 | | |
| Max. Throughput averaged over 1 SA period of 40ms | kbps | | | 247.8 | 257.4 | | |
| NOTE 1: For PSSCH transmission, the last symbol shall be punctured as per TS 36.211.<br>NOTE 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).<br>NOTE 3: Throughput (in kbps) will depend on SA period configuration | | | | | | | |

## A.6.3 Reference measurement channels for PSDCH performance requirements

**Table A.6.3-1: Fixed Reference measurement channel for PSDCH performance requirement**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Reference channel | | D.1 FDD / D.1 TDD | | | | | |
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | 2 | 2 | 2 | 2 |
| Subcarriers per resource block | | | | 12 | 12 | 12 | 12 |
| DFT-OFDM Symbols per subframe (see note) | | | | 11 | 11 | 11 | 11 |
| Modulation | | | | QPSK | QPSK | QPSK | QPSK |
| Transport Block Size | | | | 232 | 232 | 232 | 232 |
| Transport block CRC | Bits | | | 24 | 24 | 24 | 24 |
| Binary Channel Bits (see note) | Bits | | | 528 | 528 | 528 | 528 |
| Max. Throughput averaged over 1 Discovery period of 320ms | kbps | | | 0.725 | 0.725 | 0.725 | 0.725 |
| UE Category | | | | ≥ 1 | ≥ 1 | ≥ 1 | ≥ 1 |
| NOTE1: PSDCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211. | | | | | | | |

## A.6.4 Reference measurement channels for PSCCH performance requirements

**Table A.6.4-1: Fixed reference measurement channel for PSCCH performance requirement**

| Parameter | | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | | CC.1 FDD | CC.2 FDD | CC.3 FDD | CC.4 FDD | CC.5 FDD | CC.6 FDD |
| Channel bandwidth | | MHz | 5 | 10 | 5 | 10 | 5 | 10 |
| Allocated resource blocks | | | 1 | 1 | 1 | 1 | 1 | 1 |
| Subcarriers per resource block | | | 12 | 12 | 12 | 12 | 12 | 12 |
| DFT-OFDM Symbols per subframe (see NOTE 1) | | | 11 | 11 | 11 | 11 | 11 | 11 |
| Modulation | | | QPSK | QPSK | QPSK | QPSK | QPSK | QPSK |
| Transport Block Size | | Bits | 41 | 43 | 41 | 43 | 41 | 43 |
| Information bits | Frequency hopping flag | | 0 | 0 | 1 | 1 | 1 | 1 |
| | RB assignment | | Set as per PSSCH RB allocation specific in the test | | | | | |
| | Hopping bits | | N/A | N/A | 1 Type 2 Hopping | (1,1) Type 2 Hopping | 0 Type 1 Hopping | (1,0) Type 1 Hopping |
| | Time resource pattern ($I_{TRP}$) | | 8 (unless specified otherwise in the test) (NOTE 3) | | | | | |
| | Modulation and coding scheme | | Set as the PSSCH MCS specified in the test | | | | | |
| | Timing advance indication | | 0 (unless specified otherwise in the test) | | | | | |
| | Group destination ID | | As set by higher layers | | | | | |
| Transport block CRC | | Bits | 16 | 16 | 16 | 16 | 16 | 16 |
| Maximum number of HARQ transmissions | | | 2 | 2 | 2 | 2 | 2 | 2 |
| Binary Channel Bits (see NOTE 1,2) | | Bits | 264 | 264 | 264 | 264 | 264 | 264 |
| Max. Throughput averaged over one sc-period (bits/sc-period) | | | 41 | 43 | 41 | 43 | 41 | 43 |
| NOTE 1: PSCCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.<br>NOTE 2: Binary channel bits per HARQ transmission.<br>NOTE 3: For $N_{TRP}$ = 8 (FDD) and *trpt-Subset* = 010, $I_{TRP}$ = 8 corresponds to a time repetition pattern of (1,1,0,0,0,0,0,0) as per TS 36.213. | | | | | | | | |

## A.6.5 Reference measurement channels for PSSCH performance requirements

**Table A.6.5-1: Fixed reference measurement channel for PSSCH performance requirement**

| Parameter | Unit | Value | | | | |
|---|---|---|---|---|---|---|
| Reference channel | | CD.1 FDD | CD.2 FDD | CD.3 FDD | CD.4 FDD | CD.5 FDD |
| Channel bandwidth | MHz | 5 / 10 | 5 / 10 | 5 | 10 | 5 / 10 |
| Allocated resource blocks | | 10 | 10 | 25 | 50 | 2 |
| Subcarriers per resource block | | 12 | 12 | 12 | 12 | 12 |
| DFT-OFDM Symbols per subframe (see NOTE 1) | | 11 | 11 | 11 | 11 | 11 |
| Modulation | | QPSK | 16QAM | 16QAM | 16QAM | QPSK |
| Transport Block Size | | 872 | 2536 | 6546 | 12960 | 328 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 |
| Maximum number of HARQ transmissions | | 4 | 4 | 4 | 4 | 4 |
| Binary Channel Bits (see NOTE 1,2) | Bits | 2640 | 5280 | 13200 | 26400 | 528 |
| Max. Throughput averaged over one sc-period (bits/sc-period) | | 872 | 2536 | 6546 | 12960 | 328 |
| NOTE 1: PSSCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.<br>NOTE 2: Binary channel bits per HARQ transmission.<br>NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | | | |

**Table A.6.5-2: Fixed reference measurement channel for PSSCH for maximum Sidelink processes test**

| Parameter | Unit | Value | |
|---|---|---|---|
| Reference channel | | CD.6 FDD | CD.7 FDD |
| Channel bandwidth | MHz | 5 | 10 |
| Allocated resource blocks | | 25 | 50 |
| Subcarriers per resource block | | 12 | 12 |
| DFT-OFDM Symbols per subframe (see NOTE 1) | | 11 | 11 |
| Modulation | | 16QAM | 16QAM |
| Transport Block Size | | 15840 | 25456 |
| Transport block CRC | Bits | 24 | 24 |
| Maximum number of HARQ transmissions | | 4 | 4 |
| Binary Channel Bits (see NOTE 1,2) | Bits | 13200 | 26400 |
| Max. Throughput averaged over one sc-period (bits/sc-period) | | 15840 | 25456 |
| NOTE 1: PSSCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.<br>NOTE 2: Binary channel bits per HARQ transmission.<br>NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | |

## A.6.6 Reference measurement channels for PSBCH performance requirements

**Table A.6.6-1: Fixed reference measurement channel for PSBCH performance requirement**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | CP.1 FDD |
| Channel bandwidth | MHz | 5 / 10 |
| Allocated resource blocks | | 6 |
| Subcarriers per resource block | | 12 |
| DFT-OFDM Symbols per subframe (see NOTE 1) | | 7 |
| Modulation | | QPSK |
| Transport Block Size | | 40 |
| Transport block CRC | Bits | 16 |
| Maximum number of HARQ transmissions | | 1 |
| Binary Channel Bits (see NOTE 1,2) | Bits | 1008 |
| Max. Throughput averaged over 40ms | kbps | 1 |
| NOTE 1: PSBCH transmissions are rate-matched for 8 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211. | | |

# A.7 Sidelink reference resource pool configurations

## A.7.1 Reference resource pool configurations for ProSe Direct Discovery demodulation tests

### A.7.1.1 FDD

**Table A.7.1.1-1: ProSe Direct Discovery configuration for E-UTRA FDD (Configuration #1-FDD)**

| Information Element | | | Value |
|---|---|---|---|
| discRxPool | cp-Len | | Normal |
| | discPeriod | | rf32 |
| | numRetx | | 0 |
| | numRepetition | | 1 |
| | tf-ResourceConfig | prb-Num | 12 |
| | | prb-Start | 0 |
| | | prb-End | 23 |
| | | offsetIndicator | 160 |
| | | subframeBitmap | 10000000 00000000 00000000 00000000 00000000 |
| | txParameters | | not present |
| | rxParameters | | not present |
| discTxPoolCommon | | | not present |
| discTxPowerInfo | | | not present |
| SL-SyncConfig | | | not present |
| discInterFreqList | | | not present |

**Table A.7.1.1-2: ProSe Direct Discovery configuration for E-UTRA FDD (Configuration #2-FDD)**

| Information Element | | | Value |
|---|---|---|---|
| discRxPool(0) | cp-Len | | Normal |
| | discPeriod | | rf32 |
| | numRetx | | 0 |
| | numRepetition | | 1 |
| | tf-ResourceConfig | prb-Num | 12 |
| | | prb-Start | 0 |
| | | prb-End | 23 |
| | | offsetIndicator | 150 |
| | | subframeBitmap | 10000000<br>00000000<br>00000000<br>00000000<br>00000000 |
| | txParameters | | not present |
| | rxParameters | | not present |
| discRxPool(1) | cp-Len | | Normal |
| | discPeriod | | rf32 |
| | numRetx | | 0 |
| | numRepetition | | 1 |
| | tf-ResourceConfig | prb-Num | 12 |
| | | prb-Start | 0 |
| | | prb-End | 23 |
| | | offsetIndicator | 170 |
| | | subframeBitmap | 10000000<br>00000000<br>00000000<br>00000000<br>00000000 |
| | *txParameters* | | not present |
| | *rxParameters* | *tdd-Config* | not present |
| | | *syncConfigIndex* | 0 |
| *discTxPoolCommon* | | | not present |
| *discTxPowerInfo* | | | not present |
| *SL-SyncConfig(0)* | *syncCP-Len* | | Normal |
| | *syncOffsetIndicator* | | 160 |
| | *slssid* | | 30 |
| | *txParameters* | | not present |
| | *rxParamsNCell* | *physCellId* | 1 |
| | | *discSyncWindow* | w1 |
| *discInterFreqList* | | | not present |

**Table A.7.1.1-3: ProSe Direct Discovery configuration for E-UTRA FDD (Configuration #3-FDD)**

| Information Element | | | Value |
|---|---|---|---|
| discRxPool(iPool), iPool = 0…NPool-1 | cp-Len | | Normal |
| | discPeriod | | rf32 |
| | numRetx | | 3 |
| | numRepetition | | =2 if NPool > 10,<br>=1 otherwise |
| | tf-ResourceConfig | prb-Num | 5MHz: min{24, 2N-24*iPool} / 2<br>10MHz: 25<br>15MHz: min{74, 2N-74*iPool} / 2<br>20MHz: 50 |
| | | prb-Start | 0 |
| | | prb-End | 5 MHz: min{24, 2N-24*iPool} - 1<br>10 MHz: 49<br>15 MHz: min{74, 2N-74*iPool} - 1<br>20 MHz: 99 |
| | | offsetIndicator | 160 |
| | | subframeBitmap | a(0), a(1), …, a(39), s.t.<br><br>a(i * NPool + iPool) = 1, i = 0,..,K;<br>a(k) = 0 otherwise<br><br>where<br>K = 1 is NPool > 10, K = 3 otherwise |
| | txParameters | | not present |
| | rxParameters | | not present |
| discTxPoolCommon | | | not present |
| discTxPowerInfo | | | not present |
| SL-SyncConfig | | | not present |
| discInterFreqList | | | not present |
| NOTE 1: The resource pool configuration description is parameterized using channel BW, number of configured resource pools (NPool), and maximum number of configured Sidelink UEs to be supported (N). | | | |

## A.7.1.2 TDD

**Table A.7.1.2-1: ProSe Direct Discovery configuration for E-UTRA TDD Config 0 (Configuration #1-TDD)**

| Information Element | | | Value |
|---|---|---|---|
| discRxPool | cp-Len | | Normal |
| | discPeriod | | rf32 |
| | numRetx | | 0 |
| | numRepetition | | 1 |
| | tf-ResourceConfig | prb-Num | 12 |
| | | prb-Start | 0 |
| | | prb-End | 23 |
| | | offsetIndicator | 163 |
| | | subframeBitmap | 10000000<br>00000000<br>00000000<br>00000000<br>00000000<br>00 |
| | txParameters | | not present |
| | rxParameters | | not present |
| discTxPoolCommon | | | not present |
| discTxPowerInfo | | | not present |
| SL-SyncConfig | | | not present |
| discInterFreqList | | | not present |

**Table A.7.1.2-2: ProSe Direct Discovery configuration for E-UTRA TDD (Configuration #2-TDD)**

| Information Element | | | Value |
|---|---|---|---|
| discRxPool(iPool), iPool = 0…NPool-1 | cp-Len | | Normal |
| | discPeriod | | rf32 |
| | numRetx | | 3 |
| | numRepetition | | =2 if NPool > 10,<br>=1 otherwise |
| | tf-ResourceConfig | prb-Num | 5MHz: min{24, 2N-24*iPool} / 2<br>10MHz: 25<br>15MHz: min{74, 2N-74*iPool} / 2<br>20MHz: 50 |
| | | prb-Start | 0 |
| | | prb-End | 5 MHz: min{24, 2N-24*iPool} - 1<br>10 MHz: 49<br>15 MHz: min{74, 2N-74*iPool} - 1<br>20 MHz: 99 |
| | | offsetIndicator | 163 |
| | | subframeBitmap | a(0), a(1), …, a(39), s.t.<br><br>a(i * NPool + iPool) = 1, i = 0,..,K;<br>a(k) = 0 otherwise<br><br>where<br>K = 1 is NPool > 10, K = 3 otherwise |
| | txParameters | | not present |
| | rxParameters | | not present |
| discTxPoolCommon | | | not present |
| discTxPowerInfo | | | not present |
| SL-SyncConfig | | | not present |
| discInterFreqList | | | not present |
| NOTE 1: The resource pool configuration description is parameterized using channel BWs, number of configured resource pools (NPool), and maximum number of configured Sidelink UE to be supported (N). | | | |

## A.7.2 Reference resource pool configurations for ProSe Direct Communication demodulation tests

### A.7.2.1 FDD

**Table A.7.2.1-1: ProSe Direct Communication pre-configuration for E-UTRAN FDD for out-of-network coverage operation (Configuration #1-FDD)**

| Information Element / (BW configuration) | | | | Value (5MHz) | Value (10MHz) |
|---|---|---|---|---|---|
| preconfigSync | syncCP-Len-r12 | | | Normal | |
| | syncOffsetIndicator1 | | | 1 | |
| | syncOffsetIndicator2 | | | 2 | |
| | syncTxParameters | | | 23 | |
| | syncTxThreshOoC | | | 0 (-110dBm / 15kHz) | |
| | filterCoefficient | | | fc0 | |
| | syncRefMinHyst | | | dB0 | |
| | syncRefDiffHyst | | | dB0 | |
| preconfigComm | sc-CP-Len | | | Normal | |
| | sc-Period | | | sf40 | |
| | sc-TF-ResourceConfig | prb-Num | | 13 | 25 |
| | | prb-Start | | 0 | 0 |
| | | prb-End | | 24 | 49 |
| | | offsetIndicator | | 0 | |
| | | subframeBitmap | | 00011000 00000000 00000000 00000000 00000000 | |
| | data-CP-Len | | | Normal | |
| | dataHoppingConfig | hoppingParameter | | 504 | |
| | | numSubbands | | ns2 | |
| | | rb-Offset | | 0 | |
| | ue-SelectedResourceConfig | data-TF-ResourceConfig | prb-Num | 13 | 25 |
| | | | prb-Start | 0 | 0 |
| | | | prb-End | 24 | 49 |
| | | | offsetIndicator | 0 | |
| | | | subframeBitmap | 00000000 11111111 11111111 00000000 00000000 | |
| | | trpt-Subset-r12 | | 010 | |

**Table A.7.2.1-2: ProSe Direct Communication configuration for E-UTRA FDD (Configuration #2-FDD)**

| Information Element / (BW configuration) | | | | Value (5MHz) | Value (10MHz) |
|---|---|---|---|---|---|
| commRxPool | sc-CP-Len | | | Normal | |
| | sc-Period | | | sf40 | |
| | sc-TF-ResourceConfig | prb-Num | | 13 | 25 |
| | | prb-Start | | 0 | 0 |
| | | prb-End | | 24 | 49 |
| | | offsetIndicator | | 0 | |
| | | subframeBitmap | | 00111100<br>00000000<br>00000000<br>00000000<br>00000000 | |
| | data-CP-Len | | | Normal | |
| | dataHoppingConfig | hoppingParameter | | 504 | |
| | | numSubbands | | ns2 | |
| | | rb-Offset | | 0 | |
| | ue-SelectedResourceConfig | data-TF-ResourceConfig | prb-Num | 13 | 25 |
| | | | prb-Start | 0 | 0 |
| | | | prb-End | 24 | 49 |
| | | | offsetIndicator | 0 | |
| | | | subframeBitmap | 00000000<br>11111111<br>11111111<br>00000000<br>00000000 | |
| | | trpt-Subset-r12 | | 010 | |
| | rxParametersNCell | | | not present | |
| | txParameters | | | not present | |
| commTxPoolNormalCommon | | | | not present | |
| SL-SyncConfig | | | | not present | |

**Table A.7.2.1-3: ProSe Direct Communication configuration for E-UTRA FDD (Configuration #3-FDD)**

| Information Element / (BW configuration) | | | | Value (5MHz) | Value (10MHz) |
|---|---|---|---|---|---|
| commRxPool(0) | sc-CP-Len | | | Normal | |
| | sc-Period | | | sf40 | |
| | sc-TF-ResourceConfig | prb-Num | | 13 | 25 |
| | | prb-Start | | 0 | 0 |
| | | prb-End | | 24 | 49 |
| | | offsetIndicator | | 0 | |
| | | subframeBitmap | | 00110000 00000000 00000000 00000000 00000000 | |
| | data-CP-Len | | | Normal | |
| | dataHoppingConfig | hoppingParameter | | 504 | |
| | | numSubbands | | ns2 | |
| | | rb-Offset | | 0 | |
| | ue-SelectedResourceConfig | data-TF-ResourceConfig | prb-Num | 13 | 25 |
| | | | prb-Start | 0 | 0 |
| | | | prb-End | 24 | 49 |
| | | | offsetIndicator | 0 | |
| | | | subframeBitmap | 00001111 11110000 00000000 11111111 00000000 | |
| | | trpt-Subset-r12 | | 010 | |
| | rxParametersNCell | | | not present | |
| | txParameters | | | not present | |
| commRxPool(1) | sc-CP-Len | | | Normal | |
| | sc-Period | | | sf40 | |
| | sc-TF-ResourceConfig | prb-Num | | 13 | 25 |
| | | prb-Start | | 0 | 0 |
| | | prb-End | | 24 | 49 |
| | | offsetIndicator | | 0 | |
| | | subframeBitmap | | 00110000 00000000 00000000 00000000 00000000 | |
| | data-CP-Len | | | Normal | |
| | dataHoppingConfig | hoppingParameter | | 504 | |
| | | numSubbands | | ns2 | |
| | | rb-Offset | | 0 | |
| | ue-SelectedResourceConfig | data-TF-ResourceConfig | prb-Num | 13 | 25 |
| | | | prb-Start | 0 | 0 |
| | | | prb-End | 24 | 49 |
| | | | offsetIndicator | 0 | |
| | | | subframeBitmap | 00001111 11110000 00001111 11110000 00000000 | |
| | | trpt-Subset-r12 | | 010 | |
| | rxParametersNCell | tdd-Config | | not present | |
| | | syncConfigIndex | | 0 | |
| | txParameters | | | not present | |
| commTxPoolNormalCommon | | | | not present | |
| SL-SyncConfig(0) | syncCP-Len | | | Normal | |
| | syncOffsetIndicator | | | 1 | |
| | slssid | | | 30 | |
| | txParameters | | | not present | |

| | | | | |
|---|---|---|---|---|
| | rxParamsNCell | physCellId | | 1 |
| | | discSyncWindow | | w1 |

**Table A.7.2.1-4: ProSe Direct Communication configuration for E-UTRA FDD (Configuration #4-FDD)**

| Information Element / (BW configuration) | | | | Value (5MHz) | Value (10MHz) |
|---|---|---|---|---|---|
| commRxPool(0) | sc-CP-Len | | | Normal | |
| | sc-Period | | | sf80 | |
| | sc-TF-ResourceConfig | prb-Num | | 13 | 25 |
| | | prb-Start | | 0 | 0 |
| | | prb-End | | 24 | 49 |
| | | offsetIndicator | | 0 | |
| | | subframeBitmap | | 11110000 00000000 00000000 00000000 00000000 | |
| | data-CP-Len | | | Normal | |
| | dataHoppingConfig | hoppingParameter | | 504 | |
| | | numSubbands | | ns2 | |
| | | rb-Offset | | 0 | |
| | ue-SelectedResourceConfig | data-TF-ResourceConfig | prb-Num | 13 | 25 |
| | | | prb-Start | 0 | 0 |
| | | | prb-End | 24 | 49 |
| | | | offsetIndicator | 0 | |
| | | | subframeBitmap | 00000000 11111111 00000000 11111111 00000000 | |
| | | trpt-Subset-r12 | | 001 | |
| | rxParametersNCell | | | not present | |
| | txParameters | | | not present | |
| commRxPool(1) | sc-CP-Len | | | Normal | |
| | sc-Period | | | sf80 | |
| | sc-TF-ResourceConfig | prb-Num | | 13 | 25 |
| | | prb-Start | | 0 | 0 |
| | | prb-End | | 24 | 49 |
| | | offsetIndicator | | 0 | |
| | | subframeBitmap | | 00001111 00000000 00000000 00000000 00000000 | |
| | data-CP-Len | | | Normal | |
| | dataHoppingConfig | hoppingParameter | | 504 | |
| | | numSubbands | | ns2 | |
| | | rb-Offset | | 0 | |
| | ue-SelectedResourceConfig | data-TF-ResourceConfig | prb-Num | 13 | 25 |
| | | | prb-Start | 0 | 0 |
| | | | prb-End | 24 | 49 |
| | | | offsetIndicator | 0 | |
| | | | subframeBitmap | 00000000 00000000 11111111 00000000 11111111 | |
| | | trpt-Subset-r12 | | 001 | |
| | rxParametersNCell | | | not present | |
| | txParameters | | | not present | |
| commTxPoolNormalCommon | | | | not present | |
| SL-SyncConfig | | | | not present | |

**Table A.7.2.1-5: ProSe Direct Communication configuration for E-UTRA FDD (Configuration #5-FDD)**

| Information Element / (BW configuration) | | | | Value (5MHz) | Value (10MHz) |
|---|---|---|---|---|---|
| commRxPool | sc-CP-Len | | | Normal | |
| | sc-Period | | | sf40 | |
| | sc-TF-ResourceConfig | prb-Num | | 13 | 25 |
| | | prb-Start | | 0 | 0 |
| | | prb-End | | 24 | 49 |
| | | offsetIndicator | | 0 | |
| | | subframeBitmap | | 00011000<br>00000000<br>00000000<br>00000000<br>00000000 | |
| | data-CP-Len | | | Normal | |
| | dataHoppingConfig | hoppingParameter | | 504 | |
| | | numSubbands | | ns2 | |
| | | rb-Offset | | 0 | |
| | ue-SelectedResourceConfig | data-TF-ResourceConfig | prb-Num | 13 | 25 |
| | | | prb-Start | 0 | 0 |
| | | | prb-End | 24 | 49 |
| | | | offsetIndicator | 0 | |
| | | | subframeBitmap | 00000000<br>11111111<br>11111111<br>11111111<br>11111111 | |
| | | trpt-Subset-r12 | | 001 | |
| | rxParametersNCell | | | not present | |
| | txParameters | | | not present | |
| commTxPoolNormalCommon | | | | not present | |
| SL-SyncConfig | | | | not present | |

# A.8 V2X reference measurement channels

## A.8.1 General

The algorithm for determining the payload size $A$ is as follows; given a desired coding rate $R$ and radio block allocation $N_{RB}$

1. Calculate the number of channel bits $N_{ch}$ that can be transmitted during the first transmission of a given sub-frame.

2. Find $A$ such that the resulting coding rate is as close to $R$ as possible, that is,

$$\min\left|R-(A+24*(N_{CB}+1))/N_{ch}\right|, \textit{ where } N_{CB}=\begin{cases}0, \textit{if } C=1\\ C, \textit{if } C>1\end{cases},$$

subject to

a) A is a valid TB size according to section 7.1.7 of TS 36.213 [6] assuming an allocation of $N_{RB}$ resource blocks.

b) $C$ is the number of Code Blocks calculated according to section 5.1.2 of TS 36.212 [5].

3. If there is more than one $A$ that minimizes the equation above, then the larger value is chosen per default and the chosen code rate should not exceed 0.93.

## A.8.2 Reference measurement channel for receiver characteristics

For V2V side link transmission over PC5, Table A.8.2-1 is applicable for measurements on the Receiver Characteristics (clause 7) with the exception of Maximum input level (subclause 7.4G). Table A.8.2-2 and Table A.8.2-3, are applicable for Maximum input level (subclause 7.4G).

**Table A.8.2-1: Fixed Reference measurement channel for V2V receiver requirements**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | | 48 | | 96 |
| Subcarriers per resource block | | | | | 12 | | 12 |
| Packets per period | | | | | 1 | | 1 |
| Modulation | | | | | QPSK | | QPSK |
| Target Coding Rate | | | | | 1/3 | | 1/3 |
| Transport Block Size | | | | | 3496 | | 6968 |
| Transport block CRC | Bits | | | | 24 | | 24 |
| Number of Code Blocks per Sub-Frame | | | | | 1 | | 2 |
| Maximum number of HARQ transmissions | | | | | 1 | | 1 |
| Binary Channel Bits per subframe | Bits | | | | 11520 | | 23040 |
| Max. Throughput averaged over 1 period of 100ms | kbps | | | | 34.96 | | 69.68 |
| UE Category | | | | | ≥ 1 | | ≥ 1 |
| Note 1: 2RBs allocated to SA transmission and 4 symbols allocated to RS.<br>Note 2: Throughput (in kbps) will depend on SA period configuration.<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | | | | |

**Table A.8.2-2: Fixed Reference measurement channel for V2V maximum input level requirements for UE category 2-8**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | | 48 | | 96 |
| Subcarriers per resource block | | | | | 12 | | 12 |
| Packets per period | | | | | 1 | | 1 |
| Modulation | | | | | 16QAM | | 16QAM |
| Target Coding Rate | | | | | 2/3 | | 2/3 |
| Transport Block Size | | | | | 15840 | | 31704 |
| Transport block CRC | Bits | | | | 24 | | 24 |
| Number of Code Blocks per Sub-Frame | | | | | 3 | | 6 |
| Maximum number of HARQ transmissions | | | | | 1 | | 1 |
| Binary Channel Bits per subframe | Bits | | | | 23040 | | 46080 |
| Max. Throughput averaged over 1 period of 100ms | kbps | | | | 158.4 | | 317.04 |
| Note 1: 2RBs allocated to SA transmission and 4 symbols allocated to RS.<br>Note 2: Throughput (in kbps) will depend on SA period configuration.<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | | | | |

**Table A.8.2-3: Fixed Reference measurement channel for V2V maximum input level for UE category 1**

| Parameter | Unit | Value | | | | | |
|---|---|---|---|---|---|---|---|
| Channel bandwidth | MHz | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Allocated resource blocks | | | | | 32 | | 32 |
| Subcarriers per resource block | | | | | 12 | | 12 |
| Packets per period | | | | | 1 | | 1 |
| Modulation | | | | | 16QAM | | 16QAM |
| Target Coding Rate | | | | | 2/3 | | 2/3 |
| Transport Block Size | | | | | 10296 | | 10296 |
| Transport block CRC | Bits | | | | 24 | | 24 |
| Number of Code Blocks per Sub-Frame | | | | | 2 | | 2 |
| Maximum number of HARQ transmissions | | | | | 1 | | 1 |
| Binary Channel Bits per subframe | Bits | | | | 15360 | | 15360 |
| Max. Throughput averaged over 1 period of 100ms | kbps | | | | 102.96 | | 102.96 |
| Note 1: 2RBs allocated to SA transmission and 4 symbols allocated to RS.<br>Note 2: Throughput (in kbps) will depend on SA period configuration.<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | | | | |

## A.8.3 Reference measurement channel for transmitter characteristics

For V2V side link transmission over PC5, Table A.8.3-1 and Table A.8.3-2 are applicable for measurements on the Transmitter Characteristics (clause 6).

**Table A.8.3-1: Fixed Reference measurement channel for V2V Transmitter requirements for QPSK**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | Bits | Bits | | Bits | | |
| | 10, 20 | 3 | 10 | QPSK | 1/3 | 208 | 24 | 1 | 720 | 360 | ≥ 1 |
| | 10, 20 | 4 | 10 | QPSK | 1/3 | 256 | 24 | 1 | 960 | 480 | ≥ 1 |
| | 10, 20 | 5 | 10 | QPSK | 1/3 | 328 | 24 | 1 | 1200 | 600 | ≥ 1 |
| | 10, 20 | 6 | 10 | QPSK | 1/3 | 408 | 24 | 1 | 1440 | 720 | ≥ 1 |
| | 10, 20 | 8 | 10 | QPSK | 1/3 | 552 | 24 | 1 | 1920 | 960 | ≥ 1 |
| | 10, 20 | 9 | 10 | QPSK | 1/3 | 632 | 24 | 1 | 2160 | 1080 | ≥ 1 |
| | 10, 20 | 10 | 10 | QPSK | 1/3 | 696 | 24 | 1 | 2400 | 1200 | ≥ 1 |
| | 10, 20 | 12 | 10 | QPSK | 1/3 | 840 | 24 | 1 | 2880 | 1440 | ≥ 1 |
| | 10, 20 | 15 | 10 | QPSK | 1/3 | 1064 | 24 | 1 | 3600 | 1800 | ≥ 1 |
| | 10, 20 | 16 | 10 | QPSK | 1/3 | 1128 | 24 | 1 | 3840 | 1920 | ≥ 1 |
| | 10, 20 | 18 | 10 | QPSK | 1/3 | 1288 | 24 | 1 | 4320 | 2160 | ≥ 1 |
| | 10, 20 | 20 | 10 | QPSK | 1/3 | 1416 | 24 | 1 | 4800 | 2400 | ≥ 1 |
| | 10, 20 | 24 | 10 | QPSK | 1/3 | 1736 | 24 | 1 | 5760 | 2880 | ≥ 1 |
| | 10, 20 | 25 | 10 | QPSK | 1/3 | 1800 | 24 | 1 | 6000 | 3000 | ≥ 1 |
| | 10, 20 | 27 | 10 | QPSK | 1/3 | 1928 | 24 | 1 | 6480 | 3240 | ≥ 1 |
| | 10, 20 | 30 | 10 | QPSK | 1/3 | 2152 | 24 | 1 | 7200 | 3600 | ≥ 1 |
| | 10, 20 | 32 | 10 | QPSK | 1/3 | 2280 | 24 | 1 | 7680 | 3840 | ≥ 1 |
| | 10, 20 | 36 | 10 | QPSK | 1/3 | 2600 | 24 | 1 | 8640 | 4320 | ≥ 1 |
| | 10, 20 | 40 | 10 | QPSK | 1/3 | 2856 | 24 | 1 | 9600 | 4800 | ≥ 1 |
| | 10, 20 | 45 | 10 | QPSK | 1/3 | 3240 | 24 | 1 | 10800 | 5400 | ≥ 1 |
| | 10, 20 | 48 | 10 | QPSK | 1/3 | 3496 | 24 | 1 | 11520 | 5760 | ≥ 1 |
| | 20 | 50 | 10 | QPSK | 1/3 | 3624 | 24 | 1 | 24000 | 12000 | ≥ 1 |
| | 20 | 54 | 10 | QPSK | 1/3 | 4776 | 24 | 1 | 25920 | 12960 | ≥ 1 |
| | 20 | 60 | 10 | QPSK | 1/3 | 5352 | 24 | 1 | 28800 | 14400 | ≥ 1 |
| | 20 | 64 | 10 | QPSK | 1/3 | 4584 | 24 | 1 | 30720 | 15360 | ≥ 1 |
| | 20 | 72 | 10 | QPSK | 1/3 | 5160 | 24 | 1 | 34560 | 17280 | ≥ 1 |
| | 20 | 75 | 10 | QPSK | 1/3 | 5352 | 24 | 1 | 36000 | 18000 | ≥ 1 |
| | 20 | 80 | 10 | QPSK | 1/3 | 5736 | 24 | 1 | 38400 | 19200 | ≥ 1 |
| | 20 | 81 | 10 | QPSK | 1/3 | 5736 | 24 | 1 | 38880 | 19440 | ≥ 1 |
| | 20 | 90 | 10 | QPSK | 1/3 | 6456 | 24 | 2 | 43200 | 21600 | ≥ 1 |
| | 20 | 96 | 10 | QPSK | 1/3 | 6968 | 24 | 2 | 46080 | 23040 | ≥ 1 |

**Table A.8.3-2: Fixed Reference measurement channel for V2V Transmitter requirements for 16QAM**

| Parameter | Ch BW | Allocated RBs | DFT-OFDM Symbols per Sub-Frame | Mod'n | Target Coding rate | Payload size | Transport block CRC | Number of code blocks per Sub-Frame (Note 1) | Total number of bits per Sub-Frame | Total symbols per Sub-Frame | UE Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | MHz | | | | | Bits | Bits | | Bits | | |
| | 10, 20 | 3 | 10 | 16QAM | 2/3 | 904 | 24 | 1 | 1440 | 360 | ≥ 1 |
| | 10, 20 | 4 | 10 | 16QAM | 2/3 | 1224 | 24 | 1 | 1920 | 480 | ≥ 1 |
| | 10, 20 | 5 | 10 | 16QAM | 2/3 | 1544 | 24 | 1 | 2400 | 600 | ≥ 1 |
| | 10, 20 | 6 | 10 | 16QAM | 2/3 | 1800 | 24 | 1 | 2880 | 720 | ≥ 1 |
| | 10, 20 | 8 | 10 | 16QAM | 2/3 | 2472 | 24 | 1 | 3840 | 960 | ≥ 1 |
| | 10, 20 | 9 | 10 | 16QAM | 2/3 | 2728 | 24 | 1 | 4320 | 1080 | ≥ 1 |
| | 10, 20 | 10 | 10 | 16QAM | 2/3 | 3112 | 24 | 1 | 4800 | 1200 | ≥ 1 |
| | 10, 20 | 12 | 10 | 16QAM | 2/3 | 3624 | 24 | 1 | 5760 | 1440 | ≥ 1 |
| | 10, 20 | 15 | 10 | 16QAM | 2/3 | 4584 | 24 | 1 | 7200 | 1800 | ≥ 1 |
| | 10, 20 | 16 | 10 | 16QAM | 2/3 | 4968 | 24 | 1 | 7680 | 1920 | ≥ 1 |
| | 10, 20 | 18 | 10 | 16QAM | 2/3 | 5544 | 24 | 1 | 8640 | 2160 | ≥ 1 |
| | 10, 20 | 20 | 10 | 16QAM | 2/3 | 6200 | 24 | 2 | 9600 | 2400 | ≥ 1 |
| | 10, 20 | 24 | 10 | 16QAM | 2/3 | 7736 | 24 | 2 | 11520 | 2880 | ≥ 1 |
| | 10, 20 | 25 | 10 | 16QAM | 2/3 | 7992 | 24 | 2 | 12000 | 3000 | ≥ 1 |
| | 10, 20 | 27 | 10 | 16QAM | 2/3 | 8760 | 24 | 2 | 12960 | 3240 | ≥ 1 |
| | 10, 20 | 30 | 10 | 16QAM | 2/3 | 9912 | 24 | 2 | 14400 | 3600 | ≥ 1 |
| | 10, 20 | 32 | 10 | 16QAM | 2/3 | 10296 | 24 | 2 | 15360 | 3840 | ≥ 1 |
| | 10, 20 | 36 | 10 | 16QAM | 3/5 | 10296 | 24 | 2 | 17280 | 4320 | ≥ 1 |
| | 10, 20 | 40 | 10 | 16QAM | 1/2 | 9144 | 24 | 2 | 19200 | 4800 | ≥ 1 |
| | 10, 20 | 45 | 10 | 16QAM | 2/5 | 9144 | 24 | 2 | 21600 | 5400 | ≥ 1 |
| | 10, 20 | 48 | 10 | 16QAM | 2/5 | 9528 | 24 | 2 | 23040 | 5760 | ≥ 1 |
| | 20 | 50 | 10 | 16QAM | 2/5 | 9912 | 24 | 2 | 24000 | 6000 | ≥ 1 |
| | 20 | 54 | 10 | 16QAM | 2/5 | 11064 | 24 | 2 | 25920 | 6480 | ≥ 2 |
| | 20 | 60 | 10 | 16QAM | 2/5 | 12216 | 24 | 2 | 28800 | 7200 | ≥ 2 |
| | 20 | 64 | 10 | 16QAM | 2/5 | 12960 | 24 | 3 | 30720 | 7680 | ≥ 2 |
| | 20 | 72 | 10 | 16QAM | 2/5 | 14688 | 24 | 3 | 34560 | 8640 | ≥ 2 |
| | 20 | 75 | 10 | 16QAM | 2/5 | 15264 | 24 | 3 | 36000 | 9000 | ≥ 2 |
| | 20 | 80 | 10 | 16QAM | 2/5 | 16416 | 24 | 3 | 38400 | 9600 | ≥ 2 |
| | 20 | 81 | 10 | 16QAM | 2/5 | 16416 | 24 | 3 | 38880 | 9720 | ≥ 2 |
| | 20 | 90 | 10 | 16QAM | 2/5 | 18336 | 24 | 3 | 43200 | 10800 | ≥ 2 |
| | 20 | 96 | 10 | 16QAM | 2/5 | 19080 | 24 | 4 | 46080 | 11520 | ≥ 2 |

## A.8.4 Reference measurement for PSCCH performance requirements

**Table A.8.4-1: Fixed reference measurement channel for PSCCH performance requirement**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | CC.8 |
| Allocated resource blocks | | 2 |
| DFT-OFDM Symbols per subframe (see Note 1) | | 9 |
| Modulation | | QPSK |
| Payload (without CRC) | Bits | 32 |
| CRC | Bits | 16 |
| SCI Format | | 1 |
| Number of PSCCH transmissions | | 1 |
| Binary Channel Bits (see Note 2) | Bits | 432 |
| Note 1: PSCCH transmissions are rate-matched for 10 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.<br>Note 2: Binary Channel Bits are calculated under assumption of 9 symbols.<br>Note 3: Un-used or redundant bits/code-points in SCI format 1 are randomized. | | |

## A.8.5 Reference measurement for PSSCH performance requirements

**Table A.8.5-1: Fixed reference measurement channel for PSSCH performance requirement**

| Parameter | Unit | Value | | | | |
|---|---|---|---|---|---|---|
| Reference channel | | CD.8 | CD.9 | CD.10 | CD.11 | CD.12 |
| Channel bandwidth | MHz | 20 | 10 | 20 | 20 | 20 |
| Allocated resource blocks | | 8 | 3 | 3 | 96 | 8 |
| DFT-OFDM Symbols per subframe (see Note 1) | | 9 | 9 | 9 | 9 | 9 |
| Modulation | | 16QAM | QPSK | QPSK | 16QAM | QPSK |
| Transport Block Size | | 1800 | 208 | 504 | 31704 | 552 |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 24 |
| Number of PSSCH transmissions | | 1 | 2 | 1 | 2 | 1 |
| Binary Channel Bits (see Note 2) | Bits | 3456 | 648 | 648 | 41472 | 1728 |
| Note 1: PSSCH transmissions are rate-matched for 10 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.<br>Note 2: Binary Channel Bits are calculated under assumption of 9 symbols.<br>Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). | | | | | | |

## A.8.6 Reference measurement for PSBCH performance requirements

**Table A.8.6-1: Fixed reference measurement channel for PSBCH performance requirement**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | CP.2 |
| Reference channel | | CP.2 |
| Channel bandwidth | MHz | 20 |
| Allocated resource blocks | | 6 |
| DFT-OFDM Symbols per subframe (see Note 1) | | 6 |
| Modulation | | QPSK |
| Transport Block Size | | 48 |
| Transport block CRC | Bits | 16 |
| Binary Channel Bits (see Note 2) | Bits | 864 |
| Note 1: PSBCH transmissions are rate-matched for 7 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.<br>Note 2: Binary Channel Bits are calculated under assumption of 6 symbols. | | |

# A.9 V2X reference resource pool configurations

**Table A.9-1: V2X sidelink communication pre-configuration for PSSCH/PSCCH tests (Configuration #1-V2X)**

| Information Element | | | Value (10MHz) | Value (20MHz) |
|---|---|---|---|---|
| SL-V2X-PreconfigCommPool-r14 | sl-OffsetIndicator-r14 | | 0 | |
| | sl-Subframe-r14 | bs20-r14 | 0xFFFFF | |
| | adjacencyPSCCH-PSSCH-r14 | | TRUE | |
| | sizeSubchannel-r14 | | [n5] | [n10] |
| | numSubchannel-r14 | | [n1] | |
| | startRB-Subchannel-r14 | | 0 | |
| | startRB-PSCCH-Pool-r14 | | not present | |
| | dataTxParameters-r14 | P0-SL-r12 | [-126] | |
| | zoneID-r14 | | not present | |
| | threshS-RSSI-CBR-r14 | | not present | |
| | cbr-pssch-TxConfigList-r14 | | not present | |
| | resourceSelectionConfigP2X-r14 | | not present | |
| | syncAllowed-r14 | | not present | |
| | restrictResourceReservationPeriod-r14 | | not present | |

**Table A.9-2: V2X sidelink communication pre-configuration for power imbalance test (Configuration #2-V2X)**

| Information Element | | | Value (20MHz) |
|---|---|---|---|
| SL-V2X-PreconfigCommPool-r14 | sl-OffsetIndicator-r14 | | 0 |
| | sl-Subframe-r14 | bs20-r14 | 0xFFFFF |
| | adjacencyPSCCH-PSSCH-r14 | | TRUE |
| | sizeSubchannel-r14 | | [n5] |
| | numSubchannel-r14 | | [n10] |
| | startRB-Subchannel-r14 | | 0 |
| | startRB-PSCCH-Pool-r14 | | not present |
| | dataTxParameters-r14 | P0-SL-r12 | [-126] |
| | zoneID-r14 | | not present |
| | threshS-RSSI-CBR-r14 | | not present |
| | cbr-pssch-TxConfigList-r14 | | not present |
| | resourceSelectionConfigP2X-r14 | | not present |
| | syncAllowed-r14 | | not present |
| | restrictResourceReservationPeriod-r14 | | not present |

**Table A.9-3: V2X sidelink communication communication configuration for PSSCH with eNB based synchronization test (Configuration #3-V2X)**

| Information Element | | | Value (20MHz) |
|---|---|---|---|
| SL-CommResourcePoolV2X-r14 | sl-OffsetIndicator-r14 | | 0 |
| | sl-Subframe-r14 | bs20-r14 | 0xFFFFF |
| | adjacencyPSCCH-PSSCH-r14 | | TRUE |
| | sizeSubchannel-r14 | | [n10] |
| | numSubchannel-r14 | | [n1] |
| | startRB-Subchannel-r14 | | 0 |
| | startRB-PSCCH-Pool-r14 | | not present |
| | rxParametersNCell-r14 | | not present |
| | dataTxParameters-r14 | P0-SL-r12 | [-126] |
| | zoneID-r14 | | not present |
| | threshS-RSSI-CBR-r14 | | not present |
| | poolReportId-r14 | | not present |
| | cbr-pssch-TxConfigList-r14 | | not present |
| | resourceSelectionConfigP2X-r14 | | not present |
| | syncAllowed-r14 | | not present |
| | restrictResourceReservationPeriod-r14 | | not present |
| SL-TypeTxSync-r14 | | | enb |

**Table A.9-4: V2X sidelink communication pre-configuration for soft buffer test (Configuration #4-V2X)**

| Information Element | | | Value (20MHz) |
|---|---|---|---|
| SL-V2X-PreconfigCommPool-r14 | sl-OffsetIndicator-r14 | | 0 |
| | sl-Subframe-r14 | bs20-r14 | 0xFFFFF |
| | adjacencyPSCCH-PSSCH-r14 | | TRUE |
| | sizeSubchannel-r14 | | [n100] |
| | numSubchannel-r14 | | [n1] |
| | startRB-Subchannel-r14 | | 0 |
| | startRB-PSCCH-Pool-r14 | | not present |
| | dataTxParameters-r14 | P0-SL-r12 | [-126] |
| | zoneID-r14 | | not present |
| | threshS-RSSI-CBR-r14 | | not present |
| | cbr-pssch-TxConfigList-r14 | | not present |
| | resourceSelectionConfigP2X-r14 | | not present |
| | syncAllowed-r14 | | not present |
| | restrictResourceReservationPeriod-r14 | | not present |

**Table A.9-5: V2X sidelink communication pre-configuration for PSCCH/PSSCH decoding capability test (Configuration #5-V2X)**

| Information Element | | | Value (20MHz) |
|---|---|---|---|
| SL-V2X-PreconfigCommPool-r14 | sl-OffsetIndicator-r14 | | 0 |
| | sl-Subframe-r14 | bs20-r14 | 0xFFFFF |
| | adjacencyPSCCH-PSSCH-r14 | | TRUE |
| | sizeSubchannel-r14 | | [n10] [n5] |
| | numSubchannel-r14 | | [n10] [n20] |
| | startRB-Subchannel-r14 | | 0 |
| | startRB-PSCCH-Pool-r14 | | not present |
| | dataTxParameters-r14 | P0-SL-r12 | [-126] |
| | zoneID-r14 | | not present |
| | threshS-RSSI-CBR-r14 | | not present |
| | cbr-pssch-TxConfigList-r14 | | not present |
| | resourceSelectionConfigP2X-r14 | | not present |
| | syncAllowed-r14 | | not present |
| | restrictResourceReservationPeriod-r14 | | not present |

# Annex B (normative): Propagation Conditions

The propagation conditions and channel models for various environments are specified. For each environment a propagation model is used to evaluate the propagation pathless due to the distance. Channel models are formed by combining delay profiles with a Doppler spectrum, with the addition of correlation properties in the case of a multi-antenna scenario.

## B.0 No interference

The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects.

## B.1 Static propagation condition

The downlink connection between the System Simulator and the UE is an Additive White Gaussian Noise (AWGN) environment (unless otherwise stated) with no fading or multipath effects.

For 1 port transmission to UE Receiver with 2Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}.$$

For 2 port transmission to UE Receiver with 2Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 & j \\ 1 & -j \end{pmatrix}$$

For 4 port transmission to UE Receiver with 2Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & j & j \\ 1 & 1 & -j & -j \end{bmatrix}$$

For 8 port transmission to UE Receiver with 2Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & 1 & 1 & j & j & j & j \\ 1 & 1 & 1 & 1 & -j & -j & -j & -j \end{bmatrix}$$

For 1 port transmission to UE Receiver with 4Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}.$$

For 2 port transmission to UE Receiver with 4Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & j \\ 1 & -j \\ 1 & j \\ 1 & -j \end{bmatrix}.$$

For 4 port transmission to UE Receiver with 4Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & j & j \\ 1 & 1 & -j & -j \\ 1 & -1 & j & -j \\ 1 & -1 & -j & j \end{bmatrix}.$$

For 8 port transmission to UE Receiver with 4Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & 1 & 1 & j & j & j & j \\ 1 & 1 & 1 & 1 & -j & -j & -j & -j \\ 1 & 1 & -1 & -1 & j & j & -j & -j \\ 1 & 1 & -1 & -1 & -j & -j & j & j \end{bmatrix}$$

### B.1.1 Definition of Additive White Gaussian Noise (AWGN) Interferer

Note that the AWGN interferer can be used in static propagation conditions, or in conjunction with multi-path fading.

The acceptable uncertainties of the AWGN interferer are defined in Annex F.

## B.2 Multi-path fading Propagation Conditions

The multipath propagation conditions consist of several parts:

- A delay profile in the form of a "tapped delay-line", characterized by a number of taps at fixed positions on a sampling grid. The profile can be further characterized by the r.m.s. delay spread and the maximum delay spanned by the taps.
- A combination of channel model parameters that include the Delay profile and the Doppler spectrum that is characterized by a classical spectrum shape and a maximum Doppler frequency
- A set of correlation matrices defining the correlation between the UE and eNodeB antennas in case of multi-antenna systems.

### B.2.1 Delay profiles

The delay profiles are selected to be representative of low, medium and high delay spread environments. The resulting model parameters are defined in Table B.2.1-1 and the tapped delay line models are defined in Tables B.2.1-2, B.2.1-3 and B.2.1-4.

**Table B.2.1-1: Delay profiles for E-UTRA channel models**

| Model | Number of channel taps | Delay spread (r.m.s.) | Maximum excess tap delay (span) |
|---|---|---|---|
| Extended Pedestrian A (EPA) | 7 | 45 ns | 410 ns |
| Extended Vehicular A model (EVA) | 9 | 357 ns | 2510 ns |
| Extended Typical Urban model (ETU) | 9 | 991 ns | 5000 ns |

**Table B.2.1-2: Extended Pedestrian A model (EPA)**

| Excess tap delay [ns] | Relative power [dB] |
|---|---|
| 0 | 0.0 |
| 30 | -1.0 |
| 70 | -2.0 |
| 90 | -3.0 |
| 110 | -8.0 |
| 190 | -17.2 |
| 410 | -20.8 |

**Table B.2.1-3: Extended Vehicular A model (EVA)**

| Excess tap delay [ns] | Relative power [dB] |
|---|---|
| 0 | 0.0 |
| 30 | -1.5 |
| 150 | -1.4 |
| 310 | -3.6 |
| 370 | -0.6 |
| 710 | -9.1 |
| 1090 | -7.0 |
| 1730 | -12.0 |
| 2510 | -16.9 |

**Table B.2.1-4: Extended Typical Urban model (ETU)**

| Excess tap delay [ns] | Relative power [dB] |
|---|---|
| 0 | -1.0 |
| 50 | -1.0 |
| 120 | -1.0 |
| 200 | 0.0 |
| 230 | 0.0 |
| 500 | 0.0 |
| 1600 | -3.0 |
| 2300 | -5.0 |
| 5000 | -7.0 |

## B.2.2 Combinations of channel model parameters

The propagation conditions used for the performance measurements in multi-path fading environment are indicated as EVA[number], EPA[number] or ETU[number] where 'number' indicates the maximum Doppler frequency (Hz).

**Table B.2.2-1: Void**

## B.2.3 MIMO Channel Correlation Matrices

The MIMO channel correlation matrices defined in B.2.3 apply for the antenna configuration using uniform linear arrays at both eNodeB and UE.

## B.2.3.1 Definition of MIMO Correlation Matrices

Table B.2.3.1-1 defines the correlation matrix for the eNodeB

**Table B.2.3.1-1: eNodeB correlation matrix**

| | One antenna | Two antennas | Four antennas |
|---|---|---|---|
| eNode B Correlation | $R_{eNB} = 1$ | $R_{eNB} = \begin{pmatrix} 1 & \alpha \\ \alpha^* & \mathbf{1} \end{pmatrix}$ | $R_{eNB} = \begin{pmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9*} & \alpha^{1/9*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9*} & \alpha^{1/9*} & 1 \end{pmatrix}$ |

Table B.2.3.1-2 defines the correlation matrix for the UE:

**Table B.2.3.1-2: UE correlation matrix**

| | One antenna | Two antennas | Four antennas |
|---|---|---|---|
| UE Correlation | $R_{UE} = 1$ | $R_{UE} = \begin{pmatrix} 1 & \beta \\ \beta^* & \mathbf{1} \end{pmatrix}$ | $R_{UE} = \begin{pmatrix} 1 & \beta^{1/9} & \beta^{4/9} & \beta \\ \beta^{1/9*} & 1 & \beta^{1/9} & \beta^{4/9} \\ \beta^{4/9*} & \beta^{1/9*} & 1 & \beta^{1/9} \\ \beta^* & \beta^{4/9*} & \beta^{1/9*} & 1 \end{pmatrix}$ |

Table B.2.3.1-3 defines the channel spatial correlation matrix $R_{spat}$. The parameters, α and β in Table B.2.3.1-3 defines the spatial correlation between the antennas at the eNodeB and UE.

**Table B.2.3.1-3: $R_{spat}$ correlation matrices**

| | |
|---|---|
| 1x2 case | $R_{spat} = R_{UE} = \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$ |
| **2x1 case** | $R_{spat} = R_{eNB} = \begin{bmatrix} 1 & \alpha \\ \alpha^* & 1 \end{bmatrix}$ |
| 2x2 case | $R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha \\ \alpha^* & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix} = \begin{bmatrix} 1 & \beta & \alpha & \alpha\beta \\ \beta^* & 1 & \alpha\beta^* & \alpha \\ \alpha^* & \alpha^*\beta & 1 & \beta \\ \alpha^*\beta^* & \alpha^* & \beta^* & 1 \end{bmatrix}$ |
| 4x2 case | $R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9*} & \alpha^{1/9*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9*} & \alpha^{1/9*} & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$ |
| 4x4 case | $R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9*} & \alpha^{1/9*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9*} & \alpha^{1/9*} & 1 \end{bmatrix} \otimes \begin{pmatrix} 1 & \beta^{1/9} & \beta^{4/9} & \beta \\ \beta^{1/9*} & 1 & \beta^{1/9} & \beta^{4/9} \\ \beta^{4/9*} & \beta^{1/9*} & 1 & \beta^{1/9} \\ \beta^* & \beta^{4/9*} & \beta^{1/9*} & 1 \end{pmatrix}$ |

For cases with more antennas at either eNodeB or UE or both, the channel spatial correlation matrix can still be expressed as the Kronecker product of $R_{eNB}$ and $R_{UE}$ according to $R_{spat} = R_{eNB} \otimes R_{UE}$ .

## B.2.3.2 MIMO Correlation Matrices at High, Medium and Low Level

The $\alpha$ and $\beta$ for different correlation types are given in Table B.2.3.2-1.

**Table B.2.3.2-1**

| Low correlation | | Medium Correlation | | High Correlation | |
|---|---|---|---|---|---|
| α | β | α | β | α | β |
| 0 | 0 | 0.3 | 0.9 | 0.9 | 0.9 |

The correlation matrices for high, medium and low correlation are defined in Table B.2.3.2-2, B.2.3.2-3 and B.2.3.2-4,as below.

The values in the Table B.2.3.2-2 table have been adjusted for the 4x2 and 4x4 high correlation cases to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:

$$\mathbf{R}_{high} = [\mathbf{R}_{spatial} + aI_n]/(1+a)$$

Where the value "a" is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 4x2 high correlation case, a=0.00010. For the 4x4 high correlation case, a=0.00012.

The same method is used to adjust the 4x4 medium correlation matrix in Table B.2.3.2-3 to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision with a = 0.00012.

**Table B.2.3.2-2: MIMO correlation matrices for high correlation**

| | |
|---|---|
| 1x2 case | $R_{high} = \begin{pmatrix} 1 & 0.9 \\ 0.9 & 1 \end{pmatrix}$ |
| 2x1 case | $R_{high} = \begin{pmatrix} 1 & 0.9 \\ 0.9 & 1 \end{pmatrix}$ |
| 2x2 case | $R_{high} = \begin{pmatrix} 1 & 0.9 & 0.9 & 0.81 \\ 0.9 & 1 & 0.81 & 0.9 \\ 0.9 & 0.81 & 1 & 0.9 \\ 0.81 & 0.9 & 0.9 & 1 \end{pmatrix}$ |
| 4x2 case | $R_{high} = \begin{bmatrix} 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 & 0.8999 & 0.8099 \\ 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 & 0.8099 & 0.8999 \\ 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 \\ 0.8894 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 \\ 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 \\ 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 \\ 0.8999 & 0.8099 & 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8999 \\ 0.8099 & 0.8999 & 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8999 & 1.0000 \end{bmatrix}$ |
| 4x4 case | $R_{high} = \begin{bmatrix} 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 0.9541 & 0.9430 & 0.9105 & 0.8587 & 0.8999 & 0.8894 & 0.8587 & 0.8099 \\ 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9430 & 0.9541 & 0.9430 & 0.9105 & 0.8894 & 0.8999 & 0.8894 & 0.8587 \\ 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9105 & 0.9430 & 0.9541 & 0.9430 & 0.8587 & 0.8894 & 0.8999 & 0.8894 \\ 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8587 & 0.9105 & 0.9430 & 0.9541 & 0.8099 & 0.8587 & 0.8894 & 0.8999 \\ 0.9882 & 0.9767 & 0.9430 & 0.8894 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 0.9541 & 0.9430 & 0.9105 & 0.8587 \\ 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9430 & 0.9541 & 0.9430 & 0.9105 \\ 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9105 & 0.9430 & 0.9541 & 0.9430 \\ 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8587 & 0.9105 & 0.9430 & 0.9541 \\ 0.9541 & 0.9430 & 0.9105 & 0.8587 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.9882 & 0.9767 & 0.9430 & 0.8894 \\ 0.9430 & 0.9541 & 0.9430 & 0.9105 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.9767 & 0.9882 & 0.9767 & 0.9430 \\ 0.9105 & 0.9430 & 0.9541 & 0.9430 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.9430 & 0.9767 & 0.9882 & 0.9767 \\ 0.8587 & 0.9105 & 0.9430 & 0.9541 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.8894 & 0.9430 & 0.9767 & 0.9882 \\ 0.8999 & 0.8894 & 0.8587 & 0.8099 & 0.9541 & 0.9430 & 0.9105 & 0.8587 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 1.0000 & 0.9882 & 0.9541 & 0.8999 \\ 0.8894 & 0.8999 & 0.8894 & 0.8587 & 0.9430 & 0.9541 & 0.9430 & 0.9105 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9882 & 1.0000 & 0.9882 & 0.9541 \\ 0.8587 & 0.8894 & 0.8999 & 0.8894 & 0.9105 & 0.9430 & 0.9541 & 0.9430 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9541 & 0.9882 & 1.0000 & 0.9882 \\ 0.8099 & 0.8587 & 0.8894 & 0.8999 & 0.8587 & 0.9105 & 0.9430 & 0.9541 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8999 & 0.9541 & 0.9882 & 1.0000 \end{bmatrix}$ |

**Table B.2.3.2-3: MIMO correlation matrices for medium correlation**

| | |
|---|---|
| 1x2 case | N/A |
| 2x1 case | N/A |
| 2x2 case | $R_{medium} = \begin{pmatrix} 1 & 0.9 & 0.3 & 0.27 \\ 0.9 & 1 & 0.27 & 0.3 \\ 0.3 & 0.27 & 1 & 0.9 \\ 0.27 & 0.3 & 0.9 & 1 \end{pmatrix}$ |
| 4x2 case | $R_{medium} = \begin{pmatrix} 1.0000 & 0.9000 & 0.8748 & 0.7873 & 0.5856 & 0.5271 & 0.3000 & 0.2700 \\ 0.9000 & 1.0000 & 0.7873 & 0.8748 & 0.5271 & 0.5856 & 0.2700 & 0.3000 \\ 0.8748 & 0.7873 & 1.0000 & 0.9000 & 0.8748 & 0.7873 & 0.5856 & 0.5271 \\ 0.7873 & 0.8748 & 0.9000 & 1.0000 & 0.7873 & 0.8748 & 0.5271 & 0.5856 \\ 0.5856 & 0.5271 & 0.8748 & 0.7873 & 1.0000 & 0.9000 & 0.8748 & 0.7873 \\ 0.5271 & 0.5856 & 0.7873 & 0.8748 & 0.9000 & 1.0000 & 0.7873 & 0.8748 \\ 0.3000 & 0.2700 & 0.5856 & 0.5271 & 0.8748 & 0.7873 & 1.0000 & 0.9000 \\ 0.2700 & 0.3000 & 0.5271 & 0.5856 & 0.7873 & 0.8748 & 0.9000 & 1.0000 \end{pmatrix}$ |
| 4x4 case | $R_{medium} = \begin{pmatrix} 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.8747 & 0.8645 & 0.8347 & 0.7872 & 0.5855 & 0.5787 & 0.5588 & 0.5270 & 0.3000 & 0.2965 & 0.2862 & 0.2700 \\ 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.5787 & 0.5855 & 0.5787 & 0.5588 & 0.2965 & 0.3000 & 0.2965 & 0.2862 \\ 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.5588 & 0.5787 & 0.5855 & 0.5787 & 0.2862 & 0.2965 & 0.3000 & 0.2965 \\ 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.5270 & 0.5588 & 0.5787 & 0.5855 & 0.2700 & 0.2862 & 0.2965 & 0.3000 \\ 0.8747 & 0.8645 & 0.8347 & 0.7872 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.8747 & 0.8645 & 0.8347 & 0.7872 & 0.5855 & 0.5787 & 0.5588 & 0.5270 \\ 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.5787 & 0.5855 & 0.5787 & 0.5588 \\ 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.5588 & 0.5787 & 0.5855 & 0.5787 \\ 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.5270 & 0.5588 & 0.5787 & 0.5855 \\ 0.5855 & 0.5787 & 0.5588 & 0.5270 & 0.8747 & 0.8645 & 0.8347 & 0.7872 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.8747 & 0.8645 & 0.8347 & 0.7872 \\ 0.5787 & 0.5855 & 0.5787 & 0.5588 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.8645 & 0.8747 & 0.8645 & 0.8347 \\ 0.5588 & 0.5787 & 0.5855 & 0.5787 & 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.8347 & 0.8645 & 0.8747 & 0.8645 \\ 0.5270 & 0.5588 & 0.5787 & 0.5855 & 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.7872 & 0.8347 & 0.8645 & 0.8747 \\ 0.3000 & 0.2965 & 0.2862 & 0.2700 & 0.5855 & 0.5787 & 0.5588 & 0.5270 & 0.8747 & 0.8645 & 0.8347 & 0.7872 & 1.0000 & 0.9882 & 0.9541 & 0.8999 \\ 0.2965 & 0.3000 & 0.2965 & 0.2862 & 0.5787 & 0.5855 & 0.5787 & 0.5588 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.9882 & 1.0000 & 0.9882 & 0.9541 \\ 0.2862 & 0.2965 & 0.3000 & 0.2965 & 0.5588 & 0.5787 & 0.5855 & 0.5787 & 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.9541 & 0.9882 & 1.0000 & 0.9882 \\ 0.2700 & 0.2862 & 0.2965 & 0.3000 & 0.5270 & 0.5588 & 0.5787 & 0.5855 & 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.8999 & 0.9541 & 0.9882 & 1.0000 \end{pmatrix}$ |

**Table B.2.3.2-4: MIMO correlation matrices for low correlation**

| | |
|---|---|
| 1x2 case | $R_{low} = \mathbf{I}_2$ |
| 2x1 case | $R_{low} = \mathbf{I}_2$ |
| 2x2 case | $R_{low} = \mathbf{I}_4$ |
| 4x2 case | $R_{low} = \mathbf{I}_8$ |
| 4x4 case | $R_{low} = \mathbf{I}_{16}$ |

In Table B.2.3.2-4, $\mathbf{I}_d$ is the $d \times d$ identity matrix.

# B.2.3A MIMO Channel Correlation Matrices using cross polarized antennas

The MIMO channel correlation matrices defined in B.2.3A apply for the antenna configuration using cross polarized (XP/X-pol) antennas at both eNodeB and UE. The cross-polarized antenna elements with +/-45 degrees polarization

slant angles are deployed at eNB and cross-polarized antenna elements with +90/0 degrees polarization slant angles are deployed at UE.

For the cross-polarized antennas, the N antennas are labelled such that antennas for one polarization are listed from 1 to N/2 and antennas for the other polarization are listed from N/2+1 to N, where N is the number of transmit or receive antennas.

### B.2.3A.1 Definition of MIMO Correlation Matrices using cross polarized antennas

For the channel spatial correlation matrix, the following is used:

$$R_{spat} = P\left(R_{eNB} \otimes \Gamma \otimes R_{UE}\right)P^{T}$$

Where

- $R_{UE}$ is the spatial correlation matrix at the UE with same polarization,
- $R_{eNB}$ is the spatial correlation matrix at the eNB with same polarization,
- $\Gamma$ is a polarization correlation matrix, and
- $(\bullet)^{T}$ denotes transpose.

The matrix $\Gamma$ is defined as

$$\Gamma = \begin{bmatrix} 1 & 0 & -\gamma & 0 \\ 0 & 1 & 0 & \gamma \\ -\gamma & 0 & 1 & 0 \\ 0 & \gamma & 0 & 1 \end{bmatrix}$$

A permutation matrix $P$ element is defined as:

$$P(a,b) = \begin{cases} 1 & for \quad a = (j-1)Nr + i \quad and \quad b = 2(j-1)Nr + i, \qquad i = 1,\cdots,Nr,\ j = 1,\cdots Nt/2 \\ 1 & for \quad a = (j-1)Nr + i \quad and \quad b = 2(j-Nt/2)Nr - Nr + i, \quad i = 1,\cdots,Nr,\ j = Nt/2+1,\cdots,Nt \\ 0 & otherwise \end{cases}$$

Where $N_t$ and $N_r$ is the number of transmitter and receiver respectively. This is used to map the spatial correlation coefficients in accordance with the antenna element labelling system described in B.2.3A.

### B.2.3A.2 Spatial Correlation Matrices using cross polarized antennas at eNB and UE sides

#### B.2.3A.2.1 Spatial Correlation Matrices at eNB side

For 2-antenna transmitter using one pair of cross-polarized antenna elements, $R_{eNB} = 1$.

For 4-antenna transmitter using two pairs of cross-polarized antenna elements, $R_{eNB} = \begin{pmatrix} 1 & \alpha \\ \alpha^{*} & \boldsymbol{1} \end{pmatrix}$.

For 8-antenna transmitter using four pairs of cross-polarized antenna elements, $R_{eNB} = \begin{pmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9*} & \alpha^{1/9*} & 1 & \alpha^{1/9} \\ \alpha^{*} & \alpha^{4/9*} & \alpha^{1/9*} & 1 \end{pmatrix}$.

### B.2.3A.2.2 Spatial Correlation Matrices at UE side

For 2-antenna transmitter using one pair of cross-polarized antenna elements, $R_{UE} = 1$.

For 4-antenna transmitter using two pairs of cross-polarized antenna elements, $R_{UE} = \begin{pmatrix} 1 & \beta \\ \beta^* & \mathbf{1} \end{pmatrix}$.

### B.2.3A.3 MIMO Correlation Matrices using cross polarized antennas

The values for parameters α, β and γ for low correlation and high spatial correlation are given in Table B.2.3A.3-1.

**Table B.2.3A.3-1: The $\alpha$ and $\beta$ parameters for cross-polarized MIMO correlation matrices**

| Correlation Model | α | β | γ |
|---|---|---|---|
| **Medium Correlation A** | 0.3 | 0.6 | 0.2 |
| **High Correlation** | 0.9 | 0.9 | 0.3 |
| Note 1: Value of $\alpha$ applies when more than one pair of cross-polarized antenna elements at eNB side. | | | |
| Note 2: Value of β applies when more than one pair of cross-polarized antenna elements at UE side. | | | |

The correlation matrices for high spatial and low correlation are defined in Table B.2.3A.3-2 and Table B.2.3A.3-3 as below.

The values in Table B.2.3A.3-2 have been adjusted to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:

$$\mathbf{R}_{high} = [\mathbf{R}_{spat} + aI_n]/(1+a)$$

Where the value "a" is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 8x2 high spatial correlation case, a=0.00010.

**Table B.2.3A.3-2: MIMO correlation matrices for high spatial correlation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **4x2 case** | $R_{high} =$ | 1.0000 | 0.0000 | 0.9000 | 0.0000 | -0.3000 | 0.0000 | -0.2700 | 0.0000 |
| | | 0.0000 | 1.0000 | 0.0000 | 0.9000 | 0.0000 | 0.3000 | 0.0000 | 0.2700 |
| | | 0.9000 | 0.0000 | 1.0000 | 0.0000 | -0.2700 | 0.0000 | -0.3000 | 0.0000 |
| | | 0.0000 | 0.9000 | 0.0000 | 1.0000 | 0.0000 | 0.2700 | 0.0000 | 0.3000 |
| | | -0.3000 | 0.0000 | -0.2700 | 0.0000 | 1.0000 | 0.0000 | 0.9000 | 0.0000 |
| | | 0.0000 | 0.3000 | 0.0000 | 0.2700 | 0.0000 | 1.0000 | 0.0000 | 0.9000 |
| | | -0.2700 | 0.0000 | -0.3000 | 0.0000 | 0.9000 | 0.0000 | 1.0000 | 0.0000 |
| | | 0.0000 | 0.2700 | 0.0000 | 0.3000 | 0.0000 | 0.9000 | 0.0000 | 1.0000 |

**8x2 case**

$R_{high} =$

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0000 | 0.0000 | 0.9883 | 0.0000 | 0.9542 | 0.0000 | 0.8999 | 0.0000 | -0.3000 | 0.0000 | -0.2965 | 0.0000 | -0.2862 | 0.0000 | -0.2700 | 0.0000 |
| 0.0000 | 1.0000 | 0.0000 | 0.9883 | 0.0000 | 0.9542 | 0.0000 | 0.8999 | 0.0000 | 0.3000 | 0.0000 | 0.2965 | 0.0000 | 0.2862 | 0.0000 | 0.2700 |
| 0.9883 | 0.0000 | 1.0000 | 0.0000 | 0.9883 | 0.0000 | 0.9542 | 0.0000 | -0.2965 | 0.0000 | -0.3000 | 0.0000 | -0.2965 | 0.0000 | -0.2862 | 0.0000 |
| 0.0000 | 0.9883 | 0.0000 | 1.0000 | 0.0000 | 0.9883 | 0.0000 | 0.9542 | 0.0000 | 0.2965 | 0.0000 | 0.3000 | 0.0000 | 0.2965 | 0.0000 | 0.2862 |
| 0.9542 | 0.0000 | 0.9883 | 0.0000 | 1.0000 | 0.0000 | 0.9883 | 0.0000 | -0.2862 | 0.0000 | -0.2965 | 0.0000 | -0.3000 | 0.0000 | -0.2965 | 0.0000 |
| 0.0000 | 0.9542 | 0.0000 | 0.9883 | 0.0000 | 1.0000 | 0.0000 | 0.9883 | 0.0000 | 0.2862 | 0.0000 | 0.2965 | 0.0000 | 0.3000 | 0.0000 | 0.2965 |
| 0.8999 | 0.0000 | 0.9542 | 0.0000 | 0.9883 | 0.0000 | 1.0000 | 0.0000 | -0.2700 | 0.0000 | -0.2862 | 0.0000 | -0.2965 | 0.0000 | -0.3000 | 0.0000 |
| 0.0000 | 0.8999 | 0.0000 | 0.9542 | 0.0000 | 0.9883 | 0.0000 | 1.0000 | 0.0000 | 0.2700 | 0.0000 | 0.2862 | 0.0000 | 0.2965 | 0.0000 | 0.3000 |
| -0.3000 | 0.0000 | -0.2965 | 0.0000 | -0.2862 | 0.0000 | -0.2700 | 0.0000 | 1.0000 | 0.0000 | 0.9883 | 0.0000 | 0.9542 | 0.0000 | 0.8999 | 0.0000 |
| 0.0000 | 0.3000 | 0.0000 | 0.2965 | 0.0000 | 0.2862 | 0.0000 | 0.2700 | 0.0000 | 1.0000 | 0.0000 | 0.9883 | 0.0000 | 0.9542 | 0.0000 | 0.8999 |
| -0.2965 | 0.0000 | -0.3000 | 0.0000 | -0.2965 | 0.0000 | -0.2862 | 0.0000 | 0.9883 | 0.0000 | 1.0000 | 0.0000 | 0.9883 | 0.0000 | 0.9542 | 0.0000 |
| 0.0000 | 0.2965 | 0.0000 | 0.3000 | 0.0000 | 0.2965 | 0.0000 | 0.2862 | 0.0000 | 0.9883 | 0.0000 | 1.0000 | 0.0000 | 0.9883 | 0.0000 | 0.9542 |
| -0.2862 | 0.0000 | -0.2965 | 0.0000 | -0.3000 | 0.0000 | -0.2965 | 0.0000 | 0.9542 | 0.0000 | 0.9883 | 0.0000 | 1.0000 | 0.0000 | 0.9883 | 0.0000 |
| 0.0000 | 0.2862 | 0.0000 | 0.2965 | 0.0000 | 0.3000 | 0.0000 | 0.2965 | 0.0000 | 0.9542 | 0.0000 | 0.9883 | 0.0000 | 1.0000 | 0.0000 | 0.9883 |
| -0.2700 | 0.0000 | -0.2862 | 0.0000 | -0.2965 | 0.0000 | -0.3000 | 0.0000 | 0.8999 | 0.0000 | 0.9542 | 0.0000 | 0.9883 | 0.0000 | 1.0000 | 0.0000 |
| 0.0000 | 0.2700 | 0.0000 | 0.2862 | 0.0000 | 0.2965 | 0.0000 | 0.3000 | 0.0000 | 0.8999 | 0.0000 | 0.9542 | 0.0000 | 0.9883 | 0.0000 | 1.0000 |

**Table B.2.3A.3-3: MIMO correlation matrices for medium correlation A**

**4x4**

$R_{Medium\ A} =$

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0000 | 0.6000 | 0.0000 | 0.0000 | 0.3000 | 0.1800 | 0.0000 | 0.0000 | -0.2000 | -0.1200 | 0.0000 | 0.0000 | -0.0600 | -0.0360 | 0.0000 | 0.0000 |
| 0.6000 | 1.0000 | 0.0000 | 0.0000 | 0.1800 | 0.3000 | 0.0000 | 0.0000 | -0.1200 | -0.2000 | 0.0000 | 0.0000 | -0.0360 | -0.0600 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 1.0000 | 0.6000 | 0.0000 | 0.0000 | 0.3000 | 0.1800 | 0.0000 | 0.0000 | 0.2000 | 0.1200 | 0.0000 | 0.0000 | 0.0600 | 0.0360 |
| 0.0000 | 0.0000 | 0.6000 | 1.0000 | 0.0000 | 0.0000 | 0.1800 | 0.3000 | 0.0000 | 0.0000 | 0.1200 | 0.2000 | 0.0000 | 0.0000 | 0.0360 | 0.0600 |
| 0.3000 | 0.1800 | 0.0000 | 0.0000 | 1.0000 | 0.6000 | 0.0000 | 0.0000 | -0.0600 | -0.0360 | 0.0000 | 0.0000 | -0.2000 | -0.1200 | 0.0000 | 0.0000 |
| 0.1800 | 0.3000 | 0.0000 | 0.0000 | 0.6000 | 1.0000 | 0.0000 | 0.0000 | -0.0360 | -0.0600 | 0.0000 | 0.0000 | -0.1200 | -0.2000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.3000 | 0.1800 | 0.0000 | 0.0000 | 1.0000 | 0.6000 | 0.0000 | 0.0000 | 0.0600 | 0.0360 | 0.0000 | 0.0000 | 0.2000 | 0.1200 |
| 0.0000 | 0.0000 | 0.1800 | 0.3000 | 0.0000 | 0.0000 | 0.6000 | 1.0000 | 0.0000 | 0.0000 | 0.0360 | 0.0600 | 0.0000 | 0.0000 | 0.1200 | 0.2000 |
| -0.2000 | -0.1200 | 0.0000 | 0.0000 | -0.0600 | -0.0360 | 0.0000 | 0.0000 | 1.0000 | 0.6000 | 0.0000 | 0.0000 | 0.3000 | 0.1800 | 0.0000 | 0.0000 |
| -0.1200 | -0.2000 | 0.0000 | 0.0000 | -0.0360 | -0.0600 | 0.0000 | 0.0000 | 0.6000 | 1.0000 | 0.0000 | 0.0000 | 0.1800 | 0.3000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.2000 | 0.1200 | 0.0000 | 0.0000 | 0.0600 | 0.0360 | 0.0000 | 0.0000 | 1.0000 | 0.6000 | 0.0000 | 0.0000 | 0.3000 | 0.1800 |
| 0.0000 | 0.0000 | 0.1200 | 0.2000 | 0.0000 | 0.0000 | 0.0360 | 0.0600 | 0.0000 | 0.0000 | 0.6000 | 1.0000 | 0.0000 | 0.0000 | 0.1800 | 0.3000 |
| -0.0600 | -0.0360 | 0.0000 | 0.0000 | -0.2000 | -0.1200 | 0.0000 | 0.0000 | 0.3000 | 0.1800 | 0.0000 | 0.0000 | 1.0000 | 0.6000 | 0.0000 | 0.0000 |
| -0.0360 | -0.0600 | 0.0000 | 0.0000 | -0.1200 | -0.2000 | 0.0000 | 0.0000 | 0.1800 | 0.3000 | 0.0000 | 0.0000 | 0.6000 | 1.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0600 | 0.0360 | 0.0000 | 0.0000 | 0.2000 | 0.1200 | 0.0000 | 0.0000 | 0.3000 | 0.1800 | 0.0000 | 0.0000 | 1.0000 | 0.6000 |
| 0.0000 | 0.0000 | 0.0360 | 0.0600 | 0.0000 | 0.0000 | 0.1200 | 0.2000 | 0.0000 | 0.0000 | 0.1800 | 0.3000 | 0.0000 | 0.0000 | 0.6000 | 1.0000 |

## B.2.3A.4 Beam steering approach

Given the channel spatial correlation matrix in B.2.3A.1, the corresponding random channel matrix ***H*** can be calculated. The signal model for the k-th subframe is denoted as:

$$y = HD_{\theta_k}Wx + n$$

Where

- H is the N¬r xNt channel matrix per subcarrier.
- $D_{\theta_k}$ is the steering matrix,

For 8 transmission antennas, $D_{\theta_k} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & e^{j\theta_k} & 0 & 0 \\ 0 & 0 & e^{j2\theta_k} & 0 \\ 0 & 0 & 0 & e^{j3\theta_k} \end{bmatrix}$;

For 4 transmission antennas, $D_{\theta_k} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & 0 \\ 0 & e^{j\theta_k} \end{bmatrix}$.

- $\theta_k$ controls the phase variation, and the phase for k-th subframe is denoted by $\theta_k = \theta_0 + \Delta\theta \cdot k$, where $\theta_0$ is the random start value with the uniform distribution, i.e. $\theta_0 \in [0, 2\pi]$, $\Delta\theta$ is the step of phase variation, which is defined in Table B.2.3A.4-1, and ***k*** is the linear increment of 1 for every subframe throughout the simulation,
- $W$ is the precoding matrix for Nt transmission antennas,
- $y$ is the received signal, $x$ is the transmitted signal, and $n$ is AWGN.

**Table B.2.3A.4-1: The step of phase variation**

| Variation Step | Value (rad/subframe) |
|---|---|
| $\Delta\theta$ | $1.2566 \times 10^{-3}$ |

## B.2.4 Propagation conditions for CQI tests

[For Channel Quality Indication (CQI) tests, the following additional multi-path profile is used:

$$h(t,\tau) = \delta(\tau) + a\exp(-i2\pi f_D t)\delta(\tau - \tau_d)$$

in continuous time $(t,\tau)$ representation, with $\tau_d$ the delay, $a$ a constant and $f_D$ the Doppler frequency.]

## B.2.5 FFS

## B.2.6 MBSFN Propagation Channel Profile

Table B.2.6-1 shows propagation conditions that are used for the MBSFN performance requirements in multi-path fading environment in an extended delay spread environment.

**Table B.2.6-1: Propagation Conditions for Multi-Path Fading Environments for MBSFN Performance Requirements in an extended delay spread environment**

| Extended Delay Spread | |
|---|---|
| Maximum Doppler frequency [5Hz] | |
| Relative Delay [ns] | Relative Mean Power [dB] |
| 0 | 0 |
| 30 | -1.5 |
| 150 | -1.4 |
| 310 | -3.6 |
| 370 | -0.6 |
| 1090 | -7.0 |
| 12490 | -10 |
| 12520 | -11.5 |
| 12640 | -11.4 |
| 12800 | -13.6 |
| 12860 | -10.6 |
| 13580 | -17.0 |
| 27490 | -20 |
| 27520 | -21.5 |
| 27640 | -21.4 |
| 27800 | -23.6 |
| 27860 | -20.6 |
| 28580 | -27.0 |

# B.3 High speed train scenario

The high speed train condition for the test of the baseband performance is a non fading propagation channel with one tap. Doppler shift is given by

$$f_s(t) = f_d \cos\theta(t) \quad \text{(B.3.1)}$$

where $f_s(t)$ is the Doppler shift and $f_d$ is the maximum Doppler frequency. The cosine of angle $\theta(t)$ is given by

$$\cos\theta(t) = \frac{D_s/2 - vt}{\sqrt{D_{\min}{}^2 + (D_s/2 - vt)^2}},\ 0 \le t \le D_s/v \quad \text{(B.3.2)}$$

$$\cos\theta(t) = \frac{-1.5D_s + vt}{\sqrt{D_{\min}{}^2 + (-1.5D_s + vt)^2}},\ D_s/v < t \le 2D_s/v \quad \text{(B.3.3)}$$

$$\cos\theta(t) = \cos\theta(t \mod (2D_s/v)),\ t > 2D_s/v \quad \text{(B.3.4)}$$

where $D_s/2$ is the initial distance of the train form eNodeB, and $D_{\min}$ is eNodeB Railway track distance, both in meters; $v$ is the velocity of the train in m/s, $t$ is time in seconds.

Doppler shift and cosine angle are given by equation B.3.1 and B.3.2-B.3.4 respectively, where the required input parameters listed in table B.3-1 and the resulting Doppler shift is shown in Figure B.3-1 are applied for all frequency bands.

**Table B.3-1: High speed train scenario**

| Parameter | Value |
|---|---|
| $D_s$ | 300 m |
| $D_{\min}$ | 2 m |
| $v$ | 300 km/h |
| $f_d$ | 750 Hz |

NOTE 1: Parameters for HST conditions in table B.3-1 including $f_d$ and Doppler shift trajectories presented on figure B.3-1 were derived from Band7 and are applied for performance verification in all frequency bands.

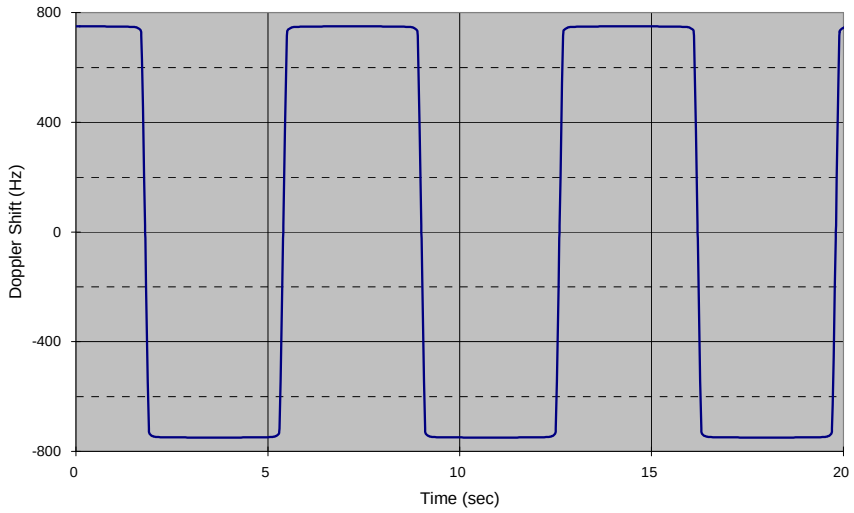



**Figure B.3-1: Doppler shift trajectory**

For 1x2 antenna configuration, the same $h(t,\tau)$ is used to describe the channel between every pair of Tx and Rx.

For 2x2 antenna configuration, the same $h(t,\tau)$ is used to describe the channel between every pair of Tx and Rx with phase shift according to $\mathbf{H} = \begin{pmatrix} 1 & j \\ 1 & -j \end{pmatrix}$.

# B.3A HST-SFN scenario

There is an infinite number of RRHs distributed equidistantly along the track with the same Cell ID as depicted in figure B.3A-1.

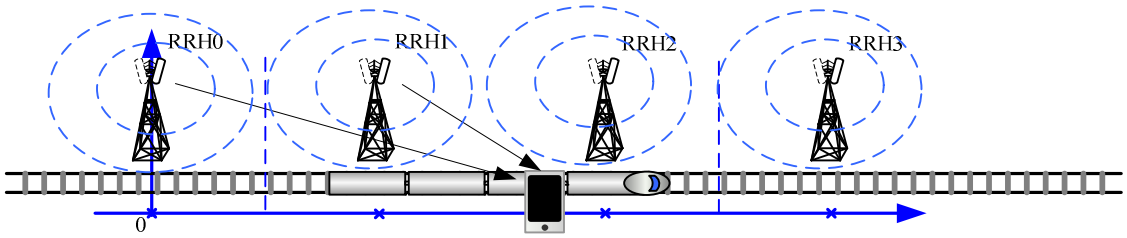



**Figure B.3A-1: Deployment of HST-SFN**

The location of RRH *k* is given as:

$$x_k = k * D_s + j * D_{\min} \qquad \text{(B.3A.1)}$$

where: $k \in [-\infty, \infty]$, $j = sqrt(-1)$ and $D_{\min}$ is the distance between the RRHs and railway track, while $D_s$ is the distance of two RRHs, both in meters.

The train location is denoted as:

$$y = a + j * 0 \qquad \text{(B.3A.2)}$$

where: $a \in [0, \infty]$ and *a* means distance in meters, which means the train is right on the track.

The HST-SFN scenario for the test of the baseband performance is a non fading propagation channel with four taps, namely the four nearest RRHs. Thus RRH *k* is visible for the train only in the range:

$$k * D_s - 2 * D_s \le a < k * D_s + 2 * D_s \qquad \text{(B.3A.3)}$$

Power level $P_k$ (dB) for the signal from *k*th RRH, normalized to the total power received from all visible RRHs, is given by:

$$P_k = -20\lg(|y - x_k|) + 20\lg(|D_S|) - 10\lg\left(\sum_{i \in \{i \mid i*D_S - 2*D_S \le a < i*D_S + 2*D_S\}} \frac{|D_S|^2}{|y - x_i|^2}\right) \text{ for}$$

$$k * D_s - 2 * D_s \le a < k * D_s + 2 * D_s \qquad \text{(B.3A.4)}$$

Doppler shift $F_{D,k}$ (Hz) from *k*th RRH is given by:

$$F_{D,k} = f_C \times real\left[-v \times \frac{y - x_k}{|y - x_k| \times C}\right] \text{ for } k * D_s - 2 * D_s \le a < k * D_s + 2 * D_s \qquad \text{(B.3A.5)}$$

The relative delay $T_k$ (s) for the signal from *k*th RRH can be derived as:

$$T_k = \frac{|y - x_k|}{C} \text{ for } k * D_s - 2 * D_s \le a < k * D_s + 2 * D_s \qquad \text{(B.3A.6)}$$

In the above *v* (m/s) is the moving speed of the train, $f_C$ (Hz) is the centre frequency, and *C* (m/s) is the velocity of light.

Power level, Doppler shift and relative delay are given by equations B.3A.4 ~ B.3A.6 respectively, where the required input parameters listed in table B.3A-1 and the resulting Doppler shift shown in Figure B.3A-3 are applied for all frequency bands.

**Table B.3A-1: HST-SFN scenario**

| Parameter | Value |
|---|---|
| $D_s$ | 1000 m |
| $D_{\min}$ | 50m |
| $v$ | 350 km/h |
| $f_d$ | 872 Hz |

NOTE 1: Parameters for HST-SFN scenario in Table B.3A-1 including $f_d$ and Doppler shift trajectories presented in Figure B.3A-2 were derived from Band 7 and are applied for performance verification in all frequency bands. And the trajectories of relative power, Doppler shifts and relative delay presented in Figures B.3A-2~ B.3A-4 are derived from the equations B.3A.4 ~ B.3A.6 respectively.

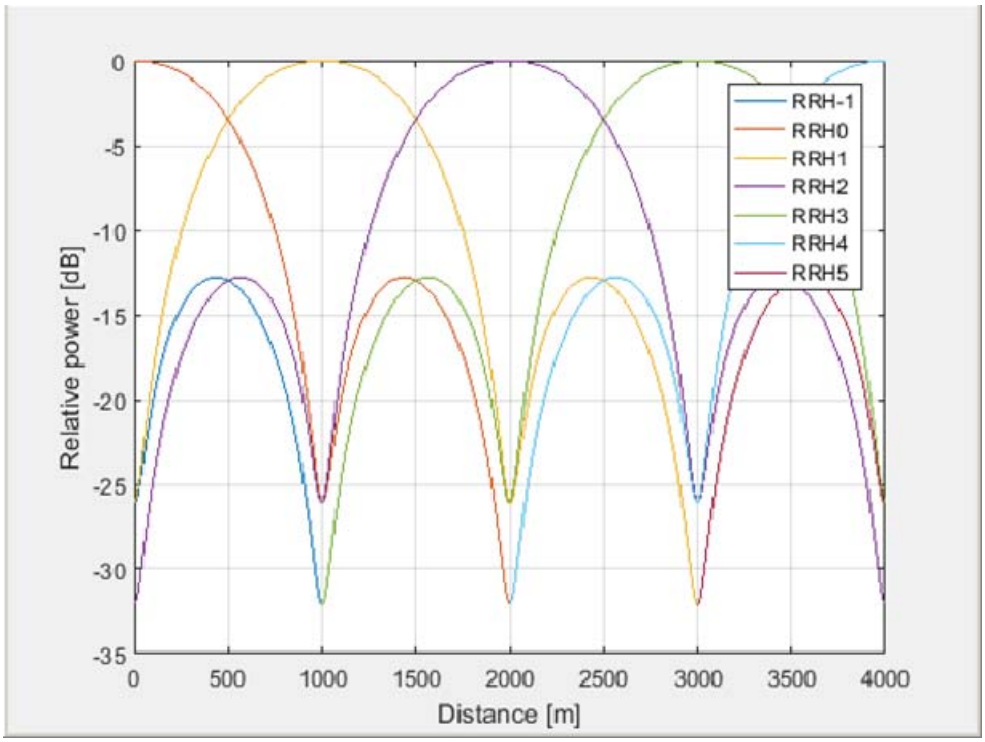



**Figure B.3A-2: Relative power level trajectories**

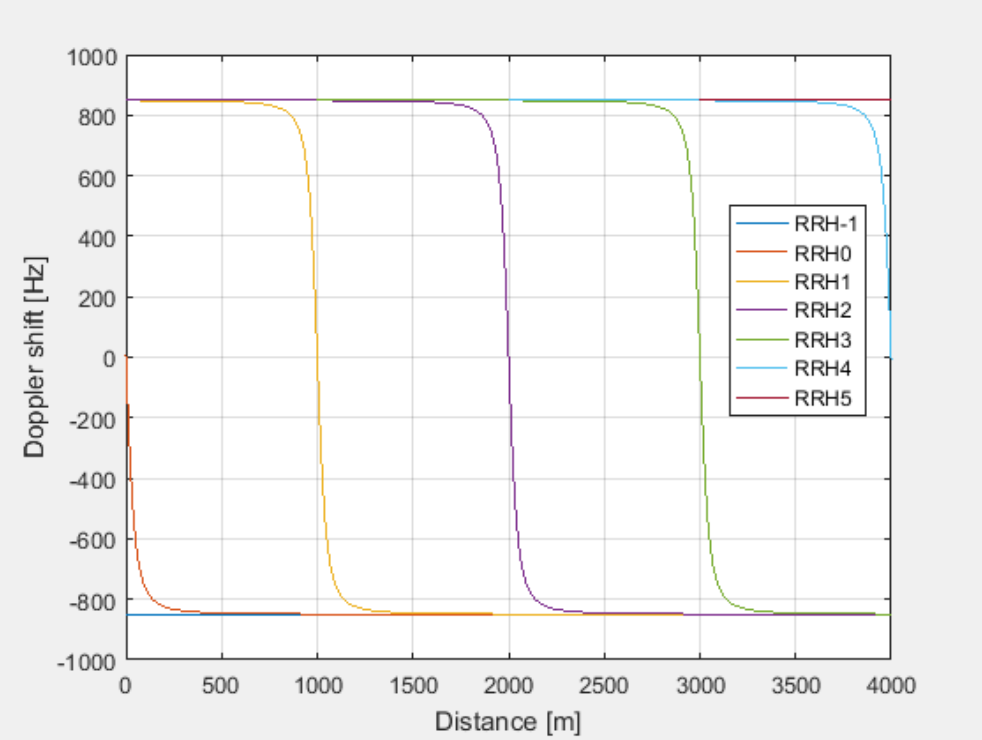



**Figure B.3A-3: Doppler shifts trajectories**

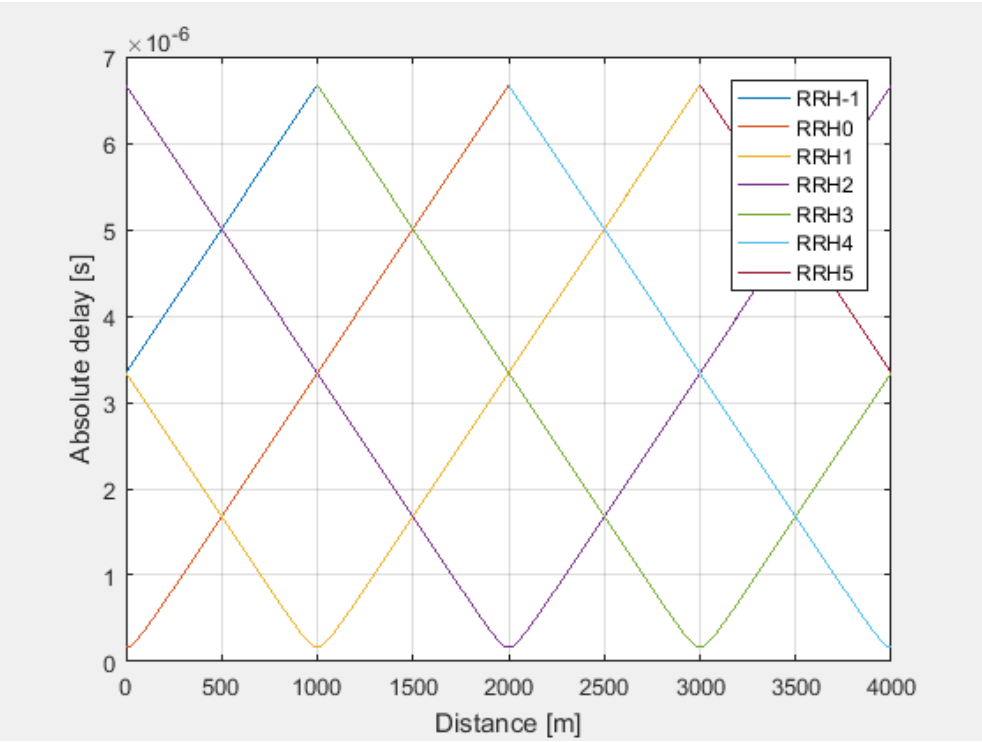



**Figure B.3A-4: Relative delay trajectories**

For 2x2 antenna configuration, the same $h(t,\tau)$ is used to describe the channel between every pair of Tx and Rx with phase shift according to $\mathbf{H} = \begin{pmatrix} 1 & j \\ 1 & -j \end{pmatrix}$.

# B.4 Beamforming Model

## B.4.1 Single-layer random beamforming (Antenna port 5, 7 or 8)

Single-layer transmission on antenna port 5 or on antenna port 7 or 8 without a simultaneous transmission on the other antenna port, is defined by using a precoder vector $W(i)$ of size $2\times 1$ randomly selected with the number of layers $\upsilon = 1$ from Table 6.3.4.2.3-1 in TS 36.211 [8] as beamforming weights. This precoder takes as an input the signal $y^{(p)}(i)$, $i = 0,1,...,M_{\text{symb}}^{\text{ap}} - 1$, for antenna port $p \in \{5, 7, 8\}$, with $M_{\text{symb}}^{\text{ap}}$ the number of modulation symbols including the user-specific reference symbols (DRS), and generates a block of signals $y_{bf}(i) = \left[y_{bf}(i) \quad \tilde{y}_{bf}(i)\right]^T$ the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W(i) y^{(p)}(i)$$

Single-layer transmission on antenna port 7 or 8 with a simultaneous transmission on the other antenna port, is defined by using a pair of precoder vectors $W_1(i)$ and $W_2(i)$ each of size $2\times 1$, which are not identical and randomly selected with the number of layers $\upsilon = 1$ from Table 6.3.4.2.3-1 in TS 36.211 [8], as beamforming weights, and normalizing the transmit power as follows:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = \frac{1}{\sqrt{2}} \left(W_1(i) y^{(7)}(i) + W_2(i) y^{(8)}(i)\right)$$

The precoder update granularity is specific to a test case.

The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \bmod 2 = 1$, $p \in \{15,16,..,22\}$, are transmitted on the same physical antenna element as the modulation symbols $y_{bf}(i)$. The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \bmod 2 = 0$, $p \in \{15,16,..,22\}$, are transmitted on the same physical antenna element as the modulation symbols $\tilde{y}_{bf}(i)$.

## B.4.1A Single-layer random beamforming (Antenna port 7, 8, 11 or 13 with enhanced DMRS table configured)

Single-layer transmission on antenna port 11 with a simultaneous transmission on one antenna port from antenna port 7,8 or 13, is defined by using a pair of precoder vectors $W_1(i)$ and $W_2(i)$ each of size $2\times 1$, which are not identical and randomly selected with the number of layers $\upsilon = 1$ from Table 6.3.4.2.3-1 in [4], as beamforming weights, and normalizing the transmit power as follows:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = \frac{1}{\sqrt{2}} \left(W_1(i) y^{(11)}(i) + W_2(i) y^{(p_1)}(i)\right)$$

The precoders takes $y^{(11)}(i)$ and $y^{(p_1)}(i)$ as the input the signals, $i = 0,1,...,M_{\text{symb}}^{\text{ap}} - 1$, with $M_{\text{symb}}^{\text{ap}}$ the number of modulation symbols including the user-specific reference symbols (DM-RS), and generates a block of signals $y_{bf}(i) = \left[y_{bf}(i) \quad \tilde{y}_{bf}(i)\right]^T$ the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements.

The antenna port $p_1 \in \{7,8,13\}$ update granularity is specific to a test case.

The precoder update granularity is specific to a test case.

The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \bmod 2 = 1$, $p \in \{15,16,..,22\}$, are transmitted on the same physical antenna element as the modulation symbols $y_{bf}(i)$. The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \bmod 2 = 0$, $p \in \{15,16,..,22\}$, are transmitted on the same physical antenna element as the modulation symbols $\tilde{y}_{bf}(i)$.

## B.4.2 Dual-layer random beamforming (antenna ports 7 and 8)

Dual-layer transmission on antenna ports 7 and 8 is defined by using a precoder matrix $W(i)$ of size $2 \times 2$ randomly selected with the number of layers $\upsilon = 2$ from Table 6.3.4.2.3-1 in TS 36.211 [8] as beamforming weights. This precoder takes as an input a block of signals for antenna ports 7 and 8, $y(i) = \left[y^{(7)}(i) \quad y^{(8)}(i)\right]^T$, $i = 0,1,..., M_{\text{symb}}^{\text{ap}} - 1$, with $M_{\text{symb}}^{\text{ap}}$ being the number of modulation symbols per antenna port including the user-specific reference symbols, and generates a block of signals $y_{bf}(i) = \left[y_{bf}(i) \quad \tilde{y}_{bf}(i)\right]^T$ the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W(i) \begin{bmatrix} y^{(7)}(i) \\ y^{(8)}(i) \end{bmatrix},$$

The precoder update granularity is specific to a test case.

The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \bmod 2 = 1$, $p \in \{15,16,..,22\}$, are transmitted on the same physical antenna element as the modulation symbols $y_{bf}(i)$. The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \bmod 2 = 0$, $p \in \{15,16,..,22\}$, are transmitted on the same physical antenna element as the modulation symbols $\tilde{y}_{bf}(i)$.

## B.4.3 Generic beamforming model (antenna ports 7-14)

The transmission on antenna port(s) $p = 7,8,..., \upsilon + 6$ is defined by using a precoder matrix $W(i)$ of size $N_{CSI} \times \upsilon$, where $N_{CSI}$ is the number of CSI reference signals configured per test and $\upsilon$ is the number of spatial layers. This precoder takes as an input a block of signals for antenna port(s) $p = 7,8,..., \upsilon + 6$, $y^{(p)}(i) = \left[y^{(7)}(i) \quad y^{(8)}(i) \quad \cdots \quad y^{(6+\upsilon)}(i)\right]$, $i = 0,1,..., M_{\text{symb}}^{\text{ap}} - 1$, with $M_{\text{symb}}^{\text{ap}}$ being the number of modulation symbols per antenna port including the user-specific reference symbols (DM-RS), and generates a block of signals $y_{bf}^{(q)}(i) = \left[y_{bf}^{(0)}(i) \quad y_{bf}^{(1)}(i) \quad \cdots \quad y_{bf}^{(N_{CSI}-1)}(i)\right]^T$ the elements of which are to be mapped onto the same time-frequency index pair $(k,l)$ but transmitted on different physical antenna elements:

$$\begin{bmatrix} y_{bf}^{(0)}(i) \\ y_{bf}^{(1)}(i) \\ \vdots \\ y_{bf}^{(N_{CSI}-1)}(i) \end{bmatrix} = W(i) \begin{bmatrix} y^{(7)}(i) \\ y^{(8)}(i) \\ \vdots \\ y^{(6+\upsilon)}(i) \end{bmatrix}$$

The precoder matrix $W(i)$ is specific to a test case.

The physical antenna elements are identified by indices $j = 0,1,..., N_{ANT} - 1$, where $N_{ANT} = N_{CSI}$ is the number of physical antenna elements configured per test.

Modulation symbols $y_{bf}^{(q)}(i)$ with (i.e. beamformed PDSCH and DM-RS) are mapped to the physical antenna index.

Modulation symbols with $p \in \{0,1,...,P-1\}$ (i.e. PBCH, PDCCH, PHICH, PCFICH) are mapped to the physical antenna index $j = p$, where $P$ is the number of cell-specific reference signals configured per test.

Modulation symbols $a_{k,l}^{(p)}$ with $p \in \{0,1,...,P-1\}$ (i.e. CRS) are mapped to the physical antenna index $j = p$, where $P$ is the number of cell-specific reference signals configured per test.

Modulation symbols $a_{k,l}^{(p)}$ with $p \in \{15,16,...,14+N_{CSI}\}$ (i.e. CSI-RS) are mapped to the physical antenna index $j = p-15$, where $N_{CSI}$ is the number of CSI reference signals configured per test.

## B.4.4 Random beamforming for EPDCCH distributed transmission (Antenna port 107 and 109)

EPDCCH distributed transmission on antenna port 107 and antenna port 109 is defined by using a pair of precoder vectors $W_1(i)$ and $W_2(i)$ each of size $2\times1$, which are not identical and randomly selected per EPDCCH PRB pair with the number of layers $\upsilon = 1$ from Table 6.3.4.2.3-1 in [8], as beamforming weights. This precoder takes as an input the signal $y^{(p)}(i)$, $i = 0,1,...,M_{\text{symb}}^{\text{ap}}-1$, for antenna port $p \in \{107,109\}$, with $M_{\text{symb}}^{\text{ap}}$ the number of modulation symbols including the user-specific reference symbols (DMRS), and generates a block of signals $y_{bf}(i) = \left[y_{bf}(i) \quad \tilde{y}_{bf}(i)\right]^T$. When EPDCCH is associated with port 107, the transmitted block of signals is denoted as

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W_1(i) y^{(107)}(i).$$

When EPDCCH is associated with port 109, the transmitted block of signals is denoted as

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W_2(i) y^{(109)}(i).$$

## B.4.5 Random beamforming for EPDCCH localized transmission (Antenna port 107, 108, 109 or 110)

EPDCCH localized transmission on antenna port 107, 108, 109 or 110 is defined by using a precoder vector $W(i)$ of size 2×1 randomly selected with the number of layers $\upsilon = 1$ from Table 6.3.4.2.3-1 in [8] as beamforming weights. This precoder takes as an input the signal $y^{(p)}(i)$, $i = 0,1,...,M_{\text{symb}}^{\text{ap}}-1$, for antenna port $p \in \{107,108,109,110\}$, with $M_{\text{symb}}^{\text{ap}}$ the number of modulation symbols including the user-specific reference symbols (DMRS), and generates a block of signals $y_{bf}(i) = \left[y_{bf}(i) \quad \tilde{y}_{bf}(i)\right]^T$ the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W(i) y^{(p)}(i).$$

## B.4.6 Beamforming model for CRI test

The transmission on antenna port(s) $p = 7,8,...,\upsilon+6$ is defined by using a precoder matrix $W(i)$ of size $N_{CSI} \times \upsilon$, where $N_{CSI}$ is the number of CSI reference signals configured per test and $\upsilon$ is the number of spatial layers. This precoder takes as an input a block of signals for antenna port(s) $p = 7,8,...,\upsilon+6$, $y^{(p)}(i) = \left[y^{(7)}(i) \quad y^{(8)}(i) \quad \cdots \quad y^{(6+\upsilon)}(i)\right]$, $i = 0,1,...,M_{\text{symb}}^{\text{ap}}-1$, with $M_{\text{symb}}^{\text{ap}}$ being the number of modulation symbols per antenna port including the user-specific reference symbols (DM-RS), and generates a block of signals

$y_{bf}^{(q)}(i) = \left[ y_{bf}^{(0)}(i) \quad y_{bf}^{(1)}(i) \quad \ldots \quad y_{bf}^{(N_{CSI}-1)}(i) \right]^T$ the elements of which are to be mapped onto the same time-frequency index pair $(k,l)$ but transmitted on different physical antenna elements:

$$\begin{bmatrix} y_{bf}^{(0)}(i) \\ y_{bf}^{(1)}(i) \\ \vdots \\ y_{bf}^{(N_{CSI}-1)}(i) \end{bmatrix} = \alpha(n) W(i) \begin{bmatrix} y^{(7)}(i) \\ y^{(8)}(i) \\ \vdots \\ y^{(6+\upsilon)}(i) \end{bmatrix}$$

- $W(i)$ is precoder matrix
- $\alpha(n)$ is amplitude scaling factor for CRI test, $\alpha(n) = 10^{P_{\theta_m}(n)/20}$
- $P_{\theta_m}(n)$ is power scaling factor as following definition:
  - $P_{\theta_m}(n) = A\cos\left(\theta_{\mathrm{m}} + \frac{2\pi n}{K}\right) + B$, A = 5 dB, B = -1.3351 dB.
  - $\theta_m$ controls the phase variation, and the phase for m-th subframe is denoted by $\theta_m = \theta_0 + \Delta\theta \cdot m$, where $\theta_0$ is the random start value with the uniform distribution, i.e., $\theta_0 \in [0, 2\pi]$, $\Delta\theta$ is the step of phase variation which is defined in Table B.4.6-1, and m is the linear increment of 1 for every sub-frame throughout the simulation.
  - K is the number of configured CSI-RS resources
  - $n \in \{0,1,\ldots,K-1\}$
- For following CRI with multiple CSI-RS resources configured, $n$ equals to CRI value reported by UE
- For fixed CRI with single CSI-RS resource configure, $n$ equals to 0.

**Table B.4.6-1: The step of phase variation**

| Variation Step | Value (rad/subframe) |
|---|---|
| $\Delta\theta$ | $1.2566\times10^{-3}$ |

The physical antenna elements are identified by indices $j = 0,1,\ldots,N_{ANT}-1$, where $N_{ANT} = N_{CSI}$ is the number of physical antenna elements configured per test.

Modulation symbols $y_{bf}^{(q)}(i)$ with $q \in \{0,1,\ldots,N_{CSI}-1\}$ (i.e. beamformed PDSCH and DM-RS) are mapped to the physical antenna index $j = q$.

For the k-th configured CSI-RS resource, modulation symbols $a_{k,l}^{(p)}$ with $p \in \{15,16,\ldots,14+N_{CSI}\}$ (i.e. CSI-RS) are firstly multiplied by amplitude scaling factor $\alpha(n)$ to generate power scaled symbols $y_{k,l}^{(p)}$:

$$y_{k,l}^{(p)} = \alpha(n) a_{k,l}^{(p)}$$

- $n$ equals to CSI-RS resource index (k-th)

And power scaled symbols $y_{k,l}^{(p)}$ with $p \in \{15,16,\ldots,14+N_{CSI}\}$ (i.e. power scaled CSI-RS) are mapped to the physical antenna index $j = p-15$, where $N_{CSI}$ is the number of CSI reference signals configured per test.

Modulation symbols $y^{(p)}(i)$ with $p \in \{0,1,...,P-1\}$ (i.e. PBCH, PDCCH, PHICH, PCFICH) are mapped to the physical antenna index $j = p$, where $P$ is the number of cell-specific reference signals configured per test.

Modulation symbols $a_{k,l}^{(p)}$ with $p \in \{0,1,...,P-1\}$ (i.e. CRS) are mapped to the physical antenna index $j = p$, where $P$ is the number of cell-specific reference signals configured per test.

# B.5 Interference models for enhanced performance requirements Type-A

This clause provides a description for the modelling of interfering cell transmissions for enhanced performance requirements Type-A including: definition of dominant interferer proportion, transmission mode 3, 4 and 9 type of interference modelling.

## B.5.1 Dominant interferer proportion

Each interfering cell involved in enhanced performance requirements Type-A is characterized by its associated dominant interferer proportion (DIP) value:

$$DIP_i = \frac{\hat{I}_{or(i+1)}}{N_{oc}'}$$

where is $\hat{I}_{or(i+1)}$ is the average received power spectral density from the i-th strongest interfering cell involved in the requirement scenario ( $\hat{I}_{or(1)}$ is assumed to be the power spectral density associated with the serving cell) and $N_{oc}' = \sum_{j=2}^{N} \hat{I}_{or(j)} + N_{oc}$ where $N_{oc}$ is the average power spectral density of a white noise source consistent with the definition provided in subclause 3.2 and $N$ is the total number of cells involved in a given requirement scenario.

## B.5.2 Transmission mode 3 interference model

This subclause provides transmission mode 3 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the entire PDSCH region and the full transmission bandwidth. Transmitted physical channels shall include PSS, SSS and PBCH.

For each subframe and each CQI subband as defined in subclause 7.2 of [10], a transmission rank shall be randomly determined independently from other CQI subbands as well as other interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in the requirement scenario.

For rank-1 transmission over a subband, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8].

For rank-2 transmission over a subband, precoding for spatial multiplexing with large delay CDD over two layers for the number of antenna ports in the requirement scenario shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.2.2 of [8].

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.5.3 Transmission mode 4 interference model

This subclause provides transmission mode 4 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the entire PDSCH region and the full transmission bandwidth. Transmitted physical channels shall include PSS, SSS and PBCH.

For each subframe and each CQI subband as defined in subclause 7.2 of [10], a transmission rank shall be randomly determined independently from other CQI subbands as well as other interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in the requirement scenario.

For each subframe and CQI subband, a precoding matrix for the number of layers $\upsilon$ associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-1 of [8]. Note that codebook index 0 shall be excluded from random precoder selection when the number of layers is $\upsilon = 2$.

Precoding for spatial multiplexing with cell-specific reference signals for the number of antenna ports in the requirement scenario shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.2.1 of [8] with the selected precoding matrices for each subframe and each CQI subband.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.5.4 Transmission mode 9 interference model

This subclause provides transmission mode 9 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the entire PDSCH region and the full transmission bandwidth. Transmitted physical channels shall include PSS, SSS and PBCH.

For each subframe and each CQI subband as defined in subclause 7.2 of [10], a transmission rank shall be randomly determined independently from other CQI subbands as well as other interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in the requirement scenario.

For each subframe and each CQI subband, a precoding matrix for the number of layers $\upsilon$ associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-2 of [8].

The generic beamforming model in subclause B.4.3 shall be applied assuming cell-specific reference signals and CSI reference signals as specified in the requirement scenario. Random precoding with selected rank and precoding matrices for each subframe and each CQI subband shall be applied to 16QAM randomly modulated layer symbols including the user-specific reference symbols over antenna port 7 when the rank is one and antenna ports 7, 8 when the rank is two.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

# B.6 Interference models for enhanced performance requirements Type-B

This clause provides a description for the modelling of interfering cell transmissions for enhanced performance requirements Type-B including: transmission mode 2, 3, 4 and 9 type of interference modelling and a definition of the random interference model.

## B.6.1 Transmission mode 2 interference model

This subclause provides transmission mode 2 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the PDSCH region as specified in subclause B.6.6. Transmitted physical channels shall include PSS, SSS and PBCH.

The MCS shall be randomly determined with probabilities of occurrence of each possible MCS as specified in subclause B.6.6.

Precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to the randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8].

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.6.2 Transmission mode 3 interference model

This subclause provides transmission mode 3 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the PDSCH region as specified in subclause B.6.6. Transmitted physical channels shall include PSS, SSS and PBCH.

The transmission rank shall be randomly determined for each user defined in section B.6.6 with probabilities of occurrence of each possible transmission rank as specified in subclause B.6.6.

The MCS shall be randomly determined with probabilities of occurrence of each possible MCS as specified in subclause B.6.6.

For rank-1 transmission, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to the randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8].

For rank-2 transmission, precoding for spatial multiplexing with large delay CDD over two layers for the number of antenna ports in the requirement scenario shall be applied to the randomly modulated layer symbols, as specified in subclause 6.3.4.2.2 of [8].

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.6.3 Transmission mode 4 interference model

This subclause provides transmission mode 4 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the PDSCH region as specified in subclause B.6.6. Transmitted physical channels shall include PSS, SSS and PBCH.

The transmission rank shall be randomly determined with probabilities of occurrence of each possible transmission rank as specified in subclause B.6.6.

The MCS shall be randomly determined with probabilities of occurrence of each possible MCS as specified in subclause B.6.6.

For each TTI, for each user defined in B.6.6, a single precoding matrix for the number of layers $\upsilon$ associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-1 of [8]. Note that codebook index 0 shall be excluded from random precoder selection when the number of layers is $\upsilon = 2$.

Precoding for spatial multiplexing with cell-specific reference signals for the number of antenna ports in the requirement scenario shall be applied to randomly modulated layer symbols, as specified in subclause 6.3.4.2.1 of [8] with the selected precoding matrices as specified in subclause B.6.6.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.6.4 Transmission mode 9 interference model

This subclause provides transmission mode 9 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the PDSCH region as specified in subclause B.6.6. Transmitted physical channels shall include PSS, SSS and PBCH.

The transmission rank shall be randomly determined with probabilities of occurrence of each possible transmission rank as specified in subclause B.6.6.

The MCS shall be randomly determined with probabilities of occurrence of each possible MCS as specified in subclause B.6.6.

For each TTI, for each user defined in B.6.6, a single precoding matrix for the number of layers $\upsilon$ associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-1 of [8]. Note that codebook index 0 shall be excluded from random precoder selection when the number of layers is $\upsilon = 2$.

The generic beamforming model in subclause B.4.3 shall be applied assuming cell-specific reference signals and CSI reference signals as specified in the requirement scenario. Random precoding with selected rank and precoding matrices for each subframe shall be applied to randomly modulated layer symbols including the user-specific reference symbols over antenna port 7 when the rank is one and antenna ports 7, 8 when the rank is two.

For each TTI, for each user defined in B.6.6, the scrambling ID value nSCID is randomly assigned from the set of $\{0,1\}$.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.6.5 CRS interference model

This subclause provides for the CRS interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe there is no PDSCH transmitted. Transmitted physical channels shall include PSS, SSS and PBCH.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

## B.6.6 Random interference model

This subclause presents the interference model which defines the resource allocation, MCS and rank for the two interference cells. The model includes approximately 10% DTX on these interference cells. Table B.6.6-1 shows the resource allocation for four users in two different configurations for each of the two interferers. Table B.6.6-2 shows the resource allocation to be used for special subframes with TM9 interference. Table B.6.6-3 shows the probabilities for the MSC and rank for these users.

**Table B.6.6-1: Resource allocation for the random interference model**

| Resource allocation configurations Indexes | User Index | Resource allocation for random interference model | | | | Probability |
|---|---|---|---|---|---|---|
| | | Resource allocation type | Bitmap for resource allocation (Note 1) | | | |
| | | | 1st field bitmap | 2nd field bitmap | 3rd field bitmap | |
| **Configuration 1** | User 0 | 1 | 00 | 0 | 10101000101010 | 50% |
| | User 1 | 1 | 00 | 0 | 01010101010101 | |
| | User 2 | 0 | 01001001001001001 | | | |
| | User 3 | 0 | 00100100100100100 | | | |
| **Configuration 2** | User 0 | 1 | 00 | 0 | 10101010101010 | 50% |
| | User 1 | 1 | 00 | 1 | 01010100010101 | |
| | User 2 | 0 | 01001001001001001 | | | |
| | User 3 | 0 | 00100100100100100 | | | |

NOTE 1: The 1st, 2nd, and 3rd field bitmaps are only valid for resource allocation type 1 which was defined in [10].
NOTE 2: The resource allocation model is used for both 1st and 2nd interfering cells and the resource allocation is independent for each interfering cell.

**Table B.6.6-2: Resource allocation for the random interference model for TM9 special subframes**

| Resource allocation configurations Indexes | User Index | Resource allocation for random interference model | | | | Probability |
|---|---|---|---|---|---|---|
| | | Resource allocation type | Bitmap for resource allocation (Note 1) | | | |
| | | | 1st field bitmap | 2nd field bitmap | 3rd field bitmap | |
| **Configuration 1** | User 0 | 1 | 00 | 0 | 10101000101010 | 50% |
| | User 1 | 1 | 00 | 0 | 01010101000001 | |
| | User 2 | 0 | 01001000001001001 | | | |
| | User 3 | 0 | 00100100000100100 | | | |
| **Configuration 2** | User 0 | 1 | 00 | 0 | 10101000101010 | 50% |
| | User 1 | 1 | 00 | 1 | 01010000010101 | |
| | User 2 | 0 | 01001000001001001 | | | |
| | User 3 | 0 | 00100100000100100 | | | |

NOTE 1: The 1st, 2nd, and 3rd field bitmaps are only valid for resource allocation type 1 which was defined in [10].
NOTE 2: The resource allocation model is used for both 1st and 2nd interfering cells and the resource allocation is independent for each interfering cell.

**Table B.6.6-3: MCS and rank configuration for the random interference model**

| MCS probability | | | Rank probability | |
|---|---|---|---|---|
| **MCS5** | **MCS14** | **MCS25** | **Rank 1** | **Rank 2** |
| 50% | 25% | 25% | 80% | 20% |

NOTE 1: The MCS and rank should follow the probability indicated in the table randomly per UE per TTI.
NOTE 2: The probabilities for MCS and rank configuration are used for both 1st and 2nd interfering cells. The MCS and rank configurations are independent for each interfering cell.

# B.7 FFS

# B.8 Burst transmission models for Frame structure type 3

## B.8.1 Burst transmission model for one LAA SCell

This clause provides a description for burst transmission models for Frame structure type 3.

One burst is defined as downlink transmissions which occupy one or more consecutive subframes. The burst transmission format is determined according to the steps below:

1) Select the number of subframes $N$ randomly from a given set of the number of subframes $S_1$ with equal probability as the total length of burst transmission format. The length includes both occupied OFDM symbols and non-occupied OFDM symbols within the burst format. $S_1$ is given per test case.

2) If $N$ is equal to 1, the subframe is set as fully occupied, otherwise:

   - For demodulation test, the starting position for the first subframe is randomly selected from OFDM symbol 0 and OFDM symbol 7 with equal probability. For CSI test, the starting position for the first subframe is OFDM symbol 0.

   - The configuration of occupied OFDM symbols in the last subframe is randomly selected from configuration set $S_2$. $S_2$ is given per test case.

A uniform random variable from [0, 1] is generated. If the random variable is less than *p* which is given per test case,

- If both the last subframe of previous burst and first subframe of new burst format are fully occupied, start burst transmission after deferring one subframe from the last subframe of previous burst. Otherwise, start burst transmission at the end of last subframe of previous burst.

- Otherwise, the burst transmission is muted and the muting duration is the same as the number of subframes for determined burst format.

# Annex C (normative): Downlink Physical Channels

This annex specifies the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

## C.0 Downlink signal levels

The downlink power settings in Table C.0-1 or Table C.0-2 are used unless otherwise specified in a test case.

If the UE has more than one Rx antenna, the downlink signal is applied to each one. All UE Rx antennas shall be connected.

If the UE has one Rx antenna, the downlink signal is applied to it.

**Table C.0-1: Default Downlink power levels for E-UTRA**

| | Unit | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Number of RBs | | 6 | 15 | 25 | 50 | 75 | 100 |
| Channel BW Power | dBm | -66 | -62 | -60 | -57 | -55 | -54 |
| RS EPRE | dBm/15kHz | -85 | -85 | -85 | -85 | -85 | -85 |
| Note 1: The channel bandwidth powers and RB allocations are informative, based on -85dBm/15kHz RS_EPRE, then scaled according to the number of RBs and rounded to the nearest integer dBm value. Full RE allocation with no boost or deboost is assumed in this calculation, but allocation may vary during setup.<br>Note 2: The power level is specified at each UE Rx antenna. | | | | | | | |

**Table C.0-2: Default Downlink power levels for NB-IoT**

| | Unit | |
|---|---|---|
| Subcarriers | | 12 |
| Channel BW Power | dBm | -74 |
| NRS EPRE | dBm/15kHz | -85 |
| Note 1: The channel bandwidth power is informative, based on -85dBm/15kHz NRS_EPRE, then scaled according to the number of subcarriers and rounded to the nearest integer dBm value. Full RE allocation with no boost or deboost is assumed in this calculation, but allocation may vary during setup.<br>Note 2: The power level is specified at the UE Rx antenna | | |

The default signal level uncertainty is +/-3dB at each test port, for any level specified. If the uncertainty value is critical for the test purpose, a tighter uncertainty is specified for the related test case in Annex F.

## C.1 General

Table C.1-1 describes the mapping of downlink physical channels and signals to physical resources for E-UTRA FDD.

Table C.1-2 describes the mapping of downlink physical channels and signals to physical resources for E-UTRA TDD.

Table C.1-3 describes the mapping of downlink physical channels and signals to physical resources for NB-IoT.

**Table C.1-1: Mapping of downlink physical channels and signals to physical resources for E-UTRA FDD**

| Physical channel | Time Domain Location | Frequency Domain Location | Note |
|---|---|---|---|
| RS | Symbols 0, 4 of each subframe for antenna port 0 & 1<br>Symbol 1 of each subframe for antenna port 2 & 3 | Downlink system bandwidth dependent | Mapping rule is specified in TS 36.211 6.10.1.2<br>- CELL_ID = 0 |
| PBCH | Symbols 0 to 3 of slot 1 of subframe 0 of each radio frame | Occupies 72 subcarriers centred on the DC subcarrier | Mapping rule is specified in TS 36.211 Section 6.6.4 (Note 2) |
| PSS | Symbol 6 of slot 0 and 10 of each radio frame | Occupies 62 subcarriers centred on the DC subcarrier. Additional 10 subcarriers (5 on each side) adjacent to the centred 62 subcarriers are reserved. | Mapping rule is specified in TS 36.211 Section 6.11.1.2 |
| SSS | Symbol 5 of slots 0 and 10 of each radio frame | Occupies 62 subcarriers centred on the DC subcarrier. Additional 10 subcarriers (5 on each side) adjacent to the centred 62 subcarriers are reserved. | Mapping rule is specified in TS 36.211 Section 6.11.2.2 |
| PCFICH | Symbol 0 of each subframe | Downlink system bandwidth dependent. Maps into 4 REGs uniformly spread in the frequency domain over the whole system bandwidth. | Mapping rule is specified in TS 36.211 Section 6.7.4 (Note 1)<br>- CELL_ID = 0 |
| PHICH | Symbol 0 of each subframe | Downlink system bandwidth dependent. Each PHICH group maps into 3 REGs in the frequency domain on the REGs not assigned to PCFICH over the whole system bandwidth | Mapping rule is specified in TS 36.211 Section 6.9.3 (Note 1)<br>- CELL_ID = 0<br>- Ng = 1<br>- Normal PHICH duration<br>-Number of PHICH groups = 1(BW=1.4MHz)/2(BW=3MHz)/ 4(BW=5MHz)/7(BW=10MHz)/ 10(BW=15MHz)/13(BW=20MHz)<br><br>Not required for UE category M1 testing |
| PDCCH | Symbols 0, 1, 2, 3 of each subframe for 1.4 MHz<br><br>Symbols 0, 1, 2, of each subframe for 3 and 5 MHz<br><br>Symbols 0, 1 of each subframe for 10, 15 and 20 MHz | The remaining REGs not allocated to both PCFICH and PHICH are used for PDCCH | Mapping rule is specified in TS 36.211 Section 6.8.5 (Note 1) |
| MPDCCH | Same as PDSCH | For Subframe 0, subcarriers corresponding to resource elements not allocated to RS, PSS, SSS and PBCH (core set and repetitions) and reserved for PBCH antenna ports 3 and 4 on the 72 central subcarriers.<br><br>For Subframe 5, subcarriers corresponding to resource elements not allocated to RS, PSS and SSS.<br><br>For Subframe 9, subcarriers corresponding to resource elements not allocated to RS, PSS, SSS and PBCH (repetitions).<br><br>For other subframes, subcarriers corresponding to resource elements not allocated to RS. | Mapping rule is specified in TS 36.211 Section 6.8B.5 (Note 1)<br><br>Only required for UE category M1 testing |
| PDSCH | All remaining OFDM symbols of | For Subframe 0, | Note that there are reserved |

| | | | |
|---|---|---|---|
| | each subframe not allocated to PDCCH | REs not allocated to RS, PSS, SSS and PBCH, is allocated to PDSCH<br><br>For Subframe 5,<br>REs not allocated to RS, PSS and SSS, is allocated to PDSCH<br><br>For other subframes,<br>REs not allocated to RS, is allocated to PDSCH | REs that are not used for transmission of any physical channels (Note 3 ) & (Note 4) which need to be taken into account when allocating REs to PDSCH |

Note 1: In case a single cell-specific RS is configured, cell-specific RS shall be assume to be present on antenna ports 0 and 1 for the purpose of mapping a symbol-quadruplet to a REG (resource-element group). (See TS 36.211 Section 6.2.4).

Note 2: PBCH is mapped into RE assuming RS from 4 antennas are used at the eNB transmitter, irrespective of the actual number of Tx antenna. Resource elements assumed to be reserved for RS but not used for transmission of RS shall not be used for transmission of any physical channel. (See TS 36.211 Section 6.6.4).

Note 3: In slot 0 and slot 10 of each radio frame, there are reserved REs for PSS and SSS that are not used for transmission of any physical channels. (See TS 36.211 Section 6.11.1.2 & 6.11.2.2).

Note 4: REs used for RS transmission on any of the antenna ports in a slot shall not be used for any transmission on any other antenna port in the same slot and set to zero. (See TS 36.211 Section 6.10.1.2).

**Table C.1-2: Mapping of downlink physical channels and signals to physical resources for E-UTRA TDD**

| Physical channel | Time Domain Location | Frequency Domain Location | Note |
|---|---|---|---|
| RS | Symbols 0, 4 of each subframe for antenna port 0 & 1<br>Symbol 1 of each subframe for antenna port 2 & 3 | Downlink system bandwidth dependent. | Mapping rule is specified in TS 36.211[8] 6.10.1.2<br>- CELL_ID = 0 |
| PBCH | Symbols 0 to 3 of slot 1 of subframe 0 of each radio frame | Occupies 72 subcarriers centred on the DC subcarrier | Mapping rule is specified in TS 36.211[8] Section 6.6.4 (Note 3) |
| PSS | Symbol 2 of slot 2 and 12 of each radio frame | Occupies 62 subcarriers centred on the DC subcarrier. Additional 10 subcarriers (5 on each side) adjacent to the centred 62 subcarriers are reserved. | Mapping rule is specified in TS 36.211[8] Section 6.11.1.2 |
| SSS | Symbol 6 of slots 1 and 11 of each radio frame | Occupies 62 subcarriers centred on the DC subcarrier. Additional 10 subcarriers (5 on each side) adjacent to the centred 62 subcarriers are reserved. | Mapping rule is specified in TS 36.211[8] Section 6.11.2.2 |
| PCFICH | Symbol 0 of each subframe and special subframe | Downlink system bandwidth dependent. Maps into 4 REGs uniformly spread in the frequency domain over the whole system bandwidth | Mapping rule is specified in TS 36.211[8] Section 6.7.4 (Note 2)<br>- CELL_ID = 0 |
| PHICH | Symbol 0 of each subframe and special subframe | Downlink system bandwidth dependent. Each PHICH group maps into 3 REGs in the frequency domain on the REGs not assigned to PCFICH over the whole system bandwidth | Mapping rule is specified in TS 36.211[8] Section 6.9.3 (Note 2)<br>- CELL_ID = 0<br>- Ng = 1<br>- Normal PHICH duration<br>-Number of PHICH groups = 1(BW=1.4MHz)/2(BW=3MHz)/ 4(BW=5MHz)/7(BW=10MHz)/ 10(BW=15MHz)/13(BW=20MHz)<br><br>Not required for UE category M1 testing |
| PDCCH | For normal subframes(0,4,5,9)<br>Symbols 0, 1, 2, 3 of each subframe for 1.4 MHz<br>Symbols 0, 1, 2, of each subframe for 3 and 5 MHz<br>Symbols 0, 1 of each subframe for 10, 15 and 20 MHz<br><br>For special subframe (1&6)<br>Symbols 0, 1 of each subframe for all BWs | The remaining REGs not allocated to both PCFICH and PHICH are used for PDCCH | Mapping rule is specified in TS 36.211[8] Section 6.8.5 (Note 2) |
| MPDCCH | Same as PDSCH | For Subframe 0, subcarriers corresponding to resource elements not allocated to RS, SSS and PBCH (core set and repetitions) and reserved for PBCH antenna ports 3 and 4 on the 72 central subcarriers.<br><br>For Subframe 5, subcarriers corresponding to resource elements not allocated to RS, SSS and PBCH (repetitions).<br><br>For Subframe 1 and 6, resource elements not allocated to RS, PSS, GP and UpPTS.<br><br>For other subframes, subcarriers corresponding to resource elements not allocated to RS. | Mapping rule is specified in TS 36.211[8] Section 6.8B.5 (Note 2)<br><br>Only required for UE category M1 testing |

| | | | |
|---|---|---|---|
| PDSCH | ,All remaining OFDM symbols of each subframe not allocated to PDCCH with the following exception:<br>For 1.4MHz,no data shall be scheduled on special subframes (1&6) to avoid problems with insufficient PDCCH performance | For Subframe 0,<br>REs not allocated to RS, SSS and PBCH, is allocated to PDSCH<br><br>For Subframe 5,<br>REs not allocated to RS and SSS, is allocated to PDSCH<br><br>For Subframe 1 and 6,<br>REs not allocated to RS, PSS, GP and UpPTS is allocated to PDSCH<br><br>For other downlink subframes,<br>REs not allocated to RS is allocated to PDSCH | Note that there are reserved REs that are not used for transmission of any physical channels (Note 4 ) & (Note 5) which need to be taken into account when allocating REs to PDSCH |

Note 1: The mapping is based on the default TDD configuration for subframe assignment and special subframe patterns (see 36.508 [7]subclause 4.6.3)

Note 2: In case a single cell-specific RS is configured, cell-specific RS shall be assume to be present on antenna ports 0 and 1 for the purpose of mapping a symbol-quadruplet to a REG (resource-element group). (See TS 36.211[8] Section 6.2.4).

Note 3: PBCH is mapped into RE assuming RS from 4 antennas are used at the eNB transmitter, irrespective of the actual number of Tx antenna. Resource elements assumed to be reserved for RS but not used for transmission of RS shall not be used for transmission of any physical channel. (See TS 36.211[8] Section 6.6.4).

Note 4: In slot 1,2,11 and 12 of each radio frame, there are reserved REs for PSS and SSS that are not used for transmission of any physical channels. (See TS 36.211[8] Section 6.11.1.2 & 6.11.2.2).

Note 5: REs used for RS transmission on any of the antenna ports in a slot shall not be used for any transmission on any other antenna port in the same slot and set to zero. (See TS 36.211[8] Section 6.10.1.2).

**Table C.1-3: Mapping of downlink physical channels and signals to physical resources for NB-IoT**

| Physical channel | Time Domain Location | Frequency Domain Location | Note |
|---|---|---|---|
| NPBCH | NPBCH is transmitted in subframe 0 in every radio frame.<br>NPBCH consists of 8 independently decodable blocks of 80 ms duration.<br>The time interval where MIB remains unchanged is 640 ms.<br>NPBCH does not use the first 3 symbols in a subframe in in-band operation.<br>For stand-alone and guard-band, the first 3 symbols (of the subframe transmitting NPBCH) contain no NPBCH. | Occupies any of the 12 subcarriers not reserved for transmission of reference signals | Mapping rule is specified in TS 36.211 [8] sub clause 10.2.4.4 |
| NPSS | NPSS is transmitted in subframe 5.<br>NPSS uses the last 11 OFDM symbols of subframes in which NB-PSS occurs for normal CP.<br>NB-IoT PSS/SSS do not use:<br>- the LTE PDCCH control region<br>- REs used by LTE CRS<br>NSSS periodicity is 10ms. | NPSS is mapped to sub-carriers #0-10 of the NB-IoT carrier | Mapping rule is specified in TS 36.211 [8] sub clause 10.2.7.1.2 |
| NSSS | NSSS is transmitted in subframe 9.<br>NSSS uses the last 11 OFDM symbols of subframes in which NB-SSS occurs for normal CP.<br>NB-IoT PSS/SSS do not use:<br>- the LTE PDCCH control region<br>- REs used by LTE CRS<br>NSSS periodicity is 20ms. | The number of subcarriers for NSSS is 12 | Mapping rule is specified in TS 36.211 [8] sub clause 10.2.7.2.2 |
| NPDCCH | NPDCCH on a given NB-IoT carrier are not mapped to the subframes containing NPSS/NSSS/PBCH on that carrier.<br>NPDCCH are not be mapped onto resources elements used for NRS.<br>NPDCCH are not overlapped with PBCH, PSS, SSS, or CRS.<br>One or two NPDCCHs can be transmitted in a subframe.<br>In in-band, first 3 OFDM symbols are not used for NPDCCH.<br>In stand-alone and guard-band, all OFDM symbols are available for NPDCCH.<br>NPDCCH and NPDSCH are multiplexed only based on TDM at subframe level:<br>- It means that only cross subframe scheduling is supported<br>- The start of an NPDCCH search space is >=4ms after the end of the last NPDCCH search space | NPDCCH is transmitted on an aggregation of one or two consecutive narrowband control channel elements (NCCEs), where a narrowband control channel element corresponds to 6 consecutive subcarriers in a subframe where NCCE 0 occupies subcarriers 0 through 5 and NCCE 1 occupies subcarriers 6 through 11 | Mapping rule is specified in TS36.211 [8] sub clause 10.2.5.5 |
| NPDSCH | The start of NB-PDSCH transmission is >=4ms later than the end of its associated DL assignment.<br>NPDSCH on a given NB-IoT | Occupies any of the 12 subcarriers not reserved for transmission of reference signals | Mapping rule is specified in TS 36.211 [8] sub clause 10.2.3.4 |

| | | | |
|---|---|---|---|
| | carrier are not mapped to the subframes containing NPSS/NSSS/PBCH on that carrier.<br>NPDSCH resource elements should be different from the ones used for NRS.<br>NPDSCH resource elements should be different from the ones used for CRS. | | |
| NRS | Narrowband reference signals are transmitted in all NB-IoT downlink subframes in a cell supporting NPDSCH transmission.<br>NRS is not transmitted in subframes that are not NB-IoT downlink subframes, except if these subframes contain NPBCH or NPDSCH carrying SystemInformationBlockType1-NB where NRS shall be transmitted<br>Narrowband reference signals are transmitted in subframes #0 and #4 and in subframes #9 not containing NSSS [when no NB-IoT downlink subframes configuration has not been established].<br>The narrowband reference signals shall not be mapped to subframes containing NPSS or NSSS.<br>NRS are transmitted on one or two antenna ports 0 to 1 (Figure 10.2.6.2-1 in TS 36.211 [8]). | 2 subcarriers per antenna port in any OFDM symbol where NRS is transmitted | |

# C.2 Set-up

Table C.2-1 describes the downlink Physical Channels that are required for E-UTRA connection set up.

**Table C.2-1: Downlink Physical Channels required for E-UTRA connection set-up**

| Physical Channel | EPRE Ratio | Note |
|---|---|---|
| **PBCH** | PBCH_RA = 0 dB | |
| | PBCH_RB = 0 dB | |
| **PSS** | PSS_RA = 0 dB | |
| **SSS** | SSS_RA = 0 dB | |
| **PCFICH** | PCFICH_RB = 0 dB | |
| **PDCCH** | PDCCH_RA = 0 dB | |
| | PDCCH_RB = 0 dB | |
| **MPDCCH** | MPDCCH_RA = 0 dB | Only required for UE category M1 testing |
| | MPDCCH_RB = 0 dB | |
| **PDSCH** | PDSCH_RA = 0 dB | |
| | PDSCH_RB = 0 dB | |
| **PHICH** | PHICH_RA = 0 dB | Note 2 Not required for UE category M1 testing |
| | PHICH_RB = 0 dB | |
| Note 1: No boosting is applied.<br>Note 2: PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group. | | |

Table C.2-2 describes the configuration of PDSCH and PDCCH before measurement for E-UTRA FDD and Table C.2-3 for E-UTRA TDD.

Table C.2-4 describes the configuration of PDSCH and MPDCCH before measurement for FDD and Table C.2-5 for TDD.

**Table C.2-2: PDSCH and PDCCH configuration for E-UTRA FDD**

| Parameter | Unit | Value | Comments |
|---|---|---|---|
| Allocated resource blocks | | 6 | |
| MCS Index | | - | TB Size with transmitting message in 1TTI |
| Number of HARQ processes | Processes | 8 | |
| Maximum number of HARQ transmission | | 5 | |
| Aggregation level | CCE | 2 | Note 4 |
| DCI Format for PDSCH | | Format 1A | |
| DCI Format for PUSCH | | Format 0 | |
| Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz.<br>Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].<br>Note 3: The PDSCH shall be occupied 6 resource blocks centred on the DC subcarrier.<br>Note 4: For PDCCH using SI-RNTI, Aggregation level:<br>a)Tables C.3.0-3, C.3.1-3, and C.3.2-3 for RF tests<br>b)Table A.2.1-1 of 36.521-3 for RRM tests. | | | |

**Table C.2-3: PDSCH and PDCCH configuration for E-UTRA TDD**

| Parameter | Unit | Value | Comments |
|---|---|---|---|
| Allocated resource blocks | | 6 | |
| MCS Index | | 0 | TB Size with transmitting message in 1TTI |
| Number of HARQ processes (Note 1) | Processes | 7 | |
| Maximum number of HARQ transmission | | 4 | |
| Aggregation level | CCE | 2 | Note 5 |
| DCI Format for PDSCH | | Format 1A | |
| DCI Format for PUSCH | | Format 0 | |

Note 1: Number of HARQ processes shall be determined by UL/DL configuration, for configuration other than 1,the process number shall be set per TS 36.213 [10] Table 8-1.
Note 2: For normal downlink subframes, 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 4: The PDSCH shall be occupied 6 resource blocks centred on the DC subcarrier.
Note 5: For PDCCH using SI-RNTI, Aggregation level:
a)Tables C.3.0-3, C.3.1-3, and C.3.2-3 for RF tests
b)Table A.2.2-1 of 36.521-3 for RRM tests

**Table C.2-4: PDSCH and MPDCCH configuration for FDD**

| Parameter | Unit | Value | Comments |
|---|---|---|---|
| Allocated resource blocks | | [6] | |
| MCS Index | | - | TB Size with transmitting message in 1TTI |
| Number of HARQ processes, CE Mode A | Processes | [8] | |
| Number of HARQ processes, CE Mode B | Processes | [2] | |
| Maximum number of HARQ transmission | | [5] | |
| Aggregation level | CCE | [2] | Note 4 |
| DCI Format for PDSCH | | Format 6-1A | CE Mode A |
| DCI Format for PDSCH | | Format 6-1B | CE mode B |
| DCI Format for PUSCH | | Format 6-0A | CE Mode A |
| DCI Format for PUSCH | | Format 6-0B | CE mode B |

Note 1: [2] symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. [3] symbols allocated to PDCCH for 5 MHz and 3 MHz. [4] symbols allocated to PDCCH for 1.4 MHz.
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: Void.
Note 4: For MPDCCH using SI-RNTI, Aggregation level:
a)Tables C.3.0-3, C.3.1-3, and C.3.2-3 for RF tests
b)Table A.2.1-1 of 36.521-3 for RRM tests.

**Table C.2-5: PDSCH and MPDCCH configuration for TDD**

| Parameter | Unit | Value | Comments |
|---|---|---|---|
| Allocated resource blocks | | [6] | |
| MCS Index | | [0] | TB Size with transmitting message in 1TTI |
| Number of HARQ processes, CE Mode A (Note 1) | Processes | [7] | |
| Number of HARQ processes, CE Mode B | Processes | [2] | |
| Maximum number of HARQ transmission | | [4] | |
| Aggregation level | CCE | [2] | Note 5 |
| DCI Format for PDSCH | | Format 6-1A | CE Mode A |
| DCI Format for PDSCH | | Format 6-1B | CE mode B |
| DCI Format for PUSCH | | Format 6-0A | CE Mode A |
| DCI Format for PUSCH | | Format 6-0B | CE mode B |
| Note 1: Number of HARQ processes shall be determined by UL/DL configuration, for configuration other than 1,the process number shall be set per TS 36.213 [10] Table 8-1.<br>Note 2: For normal downlink subframes, [2] symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. [3] symbols allocated to PDCCH for 5 MHz and 3 MHz. [4] symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only [2] OFDM symbols are allocated to PDCCH for all BWs.<br>Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8].<br>Note 4: Void.<br>Note 5: For MPDCCH using SI-RNTI, Aggregation level:<br>a)Tables C.3.0-3, C.3.1-3, and C.3.2-3 for RF tests<br>b)Table A.2.2-1 of 36.521-3 for RRM tests | | | |

**Table C.2-6: Downlink Physical Channels required for connection set-up, NB-IoT**

| Physical Channel | EPRE Ratio | Note |
|---|---|---|
| **NPBCH** | NPBCH_RA = 0 dB | |
| | NPBCH_RB = 0 dB | |
| **NPSS** | NPSS_RA = 0 dB | |
| **NSSS** | NSSS_RA = 0 dB | |
| **NPDCCH** | NPDCCH_RA = 0 dB | |
| | NPDCCH_RB = 0 dB | |
| **NPDSCH** | NPDSCH_RA = 0 dB | |
| | NPDSCH_RB = 0 dB | |
| Note 1: No boosting is applied. | | |

Table C.2-7 describes the configuration of NPDSCH and NPDCCH before measurement for NB-IoT.

**Table C.2-7: NPDSCH and NPDCCH configuration for NB-IoT**

| Parameter | Unit | Value | Comments |
|---|---|---|---|
| Allocated subcarriers | | [FFS] | |
| MCS Index | | - | TB Size with transmitting message in 1TTI |
| Number of HARQ processes | Processes | 1 | |
| Maximum number of HARQ transmission | | 1 | |
| Aggregation level | NCCE | 2 | |
| DCI Format for NPDSCH | | Format N1 | |
| DCI Format for NPUSCH | | Format N0 | |
| Note 1: Reference signal NRS, Synchronization signals NPSS, NSSS and NPBCH allocated as per TS 36.211 [8] | | | |

# C.3 Connection

The following clauses describes the downlink Physical Channels that are transmitted during a connection i.e., when measurements are done.

# C.3.0 Measurement of Transmitter Characteristics

Table C.3.0-1 is applicable for measurements on the Transmitter Characteristics (clause 6).

**Table C.3.0-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)**

| Physical Channel | EPRE Ratio | Note |
|---|---|---|
| PBCH | PBCH_RA = 0 dB | |
| | PBCH_RB = 0 dB | |
| PSS | PSS_RA = 0 dB | |
| SSS | SSS_RA = 0 dB | |
| PCFICH | PCFICH_RB = 0 dB | |
| PDCCH | PDCCH_RA = 0 dB | |
| | PDCCH_RB = 0 dB | |
| MPDCCH | MPDCCH_RA = 0 dB | Only required for UE category M1 testing |
| | MPDCCH_RB = 0 dB | |
| PDSCH | PDSCH_RA = 0 dB | |
| | PDSCH_RB = 0 dB | |
| PHICH | PHICH_RB = 0 dB | Note 1, Note 2 Not required for UE category M1 testing |
| Note 1: PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group.<br>Note 2: For CA tests with 1 UL, no PHICH resources are assigned to the DUT in the SCell.<br>Note 3: Unused PDCCH or MPDCCH resources and PHICH groups are padded with resource element groups with power level given respectively by PDCCH_RA/RB or MPDCCH_RA/RB and PHICH_RB, such that a total power spectral density in the control region that is constant on an OFDM symbol basis is targeted. | | |

NOTE 1: No boosting is applied.

**Table C.3.0-2: Power allocation for OFDM symbols and reference signals**

| Parameter | Unit | Value | Note |
|---|---|---|---|
| Transmitted power spectral density $I_{or}$ | dBm/15 kHz | Test specific | 1. $I_{or}$ shall be kept constant throughout all OFDM symbols |
| Cell-specific reference signal power ratio $E_{RS} / I_{or}$ | | 0 dB | |

**Table C.3.0-3: PDCCH Aggregation Level (in CCE-s)**

| Bandwidth | DCI for DL (SI-RNTI) | DCI for DL (C-RNTI) | DCI for UL (C-RNTI) | Notes |
|---|---|---|---|---|
| 1.4 MHz | 4 | 1 | 1 | Note 1 |
| 3 MHz | 4 | 4 | 4 | Note 1 |
| 5 MHz | 4 | 4 | 4 | Note 1 |
| 10 MHz | 8 | 8 | 8 | Note 1 |
| 15 MHz | 8 | 8 | 8 | Note 1 |
| 20 MHz | 8 | 8 | 8 | Note 1 |
| Note 1: No DL data allocated on TDD special subframes | | | | |

**Table C.3.0-3a: MPDCCH Aggregation Level (in ECCE-s)**

| Bandwidth | DCI for DL (C-RNTI) | DCI for UL (C-RNTI) |
|---|---|---|
| 1.4 MHz | 2 | 4 |
| 3 MHz | 2 | 4 |
| 5 MHz | 2 | 4 |
| 10 MHz | 2 | 4 |
| 15 MHz | 2 | 4 |
| 20 MHz | 2 | 4 |

## C.3.1 Measurement of Receiver Characteristics

Table C.3.1-1 or Table C.3.1-5 is applicable for measurements on the Receiver Characteristics (clause 7).

**Table C.3.1-1: Downlink Physical Channels transmitted during a connection (E-UTRA FDD and TDD)**

| Physical Channel | EPRE Ratio | Note |
|---|---|---|
| PBCH | PBCH_RA = 0 dB | |
| | PBCH_RB = 0 dB | |
| PSS | PSS_RA = 0 dB | |
| SSS | SSS_RA = 0 dB | |
| PCFICH | PCFICH_RB = 0 dB | |
| PDCCH | PDCCH_RA = 0 dB | |
| | PDCCH_RB = 0 dB | |
| MPDCCH | MPDCCH_RA = 0 dB | Only required for UE category M1 testing |
| | MPDCCH_RB = 0 dB | |
| PDSCH | PDSCH_RA = 0 dB | |
| | PDSCH_RB = 0 dB | |
| PHICH | PHICH_RB = 0 dB | Note 1, Note 2 Not required for UE category M1 testing |
| OCNG | OCNG_RA = 0 dB | |
| | OCNG_RB = 0 dB | |
| Note 1: PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group.<br>Note 2: For CA tests with 1 UL, no PHICH resources are assigned to the DUT in the SCell. In such case PHICH of SCell is entirely part of OCNG pattern used. | | |

NOTE 1: No boosting is applied.

**Table C.3.1-2: Power allocation for OFDM symbols and reference signals**

| Parameter | Unit | Value | Note |
|---|---|---|---|
| Transmitted power spectral density $I_{or}$ | dBm/15 kHz | Test specific | 1. $I_{or}$ shall be kept constant throughout all OFDM symbols |
| Cell-specific reference signal power ratio $E_{RS} / I_{or}$ | | 0 dB | |

**Table C.3.1-3: PDCCH Aggregation Level (in CCE-s)**

| Bandwidth | DCI for DL (SI-RNTI) | DCI for DL (C-RNTI) | DCI for UL (C-RNTI) | Notes |
|---|---|---|---|---|
| 1.4 MHz | 4 | 4 | 2 | Note 1, 2 |
| 3 MHz | 4 | 4 | 2 | Note 2 |
| 5 MHz | 8 | 8 | 4 | Note 2 |
| 10 MHz | 8 | 8 | 8 | Note 2 |
| 15 MHz | 8 | 8 | 8 | Note 2 |
| 20 MHz | 8 | 8 | 8 | Note 2 |
| Note 1: No DL data allocated on TDD special subframes<br>Note 2: No DL data allocated on subframe 5 | | | | |

**Table C.3.1-3a: MPDCCH Aggregation Level (in ECCE-s)**

| Bandwidth | DCI for DL (C-RNTI) | DCI for UL (C-RNTI) |
|---|---|---|
| 1.4 MHz | 2 | 4 |
| 3 MHz | 2 | 4 |
| 5 MHz | 2 | 4 |
| 10 MHz | 2 | 4 |
| 15 MHz | 2 | 4 |
| 20 MHz | 2 | 4 |

**Table C.3.1-4: FFS**

**Table C.3.1-5: Downlink Physical Channels transmitted during a connection for NB-IoT**

| Physical Channel | EPRE Ratio | Note |
|---|---|---|
| NPBCH | NPBCH_RA = 0 dB | |
| | NPBCH_RB = 0 dB | |
| NPSS | NPSS_RA = 0 dB | |
| NSSS | NSSS_RA = 0 dB | |
| NPDCCH | NPDCCH_RA = 0 dB | |
| | NPDCCH_RB = 0 dB | |
| NPDSCH | NPDSCH_RA = 0 dB | |
| | NPDSCH_RB = 0 dB | |

**Table C.3.1-6: Power allocation for OFDM symbols and reference signals for NB-IoT**

| Parameter | Unit | Value | Note |
|---|---|---|---|
| Transmitted power spectral density $I_{or}$ | dBm/15 kHz | Test specific | 1. $I_{or}$ shall be kept constant throughout all OFDM symbols |
| Cell-specific reference signal power ratio $E_{RS} / I_{or}$ | | 0 dB | |

**Table C.3.1-7: NPDCCH Aggregation Level (in NCCE-s)**

FFS

## C.3.2 Measurement of Performance requirements

Table C.3.2-1 is applicable for measurements in which uniform RS-to-EPRE boosting for all downlink physical channels.

**Table C.3.2-1: Downlink Physical Channels transmitted during a connection (FDD and TDD and Frame structure Type 3)**

| Physical Channel | EPRE Ratio | Note |
|---|---|---|
| PBCH | PBCH_RA = $\rho_A + \sigma$ | |
| | PBCH_RB = $\rho_B + \sigma$ | |
| PSS | PSS_RA = 0 (Note 4) | |
| SSS | SSS_RA = 0 (Note 4) | |
| PCFICH | PCFICH_RB = $\rho_B + \sigma$ | |
| PDCCH | PDCCH_RA = $\rho_A + \sigma$ | |
| | PDCCH_RB = $\rho_B + \sigma$ | |
| EPDCCH | EPDCCH_RA = $\rho_A$ | |
| | EPDCCH_RB = $\rho_B$ | |
| MPDCCH | MPDCCH_RA = $\rho_A+\delta$ | Only required for UE category M1 testing |
| | MPDCCH_RB = $\rho_B+\delta$ | |
| PDSCH | PDSCH_RA = $\rho_A$ | |
| | PDSCH_RB = $\rho_B$ | |
| PMCH | PMCH_RA = $\rho_A$ | |
| | PMCH_RA = $\rho_B$ | |
| MBSFN RS | MBSFN RS_RA = $\rho_A$ | |
| | MBSFN RS_RA = $\rho_B$ | |
| PHICH | PHICH_RB = $\rho_B + \sigma$ | Note 1, Note 2 Not required for UE category M1 testing |
| OCNG | OCNG_RA = $\rho_A + \sigma$ | |
| | OCNG_RB = $\rho_B + \sigma$ | |
| Note 1: PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group.<br>Note 2: For CA tests with 1 UL, no PHICH resources are assigned to the DUT in the SCell. In such case PHICH of SCell is entirely part of OCNG pattern used. | | |

NOTE 1: $\rho_A$ denotes the ratio of PDSCH EPRE to cell-specific RS EPRE among PDSCH REs in all the OFDM symbols not containing cell-specific RS. $\rho_B$ denotes the ratio of PDSCH EPRE to cell-specific RS EPRE among PDSCH REs in all the OFDM symbols containing cell-specific RS.

NOTE 2: $\rho_A = \rho_B$ = 0 dB means no RS boosting.

NOTE 3: MBSFN RS and OCNG are not defined downlink physical channels in [8].

NOTE 4: Assuming PSS and SSS transmitted on a single antenna port.

NOTE 5: $\rho_A$, $\rho_B$, and $\sigma$ are test specific, $\sigma$ = 0 dB otherwise.

NOTE 6: For TM8, TM9 and TM10, $\rho_A$ and $\rho_B$ are used for the purpose of the test set up only.

NOTE 7: For Frame Structure Type 3, PBCH are not defined.

**Table C.3.2-2: Power allocation for OFDM symbols and reference signals**

| Parameter | Unit | Value | Note |
|---|---|---|---|
| Total transmitted power spectral density $I_{or}$ | dBm/15 kHz | Test specific | 1. $I_{or}$ shall be kept constant throughout all OFDM symbols |
| Cell-specific reference signal power ratio $E_{RS} / I_{or}$ | | Test specific | 1. Applies for antenna port *p* |
| Energy per resource element EPRE | | Test specific | 1. The complex-valued symbols $y^{(p)}(i)$ and $a_{k,l}^{(p)}$ defined in [8] shall conform to the given EPRE value.<br>2. For TM8, TM9 and TM10, the reference point for EPRE is before the precoder in Annex B.4. |

**Table C.3.2-3: PDCCH Aggregation Level (in CCE-s) for PDSCH demodulation and PMI performance tests**

| Bandwidth | DCI for DL (SI-RNTI) | DCI for DL (C-RNTI) | DCI for UL (C-RNTI) | Notes |
|---|---|---|---|---|
| 1.4 MHz | 4 | 4 | 2 | Note 1, 2 |
| 3 MHz | 4 | 4 | 2 | Note 2 |
| 5 MHz | 8 | 8 | 4 | Note 2 |
| 10 MHz | 8 | 8 | 8 | Note 2 |
| 15 MHz | 8 | 8 | 8 | Note 2 |
| 20 MHz | 8 | 8 | 8 | Note 2 |
| Note 1: No DL data allocated on TDD special subframes<br>Note 2: No DL data allocated on subframe 5 | | | | |

**Table C.3.2-3a: MPDCCH Aggregation Level (in ECCE-s) for PDSCH demodulation tests**

| Bandwidth | DCI for DL (C-RNTI) | DCI for UL (C-RNTI) | Notes |
|---|---|---|---|
| 1.4 MHz | 16 | 16 | Note 1, 2, 3 |
| 3 MHz | 16 | 16 | Note 2, 3 |
| 5 MHz | 16 | 16 | Note 2, 3 |
| 10 MHz | 16 | 16 | Note 2, 3 |
| 15 MHz | 16 | 16 | Note 2, 3 |
| 20 MHz | 16 | 16 | Note 2, 3 |
| Note 1: No DL data allocated on TDD special subframes<br>Note 2: No DL data allocated on subframe 5<br>Note 3: For using 2PRB for MPDCCH, aggregation level 2 and 4 are used to transmit DCI for DL(C-RNTI) and UL(C-RNTI), respectively. | | | |

**Table C.3.2-4: PDCCH Aggregation Level for CQI and RI performance tests (in CCE-s)**

| Bandwidth | DCI for DL (SI-RNTI) | DCI for DL (C-RNTI) | DCI for UL (C-RNTI) | Notes |
|---|---|---|---|---|
| 1.4 MHz | | | | |
| 3 MHz | | | | |
| 5 MHz | | | | |
| 10 MHz | 8 | 8 | 8 | Note 1,2 |
| 15 MHz | | | | |
| 20 MHz | 8 | 8 | 8 | Note 1,2 |
| Note 1: 3 symbols allocated to PDCCH<br>Note 2: No DL data allocated on subframes 0 and 5 for FDD and 0, 1, 5 and 6 for TDD | | | | |

**Table C.3.2-4a: MPDCCH Aggregation Level for CQI tests (in ECCE-s)**

| Bandwidth | DCI for DL (C-RNTI) | DCI for UL (C-RNTI) | Notes |
|---|---|---|---|
| 1.4 MHz | | | |
| 3 MHz | | | |
| 5 MHz | | | |
| 10 MHz | 16 | 16 | Note 1, 2 |
| 15 MHz | | | |
| 20 MHz | | | |
| Note 1: No DL data allocated on subframes 0 and 5 for FDD and 0, 1, 5 and 6 for TDD<br>Note 2: For using 2PRB for MPDCCH, aggregation level 2 and 4 are used to transmit DCI for DL(C-RNTI) and UL(C-RNTI), respectively. | | | |

**Table C.3.2-5: PDCCH Aggregation Level for sustained downlink data rate performance tests (in CCE-s)**

| Bandwidth | DCI for DL (SI-RNTI) | DCI for DL (C-RNTI) | DCI for UL (C-RNTI) | Notes |
|---|---|---|---|---|
| 1.4 MHz | | | | |
| 3 MHz | | | | |
| 5 MHz | 4 | 2 | 2 | Note 1,4 |
| 10 MHz | 4 | 4 | 4 | Note 1,2,4 |
| 15 MHz | 4 | 8 | 4 | Note 1,3,4 |
| 20 MHz | 8 | 8 | 8 | Note 1,3,4 |
| Note 1: 1 symbol allocated to PDCCH<br>Note 2: On subframe 5 Aggregation level 2 is used to transmit DCI for DL(C-RNTI) and UL(C-RNTI).<br>Note 3: On subframe 5, Aggregation level 4 is used to transmit DCI for DL(C-RNTI) and UL(C-RNTI).<br>Note 4: No DL data allocated on subframes 1 for TDD. | | | | |

## C.3.3 Aggressor cell power allocation for Measurement of Performance Requirements when ABS is Configured

For the performance requirements and channel state information reporting when ABS is configured, the power allocation for the physical channels of the aggressor cell in non-ABS and ABS is listed in Table C.3.3-1.

**Table C.3.3-1: Downlink physical channels transmitted in aggressor cell when ABS is configured in this cell**

| Physical Channel | Parameters | Unit | EPRE Ratio | |
|---|---|---|---|---|
| | | | Non-ABS | ABS |
| PBCH | PBCH_RA | dB | $\rho_A$ | Note 1 |
| | PBCH_RB | dB | $\rho_B$ | Note 1 |
| PSS | PSS_RA | dB | $\rho_A$ | Note 1 |
| SSS | SSS_RA | dB | $\rho_A$ | Note 1 |
| PCFICH | PCFICH_RB | dB | $\rho_B$ | Note 1 |
| PHICH | PHICH_RA | dB | $\rho_A$ | Note 1 |
| | PHICH_RB | dB | $\rho_B$ | Note 1 |
| PDCCH | PDCCH_RA | dB | $\rho_A$ | Note 1 |
| | PDCCH_RB | dB | $\rho_B$ | Note 1 |
| PDSCH | PDSCH_RA | dB | N/A | Note 1 |
| | PDSCH_RB | dB | N/A | Note 1 |
| OCNG | OCNG_RA | dB | $\rho_A$ | Note 1 |
| | OCNG_RB | dB | $\rho_B$ | Note 1 |
| Note 1: -∞ dB is allocated for this channel in this test. | | | | |

**Table C.3.3-2: Downlink physical channels transmitted in aggressor cell when ABS is configured in this cell when the CRS assistance information is provided**

| Physical Channel | Parameters | Unit | EPRE Ratio | |
|---|---|---|---|---|
| | | | Non-ABS | ABS |
| PBCH | PBCH_RA | dB | $\rho_A$ | $\rho_A$ |
| | PBCH_RB | dB | $\rho_B$ | $\rho_B$ |
| PSS | PSS_RA | dB | $\rho_A$ | $\rho_A$ |
| SSS | SSS_RA | dB | $\rho_A$ | $\rho_A$ |
| PCFICH | PCFICH_RB | dB | $\rho_B$ | Note 1 |
| PHICH | PHICH_RA | dB | $\rho_A$ | Note 1 |
| | PHICH_RB | dB | $\rho_B$ | Note 1 |
| PDCCH | PDCCH_RA | dB | $\rho_A$ | Note 1 |
| | PDCCH_RB | dB | $\rho_B$ | Note 1 |
| PDSCH | PDSCH_RA | dB | N/A | Note 1 |
| | PDSCH_RB | dB | N/A | Note 1 |
| OCNG | OCNG_RA | dB | $\rho_A$ | Note 1 |
| | OCNG_RB | dB | $\rho_B$ | Note 1 |
| Note 1: -∞ dB is allocated for this channel in this test. | | | | |

## C.3.4 Power Allocation for Measurement of Performance Requirements when Quasi Co-location Type B: same Cell ID

For the performance requirements related to quasi-collocation type B behaviour when transmission points share the same Cell ID, the power allocation for the physical channels of the serving cell is listed in table C.3.4-1 and the power allocation for the physical channels of the cell transmitting PDSCH is listed in table C.3-4-2

**Table C.3.4-1: Downlink physical channels transmitted in the serving cell (TP1)**

| Physical Channel | EPRE Ratio |
|---|---|
| PBCH | PBCH_RA = $\rho_A$+ σ |
| | PBCH_RB = $\rho_B$+ σ |
| PSS | PSS_RA = 0 (Note 2) |
| SSS | SSS_RA = 0 (Note 2) |
| PDSCH | PDSCH_RA = $\rho_A$ |
| | PDSCH_RB = $\rho_B$ |
| PCFICH | PCFICH_RB = $\rho_B$+ σ |
| PDCCH | PDCCH_RA = $\rho_A$+ σ |
| | PDCCH_RB = $\rho_B$+ σ |

NOTE 1: $\rho_A$= $\rho_B$ = 0 dB means no RS boosting.

NOTE 2: Assuming PSS and SSS transmitted on a single antenna port.

NOTE 3: $\rho_A$, $\rho_B$ and σ are test specific.

**Table C.3.4-2: Downlink physical channels for the transmission point transmitting PDSCH (TP2)**

| Physical Channel | Value |
|---|---|
| PDSCH | Test Specific |

## C.3.5 Simplified CA testing method

For CA tests which require more than 16 independent faders, if a test system cannot support a throughput measurement with fading on all carriers simultaneously, the simplified CA testing method shall be used.

In the simplified CA testing method, the resulting propagation channel(s) shall be generated by considering a number of independent faders needed for one carrier and connecting them to the signal of randomly chosen carrier(s). The maximum number of channel faders on the test will be less than or equal to 16. The remaining carrier(s) shall be connected without a channel fader but with AWGN. The throughput is then collected only for the carrier(s) connected to channel faders.

In the simplified CA testing method, the test shall be repeated by choosing carrier(s) excluding already chosen carrier(s) until all the carrier(s) are tested under fading conditions. All the collected throughputs from each carrier shall be compared against the reference value of the requirements.

All supported carriers shall be configured and activated during the test.

# Annex D (normative): Characteristics of the Interfering Signal

## D.1 General

Some RF performance requirements for the E-UTRA UE receiver are defined with interfering signals present in addition to the wanted signal. When the wanted channel band width is wider than or equal to 5MHz, a modulated 5MHz full band width E-UTRA down link signal, and in some cases an additional CW signal, are used. For wanted channel band widths below 5MHz, the band width of the modulated interferer should be equal to the channel band width of the wanted signal.

## D.2 Interference signals

Table D.2-1 describes the modulated interferer for different channel band width options.

**Table D.2-1: Description of modulated E-UTRA interferer**

| | Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| RB | 6 | 15 | 25 | 25 | 25 | 25 |
| $BW_{Interferer}$ | 1.4 MHz | 3 MHz | 5 MHz | 5 MHz | 5 MHz | 5 MHz |

Table D.2-2 describes the GSM interferer.

**Table D.2-2: Description of GSM interferer**

| | |
|---|---|
| $BW_{Interferer}$ | 200kHz |
| Modulation | GMSK |

# Annex E (normative): Global In-Channel TX-Test

Note: Clauses E.2.2 to E.5.9.3 are descriptions, which assume no power ramping adjacent to the measurement period. *Power ramping adjacent to the measurement period requires exclusion periods, described in clause E.7*

## E.1 General

The global in-channel TX test enables the measurement of all relevant parameters that describe the in-channel quality of the output signal of the TX under test in a single measurement process.

The parameters describing the in-channel quality of a transmitter, however, are not necessarily independent. The algorithm chosen for description inside this annex places particular emphasis on the exclusion of all interdependencies among the parameters.

## E.2 Signals and results

### E.2.1 Basic principle

The process is based on the comparison of the actual **output signal of the TX under test**, received by an ideal receiver, with a **reference signal**, that is generated by the measuring equipment and represents an ideal error free received signal. All signals are represented as equivalent (generally complex) baseband signals.

The description below uses numbers as examples. These numbers are taken from frame structure 1 with normal CP length and 20 MHz bandwidth. The application of the text below, however, is not restricted to this frame structure and bandwidth.

### E.2.2 Output signal of the TX under test

The output signal of the TX under test is acquired by the measuring equipment and stored for further processing. It is sampled at a sampling rate of 30.72 Msps. In the time domain it comprises at least 10 uplink subframes. The measurement period is derived by concatenating the correct number of individual uplink slots until the correct measurement period is reached. The output signal is named z(v). Each slot is modelled as a signal with the following parameters: demodulated data content, carrier frequency, amplitude and phase for each subcarrier, timing, carrier leakage.

NOTE 1: TDD

For frame structure type 2, subframes with special fields (UpPTS) do not undergo any evaluation. Since the uplink subframes are not continuous, the 20 slots should be extracted from more than 1 continuous radio frame:

Figure E.2.2-1 is an example for uplink-downlink configuration 1 (DSUUDDSUUD) as specified in TS 36.211 [8] Table 4.2-2,assuming all uplink subframes are active.

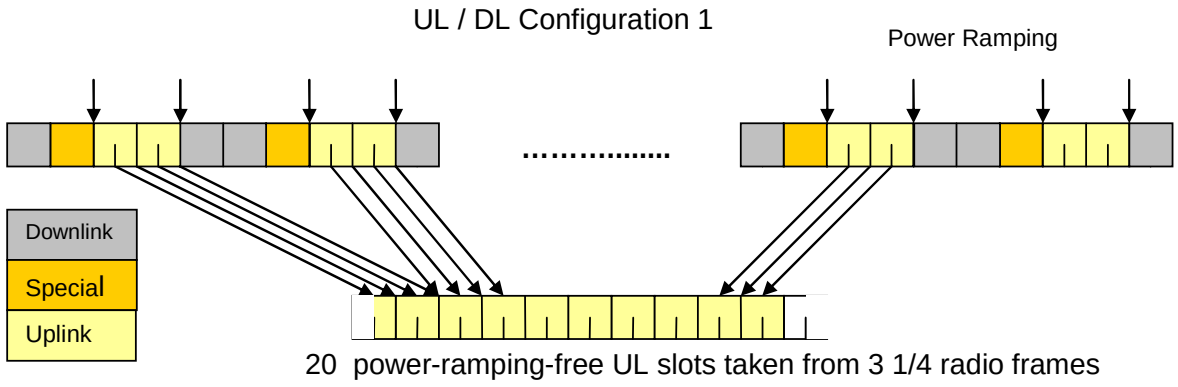



**Figure E.2.2-1: Example of uplink – downlink configuration 1**

## E.2.3 Reference signal

Two types of reference signal are defined:

The reference signal $i_1(v)$ is constructed by the measuring equipment according to the relevant TX specifications, using the following parameters: demodulated data content, nominal carrier frequency, nominal amplitude and phase for each subcarrier, nominal timing, no carrier leakage. It is represented as a sequence of samples at a sampling rate of 30.72 Msps in the time domain.

The reference signal $i_2(v)$ is constructed by the measuring equipment according to the relevant TX specifications, using the following parameters: restricted data content: nominal reference symbols, (all modulation symbols for user data symbols are set to 0V), nominal carrier frequency, nominal amplitude and phase for each applicable subcarrier, nominal timing, no carrier leakage. It is represented as a sequence of samples at a sampling rate of 30.72 Msps in the time domain.

NOTE: The PUCCH is off during the time under test.

## E.2.4 Measurement results

The measurement results, achieved by the global in channel TX test are the following:

- Carrier Frequency error
- EVM (Error Vector Magnitude)
- Carrier leakage
- Unwanted emissions, falling into non allocated resource blocks.
- EVM equalizer spectrum flatness

## E.2.5 Measurement points

The unwanted emission falling into non-allocated RB(s) is calculated directly after the FFT as described below. In contrast to this, the EVM for the allocated RB(s) is calculated after the IDFT. The samples after the TX-RX chain equalizer are used to calculate EVM equalizer spectrum flatness. Carrier frequency error and carrier leakage is calculated in the block “RF correction”.

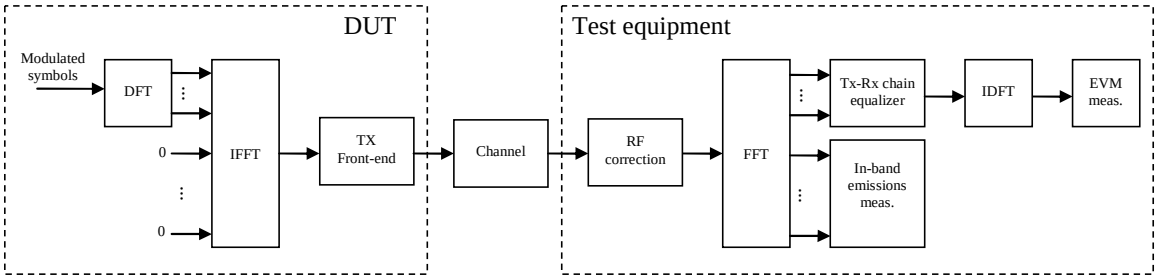



**Figure E.2.5-1: EVM measurement points**

# E.3 Signal processing

## E.3.1 Pre FFT minimization process

Before applying the pre-FFT minimization process, z(ν) and i(ν) are portioned into 20 pieces, comprising one slot each. Each slot is processed separately. Sample timing, Carrier frequency and carrier leakage in z(ν) are jointly varied in order to minimise the difference between z(ν) and i(ν). Best fit (minimum difference) is achieved when the RMS difference value between z(ν) and i(ν) is an absolute minimum.

The carrier frequency variation and the IQ variation are the measurement results: Carrier Frequency Error and Carrier leakage.

From the acquired samples 20 carrier frequencies and 20 carrier leakages can be derived.

NOTE 1: The minimisation process, to derive carrier leakage and RF error can be supported by Post FFT operations. However the minimisation process defined in the pre FFT domain comprises all acquired samples (i.e. it does not exclude the samples in between the FFT widths and it does not exclude the bandwidth outside the transmission bandwidth configuration

NOTE 2: The algorithm would allow deriving Carrier Frequency error and Sample Frequency error of the TX under test separately. However there are no requirements for Sample Frequency error. Hence the algorithm models the RF and the sample frequency commonly (not independently). It returns one error and does not distinguish between both.

After this process the samples z(ν) are called $z^0(\nu)$.

## E.3.2 Timing of the FFT window

The FFT window length is 2048 samples per OFDM symbol. 7 FFTs (14336 samples) cover less than the acquired number of samples (15360 samples) The position in time for FFT must be determined.

In an ideal signal, the FFT may start at any instant within the cyclic prefix without causing an error. The TX filter, however, reduces the window. The EVM requirements shall be met within a window W<CP. There are three different instants for FFT:

Centre of the reduced window, called $\Delta\tilde{c}$ , $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2.

The timing of the measured signal is determined in the pre FFT domain as follows, using $z^0(\nu)$ and $i_2(\nu)$ :

1. The measured signal is delay spread by the TX filter. Hence the distinct boarders between the OFDM symbols and between Data and CP are also spread and the timing is not obvious.

2. In the Reference Signal $i_2(\nu)$ the timing is known.

3. Correlation between (1.) and (2.) will result in a correlation peak. The meaning of the correlation peak is approx. the “impulse response” of the TX filter. The meaning of “impulse response” assumes that the autocorrelation of

the reference signal $i_2(v)$ is a Dirac peak and that the correlation between the reference signal $i_2(v)$ and the data in the measured signal is 0. The correlation peak, (the highest, or in case of more than one, the earliest) indicates the timing in the measured signal.

From the acquired samples 20 timings can be derived.

For all calculations, except EVM, the number of samples in $z^0(v)$ is reduced to 7 blocks of samples, comprising 2048 samples (FFT width) and starting with $\Delta\tilde{c}$ in each OFDM symbol including the demodulation reference signal.

For the EVM calculation the output signal under test is reduced to 14 blocks of samples, comprising 2048 samples (FFT width) and starting with $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2 in each OFDM symbol including the demodulation reference signal.

The number of samples, used for FFT is reduced compared to $z^0(v)$. This subset of samples is called z'(v).

The timing of the centre $\Delta\tilde{c}$ with respect to the different CP length in a slot is as follows: (Frame structure 1, normal CP length)

$\Delta\tilde{c}$ is on $T_f$=72 within the CP of length 144 (in OFDM symbol 1 to 6)

$\Delta\tilde{c}$ is on $T_f$=88 (=160-72) within the CP of length 160 (in OFDM symbol 0)

## E.3.3 Post FFT equalisation

Perform 7 FFTs on z'(v), one for each OFDM symbol in a slot using the timing $\Delta\tilde{c}$, including the demodulation reference symbol. The result is an array of samples, 7 in the time axis t times 2048 in the frequency axis f. The samples represent the DFT coded data symbols (in OFDM-symbol 0,1,2,4,5and 6 in each slot) and demodulation reference symbols ( OFDM symbol 3 in each slot) in the allocated RBs and inband emissions in the non allocated RBs within the transmission BW.

Only the allocated resource blocks in the frequency domain are used for equalisation.

The nominal demodulation reference symbols and nominal DFT coded data symbols are used to equalize the measured data symbols. (Location for equalization see Figure E.2.5-1)

NOTE: The nomenclature inside this note is local and not valid outside.

The nominal DFT coded data symbols are created by a demodulation process. The location to gain the demodulated data symbols is "EVM" in Figure E.2.5-1. A demodulation process as follows is recommended:

1. Equalize the measured DFT coded data symbols using the reference symbols for equalisation. Result: Equalized DFT coded data symbols
2. iDFT transform the equalized DFT coded data symbols: Result: Equalized data symbols
3. Decide for the nearest constellation point: Result: Nominal data symbols
4. DFT transform the nominal data symbols: Result: Nominal DFT coded data symbols

At this stage we have an array of Measured DFT coded data-Symbols and reference-Symbols (MS(f,t))

versus an array of Nominal DFT coded data-Symbols and reference Symbols (NS(f,t))

(complex, the arrays comprise 6 DFT coded data symbols and 1 demodulation reference symbol in the time axis and the number of allocated subcarriers in the frequency axis.)

MS(f,t) and NS(f,t) are processed with a least square (LS) estimator, to derive one equalizer coefficient per time slot and per allocated subcarrier. EC(f)

$$EC(f) = \frac{\sum_{t=0}^{6} NS(f,t)^* NS(f,t)}{\sum_{t=0}^{6} NS(f,t)^* MS(f,t)}$$

With * denoting complex conjugation.

EC(f) are used to equalize the DFT-coded data symbols. The measured DFT-coded data and the references symbols are equalized by:

$$Z'(f,t) = MS(f,t) \cdot EC(f)$$

With · denoting multiplication.

Z'(f,t), restricted to the data symbol (excluding t=3) is used to calculate EVM, as described in E.4.1.

EC(f) is used in E.4.4 to calculate EVM equalizer spectral flatness.

NOTE: although an exclusion period for EVM may be applicable in E.7, the post FFT minimisation process is done over 7 symbols (6 DFT-coded data symbols and 1 reference symbol).

The samples of the non allocated resource blocks within the transmission bandwidth configuration in the post FFT domain are called Y(f,t) (f covering the non allocated subcarriers within the transmission bandwidth configuration, t covering the OFDM symbols during 1 slot).

# E.4 Derivation of the results

## E.4.1 EVM

For EVM create two sets of Z'(f,t)., according to the timing " $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2" using the equalizer coefficients from E.3.3.

Perform the iDFTs on Z'(f,t). The IDFT-decoding preserves the meaning of t but transforms the variable f (representing the allocated sub carriers) into another variable g, covering the same count and representing the demodulated symbols. The samples in the post IDFT domain are called iZ'(g, t). The equivalent ideal samples are called iI(g,t). Those samples of Z'(f,t), carrying the reference symbols (=symbol 3) are not iDFT processed.

The EVM is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s)

$$EVM = \sqrt{\frac{\sum_{t \in T} \sum_{g \in G} \left| iZ'(g,t) - iI(g,t) \right|^2}{|G| \cdot |T| \cdot P_0}},$$

where

t covers the count of demodulated symbols with the considered modulation scheme being active within the measurement period, (i.e. symbol 0,1,2,4,5and 6 in each slot, →|T|=6 )

g covers the count of demodulated symbols with the considered modulation scheme being active within the allocated bandwidth. (|G|=12* $L_{CRBs}$ (with $L_{CRBs}$ : number of allocated resource blocks)).

$iZ'(g,t)$ are the samples of the signal evaluated for the EVM.

$iI(g,t)$ is the ideal signal reconstructed by the measurement equipment, and

$P_0$ is the average power of the ideal signal. For normalized modulation symbols $P_0$ is equal to 1.

From the acquired samples 40 EVM value can be derived, 20 values for the timing $\Delta\tilde{c}$ –W/2 and 20 values for the timing $\Delta\tilde{c}$ +W/2

## E.4.2 Averaged EVM

EVM is averaged over all basic EVM measurements.

The averaging comprises n UL slots (for frame structure 2: excluding special fields(UpPTS))

$$\overline{EVM} = \sqrt{\frac{1}{n}\sum_{t=1}^{n} EVM_t^2}$$

where n is

n = 20 for PUCCH, PUSCH, PSDCH, PSCCH, and PSSCH,

n = 48 for PBSCH.

The averaging is done separately for timing $\Delta\tilde{C}$ –W/2 and $\Delta\tilde{C}$ +W/2 leading to $\overline{\mathrm{EVM}}_{\mathrm{l}}$ and $\overline{\mathrm{EVM}}_{\mathrm{h}}$

$EVM_{\mathrm{final}} = \max(\overline{\mathrm{EVM}}_{l}, \overline{\mathrm{EVM}}_{h})$ is compared against the test requirements.

## E.4.3 In-band emissions measurement

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks.

Explanatory Note:

The inband emission measurement is only meaningful with allocated RBs next to non allocated RB. The allocated RBs are necessary but not under test. The non allocated RBs are under test. The RB allocation for this test is as follows: The allocated RBs are at one end of the channel BW, leaving the other end unallocated. The number of allocated RBs is smaller than half of the number of RBs, available in the channel BW. This means that the vicinity of the carrier in the centre is unallocated.

There are 3 types of inband emissions:

1. General
2. IQ image
3. Carrier leakage

*Carrier leakage* are inband emissions next to the carrier.

*IQ image* are inband emissions symmetrically (with respect to the carrier) on the other side of the allocated RBs.

*General* are applied to all unallocated RBs.

For each evaluated RB, the minimum requirement is calculated as the higher of $P_{RB}$ - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply.

In specific the following combinations:

- Power (General)
- Power (General + Carrier leakage)
- Power (General + IQ Image)

  1 and 2 is expressed in terms of power in one non allocated RB under test, normalized to the average power of an allocated RB (unit dB).

  3 is expressed in terms of power in one non allocated RB, normalized to the power of all allocated RBs. (unit dBc).

This is the reason for two formulas *Emissions* $_{relative}$.

Create one set of Y(t,f) per slot according to the timing " $\Delta\tilde{c}$ "

For the non-allocated RBs below the in-band emissions are calculated as follows

$$Emissions_{absolute}(\Delta_{RB}) = \begin{cases} \frac{1}{|T_s|}\sum_{t\in T_s} \sum_{\max(f_{\min},(c_l+12\cdot\Delta_{RB}*\Delta f))}^{c_l+(12\cdot\Delta_{RB}+11)*\Delta f} |Y(t,f)|^2, \Delta_{RB} < 0 \\ \frac{1}{|T_s|}\sum_{t\in T_s} \sum_{c_h+(12\cdot\Delta_{RB}-11)*\Delta f}^{\min(f_{\max},(c_h+12\cdot\Delta_{RB}*\Delta f))} |Y(t,f)|^2, \Delta_{RB} > 0 \end{cases},$$

where

the upper formula represents the in band emissions below the allocated frequency block and the lower one the in band emissions above the allocated frequency block.

$T_s$ is a set of $|T_s|$ SC-FDMA symbols with the considered modulation scheme being active within the measurement period,

$\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB}=1$ for the first upper or $\Delta_{RB}=-1$ for the first lower adjacent RB),

$f_{\min}$ and $f_{\max}$ are the lower and upper edge of the UL transmission BW configuration,

$c_l$ and $c_h$ are the lower and upper edge of the allocated BW,

$\Delta f$ is 15kHz,and

$Y(t,f)$ is the frequency domain signal evaluated for in-band emissions as defined in the subsection E.3.3

The allocated RB power per RB and the total allocated RB power are given by:

$$P_{RB} = \frac{1}{|T_s|\cdot L_{CRBs}}\sum_{t\in T_s} \sum_{c_l}^{c_l+(12\cdot L_{CRBs}-1)*\Delta f} |\mathrm{MS}(t,f)|^2 \ [\mathrm{dBm/180\,kHz}]$$

$$P_{All-RBs} = \frac{1}{|T_s|}\sum_{t\in T_s} \sum_{c_l}^{c_l+(12\cdot L_{CRBs}-1)*\Delta f} |\mathrm{MS}(t,f)|^2 \ [\mathrm{dBm}]$$

The relative in-band emissions, applicable for General and IQ image, are given by:

$$Emissions_{relative}(\Delta_{RB}) = 10\cdot\log_{10}\left(\frac{Emissions_{absolute}(\Delta_{RB})}{\frac{1}{|T_s|\cdot L_{CRBs}}\sum_{t\in T_s}\sum_{c_l}^{c_l+(12\cdot L_{CRBs}-1)*\Delta f}|\mathrm{MS}(t,f)|^2}\right)[\mathrm{dB}]$$

$$= Emissions_{absolute}(\Delta_{RB})[\mathrm{dBm/180\,kHz}] - P_{RB}\ [\mathrm{dBm/180\,kHz}]$$

where

$L_{CRBs}$ is the number of allocated resource blocks,

and

$\mathrm{MS}(t, f)$ is the frequency domain samples for the allocated bandwidth, as defined in the subsection E.3.3.

The relative in-band emissions, applicable for carrier leakage, is given by:

$$Emissions_{relative} = 10 \cdot \log_{10}\left(\frac{Emissions_{absolute}(RBnextDC)}{\frac{1}{|T_s|}\sum_{t \in T_s}\sum_{c_1}^{c_1+(12 \cdot L_{CRBs}-1)*\Delta f}|\mathrm{MS}(t, f)|^2}\right)[\mathrm{dBc}]$$

$$= Emissions_{absolute}(RBnextDC)[\mathrm{dBm/180\,kHz}] - P_{All-RBs}[\mathrm{dBm}]$$

where RBnextDC means: Resource Block next to the carrier.

This is one RB, namely the central one in case of an odd number of RBs in the channel BW.

This is one pair of RBs, namely the immediately adjacent RBs to the carrier in case of an even number of RBs in the channel BW.

Although an exclusion period may be applicable in the time domain, when evaluating EVM (clause E.7), the inband emissions measurement interval is defined over one complete slot in the time domain.

From the acquired samples 20 functions for general in band emissions and IQ image inband emissions can be derived. 20 values or 20 pairs of carrier leakage inband emissions can be derived. They are compared against different limits.

## E.4.4 EVM equalizer spectrum flatness

For EVM equalizer spectrum flatness use EC(f) as defined in E.3.3. Note, EC(f) represents equalizer coefficient $f \in F$ , f is the allocated subcarriers within the transmission bandwidth ((|F|=12* $L_{CRBs}$ )

From the acquired samples 20 functions EC(f) can be derived.

EC(f) is broken down to 2 functions:

$$\mathrm{EC}_1(\mathrm{f}), f \in Range\ \ 1$$

$$\mathrm{EC}_2(\mathrm{f}), f \in Range\ \ 2$$

Where Range 1 and Range 2 are as defined in Table 6.5.2.4.5-1 for normal condition and Table 6.5.2.4.5-2 for extreme condition

The following peak to peak ripple is calculated:

$\mathrm{RP}_1 = 20 * \log(\max(|\mathrm{EC}_1(\mathrm{f})|) / \min(|\mathrm{EC}_1(\mathrm{f})|))$ ,which denote the maximum ripple in Range 1

$\mathrm{RP}_2 = 20 * \log(\max(|\mathrm{EC}_2(\mathrm{f})|) / \min(|\mathrm{EC}_2(\mathrm{f})|))$ ,which denote the maximum ripple in Range 2

$\mathrm{RP}_{12} = 20 * \log(\max(|\mathrm{EC}_1(\mathrm{f})|) / \min(|\mathrm{EC}_2(\mathrm{f})|))$ ,which denote the maximum ripple between the upper side of Range 1 and lower side of Range 2

$\mathrm{RP}_{21} = 20 * \log(\max(|\mathrm{EC}_2(\mathrm{f})|) / \min(|\mathrm{EC}_1(\mathrm{f})|))$ ,which denote the maximum ripple between the upper side of Range 2 and lower side of Range 1

# E.4.5 Frequency error and Carrier leakage

See E.3.1.

# E.4.6 EVM of Demodulation reference symbols ($EVM_{DMRS}$)

For the purpose of EVM $_{DMRS}$, the steps E.2.2 to E.4.2 are repeated 6 times, constituting 6 EVM $_{DMRS}$ sub-periods. The only purpose of the repetition is to cover the longer gross measurement period of EVM $_{DMRS}$ (120 time slots) and to derive the FFT window timing per sub-period.

The bigger of the EVM results in one 20 TS period corresponding to the timing $\Delta\tilde{c}$ –W/2 or $\Delta\tilde{c}$ +W/2 is compared against the limit. (Clause E.4.2) This timing is re-used for EVM $_{DMRS}$ in the equivalent EVM $_{DMRS}$ sub-period.

For EVM the demodulation reference symbols are excluded, while the data symbols are used. For $EVM_{DMRS}$ the data symbols are excluded, while the demodulation references symbols are used. This is illustrated in figure E.4.6-1

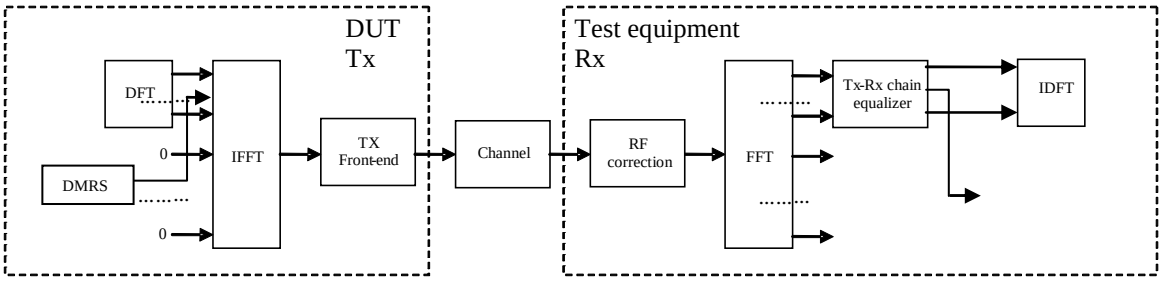



**Figure E.4.6-1: $EVM_{DMRS}$ measurement points**

Re-use the following formula from E.3.3:

$$Z'(f,t) = MS(f,t) \cdot EC(f)$$

To calculate $EVM_{DMRS}$ , the data symbol ( t=0,1,2,4,5,6) in Z'(f,t) are excluded and only the reference symbol (t=3) is used.

The EVM $_{DMRS}$ is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s)

$$EVM_{DMRS} = \sqrt{\frac{\sum_{t\in T}\sum_{f\in F}\left|Z'(f,t) - I(f,t)\right|^2}{|T| \cdot P_0 \cdot |F|}},$$

where

t covers the count of demodulation reference symbols (i.e. only symbol 3 in each slot, so count =1)

f covers the count of demodulation reference symbols within the allocated bandwidth. (|F|=12* $L_{CRBs}$ (with $L_{CRBs}$ : number of allocated resource blocks)).

$Z'(f,t)$ are the samples of the signal evaluated for the EVM $_{DMRS}$

$I(f,t)$ is the ideal signal reconstructed by the measurement equipment, and

$P_0$ is the average power of the ideal signal. For normalized modulation symbols $P_0$ is equal to 1.

20 such results are generated per measurement sub-period.

### E.4.6.1 1st average for EVM DMRS

EVM DMRS is averaged over all basic EVM DMRS measurements in one sub-period

The averaging comprises 20 UL slots (for frame structure 2: excluding special fields(UpPTS))

$$1stEVM_{DMRS} = \sqrt{\frac{1}{20}\sum_{i=1}^{20} EVM_{DMRS_i}^2}$$

The timing is taken from the EVM for the data. 6 of those results are achieved from the samples. In general the timing is not the same for each result.

### E.4.6.2 Final average for EVM DMRS

$$finalEVM_{DMRS} = \sqrt{\frac{1}{6}\sum_{i=1}^{6} 1stEVM_{DMRS_i}^2}$$

## E.5 EVM and inband emissions for PUCCH

For the purpose of worst case testing, the PUCCH shall be located on the edges of the Transmission Bandwidth Configuration (6,15,25,50,75,100 RBs).

The EVM for PUCCH ($EVM_{PUCCH}$) is averaged over 20 slots. At least 20 TSs shall be transmitted by the UE without power change. SRS multiplexing shall be avoided during this period. The following transition periods are applicable: One OFDM symbol on each side of the slot border (instant of band edge alternation).

The description below is generic in the sense that all 6 PUCCH formats are covered. Although the number of OFDM symbols in one slot is 6 or 7 (depending on the cyclic prefix length), the text below uses 7 without excluding 6.

### E.5.1 Basic principle

The basis principle is the same as described in E.2.1

### E.5.2 Output signal of the TX under test

The output signal of the TX under test is processed same as described in E.2.2

### E.5.3 Reference signal

The reference signal is defined same as in E.2.3. Same as in E.2.3, $i_1(v)$ is the ideal reference for $EVM_{PUCCH}$ and $i_2(v)$ is used to estimate the FFT window timing.

Note PUSCH is off during the PUCCH measurement period.

### E.5.4 Measurement results

The measurement results are:

- $EVM_{PUCCH}$
- Inband emissions with the sub-results: General in-band emission, IQ image (according to: 36.101. Annex F.4, Clause starting with: “At this stage the ….”)

## E.5.5 Measurement points

The measurement points are illustrated in the figure below:

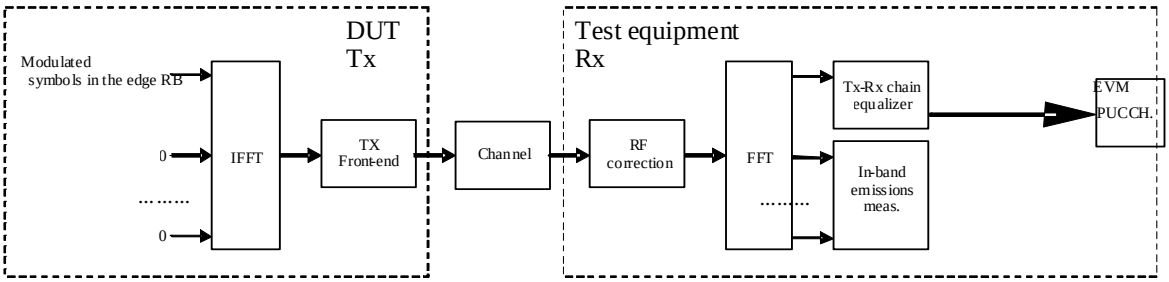



**Figure E.5.5-1**

## E.5.6 Pre FFT minimization process

The pre FFT minimisation process is the same as describes in clause E.3.1.

NOTE: although an exclusion period for $EVM_{PUCCH}$ is applicable in E.5.9.1, the pre FFT minimisation process is done over the complete slot.

RF error, and carrier leakage are necessary for best fit of the measured signal towards the ideal signal in the pre FFT domain. However they are not used to compare them against the limits.

## E.5.7 Timing of the FFT window

Timing of the FFT window is estimated with the same method as described in E.3.2.

## E.5.8 Post FFT equalisation

The post FFT equalisation is described separately without reference to E.3.3:

Perform 7 FFTs on z'(v), one for each OFDM symbol in a slot using the timing $\Delta\tilde{c}$, including the demodulation reference symbol. The result is an array of samples, 7 in the time axis t times 2048 in the frequency axis f. The samples represent the OFDM symbols (data and reference symbols) in the allocated RBs and inband emissions in the non allocated RBs within the transmission BW.

Only the allocated resource blocks in the frequency domain are used for equalisation.

The nominal reference symbols and **nominal** OFDM data symbols are used to equalize the measured data symbols.

Note: (The nomenclature inside this note is local and not valid outside)

The nominal OFDM data symbols are created by a demodulation process. A demodulation process as follows is recommended:

1. Equalize the measured OFDM data symbols using the reference symbols for equalisation. Result: Equalized OFDM data symbols
2. Decide for the nearest constellation point, however not independent for each subcarrier in the RB. 12 constellation points are decided dependent, using the applicable CAZAC sequence. Result: Nominal OFDM data symbols

At this stage we have an array of Measured data-Symbols and reference-Symbols (MS(f,t))

versus an array of Nominal data-Symbols and reference Symbols (NS(f,t))

The arrays comprise in sum 7 data and reference symbols, depending on the PUCCH format, in the time axis and the number of allocated sub-carriers in the frequency axis.

MS(f,t) and NS(f,t) are processed with a least square (LS) estimator, to derive one equalizer coefficient per time slot and per allocated subcarrier. EC(f)

$$EC(f) = \frac{\sum_{t=0}^{6} NS(f,t)^{*} NS(f,t)}{\sum_{t=0}^{6} MS(f,t)^{*} NS(f,t)}$$

With * denoting complex conjugation.

EC(f) are used to equalize the OFDM data together with the demodulation reference symbols by:

$$Z'(f,t) = MS(f,t) \cdot EC(f)$$

With · denoting multiplication.

Z'(f,t) is used to calculate $EVM_{PUCCH}$, as described in E.5.9 1

NOTE: although an exclusion period for $EVM_{PUCCH}$ is applicable in E.5.9.1, the post FFT minimisation process is done over 7 OFDM symbols.

The samples of the non allocated resource blocks within the transmission bandwidth configuration in the post FFT domain are called Y(f,t) (f covering the non allocated subcarriers within the transmission bandwidth configuration, t covering the OFDM symbols during 1 slot).

# E.5.9 Derivation of the results

## E.5.9.1 $EVM_{PUCCH}$

For $EVM_{PUCCH}$ create two sets of Z'(f,t)., according to the timing " $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2" using the equalizer coefficients from E.5.8

The $EVM_{PUCCH}$ is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s)

$$EVM_{PUCCH} = \sqrt{\frac{\sum_{t \in T} \sum_{f \in F} \left| Z'(f,t) - I(f,t) \right|^2}{|T| \cdot P_0 \cdot |F|}},$$

where

the OFDM symbols next to slot boarders (instant of band edge alternation) are excluded:

t covers less than the count of demodulated symbols in the slot (|T|= 5)

f covers the count of subcarriers within the allocated bandwidth. (|F|=12)

$Z'(f,t)$ are the samples of the signal evaluated for the $EVM_{PUCCH}$

$I(f,t)$ is the ideal signal reconstructed by the measurement equipment, and

$P_0$ is the average power of the ideal signal. For normalized modulation symbols $P_0$ is equal to 1.

From the acquired samples 40 $EVM_{PUCCH}$ value can be derived, 20 values for the timing $\Delta\tilde{c}$ –W/2 and 20 values for the timing $\Delta\tilde{c}$ +W/2

## E.5.9.2 Averaged $EVM_{PUCCH}$

$EVM_{PUCCH}$ is averaged over all basic $EVM_{PUCCH}$ measurements

The averaging comprises 20 UL slots (for frame structure 2: excluding special fields(UpPTS))

$$\overline{EVM}_{PUCCH} = \sqrt{\frac{1}{20}\sum_{i=1}^{20} EVM_{PUCCH\,i}^{2}}$$

The averaging is done separately for timing $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2 leading to $\overline{EVM}_{PUCCH,low}$ and $\overline{EVM}_{PUCCH,high}$

$EVM_{PUCCH,final} = \max(\overline{EVM}_{PUCCH,low}, \overline{EVM}_{PUCCH,high})$ is compared against the test requirements.

## E.5.9.3 In-band emissions measurement

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks

Create one set of Y(t,f) per slot according to the timing "$\Delta\tilde{c}$"

For the non-allocated RBs the in-band emissions are calculated as follows

$$Emissions_{absolute}(\Delta_{RB}) = \begin{cases} \frac{1}{|T_s|}\sum_{t\in T_s} \sum_{\max(f_{\min},(c_l+12\cdot\Delta_{RB}*\Delta f))}^{c_l+(12\cdot\Delta_{RB}+11)*\Delta f} |Y(t,f)|^2, \Delta_{RB} < 0 \\ \frac{1}{|T_s|}\sum_{t\in T_s} \sum_{c_h+(12\cdot\Delta_{RB}-11)*\Delta f}^{\min(f_{\max},(c_h+12\cdot\Delta_{RB}*\Delta f))} |Y(t,f)|^2, \Delta_{RB} > 0 \end{cases},$$

where

the upper formula represents the inband emissions below the allocated frequency block and the lower one the inband emissions above the allocated frequency block.

$T_s$ is a set of $|T_s|$ OFDM symbols in the measurement period,

$\Delta_{RB}$ is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ for the first upper or $\Delta_{RB} = -1$ for the first lower adjacent RB),

$f_{\min}$ and $f_{\max}$ are the lower and upper edge of the UL system BW,

$c_l$ and $c_h$ are the lower and upper edge of the allocated BW,

$\Delta f$ is 15kHz,and

$Y(t,f)$ is the frequency domain signal evaluated for in-band emissions as defined in the subsection E.5.8

The relative in-band emissions are, given by

$$Emissions_{relative}(\Delta_{RB}) = 10*\log_{10}\frac{Emissions_{absolute}(\Delta_{RB})}{\frac{1}{|T_s|\cdot L_{CRBs}}\sum_{t\in T_s}\sum_{c_l}^{c_l+(12\cdot L_{CRBs}-1)*\Delta f}|\mathrm{MS}(t,f)|^2}[dB]$$

where

$L_{CRBs}$ is the number of allocated RBs, which is always 1 in case of PUCCH

and $\mathrm{MS}(t, f)$ is the frequency domain samples for the allocated bandwidth, as defined in the subsection E.5.8

Although an exclusion period for EVM is applicable in E.5.9.1, the inband emissions measurement interval is defined over one complete slot in the time domain.

From the acquired samples 20 functions for inband emissions can be derived.

Since the PUCCH allocation is always on the upper or lower band-edge, the opposite of the allocated one represents the IQ image, and the remaining inner RBs represent the general inband emissions. They are compared against different limits.

# E.6 EVM for PRACH

The description below is generic in the sense that all 5 PRACH formats are covered. The numbers, used in the text below are taken from PRACH format#0 without excluding the other formats. The sampling rate for the PUSCH, 30.72 Msps in the time domain, is re-used for the PRACH. The carrier spacing of the PUSCH is 12 (format 0 to 3) and 2 (format 4) times of the PRACH. This results in an oversampling factor of 12 (format 0 to 3) and 2 (format 4), when acquiring the time samples for the PRACH. The pre-FFT algorithms (clauses E.6.6 and E.6.7) use all time samples, although oversampled. For the FFT the time samples are decimated by the factor of 12 (format 0 to 3) and 2 (format 4), resulting in the same FFT size as for the other transmit modulation tests (2048). Decimation requires a decision, which samples are used and which ones are rejected. The algorithm in E.6.6, Timing of the FFT window, can also be used to decide about the used samples.

## E.6.1 Basic principle

The basis principle is the same as described in E.2.1

## E.6.2 Output signal of the TX under test

The output signal of the TX under test is processed same as described in E.2.2

The measurement period is different:

- 2 PRACH preambles are recorded for format 0and 1,
- 1 PRACH preamble is recorded for format 2 and 3, each containing 1 CP and 2 preamble sequences
- 10 RPRACH preambles are recorded for format 4.

## E.6.3 Reference signal

The test description in 6.5.2.1.4.1A is based on non contention based access:

- PRACH configuration index (responsible for Preamble format, System frame number and subframe number)
- Preamble ID
- Preamble power

signalled to the UE, defines the reference signal unambiguously, such that no demodulation process is necessary to gain the reference signal.

The reference signal i(v) is constructed by the measuring equipment according to the relevant TX specifications, using the following parameters: the applicable Zadoff Chu sequence, nominal carrier frequency, nominal amplitude and phase for each subcarrier, nominal timing, no carrier leakage. It is represented as a sequence of samples at a sampling rate of 30.72 Msps in the time domain.

## E.6.4 Measurement results

The measurement result is:

- EVMPRACH

## E.6.5 Measurement points

The measurement points are illustrated in the figure below:

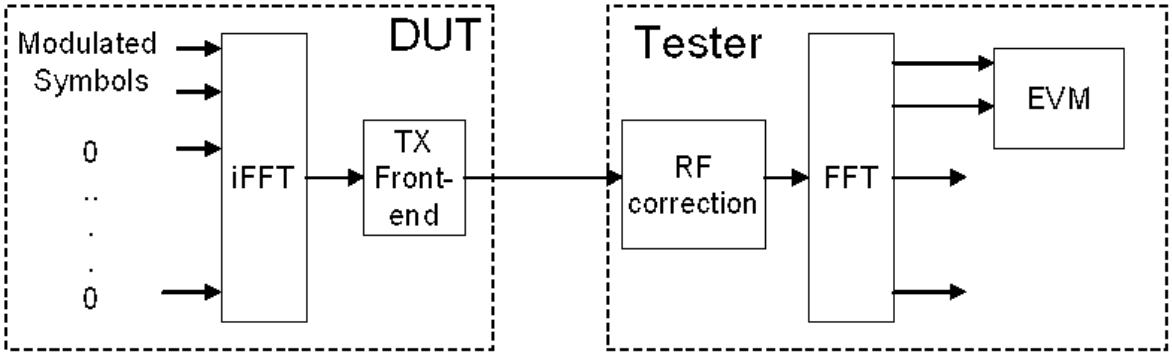



**Figure E.6.5-1**

## E.6.6 Pre FFT minimization process

The pre-FFT minimization process is applied to each PRACH preamble separately. The time period for the pre- FFT minimisation process includes the complete CP and Zadoff-Chu sequence (in other words, the power transition period is per definition outside of this time period) Sample timing, Carrier frequency and carrier leakage in z(ν) are jointly varied in order to minimise the difference between z(ν) and i(ν). Best fit (minimum difference) is achieved when the RMS difference value between z(ν) and i(ν) is an absolute minimum.

After this process the samples z(ν) are called $z^0(\nu)$.

RF error, and carrier leakage are necessary for best fit of the measured signal towards the ideal signal in the pre FFT domain. However they are not used to compare them against the limits.

## E.6.7 Timing of the FFT window

The FFT window length is 24576 samples for preamble format 0, however in the measurement period is at least 27744 samples are taken. The position in time for FFT must be determined.

In an ideal signal, the FFT may start at any instant within the cyclic prefix without causing an error. The TX filter, however, reduces the window. The EVM requirements shall be met within a window W<CP.

The reference instant for the FFT start is the centre of the reduced window, called $\Delta\tilde{c}$ ,

EVM is measured at the following two instants: $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2.

The timing of the measured signal $z^0(\nu)$ with respect to the ideal signal i(ν) is determined in the pre FFT domain as follows:

Correlation between $z^0(\nu)$ and i(ν) will result in a correlation peak. The meaning of the correlation peak is approx. the “impulse response” of the TX filter. The correlation peak, (the highest, or in case of more than one, the earliest) indicates the timing in the measured signal with respect to the ideal signal.

W is different for different preamble formats and shown in TableE.6.7-1.

**Table E.6.7-1EVM window length for PRACH**

| Preamble format | Cyclic prefix length[1] $N_{cp}$ | Nominal FFT size[2] | EVM window length *W* in FFT samples | Ratio of *W* to CP[3] |
|---|---|---|---|---|
| 0 | 3168 | 24576 | 3072 | 96.7% |
| 1 | 21024 | 24576 | 20928 | 99.5% |
| 2 | 6240 | 49152 | 6144 | 98.5% |
| 3 | 21024 | 49152 | 20928 | 99.5% |
| 4 | 448 | 4096 | 432 | 96.4% |
| Note 1: The unit is number of samples, sampling rate of 30.72MHz is assumed<br>Note 2: Decimation of time samples by 12(format 0 to 3) and factor 2 (format 4) is assumed, leading to a uniform FFT size of 2048 for all formats.<br>Note 3: These percentages are informative | | | | |

The number of samples, used for FFT is reduced compared to $z^0(\nu)$. This subset of samples is called z''(ν).

The sample frequency 30.72 MHz is oversampled with respect to the PRACH-subcarrier spacing of 1.25kHz (format 0 to 3) and 7.5kHz (format 4). EVM is based on 2048 samples per PRACH preamble and requires decimation of the time samples by the factor of 12 (format 0 to 3) and factor 2 (format 4). The final number of samples per PRACH preamble, used for FFT is reduced compared to $z^{''}(\nu)$ by the factor of 12 (format 0 to 3) and factor 2 (format 4). This subset of samples is called z'(ν).

# E.6.8 Post FFT equalisation

Equalisation is not applicable for the PRACH.

# E.6.9 Derivation of the results

## E.6.9.1 $EVM_{PRACH}$

Perform FFT on z'(ν) and i(ν) using the FFT timing $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2.

For format 2 and 3 the first and the repeated preamble sequence are FFT-converted separately. using the standard FFT length 0f 2048

The $EVM_{PRACH}$ is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s).

$$EVM_{PRACH} = \sqrt{\frac{\sum_{f \in F} \left| Z'(f) - I(f) \right|^2}{N_{ZC} \cdot P_0}},$$

where

f covers the count of demodulated symbols within the allocated bandwidth.

$Z'(f)$ are the samples of the signal evaluated for the $EVM_{PRACH}$

$I(f)$ is the ideal signal reconstructed by the measurement equipment, and

$P_0$ is the average power of the ideal signal. For normalized modulation symbols $P_0$ is equal to 1.

$N_{ZC}$ is random access preamble sequence length.

From the acquired samples 4 $EVM_{PRACH}$ value can be derived, 2 values for the timing $\Delta\tilde{c}$ –W/2 and 2 values for the timing $\Delta\tilde{c}$ +W/2 (4 and 2 applies for format 0,1,2,3. 20 and 10 applies for format 4).

### E.6.9.2 Averaged $EVM_{PRACH}$

The PRACH EVM, $EVM_{PRACH}$ , is averaged over two preamble sequence measurements for preamble formats 0, 1, 2, 3, and it is averaged over 10 preamble sequence measurements for preamble format 4.

$$\overline{EVM}_{PRACH} = \sqrt{\frac{1}{2}\sum_{i=1}^{2} EVM_{PRACH\,i}^{2}} \quad \text{for preamble formats 0,1,2,3}$$

$$\overline{EVM}_{PRACH} = \sqrt{\frac{1}{10}\sum_{i=1}^{10} EVM_{PRACH\,i}^{2}} \quad \text{for preamble format 4}$$

The averaging is done separately for timing $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2 leading to $\overline{EVM}_{PRACH,low}$ and $\overline{EVM}_{PRACH,high}$

$EVM_{PRACH,final} = \max(\overline{EVM}_{PRACH,low}, \overline{EVM}_{PRACH,high})$ is compared against the test requirements.

# E.7 EVM with exclusion period

## E.7.1 General

EVM with exclusion periods is defined in clause 6.5.2.1.1, third paragraph. For PUCCH entire symbols are excluded, if applicable. For PUSCH fractions of symbols are excluded, if applicable. The exclusion period for PUSCH is defined at the air interface, leading to exclusion periods in the EVM domain. The necessary mapping is described in this clause.

## E.7.2 The model

The exclusion period in the time domain has corresponding periods in the quasi time domains (Table E.7.2). The mapping of corresponding periods needs only scaling and cyclic shifting.

The algorithm below uses a sampling frequency 30.72 MHz and FFT-width 2048 for all bandwidths. Bandwidth-adapted sampling frequencies and FFT-widths are not excluded. Only normal cyclic prefix is mentioned in the model without excluding the extended CP.

**Table. E.7.2: Model for mapping exclusion period in the time domain**

| | TX | | | | Channel | EVM meter | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Operation | | DFT | | iFFT | | | FFT | | iDFT | |
| Meaning | Modulation symbols | | Precoded symbols | | BB samples | BB samples | | Precoded symbols | | demodula-ted symbols |
| No of samples | allocated Sub Carriers | | allocated subcarriers + unallocated subcarriers = 2048 | | allocated subcarriers + unallocated subcarriers + CP samples | 2048, position depending on EVM window | | allocated subcarriers | | allocated subcarriers |
| Domain | Quasi time domain | | Frequency domain | | Time domain | Time domain | | Frequency domain | | Quasi time domain |
| text below | | 1 | 2 | 3 | 4 | 7 | 7 | 8 | 9 | 11 |

1. A sequence of complex valued modulation symbols are Transform-Precoded (DFT) according to 36.211 clause 5.3.3. The size of this transformation is the number of allocated subcarriers.

2. The outcome of (1) is supplemented by 0 for the non allocated subcarriers. In sum 2048 subcarriers.

3. The baseband time signal (without CP) is then calculated by a iFFT according to 36.211 clause 5.6

4. (3) is then supplemented by a cyclic prefix (144 or 160 samples) leading to 2192 or 2208 samples. (144 CP samples = 144 tail samples from the data field)

5. (4) is transmitted over the channel and sampled by the EVM meter.

6. In case of an exclusion period those samples of (5) are marked, where the exclusion applies. The exclusion period is an unbroken leading or lagging exclusion period next to a subframe or timeslot boarder.

7.Depending on early or late EVM-window a subset of 2048 samples (out of 2192 or 2208 samples) are the input for the subsequent FFT. These samples may or may not comprise marked samples. The result are 2048 frequency domain samples.

8. The non allocated subcarriers are removed from the 2048 samples.

9. (8) is then iDFT transformed. The result are demodulated complex valued symbols in the same domain as (1)

10. Step 7, 8 and 9 are modified by an equalizer algorithm.
For the purpose of this clause, the equalizer partly re-does step 4 (CP insertion):
The equalizer algorithm cuts that subset of CP samples, covered by the FFT, from the head and copies it to the tail of the data field.

11. The result of (10) is: complex valued symbols in the same sequence as in (1) They are compared with (1) symbol by symbol for EVM. Due to exclusion in the time domain (6) we have marked corresponding symbols, which are disregarded for EVM.

12. From step 1 to 4 the number of samples is expanded. A subset of expanded samples is marked as excluded. Form step 6 to step 9 the number of samples is compressed, leading to a non integer number of samples, marked as excluded. The number of marked samples in this domain is rounded up at the expense of the EVM samples

## E.7.3 Illustration

The figures below illustrate the cyclic shift due to the equalizer and scaling.

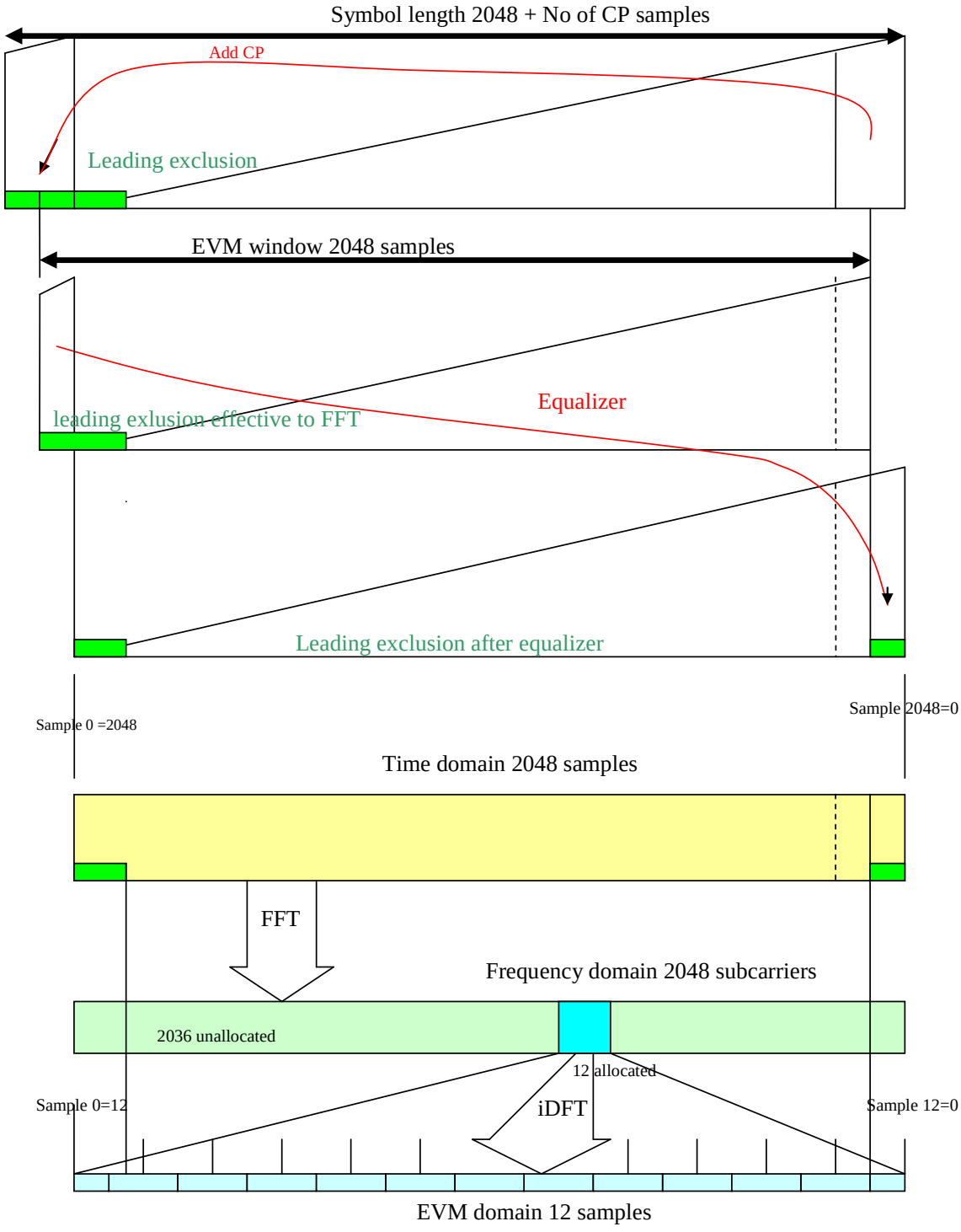



**Figure E.7.3-1: leading exclusion period (when number of RBs=1)**

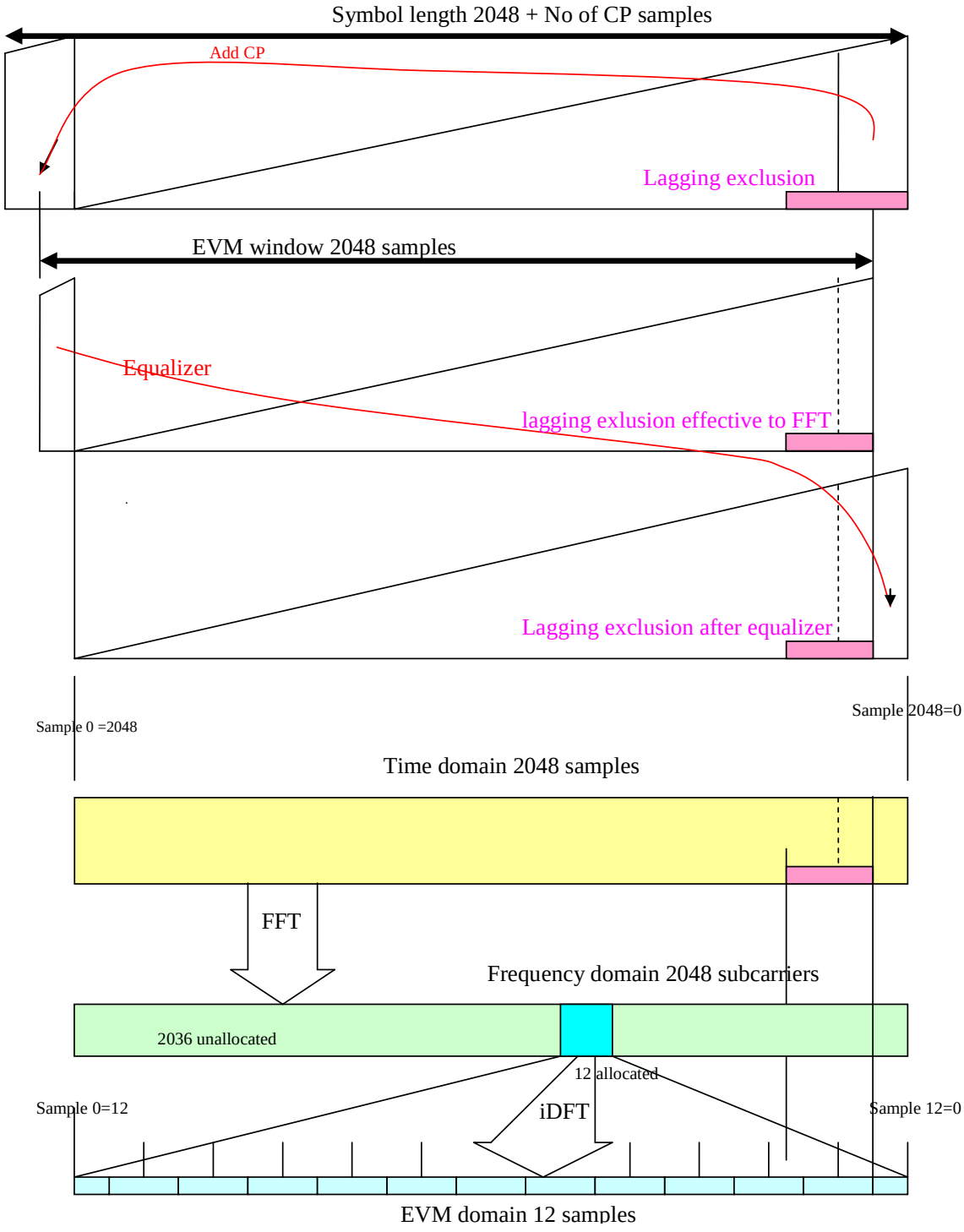



**Figure E.7.3-2: lagging exclusion period (when number of RBs=1)**

Legend to figure E.7.3-1

The figure contains 6 related subfigures.

The upper 3 triangles illustrate the cyclic shift due to EVM windowing and equalizer.

The lower 3 boxes illustrate the mapping from the time domain, where the exclusion period is defined, into the EVM domain, where EVM samples are actually excluded.

Cyclic shift

The leading exclusion period covers the entire CP and a part of the data field. The EVM window masks a part of the exclusion period. For the purpose of this annex, the equalizer re-arranges the time domain samples into the original order, splitting the exclusion period into two parts.

Mapping

The split exclusion period (after cyclic shift) is copied from above. The frequency domain is derived by Fast Fourier Transformation from the time domain and represent the frequency domain with 2048 subcarriers, 12 of them are allocated, and the rest is unallocated. The 12 allocated subcarriers are iDFT transformed into the EVM domain comprising 12 samples. Note that all 3 domains are displayed cyclically: the leftmost sample is identical to the rightmost sample.

The two transformations map the time domain into the EVM domain, carrying out a compression of samples 12/2048. In spite of the compression, there is a correspondence of ranges in the time domain and in the EVM domain. One sample in the EVM domain comprises a range, which is influenced from (and only from) the equivalent samples in the time domain vertically above. Note that this correspondence holds irrespective of the position of the 12 allocated samples in the frequency domain.

**Example leading exclusion (figure E.7.3-1)**

| Sample No in the EVM domain | Influence(exclusion) from the time domain | EVM exclusion |
|---|---|---|
| 12=0 | full | excluded |
| 1 | partly | excluded |
| 2 to 11 | none | counted |

**Example lagging exclusion example (figure E.7.3-2)**

| Sample No in the EVM domain | Influence(exclusion) from the time domain | EVM exclusion |
|---|---|---|
| 12=0 | none | counted |
| 1 to 9 | none | counted |
| 10 | partly | excluded |
| 11 | full | excluded |

## E.7.4 Formula

The exclusion period is defined in µs at the air interface.

Convert the µs's into No of samples in the time domain.

No of exclusion samples (before EVM windowing and equalizer) is calculated from:

No of exclusion sample = ceil (30.72 * Exclusion µs)

then, EVM windowing and equalizer is applied by 2048 samples based cyclic shift process.

(the upper 3 triangles illustrate in fig. E.7.3-1 and -2.)

Determine the indices **k**, to be excluded in the time domain, according to fig. E.7.3-1 and -2

(after application of EVM windowing and equaliser, original sample order,

**k** = subset from the set (0 to 2047) )

The indices **l** in the EVM domain, to be excluded, are:

**l** = [ round (**k***12* $L_{CRBs}$ / 2048)]mod(12*$L_{CRBs}$)

with $L_{CRBs}$ number of allocated resource blocks

# E.8 EVM for category NB1

## E.8.1 Averaged EVM

The general EVM for category NB1 is calculated using the procedure defined in Annex E.4 with the exception that the general EVM is averaged over basic EVM measurements for 240/$L_{Ctone}$ slots in the time domain, where $L_{Ctone}$ = {1, 3, 6, 12} is the number of subcarriers for the transmission.

## E.8.2 EVM of Demodulation reference symbols ($EVM_{DMRS}$)

The calculation of the EVM for the demodulation reference symbols for category NB1 follows the procedure defined for DMRS in Annex E.4 with the exception that the basic $EVM_{DMRS}$ measurements are first averaged over 240/ $L_{Ctone}$ slots to obtain the intermediate average EVM.

## E.8.3 EVM for NPRACH

The calculation of the NPRACH EVM for both formats follows the procedure defined for PRACH in Annex E.6 with the exception that $EVM_{PRACH}$ is averaged over 64 preamble measurements.

## E.8.4 Window length for category NB1

The EVM window length, W, for NPUSCH is set to 1 (in FFT samples where the nominal FFT size is 128 for 15 kHz sub-carrier spacing and 512 for 3.75 kHz sub-carrier spacing).
The EVM window length, W, for NPRACH is set to 110 for preamble format 0 and to 494 for preamble format 1 (both in FFT samples where the nominal FFT size is 512).

# E.9 EVM for V2X communication

## E.9.1 EVM for PSSCH and PSCCH

The calculation of the EVM for PSSCH and PSCCH follows the procedure defined in Annex E.4. The EVM is calculated separately for PSSCH and PSCCH using separate equalizer, while the in-band emission is calculated only once.
The measurement period for EVM of PSSCH and PSCCH is 15 subframes. When V2X transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the EVM measurement interval is reduced by one symbol, accordingly.

## E.9.2 EVM for PSBCH

The calculation of the EVM for PSBCH follows the procedure defined in Annex E.4. The duration over which EVM is averaged shall be 24 subframes.

# Annex F (normative): Measurement uncertainties and Test Tolerances

## F.1 Acceptable uncertainty of Test System (normative)

The maximum acceptable uncertainty of the Test System is specified below for each test, where appropriate. The Test System shall enable the stimulus signals in the test case to be adjusted to within the specified range, and the equipment under test to be measured with an uncertainty not exceeding the specified values. All ranges and uncertainties are absolute values, and are valid for a confidence level of 95 %, unless otherwise stated.

A confidence level of 95 % is the measurement uncertainty tolerance interval for a specific measurement that contains 95 % of the performance of a population of test equipment.

For RF tests it should be noted that the uncertainties in clause F.1 apply to the Test System operating into a nominal 50 ohm load and do not include system effects due to mismatch between the DUT and the Test System.

The downlink signal uncertainties apply at each receiver antenna connector.

### F.1.1 Measurement of test environments

The measurement accuracy of the UE test environments defined in TS 36.508 subclause 4.1, Test environments shall be.

- Pressure ±5 kPa.
- Temperature ±2 degrees.
- Relative Humidity ±5 %.
- DC Voltage ±1,0 %.
- AC Voltage ±1,5 %.
- Vibration 10 %.
- Vibration frequency 0,1 Hz.

The above values shall apply unless the test environment is otherwise controlled and the specification for the control of the test environment specifies the uncertainty for the parameter.

## F.1.2 Measurement of transmitter

**Table F.1.2-1: Maximum Test System Uncertainty for transmitter tests**

| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
|---|---|---|
| 6.2.2 UE Maximum Output Power | ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz<br>±1.3 dB, 4.2GHz < f ≤ 6GHz | |
| 6.2.2_1 Maximum Output Power for HPUE | ±0.7 dB, f ≤ 3.0GHz | |
| 6.2.2A.1 UE Maximum Output Power for CA (intra-band contiguous DL CA and UL CA) | Same as 6.2.2 for sum of powers of all CCs | |
| 6.2.2A.2 UE Maximum Output Power for CA (inter-band DL CA and UL CA) | For $f_1$ ≤ 3.0GHz:<br>±1.0 dB, $f_2$ ≤ 3.0GHz<br>±1.3 dB, 3.0GHz < $f_2$ ≤ 4.2GHz<br>±1.5 dB, 4.2GHz < $f_2$ ≤ 6GHz<br><br>For 3.0GHz < $f_1$ ≤ 4.2GHz:<br>±1.5 dB, 3.0GHz < $f_2$ ≤ 4.2GHz<br>±1.7 dB, 4.2GHz < $f_2$ ≤ 6GHz<br><br>For 4.2GHz < $f_1$ ≤ 6GHz:<br>±1.9 dB, 4.2GHz < $f_2$ ≤ 6GHz<br><br>where $f_1$ and $f_2$ are center frequencies of 2 CCs and $f_1$ < $f_2$ | Overall system uncertainty is RSS of UL measurement uncertainity of 2 CCs. |
| 6.2.2A.4 UE Maximum Output Power for CA (3UL CA) | For UL CA_XD:<br>For $BW_{agg}$ ≤ 40MHz<br>Same as 6.2.2 for sum of powers of all CCs<br>For 40MHz < $BW_{agg}$ ≤ 60MHz<br>±1.4 dB for f ≤ 4.2GHz<br>±1.6 dB for 4.2GHz < f ≤ 6.0GHz<br><br>For UL CA_XC_YA:<br>Same as 6.2.2A.2 with $f_1$ as the lower one among center frequencies of XC or YA.<br><br>For UL CA_XA_YA_ZA:<br>FFS | Overall system uncertainty is RSS of UL measurement uncertainity of interband or non-contiguous CCs |
| 6.2.2B UE Maximum Output Power for UL-MIMO | Same as 6.2.2 for each antenna | |
| 6.2.2E UE Maximum Output Power for UE category 0 | Same as 6.2.2 | |
| 6.2.2EA UE Maximum Output Power for UE category M1 | Same as 6.2.2 | |
| 6.2.2EB UE Maximum Output Power for UE category 1bis | Same as 6.2.2 | |
| 6.2.2EC UE Maximum Output Power for UE category M2 | Same as 6.2.2 | |
| 6.2.2F UE Maximum Output Power for UE category NB1 | Same as 6.2.2_1 | |
| 6.2.2G.1 UE maximum output power for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Same as 6.2.2 | |

| | | |
|---|---|---|
| 6.2.2G.2 UE maximum output power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | Same as 6.2.2 for sum of powers of all CCs | |
| 6.2.2G.3 UE maximum output power for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 6.2.2 for sum of powers of all CCs | |
| 6.2.3 Maximum Power Reduction | ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz<br>±1.3 dB, 4.2GHz < f ≤ 6GHz | |
| 6.2.3_1 Maximum Power Reduction (MPR) for HPUE | ±0.7 dB, f ≤ 3.0GHz | |
| 6.2.3A.1 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA) | Same as 6.2.3 for sum of powers of all CCs | |
| 6.2.3A.1_1 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | Same as 6.2.3 for sum of powers of all CCs | |
| 6.2.3A.1_2 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM | Same as 6.2.3 for sum of powers of all CCs | |
| 6.2.3A.2 Maximum Power Reduction (MPR) for CA (inter-band DL CA and UL CA) | Same as 6.2.2A.2 | |
| 6.2.3A.2_1 Maximum Power Reduction (MPR) for CA (inter-band DL CA and UL CA) for UL 64QAM | Same as 6.2.2A.2 | |
| 6.2.3A.2_2 Maximum Power Reduction (MPR) for CA (inter-band DL CA and UL CA) for UL 256QAM | Same as 6.2.3 for sum of powers of all CCs | |
| 6.2.3A.3 Maximum Power Reduction (MPR) for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.2.2A.2 | |
| 6.2.3A.3_1 Maximum Power Reduction (MPR) for CA (intra-band non-contiguous DL CA and UL CA) for UL 64QAM | Same as 6.2.2A.2 | |
| 6.2.3A.3_2 Maximum Power Reduction (MPR) for CA (intra-band non-contiguous DL CA and UL CA) for UL 256QAM | Same as 6.2.2A.2 | |
| 6.2.3B Maximum Power Reduction (MPR) for UL-MIMO | Same as 6.2.3 for each antenna | |
| 6.2.3_2 Maximum Power Reduction (MPR) for Multi-Cluster PUSCH | Same as 6.2.3 | |
| 6.2.3E Maximum Power Reduction for UE category 0 | Same as 6.2.3 | |
| 6.2.3EA Maximum Power Reduction for UE category M1 | Same as 6.2.3 | |

| | | |
|---|---|---|
| 6.2.3EB Maximum Power Reduction for UE category 1bis | Same as 6.2.3 | |
| 6.2.3_3 Maximum Power Reduction (MPR) for UL 64QAM | Same as 6.2.3 | |
| 6.2.3_4 Maximum Power Reduction (MPR) for Multi-Cluster PUSCH with UL 64QAM | Same as 6.2.3 | |
| 6.2.3G.1.1 Maximum Power Reduction (MPR) for V2X Commincation / Non-concurrent with E-UTRA uplink transmissions | Same as 6.2.3 | |
| 6.2.3G.1.2 Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Non-contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions | Same as 6.2.3 | |
| 6.2.3G.1.3 Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | Same as 6.2.3 | |
| 6.2.3G.2.1 Maximum Power Reduction (MPR) for V2X Communication / Power class 2 / Contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions | Same as 6.2.3 | |
| 6.2.3G.2.2 Maximum Power Reduction (MPR) for V2X Communication / Power class 2 / Non-contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions | Same as 6.2.3 | |
| 6.2.3_5 Maximum Power Reduction (MPR) for UL 256QAM | Same as 6.2.3 | |
| 6.2.3_6 Maximum Power Reduction (MPR) for Multi-Cluster PUSCH with UL 256QAM | Same as 6.2.3 | |
| 6.2.4 UE Maximum Output Power with additional requirements | ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz | |
| 6.2.4_1 Additional Maximum Power Reduction (A-MPR) for HPUE | ±0.7 dB, f ≤ 3.0GHz | |
| 6.2.4_2 Additional Maximum Power Reduction (A-MPR) for UL 64QAM | Same as 6.2.4 | |
| 6.2.4_3 Additional Maximum Power Reduction (A-MPR) with PUSCH frequency hopping | Same as 6.2.4 | |
| 6.2.4_4 Additional Maximum Power Reduction (A-MPR) for UL 256QAM | Same as 6.2.4 | |

| | | |
|---|---|---|
| 6.2.4A.1 Additional Maximum Power Reduction (A-MPR) for CA (intra-band contiguous DL CA and UL CA) | Same as 6.2.4 for sum of powers of all CCs | |
| 6.2.4A.1_1 Additional Maximum Power Reduction (A-MPR) for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | Same as 6.2.4 for sum of powers of all CCs | |
| 6.2.4A.1_2 Additional Maximum Power Reduction (A-MPR) for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM | Same as 6.2.4 for sum of powers of all CCs | |
| 6.2.4A.2 Additional Maximum Power Reduction (A-MPR) for CA (inter-band DL CA and UL CA) | Same as 6.2.2A.2 | |
| 6.2.4A.2_1 Additional Maximum Power Reduction (A-MPR) for CA (inter-band DL CA and UL CA) for UL 64QAM | Same as 6.2.2A.2 | |
| 6.2.4A.2_2 Additional Maximum Power Reduction (A-MPR) for CA (inter-band DL CA and UL CA) for UL 256QAM | Same as 6.2.2A.2 | |
| 6.2.4B Additional Maximum Power Reduction (A-MPR) for UL-MIMO | Same as 6.2.4 for each antenna | |
| 6.2.4E Additional Maximum Power Reduction (A-MPR) for UE category 0 | Same as 6.2.4 | |
| 6.2.4EA Additional Maximum Power Reduction (A-MPR) for UE category M1 | ±0.7 dB | |
| 6.2.4EB Additional Maximum Power Reduction (A-MPR) for UE category 1bis | Same as 6.2.4 | |
| 6.2.4G.1 Additional Maximum Power Reduction (A-MPR) for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | ±1.3 dB, 4.2GHz < f ≤ 6GHz | |
| 6.2.5 Configured UE transmitted Output Power | ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz | |
| 6.2.5_1 Configured UE transmitted Output Power for HPUE | ±0.7 dB, f ≤ 3.0GHz | |
| 6.2.5A.1 Configured UE transmitted Output Power for CA (intra-band contiguous DL CA and UL CA) | Same as 6.2.5 for sum of powers of all CCs | |
| 6.2.5A.3 Configured UE transmitted Output Power for CA (inter-band DL CA and UL CA) | Same as 6.2.2A.2 | |
| 6.2.5A.4 Configured UE transmitted Output Power for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.2.2A.2 | |

| | | |
|---|---|---|
| 6.2.5B Configured UE transmitted output power for UL-MIMO | Same as 6.2.5 for each antenna | |
| 6.2.5E Configured Transmitted Power for UE category 0 | Same as 6.2.5 | |
| 6.2.5EA Configured UE transmitted Power for UE category M1 | Same as 6.2.5 | |
| 6.2.5EB Configured UE transmitted Power for UE category 1bis | Same as 6.2.5 | |
| 6.2.5F Configured UE transmitted Output Power for UE category NB1 | ±0.7 dB, f ≤ 3.0GHz | |
| 6.2.5G.1 Configured UE transmitted Output Power for V2X Communication / Non-concurrent with E-UTRA uplink transmission | ±1.3 dB, 4.2GHz < f ≤ 6.0GHz, for UE powers >= 0dBm<br>±1.5 dB, 4.2GHz < f ≤ 6.0GHz, for -40 dBm <= UE powers <0dBm | |
| 6.2.5G.2 Configured UE transmitted Output Power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | ±1.3 dB, 4.2GHz < f ≤ 6.0GHz, for UE powers >= 0dBm<br>±1.5 dB, 4.2GHz < f ≤ 6.0GHz, for -40 dBm <= UE powers <0dBm | |
| 6.3.2 Minimum Output Power | ±1.0 dB, f ≤ 3.0GHz<br>±1.3 dB, 3.0GHz < f ≤ 4.2GHz<br>±1.5 dB, 4.2GHz < f ≤ 6GHz | |
| 6.3.2A.1 Minimum Output Power for CA (intra-band contiguous DL CA and UL CA) | Same as 6.3.2 for each CC | |
| 6.3.2A.4 Minimum Output Power for CA (3UL CA) | Same as 6.3.2 for each CC | |
| 6.3.2B Minimum Output Power for UL-MIMO | Same as 6.3.2 for each antenna | |
| 6.3.2E Minimum Output Power for UE category 0 | Same as 6.3.2 | |
| 6.3.2EA Minimum Output Power for UE category M1 | Same as 6.3.2 | |
| 6.3.2EB Minimum Output Power for UE category 1bis | Same as 6.3.2 | |
| 6.3.2F Minimum Output Power for UE category NB1 | ±1.0 dB, f ≤ 3.0GHz | |
| 6.3.2G.1 Minimum output power for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Same as 6.3.2 | |
| 6.3.2G.2 Minimum output power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Same as 6.3.2 | |
| 6.3.2G.3 Minimum output power for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 6.3.2 | |
| 6.3.3 Transmission ON/OFF Power | Transmission OFF Power: ±1.5 dB, f ≤ 3.0GHz<br>±1.8 dB, 3.0GHz < f ≤ 4.2GHz<br>±2.0 dB, 4.2GHz < f ≤ 6GHz | |
| 6.3.3A.1 UE Transmit OFF power for CA (intra-band contiguous DL CA and UL CA) | Same as 6.3.3 for each CC | |

| | | |
|---|---|---|
| 6.3.3A.2 UE Transmit OFF power for CA (inter-band DL CA and UL CA) | Same as 6.3.3A.1 | |
| 6.3.3A.3 UE Transmit OFF power for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.3.3 for each CC | |
| 6.3.3A.4 UE Transmit OFF power for CA (3UL CA) | Same as 6.3.3 for each CC | |
| 6.3.3B UE Transmit OFF power for UL-MIMO | Same as 6.3.3 for each antenna | |
| 6.3.3D UE Transmit OFF power for ProSe | Same as 6.3.3 | |
| 6.3.3E UE Transmit OFF Power for UE category 0 | Same as 6.3.3 | |
| 6.3.3EA UE Transmit OFF power for UE category M1 | Same as 6.3.3 | |
| 6.3.3EB UE Transmit OFF power for UE category 1bis | Same as 6.3.3 | |
| 6.3.3G.1 UE Transmit OFF power for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Same as 6.3.3 | |
| 6.3.3G.2 UE Transmit OFF power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Same as 6.3.3 for each CC | |
| 6.3.3G.3 UE Transmit OFF power for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 6.3.3 for each CC | |
| 6.3.4.1 General ON/OFF time mask | Transmission ON/OFF Power: ±1.5 dB, f ≤ 3.0GHz<br>±1.8 dB, 3.0GHz < f ≤ 4.2GHz | |
| 6.3.4.2 PRACH and SRS time mask | Transmission ON/OFF Power: ±1.5 dB, f ≤ 3.0GHz<br>±1.8 dB, 3.0GHz < f ≤ 4.2GHz | |
| 6.3.4A.1.2 General ON/OFF time mask for CA (inter-band DL CA and UL CA) | Same as 6.3.4A.1.1 | |
| 6.3.4A.1.1 General ON/OFF time mask for CA (intra-band contiguous DL CA and UL CA) | Same as 6.3.4.1 for each CC | |
| 6.3.4A.1.3 General ON/OFF time mask for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.3.4.1 for each CC | |
| 6.3.4A.1.4 General ON/OFF time mask for CA (3UL CA) | Same as 6.3.4.1 for each CC | |
| 6.3.4B.1 General ON/OFF time mask for UL-MIMO | Same as 6.3.4.1 for each antenna | |
| 6.3.4C.1 General ON/OFF time mask for Dual Connectivity | Same as 6.3.4A.1.1 | |
| 6.3.4E.1 General ON/OFF time mask for UE category 0 | Same as 6.3.4.1 | |
| 6.3.4E.2 PRACH and SRS time mask for UE category 0 | Same as 6.3.4.2 | |
| 6.3.4EA.1 General ON/OFF time mask for UE category M1 | Same as 6.3.4.1 | |
| 6.3.4EA.2 PRACH and SRS ON/OFF time mask for UE category M1 | Same as 6.3.4.2 | |

| | | |
|---|---|---|
| 6.3.4EB.1 General ON/OFF time mask for UE category 1bis | Same as 6.3.4.1 | |
| 6.3.4EB.2 PRACH and SRS ON/OFF time mask for UE category 1bis | Same as 6.3.4.2 | |
| 6.3.4F.1 General ON/OFF time mask for category NB1 | Transmission ON/OFF Power: ±1.5 dB, f ≤ 3.0GHz | |
| 6.3.4F.2 NPRACH time mask for category NB1 | Transmission ON/OFF Power: ±1.5 dB, f ≤ 3.0GHz | |
| 6.3.4G.1 General ON/OFF time mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | ±2.0 dB, 4.2GHz < f ≤ 6GHz | |
| 6.3.4G.2 General ON/OFF time mask for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Transmission ON/OFF Power: ±1.5 dB, f ≤ 3.0GHz<br>±1.8 dB, 3.0GHz < f ≤ 4.2GHz<br>±2.0 dB, 4.2GHz < f ≤ 6.0GHz | |
| 6.3.4G.4 PSSS/SSSS time mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | ±2.0 dB, 4.2GHz < f ≤ 6GHz | |
| 6.3.5.1 Power Control Absolute power tolerance | ±1.0 dB, f ≤ 3.0GHz<br>±1.4 dB, 3.0GHz < f ≤ 4.2GHz<br>±2.0 dB, 4.2GHz < f ≤ 6GHz | Overall system uncertainty comprises two quantities:<br>1. Downlink signal level uncertainty<br>2. Uplink level measurement uncertainty<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared.<br>Test System uncertainty = [SQRT (DL level uncert $^2$ + UL measurement uncert $^2$)]<br>f ≤ 3.0GHz<br>DL signal level uncert ± 0.7dB<br>UL meas't uncert ± 0.7dB<br><br>3.0GHz < f ≤ 4.2GHz<br>DL signal level uncert ± 1.0dB<br>UL meas't uncert ± 1.0dB<br><br>4.2GHz < f ≤ 6GHz<br>DL signal level uncert ± 1.5dB<br>UL meas't uncert ± 1.3dB |
| 6.3.5.2 Power Control Relative power tolerance | ±0.7 dB | |
| 6.3.5.3 Aggregate power control tolerance | ±0.7 dB | |
| 6.3.5_1.1 Power Control Absolute power tolerance for HPUE | ±1.0 dB, f ≤ 3.0GHz | |
| 6.3.5_1.2 Power Control Relative power tolerance for HPUE | ±0.7 dB | |
| 6.3.5_1.3 Aggregate power control tolerance for HPUE | ±0.7 dB | |
| 6.3.5A.1.1 Power Control Absolute power tolerance for CA (intra-band contiguous DL CA and UL CA) | Same as 6.3.5.1 for each CC | |

| | | |
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| 6.3.5A.1.2 Power Control Absolute power tolerance for CA (inter-band DL CA and UL CA) | Same as 6.3.5.1 for each CC | |
| 6.3.5A.1.3 Power Control Absolute power tolerance for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.3.5.1 for each CC | |
| 6.3.5A.1.4 Power Control Absolute power tolerance for CA (3UL CA) | Same as 6.3.5.1 for each CC | |
| 6.3.5A.1.5 Power Control Absolute power tolerance for CA(SRS carrier based switching) | Same as 6.3.5.1 for SCC | |
| 6.3.5A.2.1 Power Control Relative power tolerance for CA (intra-band contiguous DL CA and UL CA) | Absolute power ±1dB, f ≤ 4.2GHz<br>Relative power ±0.7 dB<br>Both requirements apply for each CC | Absolute power is used to check when power is near lower and upper limits of the range. Relative power is used to check step sizes. |
| 6.3.5A.2.4.1 Power Control Relative power tolerance for CA (intra-band contiguous 3DL CA and 3UL CA) | Same as 6.3.5A.2.1 | |
| 6.3.5A.2.4.2 Power Control Relative power tolerance for CA (inter-band 3DL CA and 3UL CA) | Same as 6.3.5A.2.2 | |
| 6.3.5A.2.4.3 Power Control Relative power tolerance for CA (intra-band non-contiguous 3DL CA and 3UL CA) | Same as 6.3.5A.2.3 | |
| 6.3.5A.3.1 Aggregate power control tolerance for CA (intra-band contiguous DL CA and UL CA) | Same as 6.3.5.3 for each CC | |
| 6.3.5A.3.2 Aggregate power control tolerance for CA (inter-band DL CA and UL CA) | Same as 6.3.5.3 for each CC | |

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| 6.3.5A.3.3 Aggregate power control tolerance for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.3.5.3 for each CC | |
| 6.3.5A.3.4 Aggregate Power Control Tolerance for CA (3UL CA) | Same as 6.3.5.3 for each CC | |
| 6.3.5B.1 Power Control Absolute Power Tolerance for UL- MIMO | Same as 6.3.5.1 for each antenna | |
| 6.3.5B.2 Power Control Relative power tolerance for UL-MIMO | Same as 6.3.5.2 for each antenna | |
| 6.3.5B.3 Aggregate power control tolerance for UL-MIMO | Same as 6.3.5.3 for each antenna | |
| 6.3.5C.2 Power Control Relative power tolerance for Dual Connectivity | Same as 6.3.5A.2.1 | |
| 6.3.5C.2_1 Power Control Relative power tolerance for asynchronous Dual Connectivity | Same as 6.3.5A.2.1 | |
| 6.3.5E.1 Power Control Absolute power tolerance for UE category 0 | Same as 6.3.5.1 | |
| 6.3.5E.2 Power Control Relative power tolerance for UE category 0 | Same as 6.3.5.2 | |
| 6.3.5E.3 Aggregate power control tolerance for UE category 0 | Same as 6.3.5.3 | |
| 6.3.5EA.1 Power Control Absolute power tolerance for UE category M1 | ±1.0 dB, f ≤ 3.0GHz | Overall system uncertainty comprises two quantities:<br>1. Downlink signal level uncertainty<br>2. Uplink level measurement uncertainty<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared.<br>Test System uncertainty = [SQRT (DL level uncert $^2$ + UL measurement uncert $^2$)]<br>f ≤ 3.0GHz<br>DL signal level uncert ± 0.7dB<br>UL meas't uncert ± 0.7dB |
| 6.3.5EA.2 Power Control Relative power tolerance for UE category M1 | ±0.7 dB | |
| 6.3.5EA.3 Aggregate power control tolerance for UE category M1 | Same as 6.3.5.3 | |
| 6.3.5EA.3_1 Aggregate power control tolerance for UE category M1 (CE Mode B) | Same as 6.3.5.3 | |
| 6.3.5EB.1 Power Control Absolute power tolerance for UE category 1bis | Same as 6.3.5.1 | |
| 6.3.5EA.2 Power Control Relative power tolerance for UE category M1 | Same as 6.3.5.2 | |
| 6.3.5EA.3 Aggregate power control tolerance for UE category M1 | Same as 6.3.5.3 | |

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| 6.3.5F.1 Power Control Absolute power tolerance for category NB1 | ±1.0 dB, f ≤ 3.0GHz | Overall system uncertainty comprises two quantities:<br>1. Downlink signal level uncertainty<br>2. Uplink level measurement uncertainty<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared.<br>Test System uncertainty = [SQRT (DL level uncert $^2$ + UL measurement uncert $^2$)]<br>f ≤ 3.0GHz<br>DL signal level uncert ± 0.7dB<br>UL meas't uncert ± 0.7dB |
| 6.3.5F.2 Power Control Relative power tolerance for category NB1 | ±0.7 dB | |
| 6.3.5G.1 Power Control Absolute power tolerance for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | ±2.0 dB, 4.2GHz < f ≤ 6GHz | Overall system uncertainty comprises two quantities:<br>1. Downlink signal level uncertainty<br>2. Uplink level measurement uncertainty<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared.<br>Test System uncertainty = [SQRT (DL level uncert $^2$ + UL measurement uncert $^2$)]<br>4.2GHz < f ≤ 6GHz<br>DL signal level uncert ± 1.5dB<br>UL meas't uncert ± 1.3dB |
| 6.3.5G.2 Power Control Absolute power tolerance for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | ±1.0 dB, f ≤ 3.0GHz<br>±2.0 dB, 4.2GHz < f ≤ 6GHz | Overall system uncertainty comprises two quantities:<br>1. Downlink signal level uncertainty<br>2. Uplink level measurement uncertainty<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared.<br>Test System uncertainty = [SQRT (DL level uncert $^2$ + UL measurement uncert $^2$)]<br>f ≤ 3.0GHz<br>DL signal level uncert ± 0.7dB<br>UL meas't uncert ± 0.7dB<br><br>4.2GHz < f ≤ 6GHz<br>DL signal level uncert ± 1.5dB<br>UL meas't uncert ± 1.3dB |
| 6.3.5G.3 Power Control Absolute power tolerance for V2X Communication / Intra-band contiguous multi-carrier operation | ±2.0 dB, 4.2GHz < f ≤ 6GHz | Overall system uncertainty comprises two quantities:<br>1. Downlink signal level uncertainty<br>2. Uplink level measurement uncertainty<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared.<br>Test System uncertainty = [SQRT (DL level uncert $^2$ + UL measurement uncert $^2$)]<br>4.2GHz < f ≤ 6GHz<br>DL signal level uncert ± 1.5dB<br>UL meas't uncert ± 1.3dB |

| | | |
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| 6.5.1 Frequency Error | ±15 Hz<br>DL Signal level: ±0.7 dB, f ≤ 3.0GHz<br>DL Signal level: ±1.0 dB, 3.0GHz < f ≤ 4.2GHz | |
| 6.5.1A.1 Frequency error for CA (intra-band contiguous DL CA and UL CA) | Same as 6.5.1 for each CC | |
| 6.5.1A.2 Frequency error for CA (inter-band DL CA and UL CA) | Same as 6.5.1 | |
| 6.5.1A.3 Frequency error for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.5.1 for each CC | |
| 6.5.1A.4 Frequency error for CA (3UL CA) | Same as 6.5.1 for each CC | |
| 6.5.1B Frequency Error for UL-MIMO | Same as 6.5.1 for each antenna<br>DL signal level same as 6.5.1 | |
| 6.5.1D.1 Frequency Error for ProSe Direct Discovery | ±15 Hz<br>Sidelink Signal level: ±0.7 dB, f ≤ 3.0GHz | |
| 6.5.1D.2 Frequency Error for ProSe Direct Communication | Same as 6.5.1D.1 | |
| 6.5.1E Frequency Error for UE category 0 | Same as 6.5.1 | |
| 6.5.1EA Frequency Error for UE category M1 | Same as 6.5.1 | |
| 6.5.1F Frequency Error for category NB1 | ±15 Hz<br>DL Signal level: ±0.7 dB, f ≤ 3.0GHz | |
| 6.5.1G.1 Frequency Error for V2X Communication / Non-concurrent with E-UTRA uplink transmission | ±36 Hz, f > 3.0GHz | |
| 6.5.1G.2 Frequency error for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | ±15 Hz, f ≤ 3.0GHz<br>±36 Hz, 4.2GHz <f ≤ 6.0GHz | |
| 6.5.2.1 Error Vector Magnitude | PUSCH: ± 2.5%<br>PUCCH: ± 2.5%<br>PRACH: ± 2.5% | |
| 6.5.2.1_1 Error Vector Magnitude (EVM) for UL 64QAM | Same as 6.5.2.1 | |
| 6.5.2.1_2 Error Vector Magnitude (EVM) for UL 256QAM | Same as 6.5.2.1 | |
| 6.5.2A.1.1 Error Vector Magnitude (EVM) for CA (intra-band contiguous DL CA and UL CA) | Same as 6.5.2.1 | |
| 6.5.2A.1.1_2 EVM for CA (intra-band contiguous DL CA and UL CA) with UL 256QAM | Same as 6.5.2.1 | |
| 6.5.2A.1.2 Error Vector Magnitude (EVM) for CA (inter-band DL CA and UL CA) | Same as 6.5.2.1 | |
| 6.5.2A.1.2_1 EVM for CA (inter-band DL CA and UL CA) with UL 64QAM | Same as 6.5.2.1 | |

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| 6.5.2A.1.2_2 Error Vector Magnitude (EVM) for CA (inter-band DL CA and UL CA) for UL 256QAM | Same as 6.5.2.1 | |
| 6.5.2A.1.3 Error Vector Magnitude (EVM) for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.5.2.1 | |
| 6.5.2A.1.1_1 EVM for CA (intra-band contiguous DL CA and UL CA) with UL 64QAM | Same as 6.5.2.1 | |
| 6.5.2A.1.3_1 Error Vector Magnitude (EVM) for CA (intra-band non-contiguous DL CA and UL CA) for UL 64QAM | Same as 6.5.2.1 | |
| 6.5.2A.1.3_2 Error Vector Magnitude (EVM) for CA (intra-band non-contiguous DL CA and UL CA) for UL 256QAM | Same as 6.5.2.1 | |
| 6.5.2A.1.4 Error Vector Magnitude (EVM) for CA (3UL CA) | Same as 6.5.2.1 | |
| 6.5.2B.1 Error Vector Magnitude (EVM) for UL-MIMO | Same as 6.5.2.1 for each antenna | |
| 6.5.2.1A PUSCH-EVM with exclusion period | PUSCH : ± 2.5% | |

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| 6.5.2.1E.1 Error Vector Magnitude for UE category 0 | Same as 6.5.2.1 | |
| 6.5.2.1E.2 PUSCH-EVM with exclusion period for UE category 0 | Same as 6.5.2.1A | |
| 6.5.2.1EA.1 Error Vector Magnitude for UE category M1 | Same as 6.5.2.1 | |
| 6.5.2.1EA.2 PUSCH-EVM with exclusion period for UE category M1 | Same as 6.5.2.1A | |
| 6.5.2.1F.1 Error Vector Magnitude (EVM) for UE category NB1 | Same as 6.5.2.1 | |
| 6.5.2.1G.1 Error Vector Magnitude (EVM) for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Same as 6.5.2.1 | |
| 6.5.2.1G.2 Error Vector Magnitude (EVM) for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | ± 2.5% | |
| 6.5.2.1G.3 Error Vector Magnitude (EVM) for V2X Communication / Intra-band contiguous multi-carrier operation | ± 2.5% | |
| 6.5.2.2 Carrier leakage | ±0.8dB | |
| 6.5.2A.2.1 Carrier leakage for CA (intra-band contiguous DL CA and UL CA) | Same as 6.5.2.2 | |
| 6.5.2A.2.2 Carrier leakage for CA (inter-band DL CA and UL CA) | ±0.8dB | |
| 6.5.2A.2.3 Carrier leakage for CA (intra-band non-contiguous DL CA and UL CA) | ±0.8dB | |
| 6.5.2A.2.4 Carrier leakage for CA (3UL CA) | ±0.8dB | |
| 6.5.2.3 In-band emissions for non allocated RB | ±0.8dB | |
| 6.5.2.4 EVM equalizer Spectrum flatness | ±1.4dB | |
| 6.5.2A.3.1 In-band emissions for non allocated RB for CA (intra-band contiguous DL CA and UL CA) | Same as 6.5.2.3 | |
| 6.5.2A.3.2 In-band emissions for non allocated RB for CA (inter-band DL CA and UL CA) | Same as 6.5.2.3 for each CC | |
| 6.5.2A.3.3 In-band emissions for non allocated RB for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.5.2.3 for each CC | |
| 6.5.2A.3.4 In-band emissions for non allocated RB for CA (3UL CA) | Same as 6.5.2.3 for each CC | |
| 6.5.2B.1 Error vector magnitude (EVM) for UL-MIMO | TBD | |

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| 6.5.2B.2 Carrier leakage for UL-MIMO | Same as 6.5.2.2 for each antenna | |
| 6.5.2B.3 In-band emissions for non allocated RB for UL-MIMO | Same as 6.5.2.3 for each antenna | |
| 6.5.2B.4 EVM equalizer spectrum flatness for UL-MIMO | Same as 6.5.2.4 for each antenna | |
| 6.5.2.2E Carrier Leakage for UE category 0 | Same as 6.5.2.2 | |
| 6.5.2.2EA Carrier Leakage for UE category M1 | Same as 6.5.2.2 | |
| 6.5.2.2F Carrier leakage for UE category NB1 | Same as 6.5.2.2 | |
| 6.5.2.2G.1 Carrier leakage for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Same as 6.5.2.2 | |
| 6.5.2.3E In-band emissions for non allocated RB for UE category 0 | Same as 6.5.2.3 | |
| 6.5.2.3EA In-band emissions for non allocated RB for UE category M1 | Same as 6.5.2.3 | |
| 6.5.2.3F In-band emissions for non allocated RB for UE category NB1 | Same as 6.5.2.3 | |
| 6.5.2.3G.1 In-band emissions for non-allocated RB for V2X Communication | Emission:<br>±0.8dB<br><br>UE transimtted power<br>±1.3 dB, 4.2GHz < f ≤ 6.0GHz, for UE powers >= 0dBm<br>±1.5 dB, 4.2GHz < f ≤ 6.0GHz, for UE powers >= -40dBm | |
| 6.5.2.3G.2 Introduction of In-band emissions for non-allocated RB for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | same as 6.5.2.3G.1 for E-UTRA uplink<br>same as 6.5.2.3G.1 for E-UTRA V2X sidelink | |
| 6.5.2.3G.3 In-band emissions for non-allocated RB for V2X Communication / Intra-band contiguous MCC operation | same as 6.5.2.3G.1 for cc of E-UTRA V2X sidelink | |
| 6.5.2.4E EVM equalizer spectrum flatness for UE category 0 | Same as 6.5.2.4 | |
| 6.5.2.4EA EVM equalizer spectrum flatness for UE category M1 | Same as 6.5.2.4 | |
| 6.5.2.4G.1 EVM equalizer spectrum flatness for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Same as 6.5.2.4 | |
| 6.5.2.4G.3 EVM equalizer spectrum flatness for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 6.5.2.4 for each cc | |
| 6.6.1 Occupied bandwidth | 1.4MHz, 3MHz: 30kHz<br>5MHz, 10MHz: 100kHz<br>15MHz, 20MHz: 300kHz | |

| | | |
|---|---|---|
| 6.6.1A.1 Occupied bandwidth for CA (intra-band contiguous DL CA and UL CA) | 1.4MHz, 3MHz: 30kHz<br>5MHz, 10MHz: 100kHz<br>15MHz, 20MHz: 300kHz<br>20MHz < f ≤ 40MHz: 500kHz | |
| 6.6.1A.2 Occupied bandwidth for CA (inter-band DL CA and UL CA) | Same as 6.6.1 for each CC | |
| 6.6.1A.3 Occupied bandwidth for CA (intra-band non-contiguous DL CA and UL CA) | 1.4MHz, 3MHz: 30kHz<br>5MHz, 10MHz: 100kHz<br>15MHz, 20MHz: 300kHz | |
| 6.6.1B Occupied bandwidth for UL-MIMO | Same as 6.6.1 for each antenna | |
| 6.6.1E Occupied bandwidth for UE category 0 | Same as 6.6.1 | |
| 6.6.1EA Occupied bandwidth for UE category M1 | Same as 6.6.1 | |
| 6.6.1EB Occupied bandwidth for UE category 1bis | Same as 6.6.1 | |
| 6.6.1G.1 Occupied bandwidth for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Same as 6.6.1 | |
| 6.6.1G.2 Occupied bandwidth for V2X Communication / Non-concurrent with E-UTRA uplink transmission | Same as 6.6.1 | |
| 6.6.1G.3 Occupied bandwidth for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 6.6.1 | |
| 6.6.1F Occupied bandwidth for UE category NB1 | 200kHz: FFS | |
| 6.6.2.1 Spectrum Emission Mask | ±1.5 dB, f ≤ 3.0GHz<br>±1.8 dB, 3.0GHz < f ≤ 4.2GHz | |
| 6.6.2.1_1 Spectrum Emission Mask for Multi-Cluster PUSCH | Same as 6.6.2.1 | |
| 6.6.2.1A.1 Spectrum emission mask for CA (intra-band contiguous DL CA and UL CA) | Same as 6.6.2.1 | |
| 6.6.2.1A.2 Spectrum Emission Mask for CA (inter-band DL CA and UL CA) | Same as 6.6.2.1 and 6.6.2.2 | |
| 6.6.2.1A.3 Spectrum Emission Mask for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.6.2.1 | |
| 6.6.2.1B Spectrum Emission Mask for UL-MIMO | Same as 6.6.2.1 for each antenna | |
| 6.6.2.1E Spectrum Emission Mask for UE category 0 | Same as 6.6.2.1 | |
| 6.6.2.1EA Spectrum Emission Mask for UE category M1 | Same as 6.6.2.1 | |
| 6.6.2.1EB Spectrum Emission Mask for UE category 1bis | Same as 6.6.2.1 | |
| 6.6.2.1F Spectrum Emission Mask for UE category NB1 | Same as 6.6.2.1 | |

| | | |
|---|---|---|
| 6.6.2.1G.1 Spectrum Emission Mask for V2X Communication Non-concurrent with E-UTRA uplink transmissions | ±1.5 dB, f ≤ 3.0GHz<br>±1.8 dB, 3.0GHz < f ≤ 4.2GHz<br>±2.0 dB, 4.2GHz < f ≤ 6GHz | |
| 6.6.2.1G.2 Spectrum Emission Mask for V2X Communication /Sidelink simultaneous with E-UTRA uplink transmissions | same as 6.6.2.1G.1 for V2X Sidelink<br>same as 6.6.2.1G.1 for E-UTRA Uplink | |
| 6.6.2.1G.3 Spectrum Emission Mask for V2X Communication / Intra-band contiguous MCC operation | Same as 6.6.2.1G.1 | |
| 6.6.2.2 Additional Spectrum Emission Mask | ±1.5 dB, f ≤ 3.0GHz<br>±1.8 dB, 3.0GHz < f ≤ 4.2GHz<br>±2.0 dB, 4.2GHz < f ≤ 6.0GHz | |
| 6.6.2.2_1 Additional Spectrum Emission Mask for UL 64QAM | Same as 6.6.2.2 | |
| 6.6.2.2_2 Additional Spectrum Emission Mask for UL 256QAM | Same as 6.6.2.2 | |
| 6.6.2.2A.1 Additional Spectrum Emission Mask for CA (intra-band contiguous DL CA and UL CA) | ±1.5 dB, f ≤ 3.0GHz<br>±1.8 dB, 3.0GHz < f ≤ 4.2GHz | |
| 6.6.2.2E Additional Spectrum Emission Mask for UE category 0 | Same as 6.6.2.2 | |
| 6.6.3G.1 Transmitter Spurious emissions for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 9kHz < f ≤ 4 GHz: ± 2.0 dB<br>4 GHz < f ≤ 19 GHz: ± 4.0 dB | |
| 6.6.2.2EA Additional Spectrum Emission Mask for UE category M1 | Same as 6.6.2.2 | |
| 6.6.2.2EB Additional Spectrum Emission Mask for UE category 1bis | Same as 6.6.2.2 | |
| 6.6.2.2A.1_1 Additional Spectrum Emission Mask for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | Same as 6.6.2.2A | |
| 6.6.2.2A.1_2 Additional Spectrum Emission Mask for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM | Same as 6.6.2.2A | |
| 6.6.2.2A.2 Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA) | Same as 6.6.2.2 | |
| 6.6.2.2A.2_1 Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA) for UL 64QAM | Same as 6.6.2.2 | |
| 6.6.2.2A.2_2 Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA) for UL 256QAM | Same as 6.6.2.2 | |
| 6.6.2.2A.3 Additional Spectrum Emission Mask for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.6.2.2 | |

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| 6.6.2.2G.1 Additional Spectrum Emission Mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Same as 6.6.2.2 | |
| 6.6.2.2G.2 Additional Spectrum Emission Mask for V2X Communication / Sidelink simultaneous with E-UTRA uplink transmissions | Same as 6.6.2.2 for V2X Sidelink<br>Same as 6.6.2.2 E-UTRA uplink | |
| 6.6.2.3_2 Adjacent Channel Leakage power Ratio for Multi-Cluster PUSCH | Same as 6.6.2.3 | |
| 6.6.2.3 Adjacent Channel Leakage power Ratio | ±0.8 dB | |
| 6.6.2.3_1 Adjacent Channel Leakage power Ratio for HPUE | ±0.8 dB | |
| 6.6.2.3_2 Adjacent Channel Leakage power Ratio for Multi-Cluster PUSCH | Same as 6.6.2.3 | |
| 6.6.2.3_3 Adjacent Channel Leakage power Ratio for UL 64QAM | Same as 6.6.2.3 | |
| 6.6.2.3_4 Adjacent Channel Leakage power Ratio for Multi-Cluster PUSCH with UL 64QAM | Same as 6.6.2.3 | |
| 6.6.2.3_5 Adjacent Channel Leakage power Ratio for UL 256QAM | Same as 6.6.2.3 | |
| 6.6.2.3_6 Adjacent Channel Leakage power Ratio for Multi-Cluster PUSCH with UL 256QAM | Same as 6.6.2.3 | |
| 6.6.2.3A.1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA) | ±0.8 dB | |
| 6.6.2.3A.1_1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | Same as 6.6.2.3A.1 | |
| 6.6.2.3A.1_2 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM | Same as 6.6.2.3A.1 | |
| 6.6.2.3A.2 Adjacent Channel Leakage power Ratio for CA (inter-band DL CA and UL CA) | ±0.8 dB<br>±1.3 dB, 4.2GHz < f ≤ 6GHz | |
| 6.6.2.3A.2_1 Adjacent Channel Leakage power Ratio for CA (inter-band DL CA and UL CA) for UL 64QAM | Same as 6.6.2.3A.2 | |
| 6.6.2.3A.2_2 Adjacent Channel Leakage power Ratio for CA (inter-band DL CA and UL CA) for UL 256QAM | Same as 6.6.2.3A.2 | |
| 6.6.2.3A.3 Adjacent Channel Leakage power Ratio for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.6.2.3 | |

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| 6.6.2.3A.3_1 Adjacent Channel Leakage power Ratio for CA (intra-band non-contiguous DL CA and UL CA) for UL 64QAM | Same as 6.6.2.3 | |
| 6.6.2.3A.4.1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous 3DL CA and 3UL CA) | Same as 6.6.2.3 | |
| 6.6.2.3A.4.2 Adjacent Channel Leakage power Ratio for CA (inter-band 3DL CA and 3UL CA) | Same as 6.6.2.3 | |
| 6.6.2.3A.4.3 Adjacent Channel Leakage power Ratio for CA (intra-band non-contiguous 3DL CA and 3UL CA) | Same as 6.6.2.3 | |
| 6.6.2.3B Adjacent Channel Leakage power Ratio for UL-MIMO | Same as 6.6.2.3 for each antenna | |
| 6.6.2.3E Adjacent Channel Leakage power Ratio for UE category 0 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3EA Adjacent Channel Leakage power Ratio for UE category M1 | Same as 6.6.2.3 | |
| 6.6.2.3EB Adjacent Channel Leakage power Ratio for UE category 1bis | Same as 6.6.2.3 | |
| 6.6.2.3_3 Adjacent Channel Leakage power Ratio for UL 64QAM | Same as 6.6.2.3 | |
| 6.6.2.3_4 Adjacent Channel Leakage power Ratio for Multi-Cluster PUSCH with UL 64QAM | Same as 6.6.2.3 | |
| 6.6.2.3F Adjacent Channel Leakage power Ratio for UE category NB1 | ±0.8 dB | |
| 6.6.2.3G.1 Adjacent Channel Leakage power Ratio for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | ±0.8 dB | |
| 6.6.2.3G. 2 Adjacent Channel Leakage power Ratio for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Same as 6.6.2.3G.1 | |
| 6.6.2.4 Void | Void | |
| 6.6.3.1 Transmitter Spurious emissions | 9kHz < f ≤ 4 GHz: ± 2.0 dB<br>4 GHz < f ≤ 19 GHz: ± 4.0 dB | |
| 6.6.3.1_1 Transmitter Spurious emissions for Multi-Cluster PUSCH | Same as 6.6.3.1 | |
| 6.6.3.1A.1 Transmitter Spurious emissions for CA (intra-band contiguous DL CA and UL CA) | Same as 6.6.3.1 | |
| 6.6.3.1A.2 Transmitter Spurious emissions for CA (inter-band DL CA and UL CA) | Same as 6.6.3.1 | |

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| 6.6.3.1A.3 Transmitter Spurious emissions for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.6.3.1 | |
| 6.6.3.1A.4.1 Transmitter Spurious emissions for CA (3UL CA) (intra-band contiguous 3DL CA and 3UL CA) | Same as 6.6.3.1 | |
| 6.6.3.1A.4.2 Transmitter Spurious emissions for CA (3UL CA) (inter-band 3DL CA and 3UL CA) | Same as 6.6.3.1 | |
| 6.6.3.1A.4.3 Transmitter Spurious emissions for CA (3UL CA) (intra-band non-contiguous 3DL CA and 3UL CA) | Same as 6.6.3.1 | |
| 6.6.3B.1Transmitter Spurious emissions for UL-MIMO | Same as 6.6.3.1, at each antenna used for transmission | The overall UL power is the linear sum of the output powers over all Tx antenna connectors |
| 6.6.3E.1 Transmitter Spurious emissions for UE category 0 | Same as 6.6.3.1 | |
| 6.6.3EA.1 Transmitter Spurious emissions for UE category M1 | Same as 6.6.3.1 | |
| 6.6.3G.3 Spurious emission for V2X Communication / Intra-band contiguous MCC operation | Same as 6.6.3G.1 | |
| 6.6.3G.3_1 Spurious emission band UE co-existence for V2X Communication / Intra-band contiguous MCC operation | Same as 6.6.3G.1 | |
| 6.6.3.2 Spurious emission band UE co-existence | ± 2.0 dB for results > -60 dBm, f ≤ 3.0GHz<br>±2.5 dB, 3.0GHz < f ≤ 4.2GHz<br>± 3.0 dB for results ≤ -60 dBm, f ≤ 3.0GHz<br>±3.6 dB, 3.0GHz < f ≤ 4.2GHz | |
| 6.6.3.2A.1 Spurious emission band UE co-existence for CA (intra-band contiguous DL CA and UL CA) | Same as 6.6.3.2 | |
| 6.6.3.2A.2 Spurious emission band UE co-existence for CA (inter-band DL CA and UL CA) | Same as 6.6.3.2 | |
| 6.6.3.2A.3 Spurious emission band UE co-existence for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.6.3.2 | |
| 6.6.3.3 Additional spurious emissions | 9kHz < f ≤ 4 GHz: ± 2.0 dB<br><br>NS-07<br>769 ≤ f ≤ 775 MHz: ± 1.5 dB | |
| 6.6.3.3_1 Additional spurious emissions for UL 64QAM | Same as 6.6.3.3 | |
| 6.6.3.3_2 Additional spurious emissions for UL 256QAM | Same as 6.6.3.3 | |
| 6.6.3.3A.1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) | 9kHz < f ≤ 4 GHz: ± 2.0 dB | |

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| 6.6.3.3A.1_1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | Same as 6.6.3.3A.1 | |
| 6.6.3.3A.1_2 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM | Same as 6.6.3.3A.1 | |
| 6.6.3.3A.2 Additional spurious emissions for CA (inter-band DL CA and UL CA) | Same as 6.6.3.3 | |
| 6.6.3.3A.2_1 Additional spurious emissions for CA (inter-band DL CA and UL CA) for UL 64QAM | Same as 6.6.3.3 | |
| 6.6.3B.2 Spurious emission band UE co-existence for UL-MIMO | Same as 6.6.3.2 at each antenna used for transmission | |
| 6.6.3B.3 Additional spurious emissions for UL-MIMO | Same as 6.6.3.3, at each antenna used for transmission | |
| 6.6.3E.2 Spurious emission band UE co-existence for UE category 0 | Same as 6.6.3.2 | |
| 6.6.3E.3 Additional spurious emissions for UE category 0 | 6.6.3.3 | |
| 6.6.3EA.2 Spurious emission band UE co-existence for UE category M1 | Same as 6.6.3.2 | |
| 6.6.3EA.3 Additional spurious emissions for UE category M1 | Same as 6.6.3.3 | |
| 6.6.3EB.1 Transmitter Spurious emissions for UE category 1bis | Same as 6.6.3.2 | |
| 6.6.3EB.2 Spurious emission band UE co-existence for UE category 1bis | Same as 6.6.3.2 | |
| 6.6.3EB.3 Additional spurious emissions for UE category 1bis | Same as 6.6.3.3 | |
| 6.6.3F.2 Spurious emission band UE co-existence for category NB1 UE | ± 2.0 dB for results > -60 dBm, f ≤ 3.0GHz<br>± 3.0 dB for results ≤ -60 dBm, f ≤ 3.0GHz | |

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|---|---|---|
| 6.7 Transmit intermodulation | ± 2.6 dB, f ≤ 3.0GHz<br>±3.6 dB, 3.0GHz < f ≤ 4.2GHz | Overall system uncertainty comprises four quantities:<br><br>1. Wanted signal setting error<br>2. CW Interferer level error<br>3. Wanted signal meas. error<br>4. Intermodulation product measurement error<br><br>The relative level of the wanted signal and the CW interferer has 2 x effect on the intermodulation product.<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared to provide the combined effect.<br><br>Test System uncertainty = SQRT [(2 x SQRT (Wanted setting_error$^2$ + CW_level_error$^2$)) $^2$ + Wanted_level_meas error$^2$ + Intermodulation product measurement error$^2$]<br><br>f ≤ 3.0GHz<br>Wanted signal setting ± 0.7dB<br>CW Interferer level ± 1.0dB<br>Wanted signal meas ± 0.7dB<br>Intermodulation product measurement error ± 0.7dB<br><br>3.0GHz < f ≤ 4.2GHz<br>Wanted signal setting ± 1.0dB<br>CW Interferer level ± 1.3dB<br>Wanted signal meas ± 1.0dB<br>Intermodulation product measurement error ± 1.0dB |
| 6.7A.1 Transmit intermodulation for CA (intra-band contiguous DL CA and UL CA) | Same as 6.7, at each antenna used for transmission | |
| 6.7A.2 Transmit intermodulation for CA (inter-band DL CA and UL CA) | Same as 6.7, at each antenna used for transmission | |
| 6.7E Transmit intermodulation for UE category 0 | Same as 6.7 | |
| 6.7EA Transmit intermodulation for UE category M1 | Same as 6.7 | |
| 6.7EB Transmit intermodulation for UE category 1bis | Same as 6.7 | |
| 6.7F Transmit intermodulation for UE category NB1 | Same as 6.7 | |
| 6.7G.1 Transmit intermodulation for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Same as 6.7 | |

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| 6.7G.2 Transmit intermodulation for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Same as 6.7 | |
| 6.7G.3 Transmit intermodulation for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 6.7 | |
| 6.8B Time alignment error for UL-MIMO | ±25 ns | |

## F.1.3 Measurement of receiver

**Table F.1.3-1: Maximum Test System Uncertainty for receiver tests**

| Subclause | Maximum Test System Uncertainty[1] | Derivation of Test System Uncertainty |
|---|---|---|
| 7.3 Reference sensitivity power level | Downlink power ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz | |
| 7.3_1 Reference sensitivity level with 4 Rx antenna ports | Same as 7.3 | |
| 7.3A.1 Reference sensitivity level for CA (intra-band contiguous DL CA and UL CA) | Same as 7.3 for each CC | |
| 7.3A.2 Reference sensitivity level for CA (intra-band contiguous DL CA without UL CA) | Same as 7.3A.1 | |
| 7.3A.3 Reference sensitivity level for CA (inter-band DL CA without UL CA) | Downlink power ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz<br>±1.5 dB, 4.2GHz < f ≤ 6GHz | |
| 7.3A.4 Reference sensitivity level for CA (intra-band non-contiguous DL CA without UL CA) | Same as 7.3A.1 | |
| 7.3A.5 Reference sensitivity level for 3DL CA | Same as 7.3A.3 | |
| 7.3A.6 Reference sensitivity level for CA (inter-band DL CA and UL CA) | Same as 7.3A.1 | |
| 7.3A.7 Reference sensitivity level for CA (intra-band non-contiguous DL CA and UL CA) | Same as 7.3A.1 | |
| 7.3A.9 Reference sensitivity level for 4DL CA | Same as 7.3A.1 | |
| 7.3A.10 Reference sensitivity level for 5DL CA | Same as 7.3A.1 | |
| 7.3B Reference Sensitivity Level for UL-MIMO | Same as 7.3 | |
| 7.3D.1 Reference sensitivity level for ProSe Direct Discovery | Sidelink power ±0.7 dB, f ≤ 3.0GHz | |
| 7.3D.2 Reference sensitivity level for ProSe Direct Communication | Same as 7.3D.1 | |
| 7.3E Reference Sensitivity Level for UE category 0 | Same as 7.3 | |
| 7.3EA Reference Sensitivity Level for UE category M1 | Same as 7.3 | |
| 7.3EB Reference sensitivity level for UE category 1bis | Same as 7.3 | |
| 7.3EC Reference Sensitivity Level for UE category M2 | Same as 7.3 | |
| 7.3F.1 Reference sensitivity level without repetitions for UE category NB1 | Downlink power ±0.7 dB, f ≤ 3.0GHz | |
| 7.3F.2 Reference sensitivity level with repetitions for category NB1 | Downlink power ±0.7 dB, f ≤ 3.0GHz | |
| 7.3G.1 Reference sensitivity level for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Downlink power ±1.5 dB, 4.2GHz < f ≤ 6GHz | |

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|---|---|---|
| 7.3G.2 Reference sensitivity level for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Downlink power ±1.5 dB, 4.2GHz < f ≤ 6GHz for V2X sidelink<br><br>Downlink power ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz for E-UTRA | |
| 7.3G.3 Reference sensitivity level for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 7.3G.1 | |
| 7.4 Maximum input level | Downlink power ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz<br>Uplink power measurement ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz | |
| 7.4_1 Maximum input level with 4 Rx antenna ports | Same as 7.4 | |
| 7.4A.1 Maximum input level for CA (intra band contiguous DL CA and UL CA) | Same as 7.4 for each CC | Uncertainties apply for each CC |
| 7.4A.1 H Maximum input level for SCE-L1 for CA (intra-band contiguous DL CA and UL CA) | Downlink power same as 7.4 for each CC<br><br>Uplink power measurement same as 7.4 | Uncertainties apply for each CC |
| 7.4A.2 Maximum input level for CA (intra band contiguous DL CA without UL CA) | Downlink power same as 7.4 for each CC<br><br>Uplink power measurement same as 7.4 | Uncertainties apply for each CC |
| 7.4A.2 H Maximum input level for SCE-L1 for CA (intra-band contiguous DL CA without UL CA) | Downlink power same as 7.4 for each CC<br><br>Uplink power measurement same as 7.4 | Uncertainties apply for each CC |
| 7.4A.3 Maximum input level for CA (inter-band DL CA without UL CA) | Downlink power ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz<br>±1.5 dB, 4.2GHz < f ≤ 6GHz<br><br>Uplink power measurement same as 7.4 | Uncertainties apply for each CC |
| 7.4A.4 Maximum input level for CA (intra band non-contiguous DL CA without UL CA) | Downlink power same as 7.4 for each CC<br><br>Uplink power measurement same as 7.4 | Uncertainties apply for each CC |
| 7.4A.5 Maximum input level for 3DL CA | Downlink power same as 7.4A.3 for each CC<br><br>Uplink power measurement same as 7.4 | Uncertainties apply for each CC |
| 7.4A.5_H Maximum input level for SCE-L1 for 3DL CA | Downlink power same as 7.4 for each CC<br><br>Uplink power measurement same as 7.4 | Uncertainties apply for each CC |
| 7.4A.7 Maximum input level for 4DL CA | Downlink power same as 7.4 for each CC<br><br>Uplink power measurement same as 7.4 | Uncertainties apply for each CC |
| 7.4A.7_H Maximum input level for 4DL CA for 256QAM in DL | Downlink power same as 7.4 for each CC<br><br>Uplink power measurement same as 7.4 | Uncertainties apply for each CC |
| 7.4A.8_H Maximum input level for 5DL CA for 256QAM in DL | Downlink power same as 7.4 for each CC<br><br>Uplink power measurement same as 7.4 | Uncertainties apply for each CC |
| 7.4B Maximum Input Level for UL-MIMO | Downlink power same as 7.4<br><br>Uplink power measurement same as 7.4, at each antenna connector used for transmission | The overall UL power is the linear sum of the output powers over all Tx antenna connectors |
| 7.4D.1 Maximum input level for ProSe Direct Discovery | Sidelink power ±0.7 dB, f ≤ 3.0GHz | |
| 7.4D.2 Maximum input level for ProSe Direct Communication | Same as 7.4D.1 | |
| 7.4E Maximum input level for UE category 0 | Same as 7.4 | |

| | | |
|---|---|---|
| 7.4EA Maximum input level for UE category M1 | Same as 7.4 | |
| 7.4EB Maximum input level for UE Category 1bis | Same as 7.4 | |
| 7.4EC Maximum input level for UE category M2 | Same as 7.4 | |
| 7.4F Maximum input level for UE category NB1 | Downlink power ±0.7 dB, f ≤ 3.0GHz | |
| 7.4G.1 Maximum input level for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Downlink power ±1.5 dB, 4.2GHz < f ≤ 6GHz | |
| 7.4G.2 Maximum input level for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Downlink power ±1.5 dB, 4.2GHz < f ≤ 6GHz for V2X sidelink<br><br>Downlink power ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz for E-UTRA<br><br>Uplink power measurement ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz for E-UTRA | |
| 7.4G.3 Maximum input level for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 7.4G.1 | |
| 7.4_H Maximum input level for SCE-L1 | Same as 7.4 | |
| 7.5 Adjacent Channel Selectivity (ACS) | ACS value ±1.1 dB, f ≤ 3.0GHz<br>±1.5 dB, 3.0GHz < f ≤ 4.2GHz<br>Uplink power measurement ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz | Overall ACS uncertainty comprises three quantities:<br><br>1. Wanted signal level error<br>2. Interferer signal level error<br>3. Additional impact of interferer ACLR<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The interferer ACLR effect is systematic, and is added arithmetically.<br><br>Test System uncertainty = [SQRT (wanted_level_error$^2$ + interferer_level_error$^2$)] + ACLR effect.<br><br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level ± 0.7dB<br>3.0GHz < f ≤ 4.2GHz<br>Wanted signal level ± 1.0dB<br>Interferer signal level ± 1.0dB<br><br>f ≤ 4.2GHz<br>Impact of interferer ACLR 0.1dB |
| 7.5_1 Adjacent Channel Selectivity (ACS) with 4 Rx antenna ports | Same as 7.5 | |

| | | |
|---|---|---|
| 7.5A.1 Adjacent Channel Selectivity (ACS) for CA (intra band contiguous DL CA and UL CA) | Same as 7.5 for each CC | Same as 7.5<br>The wanted signal level uncertainty applies for each CC.<br>Overall ACS uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect. |
| 7.5A.2 Adjacent Channel Selectivity (ACS) for CA (intra band contiguous DL CA without UL CA) | Downlink power same as 7.5<br><br>Uplink power measurement same as 7.5 | The wanted signal level uncertainty applies for each CC |
| 7.5A.3 Adjacent Channel Selectivity (ACS) for CA (inter band DL CA without UL CA) | ACS value ±1.1 dB, f ≤ 3.0GHz<br>±1.5 dB, 3.0GHz < f ≤ 4.2GHz<br>±2.2 dB, 4.2GHz < f ≤ 6GHz<br><br>Uplink power measurement ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz | The wanted signal level uncertainty applies for each CC<br><br>Overall ACS uncertainty comprises three quantities:<br><br>1. Wanted signal level error<br>2. Interferer signal level error<br>3. Additional impact of interferer ACLR<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The interferer ACLR effect is systematic, and is added arithmetically.<br><br>Test System uncertainty = [SQRT (wanted_level_error$^2$ + interferer_level_error$^2$)] + ACLR effect.<br><br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level ± 0.7dB<br>3.0GHz < f ≤ 4.2GHz<br>Wanted signal level ± 1.0dB<br>Interferer signal level ± 1.0dB<br>4.2GHz < f ≤ 6GHz<br>Wanted signal level ± 1.5dB<br>Interferer signal level ± 1.5dB<br><br>f ≤ 6GHz<br>Impact of interferer ACLR 0.1dB |
| 7.5A.4 Adjacent Channel Selectivity (ACS) for CA (intra-band non-contiguous DL CA without UL CA) | Downlink power same as 7.5<br><br>Uplink power measurement same as 7.5 | The wanted signal level uncertainty applies for each CC |
| 7.5A.5 Adjacent Channel Selectivity (ACS) for 3DL CA | Downlink power same as 7.5A.3<br><br>Uplink power measurement same as 7.5 | The wanted signal level uncertainty applies for each CC |
| 7.5A.7 Adjacent Channel Selectivity (ACS) for 4DL CA | Downlink power same as 7.5<br><br>Uplink power measurement same as 7.5 | The wanted signal level uncertainty applies for each CC |
| 7.5A.8 Adjacent Channel Selectivity (ACS) for 5DL CA | Downlink power same as 7.5<br><br>Uplink power measurement same as 7.5 | The wanted signal level uncertainty applies for each CC |

| | | |
|---|---|---|
| 7.5B Adjacent Channel Selectivity (ACS) for UL-MIMO | ACS value same as 7.5<br><br>Uplink power measurement same as 7.5, at each antenna connector used for transmission | The overall UL power is the linear sum of the output powers over all Tx antenna connectors |
| 7.5D.1 Adjacent channel selectivity (ACS) for ProSe Direct Discovery | ACS value ±1.1 dB, f ≤ 3.0GHz | Overall ACS uncertainty comprises three quantities:<br><br>1. Wanted signal level error<br>2. Interferer signal level error<br>3. Additional impact of interferer ACLR<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The interferer ACLR effect is systematic, and is added arithmetically.<br><br>Test System uncertainty = [SQRT (wanted_level_error$^2$ + interferer_level_error$^2$)] + ACLR effect.<br><br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level ± 0.7dB<br><br>f ≤ 4.2GHz<br>Impact of interferer ACLR 0.1dB |
| 7.5D.2 Adjacent channel selectivity (ACS) for ProSe Direct Communication | Same as 7.5D.1 | Same as 7.5D.1 |
| 7.5E Adjacent Channel Selectivity (ACS) for UE category 0 | Same as 7.5 | Same as 7.5 |
| 7.5EA Adjacent Channel Selectivity (ACS) for UE category M1 | Same as 7.5 | Same as 7.5 |
| 7.5EB Adjacent Channel Selectivity (ACS) for UE Category 1bis | Same as 7.5 | Same as 7.5 |
| 7.5EC Adjacent Channel Selectivity (ACS) for UE category M2 | Same as 7.5 | Same as 7.5 |

| | | |
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| 7.5F Adjacent Channel Selectivity (ACS) for UE category NB1 | ACS value ±1.1 dB, f ≤ 3.0GHz | Overall ACS uncertainty comprises three quantities:<br><br>1. Wanted signal level error<br>2. Interferer signal level error<br>3. Additional impact of interferer ACLR<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The interferer ACLR effect is systematic, and is added arithmetically.<br><br>Test System uncertainty = [SQRT (wanted_level_error$^2$ + interferer_level_error$^2$)] + ACLR effect.<br><br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level ± 0.7dB<br>Impact of interferer ACLR 0.1dB |
| 7.5G.1 Adjacent channel selectivity (ACS) for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | ACS ±2.2 dB, 4.2GHz < f ≤ 6GHz | Overall ACS uncertainty comprises three quantities:<br><br>1. Wanted signal level error<br>2. Interferer signal level error<br>3. Additional impact of interferer ACLR<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The interferer ACLR effect is systematic, and is added arithmetically.<br><br>Test System uncertainty = [SQRT (wanted_level_error$^2$ + interferer_level_error$^2$)] + ACLR effect.<br><br>4.2GHz < f ≤ 6GHz<br>Wanted signal level ± 1.5dB<br>Interferer signal level ± 1.5dB<br>Impact of interferer ACLR 0.1dB |

| | | |
|---|---|---|
| 7.5G.2 Adjacent channel selectivity (ACS) for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | ACS ±2.2 dB, 4.2GHz < f ≤ 6GHz for V2X sidelink<br><br>ACS value ±1.1 dB, f ≤ 3.0GHz<br>±1.5 dB, 3.0GHz < f ≤ 4.2GHz for E-UTRA<br><br>Uplink power measurement ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz for E-UTRA<br>±1.5 dB, 4.2GHz < f ≤ 6GHz for V2X sidelink | Overall ACS uncertainty comprises three quantities:<br><br>1. Wanted signal level error<br>2. Interferer signal level error<br>3. Additional impact of interferer ACLR<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The interferer ACLR effect is systematic, and is added arithmetically.<br><br>Test System uncertainty = [SQRT (wanted_level_error$^2$ + interferer_level_error$^2$)] + ACLR effect.<br><br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level ± 0.7dB<br>3.0GHz < f ≤ 4.2GHz<br>Wanted signal level ± 1.0dB<br>Interferer signal level ± 1.0dB<br><br>f ≤ 4.2GHz<br>Impact of interferer ACLR 0.1dB Interferer signal level ± 1.0dB<br><br>4.2GHz < f ≤ 6GHz<br>Wanted signal level ± 1.5dB<br>Interferer signal level ± 1.5dB<br>Impact of interferer ACLR 0.1dB |
| 7.5G.3 Adjacent channel selectivity (ACS) for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 7.5G.1 | Same as 7.5G.1 |

| | | |
|---|---|---|
| 7.6.1 In-band blocking | Blocking ±1.4 dB, f ≤ 3.0GHz<br>±1.8 dB, 3.0GHz < f ≤ 4.2GHz<br>Uplink power measurement ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz | Overall blocking uncertainty can have these contributions:<br>1. Wanted signal level error<br>2. Interferer signal level error<br>3. Interferer ACLR<br>4. Interferer broadband noise<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The Interferer ACLR or Broadband noise effect is systematic, and is added arithmetically.<br>Test System uncertainty = [SQRT (wanted_level_error$^2$ + interferer_level_error$^2$)] + ACLR effect + Broadband noise effect.<br><u>In-band blocking, using modulated interferer:</u><br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level:<br>± 0.7dB<br>3.0GHz < f ≤ 4.2GHz<br>Wanted signal level ± 1.0dB<br>Interferer signal level ± 1.0dB<br>f ≤ 4.2GHz<br>Interferer ACLR 0.4dB<br>Broadband noise not applicable |
| 7.6.1_1 In-band blocking with 4 Rx antenna ports | Same as 7.6.1 | Same as 7.6.1 |
| 7.6.1A.1 In-band blocking for CA (intra band contiguous DL CA and UL CA) | Same as 7.6.1 for each CC | Same as 7.6.1<br><br>The wanted signal level uncertainty applies for each CC.<br><br>Overall blocking uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect. |
| 7.6.1A.2 In-band blocking for CA (intra band contiguous DL CA without UL CA) | Same as 7.6.1A.1 | Same as 7.6.1A.1 |

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| 7.6.1A.3 In-band blocking for CA (inter band DL CA without UL CA) | Blocking ±1.4 dB, f ≤ 3.0GHz<br>±1.8 dB, 3.0GHz < f ≤ 4.2GHz<br>±2.5 dB, 4.2GHz < f ≤ 6.0GHz<br>Uplink power measurement ±0.7 dB, f ≤ 3.0GHz<br>*±1.0 dB, 3.0GHz < f ≤ 4.2GHz* | Overall blocking uncertainty can have these contributions:<br>1. Wanted signal level error<br>2. Interferer signal level error<br>3. Interferer ACLR<br>4. Interferer broadband noise<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The Interferer ACLR or Broadband noise effect is systematic, and is added arithmetically.<br>Test System uncertainty = [SQRT (wanted_level_error$^2$ + interferer_level_error$^2$)] + ACLR effect + Broadband noise effect.<br><u>In-band blocking, using modulated interferer:</u><br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level:<br>± 0.7dB<br>3.0GHz < f ≤ 4.2GHz<br>Wanted signal level ± 1.0dB<br>Interferer signal level ± 1.0dB<br>4.2GHz < f ≤ 6.0GHz<br>Wanted signal level ± 1.5dB<br>Interferer signal level ± 1.5dB<br>f ≤ 6.0GHz<br>Interferer ACLR 0.4dB<br>Broadband noise not applicable |
| 7.6.1A.4 In-band blocking for CA (intra-band non-contiguous DL CA without UL CA) | Same as 7.6.1A.1 | Same as 7.6.1A.1 |
| 7.6.1A.5 In-band blocking for 3DL CA | Same as 7.6.1A.3 | Same as 7.6.1A.1 |
| 7.6.1A.7 In-band blocking for 4DL CA | Same as 7.6.1A.1 | Same as 7.6.1A.1 |
| 7.6.1A.8 In-band blocking for 5DL CA | Same as 7.6.1A.1 | Same as 7.6.1A.1 |
| 7.6.1B In-band blocking for UL-MIMO | Blocking same as 7.6.1<br><br>Uplink power measurement same as 7.6.1, at each antenna connector used for transmission | The overall UL power is the linear sum of the output powers over all Tx antenna connectors |

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| 7.6.1D.1 In-band blocking for ProSe Direct Discovery | Blocking ±1.4 dB, f ≤ 3.0GHz | Overall blocking uncertainty can have these contributions:<br>1. Wanted signal level error<br>2. Interferer signal level error<br>3. Interferer ACLR<br>4. Interferer broadband noise<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The Interferer ACLR or Broadband noise effect is systematic, and is added arithmetically.<br><br>Test System uncertainty = [SQRT (wanted_level_error$^2$ + interferer_level_error$^2$)] + ACLR effect + Broadband noise effect.<br><br><u>In-band blocking, using modulated interferer:</u><br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level:<br>± 0.7dB<br><br>f ≤ 4.2GHz<br>Interferer ACLR 0.4dB<br>Broadband noise not applicable |
| 7.6.1D.2 In-band blocking for ProSe Direct Communication | Same as 7.6.1D.1 | Same as 7.6.1D.1 |
| 7.6.1E In-band blocking for UE category 0 | Same as 7.6.1 | Same as 7.6.1 |
| 7.6.1EB In-band blocking for UE Category 1bis | Same as 7.6.1 | Same as 7.6.1 |
| 7.6.1F In-band blocking for category NB1 | Blocking ±1.4 dB, f ≤ 3.0GHz | Overall blocking uncertainty can have these contributions:<br>1. Wanted signal level error<br>2. Interferer signal level error<br>3. Interferer ACLR<br>4. Interferer broadband noise<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The Interferer ACLR or Broadband noise effect is systematic, and is added arithmetically.<br>Test System uncertainty = [SQRT (wanted_level_error$^2$ + interferer_level_error$^2$)] + ACLR effect + Broadband noise effect.<br><u>In-band blocking, using modulated interferer:</u><br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level:<br>± 0.7dB |

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| 7.6.1G.1 In-band blocking for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Blocking ±2.5 dB, 4.2GHz < f ≤ 6.0GHz | Overall blocking uncertainty can have these contributions:<br>1. Wanted signal level error<br>2. Interferer signal level error<br>3. Interferer ACLR<br>4. Interferer broadband noise<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The Interferer ACLR or Broadband noise effect is systematic, and is added arithmetically.<br>Test System uncertainty = [SQRT (wanted_level_error$^2$ + interferer_level_error$^2$)] + ACLR effect + Broadband noise effect.<br>In-band blocking, using modulated interferer:<br>4.2GHz < f ≤ 6.0GHz<br>Wanted signal level ± 1.5dB<br>Interferer signal level:<br>± 1.5dB<br>4.2GHz < f ≤ 6.0GHz<br>Interferer ACLR 0.4dB<br>Broadband noise not applicable |
| 7.6.1G.3 In-band blocking for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 7.6.1G.1 | Same as 7.6.1G.1 |

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| 7.6.1G.2 In-band blocking for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Blocking ±2.5 dB, 4.2GHz < f ≤ 6.0GHz for V2X sidelink<br><br>Blocking ±1.4 dB, f ≤ 3.0GHz<br>±1.8 dB, 3.0GHz < f ≤ 4.2GHz for E-UTRA<br><br>Uplink power measurement ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz for E-UTRA<br>±1.5 dB, 4.2GHz < f ≤ 6GHz for V2X sidelink | Overall blocking uncertainty can have these contributions:<br>1. Wanted signal level error<br>2. Interferer signal level error<br>3. Interferer ACLR<br>4. Interferer broadband noise<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The Interferer ACLR or Broadband noise effect is systematic, and is added arithmetically.<br>Test System uncertainty = [SQRT (wanted_level_error$^2$ + interferer_level_error$^2$)] + ACLR effect + Broadband noise effect.<br>In-band blocking, using modulated interferer:<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level:<br>± 0.7dB<br>3.0GHz < f ≤ 4.2GHz<br>Wanted signal level ± 1.0dB<br>Interferer signal level ± 1.0dB<br>4.2GHz < f ≤ 6.0GHz<br>Wanted signal level ± 1.5dB<br>Interferer signal level:<br>± 1.5dB<br>f ≤ 4.2GHz,<br>4.2GHz < f ≤ 6.0GHz<br>Interferer ACLR 0.4dB<br>Broadband noise not applicable |
| 7.6.1G.3 In-band blocking for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 7.6.1G.1 | Same as 7.6.1G.1 |
| 7.6.1EA In-band blocking for UE category M1 | Blocking ±1.4 dB, f ≤ 3.0GHz<br>Uplink power measurement ±0.7 dB, f ≤ 3.0GHz | Overall blocking uncertainty can have these contributions:<br>1. Wanted signal level error<br>2. Interferer signal level error<br>3. Interferer ACLR<br>4. Interferer broadband noise<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The Interferer ACLR or Broadband noise effect is systematic, and is added arithmetically.<br>Test System uncertainty = [SQRT (wanted_level_error$^2$ + interferer_level_error$^2$)] + ACLR effect + Broadband noise effect.<br>In-band blocking, using modulated interferer:<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level:<br>± 0.7dB |
| 7.6.1EC In-band blocking for UE category M2 | Same as 7.6.1EA | Same as 7.6.1EA |

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| 7.6.2 Out-of-band blocking | Wanted signal f ≤ 3.0GHz<br>Blocking, 1MHz < $f_{interferer}$ ≤ 3 GHz: ±1.3 dB<br>Blocking, 3 GHz < $f_{interferer}$ ≤ 12.75 GHz: ±3.2 dB<br>Uplink power measurement ±0.7 dB<br><br>Wanted signal 3.0GHz < f ≤ 4.2GHz<br>Blocking, 1MHz < $f_{interferer}$ ≤ 3 GHz: ±1.5 dB<br>Blocking, 3 GHz < $f_{interferer}$ ≤ 12.75 GHz: ±3.3 dB<br>Uplink power measurement ±1.0 dB | Out of band blocking, using CW interferer:<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>3.0GHz < f ≤ 4.2GHz<br>Wanted signal level ± 1.0dB<br>Interferer signal level:<br>± 1.0dB up to 3GHz<br>± 3.0dB up to 12.75GHz<br>Interferer ACLR not applicable<br>Impact of interferer<br>Broadband noise 0.1dB<br><br>Figures are combined to give Test System uncertainty, using formula given for 7.6.1 |
| 7.6.2_1 Out of-band blocking with 4 Rx antenna ports | Same as 7.6.2 | Same as 7.6.2 |
| 7.6.2A.1 Out-of-band blocking for CA (intra band contiguous DL CA and UL CA) | Same as 7.6.2 for each CC | Same as 7.6.2<br>The wanted signal level uncertainty applies for each CC.<br>Overall blocking uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect. |
| 7.6.2A.2 Out-of-band blocking for CA (intra band contiguous DL CA without UL CA) | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.6.2A.3 Out-of-band blocking for CA (inter band DL CA without UL CA) | Wanted signal f ≤ 3.0GHz<br>Blocking, 1MHz < finterferer ≤ 3 GHz: ±1.3 dB<br>Blocking, 3 GHz < finterferer ≤ 12.75 GHz: ±3.2 dB<br>Uplink power measurement ±0.7 dB<br><br>Wanted signal 3.0GHz < f ≤ 4.2GHz<br>Blocking, 1MHz < finterferer ≤ 3 GHz: ±1.5 dB<br>Blocking, 3 GHz < finterferer ≤ 12.75 GHz: ±3.3 dB<br>Uplink power measurement ±1.0 dB<br><br>Wanted signal 4.2GHz < f ≤ 6.0GHz<br>Blocking, 1MHz < finterferer ≤ 3 GHz: ±1.9 dB<br>Blocking, 3 GHz < finterferer ≤ 12.75 GHz: ±3.5 dB | Out of band blocking, using CW interferer:<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>3.0GHz < f ≤ 4.2GHz<br>Wanted signal level ± 1.0dB<br>4.2GHz < f ≤ 6.0GHz<br>Wanted signal level ± 1.5dB<br>Interferer signal level:<br>± 1.0dB up to 3GHz<br>± 3.0dB up to 12.75GHz<br>Interferer ACLR not applicable<br>Impact of interferer<br>Broadband noise 0.1dB<br>Figures are combined to give Test System uncertainty, using formula given for 7.6.1 |
| 7.6.2A.4 Out-of-band blocking for CA (intra-band non-contiguous DL CA without UL CA) | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.6.2A.5 Out-of-band blocking for 3DL CA | Same as 7.6.2A.3 | Same as 7.6.2A.1 |
| 7.6.2A.7 Out-of-band blocking for 4DL CA | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.6.2A.8 Out-of-band blocking for 5DL CA | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.6.2B Out-of-band blocking for UL-MIMO | Blocking same as 7.6.2<br><br>Uplink power measurement same as 7.6.2, at each antenna connector used for transmission | The overall UL power is the linear sum of the output powers over all Tx antenna connectors |

| | | |
|---|---|---|
| 7.6.2D.1 Out-of-band blocking for ProSe Direct Discovery | Wanted signal f ≤ 3.0GHz<br>Blocking, 1MHz < $f_{interferer}$ ≤ 3 GHz: ±1.3 dB<br>Blocking, 3 GHz < $f_{interferer}$ ≤ 12.75 GHz: ±3.2 dB<br>±0.7 dB | Out of band blocking, using CW interferer:<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br><br>Interferer signal level:<br>± 1.0dB up to 3GHz<br>± 3.0dB up to 12.75GHz<br>Interferer ACLR not applicable<br><br>Impact of interferer<br>Broadband noise 0.1dB<br><br>Figures are combined to give Test System uncertainty, using formula given for 7.6.1 |
| 7.6.2D.2 Out-of-band blocking for ProSe Direct Communication | Same as 7.6.2D.1 | Same as 7.6.2D.1 |
| 7.6.2E Out of-band blocking for UE category 0 | Same as 7.6.2 | Same as 7.6.2 |
| 7.6.2F Out of-band blocking for category NB1 | Wanted signal f ≤ 3.0GHz<br>Blocking, 1MHz < $f_{interferer}$ ≤ 3 GHz: ±1.3 dB<br>Blocking, 3 GHz < $f_{interferer}$ ≤ 12.75 GHz: ±3.2 dB | Out of band blocking, using CW interferer:<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level:<br>± 1.0dB up to 3GHz<br>Interferer ACLR not applicable<br>Impact of interferer<br>Broadband noise 0.1dB<br><br>Figures are combined to give Test System uncertainty, using formula given for 7.6.1 |
| 7.6.2G.1 Out-of-band blocking for V2X Communication/ Non-concurrent with E-UTRA uplink transmissions | Wanted signal 4.2GHz < f ≤ 6.0GHz<br>Blocking, 1MHz < finterferer ≤ 3 GHz: ±1.9 dB<br>Blocking, 3 GHz < finterferer ≤ 12.75 GHz: ±3.5 dB | Out of band blocking, using CW interferer:<br>4.2GHz < f ≤ 6.0GHz<br>Wanted signal level ± 1.5dB<br>Interferer signal level:<br>± 1.0dB up to 3GHz<br>± 3.0dB up to 12.75GHz<br>Interferer ACLR not applicable<br>Impact of interferer<br>Broadband noise 0.1dB<br>Figures are combined to give Test System uncertainty, using formula given for 7.6.1 |
| 7.6.2EA Out-of-band blocking for UE category M1 | Wanted signal f ≤ 3.0GHz<br>Blocking, 1MHz < $f_{interferer}$ ≤ 3 GHz: ±1.3 dB<br>Blocking, 3 GHz < $f_{interferer}$ ≤ 12.75 GHz: ±3.2 dB<br>Uplink power measurement ±0.7 dB | Out of band blocking, using CW interferer:<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level:<br>± 1.0dB up to 3GHz<br>± 3.0dB up to 12.75GHz<br>Interferer ACLR not applicable<br>Impact of interferer<br>Broadband noise 0.1dB<br><br>Figures are combined to give Test System uncertainty, using formula given for 7.6.1 |
| 7.6.2EB Out-of-band blocking for UE category 1bis | Same as 7.6.2 | Same as 7.6.2 |

| | | |
|---|---|---|
| 7.6.3 Narrow band blocking | Blocking ±1. 1 dB, f ≤ 3.0GHz<br>±1. 5 dB, 3.0GHz < f ≤ 4.2GHz<br>Uplink power measurement ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz | Narrow band blocking, using CW interferer:<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level:<br>± 0.7dB<br>3.0GHz < f ≤ 4.2GHz<br>Wanted signal level ± 1.0dB<br>Interferer signal level ± 1.0dB<br><br>Interferer ACLR not applicable<br>Impact of interferer<br>Broadband noise 0.1dB<br><br>Figures are combined to give Test System uncertainty, using formula given for 7.6.1 |
| 7.6.3_1 Narrow band blocking with 4 Rx antenna ports | Same as 7.6.3 | Same as 7.6.3 |
| 7.6.3A.1 Narrow band blocking for CA (intra band contiguous DL CA and UL CA) | Same as 7.6.3 for each CC | Same as 7.6.3<br>The wanted signal level uncertainty applies for each CC.<br>Overall blocking uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect. |
| 7.6.3A.2 Narrow band blocking for CA (intra band contiguous DL CA without UL CA) | Same as 7.6.3A.1 | Same as 7.6.3A.1 |
| 7.6.3A.3 Narrow band blocking for CA (inter band DL CA without UL CA) | Same as 7.6.3A.1 | Same as 7.6.3A.1 |
| 7.6.3A.4 Narrow band blocking for CA (intra-band non-contiguous DL CA without UL CA) | Same as 7.6.3A.1 | Same as 7.6.3A.1 |
| 7.6.3A.5 Narrow band blocking for 3DL CA | Same as 7.6.3A.1 | Same as 7.6.3A.1 |
| 7.6.3A.7 Narrow band blocking for 4DL CA | Same as 7.6.3A.1 | Same as 7.6.3A.1 |
| 7.6.3A.8 Narrow band blocking for 5DL CA | Same as 7.6.3A.1 | Same as 7.6.3A.1 |
| 7.6.3B Narrow band blocking for UL-MIMO | Blocking same as 7.6.3<br><br>Uplink power measurement same as 7.6.3, at each antenna connector used for transmission | The overall UL power is the linear sum of the output powers over all Tx antenna connectors |
| 7.6.3D.1 Narrow band blocking for ProSe Direct Discovery | Blocking ±1.1 dB, f ≤ 3.0GHz | Narrow band blocking, using CW interferer:<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level:<br>± 0.7dB<br><br>Interferer ACLR not applicable<br>Impact of interferer<br>Broadband noise 0.1dB<br><br>Figures are combined to give Test System uncertainty, using formula given for 7.6.1 |
| 7.6.3D.2 Narrow band blocking for ProSe Direct Communication | Same as 7.6.3D.1 | Same as 7.6.3D.1 |

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| 7.6.3E Narrow band blocking for UE category 0 | Same as 7.6.3 | Same as 7.6.3 |
| 7.6.3EA Narrow band blocking for UE category M1 | Blocking ±1. 1 dB, f ≤ 3.0GHz<br>Uplink power measurement ±0.7 dB, f ≤ 3.0GHz | Narrow band blocking, using CW interferer:<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level:<br>± 0.7dB<br><br>Interferer ACLR not applicable<br>Impact of interferer<br>Broadband noise 0.1dB<br><br>Figures are combined to give Test System uncertainty, using formula given for 7.6.1 |
| 7.6.3EB Narrow band blocking for UE category 1bis | Same as 7.6.3 | Same as 7.6.3 |
| 7.6.3EC Narrow band blocking for UE category M2 | Same as 7.6.3EA | Same as 7.6.3EA |
| 7.7 Spurious response | Same as 7.6.2 | Same as 7.6.2. |
| 7.7_1 Spurious response with 4 Rx antenna ports | Same as 7.6.2 | Same as 7.6.2 |
| 7.7A.1 Spurious response for CA (intra band contiguous DL CA and UL CA) | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.7A.2 Spurious response for CA (intra band contiguous DL CA without UL CA) | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.7A.3 Spurious response for CA (inter band DL CA without UL CA) | Same as 7.6.2A.3 | Same as 7.6.2A.1 |
| 7.7A.4 Spurious response for CA (intra-band non-contiguous DL CA without UL CA) | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.7A.5 Spurious response for 3DL CA | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.7A.7 Spurious response for 4DL CA | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.7A.8 Spurious response for 5DL CA | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.7B Spurious response for UL-MIMO | Same as 7.7<br><br>Uplink power measurement same as 7.6.2, at each antenna connector used for transmission | The overall UL power is the linear sum of the output powers over all Tx antenna connectors |
| 7.7D.1 Spurious response for ProSe Direct Discovery | Same as 7.6.2D.1 | Same as 7.6.2D.1 |
| 7.7D.2 Spurious response for ProSe Direct Communication | Same as 7.6.2D.1 | Same as 7.6.2D.1 |
| 7.7E Spurious response for UE category 0 | Same as 7.7 | Same as 7.7 |
| 7.7EA Spurious response for UE category M1 | Same as 7.7 | Same as 7.7 |
| 7.7EB Spurious response for UE Category 1bis | Same as 7.7 | Same as 7.7 |

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| 7.7F Spurious response for category NB1 | Wanted signal f ≤ 3.0GHz<br>Blocking, 1MHz < $f_{interferer}$ ≤ □3 GHz: ±1.3 dB<br>Blocking, 3 GHz < $f_{interferer}$ ≤ □12.75 GHz: ±3.2 dB | Out of band blocking, using CW interferer:<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>Interferer signal level:<br>± 1.0dB up to 3GHz<br>Interferer ACLR not applicable<br>Impact of interferer<br>Broadband noise 0.1dB<br><br>Figures are combined to give Test System uncertainty, using formula given for 7.6.1 |
| 7.7G.1 Spurious response for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Wanted signal 4.2GHz < f ≤ 6.0GHz<br>Blocking, 1MHz < finterferer ≤ 3 GHz: ±1.9 dB<br>Blocking, 3 GHz < finterferer ≤ 12.75 GHz: ±3.5 dB | Out of band blocking, using CW interferer:<br>4.2GHz < f ≤ 6.0GHz<br>Wanted signal level ± 1.5dB<br>Interferer signal level:<br>± 1.0dB up to 3GHz<br>± 3.0dB up to 12.75GHz<br>Interferer ACLR not applicable<br>Impact of interferer<br>Broadband noise 0.1dB<br><br>Figures are combined to give Test System uncertainty, using formula given for 7.6.1 |
| 7.7G.2 Spurious response for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Wanted signal 4.2GHz < f ≤ 6.0GHz for V2X sidelink<br>Blocking, 1MHz < finterferer ≤ 3 GHz: ±1.9 dB<br>Blocking, 3 GHz < finterferer ≤ 12.75 GHz: ±3.5 dB<br><br>Same as 7.6.2 for E-UTRA | Sams as 7.7G.1<br><br>Same as 7.6.2 |
| 7.7G.3 Spurious response for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 7.7G.1 | Same as 7.7G.1 |
| 7.8.1 Wide band intermodulation | Intermodulation ±1.4 dB, f ≤ 3.0GHz<br>±2.6 dB, 3.0GHz < f ≤ 4.2GHz<br>Uplink power measurement ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz | Overall intermodulation uncertainty comprises three quantities:<br>1. Wanted signal level error<br>2. CW Interferer level error<br>3. Modulated Interferer level error<br><br>Effect of interferer ACLR has not been included as modulated interferer has larger frequency offset<br>The effect of the closer CW signal has twice the effect.<br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared to provide the combined effect of the three signals.<br>Test System uncertainty = SQRT [(2 x CW_level_error)$^2$ +(mod interferer_level_error)$^2$ +(wanted signal_level_error)$^2$]<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>CW Interferer level ± 0.5dB<br>Mod Interferer level ± 0.7dB<br>3.0GHz < f ≤ 4.2GHz<br>Wanted signal level ± 1.0dB<br>CW Interferer level ± 0.8dB<br>Mod Interferer level ± 1.0dB |

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| 7.8.1_1 Wide band Intermodulation with 4 Rx antenna ports | Same as 7.8.1 | Same as 7.8.1 |
| 7.8.1A.1 Wideband intermodulation for CA (intra band contiguous DL CA and UL CA) | Same as 7.8.1 for each CC | Same as 7.8.1<br>The wanted signal level uncertainty applies for each CC.<br>Overall intermodulation uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect. |
| 7.8.1A.2 Wideband intermodulation for CA (intra band contiguous DL CA without UL CA) | Same as 7.8.1A.1 | Same as 7.8.1A.1 |
| 7.8.1A.3 Wideband intermodulation for CA (inter band DL CA without UL CA) | Intermodulation ±1.4 dB, f ≤ 3.0GHz<br>±2.6 dB, 3.0GHz < f ≤ 4.2GHz<br>±3.8 dB, 4.2GHz < f ≤ 6GHz<br>Uplink power measurement ±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz | Overall intermodulation uncertainty comprises three quantities:<br>1. Wanted signal level error<br>2. CW Interferer level error<br>3. Modulated Interferer level error<br><br>Effect of interferer ACLR has not been included as modulated interferer has larger frequency offset<br>The effect of the closer CW signal has twice the effect.<br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared to provide the combined effect of the three signals.<br>Test System uncertainty = SQRT [(2 x CW_level_error)$^2$ +(mod interferer_level_error)$^2$ +(wanted signal_level_error)$^2$]<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>CW Interferer level ± 0.5dB<br>Mod Interferer level ± 0.7dB<br>3.0GHz < f ≤ 4.2GHz<br>Wanted signal level ± 1.0dB<br>CW Interferer level ± 0.8dB<br>Mod Interferer level ± 1.0dB<br>4.2GHz < f ≤ 6GHz<br>Wanted signal level ± 1.5dB<br>CW Interferer level ± 1.3dB<br>Mod Interferer level ± 1.5dB |
| 7.8.1A.4 Wideband intermodulation for CA (intra band non-contiguous DL CA without UL CA) | Same as 7.8.1A.1 | Same as 7.8.1A.1 |
| 7.8.1A.5 Wideband intermodulation for 3DL CA | Same as 7.8.1A.3 | Same as 7.8.1A.1 |
| 7.8.1A.7 Wideband intermodulation for 4DL CA | Same as 7.8.1A.1 | Same as 7.8.1A.1 |
| 7.8.1A.8 Wideband intermodulation for 5DL CA | Same as 7.8.1A.1 | Same as 7.8.1A.1 |
| 7.8.1B Wide band intermodulation for UL-MIMO | Intermodulation same as 7.8.1<br><br>Uplink power measurement same as 7.8.1, at each antenna connector used for transmission | The overall UL power is the linear sum of the output powers over all Tx antenna connectors |

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| 7.8.1D.1 Wide band Intermodulation for ProSe Direct Discovery | Intermodulation ±1.4 dB, f ≤ 3.0GHz<br>±2 | Overall intermodulation uncertainty comprises three quantities:<br>1. Wanted signal level error<br>2. CW Interferer level error<br>3. Modulated Interferer level error<br><br>Effect of interferer ACLR has not been included as modulated interferer has larger frequency offset<br><br>The effect of the closer CW signal has twice the effect. Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared to provide the combined effect of the three signals.<br>Test System uncertainty = SQRT [(2 x CW_level_error)$^2$ +(mod interferer_level_error)$^2$ +(wanted signal_level_error)$^2$]<br><br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>CW Interferer level ± 0.5dB<br>Mod Interferer level ± 0.7dB |
| 7.8.1D.2 Wide band Intermodulation for ProSe Direct Communication | Same as 7.8.1D.2 | Same as 7.8.1D.2 |
| 7.8.1E Wide band intermodulation for UE category 0 | Same as 7.8.1 | Same as 7.8.1 |
| 7.8.1EA Wide band Intermodulation for UE category M1 | Same as 7.8.1 | Same as 7.8.1 |
| 7.8.1EB Wide band Intermodulation for UE category 1bis | Same as 7.8.1 | Same as 7.8.1 |
| 7.8.1EC Wide band Intermodulation for UE category M2 | Same as 7.8.1 | Same as 7.8.1 |

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| 7.8.1F Wide band intermodulation for category NB1 | Intermodulation ±1.4 dB, f ≤ 3.0GHz | Overall intermodulation uncertainty comprises three quantities:<br>1. Wanted signal level error<br>2. CW Interferer level error<br>3. Modulated Interferer level error<br><br>Effect of interferer ACLR has not been included as modulated interferer has larger frequency offset<br>The effect of the closer CW signal has twice the effect.<br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared to provide the combined effect of the three signals.<br>Test System uncertainty = SQRT [(2 x CW_level_error)2 +(mod interferer_level_error)2 +(wanted signal_level_error)2]<br>f ≤ 3.0GHz<br>Wanted signal level ± 0.7dB<br>CW Interferer level ± 0.5dB<br>Mod Interferer level ± 0.7dB |
| 7.8.1G.1 Wide band Intermodulation for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Intermodulation ±3.8 dB, 4.2GHz < f ≤ 6GHz | Overall intermodulation uncertainty comprises three quantities:<br>1. Wanted signal level error<br>2. CW Interferer level error<br>3. Modulated Interferer level error<br><br>Effect of interferer ACLR has not been included as modulated interferer has larger frequency offset<br>The effect of the closer CW signal has twice the effect.<br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared to provide the combined effect of the three signals.<br>Test System uncertainty = SQRT [(2 x CW_level_error)$^2$ +(mod interferer_level_error)$^2$ +(wanted signal_level_error)$^2$]<br>4.2GHz < f ≤ 6GHz<br>Wanted signal level ± 1.5dB<br>CW Interferer level ± 1.3dB<br>Mod Interferer level ± 1.5dB |
| 7.9 Spurious emissions | 30MHz ≤ f ≤ 4.0GHz: ± 2.0 dB<br>4 GHz < f ≤ □19 GHz: ± 4.0 dB | |
| 7.9_1 Spurious emissions with 4 Rx antenna ports | Same as 7.9 | |
| 7.9A Spurious emissions for CA | 30MHz ≤ f ≤ 4.0GHz: ± 2.0 dB<br>4 GHz < f ≤ 19 GHz: ± 4.0 dB<br>19GHz < f ≤ 26 GHz: ± 6.0 dB | |
| 7.9E Spurious emissions for UE category 0 | Same as 7.9 | |
| 7.9EB Spurious emissions for UE Category 1bis | Same as 7.9 | |
| 7.9F Spurious emissions for category NB1 | Same as 7.9 | |

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| 7.9G.1 Spurious emissions for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 30MHz ≤ f ≤ 4.0GHz: ± 2.0 dB<br>4 GHz < f ≤ 19 GHz: ± 4.0 dB<br>19GHz < f ≤ 26 GHz: ± 6.0 dB | |
| Note 1: Unless otherwise noted, only the Test System stimulus error is considered here. The effect of errors in the throughput measurements due to finite test duration is not considered. | | |

# F.1.4 Measurement of performance requirements

**Table F.1.4-1: Maximum Test System Uncertainty for Performance Requirements**

| Subclause | Maximum Test System Uncertainty[1] | Derivation of Test System Uncertainty |
|---|---|---|
| 8.2.1.1.1 Multiple PRBs<br>- Propagation Condition EVA5<br>- Propagation Condition ETU70<br>- Propagation Condition ETU300 | ± 0.8 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.2.1.1.1 Multiple PRBs<br>- Propagation Condition HST | ± 0.6 dB | Overall system uncertainty for HST condition comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.2.1.1.1 Single PRB<br>- Propagation Condition ETU70 | ± 0.8 dB | Overall system uncertainty for fading condition comprises three quantities:<br>1. Average Signal-to-noise ratio uncertainty<br>2. Signal-to noise ratio variation for single PRB<br>3. Fading profile power uncertainty<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Average signal-to-noise ratio uncertainty $^2$ + Signal-to-noise ratio variation$^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Signal-to-noise ratio variation ±0.5 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx |
| 8.2.1.1.1_A.1 | Same as 8.2.1.1.1 Multiple PRBs, for each CC | Same as 8.2.1.1.1 Multiple PRBs<br>Calculation applies for each CC |
| 8.2.1.1.1_A.2 | Same as 8.2.1.1.1 Multiple PRBs, for each CC | Same as 8.2.1.1.1 Multiple PRBs<br>Calculation applies for each CC |
| 8.2.1.1.1_A.4 | Same as 8.2.1.1.1 Multiple PRBs, for each CC | Same as 8.2.1.1.1 Multiple PRBs<br>Calculation applies for each CC |

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|---|---|---|
| 8.2.1.1.1_A.5 | Same as 8.2.1.1.1 Multiple PRBs, for each CC | Same as 8.2.1.1.1 Multiple PRBs Calculation applies for each CC |
| 8.2.1.1.1_1 Multiple PRBs<br>- Propagation Condition EVA5<br>- Propagation Condition ETU70<br>- Propagation Condition ETU300 | Same as 8.2.1.1.1 Multiple PRBs Propagation EVA5, ETU70, ETU300 | |
| 8.2.1.1.1_2 Multiple PRB<br>- Propagation Condition EVA5 | Same as 8.2.1.1.1 Multiple PRBs Propagation EVA5 | |
| 8.2.1.1.2 Single PRB | ± 0.8 dB | Same as 8.2.1.1.1 Single PRB |
| 8.2.1.2.1<br>- Propagation Condition EVA5 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.2.1.2.1<br>- Propagation Condition HST | ± 0.6 dB | Overall system uncertainty for HST condition comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.2.1.2.1_1<br>- Propagation Condition EVA5 | Same as 8.2.1.2.1 Propagation EVA5 | |
| 8.2.1.2.2 | ± 0.9 dB | Same as 8.2.1.2.1 Propagation Condition EVA5 |
| 8.2.1.2.2_1 | Same as 8.2.1.2.2 | |

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| 8.2.1.2.3_C.1 | Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ ± 0.9 dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1 dB<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ ± 1.0 dB<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ ± 1.0 dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>Symbols #0, 4.. means 0, 4, 7, 11<br>Symbols #1, 2.. means 1-3, 5, 6, 8-10, 12, 13<br><br>Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc1}/N_{oc2}$ uncertainty $^2$)<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc3}/N_{oc2}$ uncertainty $^2$)<br><br>Component uncertainties:<br>Cell 1 SNR uncertainty ($E_{s1}$ / $N_{oc2}$ ratio before fading) ±0.3 dB<br>Cell 2 SNR uncertainty ($E_{s2}$ / $N_{oc2}$ ratio before fading) ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB<br>$N_{oc1}/N_{oc2}$ and $N_{oc3}/N_{oc2}$ uncertainty ±0.3 dB |

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| 8.2.1.2.3_E.1<br>- Propagation Condition EVA5 | Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ ± 0.9dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1dB<br>$\hat{E}s_3/\hat{E}s_1$ ± 1.1dB<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ ± 1.0dB<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ ± 1.0dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>Symbols #0, 4.. means 0, 4, 7, 11<br>Symbols #1, 2.. means 1-3, 5, 6, 8-10, 12, 13<br><br>Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br><br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br>$\hat{E}s_3/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 3 SNR uncertainty $^2$ + Cell 3 Fading profile power uncertainty $^2$)<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc1}/N_{oc2}$ uncertainty $^2$)<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc3}/N_{oc2}$ uncertainty $^2$)<br><br>Component uncertainties:<br>SNR uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB<br>$N_{oc1}/N_{oc2}$ and $N_{oc3}/N_{oc2}$ uncertainty ±0.3 dB |
| 8.2.1.2.4 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |

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| 8.2.1.2.5 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |
| 8.2.1.2.6 | Same as 8.2.1.2.5 | Same as 8.2.1.2.5 |
| 8.2.1.3.1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.2.1.3.1_1 | Same as 8.2.1.3.1 | Same as 8.2.1.3.1 |
| 8.2.1.3.1_A.1 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.2.1.3.1_A.2 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (3DL CA) | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.2.1.3.1_A.3 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (4DL CA) | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.2.1.3.1_A.3 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.2.1.3.1_A.4 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.2.1.3.1A_A.1 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.2.1.3.1B | ± 0.9 dB | Same as 8.2.1.3.1 |
| 8.2.1.3.1C | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |
| 8.2.1.3.2 | ± 0.9 dB | Same as 8.2.1.3.1 |

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| 8.2.1.3.3_C.1 | Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ ± 0.9 dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1 dB<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ ± 1.0 dB<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ ± 1.0 dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>Symbols #0, 4.. means 0, 4, 7, 11<br>Symbols #1, 2.. means 1-3, 5, 6, 8-10, 12, 13<br><br>Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc1}/N_{oc2}$ uncertainty $^2$)<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc3}/N_{oc2}$ uncertainty $^2$)<br><br>Component uncertainties:<br>Cell 1 SNR uncertainty ($E_{s1}$ / $N_{oc2}$ ratio before fading) ±0.3 dB<br>Cell 2 SNR uncertainty ($E_{s2}$ / $N_{oc2}$ ratio before fading) ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB<br>$N_{oc1}/N_{oc2}$ and $N_{oc3}/N_{oc2}$ uncertainty ±0.3 dB |

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| 8.2.1.3.3_C.2 | Symbol #0 during ABS:<br>$\hat{E}s_1/N_{oc2}$ ± 0.9 dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1 dB<br><br>Symbols #1..13 during ABS:<br>$\hat{E}s_1/N_{oc1}$ ± 1.0 dB<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ ± 1.0 dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>Symbol #0 during ABS:<br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br>Symbols #1..13 during ABS:<br>$\hat{E}s_1/N_{oc1}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc1}/N_{oc2}$ uncertainty $^2$)<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc3}/N_{oc2}$ uncertainty $^2$)<br><br>Component uncertainties:<br>Cell 1 SNR uncertainty ($E_{s1}$ / $N_{oc2}$ ratio before fading) ±0.3 dB<br>Cell 2 SNR uncertainty ($E_{s2}$ / $N_{oc2}$ ratio before fading) ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB<br>$N_{oc1}/N_{oc2}$ and $N_{oc3}/N_{oc2}$ uncertainty ±0.3 dB |

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| 8.2.1.3.3_E.1<br>- Propagation Condition EVA5 | Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ ± 0.9dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1dB<br>$\hat{E}s_3/\hat{E}s_1$ ± 1.1dB<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ ± 1.0dB<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ ± 1.0dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>Symbols #0, 4.. means 0, 4, 7, 11<br>Symbols #1, 2.. means 1-3, 5, 6, 8-10, 12, 13<br><br>Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br><br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br>$\hat{E}s_3/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 3 SNR uncertainty $^2$ + Cell 3 Fading profile power uncertainty $^2$)<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc1}/N_{oc2}$ uncertainty $^2$)<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc3}/N_{oc2}$ uncertainty $^2$)<br><br>Component uncertainties:<br>SNR uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB<br>$N_{oc1}/N_{oc2}$ and $N_{oc3}/N_{oc2}$ uncertainty ±0.3 dB |
| 8.2.1.4.1 | ± 0.9 dB | Same as 8.2.1.3.1 |
| 8.2.1.4.1_1 | Same as 8.2.1.4.1 | |

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| 8.2.1.4.1_E.1<br>- Propagation Condition EPA5 | Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ ± 0.9 dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1 dB<br>$\hat{E}s_3/\hat{E}s_1$ ± 1.1 dB<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ ± 1.0 dB<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ ± 1.0 dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>Symbols #0, 4.. means 0, 4, 7, 11<br>Symbols #1, 2.. means 1-3, 5, 6, 8-10, 12, 13<br><br>Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br><br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br>$\hat{E}s_3/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 3 SNR uncertainty $^2$ + Cell 3 Fading profile power uncertainty $^2$)<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc1}/N_{oc2}$ uncertainty $^2$)<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc3}/N_{oc2}$ uncertainty $^2$)<br><br>Component uncertainties:<br>SNR uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB<br>$N_{oc1}/N_{oc2}$ and $N_{oc3}/N_{oc2}$ uncertainty ±0.3 dB |
| 8.2.1.4.1_H FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 2x2 for SCE-L1 | ± 0.9 dB | Same as 8.2.1.4.1 |
| 8.2.1.4.2 | ± 0.9 dB | Same as 8.2.1.3.1 |
| 8.2.1.4.2_1 | Same as 8.2.1.4.2 | |
| 8.2.1.4.2_A.1 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.2.1.4.2_A.2 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.2.1.4.2_A.3 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.2.1.4.2_A.4 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.2.1.4.2A | ± 0.9 dB | Same as 8.2.1.3.1 |

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| 8.2.1.4.3 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect |
| 8.2.1.4.3A | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.2.1.4.4 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |
| 8.2.1.7.1_A.1 | TBD | TBD |
| 8.2.1.9<br>- Propagation Condition HST-SFN | ± 0.6 dB | Overall system uncertainty for HST-SFN condition comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |

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| 8.2.2.1.1 Multiple PRBs<br>- Propagation Condition EVA5<br>- Propagation Condition ETU70<br>- Propagation Condition ETU300 | ± 0.8 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.2.2.1.1 Multiple PRBs<br>- Propagation Condition HST | ± 0.6 dB | Overall system uncertainty for HST condition comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.2.2.1.1 Single PRB<br>- Propagation Condition ETU70 | ± 0.8 dB | Overall system uncertainty for fading condition comprises three quantities:<br>1. Average Signal-to-noise ratio uncertainty<br>2. Signal-to noise ratio variation for single PRB<br>3. Fading profile power uncertainty<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Average signal-to-noise ratio uncertainty $^2$ + Signal-to-noise ratio variation$^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Signal-to-noise ratio variation ±0.5 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx |
| 8.2.2.1.1_1 Multiple PRBs<br>- Propagation Condition EVA5<br>- Propagation Condition ETU70<br>- Propagation Condition ETU300 | Same as 8.2.2.1.1 Multiple PRBs Propagation EVA5, ETU70, ETU300 | |
| 8.2.2.1.1_2 Multiple PRB<br>- Propagation Condition EVA5 | Same as 8.2.2.1.1 Multiple PRBs Propagation EVA5 | |
| 8.2.2.1.1_A.1 | Same as 8.2.2.1.1 Multiple PRBs for each CC | Same as 8.2.2.1.1 Multiple PRBs Calculation applies for each CC |
| 8.2.2.1.1_A.2 | Same as 8.2.2.1.1 Multiple PRBs for each CC | Same as 8.2.2.1.1 Multiple PRBs Calculation applies for each CC |
| 8.2.2.1.1_A.3 | Same as 8.2.2.1.1 Multiple PRBs for each CC | Same as 8.2.2.1.1 Multiple PRBs Calculation applies for each CC |

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| 8.2.2.1.1_A.4 | Same as 8.2.2.1.1 Multiple PRBs for each CC | Same as 8.2.2.1.1 Multiple PRBs Calculation applies for each CC |
| 8.2.2.1.2 Single PRB | ± 0.8 dB | Same as 8.2.2.1.1 Single PRB |
| 8.2.2.2.1<br>- Propagation Condition EVA5 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.2.2.2.1<br>- Propagation Condition HST | ± 0.6 dB | Overall system uncertainty for HST condition comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.2.2.2.1_1<br>- Propagation Condition EVA5 | Same as 8.2.2.2.1 Propagation EVA5 | |
| 8.2.2.2.2 | ± 0.9 dB | Same as 8.2.2.2.1 Propagation Condition EVA5 |
| 8.2.2.2.2_1 | Same as 8.2.2.2.2 | |
| 8.2.2.2.3_C.1 | Same as 8.2.1.2.3_C.1 | Same as 8.2.1.2.3_C.1 |
| 8.2.2.2.3_E.1<br>- Propagation Condition EVA5 | Same as 8.2.1.2.3_E.1 | Same as 8.2.1.2.3_E.1 |
| 8.2.2.2.4 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |
| 8.2.2.2.5 | ± 0.9 dB | Same as 8.2.2.2.1 Propagation Condition EVA5 |

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| 8.2.2.2.6 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |
| 8.2.2.2.7 | Same as 8.2.2.2.6 | Same as 8.2.2.2.6 |
| 8.2.2.3.1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.2.2.3.1_1 | Same as 8.2.2.3.1 | Same as 8.2.2.3.1 |
| 8.2.2.3.1_A.1 | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1<br>Calculation applies for each CC |
| 8.2.2.3.1_A.2 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (3 DL CA) | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1<br>Calculation applies for each CC |
| 8.2.2.3.1_A.4 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (5 DL CA) | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1<br>Calculation applies for each CC |
| 8.2.2.3.1A_A.1 | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1<br>Calculation applies for each CC |
| 8.2.2.3.1B | ± 0.9 dB | Same as 8.2.2.3.1 |
| 8.2.2.3.1C | Same as 8.2.1.3.1C | Same as 8.2.1.3.1C |
| 8.2.2.3.2 | ± 0.9 dB | Same as 8.2.2.3.1 |
| 8.2.2.3.3_C.1 | Same as 8.2.1.3.3_C.1 | Same as 8.2.1.3.3_C.1 |
| 8.2.2.3.3_C.2 | Same as 8.2.1.3.3_C.2 | Same as 8.2.1.3.3_C.2 |
| 8.2.2.3.3_E.1<br>- Propagation Condition EVA5 | Same as 8.2.1.3.3_E.1 | Same as 8.2.1.3.3_E.1 |
| 8.2.2.4.1 | ± 0.9 dB | Same as 8.2.2.3.1 |
| 8.2.2.4.1_1 | Same as 8.2.2.4.1 | |
| 8.2.2.4.1_E.1<br>- Propagation Condition EPA5 | Same as 8.2.1.4.1_E.1 | Same as 8.2.1.4.1_E.1 |
| 8.2.2.4.1_H TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 2x2 for SCE-L1 | Same as 8.2.2.4.1 | |
| 8.2.2.4.2 | ± 0.9 dB | Same as 8.2.2.3.1 |
| 8.2.2.4.2_1 | Same as 8.2.2.4.2 | |
| 8.2.2.4.2_A.1 | Same as 8.2.2.4.2 for each CC | Same as 8.2.2.3.1<br><br>Calculation applies for each CC |
| 8.2.2.4.2_A.2 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (3DL CA) | Same as 8.2.2.4.2 for each CC | Same as 8.2.2.3.1<br>Calculation applies for each CC |

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| 8.2.2.4.2_A.3 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (4DL CA) | Same as 8.2.2.4.2 for each CC | Same as 8.2.2.3.1<br>Calculation applies for each CC |
| 8.2.2.4.2_A.4 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (5DL CA) | Same as 8.2.2.4.2 for each CC | Same as 8.2.2.3.1<br>Calculation applies for each CC |
| 8.2.2.4.2A | ± 0.9 dB | Same as 8.2.2.3.1 |
| 8.2.2.4.3 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |
| 8.2.2.4.4 | Same as 8.2.2.4.2 for each CC | Same as 8.2.2.3.1<br>Calculation applies for each CC |
| 8.2.2.4.5 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |
| 8.2.2.7.1_A.1 | TBD | TBD |
| 8.2.2.9<br>- Propagation Condition HST-SFN | ± 0.6 dB | Overall system uncertainty for HST-SFN condition comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.2.3.1.1.1 | Same as 8.2.1.1.1 Multiple PRBs, for each CC | Same as 8.2.1.1.1 Multiple PRBs<br>Calculation applies for each CC |
| 8.2.3.1.1.2 | Same as 8.2.1.1.1 Multiple PRBs, for each CC | Same as 8.2.1.1.1 Multiple PRBs<br>Calculation applies for each CC |
| 8.2.3.1.1.3 | Same as 8.2.1.1.1 Multiple PRBs, for each CC | Same as 8.2.1.1.1 Multiple PRBs<br>Calculation applies for each CC |

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| 8.2.3.1.1.4 | Same as 8.2.1.1.1 Multiple PRBs, for each CC | Same as 8.2.1.1.1 Multiple PRBs Calculation applies for each CC |
| 8.2.3.1.2.1 | Same as 8.2.1.1.1 Multiple PRBs, for each CC | Same as 8.2.1.1.1 Multiple PRBs Calculation applies for each CC |
| 8.2.3.1.2.2 | Same as 8.2.1.1.1 Multiple PRBs, for each CC | Same as 8.2.1.1.1 Multiple PRBs Calculation applies for each CC |
| 8.2.3.1.2.3 | Same as 8.2.1.1.1 Multiple PRBs, for each CC | Same as 8.2.1.1.1 Multiple PRBs Calculation applies for each CC |
| 8.2.3.1.2.4 | Same as 8.2.1.1.1 Multiple PRBs, for each CC | Same as 8.2.1.1.1 Multiple PRBs Calculation applies for each CC |
| 8.2.3.2.1.1 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1 Calculation applies for each CC |
| 8.2.3.2.1.2 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1 Calculation applies for each CC |
| 8.2.3.2.1.3 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1 Calculation applies for each CC |
| 8.2.3.2.1.4 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1 Calculation applies for each CC |
| 8.2.3.2.1A | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1 Calculation applies for each CC |
| 8.2.3.2.2.1 | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1 Calculation applies for each CC |
| 8.2.3.2.2.2 | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1 Calculation applies for each CC |
| 8.2.3.2.2.3 | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1 Calculation applies for each CC |
| 8.2.3.2.2.4 | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1 Calculation applies for each CC |
| 8.2.3.2.2A | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1 Calculation applies for each CC |
| 8.2.3.3.1.1 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1 Calculation applies for each CC |
| 8.2.3.3.1.2 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1 Calculation applies for each CC |
| 8.2.3.3.1.3 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1 Calculation applies for each CC |
| 8.2.3.3.1.4 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1 Calculation applies for each CC |
| 8.2.3.3.2.1 | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1 Calculation applies for each CC |
| 8.2.3.3.2.2 | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1 Calculation applies for each CC |
| 8.2.3.3.2.3 | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1 Calculation applies for each CC |
| 8.2.3.3.2.4 | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1 Calculation applies for each CC |

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| 8.2.4.1.1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.2.4.1.2 | Same as 8.2.4.1.1 for each CC | Same as 8.2.4.1.1<br>Calculation applies for each CC |
| 8.3.1.1.1_D | ± 0.9 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.3.1.1.1_H FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 without a simultaneous transmission for eDL-MIMO for SCE-L1 | Same as 8.3.1.1.1_D | Same as 8.3.1.1.1_D |
| 8.3.1.1.2_D | ± 0.9 dB | Same as 8.3.1.1.1_D |
| 8.3.1.1.3 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |

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| 8.3.1.1.4 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |
| 8.3.1.1.5 | $\hat{E}s_1/N_{oc2}$ ± 0.9 dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1 dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br><br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br><u>Component uncertainties:</u><br>Cell 1 SNR uncertainty ($E_{s1}$ / $N_{oc}$ ratio before fading) ±0.3 dB<br>Cell 2 SNR uncertainty ($E_{s2}$ / $N_{oc}$ ratio before fading) ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.3.1.1.6 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |
| 8.3.1.1.7 | TBD | TBD |
| 8.3.1.1.9 | ± 0.9 dB | Same as 8.3.1.1.1_D |
| 8.3.1.2.1_D | ± 0.9 dB | Same as 8.3.1.1.1_D |

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| 8.3.1.2.1_D_1 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |
| 8.3.1.2.2 | ± 0.9 dB | Same as 8.3.1.1.1_D |
| 8.3.1.3.1_F | $\hat{E}s/N_{oc}$ ± 0.9 dB for each TP<br><br>Time alignment error TP 2 relative to TP1: ±130 ns (±4Ts) | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.3.1.3.2_F | $\hat{E}s/N_{oc}$ ± 0.9 dB for each TP<br><br>Time alignment error TP 2 relative to TP1: ±130 ns (±4Ts) | Same as 8.3.1.3.1_F |
| 8.3.1.3.3_F | $\hat{E}s/N_{oc}$ ± 0.9 dB for each TP | Same as 8.3.1.3.1_F |
| 8.3.2.1.1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.3.2.1.1_1 | ± 0.9 dB | Same as 8.3.2.1.1 |
| 8.3.2.1.2 | ± 0.9 dB | Same as 8.2.2.3.1 |
| 8.3.2.1.2_D | ± 0.9 dB | Same as 8.2.2.3.1 |

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| 8.3.2.1.2_H TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 without a simultaneous transmission for eDL-MIMO for SCE-L1 | ± 0.9 dB | Same as 8.2.2.3.1 |
| 8.3.2.1.3 | ± 0.9 dB | Same as 8.2.2.3.1 |
| 8.3.2.1.3_D | ± 0.9 dB | Same as 8.2.2.3.1 |
| 8.3.2.1.4 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |
| 8.3.2.1.5 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |
| 8.3.2.1.6 | $\hat{E}s_1/N_{oc2}$ ± 0.9 dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1 dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br><br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br><u>Component uncertainties:</u><br>Cell 1 SNR uncertainty ($E_{s1}$ / $N_{oc}$ ratio before fading) ±0.3 dB<br>Cell 2 SNR uncertainty ($E_{s2}$ / $N_{oc}$ ratio before fading) ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB |

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| 8.3.2.1.7 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* |
| 8.3.2.1.8 | TBD | TBD |
| 8.3.2.1.10 | ± 0.9 dB | Same as 8.2.2.3.1 |
| 8.3.2.2.1 | ± 0.9 dB | Same as 8.2.2.3.1 |
| 8.3.2.2.1_D | ± 0.9 dB | Same as 8.2.2.3.1 |
| 8.3.2.2.1_D_1 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Same as 8.3.1.2.1_D_1 |
| 8.3.2.2.2 | ± 0.9 dB | Same as 8.2.2.3.1 |
| 8.3.2.4.1_F | $\hat{E}s/N_{oc}$ ± 0.9 dB for each TP<br><br>Time alignment error TP 2 relative to TP1: ±130 ns (±4Ts) | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.3.2.4.2_F | $\hat{E}s/N_{oc}$ ± 0.9 dB for each TP<br><br>Time alignment error TP 2 relative to TP1: ±130 ns (±4Ts) | Same as 8.3.2.4.1_F |
| 8.3.2.4.3_F | $\hat{E}s/N_{oc}$ ± 0.9 dB for each TP | Same as 8.3.2.4.1_F |

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| 8.3.3.1.1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.3.3.1.2 | Same as 8.3.3.1.1 | Same as 8.3.3.1.1 |
| 8.4.1.1 | ± 0.8 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.2 dB |
| 8.4.1.2.1 | ± 1.0 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.4 dB |
| 8.4.1.2.1_1 | Same as 8.4.1.2.1 | |

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| 8.4.1.2.2 | ± 1.0 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.4 dB |
| 8.4.1.2.2_1 | Same as 8.4.1.2.2 | |
| 8.4.1.2.3_C.1 | Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ ± 0.9 dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1 dB<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ ± 1.0 dB<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ ± 1.0 dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>Symbols #0, 4.. means 0, 4, 7, 11<br>Symbols #1, 2.. means 1-3, 5, 6, 8-10, 12, 13<br><br>Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc1}/N_{oc2}$ uncertainty $^2$)<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc3}/N_{oc2}$ uncertainty $^2$)<br><br>Component uncertainties:<br>SNR uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB<br>$N_{oc1}/N_{oc2}$ and $N_{oc3}/N_{oc2}$ uncertainty ±0.3 dB |

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| 8.4.1.2.3_C.2 | Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ ± 0.9 dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1 dB<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ ± 1.0 dB<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ ± 1.0 dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>Symbols #0, 4.. means 0, 4, 7, 11<br>Symbols #1, 2.. means 1-3, 5, 6, 8-10, 12, 13<br><br>Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc1}/N_{oc2}$ uncertainty $^2$)<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc3}/N_{oc2}$ uncertainty $^2$)<br><br>Component uncertainties:<br>SNR uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB<br>$N_{oc1}/N_{oc2}$ and $N_{oc3}/N_{oc2}$ uncertainty ±0.3 dB |

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| 8.4.1.2.3_E.1<br>- Propagation Condition EVA5 | Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ ± 0.9 dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1 dB<br>$\hat{E}s_3/\hat{E}s_1$ ± 1.1 dB<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ ± 1.0 dB<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ ± 1.0 dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>Symbols #0, 4.. means 0, 4, 7, 11<br>Symbols #1, 2.. means 1-3, 5, 6, 8-10, 12, 13<br><br>Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br><br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br>$\hat{E}s_3/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 3 SNR uncertainty $^2$ + Cell 3 Fading profile power uncertainty $^2$)<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc1}/N_{oc2}$ uncertainty $^2$)<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc3}/N_{oc2}$ uncertainty $^2$)<br><br>Component uncertainties:<br>SNR uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB<br>$N_{oc1}/N_{oc2}$ and $N_{oc3}/N_{oc2}$ uncertainty ±0.3 dB |
| 8.4.1.2.3_E.2<br>- Propagation Condition EVA5 | Same as 8.4.1.2.3_E.1 | Same as 8.4.1.2.3_E.1 |

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| 8.4.2.1 | ± 0.8 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.2 dB |
| 8.4.2.2.1 | ± 1.0 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.4 dB |
| 8.4.2.2.1_1 | Same as 8.4.2.2.1 | |
| 8.4.2.2.2 | ± 1.0 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.4 dB |
| 8.4.2.2.2_1 | Same as 8.4.2.2.2 | |

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| 8.4.2.2.3_C.1 | Same as 8.4.1.2.3_C.1 | |
| 8.4.2.2.3_C.2 | Same as 8.4.1.2.3_C.2 | |
| 8.4.2.2.3_E.1<br>- Propagation Condition EVA5 | Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ ± 0.9 dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1 dB<br>$\hat{E}s_3/\hat{E}s_1$ ± 1.1 dB<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ ± 1.0 dB<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ ± 1.0 dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>Symbols #0, 4.. means 0, 4, 7, 11<br>Symbols #1, 2.. means 1-3, 5, 6, 8-10, 12, 13<br><br>Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br><br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br>$\hat{E}s_3/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 3 SNR uncertainty $^2$ + Cell 3 Fading profile power uncertainty $^2$)<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc1}/N_{oc2}$ uncertainty $^2$)<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc3}/N_{oc2}$ uncertainty $^2$)<br><br>Component uncertainties:<br>SNR uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB<br>$N_{oc1}/N_{oc2}$ and $N_{oc3}/N_{oc2}$ uncertainty ±0.3 dB |
| 8.4.2.2.3_E.2<br>- Propagation Condition EVA5 | Same as 8.4.2.2.3_E.1 | Same as 8.4.2.2.3_E.1 |
| 8.4.3.1.1 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.4.3.1.2 | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1<br>Calculation applies for each CC |

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| 8.5.1.1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.4 dB |
| 8.5.1.2.1 | ± 1.1 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.6 dB |
| 8.5.1.2.1_1 | Same as 8.5.1.2.1 | |
| 8.5.1.2.2 | ± 1.0 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.4 dB |
| 8.5.1.2.2_1 | Same as 8.5.1.2.2 | |

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| 8.5.1.2.3_C.1 | Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ ± 0.9 dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1 dB<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ ± 1.0 dB<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ ± 1.0 dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>Symbols #0, 4.. means 0, 4, 7, 11<br>Symbols #1, 2.. means 1-3, 5, 6, 8-10, 12, 13<br><br>Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc1}/N_{oc2}$ uncertainty $^2$)<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc3}/N_{oc2}$ uncertainty $^2$)<br><br>Component uncertainties:<br>SNR uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB<br>$N_{oc1}/N_{oc2}$ and $N_{oc3}/N_{oc2}$ uncertainty ±0.3 dB |

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| 8.5.1.2.3_E.1 | Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ ± 0.9 dB<br>$\hat{E}s_2/\hat{E}s_1$ ± 1.1 dB<br>$\hat{E}s_3/\hat{E}s_1$ ± 1.1 dB<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ ± 1.0 dB<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ ± 1.0 dB | System uncertainties comprise a number of quantities which are selected according to their applicability in the equations below.<br><br>Uncertainties are assumed to be uncorrelated, so can be root sum squared.<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br><br>Symbols #0, 4.. means 0, 4, 7, 11<br>Symbols #1, 2.. means 1-3, 5, 6, 8-10, 12, 13<br><br>Symbols #0, 4.. during ABS:<br>$\hat{E}s_1/N_{oc2}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br><br>$\hat{E}s_2/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 2 SNR uncertainty $^2$ + Cell 2 Fading profile power uncertainty $^2$)<br><br>$\hat{E}s_3/\hat{E}s_1$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + Cell 3 SNR uncertainty $^2$ + Cell 3 Fading profile power uncertainty $^2$)<br><br>Symbols #1, 2.. during ABS:<br>$\hat{E}s_1/N_{oc1}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc1}/N_{oc2}$ uncertainty $^2$)<br><br>All symbols during non-ABS:<br>$\hat{E}s_1/N_{oc3}$ uncertainty = SQRT (Cell 1 SNR uncertainty $^2$ + Cell 1 Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + $N_{oc3}/N_{oc2}$ uncertainty $^2$)<br><br>Component uncertainties:<br>SNR uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB<br>$N_{oc1}/N_{oc2}$ and $N_{oc3}/N_{oc2}$ uncertainty ±0.3 dB |

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| 8.5.2.1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.4 dB |
| 8.5.2.2.1 | ± 1.1 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.6 dB |
| 8.5.1.2.2_1 | Same as 8.5.2.2.1 | |
| 8.5.2.2.2 | ± 1.0 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for MIMO<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.4 dB |
| 8.5.2.2.2_1 | Same as 8.5.2.2.2 | |

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|---|---|---|
| 8.5.2.2.3_C.1 | Same as 8.5.1.2.3_C.1 | |
| 8.5.2.2.3_E.1 | Same as 8.5.1.2.3_E.1 | |
| 8.7.1.1 | Downlink absolute power uncertainty, averaged over $BW_{Config}$ ±1.0 dB<br><br>Downlink EVM ≤ 3% | 3% EVM is equivalent to a Test system downlink SNR of 30.5dB. The noise from the Test system is then sufficiently below that required for the UE to demodulate the signal with the required % success rate. Under these conditions the UE throughput is limited by the Reference measurement channel and the UE capability, and not by the Test system EVM. |
| 8.7.1.1_1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.1.1_2 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.1.1_A.1 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1<br>Calculation applies for each CC |
| 8.7.1.1_A.2 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1<br>Calculation applies for each CC |
| 8.7.1.1_A.4 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1<br>Calculation applies for each CC |
| 8.7.1.1_A.5 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1<br>Calculation applies for each CC |
| 8.7.1.1_H.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.1.1_H.2 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1<br>Calculation applies for each CC |
| 8.7.1.1_H.3 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1<br>Calculation applies for each CC |
| 8.7.1.1_H.4 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1<br>Calculation applies for each CC |
| 8.7.1.1_H.5 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1<br>Calculation applies for each CC |
| 8.7.2.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.2.1_1 | Same as 8.7.2.1 | Same as 8.7.2.1 |
| 8.7.2.1_2 | Same as 8.7.2.1 | Same as 8.7.2.1 |
| 8.7.2.1_A.1 | Same as 8.7.2.1 for each CC | Same as 8.7.2.1<br>Calculation applies for each CC |
| 8.7.2.1_A.2 | Same as 8.7.2.1 for each CC | Same as 8.7.2.1<br>Calculation applies for each CC |
| 8.7.2.1_A.3 | Same as 8.7.2.1 for each CC | Same as 8.7.2.1<br>Calculation applies for each CC |
| 8.7.2.1_H.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.2.1_H.1 | Same as 8.7.2.1 for each CC | Same as 8.7.2.1<br>Calculation applies for each CC |
| 8.7.2.1_H.1 | Same as 8.7.2.1 for each CC | Same as 8.7.2.1<br>Calculation applies for each CC |
| 8.7.3.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.4.1 | Same as 8.7.3.1 | Same as 8.7.3.1 |
| 8.7.5.1.1 TDD FDD CA Sustained data rate performance for FDD PCell (2DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.5.1.2 TDD FDD CA Sustained data rate performance for FDD PCell (3DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.5.1.3 TDD FDD CA Sustained data rate performance for FDD PCell (4DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.5.1.4 TDD FDD CA Sustained data rate performance for FDD PCell (5DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.5.1_H.1 TDD FDD CA Sustained data rate performance for FDD PCell for SCE-L1 (2DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.5.1_H.2 TDD FDD CA Sustained data rate performance for FDD PCell for SCE-L1 (3DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.5.2.1 TDD FDD CA Sustained data rate performance for TDD PCell (2DL CA) | Same as 8.7.2.1 | Same as 8.7.2.1 |
| 8.7.5.2.2 TDD FDD CA Sustained data rate performance for TDD PCell (3DL CA) | Same as 8.7.2.1 | Same as 8.7.2.1 |
| 8.7.5.2.3 TDD FDD CA Sustained data rate performance for TDD PCell (4DL CA) | Same as 8.7.2.1 | Same as 8.7.2.1 |

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| 8.7.5.2_H.1 TDD FDD CA Sustained data rate performance for TDD PCell for SCE-L1 (2DL CA) | Same as 8.7.2.1 | Same as 8.7.2.1 |
| 8.7.5.2_H.2 TDD FDD CA Sustained data rate performance for TDD PCell for SCE-L1 (3DL CA) | Same as 8.7.2.1 | Same as 8.7.2.1 |
| 8.7.5.2_H.3 TDD FDD CA Sustained data rate performance for TDD PCell for SCE-L1 (4DL CA) | Same as 8.7.2.1 | Same as 8.7.2.1 |
| 8.7.6.1 FDD sustained data rate performance for Dual Connectivity 64QAM | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.6.2 FDD sustained data rate performance for Dual Connectivity 256QAM | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.7.1 TDD sustained data rate performance for Dual Connectivity 64QAM | Same as 8.7.2.1 | Same as 8.7.2.1 |
| 8.7.7.2 TDD sustained data rate performance for Dual Connectivity 256QAM | Same as 8.7.2.1 | Same as 8.7.2.1 |
| 8.7.9.2 FDD sustained data rate performance for 4 layer MIMO (single carrier) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.9.3 FDD sustained data rate performance for 4 layer MIMO (2DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.9.4 FDD sustained data rate performance for 4 layer MIMO (3DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.9.5 FDD sustained data rate performance for 4 layer MIMO (4DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.9.6 FDD sustained data rate performance for 4 layer MIMO (5DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.10.2 TDD sustained data rate performance for 4 layer MIMO (single carrier) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.10.3 TDD sustained data rate performance for 4 layer MIMO (2DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.10.4 TDD sustained data rate performance for 4 layer MIMO (3DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.10.5 TDD sustained data rate performance for 4 layer MIMO (4DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.10.6 TDD sustained data rate performance for 4 layer MIMO (5DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.11.2 TDD FDD CA sustained data rate performance for 4 layer MIMO (2DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.11.3 TDD FDD CA sustained data rate performance for 4 layer MIMO (3DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.11.4 TDD FDD CA sustained data rate performance for 4 layer MIMO (4DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.11.5 TDD FDD CA sustained data rate performance for 4 layer MIMO (5DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.12.1.2.1 FDD as Pcell with 2DL CA (2RX) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.12.1.2.2 FDD as Pcell with 2DL CA (4 layer MIMO) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.12.2.2.1 LAA sustained data rate performance with TDD PCell with 2DL CA (2Rx) | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.12.2.2.2 LAA sustained data rate performance with TDD PCell for 4 layer MIMO (2DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 |

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| 8.8.1.1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.2 dB |
| 8.8.1.2 | Same as 8.8.1.1 | Same as 8.8.1.1 |
| 8.8.2.1 | Same as 8.8.1.1 | Same as 8.8.1.1 |
| 8.8.2.2 | Same as 8.8.1.1 | Same as 8.8.1.1 |
| 8.8.3.1 | Same as 8.8.1.1 | Same as 8.8.1.1 |
| 8.8.3.2 | Same as 8.8.1.1 | Same as 8.8.1.1 |
| 8.9.1.1.1 | ± 0.8 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.9.1.1.2 | Same as 8.9.1.1.1 | Same as 8.9.1.1.1 |
| 8.9.1.1.3 | Same as 8.9.1.1.1 | Same as 8.9.1.1.1 |
| 8.9.1.1.3_1 | Same as 8.9.1.1.1 | Same as 8.9.1.1.,1 |
| 8.9.1.1.1_1 FDD PDSCH Transmit Diversity 2x1 for UE category 1bis | ± 0.8 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx<br>AWGN flatness and signal flatness ±2.0 dB |

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| 8.9.1.1.2_1 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x1 for UE Category 1bis | Same as 8.9.1.1.1_1 | Same as 8.9.1.1.1_1 |
| 8.9.1.2.1 | Same as 8.9.1.1.1 | Same as 8.9.1.1.1 |
| 8.9.1.2.1_1 TDD PDSCH Transmit Diversity 2x1 for UE category 1bis | ± 0.8 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.9.1.2.2 | Same as 8.9.1.1.1 | Same as 8.9.1.1.1 |
| 8.9.1.2.3 | Same as 8.9.1.1.1 | Same as 8.9.1.1.1 |
| 8.9.1.2.3_1 | Same as 8.9.1.1.1 | Same as 8.9.1.1.1 |
| 8.9.1.2.2_1 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x1 for UE Category 1bis | Same as 8.9.1.1.1_1 | Same as 8.9.1.1.1_1 |
| 8.9.2.1.1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.4 dB |
| 8.9.2.1.1_1 | Same as 8.9.2.1.1 | Same as 8.9.2.1.1 |

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| 8.9.2.2.1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.4 dB |
| 8.9.2.2.1_1 | Same as 8.9.2.2.1 | Same as 8.9.2.2.1 |
| 8.10.1.1.1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.10.1.1.2 | Same as 8.10.1.1.1 | Same as 8.10.1.1.1 |
| 8.10.1.1.3 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect |
| 8.10.1.1.4 | Same as 8.10.1.1.1 | Same as 8.10.1.1.1 |

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| 8.10.1.1.5 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect |
| 8.10.1.1.6 | Same as 8.3.1.2.1_D_1 | Same as 8.3.1.2.1_D_1 |
| 8.10.1.1.7 FDD Open-loop spatial multiplexing, 3 Layer Multiplexing with 4 Tx Antenna Ports | Same as 8.2.1.3.1 | Same as 8.2.1.3.1 |
| 8.10.1.1.8 FDD Closed-loop spatial multiplexing performance, 4 Layers spatial multiplexing 4 Tx antennas | Same as 8.2.1.3.1 | Same as 8.2.1.3.1 |
| 8.10.1.1.9 FDD 4 Layer Spatial Multiplexing (User-Specific Reference Symbols) | Same as 8.2.1.3.1 | Same as 8.2.1.3.1 |
| 8.10.1.2.1 | Same as 8.10.1.1.1 | Same as 8.10.1.1.1 |
| 8.10.1.2.2 | Same as 8.10.1.1.1 | Same as 8.10.1.1.1 |
| 8.10.1.2.3 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for 2 Tx<br><br>AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect |
| 8.10.1.2.4 | Same as 8.10.1.1.1 | Same as 8.10.1.1.1 |
| 8.10.1.2.5 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for 2 Tx<br><br>AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect |
| 8.10.1.2.6 | Same as 8.3.2.2.1_D_1 | Same as 8.3.2.2.1_D_1 |
| 8.10.1.2.7 TDD Open-loop spatial multiplexing, 3 Layer Multiplexing with 4 Tx Antenna Ports | Same as 8.2.2.3.1 | Same as 8.2.2.3.1 |

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| 8.10.1.2.8 TDD Closed-loop spatial multiplexing performance, 4 Layers spatial multiplexing 4 Tx antennas | Same as 8.2.2.3.1 | Same as 8.2.2.3.1 |
| 8.10.1.2.9 TDD 4 Layer Spatial Multiplexing (User-Specific Reference Symbols) | Same as 8.2.2.3.1 | Same as 8.2.2.3.1 |
| 8.10.2.1.1 FDD PCFICH/PDCCH Single-antenna Port Performance 1x4 | Same as 8.4.1.1 | |
| 8.10.2.1.2 FDD PCFICH/PDCCH Transmit Diversity 2x4 | Same as 8.4.1.2.1 | |
| 8.10.2.1.3 FDD PCFICH/PDCCH Transmit Diversity 4x4 | Same as 8.4.1.2.1 | |
| 8.10.2.2.1 TDD PCFICH/PDCCH Single-antenna Port Performance 1x4 | Same as 8.4.2.1 | |
| 8.10.2.2.2 TDD PCFICH/PDCCH Transmit Diversity 2x4 | Same as 8.4.2.2.1 | |
| 8.10.2.2.3 TDD PCFICH/PDCCH Transmit Diversity 4x4 | Same as 8.4.2.2.1 | |
| 8.10.3.1.1 FDD PHICH Single-antenna Port Performance 1x4 | Same as 8.5.1.1 | |
| 8.10.3.1.2 FDD PHICH Transmit Diversity 2x4 | Same as 8.5.1.2.1 | |
| 8.10.3.1.3 FDD PHICH Transmit Diversity 4x4 | Same as 8.5.1.2.2 | |
| 8.10.3.2.1 TDD PHICH Single-antenna Port Performance 1x4 | Same as 8.5.2.1 | |
| 8.10.3.2.2 TDD PHICH Transmit Diversity 2x4 | Same as 8.5.2.2.1 | |
| 8.10.3.2.3 TDD PHICH Transmit Diversity 4x4 | Same as 8.5.2.2.2 | |
| 8.10.4.1.1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.2 dB |
| 8.10.4.1.2 | Same as 8.10.4.1.1 | Same as 8.10.4.1.1 |
| 8.10.4.2.1 | Same as 8.10.4.1.1 | Same as 8.10.4.1.1 |
| 8.10.4.2.2 | Same as 8.10.4.1.1 | Same as 8.10.4.1.1 |

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| 8.11.1.1.1 Closed-loop spatial multiplexing performance for UE supporting CE | ± 0.9 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for 2x1 spatial multiplexing<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.11.1.1.2 FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE supporting CE | Same as 8.11.1.1.1 | Same as 8.11.1.1.1 |
| 8.11.1.1.3.1 FDD PDSCH Transmit Diversity 2x1 for UE category M1 | Same as 8.11.1.1.1 | Same as 8.11.1.1.1 |
| 8.11.1.1.3.1_1 FDD PDSCH Transmit Diversity 2x1 for UE category M1 (CEModeB) | Same as 8.11.1.1.1 | Same as 8.11.1.1.1 |
| 8.11.1.1.3.2 FDD and half-duplex FDD PDSCH Transmit Diversity 2x1 for UE category M2 | Same as 8.11.1.1.1 | Same as 8.11.1.1.1 |
| 8.11.1.2.1 TDD Closed-loop spatial multiplexing performance for UE category M1 (Cell-Specific Reference Symbols) | Same as 8.11.1.1.1 | Same as 8.11.1.1.1 |
| 8.11.1.2.2 TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category M1 | Same as 8.11.1.1.1 | Same as 8.11.1.1.1 |
| 8.11.1.2.3.1 TDD PDSCH Transmit Diversity for UE category M1 | Same as 8.11.1.1.1 | Same as 8.11.1.1.1 |
| 8.11.1.2.3.1_1 TDD PDSCH Transmit Diversity for UE category M1 (CEModeB) | Same as 8.11.1.1.1 | Same as 8.11.1.1.1 |
| 8.11.2.1.1 FDD and HD-FDD demodulation of MPDCCH in CE Mode A | ± 0.9 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.2 dB |
| 8.11.2.1.2 FDD and half-duplex FDD demodulation of MPDCCH in CE Mode B | Same as 8.11.2.1.1 | Same as 8.11.2.1.1 |

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| 8.11.2.2.1 TDD demodulation of MPDCCH in CE Mode A | ± 0.9 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.2 dB |
| 8.11.2.2.2 TDD demodulation of MPDCCH in CE Mode B | Same as 8.11.2.2.1 | Same as 8.11.2.2.1 |
| 8.12.1.1.1 Demodulation of NPDSCH (Cell-Specific Reference Symbols) in In-band mode for category NB1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB |
| 8.12.1.1.2 Demodulation of NPDSCH (Cell-Specific Reference Symbols) in standalone and Guard-band mode for category NB1 | ± 0.8 dB | Same as 8.2.1.1.1 |
| 8.12.1.1.3 Demodulation of NPDSCH (Cell-Specific Reference Symbols) in standalone for NB2 | ± 0.8 dB | Same as 8.2.1.1.1 |
| 8.12.2.1.1 Demodulation of NPDCCH single-antenna performance for category NB1 | ± 0.8 dB | Same as 8.4.1.1 |

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| 8.12.2.1.2 Demodulation of NPDCCH Transmit diversity performance for category NB1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises four quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br>4. Result variation due to finite test time<br><br>Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$ + variation due to finite test time $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB<br>Result variation due to finite test time ±0.2 dB |
| 8.13.1.1.1.2 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.1.1.1.3 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.1.1.1.4 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.1.1.1.5 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.1.1.3 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.1.1.4 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.1.2.2 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.1.2.3 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.1.2.4 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.1.2.5 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.1.3.1 | Same as 8.10.1.1.3 for each CC | Same as 8.10.1.1.3<br>Calculation applies for each CC |
| 8.13.1.4.1 | Same as 8.10.1.1.5 for each CC | Same as 8.10.1.1.5<br>Calculation applies for each CC |
| 8.13.2.1.1.2 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.2.1.1.3 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.2.1.1.4 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.2.1.1.5 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.2.1.3 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.2.1.4 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.2.2.2 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.2.2.3 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.2.2.4 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.2.2.5 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |

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| 8.13.2.3.1 | Same as 8.10.1.2.3 for each CC | Same as 8.10.1.2.3<br>Calculation applies for each CC |
| 8.13.2.4.1 | Same as 8.10.1.2.5 for each CC | Same as 8.10.1.2.5<br>Calculation applies for each CC |
| 8.13.3.1.1.2 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.3.1.1.3 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.3.1.1.4 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.3.1.1.5 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.3.1.2.2 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.3.1.2.3 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.3.1.2.4 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.3.1.2.5 | Same as 8.2.1.4.2 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.3.3.1 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect |
| 8.13.3.3.2 | Same as 8.13.3.3.1 | Same as 8.13.3.3.1 |
| 8.13.3.4.1 | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect |
| 8.13.3.4.2 | Same as 8.13.3.4.1 | Same as 8.13.3.4.1 |
| 8.13.3.6.1 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.3.6.2 | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1<br>Calculation applies for each CC |
| 8.13.3.7.1 | Same as 8.2.1.3.1 for each CC | Same as 8.2.1.3.1<br>Calculation applies for each CC |
| 8.13.3.7.2 | Same as 8.2.2.3.1 for each CC | Same as 8.2.2.3.1<br>Calculation applies for each CC |

| | | |
|---|---|---|
| 10.1 | ± 0.9 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br>AWGN flatness and signal flatness ±2.0 dB |
| 10.2 | ± 0.9 dB | Same as 10.1 |
| 14.2 | ± 0.8 dB | Overall system uncertainty for fading conditions comprises three quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br>3. Effect of AWGN flatness and signal flatness<br><br>Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.5 dB for single Tx<br>AWGN flatness and signal flatness ±2.0 dB |
| 14.3 | ± 0.8 dB | Same as 14.2 |
| 14.4 | ± 0.6 dB | Overall system uncertainty for AWGN condition comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Effect of AWGN flatness and signal flatness<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution.<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + (0.25 x AWGN flatness and signal flatness) $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>AWGN flatness and signal flatness ±2.0 dB |
| 14.8 | Downlink absolute power uncertainty, averaged over $BW_{Config}$ ±1.0 dB<br>Downlink EVM ≤ 3% | 3% EVM is equivalent to a Test system downlink SNR of 30.5dB. The noise from the Test system is then sufficiently below that required for the UE to demodulate the signal with the required % success rate. Under these conditions the UE throughput is limited by the Reference measurement channel and the UE capability, and not by the Test system EVM. |
| [Other tests FFS] | | |
| In addition, the following Test System uncertainties and related constraints apply: | | |
| AWGN Bandwidth | | ≥ 1.08MHz, 2.7MHz, 4.5MHz, 9MHz, 13.5MHz, 18MHz;<br>$N_{RB}$ x 180kHz according to $BW_{Config}$ |

| | |
|---|---|
| AWGN absolute power uncertainty, averaged over $BW_{Config}$ Note 4 | ±3 dB |
| AWGN flatness and signal flatness, max deviation for any Resource Block, relative to average over $BW_{Config}$ | ±2 dB |
| AWGN peak to average ratio | ≥10 dB @0.001% |
| Signal-to noise ratio uncertainty, averaged over downlink transmission Bandwidth | ±0.3 dB (includes uncertainty in precoding applied by the test system, where applicable) |
| Signal-to noise ratio variation for any resource block, relative to average over downlink transmission Bandwidth | ±0.5 dB |
| $N_{oc2}$ absolute power uncertainty, averaged over $BW_{Config}$ Note 5 | ±3 dB |
| $N_{oc1}$ / $N_{oc2}$ ratio uncertainty, averaged over $BW_{Config}$ Note 5 | ±0.3 dB |
| $N_{oc3}$ / $N_{oc2}$ ratio uncertainty, averaged over $BW_{Config}$ Note 5 | ±0.3 dB |
| $E_s$ / $N_{oc2}$ ratio (SNR) uncertainty, averaged over downlink transmission Bandwidth Note 5 | ±0.3 dB (includes uncertainty in precoding applied by the test system, where applicable) |
| Fading profile power uncertainty | Test-specific |
| Fading profile delay uncertainty, relative to frame timing | ±5 ns (excludes absolute errors related to baseband timing) |
| CA, DC and LAA performance requirements only:<br>Relative frequency error between carriers | 30Hz, measured over a 1ms period, and maximum carrier spacing 80MHz |
| enhanced performance requirement Type B only:<br>Frequency error on the frequency offset to cell 1 | 30Hz, measured over a 1ms period |

Note 1: Only the overall stimulus error is considered here. The effect of errors in the throughput measurements due to finite test duration is not considered.
Note 2: The AWGN or $N_{ocx}$ parameters apply to all test cases except 8.7.1 and 8.7.2. The fading parameters apply to test cases using fading
Note 3: In CA, DC and LAA test cases using multiple component carriers (CCs), the uncertainties and related constraints apply for each CC.
Note 4: Applies for test cases which specify Noc, a single value that remains constant with time.
Note 5: Applies for test cases which specify Noc1, Noc2 and Noc3, that are symbol or subframe specific.

# F.1.5 Measurement of Channel State Information reporting

**Table F.1.5-1: Maximum Test System Uncertainty for Channel State Information reporting**

| Subclause | Maximum Test System Uncertainty[1] | Derivation of Test System Uncertainty |
|---|---|---|
| 9.2.1.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 | ± 0.3 dB | Signal-to-noise ratio uncertainty ±0.3 dB<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.2.1.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 | ± 0.3 dB | Same as 9.2.1.1 |
| 9.2.1.3_C.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC (non-MBSFN ABS) | $N_{oc2}$<br>$N_{oc1}$ / $N_{oc2}$<br>$N_{oc3}$ / $N_{oc2}$<br>Cell 1 $E_s$ / $N_{oc2}$<br>Cell 2 $E_s$ / $N_{oc2}$ | $N_{oc2}$, $N_{oc}$ ratios and $E_s$ / $N_{oc2}$ ratios are generic values as specified at end of this table |
| 9.2.1.4_C.1 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC (non-MBSFN ABS) | $N_{oc2}$<br>$N_{oc1}$ / $N_{oc2}$<br>$N_{oc3}$ / $N_{oc2}$<br>Cell 1 $E_s$ / $N_{oc2}$<br>Cell 2 $E_s$ / $N_{oc2}$ | $N_{oc2}$, $N_{oc}$ ratios and $E_s$ / $N_{oc2}$ ratios are generic values as specified at end of this table |
| 9.2.1.5_E.1 FDD CQI Reporting under AWGN conditions - PUCCH 1-0 for feICIC (non-MBSFN ABS) | $N_{oc2}$<br>$N_{oc1}$ / $N_{oc2}$<br>$N_{oc3}$ / $N_{oc2}$<br>Cell 1 $E_s$ / $N_{oc2}$<br>Cell 2 $E_s$ / $N_{oc2}$<br>Cell 3 $E_s$ / $N_{oc2}$ | $N_{oc2}$, $N_{oc}$ ratios and Es / $N_{oc2}$ ratios are generic values as specified at end of this table |
| 9.2.1.6_E.1 TDD CQI Reporting under AWGN conditions - PUCCH 1-0 for feICIC (non-MBSFN ABS) | $N_{oc2}$<br>$N_{oc1}$ / $N_{oc2}$<br>$N_{oc3}$ / $N_{oc2}$<br>Cell 1 $E_s$ / $N_{oc2}$<br>Cell 2 $E_s$ / $N_{oc2}$<br>Cell 3 $E_s$ / $N_{oc2}$ | $N_{oc2}$, $N_{oc}$ ratios and Es / $N_{oc}$2 ratios are generic values as specified at end of this table |
| 9.2.1.7 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for 256QAM in DL | ± 0.3 dB | Same as 9.2.1.1 |
| 9.2.1.8 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for 256QAM in DL | ± 0.3 dB | Same as 9.2.1.1 |
| 9.2.2.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1 | ± 0.3 dB | Signal-to-noise ratio uncertainty ±0.3 dB<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.2.2.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 | ± 0.3 dB | Same as 9.2.1.1 |
| 9.2.3.1_D FDD CQI Reporting under AWGN conditions – PUCCH 1-1 for eDL-MIMO | ± 0.3 dB | Same as 9.2.2.1 |
| 9.2.3.2_D TDD CQI Reporting under AWGN conditions – PUCCH 1-1 for eDL-MIMO | ± 0.3 dB | Same as 9.2.2.1 |
| 9.2.4.1_F FDD CQI Reporting under AWGN conditions - Single CSI Process for CoMP | ± 0.3 dB | Same as 9.2.2.1 |
| 9.2.4.2_F TDD CQI Reporting under AWGN conditions - Single CSI Process for CoMP | ± 0.3 dB | Same as 9.2.2.1 |

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|---|---|---|
| 9.2.5 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 (when csi-SubframeSet – r12 and EIMTA-MainConfigServCell-r12 are configured) | ± 0.3 dB | Same as 9.2.1.1 |
| 9.2.6.1 LAA CQI Reporting under AWGN Conditions with Frame Structure Type 3 with FDD as Pcell (PUSCH 3-0) | ± 0.3 dB | Same as 9.2.2.1 |
| 9.2.6.2 LAA CQI Reporting under AWGN Conditions with Frame Structure Type 3 with TDD as Pcell (PUSCH 3-0) | ± 0.3 dB | Same as 9.2.2.1 |
| 9.2.7.1 LAA CQI Reporting under AWGN Conditions with Frame Structure Type 3 with FDD as Pcell (PUSCH 3-1) | ± 0.3 dB | Same as 9.2.1.1 |
| 9.2.7.2 LAA CQI Reporting under AWGN Conditions with Frame Structure Type 3 with TDD as Pcell (PUSCH 3-1) | ± 0.3 dB | Same as 9.2.1.1 |
| 9.3.1.1.1 FDD CQI Reporting under fading conditions – PUSCH 3-0 | ± 0.6 dB | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.5 dB<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br><br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.3.1.1.2 TDD CQI Reporting under fading conditions – PUSCH 3-0 | ± 0.6 dB | Same as 9.3.1.1.1 |
| 9.3.1.1.5 TDD CQI Reporting under fading conditions – PUCCH 3-0 (when csi-SubframeSet – r12 is configured) | ± 0.6 dB | Same as 9.3.1.1.1 |
| 9.3.1.2.1_D FDD CQI Reporting under fading conditions – PUSCH 3-1 for eDL-MIMO | ± 0.6 dB | Same as 9.3.1.1.1 |
| 9.3.1.2.2_D TDD CQI Reporting under fading conditions – PUSCH 3-1 for eDL-MIMO | ± 0.6 dB | Same as 9.3.1.1.1 |
| 9.3.1.2.3 FDD CQI Reporting under fading conditions – PUSCH 3-1 for 256QAM in DL | ± 0.6 dB | Same as 9.3.1.1.1 |
| 9.3.1.2.4 TDD CQI Reporting under fading conditions – PUSCH 3-1 for 256QAM in DL | ± 0.6 dB | Same as 9.3.1.1.1 |
| 9.3.1.2.6 TDD CQI Reporting under fading conditions – PUCCH 3-1 (when csi-SubframeSet – r12 is configured with one CSI process) | ± 0.6 dB | Same as 9.3.1.1.1 |
| 9.3.1.3.1_E.1 FDD CQI Reporting under fading conditions - PUSCH 3-0 for feICIC (non-MBSFN ABS) | $N_{oc2}$<br>$N_{oc1}$ / $N_{oc2}$<br>$N_{oc3}$ / $N_{oc2}$<br>Cell 1 $E_s$ / $N_{oc2}$<br>Cell 2 $E_s$ / $N_{oc2}$<br>Cell 3 $E_s$ / $N_{oc2}$<br><br>Fading profile power uncertainty ±0.5 dB | $N_{oc2}$, $N_{oc}$ ratios and $E_s$ / $N_{oc2}$ ratios are generic values as specified at end of this table |

| | | |
|---|---|---|
| 9.3.1.3.2_E.1 TDD CQI Reporting under fading conditions - PUSCH 3-0 for feICIC (non-MBSFN ABS) | $N_{oc2}$<br>$N_{oc1}$ / $N_{oc2}$<br>$N_{oc3}$ / $N_{oc2}$<br>Cell 1 $E_s$ / $N_{oc2}$<br>Cell 2 $E_s$ / $N_{oc2}$<br>Cell 3 $E_s$ / $N_{oc2}$<br><br>Fading profile power uncertainty ±0.5 dB | $N_{oc2}$, $N_{oc}$ ratios and $E_s$ / $N_{oc2}$ ratios are generic values as specified at end of this table |
| 9.3.2.1.1 FDD CQI Reporting under fading conditions – PUCCH 1-0 | ± 0.6 dB | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.5 dB<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.3.2.1.1_1 FDD CQI Reporting under fading conditions – PUCCH 1-0 | ± 0.6 dB | Same as 9.3.2.1.1 |
| 9.3.2.1.2 TDD CQI Reporting under fading conditions – PUCCH 1-0 | ± 0.6 dB | Same as 9.3.2.1.1 |
| 9.3.2.1.2_1 TDD CQI Reporting under fading conditions – PUCCH 1-0 | ± 0.6 dB | Same as 9.3.2.1.1 |
| 9.3.2.2.1_D FDD CQI Reporting under fading conditions – PUCCH 1-1 for eDL-MIMO | ± 0.6 dB | Same as 9.3.2.1.1 |
| 9.3.2.2.2_D TDD CQI Reporting under fading conditions – PUCCH 1-1 for eDL-MIMO | ± 0.6 dB | Same as 9.3.2.1.1 |
| 9.3.3.1.1 FDD CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0 | ± 1.2 dB | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Ior/Iot ratio uncertainty ±1.0 dB<br>2. Fading profile power uncertainty ±0.5 dB<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Ior/Iot ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>*Ior absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.3.3.1.2 TDD CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0 | ± 1.2 dB | Same as 9.3.3.1.1 |

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| 9.3.4.1.1 FDD CQI Reporting under fading conditions – PUSCH 2-0 | ± 0.6 dB | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.5 dB<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.3.4.1.2 TDD CQI Reporting under fading conditions – PUSCH 2-0 | ± 0.6 dB | Same as 9.3.4.1.1 |
| 9.3.4.2.1 FDD CQI Reporting under fading conditions – PUCCH 2-0 | ± 0.6 dB | Same as 9.3.4.1.1 |
| 9.3.4.2.2 TDD CQI Reporting under fading conditions – PUCCH 2-0 | ± 0.6 dB | Same as 9.3.4.1.1 |
| 9.3.5.1.1 FDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A | $\hat{E}s_1/N_{oc}$ ± 0.6 dB<br>$\hat{E}s_2/N_{oc}$ ± 0.3 dB | Overall system uncertainty for fading conditions on Cell 1 comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.5 dB for single Tx<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.3.5.1.2 TDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A | Same as 9.3.5.1.1 | Same as 9.3.5.1.1 |
| 9.3.5.2.1 FDD CQI Reporting under fading conditions - PUCCH 1-1 - Enhanced Performance Requirement Type A | $\hat{E}s_1/N_{oc}$ ± 0.8 dB<br>$\hat{E}s_2/N_{oc}$ ± 0.3 dB | Overall system uncertainty for fading conditions on Cell 1 comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.5 dB for two Tx antennas.<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.3.5.2.2 TDD CQI Reporting under fading conditions - PUCCH 1-1 - Enhanced Performance Requirement Type A | Same as 9.3.5.2.1 | Same as 9.3.5.2.1 |

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| 9.3.6.1_F.1 FDD CQI Reporting under fading conditions Single CSI processes for CoMP | $\hat{E}s/N_{oc}$ ± 0.8 dB | Overall system uncertainty for fading conditions on TP1 and TP2 comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.7 dB for multiple Tx<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.3.6.1_F.2 FDD CQI Reporting under fading conditions Three CSI processes for CoMP | Same as 9.3.6.1_F.1 | Same as 9.3.6.1_F.1 |
| 9.3.6.1_F.3 FDD CQI Reporting under fading conditions Four CSI processes for CoMP | Same as 9.3.6.1_F.1 | Same as 9.3.6.1_F.1 |
| 9.3.6.2_F.1 TDD CQI Reporting under fading conditions Single CSI processes for CoMP | $\hat{E}s/Noc$ ± 0.8 dB | Overall system uncertainty for fading conditions on TP1 and TP2 comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.7 dB for multiple Tx<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2)<br><br>AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect<br><br>AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect |
| 9.3.6.2_F.2 TDD CQI Reporting under fading conditions Three CSI processes for CoMP | Same as 9.3.6.2_F.1 | Same as 9.3.6.2_F.1 |
| 9.3.6.2_F.3 TDD CQI Reporting under fading conditions Four CSI processes for CoMP | Same as 9.3.6.2_F.1 | Same as 9.3.6.2_F.1 |
| 9.3.7.1 FDD CQI Reporting under fading conditions - PUSCH 3-2 for eDL MIMO Enhancement | ± 0.8 dB | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.7 dB for multiple Tx<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |

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| 9.3.7.2 TDD CQI Reporting under fading conditions - PUSCH 3-2 for eDL MIMO Enhancement | ± 0.8 dB | Same as 9.3.7.1 |
| 9.3.8.1.1 FDD CQI Reporting under fading conditions - PUCCH 1-1 (Cell Specific Reference Symbols) TM4 - Enhanced Performance Receiver Type B | $\hat{E}s/N_{oc}$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.3.8.1.2 TDD CQI Reporting under fading conditions - PUCCH 1-1 (Cell Specific Reference Symbols) TM4 - Enhanced Performance Receiver Type B | Same as 9.3.8.1.1 | Same as 9.3.8.1.1 |
| 9.3.8.2.1 FDD CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) TM9 - Enhanced Receiver Type B | $\hat{E}s/Noc$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect<br><br>AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect |
| 9.3.8.2.2 TDD CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) TM9 - Enhanced Receiver Type B | Same as 9.3.8.2.1 | Same as 9.3.8.2.1 |
| 9.3.8.3.1 FDD CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) TM10 with TM9 interference - Enhanced Receiver Type B | $\hat{E}s/Noc$ ± 0.8 dB for each cell | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty<br>2. Fading profile power uncertainty<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + Fading profile power uncertainty 2)<br>Signal-to-noise ratio uncertainty ±0.3 dB<br>Fading profile power uncertainty ±0.7 dB for Tx Diversity<br><br>AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect<br><br>AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect |

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| 9.3.8.3.2 TDD CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) TM10 with TM9 interference - Enhanced Receiver Type B | Same as 9.3.8.3.1 | Same as 9.3.8.3.1 |
| 9.4.1.1.1 FDD PMI Reporting – PUSCH 3-1 (Single PMI) | ± 0.6 dB | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.5 dB<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.4.1.1.2 TDD PMI Reporting – PUSCH 3-1 (Single PMI) | ± 0.6 dB | Same as 9.4.1.1.1 |
| 9.4.1.2.1 FDD PMI Reporting – PUCCH 2-1 (Single PMI) | ± 0.6 dB | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.5 dB<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.4.1.2.2 TDD PMI Reporting – PUCCH 2-1 (Single PMI) | ± 0.6 dB | Same as 9.4.1.2.1 |
| 9.4.1.3.1_D FDD Reporting of PMI – PUSCH 3-1 (Single PMI) for eDL-MIMO | ± 0.6 dB | Same as 9.4.1.1.1 |
| 9.4.1.3.2_D TDD Reporting of PMI – PUSCH 3-1 (Single PMI) for eDL-MIMO | ± 0.6 dB | Same as 9.4.1.1.1 |
| 9.4.1.3.3 FDD PMI Reporting with 12Tx Class A codebook – PUSCH 3-1 (Single PMI) for FD-MIMO | ± 0.8 dB | Same as 9.4.1.4.1 |
| 9.4.1.4.1 FDD PMI Reporting with 4Tx enhanced codebook – PUCCH 1-1 (Single PMI) for eDL MIMO Enhancement | ± 0.8 dB | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.7 dB for multiple Tx<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |

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| 9.4.1.4.2 TDD PMI Reporting with 4Tx enhanced codebook – PUCCH 1-1 (Single PMI) for eDL MIMO Enhancement | ± 0.8 dB | Same as 9.4.1.4.1 |
| 9.4.2.1.1 FDD PMI Reporting – PUSCH 1-2 (Multiple PMI) | ± 0.6 dB | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.5 dB<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.4.2.1.1_1 FDD PMI Reporting – PUSCH 1-2 (Multiple PMI) | ± 0.6 dB | Same as 9.4.2.1.1 |
| 9.4.2.1.2 TDD PMI Reporting – PUSCH 1-2 (Multiple PMI) | ± 0.6 dB | Same as 9.4.2.1.1 |
| 9.4.2.1.2_1 TDD PMI Reporting – PUSCH 1-2 (Multiple PMI) | ± 0.6 dB | Same as 9.4.2.1.1 |
| 9.4.2.2.1 FDD PMI Reporting – PUSCH 2-2 (Multiple PMI) | ± 0.6 dB | Same as 9.4.2.1.1 |
| 9.4.2.2.2 TDD PMI Reporting – PUSCH 2-2 (Multiple PMI) | ± 0.6 dB | Same as 9.4.2.1.1 |
| 9.4.2.3.1_D FDD PMI Reporting – PUSCH 1-2 (Multiple PMI) for eDL-MIMO | ± 0.6 dB | Same as 9.4.2.1.1 |
| 9.4.2.3.2_D TDD PMI Reporting – PUSCH 1-2 (Multiple PMI) for eDL-MIMO | ± 0.6 dB | Same as 9.4.2.1.1 |
| 9.4.2.3.3 TDD PMI Reporting with 4Tx enhanced codebook - PUSCH 1-2 (Multiple PMI) for eDL-MIMO Enhancement | ± 0.8 dB | Same as 9.4.1.4.1 |
| 9.4.2.3.4 TDD PMI Reporting with 4Tx enhanced codebook - PUSCH 1-2 (Multiple PMI) for eDL-MIMO Enhancement | ± 0.8 dB | Same as 9.4.1.4.1 |
| 9.5.1.1 FDD RI Reporting– PUCCH 1-1 | ± 0.8 dB | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.7 dB for MIMO<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.5.1.1_1 FDD RI Reporting– PUCCH 1-1 (Release 10) | ± 0.8 dB | Same as 9.5.1.1 |
| 9.5.1.1_2 FDD RI Reporting– PUCCH 1-1 (Release 11) | ± 0.8 dB | Same as 9.5.1.1 |
| 9.5.1.2 TDD RI Reporting– PUSCH 3-1 | ± 0.8 dB | Same as 9.5.1.1 |
| 9.5.1.2_1 TDD RI Reporting– PUSCH 3-1 (Release 10) | ± 0.8 dB | Same as 9.5.1.1 |

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| 9.5.1.2_2 TDD RI Reporting– PUSCH 3-1 (Release 11) | ± 0.8 dB | Same as 9.5.1.1 |
| 9.5.2.1_D FDD RI Reporting – PUCCH 1-1 for eDL-MIMO | ± 0.8 dB | Same as 9.5.1.1 |
| 9.5.2.2_D TDD RI Reporting – PUCCH 1-1 for eDL-MIMO | ± 0.8 dB | Same as 9.5.1.1 |
| 9.5.3.1_C.1 FDD RI Reporting – PUCCH 1-0 for eICIC (non-MBSFN ABS) | $N_{oc2}$<br>$N_{oc1}$ / $N_{oc2}$<br>$N_{oc3}$ / $N_{oc2}$<br>Cell 1 $E_s$ / $N_{oc2}$<br>Cell 2 $E_s$ / $N_{oc2}$<br><br>Fading profile power uncertainty ±0.7 dB for MIMO | $N_{oc2}$, $N_{oc}$ ratios and $E_s$ / $N_{oc2}$ ratios are generic values as specified at end of this table |
| 9.5.3.2_C.1 TDD RI Reporting – PUCCH 1-0 for eICIC (non-MBSFN ABS) | $N_{oc2}$<br>$N_{oc1}$ / $N_{oc2}$<br>$N_{oc3}$ / $N_{oc2}$<br>Cell 1 $E_s$ / $N_{oc2}$<br>Cell 2 $E_s$ / $N_{oc2}$<br><br>Fading profile power uncertainty ±0.7 dB for MIMO | $N_{oc2}$, $N_{oc}$ ratios and $E_s$ / $N_{oc2}$ ratios are generic values as specified at end of this table |
| 9.5.4.1_E.1 FDD RI Reporting - PUCCH 1-0 for feICIC (non-MBSFN ABS) | $N_{oc2}$<br>$N_{oc1}$ / $N_{oc2}$<br>$N_{oc3}$ / $N_{oc2}$<br>Cell 1 $E_s$ / $N_{oc2}$<br>Cell 2 $E_s$ / $N_{oc2}$<br>Cell 3 $E_s$ / $N_{oc2}$<br><br>Fading profile power uncertainty ±0.7 dB for MIMO | $N_{oc2}$, $N_{oc}$ ratios and $E_s$ / $N_{oc2}$ ratios are generic values as specified at end of this table |
| 9.5.4.2_E.1 TDD RI Reporting - PUCCH 1-0 for feICIC (non-MBSFN ABS) | $N_{oc2}$<br>$N_{oc1}$ / $N_{oc2}$<br>$N_{oc3}$ / $N_{oc2}$<br>Cell 1 $E_s$ / $N_{oc2}$<br>Cell 2 $E_s$ / $N_{oc2}$<br>Cell 3 $E_s$ / $N_{oc2}$<br><br>Fading profile power uncertainty ±0.7 dB for MIMO | $N_{oc2}$, $N_{oc}$ ratios and $E_s$ / $N_{oc2}$ ratios are generic values as specified at end of this table |
| 9.5.5.1_F.1 FDD RI Reporting with Single CSI process for CoMP | ± 0.8 dB for each TP | Overall system uncertainty for fading conditions comprises two quantities:<br><br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.7 dB for MIMO<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br><br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |

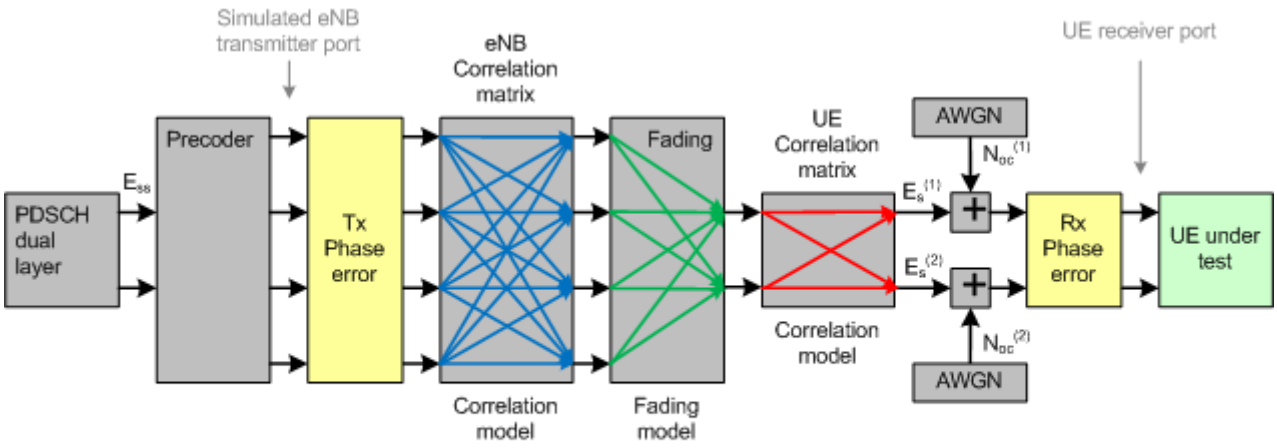
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| 9.5.5.1_F.2 FDD RI Reporting with Multiple CSI processes for CoMP | ± 0.8 dB for each TP | Overall system uncertainty for fading conditions comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.7 dB for MIMO<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.5.5.2_F.1 TDD RI Reporting with Single CSI process for CoMP | ± 0.8 dB for each TP | Same as 9.5.5.1_F.1 |
| 9.5.5.2_F.2 TDD RI Reporting with Multiple CSI processes for CoMP | ± 0.8 dB for each TP | Same as 9.5.5.1_F.2 |
| 9.6.1.1_A.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (2DL CA) | ± 0.3 dB for each CC | Signal-to-noise ratio uncertainty ±0.3 dB<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.6.1.1_A.2 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 (3DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.1_A.4 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 (5DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.2_A.1 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for 2DL CA | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.2_A.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 (3DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.2_A.3 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 (4DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.2_A.4 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 (5DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.3.1 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (2DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.3.2 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (3DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.3.3 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (4DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.3.4 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (5DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.4.1 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (2DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.4.2 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (3DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.4.3 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (4DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.4.4 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (5DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |

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| 9.7.1.1 FDD and Half duplex FDD CQI reporting definition under AWGN conditions for UE category 0 | ± 0.3 dB | Same as 9.2.1.1 |
| 9.7.1.2 TDD CQI reporting definition under AWGN conditions for UE category 0 | ± 0.3 dB | Same as 9.2.1.1 |
| 9.7.2.1 FDD and Half duplex FDD CQI reporting definition under fading conditions for UE category 0 | ± 0.6 dB | Same as 9.3.1.1.1 |
| 9.7.2.2 TDD CQI reporting definition under fading conditions for UE category 0 | ± 0.6 dB | Same as 9.3.1.1.1 |
| 9.7_1.1.1 FDD CQI reporting under AWGN conditions - PUCCH 1-0 for UE category 1bis | ± 0.3 dB | Same as 9.2.1.1 |
| 9.7_1.1.2 TDD CQI reporting under AWGN conditions - PUCCH 1-0 for UE category 1bis | ± 0.3 dB | Same as 9.2.1.1 |
| 9.7_1.1.3 FDD CQI reporting under fading conditions - PUSCH 3-0 for UE category 1bis | ± 0.6 dB | Same as 9.3.1.1.1 |
| 9.7_1.1.4 TDD CQI reporting under fading conditions - PUSCH 3-0 for UE category 1bis | ± 0.6 dB | Same as 9.3.1.1.1 |
| 9.8.1.1 FDD and Half duplex FDD CQI reporting definition under AWGN conditions for UE category M1 | ± 0.3 dB | Same as 9.2.1.1 |
| 9.8.1.2 TDD CQI reporting definition under AWGN conditions for UE category M1 | ± 0.3 dB | Same as 9.2.1.1 |
| 9.8.2.1 FDD and Half duplex FDD CQI reporting definition under fading conditions for UE category M1 | ± 0.6 dB | Same as 9.3.1.1.1 |
| 9.8.2.2 TDD CQI reporting definition under fading conditions for UE category M1 | ± 0.6 dB | Same as 9.3.1.1.1 |
| 9.9.1.1.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 with Rank 1 1x4 | ± 0.3 dB | Same as 9.2.1.1 |
| 9.9.1.1.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 with Rank 1 1x4 | ± 0.3 dB | Same as 9.2.1.1 |
| 9.9.1.2.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 2 4x4 | ± 0.3 dB | Same as 9.2.1.1 |
| 9.9.1.2.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 2 8x4 | ± 0.3 dB | Same as 9.2.1.1 |
| 9.9.1.3.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 4 4x4 | ± 0.3 dB | Same as 9.2.1.1 |
| 9.9.1.3.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 4 4x4 | ± 0.3 dB | Same as 9.2.1.1 |
| 9.9.1.4.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 3 4x4 | ± 0.3 dB | Same as 9.2.1.1 |
| 9.9.1.4.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 3 8x4 | ± 0.3 dB | Same as 9.2.1.1 |

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| 9.9.2.1.1 FDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A 1x4 | Ês1/Noc ± 0.6 dB<br>Ês2/Noc ± 0.3 dB | Overall system uncertainty for fading conditions on Cell 1 comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.5 dB for single Tx<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.9.2.1.2 TDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A 1x4 | Ês1/Noc ± 0.6 dB<br>Ês2/Noc ± 0.3 dB | Same as 9.9.2.1.1 |
| 9.9.2.2.1 FDD CQI Reporting under fading conditions - PUCCH 1-1 - Enhanced Performance Requirement Type A 2x4 | Ês1/Noc ± 0.8 dB<br>Ês2/Noc ± 0.3 dB | Overall system uncertainty for fading conditions on Cell 1 comprises two quantities:<br>1. Signal-to-noise ratio uncertainty ±0.3 dB<br>2. Fading profile power uncertainty ±0.7 dB for two Tx antennas.<br><br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared:<br>Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty $^2$ + Fading profile power uncertainty $^2$)<br><br>*AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect*<br><br>*AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect* |
| 9.9.2.2.2 TDD CQI Reporting under fading conditions - PUCCH 1-1 - Enhanced Performance Requirement Type A 2x4 | Ês1/Noc ± 0.8 dB<br>Ês2/Noc ± 0.3 dB | Same as 9.9.2.2.1 |
| 9.9.3.1.1 TDD PMI Reporting – PUSCH 3-1 (Single PMI) 8x4 | ± 0.6 dB | Same as 9.4.1.1.1 |
| 9.9.4.1.1 FDD RI Reporting– PUCCH 1-1 4x4 | ± 0.8 dB | Same as 9.5.1.1 |
| 9.9.4.1.2 TDD RI Reporting– PUSCH 3-1 4x4 | ± 0.8 dB | Same as 9.5.1.1 |
| 9.9.4.2.1 FDD RI Reporting- PUCCH 1-1 for eDL-MIMO 1x4 | ± 0.8 dB | Same as 9.5.1.1 |
| 9.9.4.2.2 TDD RI Reporting- PUCCH 1-1 for eDL-MIMO 1x4 | ± 0.8 dB | Same as 9.5.1.1 |
| In addition, the following Test System uncertainties and related constraints apply: | | |
| AWGN Bandwidth | | ≥ 1.08MHz, 2.7MHz, 4.5MHz, 9MHz, 13.5MHz, 18MHz;<br>$N_{RB}$ x 180kHz according to $BW_{Config}$ |
| AWGN absolute power uncertainty, averaged over $BW_{Config}$ Note 4 | | ±3 dB |
| AWGN flatness and signal flatness, max deviation for any Resource Block, relative to average over $BW_{Config}$ | | ±2 dB |
| AWGN peak to average ratio | | ≥10 dB @0.001% |
| Signal-to noise ratio uncertainty, averaged over downlink transmission Bandwidth | | ±0.3 dB (includes uncertainty in precoding applied by the test system, where applicable) |
| Signal-to noise ratio variation for any resource block, relative to average over downlink transmission Bandwidth | | ±0.5 dB |
| $N_{oc2}$ absolute power uncertainty, averaged over $BW_{Config}$ Note 5 | | ±3 dB |
| $N_{oc1}$ / $N_{oc2}$ ratio uncertainty, averaged over $BW_{Config}$ Note 5 | | ±0.3 dB |
| $N_{oc3}$ / $N_{oc2}$ ratio uncertainty, averaged over $BW_{Config}$ Note 5 | | ±0.3 dB |
| $E_s$ / $N_{oc2}$ ratio (SNR) uncertainty, averaged over downlink transmission Bandwidth Note 5 | | ±0.3 dB (includes uncertainty in precoding applied by the test system, where applicable) |

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| Fading profile power uncertainty | Test-specific |
| Fading profile delay uncertainty, relative to frame timing | ±5 ns (excludes absolute errors related to baseband timing) |
| Downlink channel matrix uncertainties: | |
| Tx phase error, as shown in Figure F.1.5-1 | $\Theta_{Tx} = \begin{bmatrix} e^{j\theta_1} & 0 & \cdots & 0 \\ 0 & e^{j\theta_2} & \ddots & 0 \\ \vdots & \ddots & \ddots & \vdots \\ 0 & 0 & \cdots & e^{j\theta_{N_{Tx}}} \end{bmatrix}$<br>$\theta_n$ is defined for each Tx antenna up to $N_{Tx}$<br>$\theta_n \in (-\theta_{MAX}, \theta_{MAX})$<br>$\theta_{MAX}$ ≤10°<br>$\theta_n$ is constant for the duration of the test |
| Rx phase error, as shown in Figure F.1.5-1 | $\Theta_{Rx} = \begin{bmatrix} e^{j\theta_1} & 0 & \cdots & 0 \\ 0 & e^{j\theta_2} & \ddots & 0 \\ \vdots & \ddots & \ddots & \vdots \\ 0 & 0 & \cdots & e^{j\theta_{N_{Tx}}} \end{bmatrix}$<br>$\theta_n$ is defined for each Rx antenna up to $N_{Rx}$<br>There is no constraint on the value of $\theta_n$ except that it is constant for the duration of the test |

Note 1: Only the overall stimulus error is considered. The effect of errors in the throughput measurements due to finite test duration is not considered.
Note 2: The AWGN parameters apply to all test cases except 9.3.3.1.1 and 9.3.3.1.2. The fading parameters apply to test cases using fading
Note 3: Downlink channel matrix uncertainties apply to eDL-MIMO CSI test cases
Note 4: Applies for test cases which specify Noc, a single value that remains constant with time.
Note 5: Applies for test cases which specify Noc1, Noc2 and Noc3, that are symbol or subframe specific.




*Example for dual layer PDSCH, 4Tx antennas x 2Rx antennas, fading propagation, with correlation and AWGN*

**Figure F.1.5-1: Location of Tx Phase error and Rx Phase error for eDL-MIMO (Informative)**

# F.2 Interpretation of measurement results (normative)

The measurement results returned by the Test System are compared – without any modification – against the Test Requirements as defined by the shared risk principle.

The Shared Risk principle is defined in ETR 273-1-2 clause 6.5.

The actual measurement uncertainty of the Test System for the measurement of each parameter shall be included in the test report.

The recorded value for the Test System uncertainty shall be, for each measurement, equal to or lower than the appropriate figure in clause F.1 of the present document.

If the Test System for a test is known to have a measurement uncertainty greater than that specified in clause F.1, it is still permitted to use this apparatus provided that an adjustment is made value as follows:

Any additional uncertainty in the Test System over and above that specified in clause F.1 shall be used to tighten the Test Requirement, making the test harder to pass. For some tests, for example receiver tests, this may require modification of stimulus signals. This procedure will ensure that a Test System not compliant with clause F.1does not increase the chance of passing a device under test where that device would otherwise have failed the test if a Test System compliant with clause F.1 had been used.

# F.3 Test Tolerance and Derivation of Test Requirements (informative)

The Test Requirements in the present document have been calculated by relaxing the Minimum Requirements of the core specification using the Test Tolerances defined in this clause. When the Test Tolerance is zero, the Test Requirement will be the same as the Minimum Requirement. When the Test Tolerance is non-zero, the Test Requirements will differ from the Minimum Requirements, and the formula used for the relaxation is given in this clause.

The Test Tolerances are derived from Test System uncertainties, regulatory requirements and criticality to system performance. As a result, the Test Tolerances may sometimes be set to zero.

The test tolerances should not be modified for any reason e.g. to take account of commonly known test system errors (such as mismatch, cable loss, etc.).

The downlink Test Tolerances apply at each receiver antenna connector.

## F.3.1 Measurement of test environments

The UE test environments are set to the values defined in TS 36.508 subclause 4.1, without any relaxation. The applied Test Tolerance is therefore zero.

## F.3.2 Measurement of transmitter

**Table F.3.2-1: Derivation of Test Requirements (Transmitter tests)**

| Test | Minimum Requirement in TS 36.101 | Test Tolerance (TT) | Test Requirement in TS 36.521-1 |
|---|---|---|---|
| 6.2.2 UE Maximum Output Power | f ≤ 3.0GHz<br>Power class 1: [FFS]<br>Power class 2: [FFS]<br>Power class 3: 23dBm ±2 dB<br>Power class 4: [FFS]<br><br>3.0GHz < f ≤ 4.2GHz<br>Power class 3: 23dBm +2/-3 dB<br><br>4.2GHz < f ≤ 6GHz<br>Power class 3: 23dBm ±2 dB | <br>0.7 dB<br>0.7 dB<br>0.7 dB<br>0.7 dB<br><br>1.0 dB<br><br>1.3 dB | Formula:<br>Upper limit + TT, Lower limit - TT<br><br>Power class 1: [FFS]<br>Power class 2: [FFS]<br>Power class 3: 23dBm ±2.7 dB<br>Power class 4: [FFS]<br><br>Power class 3: 23dBm +3.0/-4.0 dB<br><br>Power class 3: 23dBm ±3.3 dB |
| 6.2.2_1 UE Maximum Output Power for HPUE | f ≤ 3.0GHz<br>Power class 1: 31dBm +2/-3dB | 0.7dB | Formula:<br>Upper limit + TT, Lower limit - TT<br><br>Power class 1: 31dBm +2.7/-3.7dB |
| 6.2.2A.1 UE Maximum Output Power for CA (intra-band contiguous DL CA and UL CA) | Same as 6.2.2 | Same as 6.2.2 | Same as 6.2.2 |
| 6.2.2A.2 UE Maximum Output Power for CA (inter-band DL CA and UL CA) | Same as 6.2.2 | Same as 6.2.2 | Same as 6.2.2 |
| 6.2.2B UE Maximum Output Power for UL-MIMO | f ≤ 3.0GHz<br>Power class 1: [FFS]<br>Power class 2: [FFS]<br>Power class 3: 23dBm +2/-3 dB<br>Power class 4: [FFS]<br><br>3.0GHz < f ≤ 4.2GHz<br>Power class 3: 23dBm +2/-4 dB | Same as 6.2.2 | Formula:<br>Upper limit +TT, Lower limit - TT<br><br>Power class 1: [FFS]<br>Power class 2: [FFS]<br>Power class 3: 23dBm +2.7/-3.7 dB<br>Power class 4: [FFS]<br><br>Power class 3: 23dBm +3.0/-5.0 dB<br><br>Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 6.2.2E UE Maximum Output Power UE category 0 | Same as 6.2.2 | Same as 6.2.2 | Same as 6.2.2 |
| 6.2.2EA UE Maximum Output Power UE category M1 | Power class 3: 23dBm ±2 dB<br>Power class 5: 20dBm ±2 dB | 0.7 dB<br>0.7 dB | Formula:<br>Upper limit + TT, Lower limit - TT<br><br>Power class 3: 23dBm ±2.7 dB |

| | | | |
|---|---|---|---|
| | | | Power class 5: 20dBm ±2.7 dB |
| 6.2.2EB UE Maximum Output Power UE category 1bis | Same as 6.2.2 | Same as 6.2.2 | Same as 6.2.2 |
| 6.2.2EC UE Maximum Output Power for UE category M2 | Same as 6.2.2EA | Same as 6.2.2EA | Same as 6.2.2EA |
| 6.2.2F UE Maximum Output Power for UE category NB1 | f ≤ 3.0GHz<br>Power class 1: [FFS]<br>Power class 2: [FFS]<br>Power class 3: 23dBm ±2 dB<br>Power class 4: [FFS]<br>Power class 5: 20dBm ±2 dB | <br><br>0.7 dB<br>0.7 dB<br>0.7 dB<br>0.7 dB<br>0.7 dB | Formula:<br>Upper limit + TT, Lower limit - TT<br><br>Power class 1: [FFS]<br>Power class 2: [FFS]<br>Power class 3: 23dBm ±2.7 dB<br>Power class 4: [FFS]<br>Power class 5: 20dBm ±2.7 dB |
| 6.2.2G.1 UE maximum output power for V2X Commincation / Non-concurrent with E-UTRA uplink transmissions | 4.2GHz < f ≤ 6GHz<br>Power class 3: 23dBm ±2 dB | <br>1.3 dB | Formula:<br>Upper limit + TT, Lower limit - TT<br><br>Power class 3: 23dBm ±3.3 dB |
| 6.2.2G.2 UE maximum output power for V2X Commincation / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | 4.2GHz < f ≤ 6GHz<br>Power class 3: 23dBm +2/-3 dB | <br>1.3 dB | Formula:<br>Upper limit + TT, Lower limit - TT<br><br>Power class 3: 23dBm +3.3/-4.3 dB |
| 6.2.2G.3 UE maximum output power for V2X Commincation / Intra-band contiguous multi-carrier operation | 4.2GHz < f ≤ 6GHz<br>Power class 3: 23dBm ±2 dB | <br>1.3 dB | Formula:<br>Upper limit + TT, Lower limit - TT<br><br>Power class 3: 23dBm ±3.3 dB |
| 6.2.2G.4.1 UE maximum output power for V2X Commincation / Power class 2 / Non-concurrent with E-UTRA uplink transmissions | 4.2GHz < f ≤ 6GHz<br>Power class 2: 26dBm ±2 dB | <br>1.3 dB | Formula:<br>Upper limit + TT, Lower limit - TT<br><br>Power class 2: 26dBm ±3.3 dB |
| 6.2.3 Maximum Power Reduction | Power class 3<br><br><br>f ≤ 3.0GHz<br>QPSK: MPR ≤ 1dB<br>16QAM: MPR ≤ 1dB<br>16QAM: MPR ≤ 2dB<br><br>3.0GHz < f ≤ 4.2GHz<br>QPSK: MPR ≤ 1dB<br>16QAM: MPR ≤ 1dB<br>16QAM: MPR ≤ 2dB | <br><br><br><br>0.7 dB<br>0.7 dB<br>0.7 dB<br><br><br>1.0 dB<br>1.0 dB<br>1.0 dB | Formula:<br>Upper limit + TT,<br>Lower limit – MPR – TT<br>Power class 3:<br><br>QPSK: 23dBm +2.7 / -3.7dB<br>16QAM: 23dBm +2.7 / -3.7dB<br>16QAM: 23dBm +2.7 / -4.7dB<br><br><br>QPSK: 23dBm +3.0 / -5.0dB<br>16QAM: 23dBm +3.0 / -5.0dB |

| | | | |
|---|---|---|---|
| | | | 16QAM: 23dBm +3.0 / -6.0dB |
| 6.2.3_1 Maximum Power Reduction for HPUE | Power class 1<br><br><br>f ≤ 3.0GHz<br>QPSK: MPR ≤ 1dB<br>16QAM: MPR ≤ 1dB<br>16QAM: MPR ≤ 2dB | <br><br><br><br>0.7 dB<br>0.7 dB<br>0.7 dB | Formula:<br>Upper limit + TT,<br>Lower limit – MPR – TT<br>Power class 1:<br>QPSK: 31dBm +2.7 / -4.7dB<br>16QAM: 31dBm +2.7 / -4.7dB<br>16QAM: 31dBm +2.7 / -5.7dB |
| 6.2.3_2 UE Maximum Output Power for Multi-Cluster PUSCH | Same as 6.2.2 | Same as 6.2.2 | Same as 6.2.2 |
| 6.2.3_3 Maximum Power Reduction (MPR) for UL 64QAM | Power class 3<br><br><br><br>f ≤ 3.0GHz<br>64QAM: MPR ≤ 2dB<br>64QAM: MPR ≤ 3dB<br><br>3.0GHz < f ≤ 4.2GHz<br>64QAM: MPR ≤ 2dB<br>64QAM: MPR ≤ 3dB | <br><br><br><br>0.7 dB<br>0.7 dB<br><br><br>1.0 dB<br>1.0 dB | Formula:<br>Upper limit + TT,<br>Lower limit – MPR – TT<br>Power class 3:<br><br>64QAM: 23dBm +2.7 / -4.7dB<br>64QAM: 23dBm +2.7 / -6.2dB<br><br><br>64QAM: 23dBm +3.0 / -5.0dB<br>64QAM: 23dBm +3.0 / -6.5dB |
| 6.2.3_4 Maximum Power Reduction (MPR) for Multi-Cluster PUSCH with UL 64QAM | Same as 6.2.3_3 | Same as 6.2.3_3 | Same as 6.2.3_3 |
| 6.2.3_5 Maximum Power Reduction (MPR) for UL 256QAM | Power class 3<br><br><br><br>f ≤ 3.0GHz<br>256QAM: MPR ≤ 5dB<br><br>3.0GHz < f ≤ 4.2GHz<br>256QAM: MPR ≤ 5dB | <br><br><br><br>0.7 dB<br><br><br>1.0 dB | Formula:<br>Upper limit + TT,<br>Lower limit – MPR – TT<br>Power class 3:<br><br>256QAM: 23dBm +2.7 / -7.7dB<br><br><br>256QAM: 23dBm +3.0 / -8.0dB |
| 6.2.3_6 Maximum Power Reduction (MPR) for Multi-Cluster PUSCH with UL 256QAM | Power class 3<br><br><br><br><br><br>f ≤ 3.0GHz<br>256 QAM: MPR = 5.5dB<br>256 QAM: MPR = 6 dB<br>256 QAM: MPR = 7 dB<br>256 QAM: MPR = 7.5dB<br><br>3.0GHz < f ≤ 4.2GHz<br>256 QAM: MPR = 5.5dB<br>256 QAM: MPR = 6 dB<br>256 QAM: MPR = 7 dB<br>256 QAM: MPR = 7.5dB | <br><br><br><br><br><br><br>0.7 dB<br>0.7 dB<br>0.7 dB<br>0.7 dB<br><br><br>1.0 dB<br>1.0 dB<br>1.0 dB<br>1.0 dB | Formula:<br>Upper limit: $+T(P_{CMAX_H_C})$ + TT,<br>Lower limit: $-T(P_{CMAX_L_C})$ – MPR – TT<br>$P_{CMAX_H_C} = P_{PowerClass}$<br>$P_{CMAX_L_C} = P_{PowerClass}$-MPR<br>Power class 3:<br><br>256QAM: 23dBm +2.7 / -11.2dB<br>256QAM: 23dBm +2.7 / -11.7dB<br>256QAM: 23dBm +2.7 / -12.7dB<br>256QAM: 23dBm +2.7 / -13.2dB<br><br><br>256QAM: 23dBm +2.7 / -11.5dB |

| | | | |
|---|---|---|---|
| | | | 256QAM: 23dBm +2.7 / -12.0dB<br>256QAM: 23dBm +2.7 / -13.0dB<br>256QAM: 23dBm +2.7 / -13.5dB |
| 6.2.3A.1 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA) | Power class 3<br><br><u>f ≤ 3.0GHz</u><br>MPR = 0dB<br>MPR = 1dB<br>MPR = 2dB<br>MPR = 3dB<br>MPR = 8.5dB<br><br><u>3.0GHz < f ≤ 4.2GHz</u><br>MPR = 0dB<br>MPR = 1dB<br>MPR = 2dB<br>MPR = 3dB<br>MPR = 8.5dB | <br><br><br><br><br><br>0.7 dB<br>0.7 dB<br>0.7 dB<br>0.7 dB<br>0.7 dB<br><br><br>1.0 dB<br>1.0 dB<br>1.0 dB<br>1.0 dB<br>1.0 dB | Formula:<br>Upper limit: $+T(P_{CMAX_H})$ + TT,<br>Lower limit: $-T(P_{CMAX_L})$ – MPR – TT<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L} = P_{PowerClass}$-MPR<br>Power class 3:<br><br>23dBm +2.7 / - 2.7dB<br>23dBm +2.7 / - 3.7dB<br>23dBm +2.7 / - 4.7dB<br>23dBm +2.7 / - 6.2dB<br>23dBm +2.7 / - 14.2dB<br><br><br>23dBm +3.0 / - 4.0dB (+2/-3 limit for B42)<br>23dBm +3.0 / - 4.0dB<br>23dBm +3.0 / - 5.0dB<br>23dBm +3.0 / - 6.5dB<br>23dBm +3.0 / - 14.5dB |
| 6.2.3A.1_1 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | Power class 3<br><br><u>f ≤ 3.0GHz</u><br>MPR = 2dB<br>MPR = 3dB<br><br><u>3.0GHz < f ≤ 4.2GHz</u><br>MPR = 2dB<br>MPR = 3dB | <br><br><br>0.7 dB<br>0.7 dB<br><br>1.0 dB<br>1.0 dB | Formula:<br>Upper limit: $+T(P_{CMAX_H})$ + TT,<br>Lower limit: $-T(P_{CMAX_L})$ – MPR – TT<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L} = P_{PowerClass}$-MPR<br>Power class 3:<br><br>23dBm +2.7 / - 4.7dB<br>23dBm +2.7 / - 6.2dB<br><br><br>23dBm +3.0 / - 5.0dB<br>23dBm +3.0 / - 6.5dB |
| 6.2.3A.1_2 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM | Power class 3<br><br><u>f ≤ 3.0GHz</u><br>MPR = 5dB<br><br><u>3.0GHz < f ≤ 4.2GHz</u><br>MPR = 5dB | <br><br><br>0.7 dB<br><br>1.0 dB | Formula:<br>Upper limit: $+T(P_{CMAX_H})$ + TT,<br>Lower limit: $-T(P_{CMAX_L})$ – MPR – TT<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L} = P_{PowerClass}$-MPR<br>Power class 3:<br><br>23dBm +2.7 / - 9.7dB<br><br>23dBm +3.0 / - 10.0dB |
| 6.2.3A.2 Maximum Power Reduction (MPR) for CA (inter-band DL CA and UL CA) | Power class 3<br><br><u>f ≤ 3.0GHz</u><br>MPR = 0dB<br>MPR = 1dB | <br><br><br>0.7 dB<br>0.7 dB | Formula:<br>Upper limit: $+T(P_{CMAX_H})$ + TT,<br>Lower limit: $-T(P_{CMAX_L})$ – MPR – TT<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L}$ = MIN(linear sum of $P_{PowerClass}$ – MPR $_c$ -·$\Delta T_{C,c}$, 23 dBm)<br>Power class 3: |

| | | | |
|---|---|---|---|
| | MPR = 2dB<br><br>4.2GHz < f ≤ 6GHz<br>MPR = 0dB<br>MPR = 1dB<br>MPR = 2dB | 0.7 dB<br><br><br>1.5 dB<br>1.5 dB<br>1.5 dB | 23dBm +2.7 / - 3.7 dB<br>23dBm +2.7 / - 3.7 dB<br>23dBm +2.7 / - 3.7 dB<br><br><br>23dBm +3.5 / - 4.5 dB<br>23dBm +3.5 / - 5.5 dB<br>23dBm +3.5 / - 6.5 dB |
| 6.2.3A.2_1 Maximum Power Reduction (MPR) for CA (inter-band DL CA and UL CA) for UL 64QAM | Power class 3<br><br><br><br><br><br><br>f ≤ 3.0GHz<br>MPR = 2dB<br>MPR = 3dB | <br><br><br><br><br><br><br><br>0.7 dB<br>0.7 dB | Formula:<br>Upper limit: $+T(P_{CMAX_H}) + TT$,<br>Lower limit: $-T(P_{CMAX_L}) – TT$<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L}$ = MIN(linear sum of $P_{PowerClass} – MPR_c - \Delta T_{C,c}$, 23 dBm)<br><br><br>Power class 3:<br>23dBm +2.7 / - 5.7 dB<br>23dBm +2.7 / - 6.7 dB |
| 6.2.3A.2_2 Maximum Power Reduction (MPR) for CA (inter-band DL CA and UL CA) for UL 256QAM | Power class 3<br><br><br><br><br><br><br>f ≤ 3.0GHz<br>MPR = 5dB<br><br>3.0GHz < f ≤ 4.2GHz<br>MPR = 5dB | <br><br><br><br><br><br><br><br>0.7 dB<br><br><br>1.0 dB | Formula:<br>Upper limit: $+T(P_{CMAX_H}) + TT$,<br>Lower limit: $-T(P_{CMAX_L}) – TT$<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L}$ = MIN(linear sum of $P_{PowerClass} – MPR_c - \Delta T_{C,c}$, 23 dBm)<br>Power class 3:<br><br>23dBm +2.7 / - 7.7 dB<br>23dBm +2.7 / - 9.4 dB<br><br>23dBm +3.0 / - 8.0 dB<br>23dBm +3.0 / - 9.7 dB |
| 6.2.3A.3 Maximum Power Reduction (MPR) for CA (intra-band non-contiguous DL CA and UL CA) | Power class 3<br><br><br><br><br><br><br>f ≤ 3.0GHz<br>MPR = 7 dB<br>MPR = 12 dB<br>MPR = 18 dB | <br><br><br><br><br><br><br><br>0.7 dB<br>0.7 dB<br>0.7 dB | Formula:<br>Upper limit: $+T(P_{CMAX_H}) + TT$,<br>Lower limit: $-T(P_{CMAX_L}) –$ MPR – TT<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L} = P_{PowerClass} – MPR - \Delta T_C$ dBm)<br>Power class 3:<br><br>23dBm +2.7 / - 12.7 dB<br>23dBm +2.7 / - 18.7 dB<br>23dBm +2.7 / - 25.7 dB |
| 6.2.3A.3_1 Maximum Power Reduction (MPR) for CA (intra-band non-contiguous DL CA and UL CA) for UL 64QAM | Power class 3<br><br><br><br><br><br><br>f ≤ 3.0GHz<br>MPR = 7 dB<br>MPR = 12 dB<br>MPR = 18 dB | <br><br><br><br><br><br><br><br>0.7 dB<br>0.7 dB<br>0.7 dB | Formula:<br>Upper limit: $+T(P_{CMAX_H}) + TT$,<br>Lower limit: $-T(P_{CMAX_L}) –$ MPR – TT<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L} = P_{PowerClass} – MPR - \Delta T_C$ dBm)<br>Power class 3:<br><br>23dBm +2.7 / - 12.7 dB<br>23dBm +2.7 / - 18.7 dB<br>23dBm +2.7 / - 25.7 dB |
| 6.2.3A.3_2 Maximum Power Reduction (MPR) for CA (intra-band non-contiguous DL CA and UL CA) for UL 256QAM | Power class 3 | | Formula:<br>Upper limit: +T(PCMAX_H) + TT,<br>Lower limit: -T(PCMAX_L ) – MPR – TT<br>PCMAX_H = PPowerClass<br>PCMAX_L = PPowerClass |

| | | | |
|---|---|---|---|
| | f ≤ 3.0GHz<br>MPR = 7 dB<br>MPR = 12 dB<br>MPR = 18 dB | <br>0.7 dB<br>0.7 dB<br>0.7 dB | – MPR -·DTC dBm)<br>Power class 3:<br><br><br>23dBm +2.7 / - 12.7 dB<br>23dBm +2.7 / - 18.7 dB<br>23dBm +2.7 / - 25.7 dB |
| 6.2.3B Maximum Power Reduction (MPR) for UL-MIMO | Same as 6.2.3 | Same as 6.2.3 | Same as 6.2.3<br><br>Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 6.2.3E Maximum Power Reduction for UE category 0 | Same as 6.2.3E | Same as 6.2.3E | Same as 6.2.3E |
| 6.2.3EA Maximum Power Reduction for UE category M1 | <br><br><br>Power class 3<br>MPR ≤ 1dB<br>MPR ≤ 2dB<br><br>Power class 5<br>MPR ≤ 1dB<br>MPR ≤ 2dB | <br><br><br><br>0.7 dB<br>0.7 dB<br><br><br>0.7 dB<br>0.7 dB | Formula:<br>Upper limit + TT,<br>Lower limit – MPR – TT<br><br><br>23dBm +2.7 / - 3.7dB<br>23dBm +2.7 / - 4.7dB<br><br><br>20dBm +2.7 / - 3.7dB<br>20dBm +2.7 / - 4.7dB |
| 6.2.3EB Maximum Power Reduction for UE category 1bis | Same as 6.2.3 | Same as 6.2.3 | Same as 6.2.3 |
| 6.2.3F Maximum Power Reduction (MPR) for UE category NB1 | <br><br><br><br>Power class 3:<br>f ≤ 3.0GHz<br>BPSK: MPR = 0dB<br>QPSK: MPR = 0dB<br>QPSK: MPR ≤ 0.5dB<br>QPSK: MPR ≤ 1dB<br>QPSK: MPR ≤ 2dB<br><br><br>Power class 5:<br>f ≤ 3.0GHz<br>BPSK: MPR = 0dB<br>QPSK: MPR = 0dB<br>QPSK: MPR ≤ 0.5dB<br>QPSK: MPR ≤ 1dB<br>QPSK: MPR ≤ 2dB | <br><br><br><br><br>0.7 dB<br>0.7 dB<br>0.7 dB<br>0.7 dB<br>0.7 dB<br><br><br><br>0.7 dB<br>0.7 dB<br>0.7 dB<br>0.7 dB<br>0.7 dB | Formula:<br>Upper limit + TT,<br>Lower limit – MPR – TT<br><br>Power class 3:<br><br>BPSK: 23dBm +2.7 / - 2.7dB<br>QPSK: 23dBm +2.7 / - 2.7dB<br>QPSK: 23dBm +2.7 / - 3.2dB<br>QPSK: 23dBm +2.7 / - 3.7dB<br>QPSK: 23dBm +2.7 / - 4.7dB<br><br>Power class 5:<br><br>BPSK: 20dBm +2.7 / - 3.2dB<br>QPSK: 20dBm +2.7 / - 3.2dB<br>QPSK: 20dBm +2.7 / - 4.7dB<br>QPSK: 20dBm +2.7 / - 5.2dB<br>QPSK: 20dBm +2.7 / - 6.7dB |
| 6.2.3G.1.1 Maximum Power Reduction (MPR) for V2X Commincation / Non-concurrent with E-UTRA uplink transmissions | <br><br><br>Power class 3:<br>4.2GHz < f ≤ 6GHz<br>QPSK: MPR ≤ 1.5dB<br>16QAM: MPR ≤ 2dB | <br><br><br><br><br>1.3 dB<br>1.3 dB | Formula:<br>Upper limit + TT,<br>Lower limit – MPR – TT<br>Power class 3:<br><br>QPSK: 23dBm +3.3 / - 4.8dB |

| | | | |
|---|---|---|---|
| | | | 16QAM: 23dBm +3.3 / -5.3dB |
| 6.2.3G.1.2 Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Non-contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions | Power class 3:<br>5 RBs/10MHz: MPR ≤4.5dB<br>25 RBs/10MHz: MPR ≤3.0dB<br>40 RBs/10MHz: MPR ≤2.0dB<br>10 RBs/20MHz: MPR ≤4.5dB<br>50 RBs/20MHz: MPR ≤3.0dB<br>80 RBs/20MHz: MPR ≤2.0dB | <br>1.3 dB<br>1.3 dB<br>1.3 dB<br>1.3 dB<br>1.3 dB<br>1.3 dB | Formula:<br>Upper limit: $+T(P_{CMAX_H})$ + TT,<br>Lower limit: $-T(P_{CMAX_L})$ – MPR – TT<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L} = P_{PowerClass}$-MPR<br><br>Power class 3:<br>23dBm + 3.3 / - 9.8dB<br>23dBm + 3.3 / - 6.8dB<br>23dBm + 3.3 / - 5.3dB<br>23dBm + 3.3 / - 9.8dB<br>23dBm + 3.3 / - 6.8dB<br>23dBm + 3.3 / - 5.3dB |
| 6.2.3G.1.3 Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | Power class 3<br><br>MPR ≤ 1dB<br>MPR ≤ 2dB | <br><br>1.3 dB<br>1.3 dB | Formula:<br>Upper limit + $T_{HIGH}$ ($P_{CMAX_H}(p, q)$) + TT,<br>Lower limit – $T_{LOW}$ ($P_{CMAX_L}(p, q)$) – MPR – $\Delta T_{IB,c}$ – TT<br>Power class 3:<br><br>23dBm +3.3 / -5.3dB<br>23dBm +3.3 / -6.3dB |
| 6.2.3G.2.1 Maximum Power Reduction (MPR) for V2X Communication / Power class 2 / Contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions | Power class 2:<br>QPSK : MPR ≤ 2dB<br>16QAM : MPR ≤ 2.5dB | <br>1.3 dB<br>1.3 dB | Formula:<br>Upper limit + TT,<br>Lower limit – MPR – TT<br><br>Power class 2:<br>QPSK : 26dBm +3.3 / -5.3dB<br>16QAM : 26dBm +3.3 / -5.8dB |
| 6.2.3G.2.2 Maximum Power Reduction (MPR) for V2X Communication / Power class 2 / Non-contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions | Power class 2<br><br>4.2GHz < f ≤ 6GHz<br>For 10MHz BW:<br>$N_{RB_alloc}$ 10: MPR = 4.5dB<br>$N_{RB_alloc}$ 12: MPR = 4dB<br>$N_{RB_alloc}$ 42: MPR = 2.5dB<br><br>For 20MHz BW:<br>$N_{RB_alloc}$ 10: MPR = 9dB<br>$N_{RB_alloc}$ 22: MPR = 5.5dB<br>$N_{RB_alloc}$ 82: MPR = 3dB | <br><br><br>1.3 dB<br>1.3 dB<br>1.3 dB<br><br>1.3 dB<br>1.3 dB<br>1.3 dB | Formula:<br>Upper limit: $+T(P_{CMAX_H})$ + TT,<br>Lower limit: $-T(P_{CMAX_L})$ – MPR – TT<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L} = P_{PowerClass}$-MPR<br>Power class 2:<br><br>For 10MHz BW:<br>$N_{RB_alloc}$ 10: 26dBm +3.3 / -7.8dB<br>$N_{RB_alloc}$ 12: 26dBm +3.3 / -7.3dB<br>$N_{RB_alloc}$ 42: 26dBm +3.3 / -5.8dB<br><br>For 20MHz BW:<br>$N_{RB_alloc}$ 10: 26dBm +3.3 / -15.3dB<br>$N_{RB_alloc}$ 22: 26dBm +3.3 / -8.3dB<br>$N_{RB_alloc}$ 82: 26dBm +3.3 / -6.3dB |
| 6.2.4 UE Maximum Output Power with additional requirements | For the UE maximum output power modified by MPR and A-MPR, the power limits specified in TS 36.101 [2] clause 6.2.5 apply.<br><br>For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or | 0.7 dB | Formula:<br>Upper limit + TT,<br>A: Lower limit – TT,<br>B: (UE Maximum Output Power from 6.2.2) - $T(P_{CMAX})$ – MPR – TT,<br>C: (UE Maximum Output Power from 6.2.2) - |

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| | FUL_high – 4 MHz and FUL_high, the power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.<br><br>Power class 3:<br><br>QPSK: MPR ≤ 1dB<br><br>16QAM: Depending on the number RB allocated:<br>16QAM: MPR ≤ 1dB<br>16QAM: MPR ≤ 2dB<br><br>For network signalled value NS_03 , NS_04 (5MHz only), NS_05, to NS_06: A-MPR ≤ 1dB<br><br>For network signalled value NS-04; Depending on the RB_start and RB allocation (10MHz, 15MHz and 20MHz):<br><br>For 10MHz<br>Region A with RB_start=0 – 12: A-MPR ≤ 3dB.<br><br>Region B with RB_start=13 – 36 : A-MPR ≤ 2dB.<br><br>Region C with RB_start=37 – 49 : A-MPR ≤ 3dB.<br><br>For 15MHz<br><br>Region A with RB_start=0 – 18: A-MPR ≤ 3dB.<br><br>Region B with RB_start=19 – 55 : A-MPR ≤ 2dB.<br><br>Region C with RB_start=56 – 74 : A-MPR ≤ 3dB.<br><br>For 20MHz<br>Region A with RB_start=0 – 24: A-MPR ≤ 3dB.<br><br>Region B with RB_start=25 – 74 : A-MPR ≤ 2dB.<br><br>Region C with RB_start=75 – 99 : A-MPR ≤ 3dB.<br><br>For network signalled value NS-11; Depending on the RB_start and RB allocation (15MHz and 20MHz):<br><br>For 15MHz Fc < 2012.5<br>Region A with RB_start=0 – 4: A-MPR ≤ 15dB. | | $T(P_{CMAX})$ – A-MPR – TT,<br>D: (UE Maximum Output Power from 6.2.2) - $T(P_{CMAX})$ – A-MPR – MPR – TT<br><br>Power class 3:<br><br>Test Requirement Configuration ID versus Formula Above<br><br>Network signalled value NS_03:<br><br>[A]: 2, 5, 10, 15, 20, 25<br>[B]: 1, 3, 7<br>[C]: 9, 14, 19, 24<br>[D]: 4, 6, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27<br><br>Network signalled value NS_04 (5, 10, 15, 20MHz):<br><br>[A] 3<br>[B] 10, 11, 19, 20, 28, 29<br>[C] 2, 6, 7, 13, 14, 15, 16, 23, 24, 25, 32<br>[D] 1, 4, 5, 8, 9, 12, 17, 18, 21, 22, 26, 27, 30, 31<br><br>Network signalled value NS_05:<br><br>[A] 1, 3, 4, 8, 9, 14, 15,<br>[B] 2, 5, 10, 11, 16, 17<br>[C] None<br>[D] 6, 7, 12, 13, 18, 19<br><br>Network signalled value NS_06:<br><br>[A]:2, 5, 8, 11, 14, 17<br>[B]:1, 3, 4, 6, 7, 9, 10, 12, 13, 15, 16, 18<br>[C]: None<br>[D]: None<br><br>Network signalled value NS_07:<br><br>[A]:3, 8, 12<br>[B]: 7, 9<br>[C]: 1, 2, 5, 13, 15<br>[D]: 4, 6, 10, 11, 14, 16<br><br>Network signalled value NS_08: |

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| | Region B with RB_start=5 – 21: A-MPR ≤ 7dB ($L_{CRB}$=7-50) or ≤ 10dB ($L_{CRB}$=0-6 & ≥50).<br><br>Region C with RB_start=22 – 56: A-MPR ≤ 0dB ($L_{CRB}$=≤25) or ≤ 6dB ($L_{CRB}$>25).<br><br>Region D with RB_start=57 – 74: A-MPR ≤ 15dB.<br><br>For 15MHz Fc = 2012.5<br>Region A with RB_start=0 – 12: A-MPR ≤ 10dB.<br><br>Region B with RB_start=13 – 39: A-MPR ≤ 6dB ($L_{CRB}$=≥ 30) or ≤ 0dB ($L_{CRB}$=< 30).<br><br>Region C with RB_start=40 – 65: A-MPR ≤ 2dB.<br><br>Region D with RB_start=66 – 74: A-MPR ≤ 6.5dB.<br><br>For 20MHz<br>Region A with RB_start=0 – 12: A-MPR ≤ 15dB.<br><br>Region B with RB_start=13 – 29: A-MPR ≤ 7dB ($L_{CRB}$=10-60) or ≤ 10dB ($L_{CRB}$=1-9 & > 60).<br><br>Region C with RB_start=30 – 68: A-MPR ≤ 0dB ($L_{CRB}$=1-24) or ≤ 7dB ($L_{CRB}$= ≥ 25).<br><br>Region D with RB_start=69 – 99: A-MPR ≤ 15dB.<br><br>For network signalled value NS-20; Depending on the RB_start and RB allocation (5MHZ, 10MHz, 15MHz and 20MHz):<br><br>For 5MHz<br>Region A with RB_start=≤24: A-MPR ≤ 17dB.<br><br>Region B with RB_start=0 – 3: A-MPR ≤ 1dB ($L_{CRB}$=15-19) or ≤ 4dB ($L_{CRB}$= ≥ 20).<br><br>Region C with RB_start=4 – 6: A-MPR ≤ 2dB.<br><br>Region D with RB_start=≤24: A-MPR ≤ 0dB.<br><br>For 10MHz Fc = 2005<br>Region A with RB_start=0 – 25: A-MPR ≤ 16dB.<br><br>Region B with RB_start=26 – 34: A-MPR ≤ 2dB ($L_{CRB}$=8-15) or ≤ 5dB ($L_{CRB}$= > 15).<br><br>Region C with RB_start=35 – 49: | | [A]:1, 2, 4, 5, 12<br>[B]: 3, 6, 11, 13<br>[C]: None<br>[D]: 7, 8, 9, 10, 14, 15, 16, 17<br><br>Network signalled value NS_11:<br><br>[A]: 5c, 6b, 10c, 11c, 25<br>[B]:8b, 12c, 13c, 14c, 17a, 17b, 21a, 21b, 28<br>[C]:5a, 5b, 6a, 6c, 10a, 10b, 11, 11b, 15a, 15b, 16a, 16b, 24<br>[D]: 1a, 1b, 2a, 2b, 3a, 3b, 4a, 4b ,, 7a,7b,7c, 8a, 8c, 9a, 9b,9c, 12a, 12b, 13a, 13b, 14a, 14b, 18a, 18b, 19a, 19b, 20a, 20b, 22a, 22b, 23a, 23b, 26, 27, 29, 30<br><br>Network signalled value NS_12:<br><br>[A]: 3, 8, 13<br>[B]: None<br>[C]: 1, 4, 6, 11<br>[D]: 2, 5, 7, 9, 10, 12, 14, 15<br><br>Network signalled value NS_13:<br><br>[A]: None<br>[B]: 3, 4<br>[C]: 1<br>[D]: 2, 5<br><br>Network signalled value NS_14:<br><br>[A]: None<br>[B]: 2, 4, 7, 9<br>[C]: 1, 6<br>[D]: 3, 5, 8, 10<br><br>Network signalled value NS_15:<br><br>[A]: 1, 7, 14<br>[B]: 3, 6, 10, 15, 19, 21, 22, 25<br>[C]: 12, 13<br>[D]: 2, 4, 5, 8, 9, 11, 16, 17, 18, 20, 23, 24, 26<br><br>Network signalled value NS_20:<br><br>[A]: 1b, 1c, 1d, 6b, 7b<br>[B]: 2d, 3d, 4d, 5d, 9b<br>[C]: 1a, 6a, 7a, 11, 18, 19<br>[D]: 2a, 2b, 2c, 3a, 3b, 3c, 4a, 4b, 4c, 5a, 5b, 5c, 8a, 8b, 9a, 10a, 11b, 12, 13, 14, 15, 16, 17, 20, 21, 22, 23, 24, 25, 26 |

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| | A-MPR ≤ 6dB.<br><br>For 10MHz Fc = 2015<br>Region A with RB_start=0 – 5: A-MPR ≤ 4dB.<br><br>Region B with RB_start=6 – 10: A-MPR ≤ 2dB.<br><br>For 15MHz<br>Region A with RB_start=0 – 14: A-MPR ≤ 11dB ($L_{CRB}$=1-9 & 40-5) or ≤ 6dB ($L_{CRB}$= 10-39).<br><br>Region B with RB_start=15 – 24: A-MPR ≤ 1dB ($L_{CRB}$=24-29) or ≤ 7dB ($L_{CRB}$=≥30).<br><br>Region C with RB_start=25 – 39: A-MPR ≤ 5dB.<br><br>Region D with RB_start=61 – 74: A-MPR ≤ 6dB.<br><br>For 20MHz<br>Region A with RB_start=0 – 21: A-MPR ≤ 17dB.<br><br>Region B with RB_start=22 – 31: A-MPR ≤ 12dB ($L_{CRB}$=1-9 & 31-75) or ≤ 6dB ($L_{CRB}$=10-30).<br><br>Region C with RB_start=32 – 38: A-MPR ≤ 9dB.<br><br>Region D with RB_start=39 – 49: A-MPR ≤ 7dB.<br><br>Region E with RB_start=50 – 69: A-MPR ≤ 5dB.<br><br>Region F with RB_start=70 – 99: A-MPR ≤ 16dB.<br>For network signalled value NS-27; Depending on the RB_start and RB allocation (15MHz and 20MHz):<br><br>For 15MHz<br>With $L_{CRB}$ ≤15, LRB_start=0 – 6 or RB_end=68-74: A-MPR ≤ 4dB.<br><br>With $L_{CRB}$ ≥ 60, LRB_start≥0: A-MPR ≤ 2dB.<br><br>For 20MHz<br>With $L_{CRB}$ ≤20, LRB_start=0 – 12 or RB_end=87-99: A-MPR ≤ 4dB.<br><br>With $L_{CRB}$ ≤3, LRB_start=13 – 15 or RB_end=84-86: A-MPR ≤ 1dB.<br><br>With $L_{CRB}$ ≥ 60, LRB_start≥0: A-MPR ≤ 3dB. | | Network signalled value NS_27: TBD |
| 6.2.4_1 Additional Maximum Power Reduction (A-MPR) | For the UE maximum output power modified by MPR and A-MPR, the power limits specified in TS 36.101 | 0.7dB | Formula:<br>Upper limit + TT,<br>(UE Maximum Output |

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| for HPUE | [2] clause 6.2.5 apply.<br><br>For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.<br><br>Power class 1:<br><br>QPSK: MPR ≤ 1dB<br><br>16QAM: Depending on the number RB allocated:<br>16QAM: MPR ≤ 1dB<br>16QAM: MPR ≤ 2dB<br>Power class 1:<br>For network signalled value NS_06: A-MPR 0dB | | Power from 6.2.2) - T($P_{CMAX}$) – A-MPR – MPR – TT |
| 6.2.4_2 Additional Maximum Power Reduction (A-MPR) for UL 64QAM | Same as 6.2.4 | Same as 6.2.4 | Same as 6.2.4 |
| 6.2.4_3 Additional Maximum Power Reduction (A-MPR) with PUSCH frequency hopping | Same as 6.2.4 | Same as 6.2.4 | Same as 6.2.4 |
| 6.2.4_4 Additional Maximum Power Reduction (A-MPR) for UL 256QAM | For the UE maximum output power modified by MPR and A-MPR, the power limits specified in TS 36.101 [2] clause 6.2.5 apply.<br><br>For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.<br><br>Power class 3:<br><br>256QAM: MPR ≤ 5dB<br><br>A-MPR values as given by tables in section 6.2.4.3. | f ≤ 3.0GHz<br>0.7 dB<br><br>3.0GHz < f ≤ 4.2GHz<br>1.0 dB | Formula:<br>Upper limit + TT,<br>A: (UE Maximum Output Power from 6.2.2) - T(PCMAX) - MPR - TT,<br>B: (UE Maximum Output Power from 6.2.2) - T(PCMAX) - A-MPR - MPR - TT<br><br>Power class 3:<br>Test Requirement Configuration ID versus Formula Above<br><br>Network signalled value NS_03<br>[A]: 1, 3<br>[B]: 2, 4, 5, 6, 7, 8, 9, 10, 11<br><br>Network signalled value NS_04<br>[A]: 1, (2, 3, 4, 5) if not low range<br>[B]: (2, 3, 4, 5) for low range<br><br>Network signalled value NS_05<br>[A]: 1, 5, 6<br>[B]: 2, 3, 4, 7<br><br>Network signalled value NS_06<br>[A]: 1, 2, 3<br>[B]: None |

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| | | | Network signalled value NS_07<br>[A]: 2<br>[B]: 1, 3, 4<br><br>Network signalled value NS_08<br>[A]: 1<br>[B]: 2, 3<br><br>Network signalled value NS_09<br>[A]: 1<br>[B]: 2, 3<br><br>Network signalled value NS_11<br>[A]: 3b, 5c, 6c, 8a with high range RB allocation<br>[B]: 1a, 1b, 2a, 2b, 3a, 3c, 4a, 4b, 4c, 5a, 5b, 6a, 6b, 7a, 7b, 8a with low range RB allocation, 8b, 9a, 9b, 10a, 10b, 11, 12, 13<br><br>Network signalled value NS_12<br>[A]: None<br>[B]: 1, 2, 3, 4<br><br>Network signalled value NS_13<br>[A]: None<br>[B]: 1<br><br>Network signalled value NS_14<br>[A]: None<br>[B]: 1, 2<br><br>Network signalled value NS_15<br>[A]: None<br>[B]: 1, 2, 3, 4, 5<br><br>Network signalled value NS_16<br>[A]: 1, 2 for FC = 810.0 MHz, 3 for FC = 814.5 MHz<br>[B]: 2 for FC < 810.0 MHz, 3 for FC < 814.5 MHz, 4<br><br>Network signalled value NS_17<br>[A]: 1, 2<br>[B]: None<br><br>Network signalled value NS_18<br>[A]: None<br>[B]: 1, 2, 3, 4<br><br>Network signalled value NS_19<br>[A]: 1, (2, 3, 4) with high range RB allocation<br>[B]: (2, 3, 4) with low range RB allocation |

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| | | | Network signalled value NS_20<br>[A]: 1b with high range RB allocation, 1c, 1d, 2c, 2d, 3a with high range RB allocation, 3b, 5a with high range RB allocation<br>[B]: 1a, 1b with low range RB allocation, 2a, 2b, 3a with low range RB allocation, 4a, 4b, 5a with low range RB allocation, 6a, 7a, 8a, 9a, 10a, 11a<br><br>Network signalled value NS_21<br>[A]: None<br>[B]: 1<br><br>Network signalled value NS_22<br>[A]: 1, 2<br>[B]: 3, 4, 5, 6, 7, 8<br><br>Network signalled value NS_23<br>[A]: 1, 2<br>[B]: None<br><br>Network signalled value NS_24<br>[A]: 1, 3, 5<br>[B]: 2, 4, 6<br><br>Network signalled value NS_25<br>[A]: 6<br>[B]: 1, 2, 3, 4, 5<br><br>Network signalled value NS_27<br>[A]: 1, 2<br>[B]: 3, 4<br><br>Network signalled value NS_35<br>[A]: 1, 2, 3, 4<br>[B]: None<br><br>Network signalled value NS_36<br>[A]: 2, 4, 6<br>[B]: 1, 3, 5 |
| 6.2.4A.1 Additional Maximum Power Reduction (A-MPR) for CA (intra-band contiguous DL CA and UL CA) | A-MPR values as detailed in core requirement | Same as 6.2.4 | Formula:<br>Upper limit: $+T(P_{CMAX_H}) + TT$,<br>Lower limit: $-T(P_{CMAX_L}) – A\text{-}MPR – TT$<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L} = P_{PowerClass}$-A-MPR |
| 6.2.4A.1_1 Additional Maximum Power Reduction (A-MPR) for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | Same as 6.2.4A.1 | Same as 6.2.4A.1 | Same as 6.2.4A.1 |

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| 6.2.4A.1_2 Additional Maximum Power Reduction (A-MPR) for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM | Same as 6.2.4A.1 | Same as 6.2.4A.1 | Same as 6.2.4A.1 |
| 6.2.4A.2 Additional Maximum Power Reduction (A-MPR) for CA (inter-band DL CA and UL CA) | Same as 6.2.4 | Same as 6.2.4 | Formula:<br>Upper limit: $+T(P_{CMAX_H})$ + TT,<br>Lower limit: $-T(P_{CMAX_L})$ – MPR – AMPR – TT<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L} = P_{PowerClass}$ – MPR – AMPR $-\Delta T_C$ |
| 6.2.4A.2_1 Additional Maximum Power Reduction (A-MPR) for CA (inter-band DL CA and UL CA) for UL 64QAM | Same as 6.2.4 | Same as 6.2.4 | Formula:<br>Upper limit: $+T(P_{CMAX_H})$ + TT,<br>Lower limit: $-T(P_{CMAX_L})$ – MPR – AMPR – TT<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L} = P_{PowerClass}$ – MPR – AMPR $-\Delta T_C$ |
| 6.2.4A.2_2 Additional Maximum Power Reduction (A-MPR) for CA (inter-band DL CA and UL CA) for UL 256QAM | Same as 6.2.4 | Same as 6.2.4 | Formula:<br>Upper limit: $+T(P_{CMAX_H})$ + TT,<br>Lower limit: $-T(P_{CMAX_L})$ – MPR – AMPR – TT<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L} = P_{PowerClass}$ – MPR – AMPR $-\Delta T_C$ |
| 6.2.4B Additional Maximum Power Reduction (A-MPR) for UL-MIMO | Same as 6.2.4 | Same as 6.2.4 | Same as 6.2.4<br><br>Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 6.2.4E Additional Maximum Power Reduction (A-MPR) for UE category 0 | Same as 6.2.4 | Same as 6.2.4 | Same as 6.2.4 |
| 6.2.4EA Additional Maximum Power Reduction (A-MPR) for UE category M1 | A-MPR values as detailed in core requirement | Same as 6.2.4 | Formula:<br>Upper limit: $+T(P_{CMAX_H})$ + TT,<br>Lower limit: $-T(P_{CMAX_L})$– A-MPR – TT<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L} = P_{PowerClass}$-A-MPR |
| 6.2.4EB Additional Maximum Power Reduction (A-MPR) for UE category 1bis | Same as 6.2.4 | Same as 6.2.4 | Same as 6.2.4 |
| 6.2.4G.1 Additional Maximum Power Reduction (A-MPR) for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | A-MPR values as detailed in core requirement | Same as 6.2.4 | Formula:<br>Upper limit: $+T(P_{CMAX_H})$ + TT,<br>Lower limit: $-T(P_{CMAX_L})$ – MPR – AMPR – TT<br>$P_{CMAX_H} = P_{PowerClass}$<br>$P_{CMAX_L} = P_{PowerClass}$ – MPR – AMPR $-\Delta T_C$ |
| 6.2.5 Configured UE transmitted Output Power | f ≤ 3.0GHz<br>13 ≤ PCMAX < 18 ± 5.0<br>8 ≤ PCMAX < 13 ± 6.0<br>-40 ≤ PCMAX < 8 ± 7.0 | 0.7 dB<br>0.7 dB<br>0.7 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>13 ≤ PCMAX < 18 ± 5.7<br>8 ≤ PCMAX < 13 ± 6.7<br>-40 ≤ PCMAX < 8 ± 7.7 |

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| | 3.0GHz < f ≤ 4.2GHz<br>13 ≤ PCMAX < 18 ± 5.0<br>8 ≤ PCMAX < 13 ± 6.0<br>-40 ≤ PCMAX < 8 ± 7.0 | <br>1.0 dB<br>1.0 dB<br>1.0 dB | <br>13 ≤ PCMAX < 18 ± 6.0<br>8 ≤ PCMAX < 13 ± 7.0<br>-40 ≤ PCMAX < 8 ± 8.0 |
| 6.2.5_1 Configured UE transmitted Output Power for HPUE | f ≤ 3.0GHz<br>23 ≤ PCMAX < 33 ± 2.0<br>13 ≤ PCMAX < 18 ± 5.0<br>8 ≤ PCMAX < 13 ± 6.0<br>-40 ≤ PCMAX < 8 ± 7.0 | <br>0.7 dB<br>0.7 dB<br>0.7 dB<br>0.7 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>23 ≤ PCMAX < 33 ± 2.7<br>13 ≤ PCMAX < 18 ± 5.7<br>8 ≤ PCMAX < 13 ± 6.7<br>-40 ≤ PCMAX < 8 ± 7.7 |
| 6.2.5A.1 Configured UE transmitted Output Power for CA (intra-band contiguous DL CA and UL CA) | f ≤ 3.0GHz<br>13 ≤ PCMAX < 18 ± 5.0<br>8 ≤ PCMAX < 13 ± 6.0<br>-40 ≤ PCMAX < 8 ± 7.0<br><br>3.0GHz < f ≤ 4.2GHz<br>13 ≤ PCMAX < 18 ± 5.0<br>8 ≤ PCMAX < 13 ± 6.0<br>-40 ≤ PCMAX < 8 ± 7.0 | <br>0.7 dB<br>0.7 dB<br>0.7 dB<br><br>1.0 dB<br>1.0 dB<br>1.0 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>13 ≤ PCMAX < 18 ± 5.7<br>8 ≤ PCMAX < 13 ± 6.7<br>-40 ≤ PCMAX < 8 ± 7.7<br><br>13 ≤ PCMAX < 18 ± 6.0<br>8 ≤ PCMAX < 13 ± 7.0<br>-40 ≤ PCMAX < 8 ± 8.0 |
| 6.2.5A.3 Configured UE transmitted Output Power for CA (inter-band DL CA and UL CA) | f ≤ 3.0GHz<br>16 ≤ PCMAX < 20 ± 5.0<br>11≤ PCMAX < 16 ± 6.0<br>-40 ≤ PCMAX < 11 ± 7.0 | <br>0.7 dB<br>0.7 dB<br>0.7 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>16 ≤ PCMAX < 20 ± 5.7<br>11 ≤ PCMAX < 16 ± 6.7<br>-40 ≤ PCMAX < 11 ± 7.7 |
| 6.2.5A.4 Configured UE transmitted Output Power for CA (intra-band non-contiguous DL CA and UL CA) | f ≤ 3.0GHz<br>13 ≤ PCMAX < 18 ± 5.0<br>8 ≤ PCMAX < 13 ± 6.0<br>-40 ≤ PCMAX < 8 ± 7.0 | <br>0.7 dB<br>0.7 dB<br>0.7 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>13 ≤ PCMAX < 18 ± 5.7<br>8 ≤ PCMAX < 13 ± 6.7<br>-40 ≤ PCMAX < 8 ± 7.7 |
| 6.2.5B Configured UE transmitted output power for UL-MIMO | f ≤ 3.0GHz<br>[16] ≤ PCMAX < [20] ± [5.0]<br>[11] ≤ PCMAX < [16] ± [6.0]<br>[-40] ≤ PCMAX < [11] ± [7.0]<br><br>3.0GHz < f ≤ 4.2GHz<br>[16] ≤ PCMAX < [20] ± [5.0]<br>[11] ≤ PCMAX < [16] ± [6.0]<br>[-40] ≤ PCMAX < [11] ± [7.0] | Same as 6.2.5 | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>[16] ≤ PCMAX < [20] ± [5.7]<br>[11] ≤ PCMAX < [16] ± [6.7]<br>[-40] ≤ PCMAX < [11] ± [7.7]<br><br>[16] ≤ PCMAX < [20] ± [6.0]<br>[11] ≤ PCMAX < [16] ± [7.0]<br>[-40] ≤ PCMAX < [11] ± [8.0]<br><br>Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 6.2.5E Configurated Transmitted Power for UE category 0 | Same as 6.2.5 | Same as 6.2.5 | Same as 6.2.5 |
| 6.2.5EA Configured UE transmitted Power for UE category M1 | Same as 6.2.5 | Same as 6.2.5 | Same as 6.2.5 |
| 6.2.5EB Configured UE transmitted | Same as 6.2.5 | Same as 6.2.5 | Same as 6.2.5 |

| | | | |
|---|---|---|---|
| Power for UE category 1bis | | | |
| 6.2.5F Configured UE transmitted Output Power for UE category NB1 | Tolerances as described in core requirements | 0.7 dB | Formula:<br>Upper limit + TT, Lower limit – TT |
| 6.2.5G.1 Configured UE transmitted Output Power for V2X Communication / Non-concurrent with E-UTRA uplink transmission | 13 ≤ PCMAX < 18 ± 5.0<br>8 ≤ PCMAX < 13 ± 6.0<br>-40 ≤ PCMAX < 8 ± 7.0 | 1.3 dB<br>1.3 dB<br>1.5 dB | Formula:<br>Upper limit + TT, Lower limit - TT<br><br>13 ≤ PCMAX < 18 ± 6.3<br>8 ≤ PCMAX < 13 ± 7.3<br>-40 ≤ PCMAX < 8 ± 8.5 |
| 6.2.5G.2 Configured UE transmitted Output Power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | 16 ≤ PCMAX < 20 ± 5.0<br>11 ≤ PCMAX < 16 ± 6.0<br>-40 ≤ PCMAX < 11 ± 7.0 | 1.3 dB<br>1.3 dB<br>1.5 dB | Formula:<br>Upper limit + TT, Lower limit - TT<br><br>16 ≤ PCMAX < 20 ± 6.3<br>11 ≤ PCMAX < 16 ± 7.3<br>-40 ≤ PCMAX < 11 ± 8.5 |
| 6.3.2 Minimum Output Power | f ≤ 3.0GHz<br>-40 dBm<br><br>3.0GHz < f ≤ 4.2GHz<br>-40 dBm<br><br>4.2GHz < f ≤ 6GHz<br>-40 dBm | 1.0 dB<br><br>1.3 dB<br><br>1.5 dB | Formula:<br>Minimum Requirement + TT<br>UE min. output power =–39 dBm<br><br>UE min. output power =–38.7 dBm<br><br>UE min. output power =–38.5 dBm |
| 6.3.2A.1 Minimum Output Power for CA (intra-band contiguous DL CA and UL CA) | Same as 6.3.2 | Same as 6.3.2 | Same as 6.3.2 |
| 6.3.2A.4 Minimum Output Power for CA (3UL CA) | Same as 6.3.2 | Same as 6.3.2 | Same as 6.3.2 |
| 6.3.2B Minimum Output Power for UL-MIMO | Same as 6.3.2 | Same as 6.3.2 | Same as 6.3.2<br><br>Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 6.3.2E Minimum Output Power for UE category 0 | Same as 6.3.2 | Same as 6.3.2 | Same as 6.3.2 |
| 6.3.2EA Minimum Output Power for UE category M1 | Same as 6.3.2 | Same as 6.3.2 | Same as 6.3.2 |
| 6.3.2EB Minimum Output Power for UE category 1bis | Same as 6.3.2 | Same as 6.3.2 | Same as 6.3.2 |
| 6.3.2F Minimum Output Power for UE category NB1 | -40 dBm | 1.0 dB | Formula:<br>Minimum Requirement + TT<br>UE min. output power =–39 dBm |
| 6.3.2G.1 Minimum output power for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 4.2GHz < f ≤ 6GHz<br>-30 dBm | 1.5 dB | Formula:<br>Minimum Requirement + TT<br>UE min. output power =–28.5 dBm |
| 6.3.2G.2 Minimum | | | Formula: |

| | | | |
|---|---|---|---|
| output power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | f ≤ 3.0GHz<br>-40 dBm<br><br>4.2GHz < f ≤ 6GHz<br>-30 dBm | 1.0 dB<br><br>1.5 dB | Minimum Requirement + TT<br>UE min. output power =–39 dBm<br><br>UE min. output power =–28.5 dBm |
| 6.3.2G.3 Minimum output power for V2X Communication / Intra-band contiguous multi-carrier operation | 4.2GHz < f ≤ 6GHz<br>-3 0 dBm | 1.5 dB | Formula:<br>Minimum Requirement + TT<br>UE min. output power =–28.5 dBm |
| 6.3.3 Transmission ON/OFF Power | f ≤ 3.0GHz<br>≤ -50 dBm<br><br>3.0GHz < f ≤ 4.2GHz<br>≤ -50 dBm<br><br>4.2GHz < f ≤ 6GHz<br>≤ -50 dBm | 1.5 dB<br><br>1.8 dB<br><br>2.0 dB | Formula:<br>Minimum Requirement + TT<br>UE OFF Power ≤ -48.5 dBm<br><br>UE OFF Power ≤ -48.2 dBm<br><br>UE OFF Power ≤ -48.0 dBm |
| 6.3.3A.1 UE Transmit OFF power for CA (intra-band contiguous DL CA and UL CA) | Same as 6.3.3 | Same as 6.3.3 | Same as 6.3.3 |
| 6.3.3A.2 Transmit OFF Power for CA (inter-band DL CA and UL CA) | Same as 6.3.3 | Same as 6.3.3 | Same as 6.3.3 |
| 6.3.3A.3 UE Transmit OFF power for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.3.3 | Same as 6.3.3 | Same as 6.3.3 |
| 6.3.3A.4 UE Transmit OFF power for CA (3UL CA) | Same as 6.3.3 | Same as 6.3.3 | Same as 6.3.3 |
| 6.3.3B UE Transmit OFF power for UL-MIMO | Same as 6.3.3 | Same as 6.3.3 | Same as 6.3.3<br><br>Uplink power measurement applies to each Tx antenna connector |
| 6.3.3D UE Transmit OFF power for ProSe | Same as 6.3.3 | Same as 6.3.3 | Same as 6.3.3 |
| 6.3.3E UE Transmit OFF Power for UE category 0 | Same as 6.3.3 | Same as 6.3.3 | Same as 6.3.3 |
| 6.3.3EA UE Transmit OFF power for UE category M1 | Same as 6.3.3 | Same as 6.3.3 | Same as 6.3.3 |
| 6.3.3EB UE Transmit OFF power for UE category 1bis | Same as 6.3.3 | Same as 6.3.3 | Same as 6.3.3 |
| 6.3.3G.1 UE Transmit OFF power for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 4.2GHz < f ≤ 6GHz<br>≤ -50 dBm | 2.0 dB | Formula:<br>Minimum Requirement + TT<br>UE OFF Power ≤ -48 dBm |
| 6.3.3G.2 UE Transmit OFF power | f ≤ 3.0GHz | | Formula:<br>Minimum Requirement + TT |

| | | | |
|---|---|---|---|
| for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | ≤ -50 dBm<br><br>3.0GHz < f ≤ 4.2GHz<br>≤ -50 dBm<br><br>4.2GHz < f ≤ 6GHz<br>≤ -50 dBm | 1.5 dB<br><br>1.8 dB<br><br>2.0 dB | UE OFF Power ≤ -48.5 dBm<br><br>UE OFF Power ≤ -48.2 dBm<br><br>UE OFF Power ≤ -48.0 dBm |
| 6.3.3G.3 UE Transmit OFF power for V2X Communication / Intra-band contiguous multi-carrier operation | 4.2GHz < f ≤ 6GHz<br>≤ -50 dBm | 2.0 dB | Formula:<br>Minimum Requirement + TT<br>UE OFF Power ≤ -48 dBm |
| 6.3.4.1 General ON/OFF time mask | f ≤ 3.0GHz<br>OFF Power ≤ -50 dBm<br>ON Power BW dependent<br><br>3.0GHz < f ≤ 4.2GHz<br>OFF Power ≤ -50 dBm<br>ON Power BW dependent<br><br>Transmission ON Power value depends on the test parameters. In the particular test case parameters the ON power measurement has minimum requirements of ±6.0 dB | 1.5 dB<br>1.5 dB<br><br>1.8 dB<br>1.8 dB | Formulae:<br>OFF Power Minimum Req't + TT<br>ON Power Upper limit + TT, Lower limit – TT<br><br>UE OFF Power ≤ -48.5 dBm<br>UE ON Power: Test value ± 7.5 dB<br><br>UE OFF Power ≤ -48.2 dBm<br>UE ON Power: Test value ± 7.8 dB |
| 6.3.4.2 PRACH and SRS time mask | f ≤ 3.0GHz<br>OFF Power ≤ -50 dBm<br>ON Power BW dependent<br><br>3.0GHz < f ≤ 4.2GHz<br>OFF Power ≤ -50 dBm<br>ON Power BW dependent<br><br>Transmission ON Power value depends on the test parameters. In the particular test case parameters the ON power measurement has minimum requirements of ±6.0 dB | 1.5 dB<br>1.5 dB<br><br>1.8 dB<br>1.8 dB | Formulae:<br>OFF Power Minimum Req't + TT<br>ON Power Upper limit + TT, Lower limit – TT<br><br>UE OFF Power ≤ -48.5 dBm<br>UE ON Power: Test value ± 7.5 dB<br><br>UE OFF Power ≤ -48.2 dBm<br>UE ON Power: Test value ± 7.8 dB |
| 6.3.4A.1.1 General ON/OFF time mask for CA (intra-band contiguous DL CA and UL CA) | Same as 6.3.4.1 for each CC | Same as 6.3.4.1 | Same as 6.3.4.1 for each CC |
| 6.3.4A.1.2 General ON/OFF time mask for CA (inter-band DL CA and UL CA) | Same as 6.3.4.1 | Same as 6.3.4.1 | Same as 6.3.4.1 |
| 6.3.4A.1.3 General ON/OFF time mask for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.3.4.1 for each CC | Same as 6.3.4.1 | Same as 6.3.4.1 for each CC |
| 6.3.4A.1.4 General ON/OFF time mask for CA (3UL CA) | Same as 6.3.4.1 for each CC | Same as 6.3.4.1 | Same as 6.3.4.1 for each CC |

| | | | |
|---|---|---|---|
| 6.3.4B.1 General ON/OFF time mask for UL-MIMO | Same as 6.3.4.1 | Same as 6.3.4.1 | Same as 6.3.4.1<br><br>Uplink OFF power measurement applies to each Tx antenna connector<br><br>Uplink ON power measurement applies to [FFS] |
| 6.3.4C.1 General ON/OFF time mask for Dual Connectivity | Same as 6.3.4.1 | Same as 6.3.4.1 | Same as 6.3.4.1 |
| 6.3.4E.1 General ON/OFF time mask for UE category 0 | Same as 6.3.4.1 | Same as 6.3.4.1 | Same as 6.3.4.1 |
| 6.3.4E.2 PRACH and SRS time mask for UE category 0 | Same as 6.3.4.2 | Same as 6.3.4.2 | Same as 6.3.4.2 |
| 6.3.4EA.1 General ON/OFF time mask for UE category M1 | Same as 6.3.4.1 | Same as 6.3.4.1 | Same as 6.3.4.1 |
| 6.3.4EA.2 PRACH and SRS ON/OFF time mask for UE category M1 | Same as 6.3.4.2 | Same as 6.3.4.2 | Same as 6.3.4.2 |
| 6.3.4EB.1 General ON/OFF time mask for UE category 1bis | Same as 6.3.4.1 | Same as 6.3.4.1 | Same as 6.3.4.1 |
| 6.3.4EB.2 PRACH and SRS ON/OFF time mask for UE category 1bis | Same as 6.3.4.2 | Same as 6.3.4.2 | Same as 6.3.4.2 |
| 6.3.4F.1 General ON/OFF time mask for category NB1 | Same as 6.3.4.1 | Same as 6.3.4.1 | Same as 6.3.4.1 |
| 6.3.4F.2 NPRACH time mask for category NB1 | Same as 6.3.4.2 | Same as 6.3.4.2 | Same as 6.3.4.2 |
| 6.3.4G.1 General ON/OFF time mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | <u>4.2GHz < f ≤ 6GHz</u><br>OFF Power ≤ -50 dBm<br>ON Power BW dependent<br><br>Transmission ON Power value depends on the test parameters. In the particular test case parameters the ON power measurement has minimum requirements of ±6.0 dB | 2.0dB<br>2.0dB | Formulae:<br>OFF Power Minimum Req't + TT<br>ON Power Upper limit + TT, Lower limit – TT<br><br>UE OFF Power ≤ -48 dBm<br>UE ON Power: Test value ± 8.0 dB |
| 6.3.4G.2 General ON/OFF time mask for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | <u>f ≤ 3.0GHz</u><br>OFF Power ≤ -50 dBm<br>ON Power BW dependent<br><br><u>3.0GHz < f ≤ 4.2GHz</u><br>OFF Power ≤ -50 dBm<br>ON Power BW dependent<br><br><u>4.2GHz < f ≤ 6.0GHz</u> | 1.5 dB<br>1.5 dB<br><br>1.8 dB<br>1.8 dB<br><br>2.0 dB | Formulae:<br>OFF Power Minimum Req't + TT<br>ON Power Upper limit + TT, Lower limit – TT<br><br>UE OFF Power ≤ -48.5 dBm<br>UE ON Power: Test value ± 7.5 dB<br><br>UE OFF Power ≤ -48.2 dBm |

| | | | |
|---|---|---|---|
| | OFF Power ≤ -50 dBm<br>ON Power BW dependent<br><br>Transmission ON Power value depends on the test parameters. In the particular test case parameters the ON power measurement has minimum requirements of ±6.0 dB | 2.0 dB | UE ON Power: Test value ± 7.8 dB<br><br><br>UE OFF Power ≤ -48.0 dBm<br>UE ON Power: Test value ± 8.0 dB |
| 6.3.4G.4 PSSS/SSSS time mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Same as 6.3.4G.1 | Same as 6.3.4G.1 | Same as 6.3.4G.1 |
| 6.3.5.1 Power Control Absolute power tolerance | <br>f ≤ 3.0GHz<br>Normal conditions ± 9.0 dB<br>Extreme conditions ± 12.0 dB<br><br>3.0GHz < f ≤ 4.2GHz<br>Normal conditions ± 9.0 dB<br>Extreme conditions ± 12.0 dB<br><br>4.2GHz < f ≤ 6GHz<br>Normal conditions ± 9.0 dB<br>Extreme conditions ± 12.0 dB | <br><br>1.0 dB<br>1.0 dB<br><br><br>1.4 dB<br>1.4 dB<br><br><br>2.0 dB<br>2.0 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>Normal conditions ± 10.0 dB<br>Extreme conditions ± 13.0 dB<br><br><br>Normal conditions ± 10.4 dB<br>Extreme conditions ± 13.4 dB<br><br><br>Normal conditions ± 11.0 dB<br>Extreme conditions ± 14.0 dB |
| 6.3.5.2 Power Control Relative power tolerance | TS 36.101 [2] clause 6.3.5.1<br><br>All combinations of PUSCH and PUCCH transitions:<br><br>ΔP < 2; ±2.5 dB<br>2 ≤ ΔP < 3; ±3.0 dB<br>3 ≤ ΔP < 4; ±3.5 dB<br>4 ≤ ΔP ≤ 10; ±4.0 dB<br>10 ≤ ΔP < 15; ±5.0 dB<br>15 ≤ ΔP; ±6.0 dB | 0.7 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br>All combinations of PUSCH and PUCCH transitions:<br><br>ΔP < 2; ±3.2 dB<br>2 ≤ ΔP < 3; ±3.7 dB<br>3 ≤ ΔP < 4; ±4.2 dB<br>4 ≤ ΔP < 10; ±4.7 dB<br>10 ≤ ΔP < 15; ±5.7 dB<br>15 ≤ ΔP; ±6.7 dB |
| 6.3.5.3 Aggregate power control tolerance | Aggregate power control tolerance within 21 ms:<br><br>PUCCH = ±2.5 dB<br>PUSCH = ±3.5 dB | 0.7 dB | Formula:<br>Upper limit + TT, Lower limit - TT<br>PUCCH = ±3.2 dB<br>PUSCH = ±4.2 dB |
| 6.3.5_1.1 Power Control Absolute power tolerance for HPUE | <br>f ≤ 3.0GHz<br>Normal conditions ± 9.0 dB<br>Extreme conditions ± 12.0 dB | <br><br>1.0 dB<br>1.0 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>Normal conditions ± 10.0 dB<br>Extreme conditions ± 13.0 dB |
| 6.3.5_1.2 Power Control Relative power tolerance for HPUE | Same as 6.3.5.2 | Same as 6.3.5.2 | Same as 6.3.5.2 |
| 6.3.5_1.3 Aggregate power control tolerance for HPUE | Same as 6.3.5.3 | Same as 6.3.5.3 | Same as 6.3.5.3 |
| 6.3.5A.1.1 Power | Same as 6.3.5.1 | Same as 6.3.5.1 | Same as 6.3.5.1 |

| | | | |
|---|---|---|---|
| Control Absolute power tolerance for CA (intra-band contiguous DL CA and UL CA) | | | |
| 6.3.5A.1.2 Power Control Absolute power tolerance for CA (inter-band DL CA and UL CA) | Same as 6.3.5.1 | Same as 6.3.5.1 | Same as 6.3.5.1 |
| 6.3.5A.1.3 Power Control Absolute power tolerance for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.3.5.1 | Same as 6.3.5.1 | Same as 6.3.5.1 |
| 6.3.5A.1.4 Power Control Absolute power tolerance for CA(3UL CA) | Same as 6.3.5.1 | Same as 6.3.5.1 | Same as 6.3.5.1 |
| 6.3.5A.1.5 Power Control Absolute power tolerance for CA(SRS carrier based switching) | Same as 6.3.5.1 | Same as 6.3.5.1 | Same as 6.3.5.1 |
| 6.3.5A.2.1 Power Control Relative power tolerance for CA (intra-band contiguous DL CA and UL CA) | TS 36.101 [2] clause 6.3.5A.2 refers to Table 6.3.5.2.1-1.<br><br>All combinations of PUSCH and PUCCH transitions:<br><br><u>SCC power increase</u><br>PCC 0dB (ΔP ≤ 1dB):<br>Normal 0 ±1.0dB<br>Exceptions: 0 ±6.0dB<br>SCC +9dB (4 ≤ ΔP ≤ 10):<br>Normal +9 ±4.0dB<br>Exceptions: +9 ±6.0dB<br><br><u>SCC power decrease</u><br>PCC 0dB (ΔP ≤ 1dB):<br>Normal 0 ±1.0dB<br>Exceptions: 0 ±6.0dB<br>SCC -9dB (4 ≤ ΔP ≤ 10):<br>Normal -9 ±4.0dB<br>Exceptions: -9 ±6.0dB<br><br><u>PCC and SCC power increase</u><br>PCC +9dB (4 ≤ ΔP ≤ 10):<br>Normal +9 ±4.0dB<br>Exceptions: +9 ±6.0dB<br>SCC +9dB (4 ≤ ΔP ≤ 10):<br>Normal +9 ±4.0dB<br>Exceptions: +9 ±6.0dB<br><br><u>PCC and SCC power decrease</u><br>PCC -9dB (4 ≤ ΔP ≤ 10):<br>Normal -9 ±4.0dB<br>Exceptions: -9 ±6.0dB<br>SCC -9dB (4 ≤ ΔP ≤ 10): | <br><br><br><br><br><br><br><br><br><br><br><br>-0.7, +0.8dB<br>-0.7, +0.8dB<br><br>-0.8, +0.7dB<br>-0.8, +0.8dB<br><br><br><br>-0.8, +0.7dB<br>-0.8, +0.7dB<br><br>-0.8, +0.8dB<br>-0.8, +0.8dB<br><br><br><br>-0.7, +0.8dB<br>-0.7, +0.8dB<br><br>-0.7, +0.8dB<br>-0.7, +0.8dB<br><br><br><br>-0.8, +0.7dB<br>-0.8, +0.7dB | Relative power measurement uncertainty comprises two quantities:<br>1. Uplink Relative level measurement uncertainty of Test system<br>2. IQ image Leakage onto weaker CC at -25dBc is allowed for the UE, so is added arithmetically. It can only increase the measured power of the weaker CC.<br>UL relative meas't uncert ±0.7dB<br>Leakage +0.17dB max for 11dB CC power difference, based on -25dBc.<br>All limits rounded to nearest 0.1dB.<br><br><u>SCC power increase</u><br>PCC:<br>Normal -1.7, +1.8dB<br>Exceptions: -6.7, +6.8dB<br>SCC:<br>Normal +4.2, +13.7dB<br>Exceptions: +2.2, +15.8dB<br><br><u>SCC power decrease</u><br>PCC:<br>Normal -1.8, +1.7dB<br>Exceptions: -6.8, +6.7dB<br>SCC:<br>Normal -13.8, -4.2dB<br>Exceptions: -15.8, -2.2dB<br><br><u>PCC and SCC power increase</u><br>PCC:<br>Normal +4.3, +13.8dB<br>Exceptions: +2.3, +15.8dB<br>SCC:<br>Normal +4.3, +13.8dB |

| | | | |
|---|---|---|---|
| | Normal -9 ±4.0dB<br>Exceptions: -9 ±6.0dB<br><br>Each CC can have exceptions | -0.8, +0.7dB<br>-0.8, +0.7dB | Exceptions: +2.3, +15.8dB<br><br><u>PCC and SCC power decrease</u><br>PCC:<br>Normal -13.8, -4.3dB<br>Exceptions: -15.8, -2.3dB<br>SCC:<br>Normal -13.8, -4.3dB<br>Exceptions: -15.8, -2.3dB<br><br>The analysis is recorded in 3GPP TR 36.904 [17]<br><br>When setting SCC power for the next step, three factors are relevant:<br>1. Uplink Relative level measurement uncertainty<br>2. IQ image Leakage onto weaker CC at -25dBc is allowed for the UE<br>3) TPC step 1dB ±1dB is allowed for the UE<br>These are added arithmetically, giving an extra margin of (1+0.7+0.17) = 1.87dB (2dB is allowed) to avoid the same power step exception being counted twice. |
| 6.3.5A.2.2 Power Control Relative power tolerance for CA (inter-band DL CA and UL CA) | Same as 6.3.5.2 on both PCC and SCC separately. | Same as 6.3.5.2 on both PCC and SCC separately. | Same as 6.3.5.2 on both PCC and SCC separately. |
| 6.3.5A.2.3 Power Control Relative power tolerance for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.3.5A.2.1 | Same as 6.3.5A.2.1 | Same as 6.3.5A.2.1 |
| 6.3.5A.2.4.1 Power Control Relative power tolerance for CA (intra-band contiguous 3DL CA and 3UL CA) | Same as 6.3.5A.2.1 | Same as 6.3.5A.2.1 | Same as 6.3.5A.2.1 |
| 6.3.5A.2.4.2 Power Control Relative power tolerance for CA (inter-band 3DL CA and 3UL CA) | Same as 6.3.5A.2.2 | Same as 6.3.5A.2.2 | Same as 6.3.5A.2.2 |
| 6.3.5A.2.4.3 Power Control Relative power tolerance for CA (intra-band non-contiguous 3DL CA and 3UL CA) | Same as 6.3.5A.2.3 | Same as 6.3.5A.2.3 | Same as 6.3.5A.2.3 |
| 6.3.5A.3.1 Aggregate power control tolerance for CA (intra-band contiguous DL CA and UL CA) | Same as 6.3.5.3 | Same as 6.3.5.3 | Same as 6.3.5.3 |
| 6.3.5A.3.2 Aggregate power control tolerance for | Same as 6.3.5.3 | Same as 6.3.5.3 | Same as 6.3.5.3 |

| | | | |
|---|---|---|---|
| CA (inter-band DL CA and UL CA) | | | |
| 6.3.5A.3.3 Aggregate power control tolerance for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.3.5.3 | Same as 6.3.5.3 | Same as 6.3.5.3 |
| 6.3.5A.3.4 Aggregate Power Control Tolerance for CA (3UL CA) | Same as 6.3.5.3 | Same as 6.3.5.3 | Same as 6.3.5.3 |
| 6.3.5B.1 Power Control Absolute Power Tolerance for UL- MIMO | Same as 6.3.5.1 | Same as 6.3.5.1 | Same as 6.3.5.1<br><br>Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 6.3.5B.2 Power Control Relative power tolerance for UL-MIMO | Same as 6.3.5.2 | Same as 6.3.5.2 | Same as 6.3.5.2<br><br>Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 6.3.5B.3 Aggregate power control tolerance for UL-MIMO | Same as 6.3.5.3 | Same as 6.3.5.3 | Same as 6.3.5.3<br><br>Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 6.3.5C.2 Power Control Relative power tolerance for Dual Connectivity | Same as 6.3.5.2 on both PCC and SCC separately. | Same as 6.3.5.2 on both PCC and SCC separately. | Same as 6.3.5.2 on both PCC and SCC separately. |
| 6.3.5C.2_1 Power Control Relative power tolerance for asynchronous Dual Connectivity | Same as 6.3.5.2 on both PCC and SCC separately. | Same as 6.3.5.2 on both PCC and SCC separately. | Same as 6.3.5.2 on both PCC and SCC separately. |
| 6.3.5E.1 Power Control Absolute power tolerance for UE category 0 | Same as 6.3.5.1 | Same as 6.3.5.1 | Same as 6.3.5.1 |
| 6.3.5E.2 Power Control Relative power tolerance for UE category 0 | Same as 6.3.5.2 | Same as 6.3.5.2 | Same as 6.3.5.2 |
| 6.3.5E.3 Aggregate power control tolerance for UE category 0 | Same as 6.3.5.3 | Same as 6.3.5.3 | Same as 6.3.5.3 |
| 6.3.5EA.1 Power Control Absolute power tolerance for UE category M1 | <u>f ≤ 3.0GHz</u><br>Normal conditions ± 9.0 dB<br>Extreme conditions ± 12.0 dB | 1.0 dB<br>1.0 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>Normal conditions ± 10.0 dB<br>Extreme conditions ± 13.0 dB |

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| 6.3.5EA.2 Power Control Relative power tolerance for UE category M1 | TS 36.101 [2] clause 6.3.5.1<br><br>All combinations of PUSCH and PUCCH transitions:<br><br>ΔP < 2; ±2.5 dB<br>2 ≤ ΔP < 3; ±3.0 dB<br>3 ≤ ΔP < 4; ±3.5 dB<br>4 ≤ ΔP ≤ 10; ±4.0 dB<br>10 ≤ ΔP < 15; ±5.0 dB<br>15 ≤ ΔP; ±6.0 dB | 0.7 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br>All combinations of PUSCH and PUCCH transitions:<br><br>ΔP < 2; ±3.2 dB<br>2 ≤ ΔP < 3; ±3.7 dB<br>3 ≤ ΔP < 4; ±4.2 dB<br>4 ≤ ΔP < 10; ±4.7 dB<br>10 ≤ ΔP < 15; ±5.7 dB<br>15 ≤ ΔP; ±6.7 dB |
| 6.3.5EA.3 Aggregate power control tolerance for UE category M1 | Same as 6.3.5.3 | Same as 6.3.5.3 | Same as 6.3.5.3 |
| 6.3.5EA.3_1 Aggregate power control tolerance for UE category M1 (CE Mode B) | Same as 6.3.5.3 | Same as 6.3.5.3 | Same as 6.3.5.3 |
| 6.3.5EB.1 Power Control Absolute power tolerance for UE category 1bis | Same as 6.3.5.1 | Same as 6.3.5.1 | Same as 6.3.5.1 |
| 6.3.5EB.2 Power Control Relative power tolerance for UE category 1bis | Same as 6.3.5.2 | Same as 6.3.5.2 | Same as 6.3.5.2 |
| 6.3.5EB.3 Aggregate power control tolerance for UE category 1bis | Same as 6.3.5.3 | Same as 6.3.5.3 | Same as 6.3.5.3 |
| 6.3.5F.1 Power Control Absolute power tolerance for category NB1 | f ≤ 3.0GHz<br>Normal conditions ± 9.0 dB<br>Extreme conditions ± 12.0 dB | 1.0 dB<br>1.0 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>Normal conditions ± 10.0 dB<br>Extreme conditions ± 13.0 dB |
| 6.3.5F.2 Power Control Relative power tolerance for UE category NB1 | TS 36.101 [2] clause 6.3.5F.2<br><br>NPRACH transitions:<br><br>ΔP = 0; ±1.5 dB<br>ΔP = 2; ±2.0 dB<br>ΔP = 4; ±3.5 dB<br>ΔP = 6; ±4.0 dB | 0.7 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>NPRACH transitions:<br><br>ΔP = 0; ±2.2 dB<br>ΔP = 2; ±2.7 dB<br>ΔP = 4; ±4.2 dB<br>ΔP = 6; ±4.7 dB |
| 6.3.5G.1 Power Control Absolute power tolerance for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 4.2GHz < f ≤ 6GHz<br>Normal conditions ± 3.0 dB<br>Extreme conditions ± 6.0 dB | 2.0 dB<br>2.0 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>Normal conditions ± 5.0 dB<br>Extreme conditions ± 8.0 dB |
| 6.3.5G.2 Power Control Absolute power tolerance for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | f ≤ 3.0GHz<br>Normal conditions ± 9.0 dB<br>Extreme conditions ± 12.0 dB<br><br>4.2GHz < f ≤ 6GHz<br>Normal conditions ± 3.0 dB<br>Extreme conditions ± 6.0 dB | 1.0 dB<br>1.0 dB<br><br>2.0 dB<br>2.0 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>Normal conditions ± 10.0 dB<br>Extreme conditions ± 13.0 dB |

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| | | | Normal conditions ± 5.0 dB<br>Extreme conditions ± 8.0 dB |
| 6.3.5G.3 Power Control Absolute power tolerance for V2X Communication / Intra-band contiguous multi-carrier operation | 4.2GHz < f ≤ 6GHz<br>Normal conditions ± 3.0 dB<br>Extreme conditions ± 6.0 dB | 2.0 dB<br>2.0 dB | Formula:<br>Upper limit + TT, Lower limit – TT<br><br>Normal conditions ± 5.0 dB<br>Extreme conditions ± 8.0 dB |
| 6.5.1 Frequency Error | Modulated carrier, f ≤ 4.2GHz<br>Within ±0.1 ppm compared to the received carrier frequency<br><br>f ≤ 3.0GHz<br>DL power: Refsens<br><br>3.0GHz < f ≤ 4.2GHz<br>DL power: Refsens | 15 Hz<br><br>0.7 dB<br><br>1.0 dB | Formula:<br>Modulated carrier frequency: Upper limit + TT, Lower limit – TT<br>DL power: Refsens + TT<br><br>Modulated carrier frequency error = ±(0.1 ppm + 15 Hz)<br><br>Refsens +0.7dB<br><br>Refsens +1.0dB |
| 6.5.1A.1 Frequency error for CA (intra-band contiguous DL CA and UL CA) | Same as 6.5.1 | Same as 6.5.1 | Same as 6.5.1 |
| 6.5.1A.2 Frequency Error for CA (inter-band DL CA and UL CA) | Same as 6.5.1 per CC | Same as 6.5.1 per CC | Same as 6.5.1 per CC |
| 6.5.1A.3 Frequency Error for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.5.1 per CC | Same as 6.5.1 per CC | Same as 6.5.1 per CC |
| 6.5.1B Frequency Error for UL-MIMO | Same as 6.5.1 | Same as 6.5.1 | Same as 6.5.1 |
| 6.5.1D.1 Frequency Error for ProSe Direct Discovery | Modulated carrier, f ≤ 4.2GHz<br>Within ±0.1 ppm compared to the received carrier frequency<br><br>f ≤ 3.0GHz<br>Sidelink power: Refsens | 15 Hz<br><br>0.7 dB | Formula:<br>Modulated carrier frequency: Upper limit + TT, Lower limit – TT<br>Sidelink power: Refsens + TT<br><br>Modulated carrier frequency error = ±(0.1 ppm + 15 Hz)<br><br>Refsens +0.7dB |
| 6.5.1D.2 Frequency Error for ProSe Direct Communication | Same as 6.5.1D.1 | Same as 6.5.1D.1 | Same as 6.5.1D.1 |
| 6.5.1E Frequency Error for UE category 0 | Same as 6.5.1 | Same as 6.5.1 | Same as 6.5.1 |
| 6.5.1EA Frequency Error for UE category M1 | Same as 6.5.1 | Same as 6.5.1 | Same as 6.5.1 |
| 6.5.1F Frequency Error for category NB1 | Modulated carrier, f ≤ 3.0GHz<br>Within ±0.1 ppm compared to the received carrier frequency | 15 Hz | Formula:<br>Modulated carrier frequency: Upper limit + TT, Lower limit – TT<br>DL power: Refsens + TT<br><br>Modulated carrier frequency error = ±(0.1 ppm + 15 Hz) |

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| | f ≤ 3.0GHz<br>DL power: Refsens | 0.7 dB | Refsens +0.7dB |
| 6.5.1G.1 Frequency Error for V2X Communication / Non-concurrent with E-UTRA uplink transmission | Modulated carrier, f ≤ 6.0GHz<br>Within ±0.1 ppm compared to the received carrier frequency | 36 Hz | Formula:<br>Modulated carrier frequency: Upper limit + TT, Lower limit – TT<br>DL power: Refsens + TT<br><br>Modulated carrier frequency error = ±(0.1 ppm + 36 Hz) |
| 6.5.1G.2 Frequency error for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Modulated carrier, f ≤ 3.0GHz<br>Within ±0.1 ppm compared to the received carrier frequency<br><br>f ≤ 3.0GHz<br>DL power: Refsens<br><br>Modulated carrier, 4.2GHz <f ≤ 6.0GHz<br>Within ±0.1 ppm compared to the received carrier frequency<br><br>4.2GHz <f ≤ 6.0GHz<br>DL power: Refsens | 15 Hz<br><br>0.7 dB<br><br>36 Hz<br><br>1.5 dB | Formula:<br>Modulated carrier frequency: Upper limit + TT, Lower limit – TT<br>DL power: Refsens + TT<br><br>Modulated carrier frequency error = ±(0.1 ppm + 15 Hz)<br><br>Refsens +0.7 dB<br><br>Modulated carrier frequency error = ±(0.1 ppm + 36 Hz)<br><br>Refsens +1.5 dB |
| 6.5.2.1 Error Vector Magnitude | EVM limit:<br>BPSK :17.5 %<br>QPSK: 17.5 %<br>16QAM: 12.5 % | 0% | Formula:<br>Minimum Requirement + TT |
| 6.5.2.1_1 Error Vector Magnitude (EVM) for UL 64QAM | EVM limit:<br>64QAM: 8.0 % | 0% | Formula:<br>Minimum Requirement + TT |
| 6.5.2.1_2 Error Vector Magnitude (EVM) for UL 256QAM | EVM limit:<br>256QAM: 3.5 % | 0.3%, 15dBm < $P_{UL}$<br>0.8%, -25dBm < $P_{UL}$ ≤ 15dBm,<br>1.1%, -30dBm ≤ $P_{UL}$ ≤ -25dBm | Formula:<br>Minimum Requirement + TT |
| 6.5.2.1A PUSCH-EVM with exclusion period | EVM limit:<br>QPSK: 17.5 %<br>16QAM: 12.5 % | 0% | Formula:<br>Minimum Requirement + TT |
| 6.5.2A.1.1 Error Vector Magnitude (EVM) for CA (intra-band contiguous DL CA and UL CA) | Same as 6.5.2.1 | Same as 6.5.2.1 | Same as 6.5.2.1 |
| 6.5.2A.1.1_1 EVM for CA (intra-band contiguous DL CA and UL CA) with UL 64QAM | Same as 6.5.2.1_1 | Same as 6.5.2.1_1 | Same as 6.5.2.1_1 |
| 6.5.2A.1.1_2 EVM for CA (intra-band contiguous DL CA and UL CA) with UL 256QAM | EVM limit:<br>256QAM: 3.5 % | Same as 6.5.2.1_2 | Formula:<br>Minimum Requirement + TT |
| 6.5.2A.1.2 Error Vector Magnitude (EVM) for CA (inter-band DL CA and UL CA) | Same as 6.5.2.1 | Same as 6.5.2.1 | Same as 6.5.2.1 |
| 6.5.2A.1.2_1 EVM | Same as 6.5.2.1 | Same as 6.5.2.1 | Same as 6.5.2.1 |

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| for CA (inter-band DL CA and UL CA) with UL 64QAM | | | |
| 6.5.2A.1.2_2 Error Vector Magnitude (EVM) for CA (inter-band DL CA and UL CA) for UL 256QAM | EVM limit:<br>256QAM: 3.5 % | Same as 6.5.2.1_2 | Formula:<br>Minimum Requirement + TT |
| 6.5.2A.1.3 Error Vector Magnitude (EVM) for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.5.2.1 | Same as 6.5.2.1 | Same as 6.5.2.1 |
| 6.5.2A.1.3_1 EVM for CA (intra-band non-contiguous DL CA and UL CA) with UL 64QAM | Same as 6.5.2.1 | Same as 6.5.2.1 | Same as 6.5.2.1 |
| 6.5.2A.1.3_2 Error Vector Magnitude (EVM) for CA (intra-band non-contiguous DL CA and UL CA) for UL 256QAM | EVM limit:<br>256QAM: 3.5 % | Same as 6.5.2.1_2 | Formula:<br>Minimum Requirement + TT |
| 6.5.2A.1.4 Error Vector Magnitude (EVM) for CA (3UL CA) | Same as 6.5.2.1 | Same as 6.5.2.1 | Same as 6.5.2.1 |
| 6.5.2B.1 Error Vector Magnitude (EVM) for UL- MIMO | Same as 6.5.2.1 | Same as 6.5.2.1 | Same as 6.5.2.1<br><br>Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 6.5.2.1E.1 Error Vector Magnitude for UE category 0 | Same as 6.5.2.1 | Same as 6.5.2.1 | Same as 6.5.2.1 |
| 6.5.2.1E.2 PUSCH-EVM with exclusion period for UE category 0 | Same as 6.5.2.1A | Same as 6.5.2.1A | |
| 6.5.2.1EA.1 Error Vector Magnitude for UE category M1 | Same as 6.5.2.1 | Same as 6.5.2.1 | Same as 6.5.2.1 |
| 6.5.2.1EA.2 PUSCH-EVM with exclusion period for UE category M1 | Same as 6.5.2.1A | Same as 6.5.2.1A | |
| 6.5.2.1F.1 Error Vector Magnitude (EVM) for UE category NB1 | Same as 6.5.2.1 | Same as 6.5.2.1 | Same as 6.5.2.1 |
| 6.5.2.1G.1 Error Vector Magnitude (EVM) for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | EVM limit:<br>QPSK: 17.5 %<br>16QAM: 12.5 % | Same as 6.5.2.1 | Same as 6.5.2.1 |
| 6.5.2.1G.2 Error Vector Magnitude (EVM) for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink | EVM limit:<br>QPSK: 17.5 %<br>16QAM: 12.5 % | Same as 6.5.2.1 | Same as 6.5.2.1 |

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| transmissions | | | |
| 6.5.2.1G.3 Error Vector Magnitude (EVM) for V2X Communication / Intra-band contiguous multi-carrier operation | EVM limit:<br>QPSK: 17.5 %<br>16QAM: 12.5 % | Same as 6.5.2.1 | Same as 6.5.2.1 |
| 6.5.2.2 Carrier leakage | For Output power >0 dBm<br>-25dBc<br><br>For -30 dBm ≤ Output power ≤0 dBm<br>-20dBc<br><br>For -40 dBm ≤ Output power < -30 dBm<br>-10dBc | 0.8dB | Formula:<br>Minimum Requirement + TT |
| 6.5.2.2F Carrier leakage for UE category NB1 | Same as 6.5.2.2 | Same as 6.5.2.2 | Same as 6.5.2.2 |
| 6.5.2.2G.1 Carrier leakage for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | For Output power >0 dBm<br>-25dBc<br><br>For -30 dBm ≤ Output power ≤0 dBm<br>-20dBc | Same as 6.5.2.2 | Same as 6.5.2.2 |
| 6.5.2.3 In-band emissions for non allocated RB | For general emissions:<br>$\max\{ -25-10\cdot\log_{10}(N_{RB}/L_{CRBs}) 20\cdot\log_{10} EVM -3-5\cdot(\lvert\Delta_{RB}\rvert-1)/ -57\ dBm/180\,kHz - P_{RB}\}$<br>For IQ image:<br>-25dB<br><br>For Carrier leakage:<br><br>Output power >0 dBm<br>-25dBc<br><br>-30 dBm ≤ Output power ≤0 dBm<br>-20dBc<br><br>-40 dBm ≤ Output power < -30 dBm<br>-10dBc<br>For each evaluated RB, the test requirement is calculated as the higher of $P_{RB}-30$ dB and the power sum of all limit values (General, IQ Image or Carrier leakage) | 0.8dB | Formula:<br>Minimum Requirement + TT |
| 6.5.2.4 EVM equalizer Spectrum flatness | Normal conditions.<br><br>If (F-FUL_low ≥ [3MHz])&(FUL_high-F≥ [3MHz]) 4 dB<br>else<br>8 dB<br><br>maximum coefficient in Range 1 - the minimum coefficient in Range 2<br>5 dB<br>the maximum coefficient in Range 2 - the minimum coefficient in Range<br>7 dB<br>Extreme conditions: | 1.4dB | Formula:<br>Minimum Requirement + TT |

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| | If (F-FUL_low ≥ [5MHz])&(FUL_high-F≥ [5MHz]) 4 dB<br>else<br>12 dB<br><br>maximum coefficient in Range 1 - the minimum coefficient in Range 2<br>6 dB<br>the maximum coefficient in Range 2 - the minimum coefficient in Range<br>10 dB | | |
| 6.5.2A.2.1 Carrier leakage for CA (intra-band contiguous DL CA and UL CA) | Same as 6.5.2.2 | Same as 6.5.2.2 | Same as 6.5.2.2 |
| 6.5.2A.2.2 Carrier leakage for CA (inter-band DL CA and UL CA) | For Output power >0 dBm<br>-25dBc<br><br>For -30 dBm ≤ Output power ≤0 dBm<br>-20dBc<br><br>For -40 dBm ≤ Output power < -30 dBm<br>-10dBc | 0.8dB | Formula:<br>Minimum Requirement + TT |
| 6.5.2A.2.3 Carrier leakage for CA (intra-band non-contiguous DL CA and UL CA) | For Output power >0 dBm<br>-25dBc<br><br>For -30 dBm ≤ Output power ≤0 dBm<br>-20dBc<br><br>For -40 dBm ≤ Output power < -30 dBm<br>-10dBc | 0.8dB | Formula:<br>Minimum Requirement + TT |
| 6.5.2A.2.4 Carrier leakage for CA (3UL CA) | Same as 6.5.2.2 | Same as 6.5.2.2 | Same as 6.5.2.2 |
| 6.5.2A.3.1 In-band emissions for non allocated RB for CA (intra-band contiguous DL CA and UL CA) | Same as 6.5.2.3 | Same as 6.5.2.3 | Same as 6.5.2.3 |
| 6.5.2A.3.2 In-band emissions for non allocated RB for CA (inter-band DL CA and UL CA) | Same as 6.5.2.3 | Same as 6.5.2.3 | Same as 6.5.2.3 |
| 6.5.2A.3.3 In-band emissions for non allocated RB for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.5.2.3 | Same as 6.5.2.3 | Same as 6.5.2.3 |
| 6.5.2A.3.4 In-band emissions for non allocated RB for CA (3UL CA) | Same as 6.5.2.3 | Same as 6.5.2.3 | Same as 6.5.2.3 |
| 6.5.2B.1 Error vector magnitude (EVM) for UL-MIMO | TBD | TBD | TBD |
| 6.5.2B.2 Carrier leakage for UL- | Same as 6.5.2.2 | Same as 6.5.2.2 | Same as 6.5.2.2 |

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| MIMO | | | Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 6.5.2B.3 In-band emissions for non allocated RB for UL-MIMO | Same as 6.5.2.3 | Same as 6.5.2.3 | Same as 6.5.2.3<br><br>Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 6.5.2B.4 EVM equalizer spectrum flatness for UL-MIMO | Same as 6.5.2.4 | Same as 6.5.2.4 | Same as 6.5.2.4 |
| 6.5.2.2E Carrier Leakage for UE category 0 | Same as 6.5.2.2 | Same as 6.5.2.2 | Same as 6.5.2.2 |
| 6.5.2.2EA Carrier Leakage for UE category M1 | Same as 6.5.2.2 | Same as 6.5.2.2 | Same as 6.5.2.2 |
| 6.5.2.3E In-band emissions for non allocated RB for UE category 0 | Same as 6.5.2.3 | Same as 6.5.2.3 | Same as 6.5.2.3 |
| 6.5.2.3EA In-band emissions for non allocated RB for UE category M1 | Same as 6.5.2.3 | Same as 6.5.2.3 | Same as 6.5.2.3 |
| 6.5.2.3F In-band emissions for non allocated RB for UE category NB1 | For general emissions:<br>$\max\{ -15-10\cdot\log_{10}(N_{tone}/L_{Ctone}$<br>$-18-5\cdot(\lvert\Delta_{tone}\rvert-1)/L_{Ctone}$,<br>$-57\ dBm/(3.75kHz\ or\ 15kHz)-P$<br><br>For IQ image:<br>-25dB<br><br>For Carrier leakage:<br><br>Output power >0 dBm<br>-25dBc<br><br>-30 dBm ≤ Output power ≤0 dBm<br>-20dBc<br><br>-40 dBm ≤ Output power < -30 dBm<br>-10dBc<br>For each evaluated tone, the test requirement is calculated as the higher of $P_{tone}-30$ dB and the power sum of all limit values (General, IQ Image or Carrier leakage) | Same as 6.5.2.3 | Same as 6.5.2.3 |
| 6.5.2.3G.1 In-band emissions for non-allocated RB for V2X Communication | For general emissions:<br>$\max\{ -25-10\cdot\log_{10}(N_{RB}/L_{CRBs}$<br>$20\cdot\log_{10}EVM-3-5\cdot(\lvert\Delta_{RB}\rvert-1)/$<br>$-57\ dBm/180\ kHz-P_{RB}\}$<br>For IQ image:<br>-25dB<br><br>For Carrier leakage: | Emission:<br>0.8dB | Formula for emission:<br>Minimum Requirement + TT |

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| | Output power >0 dBm<br>-25dBc<br><br>-30 dBm ≤ Output power ≤0 dBm<br>-20dBc<br><br>For each evaluated RB, the test requirement is calculated as the higher of $P_{RB} - 30$ dB and the power sum of all limit values (General, IQ Image or Carrier leakage)<br><br>Sidelink Power Window<br>>= 0dBm, (-30 dBm, 0 dBm)<br><br>E-UTRA Uplink Power Window<br>>= 0dBm, (-30 dBm, 0 dBm) | Sidelink Power:<br><br>Absolute Transmitted Power tolerance: ±3dB referring to the TS 36.101 [2] clasue 6.3.5G.1<br><br>Wanted signal uncertainty:<br>±1.3 dB 4.2GHz < f ≤ 6.0GHz,<br>for UE powers >= 0dBm<br><br>±1.5 dB, 4.2GHz < f ≤ 6.0GHz, for UE powers >= -40dBm<br><br>Uplink power<br><br>Relative Transmitted Power | Sidelink power measurement window:<br>Bottom of the window: the Configured sidelink power - TT of sidelink power<br><br>Top of the window: the Configured sidelink power + TT of sidelink power<br><br>TT of sidelink power comprises 2 quantities:<br>1. Absolute Transmitted Power tolerance :±3dB<br>2. Test system power measurement uncertainty:<br>±1.3 dB 4.2GHz < f ≤ 6.0GHz for UE powers>= 0dBm.<br><br>±1.5 dB 4.2GHz < f ≤ 6.0GHz, for UE powers >= -40dBm<br><br>Items 1 and 2 are added arithmetically:<br>TT of sidelink power:<br>(3dB+1.3dB) =4.3dB,<br>4.2GHz < f ≤ 6.0GH for UE powers >= 0 dBm:<br><br>TT of sidelink power:<br>(3dB+1.5dB) =4.5dB,<br>4.2GHz < f ≤ 6.0GH for powers >= -40 dBm:<br><br>Ensure the bottom of the sidelink power measurement window is aligned with the bottom of the sidelink power window of the corresponding IBE requirement, and the top of the sidelink power measurement window is below the top of sidelink power window.<br><br>Uplink power measurement window:<br>Bottom of the window: the Configured sidelink power - TT of sidelink power |

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| | | tolerance: ±2.5dB referting to the TS 36.101 [2] clasue 6.3.5.2<br><br>Test system power measurement uncertainty:<br><br>±0.7 dB, f ≤ 3.0GHz<br>±1.0 dB, 3.0GHz < f ≤ 4.2GHz<br>±1.3 dB, 4.2GHz < f ≤ 6GHz | Top of the window: the Configured sidelink power + TT of sidelink power<br><br>TT of uplink power comprises 2 quantities:<br>1. Relative Transmitted Power tolerance :±2.5dB<br>2. Test system power measurement uncertainty:<br>±0.7 dB for f ≤ 3.0GHz.<br>±1 dB for 3.0GHz < f ≤ 4.2GHz<br><br>Items 1 and 2 are added arithmetically:<br><br>For f ≤ 3.0GHz<br>TT of uplink power:<br>(2.5dB+0.7dB) =3.2dB<br><br>For 3.0GHz < f ≤ 4.2GHz<br>TT of uplink power:<br>(2.5dB+1dB) =3.5dB,<br><br>Ensure the bottom of the uplink power measurement window is aligned with the bottom of the uplink power window of the corresponding IBE requirement, and the top of the uplink power measurement window is below the top of uplink power window. |
| 6.5.2.3G.2 In-band emissions for non-allocated RB for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | same as 6.5.2.3 for E-UTRA uplink<br>same as 6.5.2.3G.1 for E-UTRA V2X sidelink | same as 6.5.2.3 for E-UTRA uplink<br>same as 6.5.2.3G.1 for E-UTRA V2X sidelink | same as 6.5.2.3 for E-UTRA uplink<br>same as 6.5.2.3G.1 for E-UTRA V2X sidelink |
| 6.5.2.3G.3 In-band emissions for non-allocated RB for V2X Communication / Intra-band contiguous MCC operation | same as 6.5.2.3G.1 for each cc of E-UTRA V2X sidelink | same as 6.5.2.3G.1 for each cc of E-UTRA V2X sidelink | same as 6.5.2.3G.1 for each cc of E-UTRA V2X sidelink |
| 6.5.2.4E EVM equalizer spectrum flatness for UE category 0 | Same as 6.5.2.4 | Same as 6.5.2.4 | Same as 6.5.2.4 |
| 6.5.2.4EA EVM equalizer spectrum flatness for UE category M1 | Same as 6.5.2.4 | Same as 6.5.2.4 | Same as 6.5.2.4 |
| 6.5.2.4G.1 EVM equalizer spectrum flatness for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Same as 6.5.2.4 | Same as 6.5.2.4 | Same as 6.5.2.4 |
| 6.5.2.4G.3 EVM equalizer spectrum | Same as 6.5.2.4 | Same as 6.5.2.4 | Same as 6.5.2.4 |

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| flatness for V2X Communication / Intra-band contiguous multi-carrier operation uplink transmissions | | | |
| 6.6.1 Occupied bandwidth | For 1.4 MHz channel bandwidth: Occupied channel bandwidth = 1.4 MHz<br><br>For 3.0 MHz channel bandwidth: Occupied channel bandwidth = 3.0 MHz<br><br>For 5 MHz channel bandwidth: Occupied channel bandwidth = 5 MHz<br><br>For 10 MHz channel bandwidth: Occupied channel bandwidth = 10 MHz<br><br>For 15 MHz channel bandwidth: Occupied channel bandwidth = 15 MHz<br><br>For 20 MHz channel bandwidth: Occupied channel bandwidth = 20 MHz | 0kHz | Formula:<br>Minimum Requirement + TT |
| 6.6.1A.1 Occupied bandwidth for CA (intra-band contiguous DL CA and UL CA) | For 25(20+5) MHz channel bandwidth:<br>Occupied channel bandwidth = 24.95 MHz<br><br>For 30(20+10) MHz channel bandwidth:<br>Occupied channel bandwidth = 29.90 MHz<br><br>For 30(15+15) MHz channel bandwidth:<br>Occupied channel bandwidth = 30.00 MHz<br><br>For 35(20+15)MHz channel bandwidth:<br>Occupied channel bandwidth = 34.85 MHz<br><br>For 40(20+20) MHz channel bandwidth:<br>Occupied channel bandwidth = 39.80 MHz | Same as 6.6.1 | Same as 6.6.1 |
| 6.6.1A.2 Occupied bandwidth for CA (inter-band DL CA and UL CA) | Same as 6.6.1 per CC | Same as 6.6.1 per CC | Same as 6.6.1 per CC |
| 6.6.1A.3 | Same as 6.6.1 for each CC | Same as 6.6.1 | Same as 6.6.1 for each CC |
| 6.6.1B Occupied bandwidth for UL-MIMO | Same as 6.6.1 | Same as 6.6.1 | Same as 6.6.1 |
| 6.6.1E Occupied bandwidth for UE category 0 | Same as 6.6.1 | Same as 6.6.1 | Same as 6.6.1 |
| 6.6.1EA Occupied bandwidth for UE category M1 | Same as 6.6.1 | Same as 6.6.1 | Same as 6.6.1 |

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| 6.6.1EB Occupied bandwidth for UE category 1bis | Same as 6.6.1 | Same as 6.6.1 | Same as 6.6.1 |
| 6.6.1F Occupied bandwidth for UE category NB1 | Occupied channel bandwidth = 200KHz | 0kHz | Formula:<br>Minimum Requirement + TT |
| 6.6.1G.1 Occupied bandwidth for V2X Communication / Non-concurrent with E-UTRA uplink transmission | Same as 6.6.1 | Same as 6.6.1 | Same as 6.6.1 |
| 6.6.1G.2 Occupied bandwidth for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Same as 6.6.1 | Same as 6.6.1 | Same as 6.6.1 |
| 6.6.1G.3 Occupied bandwidth for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 6.6.1 | Same as 6.6.1 | Same as 6.6.1 |
| 6.6.2.1 Spectrum Emission Mask | For 1.4 MHz BW:<br>-10 dBm / 30kHz<br>-25dBm to -10dBm / 1MHz<br>For 3 MHz BW:<br>-13 dBm / 30kHz<br>-25dBm to -10dBm / 1MHz<br>For 5 MHz BW:<br>-15dBm / 30kHz<br>-25dBm to -10dBm / 1MHz<br>For 10 MHz BW:<br>-18dBm / 30kHz<br>-25dBm to -10dBm / 1MHz<br>For 15 MHz BW:<br>-20dBm / 30kHz<br>-25dBm to -10dBm / 1MHz<br>For 20 MHz BW:<br>-21dBm / 30kHz<br>-25dBm to -10dBm / 1MHz | All cases:<br><br>f ≤ 3.0GHz<br>1.5dB<br><br>3.0GHz < f ≤ 4.2GHz<br>1.8dB | Formula:<br>Minimum Requirement + TT<br><br>Note: The Test Tolerance would be 0dB for $\Delta f_{OOB} \geq 2$ x Channel Bandwidth, but taking into account the filter position, the Test requirements specified all have $\Delta f_{OOB} < 2$ x Channel Bandwidth |
| 6.6.2.1_1 Spectrum Emission Mask for Multi-Cluster PUSCH | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.1A.1 Spectrum emission mask for CA (intra-band contiguous DL CA and UL CA) | For 24.95 MHz BW:<br>-22 dBm / 30kHz<br>-25 dBm to - 10 dBm / 1 MHz<br>For 29.9 MHz BW:<br>-22.5 dBm / 30kHz<br>-25dBm to -10dBm / 1MHz<br>For 30 MHz BW:<br>-22.5 dBm / 30kHz<br>-25dBm to -10dBm / 1MHz<br>For 34.85 MHz BW:<br>-23.5dBm / 30kHz<br>-25dBm to -10dBm / 1MHz<br>For 39.8 MHz BW:<br>-24dBm / 30kHz<br>-25dBm to -10dBm / 1MHz | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.1A.2 Spectrum emission mask for CA (inter-band DL CA and UL CA) | Same as 6.6.2.1 per CC | Same as 6.6.2.1 per CC | Same as 6.6.2.1 per CC |
| 6.6.2.1A.3 Spectrum Emission Mask for | Same as 6.6.2.1 for each CC | Same as 6.6.2.1 | Same as 6.6.2.1 for each CC |

| | | | |
|---|---|---|---|
| CA (intra-band non-contiguous DL CA and UL CA) | | | |
| 6.6.2.1B Spectrum Emission Mask for UL-MIMO | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.1E Spectrum Emission Mask for UE category 0 | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.1EA Spectrum Emission Mask for UE category M1 | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.1EB Spectrum Emission Mask for UE category 1bis | Same as 6.6.2.1 | Same as 6.6.2.1 | Same as 6.6.2.1 |
| 6.6.2.1F Spectrum Emission Mask for UE category NB1 | For all frequencies -35dBm to 26dBm / 30kHz<br><br>For frequencies that are Foffset away from edge of NB1 channel edge as defined in Table 6.6.2.1F.3-2, same as 6.6.2.1 | All cases:<br><br>f ≤ 3.0GHz<br>1.5dB | For all frequencies interpolated Minimum Requirement + TT |
| 6.6.2.1G.1 Spectrum Emission Mask for V2X Communication Non-concurrent with E-UTRA uplink transmissions | Bandwidth: 10MHz<br>-20dBm /30kHz<br>-25 ~ -10 / 1 MHz<br><br>Bandwidth: 20MHz<br>-21dBm /30kHz<br>-25 ~ -10 / 1 MHz | ±2.0 dB, 4.2GHz < f ≤ 6GHz | Formula:<br>Minimum Requirement + TT<br><br>Note: The Test Tolerance would be 0dB for $\Delta f_{OOB} \geq 2$ x Channel Bandwidth, but taking into account the filter position, the Test requirements specified all have $\Delta f_{OOB} < 2$ x Channel Bandwidth |
| 6.6.2.1G.2 Spectrum Emission Mask for V2X Communication /Sidelink simultaneous with E-UTRA uplink transmissions | Same as 6.6.2.1G.1 for sidelink<br>Same as 6.6.2.1G.1 for E-UTRA uplink | Same as 6.6.2.1G.1 | Same as 6.6.2.1G.1 |
| 6.6.2.1G.3 Spectrum Emission Mask for V2X Communication / Intra-band contiguous MCC operation | Same as 6.6.2.1G.1 | Same as 6.6.2.1G.1 | Same as 6.6.2.1G.1 |
| 6.6.2.2 Additional Spectrum Emission Mask | For 1.4 MHz BW:<br>NS_03, NS_04<br>-10 dBm / 30 kHz<br>-25 dBm to -13 dBm / 1MHz<br><br>NS_06 or NS_07<br>-13 dBm / 30 kHz<br>-13 dBm / 100 kHz<br>-25 dBm to -13 dBm / 1MHz<br><br>For 3 MHz BW:<br>NS_03, NS_04<br>-13 dBm / 30 kHz<br>-25 dBm to -13 dBm / 1 MHz<br><br>NS_06 or NS_07<br>-13 dBm / 30 kHz<br>-13 dBm / 100kHz<br>-25 dBm to -13 dBm / 1 MHz<br><br>For 5 MHz BW:<br>NS_03, NS_04 | All cases:<br><br>f ≤ 3.0GHz<br>1.5dB<br><br>3.0GHz < f ≤ 4.2GHz<br>1.8dB<br><br>4.2GHz < f ≤ 6.0GHz<br>±2.0 dB | Formula:<br>Minimum Requirement + TT<br><br>Note: The Test Tolerance would be 0dB for $\Delta f_{OOB} \geq 2$ x Channel Bandwidth, but taking into account the filter position, the Test requirements specified all have $\Delta f_{OOB} < 2$ x Channel Bandwidth |

| | | | |
|---|---|---|---|
| | -15 dBm / 30 kHz<br>-25 dBm to -13 dBm / 1 MHz<br><br>NS_06 or NS_07<br>-15 dBm / 30 kHz<br>-13 dBm / 100 kHz<br>-25 dBm to -13 dBm / 1 MHz<br><br>For 10 MHz BW:<br>NS_03, NS_04,<br>-18 dBm / 30 kHz<br>-25 dBm to - 13dBm / 1 MHz<br><br>NS_06 or NS_07<br>-18 dBm / 30 kHz<br>-13 dBm / 100 kHz<br>-25 dBm to - 13dBm / 1 MHz<br><br>For 15 MHz BW:<br>NS_03, NS_04<br>-20 dBm / 30kHz<br>-25 dBm to -13 dBm / 1 MHz<br><br>For 20 MHz BW:<br>NS_03, NS_04<br>-21 dBm / 30 kHz<br>-25 dBm to -13 dBm / 1 MHz | | |
| 6.6.2.2_1 Additional Spectrum Emission Mask for UL 64QAM | Same as 6.6.2.2 | Same as 6.6.2.2 | Same as 6.6.2.2 |
| 6.6.2.2_2 Additional Spectrum Emission Mask for UL 256QAM | Same as 6.6.2.2 | Same as 6.6.2.2 | Same as 6.6.2.2 |
| 6.6.2.2A-1 Additional Spectrum Emission Mask for CA (intra-band contiguous DL CA and UL CA) | For network signalled value CA_NS_04:<br>-21dBm/30kHz to -22.5dBm/kHz, BW-dependent, for 0-1MHz<br>-13dBm/1MHz for 1MHz-5.5MHz<br>-25dBm/1MHz beyond 5.5MHz | Same as 6.6.2.2 | Same as 6.6.2.2 |
| 6.6.2.2A.1_1 Additional Spectrum Emission Mask for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | Same as 6.6.2.2A.1 | Same as 6.6.2.2A.1 | Same as 6.6.2.2A.1 |
| 6.6.2.2A.1_2 Additional Spectrum Emission Mask for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM | Same as 6.6.2.2A.1 | Same as 6.6.2.2A.1 | Same as 6.6.2.2A.1 |
| 6.6.2.2A.2 Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA) | Same as 6.6.2.2 | Same as 6.6.2.2 | Same as 6.6.2.2 |
| 6.6.2.2A.2_1 Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA) for UL 64QAM | Same as 6.6.2.2 | Same as 6.6.2.2 | Same as 6.6.2.2 |
| 6.6.2.2A.2_2 Additional Spectrum Emission Mask for | Same as 6.6.2.2 | Same as 6.6.2.2 | Same as 6.6.2.2 |

| | | | |
|---|---|---|---|
| CA (inter-band DL CA and UL CA) for UL 256QAM | | | |
| 6.6.2.2A.3 Additional Spectrum Emission Mask for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.6.2.2 | Same as 6.6.2.2 | Same as 6.6.2.2 |
| 6.6.2.2B Additional Spectrum Emission Mask for UL-MIMO | Same as 6.6.2.2 | Same as 6.6.2.2 | Same as 6.6.2.2 |
| 6.6.2.2E Additional Spectrum Emission Mask for UE category 0 | Same as 6.6.2.2 | Same as 6.6.2.2 | Same as 6.6.2.2 |
| 6.6.2.2EA Additional Spectrum Emission Mask for UE category M1 | Same as 6.6.2.2 | Same as 6.6.2.2 | Same as 6.6.2.2 |
| 6.6.2.2EB Additional Spectrum Emission Mask for UE category 1bis | Same as 6.6.2.2 | Same as 6.6.2.2 | Same as 6.6.2.2 |
| 6.6.2.2G.1 Additional Spectrum Emission Mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | $\Delta f_{OOB}$(MHz)<br>± 0-0.5 $[-13 - 12(\lvert \Delta f_{OOB} \rvert / MHz)]$<br><br>$\Delta f_{OOB}$(MHz)<br>± 0.5-5<br>$[-19 - \frac{16}{9}(\lvert \Delta f_{OOB} \rvert / MHz - 0.5)]$<br><br>$\Delta f_{OOB}$(MHz)<br>± 5-10<br>$[-27 - 2(\lvert \Delta f_{OOB} \rvert / MHz - 5.0)]$ | Same as 6.6.2.2 | Formula:<br>Minimum Requirement + TT |
| 6.6.2.2G.2 Additional Spectrum Emission Mask for V2X Communication / Sidelink simultaneous with E-UTRA uplink transmissions | same as 6.6.2.2 for E-UTRA uplink<br>same as 6.6.2.2G.1 for sidelink | same as 6.6.2.2 for E-UTRA uplink<br>same as 6.6.2.2G.1 for sidelink | Formula:<br>Minimum Requirement + TT |
| 6.6.2.3 Adjacent Channel Leakage power Ratio | If the adjacent channel power is greater than –50 dBm then the ACLR shall be higher than the values specified below.<br><br>E-UTRA ACLR:<br>30 dB<br><br>UTRA ACLR:<br>33 dB for UTRA ACLR 1<br>36 dB for UTRA ACLR 2 | 0 dB<br><br><br><br><br>0.8 dB<br><br><br>0.8 dB<br>0.8 dB | Formula:<br>ACLR Minimum Requirement + TT<br><br>Formula:<br>ACLR Minimum Requirement - TT<br>E-UTRA ACLR:<br>29.2 dB<br><br>UTRA ACLR:<br>32.2 dB for UTRA ACLR 1<br>35.2 dB for UTRA ACLR 2 |
| 6.6.2.3_1 Adjacent Channel Leakage power Ratio for HPUE | If the adjacent channel power is greater than –50 dBm then the ACLR shall be higher than the values specified below.<br><br>E-UTRA ACLR for Power Class 1:<br>37 dB<br>E-UTRA ACLR for Power Class 2:<br>31 dB | 0dB<br><br><br><br><br>0.8dB | Formula:<br>ACLR Minimum Requirement + TT<br><br>Formula:<br>ACLR Minimum Requirement - TT<br>E-UTRA ACLR for Power Class 1:<br>36.2 dB<br>E-UTRA ACLR for Power Class 2: |

| | | | |
|---|---|---|---|
| | | | 30.2 dB |
| 6.6.2.3_2 Adjacent Channel Leakage power Ratio for Multi-Cluster PUSCH | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3_3 Adjacent Channel Leakage power Ratio for UL 64QAM | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3_4 Adjacent Channel Leakage power Ratio for Multi-Cluster PUSCH with UL 64QAM | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3_5 Adjacent Channel Leakage power Ratio for UL 256QAM | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3_6 Adjacent Channel Leakage power Ratio for Multi-Cluster PUSCH with UL 256QAM | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3A.1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA) | If the adjacent channel power is greater than –50 dBm then the ACLR shall be higher than the values specified below.<br><br>UTRA ACLR:<br>33 dB for UTRA ACLR 1<br>36 dB for UTRA ACLR 2<br><br>E-UTRA ACLR:<br>30 dB | 0 dB<br><br>0.8 dB<br>0.8 dB<br><br>0.8 dB | Formula:<br>ACLR Minimum Requirement + TT<br><br>Formula:<br>ACLR Minimum Requirement - TT<br><br>UTRA ACLR:<br>32.2 dB for UTRA ACLR 1<br>35.2 dB for UTRA ACLR 2<br><br>E-UTRA ACLR:<br>29.2 dB |
| 6.6.2.3A.1_1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | Same as 6.6.2.3A.1 | Same as 6.6.2.3A.1 | Same as 6.6.2.3A.1 |
| 6.6.2.3A.1_2 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM | Same as 6.6.2.3A.1 | Same as 6.6.2.3A.1 | Same as 6.6.2.3A.1 |
| 6.6.2.3A.2 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA) | Same as 6.6.2.3 per component carrier<br><br>E-UTRA ACLR2:<br>40dB | Same as 6.6.2.3 per component carrier<br><br>1.3dB | Same as 6.6.2.3 per component carrier<br><br>E-UTRA ACLR:<br>38.7 dB |
| 6.6.2.3A.2_1 Adjacent Channel Leakage power Ratio for CA (inter-band DL CA and UL CA) for UL 64QAM | Same as 6.6.2.3 per component carrier | Same as 6.6.2.3 per component carrier | Same as 6.6.2.3 per component carrier |
| 6.6.2.3A.2_2 | Same as 6.6.2.3A.2 | Same as 6.6.2.3A.2 | Same as 6.6.2.3A.2 |

| | | | |
|---|---|---|---|
| Adjacent Channel Leakage power Ratio for CA (inter-band DL CA and UL CA) for UL 256QAM | | | |
| 6.6.2.3A.3 Adjacent Channel Leakage power Ratio for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3A.3_1 Adjacent Channel Leakage power Ratio for CA (intra-band non-contiguous DL CA and UL CA) for UL 64QAM | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3A.4.1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous 3DL CA and 3UL CA) | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3A.4.2 Adjacent Channel Leakage power Ratio for CA (inter-band 3DL CA and 3UL CA) | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3A.4.3 Adjacent Channel Leakage power Ratio for CA (intra-band non-contiguous 3DL CA and 3UL CA) | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3B Adjacent Channel Leakage power Ratio for UL-MIMO | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3E Adjacent Channel Leakage power Ratio for UE category 0 | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3EA Adjacent Channel Leakage power Ratio for UE category M1 | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3EB Adjacent Channel Leakage power Ratio for UE category 1bis | Same as 6.6.2.3 | Same as 6.6.2.3 | Same as 6.6.2.3 |
| 6.6.2.3F Adjacent Channel Leakage power Ratio for UE category NB1 | If the adjacent channel power is greater than –50 dBm then the ACLR shall be higher than the values specified below.<br><br>GSM ACLR:<br>20 dB<br><br>UTRA ACLR:<br>37 dB for UTRA ACLR | 0 dB<br><br>0.8 dB<br><br>0.8 dB | Formula:<br>ACLR Minimum Requirement + TT<br><br>Formula:<br>ACLR Minimum Requirement - TT<br>GSM ACLR:<br>19.2 dB<br><br>UTRA ACLR:<br>36.2 dB for UTRA ACLR |
| 6.6.2.3G.1 Adjacent Channel Leakage | If the adjacent channel power is greater than –50 dBm then the | | Formula:<br>ACLR Minimum |

| | | | |
|---|---|---|---|
| power Ratio for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | ACLR shall be higher than the values specified below.<br><br>E-UTRA ACLR:<br>30dB for power class 3 UE<br>31dB for power class 2 UE | <br><br><br>0.8 dB<br>0.8 dB | Requirement + TT<br><br>Formula:<br>ACLR Minimum Requirement - TT<br>E-UTRA ACLR:<br>29.2dB for power class 3 UE<br>30.2dB for power class 2 UE |
| 6.6.2.3G.2 Adjacent Channel Leakage power Ratio for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Same as 6.6.2.3G.1 | Same as 6.6.2.3G.1 | Same as 6.6.2.3G.1 |
| 6.6.2.4 Additional ACLR requirements | If the adjacent channel power is greater than –50 dBm then the ACLR shall be higher than the values specified below.<br><br>E-UTRA ACLR:<br>43 dB for UTRA ACLR 2 | 0 dB<br><br>0.8 dB | Formula:<br>ACLR Minimum Requirement + TT<br><br>Formula:<br>ACLR Minimum Requirement – TT<br><br>E-UTRA ACLR:<br>42.2 dB for UTRA ACLR 2 |
| 6.6.3.1 Transmitter Spurious emissions | 9 kHz ≤ f < 150 kHz:<br>-36dBm / 1kHz<br>150 kHz ≤ f < 30 MHz:<br>-36dBm / 10kHz<br>30 MHz ≤ f < 1 GHz:<br>-36dBm / 100kHz<br>1 GHz ≤ f < 12.75 GHz:<br>-30dBm / 1MHz<br>12.75 GHz ≤ f < 19 GHz:<br>-30dBm / 1MHz | 0 dB | Formula:<br>Minimum Requirement + TT |
| 6.6.3.1_1Transmitter Spurious emissions for Multi-Cluster PUSCH | Same as 6.6.3.1 | Same as 6.6.3.1 | Formula:<br>Minimum Requirement + TT |
| 6.6.3.1A.1 Transmitter Spurious emissions for CA (intra-band contiguous DL CA and UL CA) | Same as 6.6.3.1 | Same as 6.6.3.1 | Same as 6.6.3.1 |
| 6.6.3.1A.2 Transmitter Spurious emissions for CA (inter-band DL CA and UL CA) | Same as 6.6.3.1 per CC | Same as 6.6.3.1 per CC | Same as 6.6.3.1 per CC |
| 6.6.3.1A.3 Transmitter Spurious emissions for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.6.3.1 per CC | Same as 6.6.3.1 per CC | Same as 6.6.3.1 per CC |
| 6.6.3.1A.4.1 Transmitter Spurious | Same as 6.6.3.1 per CC | Same as 6.6.3.1 per CC | Same as 6.6.3.1 per CC |

| | | | |
|---|---|---|---|
| emissions for CA (3UL CA) (intra-band contiguous 3DL CA and 3UL CA) | | | |
| 6.6.3.1A.4.2 Transmitter Spurious emissions for CA (3UL CA) (inter-band 3DL CA and 3UL CA) | Same as 6.6.3.1 per CC | Same as 6.6.3.1 per CC | Same as 6.6.3.1 per CC |
| 6.6.3.1A.4.3 Transmitter Spurious emissions for CA (3UL CA) (intra-band non-contiguous 3DL CA and 3UL CA) | Same as 6.6.3.1 per CC | Same as 6.6.3.1 per CC | Same as 6.6.3.1 per CC |
| 6.6.3B.1Transmitter Spurious emissions for UL-MIMO | Same as 6.6.3.1 | Same as 6.6.3.1 | Formula:<br>Minimum Requirement + TT |
| 6.6.3E.1 Transmitter Spurious emissions for UE category 0 | Same as 6.6.3.1 | Same as 6.6.3.1 | Same as 6.6.3.1 |
| 6.6.3F.1 Transmitter Spurious emissions for UE category NB1 | Same as 6.6.3.1 | Same as 6.6.3.1 | Same as 6.6.3.1 |
| 6.6.3EA.1 Transmitter Spurious emissions for UE category M1 | Same as 6.6.3.1 | Same as 6.6.3.1 | Same as 6.6.3.1 |
| 6.6.3EB.1 Transmitter Spurious emissions for UE category 1bis | Same as 6.6.3.1 | Same as 6.6.3.1 | Same as 6.6.3.1 |
| 6.6.3EB.2 Spurious emission band UE co-existence for UE category 1bis | Same as 6.6.3.2 | Same as 6.6.3.2 | Same as 6.6.3.2 |
| 6.6.3EB.3 Additional spurious emissions for UE category 1bis | Same as 6.6.3.3 | Same as 6.6.3.3 | Same as 6.6.3.3 |
| 6.6.3G.1 Transmitter Spurious emissions for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 9 kHz ≤ f < 150 kHz:<br>-36dBm / 1kHz<br>150 kHz ≤ f < 30 MHz:<br>-36dBm / 10kHz<br>30 MHz ≤ f < 1 GHz:<br>-36dBm / 100kHz<br>1 GHz ≤ f < 12.75 GHz:<br>-30dBm / 1MHz<br>12.75 GHz ≤ f < 26 GHz:<br>-30dBm / 1MHz | 0 dB | Formula:<br>Minimum Requirement + TT |
| 6.6.3G.3 Spurious emission for V2X Communication / Intra-band contiguous MCC operation | Same as 6.6.3G.1 | Same as 6.6.3G.1 | |
| 6.6.3G.3_1 Spurious emission for V2X Communication / Intra-band contiguous MCC operation | Same as 6.6.3G.1 | Same as 6.6.3G.1 | Formula:<br>Minimum Requirement + TT |
| 6.6.3.2 Spurious emission band UE co-existence | -35 dBm / 6.25kHz<br><br>-36 dBm / 100kHz<br><br>-41 dBm / 300kHz | 0 dB | Formula:<br>Minimum Requirement + TT |

| | | | |
|---|---|---|---|
| | -37 dBm / 1MHz<br>-40 dBm / 1MHz<br>-50 dBm / 1MHz<br><br>Frequencies as detailed in core requirement | | |
| 6.6.3.2A.1 Spurious emission band UE co-existence for CA (intra-band contiguous DL CA and UL CA) | -35 dBm / 6.25kHz<br><br>-36 dBm / 100kHz<br><br>-41 dBm / 300kHz<br><br>-37 dBm / 1MHz<br>-40 dBm / 1MHz<br>-50 dBm / 1MHz<br><br>-15.5 dBm / 5MHz<br>+1.6 dBm /5MHz<br><br>Frequencies as detailed in core requirement | 0 dB | Formula:<br>Minimum Requirement + TT |
| 6.6.3.2A.3 Spurious emission band UE co-existence for CA (intra-band non-contiguous DL CA and UL CA) | Same as 6.6.3.2 | Same as 6.6.3.2 | Formula:<br>Minimum Requirement + TT |
| 6.6.3.3 Additional spurious emissions | NS_05<br>1884.5MHz ≤ f ≤ 1915.7MHz:<br>-41dBm / 300kHz<br>NS_07<br>769MHz ≤ f ≤ 775MHz<br>-57dBm / 6.25kHz<br>NS_08<br>860MHz ≤ f ≤ 895MHz<br>-40dBm / 1MHz<br>NS_09<br>1475.9MHz ≤ f ≤ 1510.9MHz<br>-35dBm / 1MHz | <br><br>0 dB<br><br><br>1.5dB<br><br>0 dB<br><br><br>0 dB | Formula:<br>Minimum Requirement + TT<br>-41dBm / 300kHz<br><br><br>-55.5 dBm / 6.25kHz<br><br><br>-40dBm / 1MHz<br><br><br>-35dBm / 1MHz |
| 6.6.3.3_1 Additional spurious emissions for UL 64QAM | Same as 6.6.3.3 | Same as 6.6.3.3 | Same as 6.6.3.3 |
| 6.6.3.3_2 Additional spurious emissions for UL 256QAM | Same as 6.6.3.3 | Same as 6.6.3.3 | Same as 6.6.3.3 |
| 6.6.3.3A.1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) | <br><br><br>CA_NS_01<br>E-UTRA band 34:<br>-50dBm / 1MHz<br>1884.5MHz ≤ f ≤ 1915.7MHz:<br>-41dBm / 300kHz<br><br>CA_NS_02<br>E-UTRA band 33:<br>-50dBm / 1MHz<br>E-UTRA band 34:<br>-50dBm / 1MHz<br><br><br>CA_NS_03<br>E-UTRA band 34:<br>-50dBm / 1MHz<br>E-UTRA band 39:<br>-50dBm / 1MHz | <br><br><br><br><br>0 dB<br><br>0 dB<br><br><br><br>0 dB<br><br>0 dB<br><br><br><br>0 dB<br><br>0 dB | Formula:<br>Minimum Requirement + TT<br><br><br><br><br>-50 MHz / 1MHz<br><br>-41 dBm / 300kHz<br><br><br><br>-50 MHz / 1MHz<br><br>-50 MHz / 1MHz<br><br><br><br>-50 MHz / 1MHz<br><br>-50 MHz / 1MHz |
| 6.6.3.3A.1_1 Additional spurious emissions for CA | Same as 6.6.3.3A.1 | Same as 6.6.3.3A.1 | Same as 6.6.3.3A.1 |

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|---|---|---|---|
| (intra-band contiguous DL CA and UL CA) for UL 64QAM | | | |
| 6.6.3.3A.1_2 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM | Same as 6.6.3.3A.1 | Same as 6.6.3.3A.1 | Same as 6.6.3.3A.1 |
| 6.6.3.3A.2 Additional spurious emissions for CA (inter-band DL CA and UL CA) | Same as 6.6.3.3 | Same as 6.6.3.3 | Same as 6.6.3.3 |
| 6.6.3.3A.2_1 Additional spurious emissions for CA (inter-band DL CA and UL CA) for UL 64QAM | Same as 6.6.3.3 | Same as 6.6.3.3 | Same as 6.6.3.3 |
| 6.6.3B.2 Spurious emission band UE co-existence for UL-MIMO | Same as 6.6.3.2 | Same as 6.6.3.2 | Formula:<br>Minimum Requirement + TT |
| 6.6.3B.3 Additional spurious emissions for UL-MIMO | Same as 6.6.3.3 | Same as 6.6.3.3 | Formula:<br>Minimum Requirement + TT |
| 6.6.3E.2 Spurious emission band UE co-existence for UE category 0 | Same as 6.6.3.2 | Same as 6.6.3.2 | |
| 6.6.3E.3 Additional spurious emissions for UE category 0 | Same as 6.6.3.3 | Same as 6.6.3.3 | Same as 6.6.3.3 |
| 6.6.3EA.2 Spurious emission band UE co-existence for UE category M1 | Same as 6.6.3.2 | Same as 6.6.3.2 | |
| 6.6.3EA.3 Additional spurious emissions for UE category M1 | Same as 6.6.3.3 | Same as 6.6.3.3 | Same as 6.6.3.3 |
| 6.6.3F.2 Spurious emission band UE co-existence for category NB1 UE | Same as 6.6.3.2 | Same as 6.6.3.2 | Formula:<br>Minimum Requirement + TT |
| 6.7 Transmit intermodulation | Intermodulation Product<br>5MHz -29 dBc<br>10MHz -35 dBc<br>CW Interferer level = -40 dBc | 0 dB | Formula: CW interferer<br>Minimum Requirement– TT<br><br>Intermod Products limits remain unchanged.<br><br>CW interferer level = -40 dBc |
| 6.7A.1 Transmit intermodulation for CA (intra-band contiguous DL CA and UL CA) | Same as 6.7 | Same as 6.7 | Same as 6.7 |
| 6.7A.2 Transmit intermodulation for CA (inter-band DL CA and UL CA) | Same as 6.7 | Same as 6.7 | Same as 6.7 |
| 6.7B Transmit intermodulation for UL-MIMO | Same as 6.7 | Same as 6.7 | Same as 6.7 |
| 6.7E Transmit intermodulation for | Same as 6.7 | Same as 6.7 | Same as 6.7 |

| | | | |
|---|---|---|---|
| UE category 0 | | | |
| 6.7EA Transmit intermodulation for UE category M1 | Same as 6.7 | Same as 6.7 | Same as 6.7 |
| 6.7EB Transmit intermodulation for UE category 1bis | Same as 6.7 | Same as 6.7 | Same as 6.7 |
| 6.7F Transmit intermodulation for UE category NB1 | Same as 6.7 | Same as 6.7 | Same as 6.7 |
| 6.7G.1 Transmit intermodulation for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Same as 6.7 | Same as 6.7 | Same as 6.7 |
| 6.7G.2 Transmit intermodulation for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Same as 6.7 | Same as 6.7 | Same as 6.7 |
| 6.7G.3 Transmit intermodulation for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 6.7 | Same as 6.7 | Same as 6.7 |
| 6.8B Time alignment error for UL-MIMO | The Time Alignment Error (TAE) shall not exceed 130 ns | 25 ns | Formula: Minimum Requirement+ TT |

## F.3.3 Measurement of receiver

**Table F.3.3-1: Derivation of Test Requirements (Receiver tests)**

| Test | Minimum Requirement in TS 36.101 | Test Tolerance (TT) | Test Requirement in TS 36.521-1 |
|---|---|---|---|
| 7.3 Reference sensitivity power level | Reference sensitivity power level:<br><br>For 1.4MHz<br>-102.2dBm<br>-103.2dBm<br>-105.2dBm<br>-106.2dBm<br><br>For 3MHz<br>-99.2dBm<br>-100.2dBm<br>-102.2dBm<br><br>For 5MHz<br>-97dBm<br>-98dBm<br>-98.5dBm<br>-99dBm<br>-100dBm<br>-96.5dBm Band 9 with Multi band<br><br>For 10MHz<br>-94dBm<br>-95dBm<br>-95.5dBm<br>-96dBm<br>-97dBm<br>-93.5dBm Band 9 with Multi band<br><br>For 15MHz<br>-92.2dBm<br>-93.2dBm<br>-93.7dBm<br>-94.2dBm<br>-95.2dBm<br>-91.7dBm Band 9 with Multi band<br><br>For 20MHz<br>-91dBm<br>-92dBm<br>-93dBm<br>-94dBm<br>-90.5dBm Band 9 with Multi band<br><br>T-put limit = 95% of maximum for the Ref Meas channel | All cases:<br><br>f ≤ 3.0GHz<br>0.7dB<br><br>3.0GHz < f ≤ 4.2GHz<br>1.0 dB | Formula: Reference sensitivity power level + TT<br><br>T-put limit unchanged |
| 7.3_1 Reference sensitivity level with 4 Rx antenna ports | Same as 7.3 | Same as 7.3 | Same as 7.3 |
| 7.3A.1 Reference sensitivity level for CA (intra-band contiguous DL CA and UL CA) | PCC and SCC<br>Value in Table 7.3.1-1<br><br>PCC and SCC values are each increased by $\Delta R_{IB,c}$ in Table | Same as 7.3 | PCC and SCC<br>Value in TS 36.101 Table 7.3.1-1+TT<br><br>PCC and SCC values are each increased by $\Delta R_{IB,c}$ in Table 7.3.3-1A |

| | | | |
|---|---|---|---|
| | 7.3.3-1A or Table 7.3.1-1B where applicable<br><br>T-put limit = 95% of maximum for the Ref Meas channel | | where applicable<br><br>T-put limit unchanged |
| 7.3A.2 Reference sensitivity level for CA (intra-band contiguous DL CA without UL CA) | Same as 7.3A.1 | Same as 7.3 | Same as 7.3A.1 |
| 7.3A.3 Reference sensitivity level for CA (inter-band DL CA without UL CA) | PCC and SCC<br>Value in Table 7.3.1-1<br><br>Exceptions in Tables 7.3.1A-0a, 7.3.1A-0bA, 7.3.1A-0d, 7.3.1A-0eA<br><br>PCC and SCC values are each increased by $\Delta R_{IB,c}$ in Table 7.3.3-1A or Table 7.3.1-1B where applicable<br><br>T-put limit = 95% of maximum for the Ref Meas channel | All cases:<br><br>f ≤ 3.0GHz<br>0.7dB<br><br>3.0GHz < f ≤ 4.2GHz<br>1.0 dB<br><br>4.2GHz < f ≤ 6.0GHz<br>1.5 dB | PCC and SCC<br>Value in TS 36.101 Table 7.3.1-1+TT<br><br>Exceptions in TS 36.101 Tables 7.3.1A-0a, 7.3.1A-0bA, 7.3.1A-0d, 7.3.1A-0eA +TT<br><br>PCC and SCC values are each increased by $\Delta R_{IB,c}$ in Table 7.3.3-1A where applicable<br><br>T-put limit unchanged |
| 7.3A.4 Reference sensitivity level for CA (intra-band non-contiguous DL CA without UL CA) | PCC<br>Value in Table 7.3.1-1<br><br>SCC<br>Value in Table 7.3.1-1 +$\Delta R_{IBNC}$ in Table 7.3.1A-3<br><br>PCC and SCC values are each increased by $\Delta R_{IB,c}$ in Table 7.3.3-1A or Table 7.3.1-1B where applicable<br><br>T-put limit = 95% of maximum for the Ref Meas channel | Same as 7.3 | PCC<br>Value in TS 36.101 Table 7.3.1-1+TT<br><br>SCC<br>Value in TS 36.101 Table 7.3.1-1+TT +$\Delta R_{IBNC}$ in TS 36.101 Table 7.3.1A-3<br><br>PCC and SCC values are each increased by $\Delta R_{IB,c}$ in Table 7.3.3-1A where applicable<br><br>T-put limit unchanged |
| 7.3A.5 Reference sensitivity level for 3DL CA | PCC and SCCs<br>Value in Table 7.3.1-1<br><br>Exceptions in Tables 7.3.1A-0a, 7.3.1A-0bC, 7.3.1A-0d<br><br>PCC and SCCs values are each increased by $\Delta R_{IB,c}$ in Table 7.3.1A-3, 7.3.1-1B or/and $\Delta R_{IBNC}$ in Table 7.3.1A-3 where applicable<br><br>T-put limit = 95% of maximum for the Ref Meas channel | Same as 7.3A.3 | PCC and SCC<br>Value in TS 36.101 Table 7.3.1-1+TT<br><br>Exceptions in TS 36.101 Tables 7.3.1A-0a, 7.3.1A-0bC, 7.3.1A-0d +TT<br><br>PCC and SCCs values are each increased by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B or/and $\Delta R_{IBNC}$ in TS 36.101 Table 7.3.1A-3 where applicable<br><br>T-put limit unchanged |
| 7.3A.6 Reference sensitivity level for CA (inter-band DL CA and UL CA) | TBD | TBD | TBD |
| 7.3A.7 Reference sensitivity level for CA (intra-band non-contiguous DL CA and UL CA) | PCC<br>Value in Table 7.3.1-1+ $\Delta R_{2UL_PCC}$ in Table 7.3.1A-4<br><br>SCC<br>Value in Table 7.3.1-1 + $\Delta R_{2UL_PCC}$ in Table 7.3.1A-4<br><br>PCC and SCC values are each increased by $\Delta R_{IB,c}$ in Table 7.3.3-1A or Table 7.3.1-1B where applicable<br><br>T-put limit = 95% of maximum for | Same as 7.3 | PCC<br>Value in TS 36.101 Table 7.3.1-1+TT+ $\Delta R_{2UL_PCC}$ in Table 7.3.1A-4<br><br>SCC<br>Value in TS 36.101 Table 7.3.1-1+TT + $\Delta R_{2UL_SCC}$ in Table 7.3.1A-4<br><br>PCC and SCC values are each increased by $\Delta R_{IB,c}$ in Table 7.3.3-1A where applicable<br><br>T-put limit unchanged |

| | | | |
|---|---|---|---|
| | the Ref Meas channel | | |
| 7.3A.9 Reference sensitivity level for 4DL CA | PCC and SCCs<br>Value in Table 7.3.1-1<br><br>Exceptions in Tables 7.3.1A-0a, 7.3.1A-0bC, 7.3.1A-0d<br><br>PCC and SCCs values are each increased by $\Delta R_{IB,c}$ in Table 7.3.1A-3, 7.3.1-1B or/and $\Delta R_{IBNC}$ in Table 7.3.1A-3 where applicable<br><br>T-put limit = 95% of maximum for the Ref Meas channel | Same as 7.3A.3 | PCC and SCC<br>Value in TS 36.101 Table 7.3.1-1+TT<br><br>Exceptions in TS 36.101 Tables 7.3.1A-0a, 7.3.1A-0bC, 7.3.1A-0d +TT<br><br>PCC and SCCs values are each increased by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B or/and $\Delta R_{IBNC}$ in TS 36.101 Table 7.3.1A-3 where applicable<br><br>T-put limit unchanged |
| 7.3A.10 Reference sensitivity level for 5DL CA | PCC and SCCs<br>Value in Table 7.3.1-1<br><br>Exceptions in Tables 7.3.1A-0a, 7.3.1A-0bC, 7.3.1A-0d<br><br>PCC and SCCs values are each increased by $\Delta R_{IB,c}$ in Table 7.3.1A-3, 7.3.1-1B or/and $\Delta R_{IBNC}$ in Table 7.3.1A-3 where applicable<br><br>T-put limit = 95% of maximum for the Ref Meas channel | Same as 7.3A.3 | PCC and SCC<br>Value in TS 36.101 Table 7.3.1-1+TT<br><br>Exceptions in TS 36.101 Tables 7.3.1A-0a, 7.3.1A-0bC, 7.3.1A-0d +TT<br><br>PCC and SCCs values are each increased by $\Delta R_{IB,c}$ in Table 7.3.3-1A, 7.3.3-1B or/and $\Delta R_{IBNC}$ in TS 36.101 Table 7.3.1A-3 where applicable<br><br>T-put limit unchanged |
| 7.3B Reference Sensitivity Level for UL-MIMO | Same as 7.3 | Same as 7.3 | Same as 7.3 |
| 7.3D.1 Reference sensitivity level for ProSe Direct Discovery | Values as defined in table 7.3D.0.1 | All cases:<br><br>f ≤ 3.0GHz<br>0.7dB | Formula: Reference sensitivity power level + TT<br><br>T-put limit unchanged |
| 7.3D.2 Reference sensitivity level for ProSe Direct Communication | Values as defined in table 7.3D.0.2 | Same as 7.3D.1 | Same as 7.3D.1 |
| 7.3E Reference Sensitivity Level for UE category 0 | Same as 7.3 | Same as 7.3 | Same as 7.3 |
| 7.3EA Reference Sensitivity Level for UE category M1 | Reference sensitivity power level as specified<br><br>T-put limit = 95% of maximum for the Ref Meas channel | All cases:<br><br>0.7dB | Formula: Reference sensitivity power level + TT<br><br>T-put limit unchanged |
| 7.3EB Reference sensitivity level for UE category 1bis | Same as 7.3 | Same as 7.3 | Same as 7.3 |
| 7.3EC Reference Sensitivity Level for UE category M2 | Same as 7.3EA | Same as 7.3EA | Same as 7.3EA |
| 7.3F.1 Reference sensitivity level without repetitions for UE category NB1 | Reference sensitivity power level:<br>-108.2dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | f ≤ 3.0GHz<br>0.7dB | Formula: Reference sensitivity power level + TT<br><br>T-put limit unchanged |
| 7.3F.2 Reference sensitivity level with repetitions for category NB1 | Reference sensitivity power level:<br>TBD<br><br>T-put limit = TBD% of maximum for the Ref Meas channel | f ≤ 3.0GHz<br>0.7dB | Formula: Reference sensitivity power level + TT<br><br>T-put limit unchanged |
| 7.3G.1 Reference sensitivity level for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Reference sensitivity power level:<br><br>For 10MHz<br>-90.4dBm | All cases:<br><br>4.2GHz < f ≤ 6GHz<br>1.5 dB | Formula: Reference sensitivity power level + TT<br><br>T-put limit unchanged |

| | | | |
|---|---|---|---|
| | For 20MHz<br>-87.5dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | | |
| 7.3G.2 Reference sensitivity level for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Reference sensitivity power level for V2X sidelink:<br>For 10MHz<br>-90.4dBm<br><br>For 20MHz<br>-87.5dBm<br><br>Reference sensitivity power level for E-UTRA:<br>For 1.4MHz<br>-101.7dBm<br>-102.2dBm<br><br>For 3MHz<br>-98.7dBm<br>-99.2dBm<br>-100.2dBm<br><br>For 5MHz<br>-97dBm<br>-97.2dBm<br>-98dBm<br>-98.5dBm<br>-100dBm<br><br>For 10MHz<br>-90.4dBm<br>-94dBm<br>-94.2dBm<br>-95dBm<br>-95.5dBm<br>-97dBm<br><br>For 15MHz<br>-91.2dBm<br>-92.2dBm<br>-93.2dBm<br>-93.7dBm<br>-95.2dBm<br><br>For 20MHz<br>-87.5dBm<br>-90dBm<br>-91dBm<br>-92dBm<br>-94dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | All cases:<br><br>4.2GHz < f ≤ 6GHz<br>1.5 dB<br><br>f ≤ 3.0GHz<br>0.7dB<br><br>3.0GHz < f ≤ 4.2GHz<br>1.0 dB | Formula: Reference sensitivity power level + TT<br><br>T-put limit unchanged |
| 7.3G.3 Reference sensitivity level for V2X Communication / Intra-band | Same as 7.3G.1 | Same as 7.3G.1 | Same as 7.3G.1 |

| | | | |
|---|---|---|---|
| contiguous multi-carrier operation | | | |
| 7.4 Maximum input level | Signal level -25dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | f ≤ 3.0GHz0.7 dB<br><br>3.0GHz < f ≤ 4.2GHz 1.0 dB<br><br>f ≤ 3.0GHz 0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB | Formula: Maximum input level - TT<br><br>Signal level:<br>f ≤ 3.0GHz: -25.7 dBm<br>3.0GHz < f ≤ 4.2GHz: -26.0 dBm<br><br>T-put limit unchanged<br><br>Uplink power measurement window comprises four quantities:<br>1. UE power step size 1dB<br>2. UE Power step tolerance ±1dB<br>3. Test system power measurement at top of window:<br>f ≤ 3.0GHz ±0.7 dB<br>3.0GHz < f ≤ 4.2GHz ±1.0 dB.<br>4. Test system power measurement at bottom of window:<br>f ≤ 3.0GHz ±0.7 dB<br>3.0GHz < f ≤ 4.2GHz ±1.0 dB.<br><br>Items 1 to 4 are added arithmetically:<br>Overall UL power window size:<br>f ≤ 3.0GHz:<br>(1dB+1dB+0.7dB+0.7dB) =3.4dB<br>3.0GHz < f ≤ 4.2GHz:<br>(1dB+1dB+1dB+1dB) =4dB<br><br>Top of window is aligned to UL power requirement, hence +0dB, -3.4dB or +0dB, -4.0dB according to frequency |
| 7.4_1 Maximum input level with 4 Rx antenna ports | Same as 7.4 | Same as 7.4 | Same as 7.4 |
| 7.4A.1 Maximum input level for CA (intra band contiguous DL CA and UL CA) | Signal level for each CC as specified<br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | f ≤ 3.0GHz 0.7 dB<br><br>3.0GHz < f ≤ 4.2GHz 1.0 dB<br><br>f ≤ 3.0GHz 0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB | Formula: Signal level for each CC - TT<br>T-put limit unchanged<br><br>Uplink power measurement window is calculated in the same way as 7.4, but the target power for each CC is scaled according to the allocation:<br>For PCC: $10\log(P_L_{CRB}/N_{RB_alloc})$<br>For SCC: $10\log(S_L_{CRB}/N_{RB_alloc})$ |
| 7.4A.1 H Maximum input level for SCE-L1 for CA (intra-band contiguous DL CA and UL CA) | Signal level for each CC as specified<br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | f ≤ 3.0GHz 0.7 dB<br><br>3.0GHz < f ≤ 4.2GHz 1.0 dB<br><br>f ≤ 3.0GHz 0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB | Formula: Signal level for each CC – TT<br>Signal level:<br>f ≤ 3.0GHz: -27.7 dBm<br>3.0GHz < f ≤ 4.2GHz: -28.0 dBm<br><br>T-put limit unchanged<br><br>Uplink power measurement window is calculated in the same way as 7.4, but the target power for each CC is scaled according to the allocation:<br>For PCC: $10\log(P_L_{CRB}/N_{RB_alloc})$<br>For SCC: $10\log(S_L_{CRB}/N_{RB_alloc})$ |
| 7.4A.2 Maximum input level for CA (intra band contiguous DL CA without UL CA) | Signal level for each CC as specified<br><br>T-put limit = 95% of maximum for the Ref Meas channel | f ≤ 3.0GHz 0.7 dB<br><br>3.0GHz < f ≤ 4.2GHz 1.0 dB | Formula: Signal level for each CC - TT<br>T-put limit unchanged |

| | | | |
|---|---|---|---|
| | Uplink power | f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | Uplink power measurement window same as 7.4 |
| 7.4A.2 H Maximum input level for SCE-L1 for CA (intra-band contiguous DL CA without UL CA) | Signal level for each CC as specified<br>T-put limit = 95% of maximum for the Ref Meas channel | f ≤ 3.0GHz<br>0.7 dB<br><br>3.0GHz < f ≤ 4.2GHz<br>1.0 dB | Formula: Signal level for each CC - TT<br>T-put limit unchanged |
| | Uplink power | f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | Uplink power measurement window same as 7.4 |
| 7.4A.3 Maximum input level for CA (inter-band DL CA without UL CA) | Signal level -25dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | f ≤ 3.0GHz<br>0.7 dB<br><br>3.0GHz < f ≤ 4.2GHz<br>1.0 dB<br><br>4.2GHz < f ≤ 6.0GHz<br>1.5 dB | Formula: Maximum input level - TT<br>Signal level:<br>f ≤ 3.0GHz: -25.7 dBm<br>3.0GHz < f ≤ 4.2GHz: -26.0 dBm4.2GHz < f ≤ 6.0GHz: -26.5 dBm<br>T-put limit unchanged |
| | Uplink power | f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | Uplink power measurement window same as 7.4 |
| 7.4A.4 Maximum input level for CA (intra band non-contiguous DL CA without UL CA) | Signal level -25dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | f ≤ 3.0GHz<br>0.7 dB<br><br>3.0GHz < f ≤ 4.2GHz<br>1.0 dB | Formula: Maximum input level - TT<br>Signal level:<br>f ≤ 3.0GHz: -25.7 dBm<br>3.0GHz < f ≤ 4.2GHz: -26.0 dBm<br>T-put limit unchanged |
| | Uplink power | f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | Uplink power measurement window same as 7.4 |
| 7.4A.5 Maximum input level for 3DL CA | Signal level for each CC as specified<br>T-put limit = 95% of maximum for the Ref Meas channel | f ≤ 3.0GHz<br>0.7 dB<br><br>3.0GHz < f ≤ 4.2GHz<br>1.0 dB<br><br>4.2GHz < f ≤ 6.0GHz<br>1.5 dB | Formula: Signal level for each CC - TT<br>T-put limit unchanged |
| | Uplink power | f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | Uplink power measurement window same as 7.4 |
| 7.4A.5_H Maximum input | Signal level for each CC as | f ≤ 3.0GHz | Formula: Signal level for each CC - |

| | | | |
|---|---|---|---|
| level for SCE-L1 for 3DL CA | specified<br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | 0.7 dB<br><br>3.0GHz < f ≤ 4.2GHz<br>1.0 dB<br><br>f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | TT<br>T-put limit unchanged<br><br>Uplink power measurement window is calculated in the same way as 7.4 |
| 7.4A.7 Maximum input level for for 4DL CA | Signal level for each CC as specified<br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | f ≤ 3.0GHz<br>0.7 dB<br><br>3.0GHz < f ≤ 4.2GHz<br>1.0 dB<br><br>f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | Formula: Signal level for each CC - TT<br>T-put limit unchanged<br><br>Uplink power measurement window is calculated in the same way as 7.4 |
| 7.4A.7_H Maximum input level for 4DL CA for 256QAM in DL | Same as 7.4A.7 | Same as 7.4A.7 | Same as 7.4A.7 |
| 7.4A.8_H Maximum input level for 5DL CA for 256QAM in DL | Signal level for each CC as specified<br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | f ≤ 3.0GHz<br>0.7 dB<br><br>3.0GHz < f ≤ 4.2GHz<br>1.0 dB<br><br>f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | Formula: Signal level for each CC - TT<br>T-put limit unchanged<br><br>Uplink power measurement window is calculated in the same way as 7.4 |
| 7.4B Maximum Input Level for UL-MIMO | Same as 7.4 | Same as 7.4 | Same as 7.4<br><br>Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 7.4D.1 Maximum input level for ProSe Direct Discovery | Signal level -22dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | f ≤ 3.0GHz<br>0.7 dB | Formula: Maximum input level - TT<br><br>Signal level:<br>f ≤ 3.0GHz: -22.7 dBm<br><br>T-put limit unchanged |
| 7.4D.2 Maximum input level for ProSe Direct Communication | Same as 7.4D.1 | Same as 7.4D.1 | Same as 7.4D.1 |
| 7.4E Maximum input level for UE category 0 | Same as 7.4 | Same as 7.4 | Same as 7.4 |
| 7.4EA Maximum input level for UE category M1 | Same as 7.4 | Same as 7.4 | Same as 7.4 |
| 7.4EB Maximum input level for UE category 1bis | Same as 7.4 | Same as 7.4 | Same as 7.4 |
| 7.4EC Maximum input level for UE category M2 | Same as 7.4 | Same as 7.4 | Same as 7.4 |
| 7.4_H Maximum input level for SCE-L1 | Signal level -27dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | f ≤ 3.0GHz<br>0.7 dB<br><br>3.0GHz < f | Formula: Maximum input level - TT<br><br>Signal level:<br>f ≤ 3.0GHz: -27.7 dBm |

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| | Uplink power | ≤ 4.2GHz<br>1.0 dB<br><br>f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | 3.0GHz < f ≤ 4.2GHz: -28.0 dBm<br>T-put limit unchanged<br>Uplink power measurement window same as 7.4 |
| 7.4F Maximum imput level for UE category NB1 | Signal level -25dBm<br>T-put limit = 95% of maximum for the Ref Meas channel | f ≤ 3.0GHz<br>0.7 dB | Formula: Maximum input level - TT<br>Signal level:<br>f ≤ 3.0GHz: -25.7dBm<br>T-put limit unchanged |
| 7.4G.1 Maximum input level for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Signal level -22dBm<br>T-put limit = 95% of maximum for the Ref Meas channel | 4.2GHz < f ≤ 6GHz<br>1.5 dB | Formula: Maximum input level - TT<br>Signal level:<br>4.2GHz < f ≤ 6GHz<br>: -23.5dBm<br>T-put limit unchanged |
| 7.4G.2 Maximum input level for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Signal level -22dBm<br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | 4.2GHz < f ≤ 6GHz<br>1.5 dB for V2X sidelink<br><br>f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB<br><br>4.2GHz < f ≤ 6GHz<br>0dB, -4.3dB | Same as 7.4G.1 for V2X sidelink<br><br>Same as 7.4 for E-UTRA |
| 7.4G.3 Maximum input level for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 7.4G.1 | Same as 7.4G.1 | Same as 7.4G.1 |
| 7.5 Adjacent Channel Selectivity (ACS) | Case 1:<br>Wanted signal power, all BWs: (REFSENS + 14 dB)<br><br>Interferer signal power<br>For 1.4 MHz, 3 MHz, 5 MHz, 10 MHz BW:<br>(REFSENS + 45.5 dB)<br>For 15 MHz BW:<br>(REFSENS + 42.5 dB)<br>For 20 MHz BW:<br>(REFSENS + 39.5 dB)<br><br>Case 2:<br>Wanted signal power<br>For 1.4 MHz, 3 MHz, 5 MHz, 10 MHz BW: -56.5 dBm<br>For 15 MHz BW: -53.5 dBm<br>For 20 MHz BW: -50.5 dBm<br><br>Interferer signal power, all BWs: -25 dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | 0 dB<br><br>f ≤ 3.0GHz<br>0dB, -3.4dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged<br><br>Uplink power measurement window same as 7.4 |

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| | | 3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | |
| 7.5_1 Adjacent Channel Selectivity (ACS) with 4 Rx antenna ports | Same as 7.5 | Same as 7.5 | Same as 7.5 |
| 7.5A.1 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA and UL CA) | Case 1:<br>Wanted signal power:<br>(REFSENS + 14 dB)<br><br>Interferer signal power<br>For CA BW Class C:<br>(Aggregated power + 22.5 dB)<br><br>Case 2:<br>Wanted signal power:<br>-47.5 +10log($N_{RB,c}/N_{RB\ agg}$) dBm<br><br>Interferer signal power<br>For CA BW Class C:<br>-25 dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | 0 dB<br><br>f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged<br><br>Uplink power measurement window same as 7.4A.1 |
| 7.5A.2 Adjacent Channel Selectivity (ACS) for CA (intra band contiguous DL CA without UL CA) | Same as 7.5A.1 | Same as 7.5A.1 | Same as 7.5A.1 |
| 7.5A.3 Adjacent Channel Selectivity (ACS) for CA (inter band DL CA without UL CA) | Same as 7.5 for each CC | Same as 7.5 | Same as 7.5 for each CC |
| 7.5A.4 Adjacent Channel Selectivity (ACS) for CA (intra-band non-contiguous DL CA without UL CA) | Same as 7.5 for each CC | Same as 7.5 | Same as 7.5 for each CC |
| 7.5A.5 Adjacent Channel Selectivity (ACS) for 3DL CA | Intra-band contiguous DL CA<br><br>Case 1:<br>Wanted signal power:<br>(REFSENS + 14 dB)<br><br>Interferer signal power<br>For CA BW Class B, Class C:<br>(Aggregated power + 22.5 dB)<br>For CA BW Class D:<br>(Aggregated power + 20.7 dB)<br><br>Case 2:<br>Wanted signal power:<br>For CA BW Class B:<br>-50.5 +10log($N_{RB,c}/N_{RB\ agg}$) dBm<br>For CA BW Class C:<br>-47.5 +10log($N_{RB,c}/N_{RB\ agg}$) dBm<br>For CA BW Class D:<br>-43.9 +10log($N_{RB,c}/N_{RB\ agg}$) dBm<br><br>Interferer signal power<br>-25 dBm | 0 dB | Formula:<br><br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged<br><br>Uplink power measurement window same as 7.4A.1 |

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| | Inter-band CA<br>Same as 7.5 for each CC<br><br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | <br><br><br><br><br>f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | |
| 7.5A.7 Adjacent Channel Selectivity (ACS) for 4DL CA | Same as 7.5A.5 for each CC | Same as 7.5A.5 | Same as 7.5A.5 for each CC |
| 7.5A.8 Adjacent Channel Selectivity (ACS) for 5DL CA | Same as 7.5A.5 for each CC except for following additional requirements<br><br>Intra-band contiguous DL CA<br><br>Case 1:<br>For CA BW Class F:<br>(Aggregated power + 18.5 dB)<br><br>Case 2:<br>Wanted signal power:<br>For CA BW Class F:<br>-43.5 +10log($N_{RB,c}/N_{RB\ agg}$) dBm | Same as 7.5A.5 | Same as 7.5A.5 for each CC |
| 7.5B Adjacent Channel Selectivity (ACS) for UL-MIMO | Same as 7.5 | Same as 7.5 | Same as 7.5<br><br>Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 7.5D.1 Adjacent channel selectivity (ACS) for ProSe Direct Discovery | Signal levels as defined in minimum requirements<br><br>T-put limit = 95% of maximum for the Ref Meas channel | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.5D.2 Adjacent channel selectivity (ACS) for ProSe Direct Communication | Signal levels as defined in minimum requirements<br><br>T-put limit = 95% of maximum for the Ref Meas channel | Same as 7.5D.1 | Same as 7.5D.1 |
| 7.5E Adjacent Channel Selectivity (ACS) for UE category 0 | Same as 7.5 | Same as 7.5 | Same as 7.5 |
| 7.5EA Adjacent Channel Selectivity (ACS) for UE category M1 | Same as 7.5 | Same as 7.5 | Same as 7.5 |
| 7.5EB Adjacent Channel Selectivity (ACS) for UE category 1bis | Same as 7.5 | Same as 7.5 | Same as 7.5 |
| 7.5EC Adjacent Channel Selectivity (ACS) for UE category M2 | Same as 7.5 | Same as 7.5 | Same as 7.5 |
| 7.5F Adjacent Channel Selectivity (ACS) for UE category NB1 | ACS 1:<br>Wanted signal power:<br>(REFSENS + 14 dB)<br><br>Interferer signal power<br>For GSM interferer:<br>(REFSENS + 42 dB)<br>For E-UTRA interferer:<br>(REFSENS + 47 dB) | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |

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| | ACS 2:<br>Wanted signal power<br>For GSM interferer: -53 dBm<br>For E-UTRA interferer: -58 dBm<br><br>Interferer signal power: -25 dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | | |
| 7.5G.1 Adjacent channel selectivity (ACS) for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Case 1:<br>Wanted signal power, all BWs: (REFSENS + 14 dB)<br><br>Interferer signal power<br>For 10 MHz BW:<br>(REFSENS + 45.5 dB)<br>For 20 MHz BW:<br>(REFSENS + 39.5 dB)<br><br>Case 2:<br>Wanted signal power<br>For 10 MHz BW: -56.5 dBm<br>For 20 MHz BW: -50.5 dBm<br><br>Interferer signal power, all BWs: -25 dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.5G.2 Adjacent channel selectivity (ACS) for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Case 1:<br>Wanted signal power, all BWs: (REFSENS + 14 dB)<br><br>Interferer signal power<br>For 10 MHz BW:<br>(REFSENS + 45.5 dB)<br>For 20 MHz BW:<br>(REFSENS + 39.5 dB)<br><br>Case 2:<br>Wanted signal power<br>For 10 MHz BW: -56.5 dBm<br>For 20 MHz BW: -50.5 dBm<br><br>Interferer signal power, all BWs: -25 dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | 0 dB<br><br>f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB<br><br>4.2GHz < f ≤ 6GHz<br>0dB, -4.3dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.5G.3 Adjacent channel selectivity (ACS) for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 7.5G.1 | Same as 7.5G.1 | Same as 7.5G.1 |
| 7.6.1 In-band blocking | Wanted signal power: | 0 dB | Formula: |

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| | (REFSENS + BW dependent value)<br><br>Interferer signal power:<br>-56dBm or -44dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | <br><br><br><br><br><br><br>f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged<br><br>Uplink power measurement window same as 7.4 |
| 7.6.1_1 In-band blocking with 4 Rx antenna ports | Same as 7.6.1 | Same as 7.6.1 | Same as 7.6.1 |
| 7.6.1A.1 In-band blocking for CA (intra band contiguous DL CA and UL CA) | Wanted signal power:<br>(REFSENS + CA BW Class specific value)<br>Interferer signal power:<br>-56dBm or -44dBm<br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | Same as 7.6.1 | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged<br><br>Uplink power measurement window same as 7.4A.1 |
| 7.6.1A.2 In-band blocking for CA (intra band contiguous DL CA without UL CA) | Same as 7.6.1A.1 | Same as 7.6.1A.1 | Same as 7.6.1A.1 |
| 7.6.1A.3 In-band blocking for CA (inter band DL CA without UL CA) | Same as 7.6.1A.1 | Same as 7.6.1A.1 | Same as 7.6.1A.1 |
| 7.6.1A.4 In-band blocking for CA (intra-band non-contiguous DL CA without UL CA) | Same as 7.6.1A.1 | Same as 7.6.1A.1 | Same as 7.6.1A.1 |
| 7.6.1A.5 In-band blocking for 3DL CA | Same as 7.6.1A.1 | Same as 7.6.1A.1 | Same as 7.6.1A.1 |
| 7.6.1A.7 In-band blocking for 4DL CA | Same as 7.6.1A.1 | Same as 7.6.1A.1 | Same as 7.6.1A.1 |
| 7.6.1A.8 In-band blocking for 5DL CA | Same as 7.6.1A.1 | Same as 7.6.1A.1 | Same as 7.6.1A.1 |
| 7.6.1B In-band blocking for UL-MIMO | Same as 7.6.1 | Same as 7.6.1 | Same as 7.6.1<br><br>Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 7.6.1D.1 In-band blocking for ProSe Direct Discovery | Signal levels as defined in minimum requirements<br><br>T-put limit = 95% of maximum for the Ref Meas channel | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.6.1D.2 In-band blocking for ProSe Direct Communication | Signal levels as defined in minimum requirements<br><br>T-put limit = 95% of maximum for the Ref Meas channel | Same as 7.6.1D.1 | Same as 7.6.1D.1 |
| 7.6.1E In-band blocking for UE category 0 | Same as 7.6.1 | Same as 7.6.1 | Same as 7.6.1 |
| 7.6.1F In-band blocking for category NB1 | Wanted signal power:<br>(REFSENS + 6dB)<br><br>Interferer signal power:<br>-56dBm or -44dBm<br><br>T-put limit = 95% of maximum for | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |

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| | the Ref Meas channel | | |
| 7.6.1EA In-band blocking for UE category M1 | Wanted signal power: (REFSENS + CA BW Class specific value)<br>Interferer signal power: -56dBm or -44dBm<br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | 0 dB<br><br><br><br><br><br>f ≤ 3.0GHz 0dB, -3.4dB | Same as 7.6.1 |
| 7.6.1EB In-band blocking for UE category 1bis | Same as 7.6.1 | Same as 7.6.1 | Same as 7.6.1 |
| 7.6.1EC In-band blocking for UE category M2 | Same as 7.6.1EA | Same as 7.6.1EA | Same as 7.6.1 |
| 7.6.1G.1 In-band blocking for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Wanted signal power: (REFSENS + BW dependent value)<br><br>Interferer signal power: -56dBm or -44dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.6.1G.2 In-band blocking for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Wanted signal power: (REFSENS + BW dependent value)<br><br>Interferer signal power: -56dBm or -44dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | 0 dB<br><br><br><br><br><br><br><br>f ≤ 3.0GHz 0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB<br><br>4.2GHz < f ≤ 6GHz 0dB, -4.3dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.6.1G.3 In-band blocking for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 7.6.1G.1 | Same as 7.6.1G.1 | Same as 7.6.1G.1 |
| 7.6.2 Out of-band blocking | Wanted signal power: (REFSENS + BW dependent value)<br><br>Interferer signal power: -44dBm, -30dBm or -15dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | 0 dB<br><br><br><br><br><br><br><br>f ≤ 3.0GHz 0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged<br><br>Uplink power measurement window same as 7.4 |
| 7.6.2_1 Out of-band blocking with 4 Rx antenna | Same as 7.6.2 | Same as 7.6.2 | Same as 7.6.2 |

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| ports | | | |
| 7.6.2A.1 Out-of-band blocking for CA (intra band contiguous DL CA and UL CA) | Wanted signal power:<br>(REFSENS + CA BW Class specific value)<br>Interferer signal power:<br>-44dBm, -30dBm or -15dBm<br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | Same as 7.6.2 | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged<br><br>Uplink power measurement window same as 7.4A.1 |
| 7.6.2A.2 Out-of-band blocking for CA (intra band contiguous DL CA without UL CA) | Same as 7.6.2A.1 | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.6.2A.3 Out-of-band blocking for CA (inter band DL CA without UL CA) | Same as 7.6.2A.1 | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.6.2A.4 Out-of-band blocking for CA (intra-band non-contiguous DL CA without UL CA) | Same as 7.6.2A.1 | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.6.2A.5 Out-of-band blocking for 3DL CA | Same as 7.6.2A.1 | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.6.2A.7 Out-of-band blocking for 4DL CA | Same as 7.6.2A.1 | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.6.2A.8 Out-of-band blocking for 5DL CA | Same as 7.6.2A.1 | Same as 7.6.2A.1 | Same as 7.6.2A.1 |
| 7.6.2B Out-of-band blocking for UL-MIMO | Same as 7.6.2 | Same as 7.6.2 | Same as 7.6.2<br><br>Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 7.6.2D.1 Out-of-band blocking for ProSe Direct Discovery | Signal levels as defined in minimum requirements<br><br>T-put limit = 95% of maximum for the Ref Meas channel | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.6.2D.2 Out-of-band blocking for ProSe Direct Communication | Signal levels as defined in minimum requirements<br><br>T-put limit = 95% of maximum for the Ref Meas channel | Same as 7.6.2D.1 | Same as 7.6.1D.1 |
| 7.6.2E Out of-band blocking for UE category 0 | Same as 7.6.2 | Same as 7.6.2 | Same as 7.6.2 |
| 7.6.2F Out of-band blocking for category NB1 | Wanted signal power:<br>(REFSENS + 6dB)<br><br>Interferer signal power:<br>-44dBm, -30dBm or -15dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.6.2G.1 Out-of-band blocking for V2X Communication/ Non-concurrent with E-UTRA uplink transmissions | Wanted signal power:<br>(REFSENS + BW dependent value)<br>Interferer signal power:<br>-44dBm, -30dBm or -15dBm<br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.6.2EA Out-of-band blocking for UE category M1 | Wanted signal power:<br>(REFSENS + BW dependent value)<br><br>Interferer signal power: | 0 dB | Same as 7.6.2 |

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|---|---|---|---|
| | -44dBm, -30dBm or -15dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | <br><br><br><br>f ≤ 3.0GHz<br>0dB, -3.4dB | |
| 7.6.2EB Out-of-band blocking for UE category 1bis | Same as 7.6.2 | Same as 7.6.2 | Same as 7.6.2 |
| 7.6.3 Narrow band blocking | Wanted signal power,:<br>(REFSENS + BW dependent value)<br>Interferer signal power:<br>-55dBm<br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | 0 dB<br><br><br><br><br><br>f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged<br><br>Uplink power measurement window same as 7.4 |
| 7.6.3_1 Narrow band blocking with 4 Rx antenna ports | Same as 7.6.3 | Same as 7.6.3 | Same as 7.6.3 |
| 7.6.3A.1 Narrow band blocking for CA (intra band contiguous DL CA and UL CA) | Wanted signal power:<br>(REFSENS + CA BW Class specific value)<br>Interferer signal power:<br>-55dBm<br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | Same as 7.6.3 | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged<br><br>Uplink power measurement window same as 7.4A.1 |
| 7.6.3A.2 Narrow band blocking for CA (intra band contiguous DL CA without UL CA) | Same as 7.6.3A.1 | Same as 7.6.3A.1 | Same as 7.6.3A.1 |
| 7.6.3A.3 Narrow band blocking for CA (inter band DL CA without UL CA) | Same as 7.6.3A.1 | Same as 7.6.3A.1 | Same as 7.6.3A.1 |
| 7.6.3A.4 Narrow band blocking for CA (intra-band non-contiguous DL CA without UL CA) | Same as 7.6.3A.1 | Same as 7.6.3A.1 | Same as 7.6.3A.1 |
| 7.6.3A.5 Narrow band blocking for 3DL CA | Same as 7.6.3A.1 | Same as 7.6.3A.1 | Same as 7.6.3A.1 |
| 7.6.3A.7 Narrow band blocking for 4DL CA | Same as 7.6.3A.1 | Same as 7.6.3A.1 | Same as 7.6.3A.1 |
| 7.6.3A.8 Narrow band blocking for 5DL CA | Same as 7.6.3A.1 | Same as 7.6.3A.1 | Same as 7.6.3A.1 |
| 7.6.3B Narrow band blocking for UL-MIMO | Same as 7.6.3 | Same as 7.6.3 | Same as 7.6.3<br><br>Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 7.6.3D.1 Narrow band blocking for ProSe Direct Discovery | Signal levels as defined in minimum requirements<br><br>T-put limit = 95% of maximum for the Ref Meas channel | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.6.3D.2 Narrow band blocking for ProSe Direct | Signal levels as defined in minimum requirements | Same as 7.6.3D.1 | Same as 7.6.3D.1 |

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|---|---|---|---|
| Communication | T-put limit = 95% of maximum for the Ref Meas channel | | |
| 7.6.3E Narrow band blocking for UE category 0 | Same as 7.6.3 | Same as 7.6.3 | Same as 7.6.3 |
| 7.6.3EA Narrow band blocking for UE category M1 | Wanted signal power,: (REFSENS + BW dependent value)<br>Interferer signal power: -55dBm<br>T-put limit = 95% of maximum for the Ref Meas channel<br>Uplink power | 0 dB<br>f ≤ 3.0GHz 0dB, -3.4dB | Same as 7.6.3 |
| 7.6.3EB Narrow band blocking for UE category 1bis | Same as 7.6.3 | Same as 7.6.3 | Same as 7.6.3 |
| 7.6.3EC Narrow band blocking for UE category M2 | Same as 7.6.3EA | Same as 7.6.3EA | Same as 7.6.3 |
| 7.7 Spurious response | Wanted signal power: (REFSENS + BW dependent value)<br>Interferer signal power: -44dBm<br>T-put limit = 95% of maximum for the Ref Meas channel<br>Uplink power | 0 dB<br>f ≤ 3.0GHz 0dB, -3.4dB<br>3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB | Formula: Wanted signal power + TT<br>Interferer signal power unchanged<br>T-put limit unchanged<br>Uplink power measurement window same as 7.4 |
| 7.7_1 Spurious response with 4 Rx antenna ports | Same as 7.7 | Same as 7.7 | Same as 7.7 |
| 7.7A.1 Spurious response for CA (intra band contiguous DL CA and UL CA) | Wanted signal power: (REFSENS + CA BW Class specific value)<br>Interferer signal power: -44dBm<br>T-put limit = 95% of maximum for the Ref Meas channel<br>Uplink power | Same as 7.7 | Formula: Wanted signal power + TT<br>Interferer signal power unchanged<br>T-put limit unchanged<br>Uplink power measurement window same as 7.4A.1 |
| 7.7A.2 Spurious response for CA (intra band contiguous DL CA without UL CA) | Same as 7.7A.1 | Same as 7.7A.1 | Same as 7.7A.1 |
| 7.7A.3 Spurious response for CA (inter band DL CA without UL CA) | Same as 7.7A.1 | Same as 7.7A.1 | Same as 7.7A.1 |
| 7.7A.4 Spurious response for CA (intra-band non-contiguous DL CA without UL CA) | Same as 7.7A.1 | Same as 7.7A.1 | Same as 7.7A.1 |
| 7.7A.5 Spurious response for 3DL CA | Same as 7.7A.1 | Same as 7.7A.1 | Same as 7.7A.1 |
| 7.7A.7 Spurious response for 4DL CA | Same as 7.7A.1 | Same as 7.7A.1 | Same as 7.7A.1 |
| 7.7A.8 Spurious response for 5DL CA | Same as 7.7A.1 | Same as 7.7A.1 | Same as 7.7A.1 |
| 7.7B Spurious response for UL-MIMO | Same as 7.7 | Same as 7.7 | Same as 7.7 |

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|---|---|---|---|
| | | | Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 7.7D.1 Spurious response for ProSe Direct Discovery | Signal levels as defined in minimum requirements<br><br>T-put limit = 95% of maximum for the Ref Meas channel | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.7D.2 Spurious response for ProSe Direct Communication | Signal levels as defined in minimum requirements<br><br>T-put limit = 95% of maximum for the Ref Meas channel | Same as 7.7D.1 | Same as 7.7D.1 |
| 7.7E Spurious response for UE category 0 | Same as 7.7 | Same as 7.7 | Same as 7.7 |
| 7.7EA Spurious response for UE category M1 | Same as 7.7 | Same as 7.7 | Same as 7.7 |
| 7.7EB Spurious response for UE category 1bis | Same as 7.7 | Same as 7.7 | Same as 7.7 |
| 7.7F Spurious response for category NB1 | Wanted signal power:<br>(REFSENS + 6 dB)<br><br>Interferer signal power:<br>-44dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.7G.1 Spurious response for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Wanted signal power:<br>(REFSENS + BW dependent value)<br><br>Interferer signal power:<br>-44dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.7G.2 Spurious response for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | Wanted signal power:<br>(REFSENS + BW dependent value)<br><br>Interferer signal power:<br>-44dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | 0 dB | Formula:<br>Wanted signal power + TT<br><br>Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.7G.3 Spurious response for V2X Communication / Intra-band contiguous multi-carrier operation | Same as 7.7G.1 | Same as 7.7G.1 | Same as 7.7G.1 |
| 7.8.1 Wide band intermodulation | Wanted signal power:<br>For 1.4 MHz BW:<br>(REFSENS + 12 dB)<br>For 3 MHz BW:<br>(REFSENS + 8 dB)<br>For 5 MHz and 10MHz BW:<br>(REFSENS + 6 dB)<br>For 15 MHz BW:<br>(REFSENS + 7 dB)<br>For 20 MHz BW:<br>(REFSENS + 9 dB)<br><br>CW Interferer power, all BWs:<br>-46 dBm<br><br>Modulated Interferer power:, all | 0 dB | Formula:<br>Wanted signal power +TT<br><br>CW Interferer signal power unchanged<br><br>Modulated Interferer signal power unchanged<br><br>T-put limit unchanged<br><br>Uplink power measurement window same as 7.4 |

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|---|---|---|---|
| | BWs:<br>-46 dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | <br><br><br><br><br><br>f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | |
| 7.8.1_1 Wide band Intermodulation with 4 Rx antenna ports | Same as 7.8.1 | Same as 7.8.1 | Same as 7.8.1 |
| 7.8.1A.1 Wideband intermodulation for CA (intra band contiguous DL CA and UL CA) | Wanted signal power:<br>(REFSENS + CA BW Class specific value)<br><br>CW Interferer power, all BWs:<br>-46 dBm<br><br>Modulated Interferer power:, all BWs:<br>-46 dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | 0 dB<br><br><br><br><br><br><br><br><br>f ≤ 3.0GHz<br>0dB, -3.4dB<br><br>3.0GHz < f ≤ 4.2GHz<br>0dB, -4.0dB | Formula:<br>Wanted signal power +TT<br><br>CW Interferer signal power unchanged<br><br>Modulated Interferer signal power unchanged<br><br>T-put limit unchanged<br><br>Uplink power measurement window same as 7.4 A.1 |
| 7.8.1A.2 Wideband intermodulation for CA (intra band contiguous DL CA without UL CA) | Same as 7.8.1A.1 | Same as 7.8.1A.1 | Same as 7.8.1A.1 |
| 7.8.1A.3 Wideband intermodulation for CA (inter band DL CA without UL CA) | Same as 7.8.1A.1 | Same as 7.8.1A.1 | Same as 7.8.1A.1 |
| 7.8.1A.4 Wideband intermodulation for CA (intra band non-contiguous DL CA without UL CA) | Same as 7.8.1A.1 | Same as 7.8.1A.1 | Same as 7.8.1A.1 |
| 7.8.1A.5 Wideband intermodulation for 3DL CA | Same as 7.8.1A.1 | Same as 7.8.1A.1 | Same as 7.8.1A.1 |
| 7.8.1A.7 Wideband intermodulation for 4 DL CA | Same as 7.8.1A.1 | Same as 7.8.1A.1 | Same as 7.8.1A.1 |
| 7.8.1A.8 Wideband intermodulation for 5 DL CA | Same as 7.8.1A.1 | Same as 7.8.1A.1 | Same as 7.8.1A.1 |
| 7.8.1B Wide band intermodulation for UL-MIMO | Same as 7.8.1 | Same as 7.8.1 | Same as 7.8.1<br><br>Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors |
| 7.8.1D.1 Wide band Intermodulation for ProSe Direct Discovery | Signal levels as defined in minimum requirements<br><br>T-put limit = 95% of maximum for the Ref Meas channel | 0 dB | Formula:<br>Wanted signal power + TT<br><br>CW Interferer signal power unchanged<br><br>Modulated Interferer signal power unchanged |

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|---|---|---|---|
| | | | T-put limit unchanged |
| 7.8.1D.2 Wide band Intermodulation for ProSe Direct Communication | Signal levels as defined in minimum requirements<br><br>T-put limit = 95% of maximum for the Ref Meas channel | Same as 7.8.1D.1 | Same as 7.8.1D.1 |
| 7.8.1E Wide band intermodulation for UE category 0 | Same as 7.8.1 | Same as 7.8.1 | Same as 7.8.1 |
| 7.8.1EA Wide band Intermodulation for UE category M1 | Same as 7.8.1 | Same as 7.8.1 | Same as 7.8.1 |
| 7.8.1EB Wide band Intermodulation for UE category 1bis | Same as 7.8.1 | Same as 7.8.1 | Same as 7.8.1 |
| 7.8.1EC Wide band Intermodulation for UE category M2 | Same as 7.8.1 | Same as 7.8.1 | Same as 7.8.1 |
| 7.8.1F Wide band intermodulation for category NB1 | Wanted signal power:<br>(REFSENS + 6 dB)<br><br>CW Interferer power:<br>-46 dBm<br><br>E-UTRA Interferer power:<br>-46 dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel | 0 dB | Formula:<br>Wanted signal power +TT<br><br>CW Interferer signal power unchanged<br><br>Modulated Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.8.1G.1 Wide band Intermodulation for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | Wanted signal power:<br>For 10MHz BW:<br>(REFSENS + 6 dB)<br>For 20 MHz BW:<br>(REFSENS + 9 dB)<br><br>CW Interferer power, all BWs:<br>-46 dBm<br><br>Modulated Interferer power:, all BWs:<br>-46 dBm<br><br>T-put limit = 95% of maximum for the Ref Meas channel<br><br>Uplink power | 0 dB | Formula:<br>Wanted signal power +TT<br><br>CW Interferer signal power unchanged<br><br>Modulated Interferer signal power unchanged<br><br>T-put limit unchanged |
| 7.9 Spurious emissions | 30MHz ≤ f < 1GHz:<br>-57dBm / 100kHz<br><br>1GHz ≤ f ≤ 12.75 GHz:<br>-47dBm / 1MHz<br><br>12.75GHz ≤ f ≤ 19 GHz:<br>-47dBm / 1MHz | 0 dB | Formula:<br>Minimum Requirement + TT |
| 7.9_1 Spurious emissions with 4 Rx antenna ports | Same as 7.9 | Same as 7.9 | Same as 7.9 |
| 7.9A Spurious emissions for CA | 30MHz ≤ f < 1GHz:<br>-57dBm / 100kHz<br><br>1GHz ≤ f ≤ 12.75 GHz:<br>-47dBm / 1MHz | 0 dB | Formula:<br>Minimum Requirement + TT |
| 7.9E Spurious emissions for UE category 0 | Same as 7.9 | Same as 7.9 | Same as 7.9 |
| 7.9EA Spurious emissions for UE category M1 | Same as 7.9 | Same as 7.9 | Same as 7.9 |
| 7.9EB Spurious emissions for UE category 1bis | Same as 7.9 | Same as 7.9 | Same as 7.9 |
| 7.9F Spurious emissions for | Same as 7.9 | Same as | Same as 7.9 |

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|---|---|---|---|
| category NB1 | | 7.9 | |
| 7.9G.1 Spurious emissions for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 30MHz ≤ f < 1GHz:<br>-57dBm / 100kHz<br><br>1GHz ≤ f ≤ 12.75 GHz:<br>-47dBm / 1MHz<br><br>12.75GHz ≤ f ≤ 26 GHz:<br>-47dBm / 1MHz | 0 dB | Formula:<br>Minimum Requirement + TT |

## F.3.4 Measurement of performance requirements

**Table F.3.4-1: Derivation of Test Requirements (performance tests)**

| Test | Minimum Requirement in TS 36.101 | Test Tolerance (TT) | Test Requirement in TS 36.521-1 |
|---|---|---|---|
| 8.2.1.1.1 Multiple PRBs<br>- Prop'n Condition EVA5<br>- Prop'n Condition ETU70<br>- Prop'n Condition ETU300 | SNRs as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.1.1 Multiple PRBs<br>- Prop'n Condition HST | SNR as specified | 0.6dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.1.1 Single PRB<br>- Prop'n Condition ETU70 | SNRs as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.1.1_1 Multiple PRBs<br>- Prop'n Condition EVA5<br>- Prop'n Condition ETU70<br>- Prop'n Condition ETU300 | SNRs as specified | Same as 8.2.1.1.1 Multiple PRBs Propagation EVA5, ETU70, ETU300 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.1.1_2 Multiple PRB<br>- Prop'n Condition EVA5 | SNRs as specified | Same as 8.2.1.1.1 Multiple PRBs Propagation EVA5 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.1.1_A.1 | SNRs as specified | Same as 8.2.1.1.1 Multiple PRBs, for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.1.1_A.2 | SNRs as specified | Same as 8.2.1.1.1 Multiple PRBs for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.1.1_A.4 | SNRs as specified | Same as 8.2.1.1.1 Multiple PRBs for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.1.1_A.5 | SNRs as specified | Same as 8.2.1.1.1 Multiple PRBs for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.1.2 Single PRB | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.2.1<br>- Prop'n Condition EVA5 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.2.1<br>- Prop'n Condition HST | SNR as specified | 0.6 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.2.1_1<br>- Prop'n Condition EVA5 | SNR as specified | Same as 8.2.1.2.1 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.2.2 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.2.2_1 | SNR as specified | Same as 8.2.1.2.2 | Formula: SNR + TT<br>T-put limit unchanged |

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|---|---|---|---|
| 8.2.1.2.3_C.1 | $N_{oc1}$: -102dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -94.8dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +3.4dB<br>$\hat{E}s_2$ / $N_{oc2}$: +6dB | -0.1dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB | $N_{oc1}$: -102.1dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -94.9dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +4.3dB<br>$\hat{E}s_2$ / $N_{oc2}$: +5.8dB<br><br>Formulae for Test Tolerance values:<br>$N_{oc1}$: -($\hat{E}s_1/N_{oc1}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$N_{oc2}$: unchanged<br>$N_{oc3}$: -($\hat{E}s_1/N_{oc3}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$\hat{E}s_1$ / $N_{oc2}$: +$\hat{E}s_1/N_{oc2}$ uncertainty<br>$\hat{E}s_2$ / $N_{oc2}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.2.1.2.3_E.1<br>- Prop'n Condition EVA5 | $N_{oc1}$: -98dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -93dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +3.4dB<br>$\hat{E}s_2$ / $N_{oc2}$: +12dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10dB | 0dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB<br>-0.2dB | $N_{oc1}$: -98dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -93.1dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +4.3dB<br>$\hat{E}s_2$ / $N_{oc2}$: +11.8dB<br>$\hat{E}s_3$ / $N_{oc2}$: +9.8dB<br><br>The analysis is recorded in 3GPP TR 36.904 [17]<br>T-put limit unchanged |
| 8.2.1.2.4 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -2.23dB<br>DIP 1: -8.06dB<br>SINR: -1.10dB | 0dB<br>+0.35dB<br>+0.85dB<br>+0.95dB | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.88dB<br>DIP 1: -7.21dB<br>SINR: -0.15dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.2.1.2.5 | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +15.5 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +13.91 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +3.34 dB<br><br>Cell 1 $\hat{E}s/N_{oc}$ is defined as SNR in minimum requirement. | 0 dB<br>+1.85 dB<br>+0.8 dB<br>+0.8 dB | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +17.35 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +14.71 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +4.14 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.2.1.2.6 | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +8.4 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +3.28 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +0.74 dB<br><br>Cell 1 $\hat{E}s/N_{oc}$ is defined as SNR in minimum requirement. | 0 dB<br>+1.54 dB<br>+0.8 dB<br>+0.8 dB | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +9.94 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +4.08 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +1.54 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.2.1.3.1 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.3.1_1 | SNR as specified | Same as 8.2.1.3.1 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.3.1_A.1 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.3.1_A.2 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.3.1_A.3 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.3.1_A.4 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.3.1A_A.1 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |

| | | | |
|---|---|---|---|
| 8.2.1.3.1B | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.3.1C | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +19.9 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +12.95 dB<br><br>Cell 1 $\hat{E}s/N_{oc}$ is defined as SNR in minimum requirement. | 0 dB<br>+1.9 dB<br>+0.8 dB | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +21.8 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +13.75 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.2.1.3.2 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.3.3_C.1 | $N_{oc1}$: -102dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -94.8dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +13.3dB<br>$\hat{E}s_2$ / $N_{oc2}$: +6dB | -0.1dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB | $N_{oc1}$: -102.1dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -94.9dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +14.2dB<br>$\hat{E}s_2$ / $N_{oc2}$: +5.8dB<br><br>Formulae for Test Tolerance values:<br>$N_{oc1}$: -($\hat{E}s_1/N_{oc1}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$N_{oc2}$: unchanged<br>$N_{oc3}$: -($\hat{E}s_1/N_{oc3}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$\hat{E}s_1$ / $N_{oc2}$: +$\hat{E}s_1/N_{oc2}$ uncertainty<br>$\hat{E}s_2$ / $N_{oc2}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>T-put limit unchanged |
| 8.2.1.3.3_C.2 | $N_{oc1}$: -102dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -94.8dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +12.0dB<br>$\hat{E}s_2$ / $N_{oc2}$: +6dB | -0.1dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB | $N_{oc1}$: -102.1dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -94.9dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +12.9dB<br>$\hat{E}s_2$ / $N_{oc2}$: +5.8dB<br><br>Formulae for Test Tolerance values:<br>$N_{oc1}$: -($\hat{E}s_1/N_{oc1}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$N_{oc2}$: unchanged<br>$N_{oc3}$: -($\hat{E}s_1/N_{oc3}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$\hat{E}s_1$ / $N_{oc2}$: +$\hat{E}s_1/N_{oc2}$ uncertainty<br>$\hat{E}s_2$ / $N_{oc2}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>T-put limit unchanged |
| 8.2.1.3.3_E.1<br>- Prop'n Condition EVA5 | $N_{oc1}$: -98dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -93dBm/15kHz<br>Test 1<br>$\hat{E}s_1$ / $N_{oc2}$: + 13.9dB<br>$\hat{E}s_2$ / $N_{oc2}$: + 9dB<br>$\hat{E}s_3$ / $N_{oc2}$: + 7dB<br>Test 2<br>$\hat{E}s_1$ / $N_{oc2}$: +22.6dB<br>$\hat{E}s_2$ / $N_{oc2}$: +9dB<br>+1dB $\hat{E}s_3$ / $N_{oc2}$: | 0dB<br>0dB<br>-0.1dB<br><br>+0.9dB<br>-0.2dB<br>-0.2dB<br><br>+0.9dB<br>-0.2dB<br>-0.2dB | $N_{oc1}$: -98dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: - 93.1 dBm/15kHz<br><br>$\hat{E}s_1$ / $N_{oc2}$: + 14.8 dB<br>$\hat{E}s_2$ / $N_{oc2}$: + 8.8dB<br>$\hat{E}s_3$ / $N_{oc2}$: + 6.8 dB<br><br>$\hat{E}s_1$ / $N_{oc2}$: +23.5dB<br>$\hat{E}s_2$ / $N_{oc2}$: +8.8dB<br>$\hat{E}s_3$ / $N_{oc2}$: +0.8dB<br><br>The analysis is recorded in 3GPP TR 36.904 [17]<br>T-put limit unchanged |
| 8.2.1.4.1 | SNRs as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.4.1_1 | SNR as specified | Same as 8.2.1.4.1 | Formula: SNR + TT<br>T-put limit unchanged |

| | | | |
|---|---|---|---|
| 8.2.1.4.1_E.1<br>- Prop'n Condition EPA5 | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +6.1 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +12 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10 dB | 0 dB<br>0 dB<br>-0.1 dB<br>+0.9 dB<br>-0.2 dB<br>-0.2 dB | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93.1 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +7.0 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +11.8 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +9.8 dB<br><br>The analysis is recorded in 3GPP TR 36.904 [17]<br>T-put limit unchanged |
| 8.2.1.4.1_H FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 2x2 for SCE-L1 | SNR as specified | Same as 8.2.1.4.1 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.4.2 | SNRs as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.4.2_1 | SNR as specified | Same as 8.2.1.4.2 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.4.2_A.1 | SNR as specified | Same as 8.2.1.4.2 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.4.2_A.2 | SNR as specified | Same as 8.2.1.4.2 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.4.2_A.3 | SNR as specified | Same as 8.2.1.4.2 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.4.2_A.4 | SNR as specified | Same as 8.2.1.4.2 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.4.2A | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.4.3 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.73dB<br>DIP 1: -8.66dB<br>SINR: 0.8dB | 0dB<br>+0.29dB<br>+0.89dB<br>+0.99dB | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.44dB<br>DIP 1: -7.77dB<br>SINR: 1.79dB<br>T-put limit unchanged |
| 8.2.1.4.3A | SNR as specified | Same as 8.2.1.4.2 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.1.4.4 | Test 1:<br>$N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +17.0 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +13.91 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +3.34 dB<br><br>Test 2:<br>$N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +10.1 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +3.28 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +0.74 dB | Test 1:<br>0 dB<br>+1.85 dB<br>+0.8 dB<br>+0.8 dB<br><br>Test 2:<br>0 dB<br>+1.54 dB<br>+0.8 dB<br>+0.8 dB | Test 1:<br>$N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +18.85 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +14.71 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +4.14 dB<br>T-put limit unchanged<br><br>Test 2:<br>$N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +11.64 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +4.08 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +1.54 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.2.1.7.1_A.1 | TBD | TBD | TBD |
| 8.2.1.9 Multiple PRBs<br>- Prop'n Condition HST-SFN | SNR as specified | 0.6dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.1.1 Multiple PRBs<br>- Prop'n Condition EVA5<br>- Prop'n Condition ETU70<br>- Prop'n Condition ETU300 | SNRs as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.1.1 Multiple PRBs<br>- Prop'n Condition HST | SNR as specified | 0.6dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.1.1 Single PRB<br>- Prop'n Condition ETU70 | SNRs as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |

| | | | |
|---|---|---|---|
| 8.2.2.1.1_1 Multiple PRBs<br>- Prop'n Condition EVA5<br>- Prop'n Condition ETU70<br>- Prop'n Condition ETU300 | SNRs as specified | Same as 8.2.2.1.1 Multiple PRBs Propagation EVA5, ETU70, ETU300 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.1.1_2 Multiple PRB<br>- Prop'n Condition EVA5 | SNRs as specified | Same as 8.2.2.1.1 Multiple PRBs Propagation EVA5 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.1.1_A.1 | SNRs as specified | 8.2.2.1.1 Multiple PRBs for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.1.1_A.2 | SNRs as specified | 8.2.2.1.1 Multiple PRBs for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.1.1_A.3 | SNRs as specified | 8.2.2.1.1 Multiple PRBs for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.1.1_A.4 | SNRs as specified | 8.2.2.1.1 Multiple PRBs for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.1.2 Single PRB | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.2.1<br>- Prop'n Condition EVA5 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.2.1<br>- Prop'n Condition HST | SNR as specified | 0.6 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.2.1_1<br>- Prop'n Condition EVA5 | SNR as specified | Same as 8.2.2.2.1 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.2.2 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.2.2_1 | SNR as specified | Same as 8.2.2.2.2 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.2.3_C.1 | $N_{oc1}$: -102dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -94.8dBm/15kHz<br>$\hat{E}s_1 / N_{oc2}$: +3.8dB<br>$\hat{E}s_2 / N_{oc2}$: +6dB | -0.1dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB | $N_{oc1}$: -102.1dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -94.9dBm/15kHz<br>$\hat{E}s_1 / N_{oc2}$: +4.7dB<br>$\hat{E}s_2 / N_{oc2}$: +5.8dB<br><br>Formulae for Test Tolerance values:<br>$N_{oc1}$: -($\hat{E}s_1/N_{oc1}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$N_{oc2}$: unchanged<br>$N_{oc3}$: -($\hat{E}s_1/N_{oc3}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$\hat{E}s_1 / N_{oc2}$: +$\hat{E}s_1/N_{oc2}$ uncertainty<br>$\hat{E}s_2 / N_{oc2}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |

| | | | |
|---|---|---|---|
| 8.2.2.2.3_E.1<br>- Prop'n Condition EVA5 | $N_{oc1}$: [-98dBm/15kHz]<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -93dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +3.5dB<br>$\hat{E}s_2$ / $N_{oc2}$: +12dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10dB | 0dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB<br>-0.2dB | $N_{oc1}$: -98dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -93.1dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +4.4dB<br>$\hat{E}s_2$ / $N_{oc2}$: +11.8dB<br>$\hat{E}s_3$ / $N_{oc2}$: +9.8dB<br><br>The analysis is recorded in 3GPP TR 36.904 [17]<br>T-put limit unchanged |
| 8.2.2.2.4 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.73dB<br>DIP 2: -8.66dB<br>SINR: -1.4dB | 0 dB<br>+0.29dB<br>+0.89dB<br>+0.99dB | $N_{oc}$: -98dBm/15kHz<br>DIP1: -1.44dB<br>DIP2: -7.77<br>SINR: -0.41dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.2.2.2.5 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.2.6 | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +15.3 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +13.91 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +3.34 dB<br><br>Cell 1 $\hat{E}s/N_{oc}$ is defined as SNR in minimum requirement. | 0 dB<br>+1.85 dB<br>+0.8 dB<br>+0.8 dB | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +17.15 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +14.71 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +4.14 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.2.2.2.7 | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +8.1 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +3.28 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +0.74 dB<br><br>Cell 1 $\hat{E}s/N_{oc}$ is defined as SNR in minimum requirement. | 0 dB<br>+1.54 dB<br>+0.8 dB<br>+0.8 dB | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +9.64 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +4.08 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +1.54 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.2.2.3.1 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.3.1_1 | SNR as specified | Same as 8.2.2.3.1 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.3.1_2 | SNR as specified | Same as 8.2.2.3.1 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.3.1_A.1 | SNRs as specified | Same as 8.2.2.3.1 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.3.1_A.2 | SNRs as specified | Same as 8.2.2.3.1 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.3.1_A.3 | SNRs as specified | Same as 8.2.2.3.1 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.3.1_A.4 | SNRs as specified | Same as 8.2.2.3.1 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.3.1A_A.1 | SNRs as specified | Same as 8.2.2.3.1 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.3.1B | SNRs as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.3.1C | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +19.6 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +12.95 dB<br><br>Cell 1 $\hat{E}s/N_{oc}$ is defined as SNR in minimum requirement. | 0 dB<br>+1.9 dB<br>+0.8 dB | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +21.5 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +13.75 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.2.2.3.2 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |

| | | | |
|---|---|---|---|
| 8.2.2.3.3_C.1 | $N_{oc1}$: -102dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -94.8dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +14.0dB<br>$\hat{E}s_2$ / $N_{oc2}$: +6dB | -0.1dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB | $N_{oc1}$: -102.1dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -94.9dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +14.9dB<br>$\hat{E}s_2$ / $N_{oc2}$: +5.8dB<br><br>Formulae for Test Tolerance values:<br>$N_{oc1}$: -($\hat{E}s_1/N_{oc1}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$N_{oc2}$: unchanged<br>$N_{oc3}$: -($\hat{E}s_1/N_{oc3}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$\hat{E}s_1$ / $N_{oc2}$: +$\hat{E}s_1/N_{oc2}$ uncertainty<br>$\hat{E}s_2$ / $N_{oc2}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>T-put limit unchanged |
| 8.2.2.3.3_C.2 | $N_{oc1}$: -102dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -94.8dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +12.2dB<br>$\hat{E}s_2$ / $N_{oc2}$: +6dB | -0.1dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB | $N_{oc1}$: -102.1dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -94.9dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +13.1dB<br>$\hat{E}s_2$ / $N_{oc2}$: +5.8dB<br><br>Formulae for Test Tolerance values:<br>$N_{oc1}$: -($\hat{E}s_1/N_{oc1}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$N_{oc2}$: unchanged<br>$N_{oc3}$: -($\hat{E}s_1/N_{oc3}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$\hat{E}s_1$ / $N_{oc2}$: +$\hat{E}s_1/N_{oc2}$ uncertainty<br>$\hat{E}s_2$ / $N_{oc2}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>T-put limit unchanged |
| 8.2.2.3.3_E.1<br>- Prop'n Condition EVA5 | $N_{oc1}$: -98dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -93dBm/15kHz<br>Test 1<br>$\hat{E}s_1$ / $N_{oc2}$: + 14.2 dB<br>$\hat{E}s_2$ / $N_{oc2}$: + 9 dB<br>$\hat{E}s_3$ / $N_{oc2}$: + 7 dB<br>Test 2<br>$\hat{E}s_1$ / $N_{oc2}$: +22.7dB<br>$\hat{E}s_2$ / $N_{oc2}$: +9dB<br>$\hat{E}s_3$ / $N_{oc2}$: +1dB | 0dB<br>0dB<br>-0.1dB<br><br>+0.9dB<br>-0.2dB<br>-0.2dB<br><br>+0.9dB<br>-0.2dB<br>-0.2dB | $N_{oc1}$: -98dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -93.1dBm/15kHz<br><br>$\hat{E}s_1$ / $N_{oc2}$: + 15.1 dB<br>$\hat{E}s_2$ / $N_{oc2}$: + 8.8 dB<br>$\hat{E}s_3$ / $N_{oc2}$: + 6.8 dB<br><br>$\hat{E}s_1$ / $N_{oc2}$: +23.6dB<br>$\hat{E}s_2$ / $N_{oc2}$: +8.8dB<br>$\hat{E}s_3$ / $N_{oc2}$: +0.8dB<br><br>The analysis is recorded in 3GPP TR 36.904 [17]<br>T-put limit unchanged |
| 8.2.2.4.1 | SNRs as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.4.1_1 | SNR as specified | Same as 8.2.2.4.1 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.4.1_E.1<br>- Prop'n Condition EPA5 | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +6.4 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +12 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +10 dB | 0 dB<br>0 dB<br>-0.1 dB<br>+0.9 dB<br>-0.2 dB<br>-0.2 dB | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93.1 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +7.3 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +11.8 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +9.8 dB<br><br>The analysis is recorded in 3GPP TR 36.904 [17]<br>T-put limit unchanged |
| 8.2.2.4.1_H TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 2x2 for SCE-L1 | SNR as specified | Same as 8.2.2.4.1 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.4.2 | SNRs as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |

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|---|---|---|---|
| 8.2.2.4.2_1 | SNR as specified | Same as 8.2.2.4.2 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.4.2_A.1 | SNR as specified | Same as 8.2.2.4.2 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.4.2_A.2 | SNR as specified | Same as 8.2.2.4.2 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.4.2_A.3 | SNR as specified | Same as 8.2.2.4.2 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.4.2_A.4 | SNR as specified | Same as 8.2.2.4.2 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.4.2A | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.4.3 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.73dB<br>DIP 2: -8.66dB<br>SINR: 1.1dB | 0 dB<br>+0.29dB<br>+0.89dB<br>+0.99dB | $N_{oc}$: -98dBm/15kHz<br>DIP1: -1.44dB<br>DIP2: -7.77<br>SINR: 2.09dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.2.2.4.4 | SNR as specified | Same as 8.2.2.4.2 for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.2.4.5 | Test 1:<br>$N_{oc}$: -98dBm/15kHz<br>Cell 1 Ês/$N_{oc}$: +16.1 dB<br>Cell 2 Ês/$N_{oc}$: +13.91 dB<br>Cell 3 Ês/$N_{oc}$: +3.34 dB<br><br>Test 2:<br>$N_{oc}$: -98dBm/15kHz<br>Cell 1 Ês/$N_{oc}$: +9.5 dB<br>Cell 2 Ês/$N_{oc}$: +3.28 dB<br>Cell 3 Ês/$N_{oc}$: +0.74 dB | Test 1:<br>0 dB<br>+1.85 dB<br>+0.8 dB<br>+0.8 dB<br><br>Test 2:<br>0 dB<br>+1.54 dB<br>+0.8 dB<br>+0.8 dB | Test 1:<br>$N_{oc}$: -98dBm/15kHz<br>Cell 1 Ês/$N_{oc}$: +17.95 dB<br>Cell 2 Ês/$N_{oc}$: +14.71 dB<br>Cell 3 Ês/$N_{oc}$: +4.14 dB<br>T-put limit unchanged<br><br>Test 2:<br>$N_{oc}$: -98dBm/15kHz<br>Cell 1 Ês/$N_{oc}$: +11.04 dB<br>Cell 2 Ês/$N_{oc}$: +4.08 dB<br>Cell 3 Ês/$N_{oc}$: +1.54 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.2.2.7.1_A.1 | TBD | TBD | TBD |
| 8.2.2.9 Multiple PRBs - Prop'n Condition HST-SFN | SNR as specified | 0.6dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.1.1.1 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.1.1.2 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.1.1.3 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.1.1.4 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.1.2.1 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.1.2.2 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.1.2.3 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.1.2.4 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.2.1.1 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.2.1.2 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |

| | | | |
|---|---|---|---|
| 8.2.3.2.1.3 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.2.1.4 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.2.1A | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.2.2.1 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.2.2.2 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.2.2.3 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.2.2.4 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.2.2A | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.3.1.1 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.3.1.2 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.3.1.3 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.3.1.4 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.3.2.1 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.3.2.2 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.3.2.3 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.3.3.2.4 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.4.1.1 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.2.4.1.2 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.1.1.1_D | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.1.1.1_H FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 without a simultaneous transmission for eDL-MIMO for SCE-L1 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.1.1.2_D | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.1.1.3 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.73dB<br>SINR: -1.10dB | 0 dB<br>+0.28dB<br>+0.98dB | $N_{oc}$: -98dBm/15kHz<br>DIP1: -1.45dB<br>SINR: -0.12dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.3.1.1.4 | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +18.5 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +13.91 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +3.34 dB<br><br>Cell 1 $\hat{E}s/N_{oc}$ is defined as SNR in minimum requirement. | 0 dB<br>+1.85 dB<br>+0.8 dB<br>+0.8 dB | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +20.35 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +14.71 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +4.14 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |

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|---|---|---|---|
| 8.3.1.1.5 | $\hat{E}s_1 / N_{oc}$: +14.3dB<br>$\hat{E}s_2 / N_{oc}$: +13.91dB<br>$\hat{E}s_3 / N_{oc}$: +3.34dB | +0.9dB<br>-0.2dB<br>0 dB | $\hat{E}s_1 / N_{oc}$: +15.2dB<br>$\hat{E}s_2 / N_{oc}$: +13.71dB<br>$\hat{E}s_3 / N_{oc}$: +3.34dB<br><br>Formulas for Test Tolerance values:<br>$\hat{E}s_1 / N_{oc}$: +$\hat{E}s_1/N_{oc}$ uncertainty<br>$\hat{E}s_2 / N_{oc}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc}$ uncertainty)<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.3.1.1.6 | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +11.5 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +3.28 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +0.74 dB<br><br>Cell 1 $\hat{E}s/N_{oc}$ is defined as SNR in minimum requirement. | 0 dB<br>+1.54 dB<br>+0.8 dB<br>+0.8 dB | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +13.04 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +4.08 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +1.54 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.3.1.1.7 | TBD | TBD | TBD |
| 8.3.1.1.9 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.1.2.1_D | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.1.2.1_D_1 | $N_{oc}$: -98dBm/15kHz<br>$\hat{E}s_1 / N_{oc}$: +14.2 dB<br>$\hat{E}s_2 / N_{oc}$: +7.25 dB | 0 dB<br>+0.8 dB<br>-0.35 dB | $N_{oc}$: -98dBm/15kHz<br>$\hat{E}s_1 / N_{oc}$: +15.0 dB<br>$\hat{E}s_2 / N_{oc}$: +6.9 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.3.1.2.2 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.1.3.1_F | SNR as specified<br>Test 1: 2us<br>Test 2: -0.5us | 0.9 dB<br>-0.145us<br>+0.142us | Formula: SNR + TT<br>Test 1: 57Ts<br>Test 2: -11Ts<br>Timings: (Offset – uncertainty), then rounded to integer multiple of Ts<br><br>T-put limit unchanged |
| 8.3.1.3.2_F | SNR as specified<br>Test 1: 2us<br>Test 2: -0.5us | 0.9 dB<br>-0.145us<br>+0.142us | Formula: SNR + TT<br>Test 1: 57Ts<br>Test 2: -11Ts<br>Timings: (Offset – uncertainty), then rounded to integer multiple of Ts<br><br>T-put limit unchanged |
| 8.3.1.3.3_F | SNR as specified<br>Test 1: 2us<br>Test 2: -0.5us | 0.9 dB<br>-0.145us<br>+0.142us | Formula: SNR + TT<br>Test 1: 57Ts<br>Test 2: -11Ts<br>Timings: (Offset - uncertainty), then rounded to integer multiple of Ts<br><br>T-put limit unchanged |
| 8.3.2.1.1 | SNRs as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.2.1.1_1 | SNRs as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.2.1.2 | SNRs as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.2.1.2_D | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |

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|---|---|---|---|
| 8.3.2.1.2_H TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 without a simultaneous transmission for eDL-MIMO for SCE-L1 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.2.1.3 | SNRs as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.2.1.3_D | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.2.1.4 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.73dB<br>SINR: -1.0dB | 0 dB<br>+0.28dB<br>+0.98dB | $N_{oc}$: -98dBm/15kHz<br>DIP1: -1.45dB<br>SINR: -0.02dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.3.2.1.5 | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +18.0 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +13.91 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +3.34 dB<br><br>Cell 1 $\hat{E}s/N_{oc}$ is defined as SNR in minimum requirement. | 0 dB<br>+1.85 dB<br>+0.8 dB<br>+0.8 dB | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +19.85 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +14.71 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +4.14 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.3.2.1.6 | $\hat{E}s_1 / N_{oc}$: +14.0dB<br>$\hat{E}s_2 / N_{oc}$: +13.91dB<br>$\hat{E}s_3 / N_{oc}$: +3.34dB | +0.9dB<br>-0.2dB<br>0 dB | $\hat{E}s_1 / N_{oc}$: +14.9dB<br>$\hat{E}s_2 / N_{oc}$: +13.71dB<br>$\hat{E}s_3 / N_{oc}$: +3.34dB<br><br>Formulas for Test Tolerance values:<br>$\hat{E}s_1 / N_{oc}$: +$\hat{E}s_1/N_{oc}$ uncertainty<br>$\hat{E}s_2 / N_{oc}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc}$ uncertainty)<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.3.2.1.7 | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +11.3 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +3.28 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +0.74 dB<br><br>Cell 1 $\hat{E}s/N_{oc}$ is defined as SNR in minimum requirement. | 0 dB<br>+1.54 dB<br>+0.8 dB<br>+0.8 dB | $N_{oc}$: -98dBm/15kHz<br>Cell 1 $\hat{E}s/N_{oc}$: +12.84 dB<br>Cell 2 $\hat{E}s/N_{oc}$: +4.08 dB<br>Cell 3 $\hat{E}s/N_{oc}$: +1.54 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.3.2.1.8 | TBD | TBD | TBD |
| 8.3.2.1.10 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.2.2.1 | SNRs as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.2.2.1_D | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.2.2.1_D_1 | $N_{oc}$: -98dBm/15kHz<br>$\hat{E}s_1 / N_{oc}$: +14.8 dB<br>$\hat{E}s_2 / N_{oc}$: +7.25 dB | 0 dB<br>+0.8 dB<br>-0.35 dB | $N_{oc}$: -98dBm/15kHz<br>$\hat{E}s_1 / N_{oc}$: +15.6 dB<br>$\hat{E}s_2 / N_{oc}$: +6.9 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.3.2.2.2 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.2.4.1_F | SNR as specified<br>Test 1: 2us<br>Test 2: -0.5us | 0.9 dB<br>-0.145us<br>+0.142us | Formula: SNR + TT<br>Test 1: 57Ts<br>Test 2: -11Ts<br>Timings: (Offset – uncertainty), then rounded to integer multiple of Ts<br><br>T-put limit unchanged |

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|---|---|---|---|
| 8.3.2.4.2_F | SNR as specified<br>Test 1: 2us<br>Test 2: -0.5us | 0.9 dB<br>-0.145us<br>+0.142us | Formula: SNR + TT<br>Test 1: 57Ts<br>Test 2: -11Ts<br>Timings: (Offset - uncertainty), then rounded to integer multiple of Ts<br><br>T-put limit unchanged |
| 8.3.2.4.3_F | SNR as specified<br>Test 1: 2us<br>Test 2: -0.5us | 0.9 dB<br>-0.145us<br>+0.142us | Formula: SNR + TT<br>Test 1: 57Ts<br>Test 2: -11Ts<br>Timings: (Offset - uncertainty), then rounded to integer multiple of Ts<br><br>T-put limit unchanged |
| 8.3.3.1.1 | SNR as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.3.3.1.2 | SNR as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.4.1.1 | SNR as specified | 0.8 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.4.1.2.1 | SNR as specified | 1.0 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.4.1.2.1_1 | SNR as specified | Same as 8.4.1.2.1 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.4.1.2.2 | SNR as specified | 1.0 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.4.1.2.2_1 | SNR as specified | Same as 8.4.1.2.2 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.4.1.2.3_C.1 | $N_{oc1}$: -100.5dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -95.3dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -3.9dB<br>$\hat{E}s_2$ / $N_{oc2}$: +1.5dB | -0.1dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB | $N_{oc1}$: -100.6dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -95.4dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -3dB<br>$\hat{E}s_2$ / $N_{oc2}$: +1.3dB<br><br>Formula for Test Tolerance values:<br>$N_{oc1}$: -($\hat{E}s_1/N_{oc1}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$N_{oc2}$: unchanged<br>$N_{oc3}$: -($\hat{E}s_1/N_{oc3}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$\hat{E}s_1$ / $N_{oc2}$: +$\hat{E}s_1/N_{oc2}$ uncertainty<br>$\hat{E}s_2$ / $N_{oc2}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>T-put limit unchanged |
| 8.4.1.2.3_C.2 | $N_{oc1}$: -100.5dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -95.3dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -4.2dB<br>$\hat{E}s_2$ / $N_{oc2}$: +1.5dB | -0.1dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB | $N_{oc1}$: -100.6dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -95.4dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -3.3dB<br>$\hat{E}s_2$ / $N_{oc2}$: +1.3dB<br><br>Formula for Test Tolerance values:<br>$N_{oc1}$: -($\hat{E}s_1/N_{oc1}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$N_{oc2}$: unchanged<br>$N_{oc3}$: -($\hat{E}s_1/N_{oc3}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$\hat{E}s_1$ / $N_{oc2}$: +$\hat{E}s_1/N_{oc2}$ uncertainty<br>$\hat{E}s_2$ / $N_{oc2}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>T-put limit unchanged |
| 8.4.1.2.3_E.1<br>- Prop'n Condition EVA5 | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -2.2 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +5 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +3 dB | 0 dB<br>0 dB<br>-0.1 dB<br>+0.9 dB<br>-0.2 dB<br>-0.2 dB | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93.1 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -1.3 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +4.8 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +2.8 dB The analysis is recorded in 3GPP TR 36.904 [17]<br>Pm-dsg limit unchanged |

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| 8.4.1.2.3_E.2<br>- Prop'n Condition EVA5 | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -2 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +5 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +3 dB | 0 dB<br>0 dB<br>-0.1 dB<br>+0.9 dB<br>-0.2 dB<br>-0.2 dB | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93.1 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -1.1 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +4.8 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +2.8 dB<br><br>The analysis is recorded in 3GPP TR 36.904 [17]<br>Pm-dsg limit unchanged |
| 8.4.2.1 | SNR as specified | 0.8 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.4.2.2.1 | SNR as specified | 1.0 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.4.2.2.1_1 | SNR as specified | Same as 8.4.2.2.1 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.4.2.2.2 | SNR as specified | 1.0 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.4.2.2.2_1 | SNR as specified | Same as 8.4.2.2.2 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.4.2.2.3_C.1 | $N_{oc1}$: -100.5dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -95.3dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -3.9dB<br>$\hat{E}s_2$ / $N_{oc2}$: +1.5dB | -0.1dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB | $N_{oc1}$: -100.6dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -95.4dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -3dB<br>$\hat{E}s_2$ / $N_{oc2}$: +1.3dB<br><br>Formula for Test Tolerance values:<br>$N_{oc1}$: -($\hat{E}s_1/N_{oc1}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$N_{oc2}$: unchanged<br>$N_{oc3}$: -($\hat{E}s_1/N_{oc3}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$\hat{E}s_1$ / $N_{oc2}$: +$\hat{E}s_1/N_{oc2}$ uncertainty<br>$\hat{E}s_2$ / $N_{oc2}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>T-put limit unchanged |
| 8.4.2.2.3_C.2 | $N_{oc1}$: -100.5dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -95.3dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -4.1dB<br>$\hat{E}s_2$ / $N_{oc2}$: +1.5dB | -0.1dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB | $N_{oc1}$: -100.6dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -95.4dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -3.2dB<br>$\hat{E}s_2$ / $N_{oc2}$: +1.3dB<br><br>Formula for Test Tolerance values:<br>$N_{oc1}$: -($\hat{E}s_1/N_{oc1}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$N_{oc2}$: unchanged<br>$N_{oc3}$: -($\hat{E}s_1/N_{oc3}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$\hat{E}s_1$ / $N_{oc2}$: +$\hat{E}s_1/N_{oc2}$ uncertainty<br>$\hat{E}s_2$ / $N_{oc2}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>T-put limit unchanged |
| 8.4.2.2.3_E.1<br>- Prop'n Condition EVA5 | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -.2 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +5 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +3 dB | 0 dB<br>0 dB<br>-0.1 dB<br>+0.9 dB<br>-0.2 dB<br>-0.2 dB | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93.1 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -1.1 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +4.8 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +2.8 dB<br><br>The analysis is recorded in 3GPP TR 36.904 [17]<br>Pm-dsg limit unchanged |

| | | | |
|---|---|---|---|
| 8.4.2.2.3_E.2<br>- Prop'n Condition EVA5 | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -1.8 dB:<br>$\hat{E}s_2$ / $N_{oc2}$ +5 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +3 dB | 0 dB<br>0 dB<br>-0.1 dB<br>+0.9 dB<br>-0.2 dB<br>-0.2 dB | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93.1 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: -0.9 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +4.8 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +2.8 dB<br><br>The analysis is recorded in 3GPP TR 36.904 [17]<br>Pm-dsg limit unchanged |
| 8.4.3.1.1 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.4.3.1.2 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.5.1.1 | SNRs as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.5.1.2.1 | SNR as specified | 1.1 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.5.1.2.1_1 | SNR as specified | Same as 8.5.1.2.1 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.5.1.2.2 | SNR as specified | 1.0 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.5.1.2.3_C.1 | $N_{oc1}$: -100.5dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -95.3dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +4.6dB<br>$\hat{E}s_2$ / $N_{oc2}$: +1.5dB | -0.1dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB | $N_{oc1}$: -100.6dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -95.4dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +5.5dB<br>$\hat{E}s_2$ / $N_{oc2}$: +1.3dB<br><br>Formula for Test Tolerance values:<br>$N_{oc1}$: -($\hat{E}s_1/N_{oc1}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$N_{oc2}$: unchanged<br>$N_{oc3}$: -($\hat{E}s_1/N_{oc3}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$\hat{E}s_1$ / $N_{oc2}$: +$\hat{E}s_1/N_{oc2}$ uncertainty<br>$\hat{E}s_2$ / $N_{oc2}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>T-put limit unchanged |
| 8.5.1.2.3_E.1 | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +5 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +5 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +3 dB | 0 dB<br>0 dB<br>-0.1 dB<br>+0.9 dB<br>-0.2 dB<br>-0.2 dB | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93.1 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +5.9 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +4.8 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +2.8 dB The analysis is recorded in 3GPP TR 36.904 [17]<br>Pm-an limit unchanged |
| 8.5.1.2.2_1 | SNR as specified | Same as 8.5.1.2.2 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.5.2.1 | SNRs as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.5.2.2.1 | SNR as specified | 1.1 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.5.2.2.1_1 | SNR as specified | Same as 8.5.2.2.1 | Formula: SNR + TT<br>T-put limit unchanged |
| 8.5.2.2.2 | SNR as specified | 1.0 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.5.2.2.2_1 | SNR as specified | Same as 8.5.2.2.2 | Formula: SNR + TT<br>T-put limit unchanged |

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| 8.5.2.2.3_C.1 | $N_{oc1}$: -100.5dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -95.3dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +4.6dB<br>$\hat{E}s_2$ / $N_{oc2}$: +1.5dB | -0.1dB<br>0dB<br>-0.1dB<br>+0.9dB<br>-0.2dB | $N_{oc1}$: -100.6dBm/15kHz<br>$N_{oc2}$: -98dBm/15kHz<br>$N_{oc3}$: -95.4dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +5.5dB<br>$\hat{E}s_2$ / $N_{oc2}$: +1.3dB<br><br>Formula for Test Tolerance values:<br>$N_{oc1}$: -($\hat{E}s_1/N_{oc1}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$N_{oc2}$: unchanged<br>$N_{oc3}$: -($\hat{E}s_1/N_{oc3}$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>$\hat{E}s_1$ / $N_{oc2}$: +$\hat{E}s_1/N_{oc2}$ uncertainty<br>$\hat{E}s_2$ / $N_{oc2}$: -($\hat{E}s_2/\hat{E}s_1$ uncertainty - $\hat{E}s_1/N_{oc2}$ uncertainty)<br>T-put limit unchanged |
| 8.5.2.2.3_E.1 | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +5.7 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +5 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +3 dB | 0 dB<br>0 dB<br>-0.1 dB<br>+0.9 dB<br>-0.2 dB<br>-0.2 dB | $N_{oc1}$: -98 dBm/15kHz<br>$N_{oc2}$: -98 dBm/15kHz<br>$N_{oc3}$: -93.1 dBm/15kHz<br>$\hat{E}s_1$ / $N_{oc2}$: +6.6 dB<br>$\hat{E}s_2$ / $N_{oc2}$: +4.8 dB<br>$\hat{E}s_3$ / $N_{oc2}$: +2.8 dB The analysis is recorded in 3GPP TR 36.904 [17]<br>Pm-an limit unchanged |
| 8.7.1.1 FDD sustained data rate performance | Downlink power -85dBm/15kHz | 0 dB | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.1.1_1 | Same as 8.7.1.1 | Same as 8.7.1.1 | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.1.1_2 | Same as 8.7.1.1 | Same as 8.7.1.1 | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.1.1_A.1 | Same as 8.7.1.1 | Same as 8.7.1.1 | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.1.1_A.2 | Same as 8.7.1.1 | Same as 8.7.1.1 | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.1.1_A.4 | Same as 8.7.1.1 | Same as 8.7.1.1 | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.1.1_A.5 | Same as 8.7.1.1 | Same as 8.7.1.1 | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.1.1_H.1 | Same as 8.7.1.1 | Same as 8.7.1.1 | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.1.1_H.2 | Same as 8.7.1.1 | Same as 8.7.1.1 for each CC | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.1.1_H.3 | Same as 8.7.1.1 | Same as 8.7.1.1 for each CC | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.1.1_H.4 | Same as 8.7.1.1 | Same as 8.7.1.1 for each CC | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.1.1_H.5 | Same as 8.7.1.1 | Same as 8.7.1.1 for each CC | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.2.1 TDD sustained data rate performance | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.2.1_1 | Same as 8.7.2.1 | Same as 8.7.2.1 | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.2.1_2 | Same as 8.7.2.1 | Same as 8.7.2.1 | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.2.1_A.1 | Same as 8.7.2.1 | Same as 8.7.2.1 for each CC | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.2.1_A.2 | Same as 8.7.2.1 | Same as 8.7.2.1 for each CC | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.2.1_A.3 | Same as 8.7.2.1 | Same as 8.7.2.1 for each CC | Formula: Downlink power + TT<br>T-put limit unchanged |

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| 8.7.2.1_H.1 | Same as 8.7.2.1 | Same as 8.7.2.1 | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.2.1_H.2 | Same as 8.7.2.1 | Same as 8.7.2.1 for each CC | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.2.1_H.3 | Same as 8.7.2.1 | Same as 8.7.2.1 for each CC | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.3.1 FDD sustained data rate performance for EPDCCH scheduling | Same as 8.7.1.1 | Same as 8.7.1.1 | Formula: Downlink power + TT<br>T-put limit unchanged |
| 8.7.4.1 TDD sustained data rate performance for EPDCCH scheduling | Same as 8.7.2.1 | Same as 8.7.2.1 | Same as 8.7.2.1 |
| 8.7.5.1.1 TDD FDD CA Sustained data rate performance for FDD PCell (2DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1 |
| 8.7.5.1.2 TDD FDD CA Sustained data rate performance for FDD PCell (3DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1 |
| 8.7.5.1.3 TDD FDD CA Sustained data rate performance for FDD PCell (4DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1 |
| 8.7.5.1.4 TDD FDD CA Sustained data rate performance for FDD PCell (5DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1 |
| 8.7.5.1_H.1 TDD FDD CA Sustained data rate performance for FDD PCell for SCE-L1 (2DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1 |
| 8.7.5.1_H.2 TDD FDD CA Sustained data rate performance for FDD PCell for SCE-L1 (3DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 for each CC | Same as 8.7.1.1 |
| 8.7.5.2.1 TDD FDD CA Sustained data rate performance for TDD PCell (2DL CA) | Same as 8.7.2.1 | Same as 8.7.2.1 for each CC | Same as 8.7.2.1 |
| 8.7.5.2.2 TDD FDD CA Sustained data rate performance for TDD PCell (3DL CA) | Same as 8.7.2.1 | Same as 8.7.2.1 for each CC | Same as 8.7.2.1 |
| 8.7.5.2.3 TDD FDD CA Sustained data rate performance for TDD PCell (4DL CA) | Same as 8.7.2.1 | Same as 8.7.2.1 for each CC | Same as 8.7.2.1 |
| 8.7.5.2_H.1 TDD FDD CA Sustained data rate performance for TDD PCell for SCE-L1 (2DL CA) | Same as 8.7.2.1 | Same as 8.7.2.1 for each CC | Same as 8.7.2.1 |
| 8.7.5.2_H.2 TDD FDD CA Sustained data rate performance for TDD PCell for SCE-L1 (3DL CA) | Same as 8.7.2.1 | Same as 8.7.2.1 for each CC | Same as 8.7.2.1 |
| 8.7.5.2_H.3 TDD FDD CA Sustained data rate performance for TDD PCell for SCE-L1 (4DL CA) | Same as 8.7.2.1 | Same as 8.7.2.1 for each CC | Same as 8.7.2.1 |
| 8.7.6.1 FDD sustained data rate performance for Dual Connectivity 64QAM | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.6.2 FDD sustained data rate performance for Dual Connectivity 256QAM | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |

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| 8.7.7.1 TDD sustained data rate performance for Dual Connectivity 64QAM | Same as 8.7.2.1 | Same as 8.7.2.1 | Same as 8.7.2.1 |
| 8.7.7.2 TDD sustained data rate performance for Dual Connectivity 256QAM | Same as 8.7.2.1 | Same as 8.7.2.1 | Same as 8.7.2.1 |
| 8.7.9.2 FDD sustained data rate performance for 4 layer MIMO (single carrier) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.9.3 FDD sustained data rate performance for 4 layer MIMO (2DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.9.4 FDD sustained data rate performance for 4 layer MIMO (3DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.9.5 FDD sustained data rate performance for 4 layer MIMO (4DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.9.6 FDD sustained data rate performance for 4 layer MIMO (5DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.10.2 TDD sustained data rate performance for 4 layer MIMO (single carrier) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.10.3 TDD sustained data rate performance for 4 layer MIMO (2DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.10.4 TDD sustained data rate performance for 4 layer MIMO (3DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.10.5 TDD sustained data rate performance for 4 layer MIMO (4DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.10.6 TDD sustained data rate performance for 4 layer MIMO (5DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.11.2 TDD FDD CA sustained data rate performance for 4 layer MIMO (2DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.11.3 TDD FDD CA sustained data rate performance for 4 layer MIMO (3DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.11.4 TDD FDD CA sustained data rate performance for 4 layer MIMO (4DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.11.5 TDD FDD CA sustained data rate performance for 4 layer MIMO (5DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.12.1.2.1 FDD as Pcell with 2DL CA (2RX) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.12.1.2.2 FDD as Pcell with 2DL CA (4 layer MIMO) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.12.2.2.1 LAA sustained data rate performance with TDD PCell with 2DL CA (2Rx) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.7.12.2.2.2 LAA sustained data rate performance with TDD PCell for 4 layer MIMO (2DL CA) | Same as 8.7.1.1 | Same as 8.7.1.1 | Same as 8.7.1.1 |
| 8.8.1.1 FDD distributed EPDCCH performance | SNR as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |

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| 8.8.1.2 TDD distributed EPDCCH performance | SNR as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.8.2.1 FDD localized EPDCCH performance with TM9 | SNR as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.8.2.2 TDD localized EPDCCH performance with TM9 | SNR as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.8.3.1 FDD localized EPDCCH transmission with TM10 Type B quasi co-location type | SNR as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.8.3.2 TDD localized EPDCCH transmission with TM10 Type B quasi co-location type | SNR as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.9.1.1.1 FDD PDSCH Transmit Diversity 2x1 for UE category 0 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.1.1.2 FDD Closed-loop spatial multiplexing performance (Cell-Specific Reference Symbols) for UE category 0 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.1.1.3 FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 0 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.1.1.3_1 FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 1bis | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.1.1.1_1 FDD PDSCH Transmit Diversity 2x1 for UE category 1bis | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.1.1.2_1 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x1 for UE Category 1bis | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.1.2.1 TDD PDSCH Transmit Diversity for UE category 0 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.1.2.1_1 TDD PDSCH Transmit Diversity 2x1 for UE category 1bis | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.1.2.2 TDD Closed-loop spatial multiplexing performance (Cell-Specific Reference Symbols) for UE category 0 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.1.2.2_1 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x1 for UE Category 1bis | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.1.2.3 TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 0 | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.1.2.3_1 TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 1bis | SNR as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |

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| 8.9.2.1.1 FDD PHICH transmit diversity for UE category 0 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.2.1.1_1 FDD PHICH transmit diversity for UE category 1bis | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.2.2.1 TDD PHICH Transmit Diversity for UE category 0 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.9.2.2.1_1 TDD PHICH transmit diversity for UE category 1bis | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.1.1.1 FDD PDSCH Transmit Diversity 2x4 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.1.1.2 FDD PDSCH Open Loop Spatial Multiplexing 2x4 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.1.1.3 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model – Enhanced Performance Requirement Type A | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.73dB<br>SINR: -2.3dB | 0dB<br>+0.28dB<br>+0.98dB | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.45dB<br>SINR: -1.32dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.10.1.1.4 FDD PDSCH Closed Loop Spatial Multiplexing 4x4 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.1.1.5 FDD PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 interference model – Enhanced Performance Requirement Type A | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.73dB<br>SINR: -3.0dB | 0 dB<br>+0.28dB<br>+0.98dB | $N_{oc}$: -98dBm/15kHz<br>DIP1: -1.45dB<br>SINR: -2.03dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.10.1.1.6 FDD Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols) | $N_{oc}$: -98dBm/15kHz<br>$\hat{E}_{S1}$ / $N_{oc}$: +9.2 dB<br>$\hat{E}_{S2}$ / $N_{oc}$: +7.25 dB | 0 dB<br>+0.8 dB<br>-0.35 dB | $N_{oc}$: -98dBm/15kHz<br>$\hat{E}_{S1}$ / $N_{oc}$: +10.0 dB<br>$\hat{E}_{S2}$ / $N_{oc}$: +6.9 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.10.1.1.7 FDD Open-loop spatial multiplexing, 3 Layer Multiplexing with 4 Tx Antenna Ports | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.1.1.8 FDD Closed-loop spatial multiplexing performance, 4 Layers spatial multiplexing 4 Tx antennas | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.1.1.9 FDD 4 Layer Spatial Multiplexing (User-Specific Reference Symbols) | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.1.2.1 TDD PDSCH Transmit Diversity 2x4 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.1.2.2 TDD PDSCH Open Loop Spatial Multiplexing 2x4 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.1.2.3 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model – Enhanced Performance Requirement Type A | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.73dB<br>SINR: -1.9dB | 0dB<br>+0.28dB<br>+0.98dB | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.45dB<br>SINR: -0.92dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |

| | | | |
|---|---|---|---|
| 8.10.1.2.4 TDD PDSCH Closed Loop Spatial Multiplexing 4x4 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.1.2.5 FDD PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 interference model – Enhanced Performance Requirement Type A | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.73dB<br>SINR: -3.3dB | 0 dB<br>+0.28dB<br>+0.98dB | $N_{oc}$: -98dBm/15kHz<br>DIP1: -1.45dB<br>SINR: -2.32dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.10.1.2.6 TDD Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols) | $N_{oc}$: -98dBm/15kHz<br>$\hat{E}_{S1}$ / $N_{oc}$: +9.5 dB<br>$\hat{E}_{S2}$ / $N_{oc}$: +7.25 dB | 0 dB<br>+0.8 dB<br>-0.35 dB | $N_{oc}$: -98dBm/15kHz<br>$\hat{E}_{S1}$ / $N_{oc}$: +10.3 dB<br>$\hat{E}_{S2}$ / $N_{oc}$: +6.9 dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.10.1.2.7 TDD Open-loop spatial multiplexing, 3 Layer Multiplexing with 4 Tx Antenna Ports | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.1.2.8 TDD Closed-loop spatial multiplexing performance, 4 Layers spatial multiplexing 4 Tx antennas | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.1.2.9 TDD 4 Layer Spatial Multiplexing (User-Specific Reference Symbols) | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.2.1.1 FDD PCFICH/PDCCH Single-antenna Port Performance 1x4 | SNR as specified | 0.8 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.2.1.2 FDD PCFICH/PDCCH Transmit Diversity 2x4 | SNR as specified | 1.0 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.2.1.3 FDD PCFICH/PDCCH Transmit Diversity 4x4 | SNR as specified | 1.0 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.2.2.1 TDD PCFICH/PDCCH Single-antenna Port Performance 1x4 | SNR as specified | 0.8 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.2.2.2 TDD PCFICH/PDCCH Transmit Diversity 2x4 | SNR as specified | 1.0 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.2.2.3 TDD PCFICH/PDCCH Transmit Diversity 4x4 | SNR as specified | 1.0 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.10.3.1.1 FDD PHICH Single-antenna Port Performance 1x4 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>Pm-an limit unchanged |
| 8.10.3.1.2 FDD PHICH Transmit Diversity 2x4 | SNR as specified | 1.1 dB | Formula: SNR + TT<br>Pm-an limit unchanged |
| 8.10.3.1.3 FDD PHICH Transmit Diversity 4x4 | SNR as specified | 1.0 dB | Formula: SNR + TT<br>Pm-an limit unchanged |
| 8.10.3.2.1 TDD PHICH Single-antenna Port Performance 1x4 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>Pm-an limit unchanged |
| 8.10.3.2.2 TDD PHICH Transmit Diversity 2x4 | SNR as specified | 1.1 dB | Formula: SNR + TT<br>Pm-an limit unchanged |
| 8.10.3.2.3 TDD PHICH Transmit Diversity 4x4 | SNR as specified | 1.0 dB | Formula: SNR + TT<br>Pm-an limit unchanged |
| 8.10.4.1.1 FDD distributed E2PDCCH performance 2x4 | SNRs as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |

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| 8.10.4.1.2 TDD distributed EPDCCH performance 2x4 | SNR as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.10.4.2.1 FDD localized EPDCCH performance with TM9 2x4 | SNRs as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.10.4.2.2 TDD localized EPDCCH performance with TM9 2x4 | SNRs as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.11.1.1.1 Closed-loop spatial multiplexing performance for UE supporting CE | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.11.1.1.2 FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE supporting CE | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.11.1.1.3.1 FDD PDSCH Transmit Diversity 2x1 for UE category M1 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.11.1.1.3.1_1 FDD PDSCH Transmit Diversity 2x1 for UE category M1 (CEModeB) | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.11.1.1.3.2 FDD and half-duplex FDD PDSCH Transmit Diversity 2x1 for UE category M2 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.11.1.2.1 | Same as 8.11.1.1.1 | Same as 8.11.1.1.1 | Same as 8.11.1.1.1 |
| 8.11.1.2.2 TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category M1 | SNRs as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.11.1.2.3.1 TDD PDSCH Transmit Diversity for UE category M1 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.11.1.2.3.1_1 TDD PDSCH Transmit Diversity for UE category M1 (CEModeB) | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.11.2.1.1 FDD and HD-FDD demodulation of MPDCCH in CE Mode A | SNRs as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.11.2.1.2 FDD and HD-FDD demodulation of MPDCCH in CE Mode B | SNRs as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.11.2.2.1 TDD demodulation of MPDCCH in CE Mode A | SNRs as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.11.2.2.2 TDD demodulation of MPDCCH in CE Mode B | SNRs as specified | 0.9dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.12.1.1.1 Demodulation of NPDSCH (Cell-Specific Reference Symbols) in In-band mode for category NB1 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.12.1.1.2 Demodulation of NPDSCH (Cell-Specific Reference Symbols) in standalone and Guard-band mode for category NB1 | SNRs as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |

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| 8.12.1.1.3 Demodulation of NPDSCH (Cell-Specific Reference Symbols) in standalone for NB2 | SNRs as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 8.12.2.1.1 Demodulation of NPDCCH single-antenna performance for category NB1 | SNRs as specified | 0.8dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.12.2.1.2 Demodulation of NPDCCH Transmit diversity performance for category NB1 | SNR as specified | 0.9 dB | Formula: SNR + TT<br>Pm-dsg limit unchanged |
| 8.13.1.1.1.2 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.1.1.1.3 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.1.1.1.4 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.1.1.1.5 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.1.1.3 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.1.1.4 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.1.2.2 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.1.2.3 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.1.2.4 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.1.2.5 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.1.3.1 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.73dB<br>SINR: -2.3dB | 0dB<br>+0.28dB<br>+0.98dB | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.45dB<br>SINR: -1.32dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.13.1.4.1 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.73dB<br>SINR: -3.0dB | 0 dB<br>+0.28dB<br>+0.98dB | $N_{oc}$: -98dBm/15kHz<br>DIP1: -1.45dB<br>SINR: -2.03dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.13.2.1.1.2 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.2.1.1.3 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.2.1.1.4 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.2.1.1.5 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.2.1.3 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br><br>T-put limit unchanged |
| 8.13.2.1.4 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br><br>T-put limit unchanged |

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| 8.13.2.2.2 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.2.2.3 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.2.2.4 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.2.2.5 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.2.3.1 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.73dB<br>SINR: -1.9dB | 0dB<br>+0.28dB<br>+0.98dB | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.45dB<br>SINR: -0.92dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.13.2.4.1 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.73dB<br>SINR: -3.3dB | 0 dB<br>+0.28dB<br>+0.98dB | $N_{oc}$: -98dBm/15kHz<br>DIP1: -1.45dB<br>SINR: -2.32dB<br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.13.3.1.1.2 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.3.1.1.3 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.3.1.1.4 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.3.1.1.5 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.3.1.2.2 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.3.1.2.3 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.3.1.2.4 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.3.1.2.5 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.3.3.1 TDD-FDD CA PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model-Enhanced Performance Requirement Type A for FDD Pcell (2DL CA) | - $N_{oc}$: -98dBm/15kHz<br>- DIP 1: -1.73dB<br>- FDD Cell 2Rx SINR:<br>5MHz: 0.8dB<br>10MHz: 1.0dB<br>15MHz: 0.8dB<br>20MHz: 1.1dB<br>- FDD Cell 4Rx SINR:<br>5MHz: -3.0dB<br>10MHz: -2.7dB<br>15MHz: -2.9dB<br>20MHz: -2.8dB<br>- TDD Cell 2Rx SINR:<br>5MHz: 0.8dB<br>10MHz: 1.3dB<br>15MHz: 1.0 dB<br>20MHz: 1.3dB<br>- TDD Cell 4Rx SINR:<br>5MHz: -2.8dB<br>10MHz: -2.5dB<br>15MHz: -2.7dB<br>20MHz: -2.3dB | 0dB<br>+0.28dB<br>+0.98dB<br><br><br><br><br>+0.98dB<br><br><br><br><br>+0.98dB<br><br><br><br><br>+0.98dB | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.45dB<br>- FDD Cell 2Rx SINR:<br>5MHz: 1.78dB<br>10MHz: 1.98dB<br>15MHz: 1.78dB<br>20MHz: 2.08dB<br>- FDD Cell 4Rx SINR:<br>5MHz: 2.02dB<br>10MHz: 1.72dB<br>15MHz: 1.92dB<br>20MHz: 1.82dB<br>- TDD Cell 2Rx SINR:<br>5MHz: 1.78dB<br>10MHz: 2.28dB<br>15MHz: 1.98dB<br>20MHz: 2.28dB<br>- TDD Cell 4Rx SINR:<br>5MHz: 1.82dB<br>10MHz: 1.52dB<br>15MHz: 1.72dB<br>20MHz: 1.32dB<br><br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |

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|---|---|---|---|
| 8.13.3.3.2 TDD-FDD CA PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model-Enhanced Performance Requirement Type A for TDD Pcell (2DL CA) | Same as 8.13.3.3.1 | Same as 8.13.3.3.1 | Same as 8.13.3.3.1 |
| 8.13.3.4.1 TDD-FDD CA PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 Interference Model-Enhanced Performance Requirement Type A for FDD Pcell (2DL CA) | - $N_{oc}$: -98dBm/15kHz<br>- DIP 1: -1.73dB<br>- FDD Cell 2Rx SINR:<br>5MHz: -0.4dB<br>10MHz: 0.1dB<br>15MHz: -0.2dB<br>20MHz: -0.4dB<br>- FDD Cell 4Rx SINR:<br>5MHz: -2.0dB<br>10MHz: -1.8dB<br>15MHz: -1.9dB<br>20MHz: -1.7dB<br>- TDD Cell 2Rx SINR:<br>5MHz: -0.6dB<br>10MHz: -0.1dB<br>15MHz: -0.2dB<br>20MHz: -0.4dB<br>- TDD Cell 4Rx SINR:<br>5MHz: -2.4dB<br>10MHz: -2.1dB<br>15MHz: -2.1dB<br>20MHz: -2.1dB | 0dB<br>+0.28dB<br>+0.98dB<br><br><br><br><br>+0.98dB<br><br><br><br><br>+0.98dB<br><br><br><br><br>+0.98dB | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -1.45dB<br>- FDD Cell 2Rx SINR:<br>5MHz: 0.58dB<br>10MHz: 1.08dB<br>15MHz: 0.78dB<br>20MHz: 0.58dB<br>- FDD Cell 4Rx SINR:<br>5MHz: -1.02dB<br>10MHz: -0.82dB<br>15MHz: -0.92dB<br>20MHz: -0.72dB<br>- TDD Cell 2Rx SINR:<br>5MHz: 0.38dB<br>10MHz: 0.88dB<br>15MHz: 0.78dB<br>20MHz: 0.58dB<br>- TDD Cell 4Rx SINR:<br>5MHz: -1.42dB<br>10MHz: -1.12dB<br>15MHz: -1.12dB<br>20MHz: -1.12dB<br><br>T-put limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 8.13.3.4.2 TDD-FDD CA PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 Interference Model-Enhanced Performance Requirement Type A for TDD Pcell (2DL CA) | Same as 8.13.3.4.1 | Same as 8.13.3.4.1 | Same as 8.13.3.4.1 |
| 8.13.3.6.1 | SNR as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.3.6.2 | SNR as specified | 0.9 dB for each CC | Formula: SNR + TT<br>T-put limit unchanged |
| 8.13.3.7.1 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br><br>T-put limit unchanged |
| 8.13.3.7.2 | SNRs as specified | 0.9 dB for each CC | Formula: SNR + TT<br><br>T-put limit unchanged |
| 10.1 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 10.2 | SNR as specified | 0.9dB | Formula: SNR + TT<br>T-put limit unchanged |
| 14.2 | SNRs as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 14.3 | SNRs as specified | 0.8dB | Formula: SNR + TT<br>T-put limit unchanged |
| 14.4 | SNRs as specified | 0.6dB | Formula: SNR + TT<br>T-put limit unchanged |
| 14.8 | Downlink power -85dBm/15kHz | 0 dB | Formula: Downlink power + TT<br>T-put limit unchanged |
| [Other tests FFS] | | | |

## F.3.5 Measurement of Channel State Information reporting

**Table F.3.5-1: Derivation of Test Requirements (Channel State Information reporting tests)**

| Test | Minimum Requirement in TS 36.101 | Test Tolerance (TT) | Test Requirement in TS 36.521-1 |
|---|---|---|---|
| 9.2.1.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.2.1.2 TDD CQI Reporting under AWGN condit.1ions – PUCCH 1-0 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.2.1.3_C.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC (non-MBSFN ABS) | Values as specified<br>Limits as in the Test Procedure | No test tolerances applied | The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.2.1.4_C.1 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC (non-MBSFN ABS) | Values as specified<br>Limits as in the Test Procedure | No test tolerances applied | The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.2.1.5_E.1 FDD CQI Reporting under AWGN conditions - PUCCH 1-0 for feICIC (non-MBSFN ABS) | Values as specified<br>Limits as in the Test Procedure | No test tolerances applied | The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.2.1.6_E.1 TDD CQI Reporting under AWGN conditions - PUCCH 1-0 for feICIC (non-MBSFN ABS) | Values as specified<br>Limits as in the Test Procedure | No test tolerances applied | The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.2.1.7 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for 256QAM in DL | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.2.1.8 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for 256QAM in DL | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.2.2.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.2.2.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.2.3.1_D FDD CQI Reporting under AWGN conditions – PUCCH 1-1 for eDL-MIMO | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.2.3.2_D TDD CQI Reporting under AWGN conditions – PUCCH 1-1 for eDL-MIMO | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.2.4.1_F FDD CQI Reporting under AWGN conditions - Single CSI Process for CoMP | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.2.4.2_F TDD CQI Reporting under AWGN conditions - Single CSI Process for CoMP | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |

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| 9.2.5 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 (when csi-SubframeSet – r12 and EIMTA-MainConfigServCell-r12 are configured) | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.2.6.1 LAA CQI Reporting under AWGN Conditions with Frame Structure Type 3 with FDD as Pcell (PUSCH 3-0) | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.2.6.2 LAA CQI Reporting under AWGN Conditions with Frame Structure Type 3 with TDD as Pcell (PUSCH 3-0) | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.2.7.1 LAA CQI Reporting under AWGN Conditions with Frame Structure Type 3 with FDD as Pcell (PUSCH 3-1) | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.2.7.2 LAA CQI Reporting under AWGN Conditions with Frame Structure Type 3 with TDD as Pcell (PUSCH 3-1) | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.3.1.1.1 FDD CQI Reporting under fading conditions – PUSCH 3-0 | SNRs as specified<br>$\alpha$ 2%<br>$\beta$ 55%<br>$\gamma$ 1.10<br>BLER 0.05 | SNR 0dB<br>$\alpha$ 0%<br>$\beta$ 0%<br>$\gamma$ 0.01<br>BLER 0 | SNR unchanged<br>$\alpha$ limit unchanged<br>$\beta$ limit unchanged<br>$\gamma$1.09 as per Table G.5.4-1<br>BLER limit unchanged |
| 9.3.1.1.2 TDD CQI Reporting under fading conditions – PUSCH 3-0 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 |
| 9.3.1.1.5 TDD CQI Reporting under fading conditions – PUCCH 3-0 (when csi-SubframeSet – r12 is configured) | SNRs as specified<br>$\alpha$ 2%<br>$\beta$ 55%<br>$\gamma$ 1.10<br>BLER 0.05~0.60<br>Delta CQI 3 | SNR 0dB<br>$\alpha$ 0%<br>$\beta$ 0%<br>$\gamma$ 0.01<br>BLER 0<br>Delta CQI 0 | SNR unchanged<br>$\alpha$ limit unchanged<br>$\beta$ limit unchanged<br>$\gamma$1.09 as per Table G.5.4-1<br>BLER limit unchanged<br>Delta CQI limit unchanged |
| 9.3.1.2.1_D FDD CQI Reporting under fading conditions – PUSCH 3-1 for eDL-MIMO | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 |
| 9.3.1.2.2_D TDD CQI Reporting under fading conditions – PUSCH 3-1 for eDL-MIMO | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 |
| 9.3.1.2.3 FDD CQI Reporting under fading conditions – PUSCH 3-1 for 256QAM in DL | SNRs as specified<br>$\alpha$ 2%<br>$\beta$ 40<br>$\gamma$ 1.10<br>BLER 0.05 | SNR 0dB<br>$\alpha$ 0%<br>$\beta$ 0%<br>$\gamma$ 0.01<br>BLER 0 | SNR unchanged<br>$\alpha$ limit unchanged<br>$\beta$ limit unchanged<br>$\gamma$1.09 as per Table G.5.4-1<br>BLER limit unchanged |
| 9.3.1.2.4 TDD CQI Reporting under fading conditions – PUSCH 3-1 for 256QAM in DL | Same as 9.3.1.2.3 | Same as 9.3.1.2.3 | Same as 9.3.1.2.3 |

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| 9.3.1.2.6 TDD CQI Reporting under fading conditions – PUCCH 3-1 (when csi-SubframeSet – r12 is configured with one CSI process) | SNRs as specified<br>$\alpha$ 2%<br>$\beta$ 55%<br>$\gamma$ 1.02<br>BLER 0.01<br>Delta CQI 3 | SNR 0dB<br>$\alpha$ 0%<br>$\beta$ 0%<br>$\gamma$ 0.01<br>BLER 0<br>Delta CQI 0 | SNR unchanged<br>$\alpha$ limit unchanged<br>$\beta$ limit unchanged<br>$\gamma$1.01 as per Table G.5.4-1<br>BLER limit unchanged<br>Delta CQI limit unchanged |
| 9.3.1.3.1_E.1 FDD CQI Reporting under fading conditions - PUSCH 3-0 for feICIC (non-MBSFN ABS) | SNRs as specified<br>$\alpha$ 2%<br>$\beta$ 55%<br>$\gamma$ 1.10<br>BLER 0.01 | SNR 0dB<br>$\alpha$ 0%<br>$\beta$ 0%<br>$\gamma$ 0.01<br>BLER 0 | SNR unchanged<br>$\alpha$ limit unchanged<br>$\beta$ limit unchanged<br>$\gamma$1.09 as per Table G.5.4-1<br>BLER limit unchanged<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.3.1.3.2_E.1 TDD CQI Reporting under fading conditions - PUSCH 3-0 for feICIC (non-MBSFN ABS) | Same as 9.3.1.3.1_E.1 | Same as 9.3.1.3.1_E.1 | Same as 9.3.1.3.1_E.1 |
| 9.3.2.1.1 FDD CQI Reporting under fading conditions – PUCCH 1-0 | SNRs as specified<br>$\alpha$ 20%<br>$\gamma$ 1.05<br>BLER 0.02 | SNR 0dB<br>$\alpha$ 0%<br>$\gamma$ 0.01<br>BLER 0 | SNR and $\alpha$, BLER limits unchanged<br>$\alpha$ limit unchanged<br>$\gamma$1.04 as per Table G.5.4-1<br>BLER limit unchanged |
| 9.3.2.1.1_1 FDD CQI Reporting under fading conditions – PUCCH 1-0 | Same as 9.3.2.1.1 | Same as 9.3.2.1.1 | Same as 9.3.2.1.1 |
| 9.3.2.1.2 TDD CQI Reporting under fading conditions – PUCCH 1-0 | Same as 9.3.2.1.1 | Same as 9.3.2.1.1 | Same as 9.3.2.1.1 |
| 9.3.2.1.2_1 TDD CQI Reporting under fading conditions – PUCCH 1-0 | Same as 9.3.2.1.1 | Same as 9.3.2.1.1 | Same as 9.3.2.1.1 |
| 9.3.2.2.1_D FDD CQI Reporting under fading conditions – PUCCH 1-1 for eDL-MIMO | Same as 9.3.2.1.1 | Same as 9.3.2.1.1 | Same as 9.3.2.1.1 |
| 9.3.2.2.2_D TDD CQI Reporting under fading conditions – PUCCH 1-1 for eDL-MIMO | Same as 9.3.2.1.1 | Same as 9.3.2.1.1 | Same as 9.3.2.1.1 |

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| 9.3.3.1.1 FDD CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0 | Ior and Iot as specified<br>$\alpha$ 60%<br>$\gamma$ 1.60 | Ior, Iot 0dB<br>$\alpha$ 20%<br>$\gamma$ 0.10 | Ior and Iot unchanged<br>$\alpha$ 40%, Formula: Min Req't – Test Tol<br>$\gamma$ 1.50, Formula: Min Req't – Test Tol<br>The effect of AWGN flatness and signal flatness on the $\alpha$ requirement was derived by simulation.<br>AWGN flatness / signal flatness and the statistical effect of a finite test time both affect the T-put result. The Test Tolerance comprises two quantities:<br>1. Effect of AWGN flatness and signal flatness, derived by simulation<br>2. Statistical effect as per Table G.5.4-1<br>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared<br>T-put requirement Test Tol = SQRT (AWGN flatness and signal flatness effect $^2$ + Statistical effect $^2$)<br>AWGN flatness and signal flatness effect 0.1, Statistical effect 0.01, giving overall effect 0.10 |
| 9.3.3.1.2 TDD CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0 | Same as 9.3.3.1.1 | Same as 9.3.3.1.1 | Same as 9.3.3.1.1 |
| 9.3.4.1.1 FDD CQI Reporting under fading conditions – PUSCH 2-0 | SNRs as specified<br>Limits as in the Test Procedure<br>$\gamma$ 1.2 | $\gamma$ 0.01 | SNR unchanged<br>$\gamma$ 1.19 as per Table G.5.4-1 |
| 9.3.4.1.2 TDD CQI Reporting under fading conditions – PUSCH 2-0 | Same as 9.3.4.1.1 | Same as 9.3.4.1.1 | Same as 9.3.4.1.1 |
| 9.3.4.2.1 FDD CQI Reporting under fading conditions – PUCCH 2-0 | SNRs as specified<br>Limits as in the Test Procedure<br>$\gamma$ 1.15 | $\gamma$ 0.01 | SNR unchanged<br>$\gamma$ 1.14 as per Table G.5.4-1 |
| 9.3.4.2.2 TDD CQI Reporting under fading conditions – PUCCH 2-0 | Same as 9.3.4.2.1 | Same as 9.3.4.2.1 | Same as 9.3.4.2.1 |
| 9.3.5.1.1 FDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -0.41dB<br>SINR: -2.00dB<br>$\gamma$ 1.8<br>BLER 0.02 | 0dB<br>+0.03dB<br>+0.03dB<br>$\gamma$ 0.01 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -0.38dB<br>SINR: -1.97dB<br>$\gamma$ 1.79 as per Table G.5.4-1<br>BLER limit unchanged<br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.3.5.1.2 TDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A | Same as 9.3.5.1.1 | Same as 9.3.5.1.1 | Same as 9.3.5.1.1 |
| 9.3.5.2.1 FDD CQI Reporting under fading conditions - PUCCH 1-1 - Enhanced Performance Requirement Type A | Same as 9.3.5.1.1 Same as 9.3.5.1.1 | Same as 9.3.5.1.1 | Same as 9.3.5.1.1 |

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| 9.3.5.2.2 TDD CQI Reporting under fading conditions - PUCCH 1-1 - Enhanced Performance Requirement Type A | Same as 9.3.5.1.1 | Same as 9.3.5.1.1 | |
| 9.3.6.1_F FDD CQI Reporting under fading conditions Single CSI processes for CoMP | $\gamma$ 1.02 | $\gamma$ 0.01 | $\gamma$1.01 as per Table G.5.4-1 |
| 9.3.6.1_F.2 FDD CQI Reporting under fading conditions Three CSI processes for CoMP | Same as 9.3.6.1_F.1 | Same as 9.3.6.1_F.1 | Same as 9.3.6.1_F.1 |
| 9.3.6.1_F.3 FDD CQI Reporting under fading conditions Four CSI processes for CoMP | Same as 9.3.6.1_F.1 | Same as 9.3.6.1_F.1 | Same as 9.3.6.1_F.1 |
| 9.3.6.2_F.1 TDD CQI Reporting under fading conditions Single CSI processes for CoMP | $\gamma$ 1.02 | $\gamma$ 0.01 | $\gamma$1.01 as per Table G.5.4-1 |
| 9.3.6.2_F.2 TDD CQI Reporting under fading conditions Three CSI processes for CoMP | Same as 9.3.6.2_F.1 | Same as 9.3.6.2_F.1 | Same as 9.3.6.2_F.1 |
| 9.3.6.2_F.3 TDD CQI Reporting under fading conditions Four CSI processes for CoMP | Same as 9.3.6.2_F.1 | Same as 9.3.6.2_F.1 | Same as 9.3.6.2_F.1 |
| 9.3.7.1 FDD CQI Reporting under fading conditions - PUSCH 3-2 for eDL MIMO Enhancement | SNRs as specified<br>Limits as in the Test Procedure<br><br>$N_{oc}$: -98dBm/15kHz<br><br>$\alpha$: *1.05*<br>$\beta$: *1.15* | <br><br><br>0dB<br><br>$\alpha$ 0.01<br>$\beta$ 0.01 | SNR unchanged<br><br><br>$N_{oc}$: -98dBm/15kHz<br><br>$\alpha$: *1.04* as per Table G.5.4-1<br>$\beta$: *1.14* as per Table G.5.4-1<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.3.7.2 TDD CQI Reporting under fading conditions - PUSCH 3-2 for eDL MIMO Enhancement | Same as 9.3.7.1 | Same as 9.3.7.1 | Same as 9.3.7.1 |
| 9.3.8.1.1 | $N_{oc}$: -98dBm/15kHz<br>SNR: +8.34dB<br>Cell 2 Ês/$N_{oc}$: +3.28 dB<br>Cell 3 Ês/$N_{oc}$: +0.74 dB<br>$\gamma$ : 0.925 | 0 dB<br>+0.63 dB<br>+0.8 dB<br>+0.8 dB<br>0.01 | $N_{oc}$: -98dBm/15kHz<br>SNR: +8.97dB<br>Cell 2 Ês/$N_{oc}$: +4.08 dB<br>Cell 3 Ês/$N_{oc}$: +1.54 dB<br>$\gamma$ : 0.915 as per Table G.5.4-1<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.3.8.1.2 | Same as 9.3.8.1.1 | Same as 9.3.8.1.1 | Same as 9.3.8.1.1 |
| 9.3.8.2.1 | Noc: -98dBm/15kHz<br>SNR: +8.34dB<br>Cell 2 Ês/Noc: +3.28 dB<br>Cell 3 Ês/Noc: +0.74 dB<br>0.925 | 0 dB<br>+0.63 dB<br>+0.8 dB<br>+0.8 dB<br>0.01 | Noc: -98dBm/15kHz<br>SNR: +8.97dB<br>Cell 2 Ês/Noc: +4.08 dB<br>Cell 3 Ês/Noc: +1.54 dB<br>0.915 as per Table G.5.4-1<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.3.8.2.2 | Same as 9.3.8.2.1 | Same as 9.3.8.2.1 | Same as 9.3.8.2.1 |

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| 9.3.8.3.1 FDD CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) TM10 with TM9 interference - Enhanced Receiver Type B | Noc: -98dBm/15kHz<br>SNR: +8.34dB<br>Cell 2 Ês/Noc: +3.28 dB<br>Cell 3 Ês/Noc: +0.74 dB<br>$\gamma$: 0.925 | 0 dB<br>+0.63 dB<br>+0.8 dB<br>+0.8 dB<br>0.01 | Noc: -98dBm/15kHz<br>SNR: +8.97dB<br>Cell 2 Ês/Noc: +4.08 dB<br>Cell 3 Ês/Noc: +1.54 dB<br>$\gamma$: 0.915 as per Table G.5.4-1 |
| 9.3.8.3.2 TDD CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) TM10 with TM9 interference - Enhanced Receiver Type B | Same as 9.3.8.3.1 | Same as 9.3.8.3.1 | Same as 9.3.8.3.1 |
| 9.4.1.1.1 FDD PMI Reporting – PUSCH 3-1 (Single PMI) | $\gamma$ 1.10 | $\gamma$ 0.01 | $\gamma$1.09 as per Table G.5.4-1 |
| 9.4.1.1.2 TDD PMI Reporting – PUSCH 3-1 (Single PMI) | Same as 9.4.1.1.1 | Same as 9.4.1.1.1 | Same as 9.4.1.1.1 |
| 9.4.1.2.1 FDD PMI Reporting – PUCCH 2-1 (Single PMI) | $N_{oc}$ as specified in test procedure<br><br>$\gamma$ 1.2 | <br><br>$\gamma$ 0.01 | $N_{oc}$ unchanged<br>Ior/ $N_{oc}$=$SNR_{rnd}$ is a result of an approach according to G.5.2 and is reused unchanged as setting in procedure step 3.<br>$\gamma$1.19 as per Table G.5.4-1 |
| 9.4.1.2.2 TDD PMI Reporting – PUCCH 2-1 (Single PMI) | Same as 9.4.1.2.1 | Same as 9.4.1.2.1 | Same as 9.4.1.2.1 |
| 9.4.1.3.1_D FDD Reporting of PMI – PUSCH 3-1 (Single PMI) for eDL-MIMO | Same as 9.4.1.2.1 | Same as 9.4.1.2.1 | Same as 9.4.1.2.1 |
| 9.4.1.3.2_D TDD Reporting of PMI – PUSCH 3-1 (Single PMI) for eDL-MIMO | Same as 9.4.1.2.1 | Same as 9.4.1.2.1 | Same as 9.4.1.2.1 |
| 9.4.1.3.3 FDD PMI Reporting with 12Tx Class A codebook – PUSCH 3-1 (Single PMI) for FD-MIMO | $N_{oc}$ as specified in test procedure<br><br>$\gamma$ 2.50 | $\gamma$ 0.01 | $N_{oc}$ unchanged<br>Ior/ $N_{oc}$=$SNR_{rnd}$ is a result of an approach according to G.5.2 and is used unchanged.<br>$\gamma$ 2.49 as per Table G.5.4-1 |
| 9.4.1.4.1 FDD PMI Reporting with 4Tx enhanced codebook – PUCCH 1-1 (Single PMI) for eDL MIMO Enhancement 9.6.1.3.2, TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (3DL CA) | $N_{oc}$: -98dBm/15kHz<br><br>*$\gamma$: 1.8* | <br><br>$\gamma$ 0.01 | $N_{oc}$: -98dBm/15kHz<br><br>*$\gamma$: 1.79* as per Table G.5.4-1<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.4.1.4.2 TDD PMI Reporting with 4Tx enhanced codebook – PUCCH 1-1 (Single PMI) for eDL MIMO Enhancement 9.6.1.4.2, TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (3DL CA) | Same as 9.4.1.4.1 | Same as 9.4.1.4.1 | Same as 9.4.1.4.1 |
| 9.4.2.1.1 FDD PMI Reporting – PUSCH 1-2 (Multiple PMI) | $N_{oc}$ as specified in test procedure<br><br>$\gamma$ 1.20 | $\gamma$ 0.01 | $N_{oc}$ unchanged<br>Ior/ $N_{oc}$=$SNR_{rnd}$ is a result of an approach according to G.5.2 and is reused unchanged as setting in procedure step 3.<br>$\gamma$ 1.19 as per Table G.5.4-1 |

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| 9.4.2.1.1_1 FDD PMI Reporting – PUSCH 1-2 (Multiple PMI) | Same as 9.4.2.1.1 | Same as 9.4.2.1.1 | Same as 9.4.2.1.1 |
| 9.4.2.1.2 TDD PMI Reporting – PUSCH 1-2 (Multiple PMI) | Same as 9.4.2.1.1 | Same as 9.4.2.1.1 | Same as 9.4.2.1.1 |
| 9.4.2.1.2_1 TDD PMI Reporting – PUSCH 1-2 (Multiple PMI) | Same as in 9.4.2.1.1 | Same as in 9.4.2.1.1 | Same as in 9.4.2.1.1 |
| 9.4.2.2.1 FDD PMI Reporting – PUSCH 2-2 (Multiple PMI) | Same as in 9.4.2.1.1 | Same as in 9.4.2.1.1 | Same as in 9.4.2.1.1 |
| 9.4.2.2.2 TDD PMI Reporting – PUSCH 2-2 (Multiple PMI) | $N_{oc}$ as specified in test procedure<br><br>$\gamma$ 1.15 | <br><br>$\gamma$ 0.01 | $N_{oc}$ unchanged<br>Ior/ $N_{oc}$=$SNR_{rnd}$ is a result of an approach according to G.5.2 and is reused unchanged as setting in procedure step 3.<br>$\gamma$ 1.14 as per Table G.5.4-1 |
| 9.4.2.3.1_D FDD PMI Reporting – PUSCH 1-2 (Multiple PMI) for eDL-MIMO | $N_{oc}$ as specified in test procedure<br><br>$\gamma$ 1.30 | $\gamma$ 0.01 | $N_{oc}$ unchanged<br>Ior/ $N_{oc}$=$SNR_{rnd}$ is a result of an approach according to G.5.2 and is reused unchanged as setting in procedure step 3.<br>$\gamma$ 1.29 as per Table G.5.4-1 |
| 9.4.2.3.2_D TDD PMI Reporting – PUSCH 1-2 (Multiple PMI) for eDL-MIMO | $N_{oc}$ as specified in test procedure<br><br>$\gamma$ 3.50 | $\gamma$ 0.01 | $N_{oc}$ unchanged<br>Ior/ $N_{oc}$=$SNR_{rnd}$ is a result of an approach according to G.5.2 and is reused unchanged as setting in procedure step 3.<br>$\gamma$ 3.49 as per Table G.5.4-1 |
| 9.4.2.3.3 FDD PMI Reporting with 4Tx enhanced codebook - PUSCH 1-2 (Multiple PMI) for eDL-MIMO Enhancement | $N_{oc}$: -98dBm/15kHz<br><br>*$\gamma$: 1.2* | $\gamma$ 0.01 | $N_{oc}$: -98dBm/15kHz<br><br>*$\gamma$: 1.19* as per Table G.5.4-1<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.4.2.3.4 TDD PMI Reporting with 4Tx enhanced codebook - PUSCH 1-2 (Multiple PMI) for eDL-MIMO Enhancement | Same as 9.4.2.3.3 | Same as 9.4.2.3.3 | Same as 9.4.2.3.3 |
| 9.5.1.1 FDD RI Reporting– PUCCH 1-1 | SNRs as specified<br>Test 1: $\gamma_2$ 1.00<br>Test 2: $\gamma_1$ 1.05<br>Test 3: $\gamma_2$ 1.10 | SNR 0dB<br>$\gamma_2$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_2$ 0.01 | SNR unchanged<br>$\gamma_2$ 0.99 as per Table G.5.4-1<br>$\gamma_1$ 1.04 as per Table G.5.4-1<br>$\gamma_2$ 1.09 as per Table G.5.4-1 |
| 9.5.1.1_1 FDD RI Reporting– PUCCH 1-1 (Release 10) | SNRs as specified<br>Test 1: $\gamma_2$ 1.00<br>Test 2: $\gamma_1$ 1.05<br>Test 3: $\gamma_1$ 0.90, $\gamma_2$ 1.10 | SNR 0dB<br>$\gamma_2$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_2$ 0.01 | SNR unchanged<br>$\gamma_2$ 0.99 as per Table G.5.4-1<br>$\gamma_1$ 1.04 as per Table G.5.4-1<br>$\gamma_1$ 0.89, $\gamma_2$ 1.09 as per Table G.5.4-1 |
| 9.5.1.1_2 FDD RI Reporting– PUCCH 1-1 (Release 11) | SNRs as specified<br>Test 1: $\gamma_2$ 1.00<br>Test 2: $\gamma_1$ 1.05<br>Test 3: $\gamma_1$ 0.90 | SNR 0dB<br>$\gamma_2$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_1$ 0.01 | SNR unchanged<br>$\gamma_2$ 0.99 as per Table G.5.4-1<br>$\gamma_1$ 1.04 as per Table G.5.4-1<br>$\gamma_1$ 0.89 as per Table G.5.4-1 |
| 9.5.1.2 TDD RI Reporting– PUSCH 3-1 | Same as 9.5.1.1 | Same as 9.5.1.1 | Same as 9.5.1.1 |
| 9.5.1.2_1 TDD RI Reporting– PUSCH 3-1 (Release 10) | Same as 9.5.1.1_1 | Same as 9.5.1.1_1 | Same as 9.5.1.1_1 |

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| 9.5.1.2_2 TDD RI Reporting– PUSCH 3-1 (Release 11) | Same as 9.5.1.1_2 | Same as 9.5.1.1_2 | Same as 9.5.1.1_2 |
| 9.5.2.1_D FDD RI Reporting – PUCCH 1-1 for eDL-MIMO | SNR as specified<br>Test 1: $\gamma_2$ 1.00<br>Test 2: $\gamma_1$ 1.05<br>Test 3: $\gamma_1$ 0.9 | SNR 0dB<br>$\gamma_2$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_2$ 0.01 | SNR unchanged<br>$\gamma_2$ 0.99 as per Table G.5.4-1<br>$\gamma_1$ 1.04 as per Table G.5.4-1<br>$\gamma_1$ 0.89 as per Table G.5.4-1 |
| 9.5.2.2_D TDD RI Reporting – PUCCH 1-1 for eDL-MIMO | SNR as specified<br>Test 1: $\gamma_2$ 1.00<br>Test 2: $\gamma_1$ 1.05<br>Test 3: $\gamma_1$ 0.9 | SNR 0dB<br>$\gamma_2$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_2$ 0.01 | SNR unchanged<br>$\gamma_2$ 0.99 as per Table G.5.4-1<br>$\gamma_1$ 1.04 as per Table G.5.4-1<br>$\gamma_1$ 0.89 as per Table G.5.4-1 |
| 9.5.3.1_C.1 FDD RI Reporting – PUCCH 1-0 for eICIC (non-MBSFN ABS) | SNRs as specified<br>Test 1: $\gamma_1$ 0.90<br>Test 2: $\gamma_1$ 1.05 | SNR 0dB<br>$\gamma_1$ 0.01<br>$\gamma_1$ 0.01 | SNR unchanged<br>$\gamma_1$ 0.89 as per Table G.5.4-1<br>$\gamma_1$ 1.04 as per Table G.5.4-1<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.5.3.2_C.1 TDD RI Reporting – PUCCH 1-0 for eICIC (non-MBSFN ABS) | SNRs as specified<br>Test 1: $\gamma_1$ 0.90<br>Test 2: $\gamma_1$ 1.05 | SNR 0dB<br>$\gamma_1$ 0.01<br>$\gamma_1$ 0.01 | SNR unchanged<br>$\gamma_1$ 0.89 as per Table G.5.4-1<br>$\gamma_1$ 1.04 as per Table G.5.4-1<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.5.4.1_E.1 FDD RI Reporting - PUCCH 1-0 for feICIC (non-MBSFN ABS) | SNR as specified<br>Test 1: $\gamma_2$ 1.05<br>Test 2: $\gamma_1$ 1.05<br>Test 3: $\gamma_1$ 0.9 | SNR 0dB<br>$\gamma_2$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_1$ 0.01 | SNR unchanged<br>$\gamma_2$ 1.04 as per Table G.5.4-1<br>$\gamma_1$ 1.04 as per Table G.5.4-1<br>$\gamma_1$ 0.89 as per Table G.5.4-1<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.5.4.2_E.1 TDD RI Reporting - PUCCH 1-0 for feICIC (non-MBSFN ABS) | Same as 9.5.4.1_E.1 | Same as 9.5.4.1_E.1 | Same as 9.5.4.1_E.1 |
| 9.5.5.1_F.1 FDD RI Reporting with Single CSI process for CoMP | SNRs as specified<br>Test 1: $\gamma_2$ 1.00<br>Test 2: $\gamma_1$ 1.00 | SNR 0dB<br>$\gamma_2$ 0.01<br>$\gamma_1$ 0.01 | SNR unchanged<br>$\gamma_2$ 0.99 as per Table G.5.4-1<br>$\gamma_1$ 0.99 as per Table G.5.4-1 |
| 9.5.5.1_F.2 FDD RI Reporting with Multiple CSI processes for CoMP | SNRs as specified<br>Test 1: $\gamma_2$ 1.00<br>Test 2: $\gamma_1$ 1.00 | SNR 20dB<br>$\gamma_2$ 0.01<br>$\gamma_1$ 0.01 | SNR unchanged<br>$\gamma_2$ 0.99 as per Table G.5.4-1<br>$\gamma_1$ 0.99 as per Table G.5.4-1 |
| 9.5.5.2_F.1 TDD RI Reporting with Single CSI process for CoMP | Same as 9.5.5.1_F.1 | Same as 9.5.5.1_F.1 | Same as 9.5.5.1_F.1 |
| 9.5.5.2_F.2 TDD RI Reporting with Multiple CSI processes for CoMP | Same as 9.5.5.2_F.1 | Same as 9.5.5.2_F.1 | Same as 9.5.5.2_F.1 |
| 9.6.1.1_A.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (2DL CA) | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR ratios each have an uncertainty of ±0.3 dB. For uncorrelated uncertainties, the overall uncertainty in the SNR difference between any two CCs would be SQRT ($0.3^2 + 0.3^2$) = 0.42dB. This could widen the Median CQI difference, but the uncertainty is significantly less than one reported CQI step. Relaxing the allowed Median CQI difference would relax the test excessively, so in this case the Test requirement should be left unchanged. |
| 9.6.1.1_A.2 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 (3DL CA) | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | Same as 9.6.1.1_A.1 |
| 9.6.1.1_A.4 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 (5DL CA) | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | Same as 9.6.1.1_A.1 |

| | | | |
|---|---|---|---|
| 9.6.1.2_A.1 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for 2DL CA | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.2_A.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 (3DL CA) | Same as 9.6.1.1_A.2 | Same as 9.6.1.1_A.2 | Same as 9.6.1.1_A.2 |
| 9.6.1.2_A.3 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 (4DL CA) | Same as 9.6.1.1_A.3 | Same as 9.6.1.1_A.3 | Same as 9.6.1.1_A.3 |
| 9.6.1.2_A.4 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 (5DL CA) | Same as 9.6.1.1_A.4 | Same as 9.6.1.1_A.4 | Same as 9.6.1.1_A.4 |
| 9.6.1.3.1 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (2DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.6.1.3.2 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (3DL CA) | Same as 9.6.1.1_A.2 | Same as 9.6.1.1_A.2 | Same as 9.6.1.1_A.2<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.6.1.3.3 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (4DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.3.4 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (5DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.4.1 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (2DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.6.1.4.2 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (3DL CA) | Same as 9.6.1.1_A.2 | Same as 9.6.1.1_A.2 | Same as 9.6.1.1_A.2<br><br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.6.1.4.3 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (4DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.6.1.4.4 TDD FDD CA CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (5DL CA) | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 | Same as 9.6.1.1_A.1 |
| 9.7.1.1 FDD and Half duplex FDD CQI reporting definition under AWGN conditions for UE category 0 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.7.1.2 TDD CQI reporting definition under AWGN conditions for UE category 0 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.7.2.1 FDD and Half duplex FDD CQI reporting definition under fading conditions for UE category 0 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 |
| 9.7.2.2 TDD CQI reporting definition under fading conditions for UE category 0 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 |

| | | | |
|---|---|---|---|
| 9.7_1.1.1 FDD CQI reporting under AWGN conditions - PUCCH 1-0 for UE category 1bis | Same as 9.2.1.1 | Same as 9.2.1.1 | Same as 9.2.1.1 |
| 9.7_1.1.2 TDD CQI reporting under AWGN conditions - PUCCH 1-0 for UE category 1bis | Same as 9.2.1.2 | Same as 9.2.1.2 | Same as 9.2.1.2 |
| 9.7_1.1.3 FDD CQI reporting under fading conditions - PUSCH 3-0 for UE category 1bis | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 |
| 9.7_1.1.4 TDD CQI reporting under fading conditions - PUSCH 3-0 for UE category 1bis | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 |
| 9.8.1.1 FDD and Half duplex FDD CQI reporting definition under AWGN conditions for UE category M1 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.8.1.2 TDD CQI reporting definition under AWGN conditions for UE category M1 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.8.2.1 FDD and Half duplex FDD CQI reporting definition under fading conditions for UE category M1 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 |
| 9.8.2.2 TDD CQI reporting definition under fading conditions for UE category M1 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 | Same as 9.3.1.1.1 |
| 9.9.1.1.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 with Rank 1 1x4 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.9.1.1.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 with Rank 1 1x4 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.9.1.2.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 2 4x4 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.9.1.2.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 2 8x4 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.9.1.3.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 4 4x4 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.9.1.3.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 4 4x4 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.9.1.4.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 3 4x4 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |
| 9.9.1.4.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1 with rank 3 8x4 | SNRs as specified<br>Limits as in the Test Procedure | No test tolerances applied | SNR and limits unchanged |

| | | | |
|---|---|---|---|
| 9.9.2.1.1 FDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A 1x4 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -0.41dB<br>SINR: -4.00dB<br>$\gamma$ 1.8<br>BLER 0.02 | 0dB<br>+0.03dB<br>+0.03dB<br>$\gamma$ 0.01 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -0.38dB<br>SINR: -3.97dB<br>$\gamma$ 1.79 as per Table G.5.4-1<br>BLER limit unchanged<br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.9.2.1.2 TDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A 1x4 | Same as 9.9.2.1.1 | Same as 9.9.2.1.1 | Same as 9.9.2.1.1 |
| 9.9.2.2.1 FDD CQI Reporting under fading conditions - PUCCH 1-1 - Enhanced Performance Requirement Type A 2x4 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -0.41dB<br>SINR: -4.00dB<br>$\gamma$ 1.8<br>BLER 0.02 | 0dB<br>+0.03dB<br>+0.03dB<br>$\gamma$ 0.01 | $N_{oc}$: -98dBm/15kHz<br>DIP 1: -0.38dB<br>SINR: -3.97dB<br>$\gamma$ 1.79 as per Table G.5.4-1<br>BLER limit unchanged<br>The analysis is recorded in 3GPP TR 36.904 [17] |
| 9.9.2.2.2 TDD CQI Reporting under fading conditions - PUCCH 1-1 - Enhanced Performance Requirement Type A 2x4 | Same as 9.9.2.2.1 | Same as 9.9.2.2.1 | Same as 9.9.2.2.1 |
| 9.9.3.1.1 TDD PMI Reporting – PUSCH 3-1 (Single PMI) 8x4 | Noc as specified in test procedure<br>2.50 | 0.01 | Noc unchanged<br>Ior/ Noc=SNRrnd is a result of test procedure step 2 and is used as setting in test procedure step 3.<br>2.49 as per Table G.5.4-1 |
| 9.9.4.1.1 FDD RI Reporting– PUCCH 1-1 4x4 | SNRs as specified<br>Test 1: $\gamma_2$ 1.00<br>Test 2: $\gamma_1$ 1.05<br>Test 3: $\gamma_1$ 0.9<br>Test 4: $\gamma_2$ 1.10 | SNR 0dB<br>$\gamma_2$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_2$ 0.01 | SNR unchanged<br>$\gamma_2$ 0.99 as per Table G.5.4-1<br>$\gamma_1$ 1.04 as per Table G.5.4-1<br>$\gamma_1$ 0.89 as per Table G.5.4-1<br>$\gamma_2$ 1.09 as per Table G.5.4-1 |
| 9.9.4.1.2 TDD RI Reporting– PUSCH 3-1 4x4 | SNRs as specified<br>Test 1: $\gamma_2$ 1.00<br>Test 2: $\gamma_1$ 1.05<br>Test 3: $\gamma_1$ 0.9<br>Test 4: $\gamma_2$ 1.10 | SNR 0dB<br>$\gamma_2$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_2$ 0.01 | SNR unchanged<br>$\gamma_2$ 0.99 as per Table G.5.4-1<br>$\gamma_1$ 1.04 as per Table G.5.4-1<br>$\gamma_1$ 0.89 as per Table G.5.4-1<br>$\gamma_2$ 1.09 as per Table G.5.4-1 |
| 9.9.4.2.1 FDD RI Reporting- PUCCH 1-1 for eDL-MIMO 1x4 | SNRs as specified<br>Test 1: $\gamma_2$ 1.00<br>Test 2: $\gamma_1$ 1.05<br>Test 3: $\gamma_1$ 0.9<br>Test 4: $\gamma_2$ 1.10 | SNR 0dB<br>$\gamma_2$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_2$ 0.01 | SNR unchanged<br>$\gamma_2$ 0.99 as per Table G.5.4-1<br>$\gamma_1$ 1.04 as per Table G.5.4-1<br>$\gamma_1$ 0.89 as per Table G.5.4-1<br>$\gamma_2$ 1.09 as per Table G.5.4-1 |
| 9.9.4.2.2 TDD RI Reporting- PUCCH 1-1 for eDL-MIMO 1x4 | SNRs as specified<br>Test 1: $\gamma_2$ 1.00<br>Test 2: $\gamma_1$ 1.05<br>Test 3: $\gamma_1$ 0.9<br>Test 4: $\gamma_2$ 1.10 | SNR 0dB<br>$\gamma_2$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_1$ 0.01<br>$\gamma_2$ 0.01 | SNR unchanged<br>$\gamma_2$ 0.99 as per Table G.5.4-1<br>$\gamma_1$ 1.04 as per Table G.5.4-1<br>$\gamma_1$ 0.89 as per Table G.5.4-1<br>$\gamma_2$ 1.09 as per Table G.5.4-1 |

# Annex G (normative): Statistical Testing

## G.1 General

FFS.

## G.2 Statistical testing of receiver characteristics

### G.2.1 General

The test of receiver characteristics is two fold.

1. A signal or a combination of signals is offered to the RX port(s) of the receiver.
2. The ability of the receiver to demodulate /decode this signal is verified by measuring the throughput.

In (2) is the statistical aspect of the test and is treated here.

The minimum requirement for all receiver tests is >95% of the maximum throughput.

All receiver tests are performed in static propagation conditions. No fading conditions are applied.

### G.2.2 Mapping throughput to error ratio

a) The measured information bit throughput R is defined as the sum (in kilobits) of the information bit payloads successfully received during the test interval, divided by the duration of the test interval (in seconds).

b) In measurement practice the UE indicates successfully received information bit payload by signalling an ACK to the SS.
If payload is received, but damaged and cannot be decoded, the UE signals a NACK.

c) Only the ACK and NACK signals, not the data bits received, are accessible to the SS.
The number of bits is known in the SS from knowledge of what payload was sent.

d) For the reference measurement channel, applied for testing, the number of bits is different in different subframes, however in a radio frame it is fixed during one test.

e) The time in the measurement interval is composed of successfully received subframes (ACK), unsuccessfully received subframes (NACK) and no reception at all (DTX-subframes).

f) DTX-subframes may occur regularly according the applicable reference measurement channel (regDTX).
In real live networks this is the time when other UEs are served. In TDD these are the UL and special subframes.
regDTX vary from test to test but are fixed within the test.

g) Additional DTX-subframes occur statistically when the UE is not responding ACK or NACK where it should. (statDTX)
This may happen when the UE was not expecting data or decided that the data were not intended for it.

The pass / fail decision is done by observing the:

- number of NACKs
- number of ACKs and
- number of statDTXs (regDTX is implicitly known to the SS)

The ratio (NACK + statDTX)/(NACK+ statDTX + ACK) is the Error Ratio (ER). Taking into account the time consumed by the ACK, NACK, and DTX-TTIs (regular and statistical), ER can be mapped unambiguously to throughput for any single reference measurement channel test.

## G.2.3 Design of the test

The test is defined by the following design principles (see clause G.x, Theory….):

1. The early decision concept is applied.
2. A second limit is introduced: Bad DUT factor M>1
3. To decide the test pass:

   Supplier risk is applied based on the Bad DUT quality

   To decide the test fail

   Customer Risk is applied based on the specified DUT quality

The test is defined by the following parameters:

1. Limit ER = 0.05 (Throughput limit = 95%)
2. Bad DUT factor M=1.5 (selectivity)
3. Confidence level CL = 95% (for specified DUT and Bad DUT-quality)

## G.2.4 Numerical definition of the pass fail limits

**Table G.2.4-1: pass fail limits**

| ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 67 | NA | 39 | 763 | 500 | 78 | 1366 | 1148 | 117 | 1951 | 1828 |
| 1 | 95 | NA | 40 | 778 | 516 | 79 | 1381 | 1166 | 118 | 1965 | 1845 |
| 2 | 119 | 2 | 41 | 794 | 532 | 80 | 1396 | 1183 | 119 | 1980 | 1863 |
| 3 | 141 | 7 | 42 | 810 | 548 | 81 | 1412 | 1200 | 120 | 1995 | 1881 |
| 4 | 162 | 14 | 43 | 826 | 564 | 82 | 1427 | 1217 | 121 | 2010 | 1899 |
| 5 | 183 | 22 | 44 | 842 | 580 | 83 | 1442 | 1234 | 122 | 2025 | 1916 |
| 6 | 202 | 32 | 45 | 858 | 596 | 84 | 1457 | 1252 | 123 | 2039 | 1934 |
| 7 | 222 | 42 | 46 | 873 | 612 | 85 | 1472 | 1269 | 124 | 2054 | 1952 |
| 8 | 241 | 53 | 47 | 889 | 629 | 86 | 1487 | 1286 | 125 | 2069 | 1969 |
| 9 | 259 | 64 | 48 | 905 | 645 | 87 | 1502 | 1303 | 126 | 2084 | 1987 |
| 10 | 278 | 76 | 49 | 920 | 661 | 88 | 1517 | 1321 | 127 | 2099 | 2005 |
| 11 | 296 | 88 | 50 | 936 | 678 | 89 | 1532 | 1338 | 128 | 2113 | 2023 |
| 12 | 314 | 100 | 51 | 952 | 694 | 90 | 1547 | 1355 | 129 | 2128 | 2040 |
| 13 | 332 | 113 | 52 | 967 | 711 | 91 | 1562 | 1373 | 130 | 2143 | 2058 |
| 14 | 349 | 126 | 53 | 983 | 727 | 92 | 1577 | 1390 | 131 | 2158 | 2076 |
| 15 | 367 | 140 | 54 | 998 | 744 | 93 | 1592 | 1407 | 132 | 2172 | 2094 |
| 16 | 384 | 153 | 55 | 1014 | 760 | 94 | 1607 | 1425 | 133 | 2187 | 2111 |
| 17 | 401 | 167 | 56 | 1029 | 777 | 95 | 1623 | 1442 | 134 | 2202 | 2129 |
| 18 | 418 | 181 | 57 | 1045 | 793 | 96 | 1637 | 1459 | 135 | 2217 | 2147 |
| 19 | 435 | 195 | 58 | 1060 | 810 | 97 | 1652 | 1477 | 136 | 2231 | 2165 |
| 20 | 452 | 209 | 59 | 1076 | 827 | 98 | 1667 | 1494 | 137 | 2246 | 2183 |
| 21 | 469 | 224 | 60 | 1091 | 844 | 99 | 1682 | 1512 | 138 | 2261 | 2201 |
| 22 | 486 | 238 | 61 | 1106 | 860 | 100 | 1697 | 1529 | 139 | 2275 | 2218 |
| 23 | 503 | 253 | 62 | 1122 | 877 | 101 | 1712 | 1547 | 140 | 2290 | 2236 |
| 24 | 519 | 268 | 63 | 1137 | 894 | 102 | 1727 | 1564 | 141 | 2305 | 2254 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 536 | 283 | 64 | 1153 | 911 | 103 | 1742 | 1582 | 142 | 2320 | 2272 |
| 26 | 552 | 298 | 65 | 1168 | 928 | 104 | 1757 | 1599 | 143 | 2334 | 2290 |
| 27 | 569 | 313 | 66 | 1183 | 944 | 105 | 1772 | 1617 | 144 | 2349 | 2308 |
| 28 | 585 | 328 | 67 | 1199 | 961 | 106 | 1787 | 1634 | 145 | 2364 | 2326 |
| 29 | 602 | 343 | 68 | 1214 | 978 | 107 | 1802 | 1652 | 146 | 2378 | 2344 |
| 30 | 618 | 359 | 69 | 1229 | 995 | 108 | 1817 | 1669 | 147 | 2393 | 2361 |
| 31 | 634 | 374 | 70 | 1244 | 1012 | 109 | 1832 | 1687 | 148 | 2408 | 2379 |
| 32 | 650 | 389 | 71 | 1260 | 1029 | 110 | 1847 | 1704 | 149 | 2422 | 2397 |
| 33 | 667 | 405 | 72 | 1275 | 1046 | 111 | 1861 | 1722 | 150 | 2437 | 2415 |
| 34 | 683 | 421 | 73 | 1290 | 1063 | 112 | 1876 | 1740 | 151 | 2452 | 2433 |
| 35 | 699 | 436 | 74 | 1305 | 1080 | 113 | 1891 | 1757 | 152 | 2466 | 2451 |
| 36 | 715 | 452 | 75 | 1321 | 1097 | 114 | 1906 | 1775 | 153*) | NA | 2469 |
| 37 | 731 | 468 | 76 | 1336 | 1114 | 115 | 1921 | 1793 | | | |
| 38 | 747 | 484 | 77 | 1351 | 1131 | 116 | 1936 | 1810 | *) note 2 in G.2.5 | | |

NOTE 1: The first column is the number of errors (ne = number of NACK + statDTX)

NOTE 2: The second column is the number of samples for the pass limit ($ns_p$, ns=Number of Samples= number of `NACK + statDTX + ACK`)

NOTE 3: The third column is the number of samples for the fail limit ($ns_f$)

## G.2.5 Pass fail decision rules

The pass fail decision rules apply for a single test, comprising one component in the test vector. The over all Pass /Fail conditions are defined in clause G.2.6and G.2A.6

Having observed 0 errors, pass the test at 67+ samples, otherwise continue

Having observed 1 error, pass the test at 95+ otherwise continue

Having observed 2 errors, pass the test at 119+ samples, fail the test at 2- samples, otherwise continue

Etc. etc.

Having observed 151 errors, pass the test at 2452+ samples, fail the test at 2433- samples, otherwise continue

Having observed 152 errors, pass the test at 2466+ samples, fail the test at 2451- samples.

Where x+ means: x or more, x- means x or less

NOTE 1: an ideal DUT passes after 67 samples. The maximum test time is 2466 samples.

NOTE 2: It is allowed to deviate from the early decision concept by postponing the decision (pass/fail or continue). Postponing the decision to or beyond the end of Table G.2.4-1 requires a pass fail decision against the test limit: pass the DUT for ER<0.0618, otherwise fail.

# G.2.6 Test conditions for receiver tests

**Table G.2.6-1: Test conditions for receiver tests**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | Over all Pass/Fail condition |
|---|---|---|---|
| 7.3 Reference sensitivity level | Yes: the inherent receiver noise is assumed to be AWGN | tbd | To pass 7.3 each component in the test vector must pass |
| 7.3F.1 Reference sensitivity level without repetitions for category NB1 | Yes: the inherent receiver noise is assumed to be AWGN | tbd | To pass 7.3F each component in the test vector must pass |
| 7.4 Maximum input level | Unclear: in case, clipping causes errors, errors are data dependent. Statistical independence is assumed. | tbd | To pass 7.4 each component in the test vector must pass |
| 7.4A.3 Maximum input level for CA (inter-band DL CA without UL CA) | Unclear: in case, clipping causes errors, errors are data dependent. Statistical independence is assumed. | tbd | To pass 7.4A.3 each component in the test vector must pass |
| 7.4F Maximum input level for category NB1 | Unclear: in case, clipping causes errors, errors are data dependent. Statistical independence is assumed. | tbd | To pass 7.4f each component in the test vector must pass |
| 7.5 Adjacent Channel Selectivity (ACS) | Unclear: errors are data dependent on the interferers data. Statistical independence is assumed. | tbd | To pass 7.5 each component in the test vector must pass |
| 7.5A.3 Adjacent Channel Selectivity (ACS) for CA (inter-band DL CA without UL CA) | Unclear: errors are data dependent on the interferers data. Statistical independence is assumed. | tbd | To pass 7.5A.3 each component in the test vector must pass |
| 7.5F Adjacent Channel Selectivity (ACS) for category NB1 | Unclear: errors are data dependent on the interferers data. Statistical independence is assumed | 8 | To pass 7.5F each component in the test vector must pass |
| 7.6.1 In-band blocking | Unclear: errors are data dependent on the interferers data. Statistical independence is assumed. | tbd | To pass 7.6.1 each component in the test vector must pass |
| 7.6.1_1 In-band blocking with 4 Rx antenna ports | Unclear: errors are data dependent on the interferers data. Statistical independence is assumed. | tbd | To pass 7.6.1_1 each component in the test vector must pass |
| 7.6.1A.3 In-band blocking for CA (inter-band DL CA without UL CA) | Unclear: errors are data dependent on the interferers data. Statistical independence is assumed. | tbd | To pass 7.6.1A.3 each component in the test vector must pass |
| 7.6.2 Out of-band blocking | yes: it is assumed that the CW interferer causes errors, which are independent and time invariant. | tbd | To pass 7.6.2, all except [tbd] components in the test vector must pass |
| 7.6.2A.3 Out-of-band blocking for CA (inter-band DL CA without UL CA) | yes: it is assumed that the CW interferer causes errors, which are independent and time invariant. | tbd | To pass 7.6.2A.3, all except [tbd] components in the test vector must pass |
| 7.6.3 Narrow band | yes: it is assumed that the CW | tbd | To pass 7.6.3 each component in |

| | | | |
|---|---|---|---|
| blocking | interferer causes errors, which are independent and time invariant. | | the test vector must pass |
| 7.6.3A.3 Narrow band blocking for CA (inter-band DL CA without UL CA) | yes: it is assumed that the CW interferer causes errors, which are independent and time invariant. | tbd | To pass 7.6.3A.3 each component in the test vector must pass |
| 7.7 Spurious response | yes: it is assumed that the CW interferer causes errors, which are independent and time invariant. | tbd | To pass 7.7 each component in the test vector must pass |
| 7.7A.3 Spurious response for CA (inter-band DL CA without UL CA) | yes: it is assumed that the CW interferer causes errors, which are independent and time invariant. | tbd | To pass 7.7A.3 each component in the test vector must pass |
| 7.7F Spurious response for category NB1 | yes: it is assumed that the CW interferer causes errors, which are independent and time invariant. | tbd | To pass 7.7F each component in the test vector must pass |
| 7.8.1 Wide band Intermodulation | Unclear: errors are dependent on the data content of the interferer. Statistical independence is assumed. | tbd | To pass 7.8.1 each component in the test vector must pass |
| 7.8.1A.3 Wide-band intermodulation for CA (inter-band DL CA without UL CA) | Unclear: errors are dependent on the data content of the interferer. Statistical independence is assumed. | tbd | To pass 7.8.1A.3 each component in the test vector must pass |
| 7.8.1F Wide band Intermodulation for category NB1 | Unclear: errors are dependent on the data content of the interferer. Statistical independence is assumed. | tbd | To pass 7.8.1F each component in the test vector must pass |

# G.2A Statistical testing of receiver characteristics with CA

## G.2A.1 General

G.2.1 applies.

## G.2A.2 Mapping throughput to error ratio

The test is defined by the following design principles (see clause G.x, Theory….):

1. The standard concept is applied. (not the early decision concept).
2. A second limit is introduced, defining the Bad DUT.
3. To decide the test pass:
   - Supplier risk is applied based on the Bad DUT quality.
   - To decide the test fail.
   - Customer Risk is applied based on the specified DUT quality.

The test is defined by the following parameters:

1) Limit Error Ratio = 0.05 (95% throughput is tested).
2) Bad DUT factor M=1.5 (selectivity).
3) Confidence level CL = 95% (for specified DUT and Bad DUT-quality).

# G.2A.3

# G.2A.4 Pass fail limits

Apply 1003 samples to the DUT per CC.

Decide pass per CC in case of $\leq$ 62 errors, otherwise fail.

NOTE 1: The pass fail decision is done individually for each CC. The pass fail decision for one component in the test vector is as follows: pass if all CCs or SCC only according to the test cases pass, otherwise fail. The overall pass fail decision is according to clause G.2A.6

NOTE 2: It is allowed to apply more samples to the DUT, common for all CCs, (e.g. up to an integer number of frames). Use the ratio (62/1003) for the pass fail decision.

NOTE 3: 62/1003 = 0.0618, the same test limit is used at the end of Table G.2.4-1

## G.2A.5 void

## G.2A.6 Test conditions for receiver tests with CA

**Table G.2A.6-1: Test conditions for receiver tests with CA**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test Note 1 | Over all Pass/Fail condition Note 1 |
|---|---|---|---|
| 7.3A Reference sensitivity level for CA | Yes: the inherent receiver noise is assumed to be AWGN | tbd | To pass 7.3A each component in the test vector must pass |
| 7.4A Maximum input level for CA | Unclear: in case, clipping causes errors, errors are data dependent. Statistical independence is assumed. | tbd | To pass 7.4A each component in the test vector must pass |
| 7.5A Adjacent Channel Selectivity (ACS) for CA | Unclear: errors are data dependent on the interferers data. Statistical independence is assumed. | tbd | To pass 7.5A each component in the test vector must pass |
| 7.6.1A In-band blocking for CA | Unclear: errors are data dependent on the interferers data. Statistical independence is assumed. | tbd | To pass 7.6.1A each component in the test vector must pass |
| 7.6.2.A Out of-band blocking for CA | yes: it is assumed that the CW interferer causes errors, which are independent and time invariant. | tbd | To pass 7.6.2A, all except [tbd] components in the test vector must pass |
| 7.6.3A Narrow band blocking for CA | yes: it is assumed that the CW interferer causes errors, which are independent and time invariant. | tbd | To pass 7.6.3A each component in the test vector must pass |
| 7.7A Spurious response for CA | yes: it is assumed that the CW interferer causes errors, which are independent and time invariant. | tbd | To pass 7.7A each component in the test vector must pass |
| 7.8.1A Wide band Intermodulation | [place holder] | | |
| Note 1: A DUT with marginal performance on one component in the test vector passes this component with a confidence level of 95%, which is a false fail probability of 5%. All components in the test vector shall pass, to pass the test, For more than 1 component, performing marginal, there is an increased probability of a false fail for the test. | | | |

# G.3 Statistical testing of Performance Requirements with throughput

## G.3.1 General

The test of receiver performance characteristics is two fold.

1. A signal or a combination of signals is offered to the RX port(s) of the receiver.
2. The ability of the receiver to demodulate /decode this signal is verified by measuring the throughput.

In (2) is the statistical aspect of the test and is treated here.

The minimum requirement for all receiver performance tests is either 70% or 30% of the maximum throughput.

All receiver performance tests are performed in fading conditions. In addition to the statistical considerations, this requires the definition of a minimum test time.

## G.3.2 Mapping throughput to error ratio

G.2.2 applies

## G.3.3 Design of the test

The test is defined by the following design principles (see clause G.x, Theory….):

1. The standard concept is applied. (not the early decision concept)
2. A second limit is introduced: The second limit is different, whether 30% or 70% throughput is tested.
3. To decide the test pass:

   Supplier risk is applied based on the Bad DUT quality

   To decide the test fail:

   Customer Risk is applied based on the specified DUT quality

The test is defined by the following parameters:

1a) Limit Error Ratio = 0.3 (in case 70% Throughput is tested) or

1b) Limit Throughput = 0.3 (in case 30% Throughput is tested)

2a) Bad DUT factor M=1.378 (selectivity)

2b) Bad DUT factor m=0.692 (selectivity)

justification see: TS 34.121 Clause F.6.3.3

3) Confidence level CL = 95% (for specified DUT and Bad DUT-quality)

## G.3.4 Pass Fail limit

Testing Throughput = 30%, then the test limit is

Number of successes (ACK) / number of samples $\geq$ 59 / 233

Testing Throughput = 70% then the test limit is

Number of fails (NACK and statDTX) / number of samples $\leq$ 66 / 184

We have to distinguish 3 cases:

a) The duration for the number of samples (233 or 184) is greater than the minimum test time:

Then the number of samples (233 or 184) is predefined and the decision is done according to the number of events (59 successes or 66 fails)

b) Since subframe 0 and 5 contain less bits than the remaining subframes, it is allowed to predefine a number of samples contained in an integer number of frames. In this case test-limit-ratio applies.

c) The minimum test time is greater than the duration for the number of samples:

The minimum test time is predefined and the decision is done comparing the measured ratio at that instant against the test-limit-ratio.

NOTE: The test time for most of the tests is governed by the Minimum Test Time

## G.3.5 Minimum Test time

If a pass fail decision in G.3.4 can be achieved earlier than the minimum test time, then the test shall not be decided, but continued until the minimum test time is elapsed.

The tables below contain the minimum number of subframes for FDD and TDD.

By simulations the minimum number of active subframes (carrying DL payload) was derived (MNAS),

then adding inactive subframes to the active ones (e.g. subframe 5 contains no DL payload. For TDD additional subframes contain no DL payload)

then rounding up to full thousand and

then adding a bias of 1000 (BMNSF).

Simulation method to derive minimum test time:

With a level, corresponding a throughput at the test limit (here 30% or 70% of the max. throughput) the preliminary throughput versus time converges towards the final throughput. The allowance of ± 0.2 dB around the above mentioned level is predefined by RAN5 to find the minimum test time. The allowance of ±0.2 dB maps through the function “final throughput versus level” into a throughput corridor. The minimum test time is achieved when the preliminary throughput escapes the corridor the last time. The two functions “final throughput versus level” and “preliminary throughput versus time” are simulation results, which are done individual for each demodulation scenario. HST-scenarios and scenarios with MNAS ≥ 50000 are derived differently.

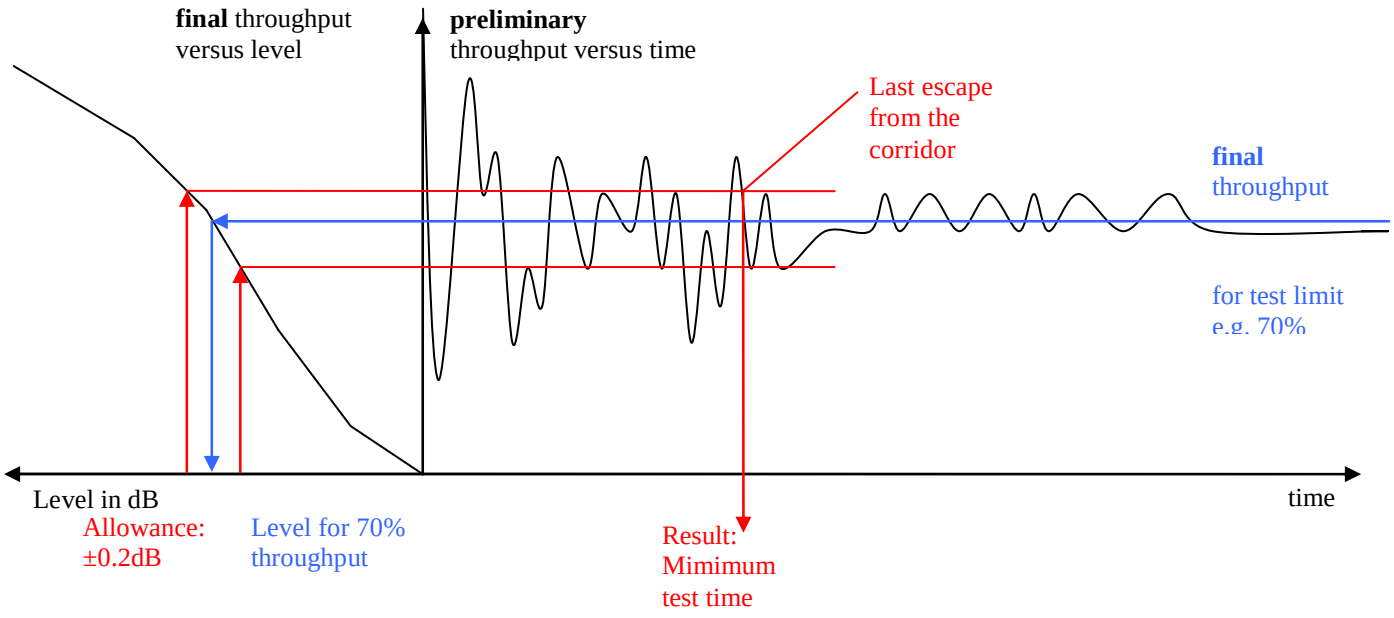



**Figure G.3.5-1: Simulation method to derive minimum test time**

**Table G.3.5-1: Minimum Test time for PDSCH Single Antenna Port Performance**

| Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes (MNAS) to reach the corridor (Simulation, info only) | Minimum Number of Subframes (MNS) to reach the corridor<br><br>(MNS = active and inactive subframes)<br><br>(Calculation, info only) | | Biased Minimum Number of SubFrames (BMNSF)<br><br>BMNSF= $1000 * \lceil \frac{MNS}{1000} \rceil$ +1000<br><br>(mandatory) | |
|---|---|---|---|---|---|---|
| | | | FDD | TDD | FDD | TDD |
| 1 | R.2<br>(10 MHz, full, QPSK, 1/3)<br>(1x2 Low)<br>EVA,5 | 38 764 | 43 072 | 77 528 | 45 000 | 79 000 |
| 2 | R.2<br>(10 MHz, full, QPSK, 1/3)<br>(1x2 Low)<br>ETU,70 | 2 764 | 3 072 | 5 528 | 5 000 | 7 000 |
| 3 | R.2<br>(10 MHz, full, QPSK, 1/3)<br>(1x2 Low)<br>ETU,300 | 1 424 | 1 583 | 2 848 | 3 000 | 4 000 |
| 4 | R.2<br>(10 MHz , full, QPSK, 1/3)<br>(1x2)<br>HST | 28 800 | NA | NA | 28 800 | 57 600 |
| 5 | R.4<br>(1.4 MHz, full, QPSK, 1/3)<br>(1x2 Low)<br>EVA,5 | 44 354 | 49 283 | 147 847 | 51 000 | 149 000 |
| 6 | R.3<br>(10 MHz, full, 16QAM, ½)<br>(1x2 Low)<br>EVA,5 | 39 020 | 43 356 | 78 040 | 45 000 | 80 000 |
| | R.3-1<br>(5 MHz, full, 16QAM, ½)<br>(1x2 Low)<br>EVA,5 | 39 020 | 43 356 | 78 040 | 45 000 | 80 000 |
| 6<br>Rel-9 | R.3-1<br>(5MHz, full, 16QAM, ½) (1x2 Low)<br>EVA5 | 39 020<br>(MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test6) | 43 356 | 78 040 | 45 000 | 80 000 |
| 7 | R.3<br>(10 MHz, full, 16QAM, ½)<br>(1x2 Low)<br>ETU,70 | 1 366 | 1 518 | 2 732 | 3 000 | 4 000 |
| | R.3-1<br>(5 MHz, full, 16QAM, ½)<br>(1x2 Low)<br>ETU70 | 1 366 | 1 518 | 2 732 | 3 000 | 4 000 |
| 7<br>Rel-9 | R.3-1<br>(5MHz, full, 16QAM, ½) (1x2 Low)<br>ETU70 | 1 366<br>(MNAS is not simulated, but estimated based on similar scenario in | 1 518 | 2 732 | 3 000 | 4 000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Table G.3.5-1 Test7) | | | | |
| 8 | R.3 (10 MHz, full, 16QAM, ½) (1x2 High) ETU,300 | 3 189 | 3 544 | 6 378 | 5 000 | 8 000 |
| | R.3-1 (5MHz, full, 16QAM, ½) (1x2 High) ETU300 | 3 189 | 3 544 | 6 378 | 5 000 | 8 000 |
| 8 Rel-9 | R.3-1 (5MHz, full, 16QAM, ½) (1x2 High) ETU300 | 3 189 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test8) | 3 544 | 6 378 | 5 000 | 8 000 |
| 9 | R.5 (3 MHz, full, 64QAM, ¾) (1x2 Low) EVA,5 | 50 000 | 55 556 | 100 000 | 57 000 | 101 000 |
| 10 | R.6 (5 MHz, full, 64QAM, 3/4) (1x2 Low) EVA,5 | 48 847 | 54 275 | 97 694 | 56 000 | 99 000 |
| 10 Rel-9 | R.6-1 (5MHz, partial, 64QAM, ¾) (1x2 Low) EVA5 | 48 847 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test10) | 54 275 | 97 694 | 56 000 | 99 000 |
| 11 | R.7 (10 MHz, full, 64QAM, ¾) (1x2 Low) EVA,5 | 46 524 | 51 694 | 93 048 | 53 000 | 95 000 |
| 11 Rel-9 | R.7-1 (10MHz, partial, 64QAM, ¾) (1x2 Low) EVA5 | 46 524 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test11) | 51 694 | 93 048 | 53 000 | 95 000 |
| 12 | R.7 (10 MHz, full, 64QAM, ¾) (1x2 Low) ETU,70 | 4 722 | 5 247 | 9 444 | 7 000 | 11 000 |
| 12 Rel-9 | R.7-1 (10MHz, partial, 64QAM, ¾) (1x2 Low) ETU70 | 4 722 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test12) | 5 247 | 9 444 | 7 000 | 11 000 |
| 13 | R.7 (10 MHz, full, 64 QAM, 3/4) (1x2High) EVA,5 | 100 000 | 111 112 | 200 000 | 113 000 | 201 000 |
| 13 Rel-9 | R.7-1 (10MHz, partial, 64QAM, ¾) | 100 000 (MNAS is not | 111 112 | 200 000 | 113 000 | 201 000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (1x2 High)<br>EVA5 | simulated, but estimated based on similar scenario in Table G.3.5-1 Test13) | | | | |
| 14 | R.8<br>(15 MHz, full, 64QAM, ¾)<br>(1x2 Low)<br>EVA,5 | 48 434 | 53 816 | 96 868 | 55 000 | 98 000 |
| 14<br>Rel-9 | R.8-1<br>(15MHz, partial, 64QAM, ¾)<br>(1x2 Low)<br>EVA5 | 48 434<br>(MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test14) | 53 816 | 96 868 | 55 000 | 98 000 |
| 15 | R.9<br>(20 MHz, full, 64QAM,3/4)<br>(1x2 Low)<br>EVA,5 | 100 000 | 111 112 | 200 000 | 113 000 | 201 000 |
| 15<br>Rel-9 | R.9-1<br>(20MHz, partial, 64QAM, ¾)<br>(1x2 Low)<br>EVA5 | 100 000<br>(MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test15) | 111 112 | 200 000 | 113 000 | 201 000 |
| 15<br>Rel-9 | R.9-2<br>(20MHz, partial, 64QAM, ¾)<br>(1x2 Low)<br>EVA5 | 100 000<br>(MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test15) | 111 112 | 200 000 | 113 000 | 201 000 |
| 16 | R.0<br>(3 MHz, 1PRB,16QAM, ½)<br>(1x2 Low)<br>ETU,70 | 5 710 | 6 345 | 11 420 | 8 000 | 13 000 |
| 17 | R.1<br>(10MHz,1PRB,16QAM, ½)<br>(1x2 Low)<br>ETU,70 | 9 234 | 10 260 | 18 468 | 12 000 | 20 000 |
| 18 | R.1<br>(20MHz,1PRB,16QAM, ½)<br>(1x2 Low)<br>ETU,70 | 13 373 | 14 859 | 26 746 | 16 000 | 28 000 |

**Table G.3.5-2: Minimum Test time for PDSCH Single Antenna Port Performance with 1 PRB**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | FDD | TDD | FDD | TDD |
| 1 | R.29<br>(10MHz,1PRB,16QAM,½)<br>(1x2 Low)<br>ETU,70<br>[MBSFN] | 5 246 | 17 487 | 17 487 | 19 000 | 19 000 |

**Table G.3.5-3: Minimum Test time for PDSCH Transmit diversity 2x2**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | FDD | TDD | FDD | TDD |
| 1 | R.11<br>(10MHz, full, 16QAM, ½)<br>(2x2 Med)<br>EVA,5<br>[SFBC, Space Frequency Block Code] | 50 000 | 55 556 | 100 000 | 57 000 | 101 000 |
| | R.11-1<br>(5MHz, full, 16QAM, ½)<br>(2x2 Med)<br>EVA5<br>[SFBC, Space Frequency Block Code] | 50 000 | 55 556 | 100 000 | 57 000 | 101 000 |
| 1<br>Rel-9 | R.11-2<br>(5MHz, full, 16QAM, ½)<br>(2x2 Med)<br>EVA5<br>[SFBC] | 50 000<br>(MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-3 Test1) | 55 556 | 100 000 | 57 000 | 101 000 |
| 2 | R.10<br>(10MHz, Full, QPSK, 1/3)<br>(2x2)<br>HST<br>[SFBC] | 28 800 | NA | NA | 28 800 | 57 600 |

**Table G.3.5-3a: Minimum Test time for PDSCH Transmit diversity 2x2 for eICIC**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.11-4<br>(10MHz, full, QPSK, ½)<br>(2x2 Med)<br>EVA,5<br>[SFBC, Space Frequency Block Code] | 50 000<br>(MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-3 Test1) | 224 000 | 501 000 |

**Table G.3.5-3b: Minimum Test time for PDSCH Transmit diversity 2x2 for feICIC**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.11-4<br>(10MHz, full, QPSK, ½)<br>(2x2 Med)<br>EVA,5<br>[SFBC, Space Frequency Block Code] | 50 000<br>MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-3 Test1 | 224 000 | 501 000 |

**Table G.3.5-4: Minimum Test time for PDSCH Transmit diversity 4x2**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | FDD | TDD | FDD | TDD |
| 1 | R.12<br>(1.4MHz, full, QPSK, 1/3)<br>(4x2 med)<br>EPA,5<br>[SFBC-FSTD, SFBC-Frequency Shifted Transmit Diversity] | 150 000 | 166 667 | 300 000 | 168 000 | 301 000 |
| 1<br>Rel-9 | R.13<br>(10 MHz, full, QPSK, 1/3)<br>(4x2 Low)<br>ETU70<br>[SFBC-FSTD] | 10 000<br>(MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-4 Test1) | 11 112 | 20 000 | 13 000 | 21 000 |

**Table G.3.5-5: Minimum Test time for PDSCH Open Loop Spacial Multiplexing 2x2**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | FDD | TDD | FDD | TDD |
| 1<br>FDD | R.11<br>(10MHz, Full, 16QAM, ½)<br>(2x2 Low)<br>EVA70<br>[LD-CDD, Large Delay-Cyclic Delay Diversity] | 7 600 | 8 445 | - | 10 000 | - |
| 1<br>TDD | R.11-1<br>(10MHz, Full, 16QAM, ½)<br>(2x2 Low)<br>EVA70<br>[LD-CDD, Large Delay-Cyclic Delay Diversity] | 7 600 | - | 19 000 | - | 20 000 |
| 2 | R.11-2<br>(5MHz, Full, 16QAM, ½)<br>(2x2 Low)<br>EVA,70<br>[LD-CDD, Large Delay-Cyclic Delay Diversity] | 7 600<br>(MNAS is not simulated, just follow the similar 10MHz test scenario in Test 1) | 8 445 | - | 10 000 | - |

**Table G.3.5-5a: Minimum Test time for PDSCH Open Loop Spacial Multiplexing 2x2 for eICIC**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |

| | | | | |
|---|---|---|---|---|
| 1 | R.11<br>(10MHz, Full, 16QAM, ½)<br>(2x2 Low)<br>EVA,5<br>[LD-CDD, Large Delay-Cyclic Delay Diversity, Non-MBSFN ABS] | 7 600<br>(MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-5 Test1) | 35 000 | 77 000 |
| 1 | R.11<br>(10MHz, Full, 16QAM, ½)<br>(2x2 Low)<br>EVA,5<br>[LD-CDD, Large Delay-Cyclic Delay Diversity, MBSFN ABS] | 7 600<br>(MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-3 Test1) | 77 000 | 77 000 |

**Table G.3.5-5b: Minimum Test time for PDSCH Open Loop Spacial Multiplexing 2x2 for feICIC**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.11<br>(10MHz, Full, 16QAM, ½)<br>(2x2 Low)<br>EVA,5<br>[LD-CDD, Large Delay-Cyclic Delay Diversity] | 7 600<br>MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-5 Test1 | 35 000 | 77 000 |
| 2 | R.35<br>(10MHz, full, 64QAM, ½)<br>(2x2 Low)<br>EVA,5<br>[LD-CDD, Large Delay-Cyclic Delay Diversity] | 7 600<br>MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-5 Test1 | 35 000 | 77 000 |

**Table G.3.5-6: Minimum Test time for PDSCH Open Loop Spacial Multiplexing 4x2**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | FDD | TDD | FDD | TDD |
| 1 | R.14<br>(10MHz, full, 16 QAM, ½)<br>(4x2 low)<br>EVA,70<br>[LD-CDD] | 4 860 | 5 400 | 12 150 | 7 000 | 14 000 |

**Table G.3.5-7: Minimum Test time for PDSCH Closed LoopSingle/Multilayer Spacial Multiplexing 2x2**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | FDD | TDD | FDD | TDD |
| 1 | R.10<br>(10MHz, Full, QPSK,1/3)<br>(2x2 Low)<br>EVA5<br>[SCW, Single CodeWord] | 49 140 | 54 600 | 98 280 | 56 000 | 100 000 |
| 1A | R.10-2<br>(5MHz, Full, QPSK,1/3)<br>(2x2 Low)<br>EVA5<br>[SCW, Single CodeWord] | 49 140 | 54 600 | 98 280 | 56 000 | 100 000 |
| 2 | R.10<br>(10MHz, Full, QPSK, 1/3)<br>(2x2 High)<br>EPA5<br>[SCW] | 50 000 | 55 556 | 100 000 | 57 000 | 101 000 |
| 3<br>FDD | R.11<br>(10MHz,full, 16QAM, ½)<br>(2x2Low)<br>EVA5<br>[MCW, Multiple Code Word] | 34 266 | 38 074 | - | 40 000 | - |
| 3<br>TDD | R.11-1<br>(10MHz,full, 16QAM, ½)<br>(2x2Low)<br>EVA5<br>[MCW, Multiple Code Word] | 34 266 | - | 85 665 | - | 87 000 |
| 3<br>Rel-9 | R.35<br>(10MHz, full, 64QAM, ½)<br>(2x2 Low)<br>EPA5<br>[MCW] | 48 000<br>(MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-12 Test5) | 53 333 | 120 000 | 55 000 | 121 000 |
| 4<br>FDD | R.11<br>(10MHz, full, 16QAM, ½)<br>(2x2Low)<br>ETU70<br>[MCW] | 2 736 | 3 040 | - | 5 000 | - |
| 4<br>TDD | R.11-1<br>(10MHz, full, 16QAM, ½)<br>(2x2Low)<br>ETU70<br>[MCW] | 2 736 | - | 6840 | - | 8000 |
| 4A | R.11-2<br>(5MHz, full, 16QAM, ½)<br>(2x2Low)<br>ETU70<br>[MCW] | 2 736 | 3 040 | - | 5 000 | - |

**Table G.3.5-8: Minimum Test time for PDSCH Closed Loop Single/Multilayer Spacial Multiplexing 4x2**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | FDD | TDD | FDD | TDD |
| 1 | R.13<br>(10 MHz, Full, QPSK, 1/3)<br>(4x2 Low)<br>EVA,5<br>[SCW] | 26 528 | 29 476 | 53 056 | 31 000 | 55 000 |
| 2 | R.14<br>(10MHz, Full, 16QAM, ½)<br>(4x2low)<br>EVA5<br>[MCW] | 26 066 | 28 963 | 65 165 | 30 000 | 67 000 |
| 2<br>Rel-9 | R.36<br>(10MHz, full, 64QAM 1/2)<br>(4x2 Low)<br>EPA5<br>[MCW] | 30 000<br>(MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-4 Test1) | 33 333 | 75 000 | 35 000 | 76 000 |

**Table G.3.5-9: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 8 and forward)**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | FDD | TDD | FDD | TDD |
| 1 | R.25<br>(10 MHz, full, QPSK, 1/3)<br>(1x2 Low)<br>EPA,5 | 38 879 | 43 199 | 77 758 | 45 000 | 79 000 |
| 2 | R.26<br>(10MHz, full, 16QAM, ½)<br>(1x2 Low)<br>EPA5 | 47 781 | 53 090 | 95 562 | 55 000 | 97 000 |
| 3 | R.27<br>(10MHz, full, 64QAM, 3/4)<br>(1x2 Low)<br>EPA,5 | 48 685 | 54 095 | 97 370 | 56 000 | 99 000 |
| 4 | R.28<br>(10MHz, 1PRB, 16QAM, ½)<br>(1x2 Low)<br>EPA,5 | 100 000 | 111 112 | 200 000 | 113 000 | 201 000 |

**Table G.3.5-10: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 9 and forward)**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1<br>NA | | | | |
| 2 | R.26-1<br>(5MHz, full, 16QAM ½)<br>(2x2 Low)<br>EPA5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for antenna configuration, MNSF is reused from Table G.3.5-9, Test 2 | 55 000 | 97 000 |
| 3 | R.27-1<br>(10MHz, part, 64QAM 3/4)<br>(2x2 Low)<br>EPA,5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for antenna configuration, MNSF is reused from Table G.3.5-9, Test 3 | 56 000 | 99 000 |
| 4<br>NA | | | | |

**Table G.3.5-11: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without simultaneous transmission**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.31<br>(10 MHz, full, QPSK, 1/3)<br>(2x2 Low)<br>EVA,5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, MNSF is reused from Table G.3.5-9, Test 1 | 45 000 | 79 000 |
| 2 | R.32<br>(10MHz, full, 16QAM, ½)<br>(2x2 Medium)<br>EPA5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, MNSF is reused from Table G.3.5-9, Test 2 | 55 000 | 97 000 |
| | R.32-1<br>(5MHz, full, 16QAM, ½)<br>(2x2 Medium)<br>EPA5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC, channel BW, antenna configuration, MNSF is reused from Table G.3.5-9, Test 2 | | |
| 3 | R.33<br>(10MHz, full, 64QAM, 3/4)<br>(2x2 Low)<br>EPA,5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, MNSF is reused from Table G.3.5-9, Test 3 | 56 000 | 99 000 |
| | R.33-1<br>(10MHz, part, 64QAM, 3/4)<br>(2x2 Low)<br>EPA5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC, allocation, antenna configuration, MNSF is reused from Table G.3.5-9, Test 3 | | |

**Table G.3.5-12: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 4 | R.32<br>(10MHz, full, 16QAM, 1/2)<br>(2x2 Medium)<br>EPA,5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC number, antenna configuration, MNSF is reused from Table G.3.5-9, Test 2 | 55 000 | 97 000 |
| 5 | R.34<br>(10MHz, full, 64QAM, 1/2)<br>(2x2 Low)<br>EPA,5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC number, target coding rate, antenna configuration, MNSF is reused from Table G.3.5-9, Test 3 | 56 000 | 99 000 |

**Table G.3.5-12a: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without simultaneous transmission for eDL-MIMO**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.43 FDD, R50 TDD<br>(10 MHz, full, QSPK, 1/3)<br>(2x2 Low)<br>EVA,5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, propagation condition, MNSF is reused from Table G.3.5-9, Test 1 | 45 000 | 79 000 |

**Table G.3.5-12b: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission for eDL-MIMO**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 2 | R.50 FDD, R.44 TDD<br>(10MHz, full, 64QAM, 1/2)<br>(2x2 Low)<br>EPA,5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC, target coding rate, antenna configuration, MNSF is reused from Table G.3.5-9, Test 3 | 56 000 | 99 000 |

**Table G.3.5-12c: Minimum Test time for PDSCH Single-layer Spatial Multiplexing for FeICIC**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.11 FDD, R11 TDD<br>(10 MHz, full, 16QAM, 1/2)<br>(2x2 High)<br>EPA, 5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, propagation condition, MNSF is reused from Table G.3.5-9, Test 1 | 55 000 | 97 000 |

**Table G.3.5-13: Minimum Test time for PDSCH Dual-layer Spatial Multiplexing**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.31<br>(10 MHz, full, QPSK, 1/3)<br>(2x2 Low)<br>EVA,5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, MNSF is reused from Table G.3.5-9, Test 1 | [45 000] | [79 000] |
| 2 | R.32<br>(10MHz, full, 16QAM, ½)<br>(2x2 Medium)<br>EPA5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, MNSF is reused from Table G.3.5-9, Test 2 | [55 000] | [97 000] |

**Table G.3.5-13a: Minimum Test time for PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.51<br>(10MHz, full, 16QAM, 1/2)<br>(2x2 Low)<br>EPA5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, MNSF is reused from Table G.3.5-9, Test 2 | 55 000 | 97 000 |

**Table G.3.5-14: Minimum Test time for PDSCH transmit Diversity 2x2 with TM3 Interference Model – Enhanced Performance Type A**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.46<br>(10MHz, full, QPSK, 1/3)<br>(2x2 Low)<br>EVA70 | Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EVA70 or ETU70 propagation conditions | 15 000 | 27 000 |

**Table G.3.5-15: Minimum Test time for PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 with TM4 Interference Model – Enhanced Performance Type A**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.47<br>(10MHz, full, 16QAM, 1/3)<br>(2x2 Low)<br>EVA5 | Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EVA5 or ETU70 propagation conditions | 56 000 | 100 000 |

**Table G.3.5-16: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model – Enhanced Performance Type A**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.48<br>(10MHz, full, QPSK, 1/2)<br>(4x2 Low)<br>EVA5 | Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 57 000 | 101 000 |

**Table G.3.5-17: Minimum Test time for PDSCH Closed Loop Single layer Spacial Multiplexing 2x1 for UE Category 0**

| Clause 8.9.1.1.2/8.9.1.2.2 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | HD-FDD | TDD | HD-FDD | TDD |
| 1 | R.63<br>(10MHz, 1PRB, 64QAM, ½)<br>(2x1 Low)<br>EPA5 | 48 000<br>(MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-7 Test3 Rel-9) with HD-FDD pattern | 142 222 | 120 000 | 144 000 | 121 000 |

**Table G.3.5-17a: Minimum Test time for PDSCH Closed Loop Single layer Spacial Multiplexing 2x1 for UE Category M1**

| Clause 8.11.1.1.1/8.11.1.2.1 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | HD-FDD | TDD | HD-FDD | TDD |
| 1 | R.79]<br>(10MHz, 1PRB, 16QAM, ½)<br>(2x1 Low)<br>EPA5 | 48 000<br>(MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-7 Test3 Rel-9) with HD-FDD pattern | 240 000 | 120 000 | 241 000 | 121 000 |

**Table G.3.5-18: Minimum Test time for PDSCH Open Loop Spatial Multiplexing 2x2– Enhanced Performance Type C**

| Clause 8.2.1.3.1B/8.2.2.3.1B Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.11 FDD<br>R.11-1 TDD<br>(10MHz, Full, 16QAM, ½)<br>(2x2 Medium)<br>EVA70<br>[LD-CDD, Large Delay-Cyclic Delay Diversity] | 7 600<br>(MNAS is not simulated, just follow the similar 10MHz test scenario in Table G.3.5-5 Test 1 FDD) | 10 000 | 20 000 |

**Table G.3.5-19: Minimum Test time for PDSCH Closed Loop Spatial Multiplexing 2x2– Enhanced Performance Type C**

| Clause 8.2.1.4.2A/8.2.2.4.2A Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.11 FDD<br>R.11-1 TDD<br>(10MHz, full, 16QAM, ½)<br>(2x2 Medium)<br>ETU70<br>[MCW] | 2 736 (MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-7 Test4 FDD) | 5 000 | 8 000 |

**Table G.3.5-20: Minimum Test time for PDSCH Open Loop Single/Multilayer Spatial Multiplexing 2x2 with TM1 Interference Model – Enhanced Performance Type C**

| Clause 8.2.1.3.1C/8.2.2.3.1C Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.11-8 FDD<br>R.11-10 TDD<br>(10MHz, full, QPSK, 3/5, 1/2)<br>(2x2 Medium)<br>EVA70 | Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EVA70 or ETU70 propagation conditions | 15 000 | 26 000 |

**Table G.3.5-21: Minimum Test time for for CDM-multiplexed DM RS – Enhanced Performance Type C**

| Clause 8.3.1.2.2/8.3.2.2.2 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.51 FDD<br>R.32 TDD<br>(10MHz, full, 16QAM, 1/2)<br>(2x2 Medium)<br>EPA5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, MNSF is reused from Table G.3.5-9, Test 2 | [55 000] | [97 000] |

**Table G.3.5-22: Minimum Test time for PDSCH transmit Diversity 2x2 with TM2 Interference Model – Enhanced Performance Type B**

| Clause 8.2.1.2.5 / 8.2.2.2.6 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.11-10 FDD<br>R.11-12 TDD<br><br>(10MHz, full, QPSK, 0.67 FDD, 0.54-0.66 TDD)<br>(2x2 Low)<br>EPA5 | 48000<br>Note: MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 60 000 | 120 000 |

**Table G.3.5-23: Minimum Test time for PDSCH transmit Diversity 2x2 with TM9 Interference Model – Enhanced Performance Type B**

| Clause 8.2.1.2.6 / 8.2.2.2.7 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.11-9 FDD<br>R.11-11 TDD<br><br>(10MHz, full, QPSK, 0.58 FDD, 0.48-0.58 TDD)<br>(2x2 Low)<br>EPA5 | 48000<br>Note: MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 60 000 | 120 000 |

**Table G.3.5-24: Minimum Test time for PDSCH Performance with DCI format 2D, non Quasi Co-located Antenna Ports, Same Cell ID and single NZP CSI-RS resource for CoMP**

| Clause 8.3.1.3.1_F/ 8.3.2.4.1_F Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.52 FDD<br>R.52 TDD<br>(10MHz, full, 64QAM, 1/2)<br>(2x2 Low)<br>EPA,5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC number, target coding rate, antenna configuration, MNSF is reused from Table G.3.5-9, Test 3 | 56 000 | 99 000 |
| 2 | R.52 FDD<br>R.52 TDD<br>(10MHz, full, 64QAM, 1/2)<br>(2x2 Low)<br>EPA,5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC number, target coding rate, antenna configuration, MNSF is reused from Table G.3.5-9, Test 3 | 56 000 | 99 000 |

**Table G.3.5-25: Minimum Test time for PDSCH Performance with DCI format 2D, non Quasi Co-located Antenna Ports, Same Cell ID and multiple NZP CSI-RS resources for CoMP**

| Clause 8.3.1.3.2_F/ 8.3.2.4.2_F Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.53 FDD<br>R.53 TDD<br>(10MHz, full, 64QAM, 1/2)<br>(2x2 Low)<br>EPA,5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC number, target coding rate, antenna configuration, MNSF is reused from Table G.3.5-9, Test 3 | 56 000 | 99 000 |
| 2 | R.53 FDD<br>R.53 TDD<br>(10MHz, full, 64QAM, 1/2)<br>(2x2 Low)<br>EPA,5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC number, target coding rate, antenna configuration, MNSF is reused from Table G.3.5-9, Test 3 | 56 000 | 99 000 |

**Table G.3.5-26: Minimum Test time for PDSCH Performance with DCI format 2D, non Quasi Co-located Antenna Ports, Different Cell ID, Colliding CRS and single NZP CSI-RS resource for CoMP**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.54 FDD<br>R.54 TDD<br>(10MHz, full, 16QAM, 1/2)<br>(2x2 Low)<br>EPA,5 | Note:<br>MNAS is not simulated. Because of same demodulation scenario except for RMC number, antenna configuration, MNSF is reused from Table G.3.5-9, Test 2 | 55 000 | 97 000 |

**Table G.3.5-27: Minimum Test time for PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 with TM4 Interference Model – Enhanced Performance Type B**

| Clause 8.2.1.4.4 / 8.2.2.4.5 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.11-10 FDD<br>R.11-12 TDD<br><br>(10MHz, full, QPSK, 0.67 FDD, 0.54-0.66 TDD)<br>(2x2 Low)<br>EVA5 | 48000<br>Note: MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 60 000 | 120 000 |
| 2 | R.11-9 FDD<br>R.11-11 TDD<br><br>(10MHz, full, QPSK, 0.58 FDD, 0.48-0.58 TDD)<br>(2x2 Low)<br>EPA5 | 48000<br>Note: MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 60 000 | 120 000 |

**Table G.3.5-28: Minimum Test time for PDSCH Transmit Diversity for UE Category 0**

| Clause 8.9.1.1.1/8.9.1.2.1 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | HD-FDD | TDD | HD-FDD | TDD |
| 1 | R.62 (10MHz, 16QAM, ½) (2x1 Low) EPA5 | 50 000 (MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-3 Test1) with HD-FDD pattern | 133 333 | 125 000 | 145 000 | 126 000 |

**Table G.3.5-28a: Minimum Test time for PDSCH Transmit Diversity for UE Category M1**

| Clause 8.11.1.1.3.1/8.11.1.1.3.1_1/ 8.11.1.2.3.1/8.11.1.2.3.1_1 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | HD-FDD | TDD | HD-FDD | TDD |
| 1 | R.81 (10MHz, QPSK, 1/10) (2x1 Low) ETU1 | 194 560 (MNAS is not simulated but based on Table G.4.4-1) | 486 400 | 1 167 360 | 488 000 | 1 169 000 |
| 2 | R.79 (10MHz, 16QAM, ½) (2x1 Low) EPA5 | 48 000 (MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-9 Test2) with HD-FDD pattern | 240 000 | 120 000 | 241 000 | 121 000 |

**Table G.3.5-28b: Minimum Test time for PDSCH Transmit Diversity for UE Category M2**

| Clause 8.11.1.1.3.2 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | HD-FDD | TDD | HD-FDD | TDD |
| 1 | R.xx (10MHz, QPSK, 1/3) (2x1 Low) EPA5 | TBD | TBD | TBD | TBD | TBD |

**Table G.3.5-29: Minimum Test time for Closed Loop spatial multiplexing, 4 Layers spatial multiplexing with 4 Tx ports and 4 Rx ports**

| Clause 8.10.1.1.8/ 8.10.1.2.8 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.74<br>(10MHz, full, 16QAM, 1/2)<br>(4x4 Low)<br>EPA5 | Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 168 000 | 301 000 |

**Table G.3.5-30: Minimum Test time for 4 Layer Spatial Multiplexing for 4 Rx (User-Specific Reference Symbols)**

| Clause 8.10.1.1.9/ 8.10.1.2.9 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.75<br>(10MHz, full, 16QAM, 1/2)<br>(4x4 Low)<br>EPA5 | Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 56 000 | 99 000 |

**Table G.3.5-31: Minimum Test time for Open Loop spatial multiplexing, 3 Layers with 4 Tx ports and 4 Rx ports**

| Clause 8.10.1.1.7/ 8.10.1.2.7 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.73<br>(10MHz, full, 64QAM, 0.43)<br>(4x4 Low)<br>EVA70 | 4 860<br>Note:<br>MNAS is not simulated, but estimated based on the similar scenario in Table G.3.5-6 Test1 | 7 000 | 14 000 |

**Table G.3.5-32: Minimum Test time for 4-Rx PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model – Enhanced Performance Type A**

| Clause 8.10.1.1.3/8.10.1.2.3 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.47<br>(10MHz, full, 16QAM, 1/3)<br>(2x4 Low)<br>EVA5 | Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EVA5 or ETU70 propagation conditions | 56 000 | 100 000 |

**Table G.3.5A-33: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 0**

| Clause 8.9.1.1.3/8.9.1.2.3 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | HD-FDD | TDD | FDD | TDD |
| 1 | R.64<br>(10 MHz, 6l, QPSK, 1/3)<br>(2x1 Low)<br>EPA,5 | 38 879<br>(MNAS is not simulated. It is estimated based on other similar scenarios in Table G.3.5-9 Test 1) with HD-FDD pattern | 115 197 | 97 198 | 117 000 | 99 000 |

**Table G.3.5-33a: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category M1**

| Clause 8.11.1.1.2/8.11.1.2.2 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | HD-FDD | TDD | FDD | TDD |
| 1 | R.80<br>(10 MHz, 6l, QPSK, 1/3)<br>(2x1 Low)<br>EPA,5 | 38 879<br>(MNAS is not simulated. It is estimated based on other similar scenarios in Table G.3.5-9 Test 1) with HD-FDD pattern | 1 244 128 | 2 138 345 | 1 246 000 | 2 140 000 |

**Table G.3.5-33b: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 1bis**

| Clause 8.9.1.1.3_1/8.9.1.2.3_1 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | HD-FDD | TDD | HD-FDD | TDD |
| 2 | R.86<br>(10MHz, 16QAM, 1/3)<br>(2x1 Low)<br>EPA5 | 50 000<br>(MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-3 Test1) with HD-FDD pattern | 133 333 | 125 000 | 145 000 | 126 000 |

**Table G.3.5-34: Minimum Test time for 4-Rx PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model – Enhanced Performance Type A**

| Clause 8.10.1.1.5 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.76<br>(10MHz, full, QPSK,)<br>(2x4 Low)<br>EVA5 | Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 56 000 | 100 000 |

**Table G.3.5-35: Minimum Test time for PDSCH Closed Loop Multi-layer Spatial Multiplexing 2x2 for 256QAM in DL**

| Clause 8.2.1.4.1_H/ 8.2.2.4.1_H Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 3 | R.65 FDD<br>(10MHz, full, 256QAM,)<br>(2x2 Low)<br>EVA5<br><br>R.65 TDD<br>(20MHz, full, 256QAM,)<br>(2x2 Low)<br>EVA5 | 50 000<br>Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 63 000 | 125 000 |

**Table G.3.5-36: PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 without simultaneous transmission for eDL-MIMO for 256QAM in DL**

| Clause 8.3.1.1.1_H /8.3.2.1.2_H Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 3 | R.66 FDD<br>(10MHz, full, 256QAM,)<br>(2x2 Low)<br>EPA5<br><br>R.66 TDD<br>(20MHz, full, 256QAM,)<br>(2x2 Low)<br>EPA5 | 50 000<br>Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 63 000 | 125 000 |

**Table G.3.5-37: PDSCH Transmit Diversity 2x4**

| Clause 8.10.1.1.1 /8.10.1.2.1 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.11<br>(10MHz, full, 16QAM,)<br>(2x4 Medium correlation A)<br>EVA5 | 50 000<br>Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 56 000 | 100 000 |

**Table G.3.5-38: PDSCH Open Loop Spatial Multiplexing 2x4**

| Clause 8.10.1.1.2 /8.10.1.2.2 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.11<br>(10MHz, full, 16QAM,)<br>(2x4 Low)<br>EVA70 | 7600<br>Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EVA70 propagation conditions | 10 000 | 17 000 |

**Table G.3.5-39: PDSCH Open Loop Spatial Multiplexing 2x4**

| Clause 8.10.1.1.4 /8.10.1.2.4 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.36<br>(10MHz, full, 64QAM,)<br>(4x4 Low)<br>EPA5 | 50 000<br>Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 56000 | 126 000 |
| 2 | R.72<br>(10MHz, full, 256QAM,)<br>(4x4 Low)<br>EPA5 | 50 000<br>Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 56000 | 126 000 |

**Table G.3.5-40: Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols)**

| Clause 8.10.1.1.6 /8.10.1.2.6 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.51<br>(10MHz, full, 16QAM,)<br>(2x4 Low)<br>ETU5 | 50000<br>Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 56 000 | 100 000 |

**Table G.3.5-41: Minimum Test time for PDSCH Transmit Diversity for UE Category 1bis**

| Clause 8.9.1.1.1_1/8.9.1.2.1_1 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | HD-FDD | TDD | HD-FDD | TDD |
| 2 | R.84<br>(10MHz, 16QAM, ½)<br>(2x1 Low)<br>EPA5 | 50 000<br>(MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-3 Test1) with HD-FDD pattern | 133 333 | 125 000 | 145 000 | 126 000 |

**Table G.3.5-42: Minimum Test time for PDSCH for UE Category NB1**

| Clause 8.12.1.1.2 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | HD-FDD | TDD |
| 1 | R.NB.3 FDD (200kHz, QPSK,1/2) (1x1) EPA5 | 3609 | 3466000 | N/A |
| 2 | R.NB.3 FDD (200kHz, QPSK,1/2) (1x1) ETU1 | 3609 | 5544000 | N/A |

**Table G.3.5-43: Minimum Test time for PDSCH for UE Category NB1**

| Clause 8.12.1.1.1 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | HD-FDD | TDD |
| 1 | R.NB.5 FDD (200kHz, QPSK,1/3) (2x1 Low) EPA5 | 3040 | 99000 | N/A |
| 2 | R.NB.5 FDD (200kHz, QPSK,1/3) (2x1 Low) EPA5 | 97280 | 293000 | |
| 3 | R.NB.5-1 FDD (200kHz, QPSK,1/3) (2x1 Low) ETU1 | 778240 | 1752000 | N/A |

**Table G.3.5-44: Minimum Test time for PDSCH for UE Category NB2**

| Clause 8.12.1.1.3 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | HD-FDD | TDD |
| 1 | R.NB.7 FDD (200kHz, QPSK,1/2) (1x1) EPA5 | 3609 | 44000 | N/A |

**Table G.3.5-45: Minimum Test time for PDSCH Single-layer Spatial Multiplexing for FD-MIMO**

| Clause 8.3.1.1.9/8.3.2.1.10 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.50 FDD, R.44 TDD (10MHz, full, 64QAM, 1/2) (2x2 Low) EPA5 | Note: MNAS is not simulated. Because of same demodulation scenario except for RMC, target coding rate, antenna configuration, MNSF is reused from Table G.3.5-9, Test 3 | 56 000 | 99 000 |

## G.3.6 Test conditions for receiver performance tests

**Table G.3.6: Test conditions for receiver performance tests**

**Table G.3.6-1: Single Antenna Port Performance (Cell-specific Reference Symbols) for test case 8.2.1.1 and 8.2.2.1 demodulation of PDSCH**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | | | | Over all Pass/Fail condition |
|---|---|---|---|---|---|---|
| 8.2.1.1 FDD PDSCH Single Antenna Port Performance (Cell-Specific Reference Symbols) | subframes are independent | CAT | 1 | 2 | 3-5 | To pass 8.2.1.1 and 8.2.2.1each component in the test vector must pass<br><br>For UEs, supporting multiple E_UTRA-bands (number of bands =B), the number of repetitions must be multiplied by B.<br><br>If a test is defined over a BW>(BW of the E_UTRA band), the test is not applicable and reduces the number of repetitions.<br><br>If a test is defined over a BW, which is not supported in the E_UTRAN band, the test is not applicable and reduces the number of repetitions. |
| | | QPSK | 5 | 5 | 5 | |
| | | 16QAM | 0 | 3 | 3 | |
| 8.2.1.2 TDD PDSCH Single Antenna Port Performance (Cell-Specific Reference Symbols) | subframes are independent | 64 QAM | 1 | 6 | 7 | |
| | | 1PRB | 4 | 4 | 4 | |
| | | Σ | 10 | 18 | 19 | |

**Table G.3.6-2: Transmit Diversity Performance (Cell-specific Reference Symbols) for test case 8.2.1.2 and 8.2.2.2 demodulation of PDSCH**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | | | | Over all Pass/Fail condition |
|---|---|---|---|---|---|---|
| 8.2.1.2 FDD PDSCH Transmit Diversity Performance (Cell-Specific Reference Symbols) | subframes are independent | CAT | 1 | 2 | 3-5 | To pass 8.2.1.2 and 8.2.2.2 each component in the test vector must pass<br><br>For UEs, supporting multiple E_UTRA-bands (number of bands =B), the number of repetitions must be multiplied by B.<br><br>If a test is defined over a BW, which is not supported in the E_UTRAN band, the test is not applicable and reduces the number of repetitions. |
| | | QPSK | 2 | 2 | 2 | |
| 8.2.2.2 TDD PDSCH Transmit Diversity Performance (Cell-Specific Reference Symbols) | subframes are independent | 16QAM | 0 | 1 | 1 | |
| | | Σ | 2 | 3 | 3 | |

**Table G.3.6-3: Open Loop Spatial Multiplexing Performance (Cell-specific Reference Symbols) for test case 8.2.1.3 and 8.2.2.3 demodulation of PDSCH**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | | | | Over all Pass/Fail condition |
|---|---|---|---|---|---|---|
| 8.2.1.3 FDD PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols) | subframes are independent | CAT | 1 | 2 | 3-5 | To pass 8.2.1.3 and 8.2.2.3 each component in the test vector must pass |
| | | 16QAM | 0 | 2 | 2 | |
| 8.2.2.3 TDD PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols) | subframes are independent | Σ | 0 | 2 | 2 | |

**Table G.3.6-4: Closed Loop Spatial Multiplexing Performance (Cell-specific Reference Symbols) for test case 8.2.1.4 and 8.2.2.4 demodulation of PDSCH**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | | | | Over all Pass/Fail condition |
|---|---|---|---|---|---|---|
| 8.2.1.4 FDD PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols) | subframes are independent | CAT | 1 | 2 | 3-5 | To pass 8.2.1.4 and 8.2.2.4 each component in the test vector must pass |
| | | Single layer QPSK | 3 | 3 | 3 | |
| 8.2.2.4 TDD PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols) | subframes are independent | Multi layer 16QAM | 0 | 3 | 3 | |
| | | Σ | 3 | 6 | 6 | |

**Table G.3.6-5: TDD PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 8 and forward)**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | | | | Over all Pass/Fail condition |
|---|---|---|---|---|---|---|
| 8.3.2.1.1 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 8 and forward) | subframes are independent | CAT | 1 | 2 | 3-5 | To pass 8.3.2.1 each component in the test vector must pass |
| | | QPSK | 1 | 1 | 1 | |
| | | 16QAM | 1 | 2 | 2 | |
| | | 64 QAM | 0 | 1 | 1 | |
| | | Σ | 2 | 4 | 4 | |

**Table G.3.6-6: TDD PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 9 and forward)**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | | | | Over all Pass/Fail condition |
|---|---|---|---|---|---|---|
| 8.3.2.1.1_1 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 9 and forward) | subframes are independent | CAT | 1 | 2 | 3-5 | To pass 8.3.2.1.1_1 each component in the test vector must pass |
| | | 16QAM | 1 | 0 | 0 | |
| | | 64 QAM | 1 | 0 | 0 | |
| | | Σ | 2 | 0 | 0 | |
| | | | | | | |

**Table G.3.6-7: TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without a simultaneous transmission**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | | | | Over all Pass/Fail condition |
|---|---|---|---|---|---|---|
| 8.3.2.1.2 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without a simultaneous transmission | subframes are independent | CAT | 1 | 2-5 | | To pass 8.3.2.1.2 each component in the test vector must pass |
| | | QPSK | 1 | 1 | | |
| | | 16QAM | 1 | 1 | | |
| | | 64 QAM | 1 | 1 | | |
| | | Σ | 3 | 3 | | |

**Table G.3.6-8: TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | | | | Over all Pass/Fail condition |
|---|---|---|---|---|---|---|
| 8.3.2.1.3 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission | subframes are independent | CAT | 1 | 2-5 | | To pass 8.3.2.1.3 each component in the test vector must pass |
| | | 16QAM | 0 | 1 | | |
| | | 64 QAM | 0 | 1 | | |
| | | Σ | 0 | 2 | | |
| | | | | | | |

**Table G.3.6-8a: PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without a simultaneous transmission for eDL-MIMO**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | | | | Over all Pass/Fail condition |
|---|---|---|---|---|---|---|
| 8.3.1.1.1_D FDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without a simultaneous transmission | subframes are independent | CAT | 1-8 | | | To pass 8.3.1.1.1_D and 8.3.2.1.2_D each component in the test vector must pass |
| | | QPSK | 1 | | | |
| 8.3.2.1.2_D TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without a simultaneous transmission | subframes are independent | QPSK | 1 | | | |
| | | Σ | 2 | | | |

**Table G.3.6-8b: PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission for eDL-MIMO**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | | | | Over all Pass/Fail condition |
|---|---|---|---|---|---|---|
| 8.3.1.1.2_D FDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission for eDL-MIMO | subframes are independent | CAT | 1 | 2-8 | | To pass 8.3.1.1.2_D and 8.3.2.1.3_D each component in the test vector must pass |
| | | 64QAM | 0 | 1 | | |
| 8.3.2.1.3_D TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission for eDL-MIMO | subframes are independent | 64QAM | 0 | 1 | | |
| | | Σ | 0 | 2 | | |

**Table G.3.6-8c: PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model - Enhanced Performance Requirement Type A**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | | | | Over all Pass/Fail condition |
|---|---|---|---|---|---|---|
| 8.3.1.1.3 FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model - Enhanced Performance Requirement Type A | subframes are independent | CAT | 1-8 | | | To pass 8.3.1.1.3 and 8.3.2.1.4 each component in the test vector must pass |
| | | QPSK | 1 | | | |
| 8.3.2.1.4 TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model - Enhanced Performance Requirement Type A | subframes are independent | QPSK | 1 | | | |
| | | Σ | 2 | | | |

**Table G.3.6-9: TDD PDSCH Dual-layer Spatial Multiplexing**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | | | | Over all Pass/Fail condition |
|---|---|---|---|---|---|---|
| 8.3.2.2.1 TDD PDSCH Dual-layer Spatial Multiplexing | subframes are independent | CAT | 1 | 2 | 3-5 | To pass 8.3.2.2.1 each component in the test vector must pass |
| | | QPSK | 1 | 1 | 1 | |
| | | 16QAM | 1 | 2 | 2 | |
| | | 64 QAM | 0 | 1 | 1 | |
| | | Σ | 2 | 4 | 4 | |

**Table G.3.6-9a: PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | | | | Over all Pass/Fail condition |
|---|---|---|---|---|---|---|
| 8.3.1.2.1_D FDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO | subframes are independent | CAT | 1 | 2-8 | | To pass 8.3.1.2.1_D and 8.3.2.2.1_D each component in the test vector must pass |
| | | 16QAM | 0 | 1 | | |
| 8.3.2.2.1_D TDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO | subframes are independent | 16QAM | 0 | 1 | | |
| | | Σ | 0 | 2 | | |

# G.3A Statistical testing of Performance Requirements with throughput for CA/DC/LAA

## G.3A.1 General

The minimum requirements for performance tests in fading conditions in clause 8 with respect to CA/DC are 70% of the maximum throughput. The minimum requirements in static conditions in clause 8 with respect to CA/DC are [TBD]. Statistical tests in static propagation conditions lead to a statistically justified number of samples (testtime) and a test limit. The fading conditions require a minimum test time, overriding the statistically justified test time. It can be found in Tables G.3A.5. The statistically justified test limit is also used for the tests under fading conditions. The throughput is measured on both carriers in parallel (unless otherwise stated). The test for both carriers need the same time. The sum of the CC's throughput is compared against the limit, where the limit is the sum of the individual carrier's limit.

## G.3A.2 Mapping throughput to error ratio

G.2.2 applies separate for each CC

## G.3A.3 Design of the test

The test is defined by the following design principles (see clause G.x, Theory….):

1. The standard concept is applied (not the early decision concept).
2. A second limit is introduced, defining the Bad DUT.
3. To decide the test pass:
   - Supplier risk is applied based on the Bad DUT quality.
   - To decide the test fails.
   - Customer Risk is applied based on the specified DUT quality.

The test is defined by the following parameters:

1) Limit Error Ratio = 0.3.
(in case 70% throughput is tested , otherwise [TBD]).

2) Bad DUT factor M = 1.378 (selectivity) justification see: TS 34.121 Clause F.6.3.3.
(M = 1.378 is tied to 70% throughput, otherwise M is [TBD].)

3) Confidence level CL = 95% (for specified DUT and Bad DUT-quality).

## G.3A.4 Pass Fail limit

Testing with the parameters from G.3A.3 (70% throughput, M = 1.378, CL95%): Apply 184 samples to the DUT per CC and count the errors for each CC. The test limit to pass for one CC is $\leq$ 66 errors, however this is not individually applicable for CA/DC.

Pass fail decision for one test point in CA/DC: The sum of the CC's errors is compared against the test limit, where the test limit is the sum of the individual carrier's test limit.

It is allowed to apply more samples, in parallel for all CCs, to the DUT (e.g. up to an integer number of frames).

In fading conditions it is necessary to apply more samples, in parallel for all CCs, to the DUT, as in fading conditions the minimum test time overrides the statistically justified test time.

When more samples are applied, decide against the ratio 66/184 = 0.3587.

Testing with parameters from G.3A.3 ([TBD]% throughput, M = [TBD], CL = 95%) is [TBD].

## G.3A.5 Minimum test time

In contrast to G.3.5, where the minimum test time is derived from simulations, the test time here is selected without simulation utilising test time information from similar demodulation scenarios in non-CA test cases and while maintaining the reasonable testing time.

Note MNAS values in this clause may need to be changed in future if current MNAS values turn out to be too short for giving stable CA/DC throughput results.

**Table G.3A.5-1: Minimum Test time FDD PDSCH Single Antenna Port Performance for CA (2DL CA)**

| Clause 8.2.1.1.1_A.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.2FDD<br>(2x10 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 2 | R.42FDD<br>(2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 3 | R.42-3 FDD + R.42-2 FDD<br>(15MHz+5MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5) | 50 000 | 55 556 |

**Table G.3A.5-1A: Minimum Test time FDD PDSCH Single Antenna Port Performance for CA (3DL CA)**

| Clause 8.2.1.1.1_A.2 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.42FDD<br>(3x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 2 | R.42FDD + R.42-3FDD<br>(20+20+15 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 3 | R.42FDD + R.2FDD<br>(20+20+10 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 4 | R.42FDD + R.42-3FDD<br>(20+15+15 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 5 | R.42FDD + R.42-3FDD + R.2FDD<br>(20+15+10 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 6 | R.42FDD + R.2FDD<br>(20+10+10 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 7 | R.42-3FDD + R.2FDD<br>(15+15+10 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 8 | R.42FDD + R.2FDD + R.42-2FDD<br>(20+10+5 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 9 | R.42FDD + R.42-3FDD + R.42-2FDD<br>(20+15+5 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |

**Table G.3A.5-1B: Minimum Test time FDD PDSCH Single Antenna Port Performance for CA (4DL CA)**

| Clause 8.2.1.1.1_A.4 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.42FDD<br>(4x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 2 | R.2FDD + R.42FDD<br>(10+20+20+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 3 | R.2FDD + R.42FDD<br>(10+10+20+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 4 | R.42-2FDD + R.2FDD + R.42FDD<br>(5+10+20+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 5 | R.42-2FDD + R.2FDD + R.42FDD<br>(5+10+10+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |

**Table G.3A.5-1C: Minimum Test time FDD PDSCH Single Antenna Port Performance for CA (5DL CA)**

| Clause 8.2.1.1.1_A.5 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.42FDD<br>(5x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 2 | R.42-3FDD + R.42FDD<br>(15+4x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 3 | R.2FDD + R.42FDD<br>(10+4x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 4 | R.2FDD + R.42FDD<br>(2x10+3x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 5 | R.42-2FDD + R.2FDD + R.42FDD<br>(5+10+3x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 6 | R.2FDD + R.42FDD<br>(3x10+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 7 | R.2FDD + R.42FDD<br>(4x10+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 55 556 |

**Table G.3A.5-2: Minimum Test time FDD PDSCH Open Loop Spatial Multiplexing 2x2 (2DL CA)**

| Clause 8.2.1.3.1_A.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.11 FDD (2x10 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 2 | R.30 FDD (2x20 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 3 | R.11-2 FDD (2x5 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 4 | FFS | FFS | FFS |
| 5 | R.11-7 FDD + R.11-2 FDD (15MHz+5MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |

**Table G.3A.5-2A: Minimum Test time FDD PDSCH Open Loop Spatial Multiplexing 2x2 (3DL CA)**

| Clause 8.2.1.3.1_A.2 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.30 FDD (3x20 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 2 | R.30 FDD + R.11-7 FDD (20+20+15 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 3 | R.30 FDD + R.11 FDD (20+20+10 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 4 | R.30 FDD + R.11-7 FDD (20+15+15 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 5 | R.30 FDD + R.11-7 FDD + R.11 FDD (20+15+10 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 6 | R.30 FDD + R.11 FDD (20+10+10 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 7 | R.11-7 FDD + R.11 FDD (15+15+10 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 8 | R.30 FDD + R.11 FDD + R.11-2 FDD (20+10+5 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 9 | R.30 FDD + R.11-7 FDD + R.11-2 FDD (20+15+5 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |

**Table G.3A.5-2B: Minimum Test time FDD PDSCH Open Loop Spatial Multiplexing 2x2 (4DL CA)**

| Clause 8.2.1.3.1_A.3 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.30 FDD (4x20 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 2 | R.11 FDD + R.30 FDD (10+20+20+20 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 3 | R.11 FDD + R.30 FDD (10+10+20+20 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 4 | R.11-2 FDD + R.11 FDD + R.30 FDD (5+10+20+20 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 5 | R.11-2 FDD + R.11 FDD + R.30 FDD (5+10+10+20 MHz, full 16QAM, 1/2), (2x2 Low)<br>EVA70 | 10 000 | 11 112 |

**Table G.3A.5-2C: Minimum Test time FDD PDSCH Open Loop Spatial Multiplexing 2x2 (5DL CA)**

| Clause 8.2.1.3.1_A.4 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.30FDD<br>(5x20 MHz,full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 2 | R.11-7FDD + R.30FDD<br>(15+4x20 MHz,full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 3 | R.11FDD + R.30FDD<br>(10+4x20 MHz,full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 4 | R.11FDD + R.30FDD<br>(2x10+3x20 MHz,full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 5 | R.11-2FDD + R.11FDD + R.30FDD<br>(5+10+3x20 MHz,full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 6 | R.11FDD + R.30FDD<br>(3x10+2x20 MHz,full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 7 | R.11FDD + R.30FDD<br>(4x10+20 MHz,full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 11 112 |

**Table G.3A.5-3: Minimum Test time FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 (2DL CA)**

| Clause 8.2.1.4.2_A.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.14-3 FDD<br>(2x20 MHz, full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 2 | R.14FDD<br>(2x10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 3 | R.14-7 FDD + R.14-6 FDD<br>(15MHz+5MHz,full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 55 556 |

**Table G.3A.5-3A: Minimum Test time FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 (3DL CA)**

| Clause 8.2.1.4.2_A.2 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.14-3 FDD<br>(3x20 MHz,full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 2 | R.14-3 FDD + R.14-7 FDD<br>(20+20+15 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 3 | R.14-3 FDD + R.14 FDD<br>(20+20+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 4 | R.14-3 FDD + R.14-7 FDD<br>(20+15+15 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 5 | R.14-3 FDD + R.14-7 FDD + R.14 FDD<br>(20+15+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 6 | R.14-3 FDD + R.14 FDD<br>(20+10+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 7 | R.14-7 FDD + R.14 FDD<br>(15+15+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 8 | R.14-3 FDD + R.14 FDD + R.14-6 FDD<br>(20+10+5 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 9 | R.14-3 FDD + R.14-7 FDD + R.14-6 FDD<br>(20+15+5 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |

**Table G.3A.5-3B: Minimum Test time FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 (4DL CA)**

| Clause 8.2.1.4.2_A.3 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.14-3 FDD<br>(4x20 MHz,full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 2 | R.14-3 FDD + R.14-7 FDD<br>(20+20+20+15 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 3 | R.14-3 FDD + R.14 FDD<br>(20+20+20+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 4 | R.14-3 FDD + R.14-7 FDD<br>(20+20+15+15 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 5 | R.14-3 FDD + R.14-7 FDD + R.14 FDD<br>(20+20+15+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 6 | R.14-3 FDD + R.14 FDD<br>(20+20+10+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 7 | R.14-3 FDD + R.14-7 FDD + R.14 FDD<br>(20+15+15+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 8 | R.14-3 FDD + R.14-7 FDD + R.14 FDD<br>(20+15+10+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 9 | R.14-3 FDD + R.14 FDD<br>(20+10+10+10MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 10 | R.14-7 FDD + R.14 FDD<br>(15+15+15+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |

| | | | |
|---|---|---|---|
| 11 | R.14-3 FDD + R.14 FDD + R.14-6 FDD<br>(20+20+10+5 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 12 | R.14-6FDD + R.14 FDD + R.14-3 FDD<br>(5+10+10+10+20MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |

**Table G.3A.5-3C: Minimum Test time FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 (5DL CA)**

| **Clause 8.2.1.4.2_A.4 Test No** | **Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs,<br>modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only)** | **Minimum Number of Active Subframes in each CC** | **Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes)** |
|---|---|---|---|
| | | | **FDD** |
| 1 | R.14-3 FDD<br>(5x20 MHz,full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 2 | R.14-7 FDD + R.14-3 FDD<br>(15 + 4x20MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 3 | R.14 FDD + R.14-3 FDD<br>(10 + 4x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 4 | R.14 FDD + R.14-3 FDD<br>(2x10 + 3x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 5 | R.14-6 FDD + R.14 FDD + R.14-3 FDD<br>(5 + 10 + 3x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 6 | R.14 FDD + R.14-3 FDD<br>(3x10 + 2x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |
| 7 | R.14 FDD + R.14-3 FDD<br>(4x10 + 20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 55 556 |

**Table G.3A.5-4: Minimum Test time FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for Dual Connectivity**

| Clause 8.2.1.4.3A Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.14-3FDD<br>(2x20 MHz, full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 2 | R.14-7FDD + R.14-3FDD<br>(15+20 MHz,full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 3 | R.14FDD + R.14-3FDD<br>(10+20 MHz,full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 4 | R.14-7FDD<br>(2x15 MHz,full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 55 556 |
| 5 | R.14FDD<br>(2x10 MHz,full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 55 556 |

**Table G.3A.5-4A: Void**

**Table G.3A.5-5: Void**

**Table G.3A.5-6: Minimum Test time TDD PDSCH Single Antenna Port Performance for CA (2DL CA)**

| Clause 8.2.2.1.1_A.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.42TDD<br>(2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 2 | R.42TDD<br>(20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| | R.42-3 TDD (1x2 Low)<br>EVA5 | | |

**Table G.3A.5-6A: Minimum Test time TDD PDSCH Single Antenna Port Performance for CA (3DL CA)**

| Clause 8.2.2.1.1_A.2 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.42TDD<br>(3x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 2 | R.42TDD + R.42-3TDD<br>(20+20+15 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |

**Table G.3A.5-6B: Minimum Test time TDD PDSCH Single Antenna Port Performance for CA (4DL CA)**

| Clause 8.2.2.1.1_A.3 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.42TDD<br>(4x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 2 | R.42TDD + R.42-3TDD<br>(20+20+20+15<br>MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |

**Table G.3A.5-6C: Minimum Test time TDD PDSCH Single Antenna Port Performance for CA (5DL CA)**

| Clause 8.2.2.1.1_A.4 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.42TDD<br>(5x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 2 | R.42TDD + R.42-3TDD<br>(20+20+20+20+15<br>MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |

**Table G.3A.5-7: Minimum Test time TDD PDSCH Open Loop Spatial Multiplexing 2x2 2DL CA**

| Clause 8.2.2.3.1_A.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.30-1 TDD<br>(2x20 MHz, full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 20 000 |
| 2 | R.30-1 TDD<br>(20 MHz, full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 20 000 |
| | [TBD]<br>(2x2 Low)<br>EVA70 | | |

**Table G.3A.5-7A: Minimum Test time TDD PDSCH Open Loop Spatial Multiplexing 2x2 3DL CA**

| Clause 8.2.2.3.1_A.2 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.30-1 TDD<br>(3x20 MHz, full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 20 000 |
| 2 | R.30-1 TDD + R.11-9 TDD<br>(20+20+15 MHz, full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 20 000 |

**Table G.3A.5-7B: Minimum Test time TDD PDSCH Open Loop Spatial Multiplexing 2x2 4DL CA**

| Clause 8.2.2.3.1_A.3 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.30-1 TDD<br>(4x20 MHz, full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 20 000 |
| 2 | R.30-1 TDD + R.11-9 TDD<br>(20+20+20+15 MHz, full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 20 000 |

**Table G.3A.5-7C: Minimum Test time TDD PDSCH Open Loop Spatial Multiplexing 2x2 5DL CA**

| Clause 8.2.2.3.1_A.4 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.30-1 TDD<br>(5x20 MHz, full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 20 000 |
| 2 | R.30-1 TDD + R.11-9 TDD<br>(20+20+20+20+15 MHz, full,16QAM,1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 20 000 |

**Table G.3A.5-8: Minimum Test time TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 2DL CA**

| Clause 8.2.2.4.2_A.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.43TDD<br>(2x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 100 000 |
| 2 | R.43TDD<br>(20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 100 000 |
| | R.43-5 TDD<br>(15 MHz, full, 16QAM,1/2)<br>(4x2 Low)<br>EVA 5 | | |

**Table G.3A.5-8A: Minimum Test time TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 3DL CA**

| Clause 8.2.2.4.2_A.2 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.43 TDD<br>(3x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 100 000 |
| 2 | R.43 TDD + R.43-5 TDD<br>(20+20+15 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 100 000 |

**Table G.3A.5-8B: Minimum Test time TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 4DL CA**

| Clause 8.2.2.4.2_A.3 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.43 TDD<br>(4x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 100 000 |
| 2 | R.43 TDD + R.43-5 TDD<br>(20+20+20+15 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 100 000 |

**Table G.3A.5-8C: Minimum Test time TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 5DL CA**

| Clause 8.2.2.4.2_A.4 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.43 TDD<br>(5x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 100 000 |
| 2 | R.43 TDD + R.43-5 TDD<br>(20+20+20+20+15 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 100 000 |

**Table G.3A.5-9: Minimum Test time TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for Dual Connectivity**

| Clause 8.2.2.4.4 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.43 TDD<br>(2x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 100 000 |

**Table G.3A.5-10Void**

**Table G.3A.5-11: Minimum Test time TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 (intra band non-contiguous DL CA)**

| Clause 8.2.2.4.2_A.3 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.43TDD<br>(2x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 100 000 |

**Table G.3A.5-12: Minimum Test time FDD PDSCH Soft buffer management test (2 DL CA)**

| Clause 8.2.1.3.1A_A.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.30 FDD<br>(2x20 MHz, full 16QAM, 1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| 2 | R.35-2 FDD<br>(15MHz, full 64QAM, 0.39)<br>(2x2 Low)<br>EVA5 | 10 000 | 12 500 |
| | R.35-3 FDD<br>(10MHz, full 64QAM, 0.39)<br>(2x2 Low)<br>EVA5 | | |
| 3 | R.30 FDD<br>(20 MHz, full 16QAM, 1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 11 112 |
| | R.11 FDD<br>(10 MHz, full 16QAM, 1/2)<br>(2x2 Low)<br>EVA70 | | |
| 4 | R.30 FDD<br>(20 MHz, full 16QAM, 1/2)<br>(2x2 Low)<br>EVA70 | 10 000 | 12 500 |
| | R.30-1 FDD<br>(15 MHz, full 16QAM, 1/2)<br>(2x2 Low)<br>EVA70 | | |
| 5 | R.35-1 FDD<br>(2x20 MHz, full 64QAM, 0.39)<br>(2x2 Low)<br>EVA5 | 10 000 | 12 500 |
| 6 | R.35-1 FDD<br>(20 MHz, full 64QAM, 0.39)<br>(2x2 Low)<br>EVA5 | 10 000 | 12 500 |
| | R.35-3 FDD<br>(10MHz, full 64QAM, 0.39)<br>(2x2 Low)<br>EVA5 | | |
| 7 | R.35-1 FDD<br>(20 MHz, full 64QAM, 0.39)<br>(2x2 Low)<br>EVA5 | 10 000 | 12 500 |
| | R.35-2 FDD<br>(15MHz, full 64QAM, 0.39)<br>(2x2 Low)<br>EVA5 | | |

**Table G.3A.5-14: Minimum Test time TDD PDSCH Soft buffer management test (2 DL CA)**

| Clause 8.2.2.3.1A_A.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.30-2 TDD<br>(2x20 MHz,full,16QAM,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 50 000 |
| 2 | R.35-1 TDD<br>(2x20 MHz,full,64QAM,1/3)<br>(2x2 Low)<br>EVA5 | 10 000 | 50 000 |

**Table G.3A.5-15: Minimum Test time TDD power imbalance test (2 DL CA)**

| Clause 8.2.2.7_A.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.49 TDD for PCC<br>(20 MHz,full, 64QAM, 0.81-087)<br>(1x2)<br>OCNG for SCC | 10 000 in PCC | 20 000 |
| 2 | OCNG for PCC<br>R.49-1 TDD for SCC<br>(15 MHz,full, 64QAM, 0.80-0.86)<br>(1x2) | 10 000 in SCC | 20 000 |

**Table G.3A.5-16: Minimum Test time TDD FDD CA PDSCH Single Antenna Port Performance for FDD Pcell (2DL CA)**

| Clause 8.2.3.1.1.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.42 FDD+R.42 TDD<br>(20+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 2 | R.2 FDD+R.42 TDD<br>(20+10 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 3 | R.42-3 FDD+R.42 TDD<br>(20+15 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |

**Table G.3A.5-17: Minimum Test time TDD FDD CA PDSCH Single Antenna Port Performance for FDD PCell (3DL CA)**

| Clause 8.2.3.1.1.2 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.42 FDD+R.42 TDD<br>(20+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 2 | R.42-3 FDD+R.42 TDD<br>(15+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 3 | R.2 FDD+R.42 TDD<br>(10+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 4 | R.42 FDD+R.42 TDD<br>(2x20+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 5 | R.42-3 FDD+R.42 FDD+R.42 TDD<br>(15+20+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 6 | R.2 FDD+R.42 FDD +R.42 TDD<br>(10+20+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |

**Table G.3A.5-17a: Minimum Test time TDD FDD CA PDSCH Single Antenna Port Performance for FDD PCell (4DL CA)**

| Clause 8.2.3.1.1.3 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.42 FDD+R.42 TDD<br>(20+3x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 2 | R.42 FDD+R.42 TDD<br>(2x20+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 3 | R.42 FDD+R.42-3 FDD+ R.42 TDD<br>(20+15+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 4 | R.42-3 FDD+R.42 TDD<br>(2x15+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 5 | R.42 FDD +R.42-3 FDD+R.42 FDD+R.42 TDD<br>(2x20+15+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 6 | R.42 FDD+ R.42-3 FDD +R.42 TDD<br>(2x15+20+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 7 | R.42 FDD+ R.2 FDD +R.42 TDD<br>(2x20+10+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |

**Table G.3A.5-17b: Minimum Test time TDD FDD CA PDSCH Single Antenna Port Performance for FDD PCell (5DL CA)**

| Clause 8.2.3.1.1.4 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.42-3 FDD+R.42 FDD+R.42 TDD<br>(15+2x20+2x20MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 2 | R.42-3 FDD+R.42 FDD+R.42 TDD<br>(2x15+20+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |

**Table G.3A.5-18: Minimum Test time TDD FDD CA PDSCH Single Antenna Port Performance for TDD Pcell (2DL CA)**

| Clause 8.2.3.1.2.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.42 FDD+R.42 TDD<br>(20+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 2 | R.2 FDD+R.42 TDD<br>(20+10 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 3 | R.42-3 FDD+R.42 TDD<br>(20+15 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |

**Table G.3A.5-19: Minimum Test time TDD FDD CA PDSCH Single Antenna Port Performance for TDD PCell(3DL CA)**

| Clause 8.2.3.1.2.2 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.42 FDD+R.42 TDD<br>(20+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 2 | R.42-3 FDD+R.42 TDD<br>(15+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 3 | R.2 FDD+R.42 TDD<br>(10+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 4 | R.42 FDD+R.42 TDD<br>(2x20+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 5 | R.42-3 FDD+R.42 FDD+R.42 TDD<br>(15+20+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 6 | R.2 FDD+R.42 FDD +R.42 TDD<br>(10+20+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |

**Table G.3A.5-19a: Minimum Test time TDD FDD CA PDSCH Single Antenna Port Performance for TDD PCell(4DL CA)**

| Clause 8.2.3.1.2.3 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.42 FDD+R.42 TDD<br>(20+3x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 2 | R.42 FDD+R.42 TDD<br>(2x20+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 3 | R.42 FDD+ R.42-3 FDD+ R.42 TDD<br>(20+15+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 4 | R.42-3 FDD+R.42 TDD<br>(2x15+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 5 | R.42 FDD + R.42-3 FDD+R.42 TDD<br>(2x20+15+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 6 | R.42-3 FDD+R.42 FDD +R.42 TDD<br>(2x15+20+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 7 | R.42 FDD+R.2 FDD +R.42 TDD<br>(2x20+10+20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |

**Table G.3A.5-19b: Minimum Test time TDD FDD CA PDSCH Single Antenna Port Performance for TDD PCell(5DL CA)**

| Clause 8.2.3.1.2.4 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.42-3 FDD+ R.42 FDD+R.42 TDD<br>(15+2x20+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |
| 2 | R.42-3 FDD+ R.42 FDD + R.42 TDD<br>(2x15+20+2x20 MHz,full,QPSK,1/3)<br>(1x2 Low)<br>EVA5 | 50 000 | 100 000 |

**Table G.3A.5-20: Minimum Test time TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for FDD PCell (2DL CA)**

| Clause 8.2.3.2.1.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.30 FDD + R.30-1 TDD<br>(20+20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 2 | R.11 FDD + R.30-1 TDD<br>(20+10 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 3 | R.11-7 FDD + R.30-1 TDD<br>(20+15 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |

**Table G.3A.5-21: Minimum Test time TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for FDD PCell (3DL CA)**

| Clause 8.2.3.2.1.2 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.30 FDD + R.30-1 TDD<br>(20+2x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 2 | R.11-7 FDD + R.30-1 TDD<br>(15+2x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 3 | R.11 FDD + R.30-1 TDD<br>(10+2x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |

**Table G.3A.5-21a: Minimum Test time TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for FDD PCell (4DL CA)**

| Clause 8.2.3.2.1.3 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.30 FDD + R.30-1 TDD<br>(20+3x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 2 | R.30FDD + R.30-1 TDD<br>(2x20+2x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 3 | R.30FDD +R.11-7 FDD + R.30-1 TDD<br>(20+15+2x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 4 | R.11-7 FDD + R.30FDD + R.30-1 TDD<br>(2x15+2x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 5 | R.30FDD +R.11-7 FDD + R.30-1 TDD<br>(2x20+15+20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 6 | R.11-7 FDD + R.30FDD +R.30-1 TDD<br>(2x15+20+20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 7 | R.30FDD +R.11 FDD + R.30-1 TDD<br>(2x20+10+20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |

**Table G.3A.5-21b: Minimum Test time TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for FDD PCell (5DL CA)**

| Clause 8.2.3.2.1.4 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.11-7 FDD+R.30 FDD + R.30-1 TDD<br>(15+2x20+2x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 2 | R.11-7 FDD+R.30FDD + R.30-1 TDD<br>(2x15+20+2x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |

**Table G.3A.5-22: Minimum Test time TDD FDD CA Soft buffer management test for FDD PCell (2DL CA)**

| Clause 8.2.3.2.1A Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.35-1 FDD+ R.35-1 TDD<br>(20+20 MHz,full,64QAM,0.39)<br>(2x2 Low)<br>EVA70 | 10 000 | 50 000 |
| 2 | R.35-1 FDD+ R.35-1 TDD<br>(20+20 MHz,full,64QAM,0.39)<br>(2x2 Low)<br>EVA70 | 10 000 | 50 000 |
| 3 | R.35-3 FDD+ R.35-1 TDD<br>(10+20 MHz,full,64QAM,0.39)<br>(2x2 Low)<br>EVA70 | 10 000 | 50 000 |
| 4 | R.35-3 FDD+ R.35-1 TDD<br>(10+20 MHz,full,64QAM,0.39)<br>(2x2 Low)<br>EVA70 | 10 000 | 50 000 |
| 5 | R.35-2 FDD+ R.35-1 TDD<br>(15+20 MHz,full,64QAM,0.39)<br>(2x2 Low)<br>EVA70 | 10 000 | 50 000 |
| 6 | R.35-2 FDD+ R.35-1 TDD<br>(15+20 MHz,full,64QAM,0.39)<br>(2x2 Low)<br>EVA70 | 10 000 | 50 000 |

**Table G.3A.5-23: Minimum Test time TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for TDD PCell (2DL CA)**

| Clause 8.2.3.2.2.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.30 FDD + R.30-1 TDD<br>(20+20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 2 | R.11 FDD + R.30-1 TDD<br>(20+10 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 3 | R.11-7 FDD + R.30-1 TDD<br>(20+15 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |

**Table G.3A.5-24: Minimum Test time TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for TDD PCell (3DL CA)**

| Clause 8.2.3.2.2.2 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.30 FDD + R.30-1 TDD<br>(20+2x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 2 | R.11-7 FDD + R.30-1 TDD<br>(15+2x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 3 | R.11 FDD + R.30-1 TDD<br>(10+2x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |

**Table G.3A.5-24a: Minimum Test time TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for TDD PCell (4DL CA)**

| Clause 8.2.3.2.2.3 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.30 FDD + R.30-1 TDD<br>(20+3x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 2 | R.30 FDD + R.30-1 TDD<br>(2x20+2x20MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 3 | R.30FDD +R.11-7 FDD + R.30-1 TDD<br>(20+15+2x20MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 4 | R.11-7 FDD+ R.30FDD + R.30-1 TDD<br>(2x15+2x20MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 5 | R.30FDD +R.11-7 FDD + R.30-1 TDD<br>(2x20+15+20MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 6 | R.11-7 FDD+ R.30FDD+ R.30-1 TDD<br>(2x15+20+20MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 7 | R.30FDD +R.11 FDD + R.30-1 TDD<br>(2x20+10+20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |

**Table G.3A.5-24b: Minimum Test time TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for TDD PCell (5DL CA)**

| Clause 8.2.3.2.2.4 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.11-7 FDD+R.30 FDD + R.30-1 TDD<br>(15+2x20+2x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |
| 2 | R.11-7 FDD+R.30FDD + R.30-1 TDD<br>(2x15+20+2x20 MHz,full,QPSK,1/3)<br>(2x2 Low)<br>EVA70 | 10 000 | 25 000 |

**Table G.3A.5-25: Minimum Test time TDD FDD CA PDSCH Soft buffer management test for TDD PCell (2DL CA)**

| Clause 8.2.3.2.2A Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in the measured CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.35-1 FDD+ R.35-1 TDD<br>(20+20 MHz,full,64QAM,0.39)<br>(2x2 Low)<br>EVA70 | 10 000 | 50 000 |
| 2 | R.35-1 FDD+ R.35-1 TDD<br>(20+20 MHz,full,64QAM,0.39)<br>(2x2 Low)<br>EVA70 | 10 000 | 50 000 |
| 3 | R.35-3 FDD+ R.35-1 TDD<br>(10+20 MHz,full,64QAM,0.39)<br>(2x2 Low)<br>EVA70 | 10 000 | 50 000 |
| 4 | R.35-3 FDD+ R.35-1 TDD<br>(10+20 MHz,full,64QAM,0.39)<br>(2x2 Low)<br>EVA70 | 10 000 | 50 000 |
| 5 | R.35-2 FDD+ R.35-1 TDD<br>(15+20 MHz,full,64QAM,0.39)<br>(2x2 Low)<br>EVA70 | 10 000 | 50 000 |
| 6 | R.35-2 FDD + R.35-1 TDD<br>(15+20 MHz,full,64QAM,0.39)<br>(2x2 Low)<br>EVA70 | 10 000 | 50 000 |

**Table G.3A.5-26: Minimum Test time TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for FDD PCell (2DL CA)**

| Clause 8.2.3.3.1.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.14-3 FDD + R.43TDD<br>(2x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 125 000 |
| 2 | R.14 FDD + R.43TDD<br>(20+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 125 000 |
| 3 | R.14-7 FDD + R.43 TDD<br>(20+15 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 125 000 |

**Table G.3A.5-27: Minimum Test time TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for FDD PCell (3DL CA)**

| Clause 8.2.3.3.1.2 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.14-3 FDD + R.43TDD<br>(3x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 125 000 |
| 2 | R.14-7 FDD +R.43 TDD<br>(20+20+15 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 125 000 |
| 3 | R.14 FDD +R.43 TDD<br>(20+20+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 125 000 |

**Table G.3A.5-27a: Minimum Test time TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for FDD PCell (4DL CA)**

| Clause 8.2.3.3.1.3 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| 1 | R.14-3 FDD+R.43 TDD<br>(20+3x20 MHz, full,16QAM, 1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |
| 2 | R.14-3 FDD+R.43 TDD<br>(2x20+2x20 MHz, full,16QAM, 1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |
| 3 | R.14-3FDD+ R.14-7FDD+R.43TDD<br>(20+15+2x20 MHz, full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |
| 4 | R.14-7 FDD+R.43 TDD<br>(2x15+2x20 MHz, full,16QAM, 1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |
| 5 | R.14-3FDD +R.14-7FDD+R.43TDD<br>(2x20+15+20 MHz, full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |
| 6 | R.14-7FDD+ R.14-3FDD+R.43TDD<br>(2x15+20+20 MHz, full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |
| 7 | R.14-3 FDD+ R.14 FDD +R.43TDD<br>(2x20+10+20 MHz, full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |

**Table G.3A.5-27b: Minimum Test time TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for FDD PCell (5DL CA)**

| Clause 8.2.3.3.1.4 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| 1 | R.14-7 FDD+R.14-3FDD+R.43TDD<br>(15+2x20+2x20MHz,<br>full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |
| 2 | R.14-7 FDD+R.14-3FDD+R.43TDD<br>(2x15+20+2x20 MHz,<br>full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |

**Table G.3A.5-28: Minimum Test time TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (2DL CA)**

| Clause 8.2.3.3.2.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs,<br>modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler<br>[additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.14-3 FDD + R.43TDD<br>(2x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 125 000 |
| 2 | R.14 FDD + R.43TDD<br>(20+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 125 000 |
| 3 | R.14-7 FDD + R.43TDD<br>(15+20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 125 000 |

**Table G.3A.5-29: Minimum Test time TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (3DL CA)**

| Clause 8.2.3.3.2.2 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs,<br>modulation, coding)<br>Antenna (configuration, | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |

| | **correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only)** | | |
|---|---|---|---|
| 1 | R.14-3 FDD + R.43TDD<br>(3x20 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 125 000 |
| 2 | R.14 FDD + R.43TDD<br>(20+20+15 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 125 000 |
| 3 | R.14-7 FDD + R.43TDD<br>(20+20+10 MHz,full,16QAM, 1/2)<br>(4x2 Low)<br>EVA 5 | 50 000 | 125 000 |

**Table G.3A.5-29a: Minimum Test time TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (4DL CA)**

| **Clause 8.2.3.3.2.3 Test No** | **Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br>(info only)** | **Minimum Number of Active Subframes in each CC** | **Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes)** |
|---|---|---|---|
| | | | **FDD/TDD** |
| 1 | R.14-3 FDD+R.43 TDD<br>(20+3x20 MHz, full,16QAM, 1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |
| 2 | R.14-3 FDD+R.43 TDD<br>(2x20+2x20 MHz, full,16QAM, 1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |
| 3 | R.14-3FDD+ R.14-7FDD+R.43TDD<br>(20+15+2x20 MHz, full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |
| 4 | R.14-7 FDD+R.43 TDD<br>(2x15+2x20 MHz, full,16QAM, 1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |
| 5 | R.14-3FDD +R.14-7FDD+R.43TDD<br>(2x20+15+20 MHz, full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |
| 6 | R.14-7FDD+ R.14-3FDD+R.43TDD<br>(2x15+20+20 MHz, full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |
| 7 | R.14-3 FDD+ R.14 FDD +R.43TDD<br>(2x20+10+20 MHz, full,16QAM,1/2)<br>(4x2 Low)<br>EVA5 | 50 000 | 125 000 |

**Table G.3A.5-29b: Minimum Test time TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (5DL CA)**

| Clause 8.2.3.3.2.4 Test No | Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes) |
|---|---|---|---|
| 1 | R.14-7 FDD+R.14-3FDD+R.43TDD (15+2x20+2x20MHz, full,16QAM,1/2) (4x2 Low) EVA5 | 50 000 | 125 000 |
| 2 | R.14-7 FDD+R.14-3FDD+R.43TDD (2x15+20+2x20 MHz, full,16QAM,1/2) (4x2 Low) EVA5 | 50 000 | 125 000 |

**Table G.3A.5-30: LAA Dual-Layer Spatial Multiplexing with DM-RS with FDD as Pcell**

| Clause 8.3.3.1.1 Test No | Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD |
| 1 | R.30 FDD (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA70 + R.2-FS3 (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA5 | 50,000 | 121,000 |
| 2 | R.30 FDD (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA70 + R.2-FS3 (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA5 | 50,000 | 121,000 |
| 3 | R.30 FDD (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA70 + R.2-FS3 (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA5 | 50,000 | 121,000 |
| 4 | R.30 FDD (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA70 + R.2-FS3 (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA5 | 50,000 | 121,000 |
| NOTE 1: MNAS is not simulated, but estimated based on similar scenario in Table G.3A.5-16 Test1.<br>NOTE 2: MNS for SCC is not deterministic due to the statistical burst transmission model in clause B.3.8. The average MNS is presented in this table. This is calculated based on an average burst length of 5.25 ms which in average takes 6.25 ms assuming UE not capable of partial subframes, and a simulated probability of LBT success (p) equal to 0.5 (ratio 6.25/5.25/0.5). | | | |

**Table G.3A.5-30A: LAA Dual-Layer Spatial Multiplexing with DM-RS with TDD as Pcell**

| Clause 8.3.3.1.2 Test No | Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD |
| 1 | R.30-1 TDD (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA70 + R.2 FS3 (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA5 | 50,000 | 121,000 |
| 2 | R.30-1 TDD (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA70 + R.2 FS3 (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA5 | 50,000 | 121,000 |
| 3 | R.30-1 TDD (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA70 + R.2 FS3 (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA5 | 50,000 | 121,000 |
| 4 | R.30-1 TDD (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA70 + R.2 FS3 (1x20 MHz, full 16QAM, 1/2), (2x2 Low) EVA5 | 50,000 | 121,000 |
| NOTE 1: MNAS is not simulated, but estimated based on similar scenario in Table G.3A.5-16 Test1.<br>NOTE 2: MNS for SCC is not deterministic due to the statistical burst transmission model in clause B.3.8. The average MNS is presented in this table. This is calculated based on an average burst length of 5.25 ms which in average takes 6.25 ms assuming UE not capable of partial subframes, and a simulated probability of LBT success (p) equal to 0.5 (ratio 6.25/5.25/0.5). | | | |

**Table G.3A.5-31: Minimum Test time LAA PDSCH CA Closed Loop Spatial Multiplexing Performance with 4Tx Antenna ports and with FDD as PCell (FDD Single Carrier)**

| Clause 8.2.4.1.1 Test No | Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/FS3 |
| 1 | R.14-3 FDD + R.1 FS3 (20 MHz, full,16QAM, 1/2) + (20 MHz, full, 64QAM, 0.6) (4x2 Low) + (4x2 Low) EVA 5 + EVA5 | 50 000 | 300,000 |
| NOTE 1: MNAS is not simulated, but estimated based on similar scenario in Table G.3A.5-xx Test1.<br>NOTE 2: MNS for SCC is not deterministic due to the statistical burst transmission model in clause B.3.8. The average MNS is presented in this table. This is calculated based on an average burst length of 5.25 ms which in average takes 6.25 ms assuming UE not capable of partial subframes, and a simulated probability of LBT success (p) equal to 0.5 (ratio 6.25/5.25/0.5). | | | |

**Table G.3A.5-32: Minimum Test time LAA PDSCH CA Closed Loop Spatial Multiplexing Performance with 4Tx Antenna ports and with TDD as PCell (TDD Single Carrier)**

| Clause 8.2.4.1.2 Test No | Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes) |
|---|---|---|---|
| | | | TDD/FS3 |
| 1 | R.43 TDD + R.1 FS3 (20 MHz, full,16QAM, 1/2) + (20 MHz, full, 64QAM, 0.6) (4x2 Low) + (4x2 Low) EVA 5 + EVA5 | 50 000 | 300 000 |
| NOTE 1: MNAS is not simulated, but estimated based on similar scenario in Table G.3A.5-yy Test1.<br>NOTE 2: MNS for SCC is not deterministic due to the statistical burst transmission model in clause B.3.8. The average MNS is presented in this table. This is calculated based on an average burst length of 5.25 ms which in average takes 6.25 ms assuming UE not capable of partial subframes, and a simulated probability of LBT success (p) equal to 0.5 (ratio 6.25/5.25/0.5). | | | |

**Table G.3.5A-33: Minimum Test time for PDSCH Dual-layer Spatial Multiplexing for 4Rx (2DL CA - 5DL CA)**

| Clause 8.13.1.2.2-8.13.1.2.5/8.13.2.2.2-8.13.2.2.5 Test No | Demodulation scenario (info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| All | R.51 (5-20MHz, full, 16QAM,) (2x4 Low) ETU5 | 50000 Note: MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 56 000 | 100 000 |

**Table G.3.5A-34: Minimum Test time for PDSCH Closed Loop Multi Layer Spatial Multiplexing for 4Rx (2DL CA - 5DL CA)**

| Clause 8.13.1.1.1.2-8.13.1.1.1.5/8.13.2.1.1.2-8.13.2.1.1.5 Test No | Demodulation scenario (info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| All | R.43 (1.4-20MHz, full, 16QAM,) (4x4 Low) EVA5 | 50000 Note: MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 56 000 | 100 000 |

**Table G.3A.5-35: Minimum Test time TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 (2DL CA - 5DL CA)**

| Clause 8.13.3.1.1.2-8.13.3.1.1.5/ 8.13.3.1.2.2-8.13.3.1.2.5 Test No | Demodulation scenario (info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| All | R.14 FDD + R.43 TDD (1.4-20MHz, full, 16QAM,) (4x4 Low) EVA5 | 50 000 | 125 000 |

**Table G.3A.5-36: Minimum Test time TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 with 256QAM for FDD PCell (2DL CA)**

| Clause 8.13.3.6.1 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.72-3 FDD + R.72-3 TDD<br>(2x20 MHz,full,256QAM, 0.62)<br>(4x4 Low)<br>EPA 5 | 50 000<br>Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 126 000 |
| 2 | R.72 FDD + R.72-3 TDD<br>(10 + 20MHz,full,256QAM, 0.62)<br>(4x4 Low)<br>EPA 5 | 50 000<br>Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 126 000 |
| 3 | R.72-2 FDD + R.72-3 TDD<br>(15 MHz,full,256QAM, 0.61) + (20 MHz,full,256QAM, 0.62)<br>(4x4 Low)<br>EPA 5 | 50 000<br>Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 126 000 |

**Table G.3A.5-37: Minimum Test time TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 with 256QAM for TDD PCell (2DL CA)**

| Clause 8.13.3.6.2 Test No | Demodulation scenario plain text:<br><br>RMC (Bandwidth, allocated RBs, modulation, coding)<br>Antenna (configuration, correlation)<br>Propagation condition, Doppler [additional parameters, if applicable]<br><br>(info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| 1 | R.72-3 FDD + R.72-3 TDD<br>(2x20 MHz,full,256QAM, 0.62)<br>(4x4 Low)<br>EPA 5 | 50 000<br>Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 126 000 |
| 2 | R.72 FDD + R.72-3 TDD<br>(10 + 20MHz,full,256QAM, 0.62)<br>(4x4 Low)<br>EPA 5 | 50 000<br>Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 126 000 |
| 3 | R.72-2 FDD + R.72-3 TDD<br>(15 MHz,full,256QAM, 0.61) + (20 MHz,full,256QAM, 0.62)<br>(4x4 Low)<br>EPA 5 | 50 000<br>Note:<br>MNAS is not simulated. It is estimated based on other similar test cases using EPA5 propagation conditions | 126 000 |

**Table G.3A.5-38: Minimum Test time for PDSCH Closed Loop Multi Layer Spatial Multiplexing with 256QAM (2DL CA)**

| Clause 8.13.1.1.3/ 8.13.2.1.3 Test No | Demodulation scenario (info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC<br><br>(MNS = active and inactive subframes) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| All | R.72<br>(1.4-20MHz, full, 256QAM,)<br>(4x4 Low)<br>EPA5 | 50000 | 56 000 | 100 000 |

**Table G.3A.5-39: Minimum Test time for PDSCH Closed Loop Four-Layer Spatial Multiplexing (2DL CA)**

| Clause 8.13.1.1.4/ 8.13.2.1.4 Test No | Demodulation scenario (info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| All | R.74 (1.4-20MHz, full, 16QAM,) (4x4 Low) EPA5 | 50000 | 56 000 | 100 000 |

**Table G.3.5A-40: Minimum Test time for TDD-FDD CA PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model-Enhanced Performance Requirement Type A (2DL CA)**

| Clause 8.13.3.3.1/ 8.13.3.3.2 Test No | Demodulation scenario (info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| All | R.47 FDD + R.47 TDD (5-20MHz, full, 16QAM) (2x4 Low) EVA5 | 50 000 | 125 000 |

**Table G.3.5A-41: Minimum Test time for TDD-FDD CA PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 Interference Model-Enhanced Performance Requirement Type A (2DL CA)**

| Clause 8.13.3.4.1/ 8.13.3.4.2 Test No | Demodulation scenario (info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| All | R.76 FDD + R.76 TDD (5-20MHz, full, QPSK) (2x4 Low) EVA5 | 50 000 | 125 000 |

**Table G.3.5A-42: Minimum Test time for 4-Rx PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model – Enhanced Performance Type A(2DL CA)**

| Clause 8.13.1.3.1 8.13.2.3.1 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.47 (2x10 MHz, full, 16QAM, 1/3) (2x2+ 2x4 Low) EVA5 | Note: MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 56 000 | 100 000 |
| 2 | R.47-3 (2x20 MHz, full, 16QAM, 1/3) (2x2+ 2x4 Low) EVA5 | Note: MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 56 000 | 100 000 |
| 3 | R.47-1 (2x5 MHz, full, 16QAM, 1/3) (2x2+ 2x4 Low) EVA5 | Note: MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 56 000 | 100 000 |
| 4 | R.47-2 + R.47-1 (15+5 MHz, full, 16QAM, 1/3) (2x2+ 2x4 Low) EVA5 | Note: MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 56 000 | 100 000 |
| 5 | R.47 + R.47-1 (10+5 MHz, full, 16QAM, 1/3) (2x2+ 2x4 Low) EVA5 | Note: MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 56 000 | 100 000 |

**Table G.3.5A-43: Minimum Test time for 4-Rx PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model – Enhanced Performance Type A(2DL CA)**

| Clause 8.13.1.4.1 8.13.2.4.1 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|
| | | | FDD | TDD |
| 1 | R.76 + R76-5 (2x10 MHz, full, QPSK, 1/2) (2x2+ 2x4 Low) EVA5 | Note: MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 56 000 | 100 000 |
| 2 | R.76-3+ R.76-7 (2x20 MHz, full, QPSK, 1/2) (2x2+ 2x4 Low) EVA5 | Note: MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 56 000 | 100 000 |
| 3 | R.76-1+ R.76-4 (2x5 MHz, full, QPSK, 1/2) (2x2+ 2x4 Low) EVA5 | Note: MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 56 000 | 100 000 |
| 4 | R.76-2+R.76-6+ R.76-1+R.76-4 (15+5 MHz, full, QPSK, 1/2) (2x2+ 2x4 Low) EVA5 | Note: MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 56 000 | 100 000 |
| 5 | R.76+R.76-5+ R.76-1+R.76-4 (10+5 MHz, full, QPSK, 1/2) (2x2+ 2x4 Low) EVA5 | Note: MNAS is not simulated. It is estimated based on other similar test cases using EVA5 propagation conditions | 56 000 | 100 000 |

**Table G.3A.5-44: Minimum Test time TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 (2DL CA)**

| Clause 8.13.7.1/ 8.13.7.2 Test No | Demodulation scenario (info only) | Minimum Number of Active Subframes in each CC | Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes) |
|---|---|---|---|
| | | | FDD/TDD |
| All | R.74 (1.4-20MHz, full, 16QAM,) (4x4 Low) EPA5 | 50 000 | 125 000 |

# G.3A.6 Test conditions

**Table G.3A.6-1: Test conditions for CA/DC performance tests**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | Over all Pass/Fail condition |
|---|---|---|---|
| 8.2.1.1.1_A.1 FDD PDSCH Single Antenna Port Performance for CA (2DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.1.1.1_A.2 FDD PDSCH Single Antenna Port Performance for CA (3DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.1.1.1_A.4 FDD PDSCH Single Antenna Port Performance for CA (4DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.1.1.1_A.5 FDD PDSCH Single Antenna Port Performance for CA (5DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.1.3.1_A.1 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (2DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.1.3.1_A.2 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (3DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.1.3.1_A.3 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (4DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.1.3.1_A.4 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (5DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.1.3.1A_A.1 FDD PDSCH Soft buffer management test for CA (2 DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.1.4.2_A.1 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4 x 2 for CA (2DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.1.4.2_A.2 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4 x 2 for CA (3DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.1.4.2_A.3 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4 x 2 for CA (4DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.1.4.2_A.4 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4 x 2 for CA (5DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |

| | | | |
|---|---|---|---|
| 8.2.1.4.3A FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for Dual Connectivity | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.1.1_A.1 TDD PDSCH Single Antenna Port Performance for CA (2DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.1.1_A.2 TDD PDSCH Single Antenna Port Performance for CA (3DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.1.1_A.3 TDD PDSCH Single Antenna Port Performance for CA (4DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.1.1_A.4 TDD PDSCH Single Antenna Port Performance for CA (5DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.3.1_A.1 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (2DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.3.1_A.2 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (3DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.3.1_A.3 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (4DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.3.1_A.4 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (5DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.3.1A_A.1 TDD PDSCH Soft buffer management test (2 DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.4.2_A.1 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (2DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.4.2_A.2 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (3DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.4.2_A.3 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (4DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.4.2_A.4 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (5DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.2.4.4 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for Dual Connectivity | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.2.3.2.2.1 TDD FDD CA PDSCH | subframes are independent | 1 | To pass the test case all applicable components in the test vector must |

| | | | |
|---|---|---|---|
| Open Loop Spatial Multiplexing 2x2 for TDD PCell (2DL CA) | | | pass |
| 8.2.3.2.2.2<br>TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for TDD PCell (3DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.3.3.1.1<br>LAA Dual-Layer Spatial Multiplexing with DM-RS with FDD as Pcell | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.3.3.1.2<br>LAA Dual-Layer Spatial Multiplexing with DM-RS with TDD as Pcell | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.7.1.1_A.1<br>FDD Sustained data rate performance for CA (2DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.7.1.1_A.2<br>FDD Sustained data rate performance for CA (3DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.7.1.1_A.4<br>FDD Sustained data rate performance for CA (4DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.7.2.1_A.1<br>TDD Sustained data rate performance for CA (2DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.7.2.1_A.2<br>TDD Sustained data rate performance for CA (3DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.7.2.1_A.4<br>TDD Sustained data rate performance for CA (4DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 8.7.2.1_A.5<br>TDD Sustained data rate performance for CA (5DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |
| 9.6.1.1_A.3<br>FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (4DL CA) | subframes are independent | 1 | To pass the test case all applicable components in the test vector must pass |

# G.4 Statistical testing of Performance Requirements with probability of misdetection

## G.4.1 General

The test of receiver performance characteristics is two fold.

1. A signal or a combination of signals is offered to the RX port(s) of the receiver.
2. The ability of the receiver to demodulate /decode this signal is verified by analyzing the reaction of the UE to this signal.

In (2) is the statistical aspect of the test and is treated here.

The minimum requirement for those receiver performance tests are 1% or 0.1% misdetection probability

All receiver performance tests are performed in fading conditions. In addition to the statistical considerations, this requires the definition of a minimum test time.

NOTE: All demodulation performance tests (state from version 9.5.0) require a minimum test time, which exceeds the maximum test time in tables G.4.4. Under this circumstances only the test limit at the end of tables G.4.4.-1 resp. G.4.4.-2 is applicable.

## G.4.2 Mapping the UE reaction to error ratio

The UE can not indicate the detection or misdetection of the physical channel under test directly. Indirect methods are described in the procedure of the applicable test.

## G.4.3 Design of the test

G.2.3 applies, exception:

Limit ER = 0.01 and ER = 0.001

# G.4.4 Numerical definition of the pass fail limits

**Table G.4.4-1: pass fail limits for ER = 0.01**

| ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 344 | NA | 40 | 3929 | 2553 | 80 | 7033 | 5874 | 120 | 10036 | 9354 |
| 1 | 485 | NA | 41 | 4009 | 2632 | 81 | 7109 | 5960 | 121 | 10110 | 9442 |
| 2 | 607 | 10 | 42 | 4089 | 2712 | 82 | 7185 | 6046 | 122 | 10184 | 9530 |
| 3 | 719 | 33 | 43 | 4168 | 2792 | 83 | 7261 | 6131 | 123 | 10259 | 9619 |
| 4 | 826 | 66 | 44 | 4247 | 2873 | 84 | 7336 | 6217 | 124 | 10333 | 9707 |
| 5 | 929 | 107 | 45 | 4327 | 2953 | 85 | 7412 | 6303 | 125 | 10407 | 9796 |
| 6 | 1029 | 152 | 46 | 4406 | 3034 | 86 | 7488 | 6389 | 126 | 10481 | 9884 |
| 7 | 1127 | 202 | 47 | 4484 | 3115 | 87 | 7564 | 6475 | 127 | 10555 | 9972 |
| 8 | 1223 | 255 | 48 | 4563 | 3196 | 88 | 7639 | 6561 | 128 | 10629 | 10061 |
| 9 | 1317 | 311 | 49 | 4642 | 3278 | 89 | 7715 | 6648 | 129 | 10703 | 10150 |
| 10 | 1409 | 370 | 50 | 4720 | 3359 | 90 | 7790 | 6734 | 130 | 10777 | 10238 |
| 11 | 1501 | 430 | 51 | 4799 | 3441 | 91 | 7866 | 6820 | 131 | 10851 | 10327 |
| 12 | 1592 | 492 | 52 | 4877 | 3523 | 92 | 7941 | 6907 | 132 | 10925 | 10416 |
| 13 | 1681 | 555 | 53 | 4955 | 3605 | 93 | 8017 | 6993 | 133 | 10999 | 10504 |
| 14 | 1770 | 620 | 54 | 5033 | 3688 | 94 | 8092 | 7080 | 134 | 11073 | 10593 |
| 15 | 1858 | 686 | 55 | 5111 | 3770 | 95 | 8167 | 7167 | 135 | 11147 | 10682 |
| 16 | 1946 | 754 | 56 | 5189 | 3853 | 96 | 8242 | 7253 | 136 | 11221 | 10771 |
| 17 | 2032 | 822 | 57 | 5267 | 3935 | 97 | 8317 | 7340 | 137 | 11295 | 10860 |
| 18 | 2119 | 891 | 58 | 5344 | 4018 | 98 | 8393 | 7427 | 138 | 11369 | 10949 |
| 19 | 2204 | 961 | 59 | 5422 | 4101 | 99 | 8468 | 7514 | 139 | 11442 | 11038 |
| 20 | 2290 | 1032 | 60 | 5499 | 4185 | 100 | 8543 | 7601 | 140 | 11516 | 11127 |
| 21 | 2374 | 1103 | 61 | 5577 | 4268 | 101 | 8618 | 7688 | 141 | 11590 | 11216 |
| 22 | 2459 | 1175 | 62 | 5654 | 4352 | 102 | 8693 | 7775 | 142 | 11664 | 11305 |
| 23 | 2543 | 1248 | 63 | 5731 | 4435 | 103 | 8768 | 7863 | 143 | 11737 | 11394 |
| 24 | 2627 | 1321 | 64 | 5809 | 4519 | 104 | 8843 | 7950 | 144 | 11811 | 11483 |
| 25 | 2710 | 1395 | 65 | 5886 | 4603 | 105 | 8917 | 8037 | 145 | 11885 | 11573 |
| 26 | 2793 | 1470 | 66 | 5963 | 4687 | 106 | 8992 | 8125 | 146 | 11958 | 11662 |
| 27 | 2876 | 1544 | 67 | 6039 | 4771 | 107 | 9067 | 8212 | 147 | 12032 | 11751 |
| 28 | 2958 | 1620 | 68 | 6116 | 4855 | 108 | 9142 | 8300 | 148 | 12105 | 11840 |
| 29 | 3040 | 1696 | 69 | 6193 | 4940 | 109 | 9216 | 8387 | 149 | 12179 | 11930 |
| 30 | 3122 | 1772 | 70 | 6270 | 5024 | 110 | 9291 | 8475 | 150 | 12252 | 12019 |
| 31 | 3204 | 1848 | 71 | 6346 | 5109 | 111 | 9366 | 8562 | 151 | 12326 | 12109 |
| 32 | 3285 | 1925 | 72 | 6423 | 5193 | 112 | 9440 | 8650 | 152 | 12399 | 12198 |
| 33 | 3366 | 2003 | 73 | 6499 | 5278 | 113 | 9515 | 8738 | 153 | 12473 | 12288 |
| 34 | 3447 | 2080 | 74 | 6576 | 5363 | 114 | 9589 | 8826 | 154 | 12546 | 12377 |
| 35 | 3528 | 2158 | 75 | 6652 | 5448 | 115 | 9664 | 8914 | 155 | 12620 | 12467 |
| 36 | 3609 | 2237 | 76 | 6728 | 5533 | 116 | 9738 | 9002 | 156 | 12693 | 12556 |
| 37 | 3689 | 2315 | 77 | 6805 | 5618 | 117 | 9813 | 9090 | 157 | 12767 | 12646 |
| 38 | 3769 | 2394 | 78 | 6881 | 5704 | 118 | 9887 | 9178 | 158 | 12840 | 12736 |
| 39 | 3850 | 2473 | 79 | 6957 | 5789 | 119 | 9962 | 9266 | 159 | 12913 | 12826 |
| | | | | | | | | | 160 | NA | 12915 |
| | | | | | | | | | Test limit = 1.2352E-2 | | |

**Table G.4.4-2: pass fail limits for ER = 0.001**

| ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ | ne | $ns_p$ | $ns_f$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 3463 | NA | 41 | 40174 | 26265 | 82 | 71961 | 60368 | 123 | 102723 | 96075 |
| 1 | 4874 | 4 | 42 | 40971 | 27063 | 83 | 72720 | 61225 | 124 | 103465 | 96958 |
| 2 | 6096 | 99 | 43 | 41766 | 27863 | 84 | 73479 | 62083 | 125 | 104208 | 97842 |
| 3 | 7226 | 329 | 44 | 42559 | 28666 | 85 | 74237 | 62941 | 126 | 104949 | 98726 |
| 4 | 8298 | 658 | 45 | 43352 | 29471 | 86 | 74995 | 63801 | 127 | 105691 | 99610 |
| 5 | 9330 | 1059 | 46 | 44142 | 30279 | 87 | 75752 | 64661 | 128 | 106432 | 100495 |
| 6 | 10332 | 1513 | 47 | 44932 | 31088 | 88 | 76509 | 65522 | 129 | 107173 | 101380 |
| 7 | 11310 | 2009 | 48 | 45720 | 31899 | 89 | 77265 | 66383 | 130 | 107914 | 102266 |
| 8 | 12269 | 2539 | 49 | 46507 | 32713 | 90 | 78020 | 67246 | 131 | 108655 | 103152 |
| 9 | 13212 | 3096 | 50 | 47293 | 33528 | 91 | 78776 | 68109 | 132 | 109395 | 104039 |
| 10 | 14141 | 3677 | 51 | 48078 | 34345 | 92 | 79530 | 68973 | 133 | 110135 | 104926 |
| 11 | 15058 | 4278 | 52 | 48861 | 35164 | 93 | 80285 | 69838 | 134 | 110875 | 105813 |
| 12 | 15965 | 4896 | 53 | 49644 | 35984 | 94 | 81038 | 70704 | 135 | 111614 | 106701 |
| 13 | 16863 | 5530 | 54 | 50425 | 36807 | 95 | 81792 | 71570 | 136 | 112353 | 107589 |
| 14 | 17753 | 6177 | 55 | 51205 | 37631 | 96 | 82544 | 72437 | 137 | 113092 | 108478 |
| 15 | 18635 | 6836 | 56 | 51985 | 38456 | 97 | 83297 | 73305 | 138 | 113830 | 109367 |
| 16 | 19511 | 7507 | 57 | 52763 | 39283 | 98 | 84049 | 74173 | 139 | 114569 | 110257 |
| 17 | 20380 | 8188 | 58 | 53541 | 40112 | 99 | 84800 | 75042 | 140 | 115307 | 111146 |
| 18 | 21244 | 8878 | 59 | 54317 | 40942 | 100 | 85551 | 75911 | 141 | 116045 | 112037 |
| 19 | 22103 | 9576 | 60 | 55092 | 41773 | 101 | 86302 | 76782 | 142 | 116782 | 112927 |
| 20 | 22957 | 10282 | 61 | 55867 | 42606 | 102 | 87052 | 77653 | 143 | 117520 | 113818 |
| 21 | 23806 | 10995 | 62 | 56641 | 43440 | 103 | 87802 | 78524 | 144 | 118257 | 114710 |
| 22 | 24652 | 11715 | 63 | 57414 | 44276 | 104 | 88552 | 79396 | 145 | 118994 | 115602 |
| 23 | 25493 | 12441 | 64 | 58186 | 45113 | 105 | 89301 | 80269 | 146 | 119730 | 116494 |
| 24 | 26331 | 13173 | 65 | 58957 | 45951 | 106 | 90050 | 81143 | 147 | 120466 | 117386 |
| 25 | 27166 | 13911 | 66 | 59728 | 46790 | 107 | 90798 | 82017 | 148 | 121203 | 118279 |
| 26 | 27997 | 14654 | 67 | 60497 | 47631 | 108 | 91546 | 82891 | 149 | 121939 | 119173 |
| 27 | 28826 | 15401 | 68 | 61266 | 48472 | 109 | 92293 | 83766 | 150 | 122674 | 120066 |
| 28 | 29651 | 16154 | 69 | 62035 | 49315 | 110 | 93041 | 84642 | 151 | 123410 | 120960 |
| 29 | 30474 | 16910 | 70 | 62802 | 50159 | 111 | 93787 | 85518 | 152 | 124145 | 121855 |
| 30 | 31294 | 17671 | 71 | 63569 | 51004 | 112 | 94534 | 86395 | 153 | 124880 | 122749 |
| 31 | 32111 | 18436 | 72 | 64335 | 51851 | 113 | 95280 | 87273 | 154 | 125615 | 123644 |
| 32 | 32927 | 19204 | 73 | 65100 | 52698 | 114 | 96026 | 88151 | 155 | 126349 | 124540 |
| 33 | 33740 | 19976 | 74 | 65865 | 53546 | 115 | 96771 | 89029 | 156 | 127083 | 125435 |
| 34 | 34551 | 20752 | 75 | 66629 | 54396 | 116 | 97516 | 89908 | 157 | 127818 | 126332 |
| 35 | 35360 | 21531 | 76 | 67393 | 55246 | 117 | 98261 | 90788 | 158 | 128551 | 127228 |
| 36 | 36166 | 22312 | 77 | 68156 | 56097 | 118 | 99005 | 91668 | 159 | 129285 | 128125 |
| 37 | 36971 | 23097 | 78 | 68918 | 56950 | 119 | 99750 | 92548 | 160 | 130019 | 129022 |
| 38 | 37775 | 23885 | 79 | 69679 | 57803 | 120 | 100493 | 93429 | 161 | 130752 | 129919 |
| 39 | 38576 | 24676 | 80 | 70440 | 58657 | 121 | 101237 | 94311 | 162 | NA | 130817 |
| 40 | 39376 | 25469 | 81 | 71201 | 59512 | 122 | 101980 | 95193 | Test limit = 1.2345E-3 | | |

NOTE 1: The first column is the number of errors (ne = number of misdetections)

NOTE 2: The second column is the number of samples for the pass limit ($ns_p$, ns=Number of Samples= number misdetections + number of detections)

NOTE 3: The third column is the number of samples for the fail limit ($ns_f$)

NOTE 4: The test limit at the end of the table is applicable, when the minimum test time in clause 3.5 governs the test. Pass the test for ER $\leq$ Test limit, otherwise fail.

## G.4.5 Pass fail decision rules

G.2.5 applies

NOTE: For ER=0.01 an ideal DUT passes after 344 samples. The maximum test time is 12913 samples. For ER=0.001 an ideal DUT passes after 3463 samples. The maximum test time is 130752 samples.

For LAA the following also apply:

The pass fail decision is done individually for each CC. The pass fail decision for one component in the test vector is as follows: pass if all CCs or SCC only according to the test cases pass, otherwise fail.

It is allowed to apply more samples to the DUT, common for all CCs, (e.g. up to an integer number of frames). Use the ratio for the pass fail decision.

## G.4.6 Minimum Test time

**Table G.4.6-1: Minimum Test time for Demodulation of PCFICH/PDCCH**

| Test No | Demod. Scenario | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|---|
| | | | | FDD | TDD | FDD | TDD |
| 1 | [8.1] | R.15 (10 MHz, 8CCE, full, QPSK 1/3) (1x2 Low) ETU70 | 200 000 | 222 222 | 400 000 | 224 000 | 401 000 |
| 1 | [8.2] | R.16 (1.4MHz, 2CCE, full, QPSK 1/3) (2x2 Low) EPA5 | 200 000 | 222 222 | 400 000 | 224 000 | 401 000 |
| 1 Rel-9 … | [ ] | R.16_1 (10MHz, 4CCE, full, QPSK 1/3) (2x2 Low) EVA70 | 200 000 | 222 222 | 400 000 | 224 000 | 401 000 |
| 1 | [8.3] | R.17 (10MHz, 4CCE, full, QPSK 1/3) (4x2 Medium) EVA5 | 200 000 | 222 222 | 400 000 | 224 000 | 401 000 |
| 1 Rel-9 … | [ ] | R.17_1 (5MHz, 2CCE, full, QPSK 1/3) (4x2 Medium) EPA5 | 200 000 | 222 222 | 400 000 | 224 000 | 401 000 |
| Note: | Simulation method to derive MNAS is based on finite test time and its effect on test system uncertainty specified in clause F.1.4. | | | | | | |

**Table G.4.6-1a: Minimum Test time for Demodulation of PCFICH/PDCCH for eICIC**

| Test No | Demod. Scenario | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|---|
| | | | | FDD | TDD | FDD | TDD |
| 1 | [ ] | R.15-1 (10 MHz, 8CCE, full, QPSK 1/3) (2x2 Low) EVA5 | 200 000 (MNAS is not simulated, but estimated based on similar scenario in Table G.4.6-1 Test1) | 2 000 000 | 2 000 000 | 2 001 000 | 2 001 000 |
| Note: | Simulation method to derive MNAS is based on finite test time and its effect on test system uncertainty specified in clause F.1.4. | | | | | | |

**Table G.4.6-1b: Minimum Test time for Demodulation of PCFICH/PDCCH for feICIC**

| Test No | Demod. Scenario | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|---|
| | | | | FDD | TDD | FDD | TDD |
| 1 | [ ] | R.15-2 (10 MHz, 8CCE, full, QPSK 1/3) (2x2 Low) EVA5 | 200 000 (MNAS is not simulated, but estimated based on similar scenario in Table G.4.6-1 Test1) | 2 000 000 | 2 000 000 | 2 001 000 | 2 001 000 |
| Note: | Simulation method to derive MNAS is based on finite test time and its effect on test system uncertainty specified in clause F.1.4. | | | | | | |

**Table G.4.6-2: Minimum Test time for Demodulation of PHICH**

| Test No | Demod. scenario | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|---|
| | | | | FDD | TDD | FDD | TDD |
| 1 | [9.1] | R.18 (10 MHz, full, QPSK 1/3) (1x2 Low) ETU70 | 200 000 | 200 000 | 500 000 | 200 000 | 500 000 |
| 2 | [9.4] | R.24 (10MHz, full, 16QAM ½) (1x2 Low) ETU70 | 200 000 | 200 000 | 500 000 | 200 000 | 500 000 |
| 1 | [9.2] | R.19 (1.4MHz, full, 64QAM 3/4) (2x2 Low) EPA5 | 200 000 | 200 000 | 500 000 | 200 000 | 500 000 |
| 1 Rel-9… | [ ] | R.19_1 (10MHz, full, 64QAM 3/4) (2x2 Low) EVA70 | 200 000 | 200 000 | 500 000 | 200 000 | 500 000 |
| 1A | | R.19-1 (5MHz, full, 64QAM 3/4) (2x2 Low) EVA70 | 200 000 | 200 000 | 500 000 | 200 000 | 500 000 |
| 1 | [9.3] | R.20 (10MHz, 1PRB, 16QAM ½) (4x2 Medium) EVA5 | 200 000 | 200 000 | 500 000 | 200 000 | 500 000 |
| 1 Rel-9… | [ ] | R.20_1 (5MHz, 1PRB, 16QAM ½) (4x2 Medium) EPA5 | 200 000 | 200 000 | 500 000 | 200 000 | 500 000 |
| Note: | Simulation method to derive MNAS is based on finite test time and its effect on test system uncertainty specified in clause F.1.4. | | | | | | |

**Table G.4.6-2a: Minimum Test time for Demodulation of PHICH for eICIC**

| Test No | Demod. scenario | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|---|
| | | | | FDD | TDD | FDD | TDD |
| 1 | [ ] | R.19_1 (10MHz, full, 64QAM 3/4) (2x2 Low) EPA5 | 200 000 (MNAS is not simulated, but estimated based on similar scenario in Table G.4.6-2 Test1) | 1 600 000 | 2 000 000 | 1 600 000 | 2 000 000 |
| Note: Simulation method to derive MNAS is based on finite test time and its effect on test system uncertainty specified in clause F.1.4. | | | | | | | |

**Table G.4.6-2b: Minimum Test time for Demodulation of PHICH for feICIC**

| Test No | Demod. scenario | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|---|
| | | | | FDD | TDD | FDD | TDD |
| 1 | [ ] | R.19_1 (10MHz, full, 64QAM 3/4) (2x2 Low) EPA5 | 200 000 (MNAS is not simulated, but estimated based on similar scenario in Table G.4.6-2 Test1) | 1 600 000 | 2 000 000 | 1 600 000 | 2 000 000 |
| Note: Simulation method to derive MNAS is based on finite test time and its effect on test system uncertainty specified in clause F.1.4. | | | | | | | |

**Table G.4.6-3: Minimum Test time for PHICH for UE Category 0 and UE Category 1bis**

| Clause 8.9.2.1.1/8.9.2.1.1_1/8.9.2.2.1/8.9.2.2.1_1 Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | HD-FDD | TDD | HD-FDD | TDD |
| 1 | R.19 (10MHz, 1PRB, PBSK, 1/2) (2x1 Low) EPA5 | 46 524 (MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-1 Test11) with HD-FDD pattern | 124 064 | 93 048 | 126 000 | 95 000 |

**Table G.4.6-4: Minimum Test time for Demodulation of PCFICH/PDCCH for 4 Rx antenna ports**

| Test No | Demod. Scenario | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|---|
| | | | | FDD | TDD | FDD | TDD |
| 8.10.2.1.1, 8.10.2.2.1: Test 1 | [ ] | R.15 (10 MHz, 8CCE, full, QPSK 1/3) (1x4 Low) ETU70 | 200 000 (MNAS is not simulated, but estimated based on similar scenario in Table G.4.6-1 Test 1) | 222 222 | 400 000 | 224 000 | 401 000 |
| 8.10.2.1.2, 8.10.2.2.2: Test 1 | [ ] | R.16_1 (10MHz, 4CCE, full, QPSK 1/3) (2x4 Low) EVA70 | 200 000 (MNAS is not simulated, but estimated based on similar scenario in Table G.4.6-1 Test 1) | 222 222 | 400 000 | 224 000 | 401 000 |
| 8.10.2.1.3, 8.10.2.2.3: Test 1 | [ ] | R.17_1 (5MHz, 2CCE, full, QPSK 1/3) (4x4 Medium A Xpol) EPA5 | 200 000 (MNAS is not simulated, but estimated based on similar scenario in Table G.4.6-1 Test 1) | 222 222 | 400 000 | 224 000 | 401 000 |

**Table G.4.6-4.0: Minimum Test time for Demodulation of LAA PCFICH/PDCCH**

| Test No | Demodulation scenario (info only) | MNAS (Note 1) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | FDD | TDD | FDD | TDD |
| 8.4.3.1.1 Test 1 for PCC | PCC: R.16_1 FDD (10 MHz, 4CCE, full, QPSK 1/3) (2x2 Low) EVA5 | 200 000 | 222 222 | N/A | 224 000 | N/A |
| 8.4.3.1.1 Test 1-4 for SCC | SCC: R.3 FS3 (20 MHz, 4CCE, full, QPSK 1/3) (2x2 Low) EVA5 | 200 000 | N/A | 476 190 (Note 2) | N/A | 478 000 |
| Note 1: MNAS is not simulated, but estimated based on similar scenario in Table G.4.6-1 Test1.<br>Note 2: MNS for SCC is not deterministic due to the statistical burst transmission model in clause B.3.8. The average MNS is presented in this table. This is calculated based on an average burst length of 5.25 ms which in average takes 6.25 ms assuming UE not capable of partial subframes, and a simulated probability of LBT success (p) equal to 0.5 (ratio 6.25/5.25/0.5). | | | | | | |

**Table G.4.6-4a: Minimum Test time for Demodulation of PHICH for 4 Rx antenna ports**

| Test No | Demod. Scenario | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|---|
| | | | | FDD | TDD | FDD | TDD |
| 8.10.3.1.1, 8.10.3.2.1: Test 1 | [ ] | R.18 (10 MHz, full, QPSK 1/3) (1x4 Low) ETU70 | 200 000 (MNAS is not simulated, but estimated based on similar scenario in Table G.4.6-2 Test 1) | 200 000 | 500 000 | 200 000 | 500 000 |
| 8.10.3.1.2, 8.10.3.2.2: Test 1 | [ ] | R.19_1 (10MHz, full, 64QAM 3/4) (2x4 Low) EVA70 | 200 000 (MNAS is not simulated, but estimated based on similar scenario in Table G.4.6-2 Test 1) | 200 000 | 500 000 | 200 000 | 500 000 |
| 8.10.3.1.3, 8.10.3.2.3: Test 1 | [ ] | R.20_1 (5MHz, 1PRB, 16QAM ½) (4x4 Medium correlation A, Cross polarized) EPA5 | 200 000 (MNAS is not simulated, but estimated based on similar scenario in Table G.4.6-2 Test 1) | 200 000 | 500 000 | 200 000 | 500 000 |

**Table G.4.6-5: Minimum Test time for MPDCCH for UE Category M1 for FDD & HD-FDD**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | MNSF (Min No Sub Frames, mandatory) |
|---|---|---|---|---|
| | | | FDD & HD-FDD | FDD & HD-FDD |
| 8.11.2.1.1: Test 1 | R.82 FDD (10MHz, 4 PRB, QPSK, 1/2) (2x1 Low) EPA5 | 97 280 | 291 840 | 293 000 |
| 8.11.2.1.2: Test 1 | R.83 FDD (10MHz, 2+4 PRB, QPSK, 1/2) (2x1 Low) ETU1 | 194 560 | 583 680 | 585 000 |

**Table G.4.6-5a: Minimum Test time for MPDCCH for UE Category M1 for TDD**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | MNSF (Min No Sub Frames, mandatory) |
|---|---|---|---|---|
| | | | TDD | TDD |
| 8.11.2.2.1: Test 1 | R.82 TDD (10MHz, 4 PRB, QPSK, 1/2) (2x1 Low) EPA5 | 48 640 | 486 400 | 488 000 |
| 8.11.2.2.2: Test 1 | R.83 TDD (10MHz, 2+4 PRB, QPSK, 1/2) (2x1 Low) ETU1 | 97 280 | 972 800 | 974 000 |

**Table G.4.6-6: Minimum Test time for Demodulation of LAA PCFICH/PDCCH**

| Test No | Demodulation scenario (info only) | MNAS (Note 1) | MNS (Calculation) | | MNSF (Min No Sub Frames, mandatory) | |
|---|---|---|---|---|---|---|
| | | | FDD | TDD | FDD | TDD |
| 8.4.3.1.2 Test 1 for PCC | PCC: R.16_1 TDD (10 MHz, 4CCE, full, QPSK 1/3) (2x2 Low) EVA5 | 200 000 | N/A | 400 000 | N/A | 401 000 |
| 8.4.3.1.2 Test 1-4 for SCC | SCC: R.4 FS3 (20 MHz, 4CCE, full, QPSK 1/3) (2x2 Low) EVA5 | 200 000 | N/A | 476 190 (Note 2) | N/A | 478 000 |
| Note 1: MNAS is not simulated, but estimated based on similar scenario in Table G.4.6-1 Test1. Note 2: MNS for SCC is not deterministic due to the statistical burst transmission model in clause B.3.8. The average MNS is presented in this table. This is calculated based on an average burst length of 5.25 ms which in average takes 6.25 ms assuming UE not capable of partial subframes, and a simulated probability of LBT success (p) equal to 0.5 (ratio 6.25/5.25/0.5). | | | | | | |

**Table G.4.6-7: Minimum Test time for NPDCCH for UE Category NB1**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | MNSF (Min No Sub Frames, mandatory) |
|---|---|---|---|---|
| | | | HD-FDD | HD-FDD |
| 8.12.2.1.1: Test 1 | R.NB.3 FDD (200kHz, QPSK,1/2) (1x1) EPA5 | 36166 | 15430827 | 15431000 |
| 8.12.2.1.1: Test 2 | R.NB.3 FDD (200kHz, QPSK,1/2) (1x1) ETU1 | 36166 | 55550976 | 55551000 |

**Table G.4.6-8: Minimum Test time for NPDCCH Transmit diversity performance for UE Category NB1**

| Test No | Demodulation scenario (info only) | MNAS (Simulation) | MNS (Calculation) | MNSF (Min No Sub Frames, mandatory) |
|---|---|---|---|---|
| | | | HD-FDD | HD-FDD |

| | | | | |
|---|---|---|---|---|
| 8.12.2.1.2: Test 1 | R.NB.4 FDD<br>(200kHz, QPSK,1/2)<br>(2x1)<br>EPA5 | 36166 | 4629248 | 4631000 |
| 8.12.2.1.2: Test 2 | R.NB.4 FDD<br>(200kHz, QPSK,1/2)<br>(2x1)<br>ETU1 | 36166 | 27775488 | 27777000 |

# G.4.7 Test conditions for receiver performance tests

**Table G.4.7: Test conditions for receiver performance tests**

| Test | Statistical independence | Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test | Over all Pass/Fail condition Restrictions and extensions see Table G.3.6-1 |
|---|---|---|---|
| 8.4.1.1 FDD PCFICH/PDCCH Single-antenna Port Performance | A misdetection is an independent event | 1 | NA |
| 8.4.1.2 FDD PCFICH/PDCCH Transmit Diversity Performance | A misdetection is an independent event | 2 | To pass 8.4.1.2 each component in the test vector must pass |
| 8.4.2.1 TDD PCFICH/PDCCH Single-antenna Port Performance | A misdetection is an independent event | 1 | NA |
| 8.4.2.2 TDD PCFICH/PDCCH Transmit Diversity Performance | A misdetection is an independent event | 2 | To pass 8.4.2.2 each component in the test vector must pass |
| 8.5.1.1 FDD PHICH Single-antenna Port Performance | A misdetection is an independent event | 2 | To pass 8.5.1.1 each component in the test vector must pass |
| 8.5.1.2 FDD PHICH Transmit Diversity Performance | A misdetection is an independent event | 2 | To pass 8.5.1.2 each component in the test vector must pass |
| 8.5.2.1 TDD PHICH Single-antenna Port Performance | A misdetection is an independent event | 2 | To pass 8.5.2.1 each component in the test vector must pass |
| 8.5.2.2 TDD PHICH Transmit Diversity Performance | A misdetection is an independent event | 2 | To pass 8.5.2.2 each component in the test vector must pass |

# G.5 Measuring throughput ratio

## G.5.1 General

Annex G.5 is applicable for clauses 9.3, 9.4, 9.5 and 9.7. Common to those clauses is, that a throughput ratio γ of the form $\gamma = \frac{t_{Numerator}}{t_{Denominator}}$ is measured. These clauses are tested exclusively with "slow" multipath fading profiles. Hence the test time is governed by test time due to fading, and number of samples due to statistical significance is not applicable.

The test requirement in clause 9.4 is a ratio of 2 throughput tests γ. In either numerator or denominator (depending on test case) a target throughput is desired, which is established by an approach resulting in the throughput and the reference SNR. This SNR is then reused when measuring the throughput of the other factor of the formula. The formulas for calculation of γ are defined directly under sections 9.4.

The test requirements in clauses 9.3 and 9.5 are a ratio of 2 throughput tests γ. , where numerator and denominator are ordinary throughput tests. The formulas for calculation of γ are defined in sections 9.3 and 9.5 respectively

## G.5.2 Establishing SNR

Adjust SNR such that the measured throughput is within 2% of target value (60, 70 or 90% depending on test case). The approach, leading to target throughput and reference SNR is not specified.

The resulting SNR is the reference SNR to use when measuring throughput in the other factor (numerator or denominator) of γ.

To achieve statistical significance the final throughput measurement must be done with MNS samples, given table G.5.4-1

## G.5.3 Measuring T-put

To achieve statistical significance the final throughput measurement must be done with MNS samples, given in table.G.5.4 -1. Number of samples due to statistical significance is not applicable.

For measuring $t_{subband}$, $t_{wideband}$, $t_{reported}$ and $t_{fix}$, the SS collects ACK, NACK and statDTX from the UE and records the time, elapsed from the beginning of the test. The payload size, received by the UE and acknowledged towards the SS, may vary within a test versus time (e.g. due to subband changes upon a UE report) Throughput is calculated in the SS by summing up the payload, associated to each ACK, from the start of the test and dividing the accumulated payload in kilobits by the time in seconds, elapsed from the beginning of the test. This is similar but not same as in G.2.2. (Main difference in bullet d, where the payload size is constant).

For measuring $t_{median}$, $t_{ue}$, $t_{rnd}$, $t_{ue,follow1,follow2}$ and $t_{ue,rnd1,rnd2}$, the SS collects ACK, NACK and statDTX from the UE and records the time, elapsed from the beginning of the test. The payload size, received by the UE and acknowledged towards the SS, is constant. Throughput can be calculated in the SS by multiplying the payload size with the number of ACKs and dividing the accumulated payload in kilobits by the time in seconds, elapsed from the beginning of the test, being associated to the following ratio: ACK/ (ACK+NACK + DTX).

## G.5.4 Number of samples for throughput ratios

TT for γ and MNS are based on theoretical estimations.

**Table G.5.4-1: Test time for testing throughput ratios**

| Test | Demodulation scenario: RMC (Bandwidth, allocated RBs, modulation, coding) [Antenna configuration, correlation] Propagation condition, Doppler | Γ | Minimum Number of Subframes (MNS) (MNS = active and inactive Subframes, more details in Annex G.3.5 and table G.3.5-1) | | Γ including TT | BLER |
|---|---|---|---|---|---|---|
| | | | FDD | TDD | | |
| 9.3.1.1.1<br>9.3.1.1.2 | (10 MHz, 6, variable modulation and coding) [1x2, full] Special propagation according to clause B.2.4, 5Hz | 1.1 | 100000<br>For denominator- and numerator - measurement each | 170000<br>For denominator- and numerator - measurement each | γ =1.09 | BLER=0.05, no TT<br>No of samples: subset of ACKs and NACKs in the MNS for throughput. |
| 9.3.1.2.1_D | (10 MHz, 6, variable modulation and coding) [2x2, full] Special propagation according to clause B.2.4, 5Hz | 1.1 | 100000<br>For denominator- and numerator - measurement each | NA | γ =1.09 | BLER=0.05, no TT<br>No of samples: subset of ACKs and NACKs in the MNS for throughput. |
| 9.3.1.2.2_D | (10 MHz, 6, variable modulation and coding) [2x2, full] Special propagation according to clause B.2.4, 5Hz | 1.1 | NA | 170000<br>For denominator- and numerator- measurement each | γ =1.09 | BLER=0.05, no TT<br>No of samples: subset of ACKs and NACKs in the MNS for throughput. |
| 9.3.1.3.1_E | (10 MHz, 6, variable modulation and coding) [1x2, full] Special propagation according to clause B.2.4, 5Hz | 1.1 | 200000<br>For denominator- and numerator - measurement each | NA | γ =1.09 | BLER=0.01, no TT<br>No of samples: subset of ACKs and NACKs in the MNS for throughput. |
| 9.3.1.3.2_E | (10 MHz, 6, variable modulation and coding) [1x2, full] Special propagation according to clause B.2.4, 5Hz | 1.1 | NA | 680000<br>For denominator- and numerator - measurement each | γ =1.09 | BLER=0.01, no TT<br>No of samples: subset of ACKs and NACKs in the MNS for throughput. |
| 9.3.2.1.1 | (10 MHz or | 1.05 | 100000 | 170000 | γ =1.04 | BLER=0.02, no TT |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9.3.2.1.2 | 5MHz according to test, full, variable modulation and coding) [1x2, high] EPA5 | | For denominator- and numerator - measurement each | For denominator- and numerator - measurement each | | No of samples for FDD: subset of ACKs and NACKs in the MNS for throughput.<br>No of samples for TDD: subset of *filtered* ACKs and NACKs in the MNS for throughput. |
| 9.3.2.1.1_1<br>9.3.2.1.2_1 | (10 MHz or 5MHz according to test, partial, variable modulation and coding) [1x2, high] EPA5 | 1.05 | 100000<br>For denominator- and numerator - measurement each | 170000<br>For denominator- and numerator - measurement each | γ =1.04 | BLER=0.02, no TT<br>No of samples for FDD: subset of ACKs and NACKs in the MNS for throughput.<br>No of samples for TDD: subset of *filtered* ACKs and NACKs in the MNS for throughput. |
| 9.3.2.2.1_D | (10 MHz, full, variable modulation and coding) [4x2, high] EPA5 | 1.05 | 100000<br>For denominator- and numerator - measurement each | NA | γ =1.04 | BLER=0.02, no TT<br>No of samples for FDD: subset of ACKs and NACKs in the MNS for throughput. |
| 9.3.2.2.2_D | (10 MHz, full, variable modulation and coding) [8x2, high] EPA5 | 1.05 | NA | 170000<br>For denominator- and numerator - measurement each | γ =1.04 | BLER=0.02, no TT<br>No of samples for TDD: subset of *filtered* ACKs and NACKs in the MNS for throughput. |
| 9.3.3.1.1<br>9.3.3.1.2 | 10 MHz, full(however unequal SNR), variable modulation and coding) [1x2, full]<br>Special: propagation according to clause B.2.4, 5Hz | 1.6 | 100000<br>For denominator- and numerator - measurement each | 170000<br>For denominator- and numerator - measurement each | 1.50 | |
| 9.3.4.1.1<br>9.3.4.1.2 | Same as 9.3.3 | 1.2 | 100000 | 170000 | 1.19 | |
| 9.3.4.2.1<br>9.3.4.2.2 | Same as 9.3.3 | 1.15 | 100000 | 170000 | 1.14 | |
| 9.3.5.1.1<br>9.3.5.1.2 | variable modulation and coding, 1x2 Low, EPA5 | 1.8 | 100000 | 170000 | 1.79 | |
| 9.3.5.2.1<br>9.3.5.2.2 | variable modulation and coding, 2x2 Low, EPA5 | 1.8 | 100000 | 170000 | 1.79 | |
| 9.3.7.1<br>9.3.7.2 | Test1: (10 MHz, full, variable modulation and coding) [4x2, low]EVA5<br>Test2: (10 MHz, full, variable | Test 1: $\alpha$: 1.05<br>Test 2: $\beta$: 1.15 | 100000 | 170000 | Test1: $\alpha$: 1.04<br>Test2: $\beta$: 1.14 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | modulation and coding) [4x2, High XP] EVA5 | | | | | |
| 9.3.8.1.1<br>9.3.8.1.2 | variable modulation and coding, 2x2 Low, EPA5 | 0.925 | 100000 | 170000 | 0.915 | |
| 9.3.8.2.1<br>9.3.8.2.2 | variable modulation and coding, 2x2 Low, EPA5 | 0.925 | 100000 | 170000 | 0.915 | |
| 9.3.8.3.1<br>9.3.8.3.2 | variable modulation and coding, 2x2 Low, EPA5 | 0.925 | 100000 | 170000 | 0.915 | |
| 9.4.1.1.1<br>9.4.1.1.2 | R.10 (10 MHz, full, QPSK, 1/3) [2x2, Low] EVA5 | 1.1 | 100000 | 170000 | γ =1.09 | |
| 9.4.1.2.1<br>9.4.1.2.2 | R.14-1 (10 MHz, partial, 16QAM,1/2) [4x2, Low] EVA5 | 1.2 | 100000 | 170000 | 1.19 | |
| 9.4.2.1.1<br>9.4.2.1.2 | R.30 (20 MHz, full, 16QAM, 1/2) [2x2, Low] EPA5 | 1.2 | 100000 | 170000 | γ =1.19 | |
| 9.4.2.1.1_1<br>9.4.2.1.2_1 | R.11-3 or R.11 (10 MHz, partial or full, 16QAM, 1/2) [2x2, Low] EPA5 | 1.2 | 100000 | 170000 | γ =1.19 | |
| 9.4.2.2.1 | R.14-2 FDD (10MHz, 3, 16 QAM, ½) [4x2, low] EVA5 | 1.2 | 100000 | NA | 1.19 | |
| 9.4.2.2.2 | R.14-2 TDD (10MHz, 3, 16QAM, ½) [4x2, low] EVA5 | 1.15 | NA | 170000 | 1.14 | |
| 9.4.1.3.1_D | R.44 (10 MHz, partial, QPSK, 1/3) [4x2, Low] EPA5 | 1.2 | 100000 | NA | γ =1.19 | |
| 9.4.1.3.3 | R.77 (10 MHz, 50, 64QAM, 1/3) [High 2D XP 12(2,3,2) x 2] EPA5 | 2.5 | 100000 | NA | 2.49 | |
| 9.4.1.3.4 | R.77 (10 MHz, 50, 64QAM, 1/3) [High 2D XP 12(2,3,2) x 2] | 2.5 | NA | 17000 | 2.49 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | EPA5 | | | | | |
| 9.4.1.3.2_D | R.45-1 or R.45 (10 MHz, partial or full, 16QAM, 1/2) [8x2, High] EVA5 | 3 | NA | 170000 | γ =2.99 | |
| 9.4.1.4.1 9.4.1.4.2 | R.60 (10MHz, full, QPSK, 1/2) [4x2, High XP] EVA5 | 1.8 | 100000 | 170000 | γ =1.79 | |
| 9.4.2.3.1_D | R.45-1 or R.45 (10 MHz, partial or full, 16QAM, 1/2) [4x2, Low] EVA5 | 1.3 | 100000 | NA | γ =1.29 | |
| 9.4.2.3.2_D | R.45-1 or R.45 (10 MHz, partial or full, 16QAM, 1/2) [8x2, High] EVA5 | 3.5 | NA | 170000 | γ =3.49 | |
| 9.4.2.3.3 | R.45-1 or R.45 (10 MHz, partial or full, 16QAM, 1/2) [4x2, High XP] EVA5 | 1.2 | 100000 | NA | γ =1. 19 | |
| 9.4.2.3.4 | R.61-1 or R.61(10MHz, full, 16QAM, 1/2) [4x2, High XP] EVA5 | 1.2 | NA | 170000 | γ =1. 19 | |
| 9.5.1.1 9.5.1.2 | (10MHz, full, variable modulation and coding) [2x2, low or high according to test] EPA5 | Test 2 $\gamma_1$=1.05 Test 1 $\gamma_2$=1 Test 3 $\gamma_2$=1.1 | 100000 | 170000 | Test2 $\gamma_1$= 1.04 Test1 $\gamma_2$= 0.99 Test3 $\gamma_2$= 1.09 | |
| 9.5.1.1_1 9.5.1.2_1 | (10MHz, full, variable modulation and coding) [2x2, low or high according to test] EPA5 | Test 2 $\gamma_1$=1.05 Test 1 $\gamma_2$=1 Test 3: $\gamma_1$=0.90 $\gamma_2$=1.10 | 100000 | 170000 | Test2 $\gamma_1$= 1.04 Test1 $\gamma_2$= 0.99 Test3: $\gamma_1$=0.89 $\gamma_2$=1.09 | |
| 9.5.1.1_2 9.5.1.2_2 | (10MHz, full, variable modulation and coding) [2x2, low or high according to test] | Test 2 $\gamma_1$=1.05 Test 1 $\gamma_2$=1 Test 3: $\gamma_1$=0. | 100000 | 170000 | Test2 $\gamma_1$= 1.04 Test1 $\gamma_2$= 0.99 Test3: $\gamma_1$=0.89 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | EPA5 | 90 | | | | |
| 9.5.2.1_D<br>9.5.2.2_D | (10MHz, full, variable modulation and coding) [2x2, low or high according to test] EPA5 | Test 2 $\gamma_1$=1.05 Test 3 $\gamma_1$=0.9 Test 1 $\gamma_2$=1.00 | 100000 | 170000 | Test2 $\gamma_1$= 1.04 Test3 $\gamma_1$= 0.89 Test1 $\gamma_2$= 0.99 | |
| 9.5.3.1_C.1<br>9.5.3.2_C.1 | (10MHz, full, variable modulation and coding) [2x2, low according to test] EPA5 | Test 1 $\gamma_1$=0.9 Test 2 $\gamma_1$=1.05 | 800000 | 680000 | Test1 $\gamma_1$= 0.89 Test2 $\gamma_1$= 1.04 | |
| 9.5.4.1_E<br>9.5.4.2_E | (10MHz, full, variable modulation and coding) [2x2, low or high according to test] EPA5 | Test 2 $\gamma_1$=1.05 Test 3 $\gamma_1$=0.9 Test 1 $\gamma_2$=1.00 | 800000 | 680000 | Test2 $\gamma_1$= 1.04 Test3 $\gamma_1$= 0.89 Test1 $\gamma_2$= 0.99 | |
| 9.5.5.1_F.2<br>9.5.5.2_F.2 | (10MHz, full, variable modulation and coding) [2x2, low or high according to test] EPA5 | Test 2 $\gamma_1$=1.00 | 100000 | 170000 | Test2 $\gamma_1$= 0.99 | |
| 9.7.2.1<br>9.7.2.2 | (10 MHz, 6, variable modulation and coding) [1x1, full] Special propagation according to clause B.2.4, 5Hz | 1.1 | 100000 | 170000 | $\gamma$ =1.09 | |
| 9.8.2.1 | (10 MHz, 6, variable modulation and coding) [1x1, full] Special propagation according to clause B.2.4, 1Hz | 1.30 | 800000 | NA | 1.29 | |
| 9.9.2.1.1<br>9.9.2.1.2 | variable modulation and coding, 1x4 Low, EPA5 | 1.8 | 100000 | 170000 | 1.79 | |
| 9.9.2.2.1<br>9.9.2.2.2 | variable modulation and coding, 2x4 Low, EPA5 | 1.8 | 100000 | 170000 | 1.79 | |
| 9.9.3.1.1 | R.45-2 (10 MHz, full, | 2.5 | NA | 170000 | $\gamma$ =2.49 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 64QAM) [8x4, High] EVA5 | | | | | |
| 9.9.4.1.1 9.9.4.1.2 | (10MHz, full, variable modulation and coding) [2x4, low or high for test 1, 2 and 3; 4x4, low for test 4 according to test] EPA5 | Test 1 $\gamma_2$=1 Test 2 $\gamma_1$=1.05 Test 3 $\gamma_1$=0.9 Test 4 $\gamma_2$=1.1 | 100000 | 170000 | Test1 $\gamma_2$= 0.99 Test2 $\gamma_1$= 1.04 Test3 $\gamma_1$= 0.89 Test4 $\gamma_2$= 1.09 | |
| 9.9.4.2.1 9.9.4.2.2 | (10MHz, full, variable modulation and coding) [2x4, low or high for test 1, 2 and 3; 4x4, low for test 4 according to test] EPA5 | Test 1 $\gamma_2$=1 Test 2 $\gamma_1$=1.05 Test 3 $\gamma_1$=0.9 Test 4 $\gamma_2$=1.1 | 100000 | 170000 | Test1 $\gamma_2$= 0.99 Test2 $\gamma_1$= 1.04 Test3 $\gamma_1$= 0.89 Test4 $\gamma_2$= 1.09 | |

# G.6 Statistical testing of MBMS Performance

## G.6.1 General

The system simulator sends MBMS packets to the UE under test. The number of packets, the SS sends, is predefined by the test time in G.6.4. The UE under tests demodulates the MBMS packets and counts the successfully received number of MBMS packets into the UE internal MBMS packet counter. The SS reads out the counter and issues a pass fail decision.

## G.6.2 Mapping of MBMS Packet ratio to BLER

The minimum requirements are designed in terms of BLER = 1%. 10 MBMS packets are included in one Transport block, constant throughout the test. The ratio of correct received MBMS packets ($M_{ok}$) to transmitted packets ($M_{tot}$) is assumed to be equal to the ratio of correct received transport blocks to transmitted transport blocks. This assumption ignores the unlikely case that payload and CRC for a transport block are consistent but wrong.

## G.6.3 Design of the test

The minimum requirement for all MBMS tests is BLER = 1%. All MBMS tests are performed under a fading scenario: MBSFN channel model (Table B.2.6-1). It is obvious, that this fading scenario requires a minimum test time, greater than the time, required for statistical significance. In addition the test design with the MBMS packet counter in the UE suggest a fixed test time. Without simulation the test time is set to 200 000 active subframes (Transport blocks), leading to 333 333 subframes (333sec) for FDD and 400 000 subframes (400sec) for TDD. In order to avoid the fail of a good DUT due to statistical uncertainty the minimum requirement of BLER = 1% leads to a

Test limit = 1.2352 %. (refer Table G.4.4-1)

This means a DUT actually on the limit (1%) is measured and passed with a confidence level of greater than 95%.

## G.6.4 Test time for MBMS performance tests

**Table G.6.4-1: Minimum Test time for MBMS**

| Test No | Demodulation scenario (info only) | Min No of Sub Frames | |
|---|---|---|---|
| | | FDD (6 of 10 subframes are active) | TDD (5 of 10 subframes are active) |
| 1 | R.37 (10 MHz, full, QPSK 1/3) (1x2 Low) MBSFN channel model | 333 333 | 400 000 |
| 2 | R.38 (10MHz, full, 16QAM 1/2) (1x2 Low) MBSFN channel model | 333 333 | 400 000 |
| 3 | R.39 (10 MHz, full, 64QAM 2/3) (1x2 Low) MBSFN channel model | 333 333 | 400 000 |
| 3 | R.39-1 (5 MHz, full, 64QAM 2/3) (1x2 Low) MBSFN channel model | 333 333 | 400 000 |
| 4 | R.40 (1.4 MHz, full, QPSK 1/3) (1x2 Low) MBSFN channel model | 333 333 | 400 000 |

# G.7 Theory to derive the numbers in Table G.2.4-1 (Informative)

Editor's note: This clause of the Annex G is for information only and it described the background theory and information to derive the entries in the table G.2.4-1.

## G.7.1 Error Ratio (ER)

The Error Ratio (ER) is defined as the ratio of number of errors (ne) to all results, number of samples (ns).

(1-ER is the success ratio).

## G.7.2 Test Design

A statistical test is characterised by:

Test-time, Selectivity and Confidence level.

## G.7.3 Confidence level

The outcome of a statistical test is a decision. This decision may be correct or in-correct. The Confidence Level CL describes the probability that the decision is a correct one. The complement is the wrong decision probability (risk) D = 1-CL

## G.7.4 Introduction: Supplier Risk versus Customer Risk

There are two targets of decision:

(a) A measurement on the pass-limit shows, that the DUT has the specified quality or is better with probability CL (CL e.g.95%) This shall lead to a "pass decision"

The pass-limit is on the good side of the specified DUT-quality. A more stringent CL (CL e.g.99%) shifts the pass-limit farer into the good direction. Given the quality of the DUTs is distributed, a greater CL passes less and better DUTs.

A measurement on the bad side of the pass-limit is simply “not pass” (undecided or artificial fail).

(aa) Complementary:

A measurement on the fail-limit shows, that the DUT is worse than the specified quality with probability CL.

The fail-limit is on the bad side of the specified DUT-quality. A more stringent CL shifts the fail-limit farer into the bad direction. Given the quality of the DUTs is distributed, a greater CL fails less and worse DUTs.

A measurement on the good side of the fail-limit is simply “not fail”.

(b) A DUT, known to have the specified quality, shall be measured and decided pass with probability CL. This leads to the test limit.

For CL e.g. 95%, the test limit is on the bad side of the specified DUT-quality. CL e.g.99% shifts the pass-limit farer into the bad direction. Given the DUT-quality is distributed, a greater CL passes more and worse DUTs.

(bb) A DUT, known to be an ($\varepsilon \rightarrow 0$) beyond the specified quality, shall be measured and decided fail with probability CL.

For CL e.g.95%, the test limit is on the good side of the specified DUT-quality.

NOTE 1: The different sense for CL in (a), (aa) versus (b), (bb).

NOTE 2: For constant CL in all 4 bullets (a) is equivalent to (bb) and (aa) is equivalent to (b).

## G.7.5 Supplier Risk versus Customer Risk

The table below summarizes the different targets of decision.

**Table G.X.5-1: Equivalent statements**

| | **Equivalent statements, using different cause-to-effect-directions, and assuming CL = constant >1/2** | |
|---|---|---|
| cause-to-effect-directions | Known measurement result → estimation of the DUT’s quality | Known DUT’s quality → estimation of the measurement’s outcome |
| Supplier Risk | A measurement on the pass-limit shows, that the DUT has the specified quality or is better (a) | A DUT, known to have an ($\varepsilon \rightarrow 0$) beyond the specified DUT-quality, shall be measured and decided fail (bb) |
| Customer Risk | A measurement on the fail-limit shall shows, that the DUT is worse than the specified quality (aa) | A DUT, known to have the specified quality, shall be measured and decided pass (b) |

The shaded area shown the direct interpretation of Supplier Risk and Customer Risk.

The same statements can be based on other DUT-quality-definitions.

## G.7.6 Introduction: Standard test versus early decision concept

In standard statistical tests, a certain number of results (ns) is predefined in advance to the test. After ns results the number of bad results (ne) is counted and the error ratio (ER) is calculated by ne/ns.

Applying statistical theory, a decision limit can be designed, against which the calculated ER is compared to derive the decision. Such a limit is one decision point and is characterised by:

- D: the wrong decision probability (a predefined parameter)
- ns: the number of results (a fixed predefined parameter)
- ne: the number of bad results (the limit based on just ns)

In the formula for the limit, D and ns can be understood as variable parameter and variable. However the standard test execution requires fixed ns and D. The property of such a test is: It discriminate between two states only, depending on the test design:

- pass (with CL) / undecided (undecided in the sense: finally undecided)
- fail (with CL) / undecided (undecided in the sense: finally undecided)
- pass(with CL) / fail (with CL) (however against two limits).

In contrast to the standard statistical tests, the early decision concept predefines a set of (ne,ns) co-ordinates, representing the limit-curve for decision. After each result a preliminary ER is calculated and compared against the limit-curve. After each result one may make the decision or not (undecided for later decision). The parameters and variables in the limit-curve for the early decision concept have a similar but not equal meaning:

- D: the wrong decision probability (a predefined parameter)
- ns: the number of results (a variable parameter)
- ne: the number of bad results (the limit. It varies together with ns)

To avoid a “final undecided” in the standard test, a second limit must be introduced and the single decision co-ordinate (ne,ns) needs a high ne, leading to a fixed (high) test time. In the early decision concept, having the same selectivity and the same confidence level an “undecided” need not to be avoided, as it can be decided later. A perfect DUT will hit the decision coordinate (ne,ns) with ne=0. This test time is short.

## G.7.7 Standard test versus early decision concept

For Supplier Risk:

The wrong decision probability D in the standard test is the probability, to decide a DUT in-correct in the single decision point. In the early decision concept there is a probability of in-correct decisions d at each point of the limit-curve. The sum of all those wrong decision probabilities accumulate to D. Hence $d<D$

For Customer Risk:

The correct decision probability CL in the standard test is the probability, to decide a DUT correct in the single decision point. In the early decision concept there is a probability of correct decisions cl at each point of the limit-curve. The sum of all those correct decision probabilities accumulate to CL. Hence $cl<CL$ or $d>D$

## G.7.8 Selectivity

There is no statistical test which can discriminate between a limit DUT and a DUT which is an ($\varepsilon \rightarrow 0$) apart from the limit in finite time and high confidence level CL. Either the test discriminates against one limit with the results pass

(with CL)/undecided or fail (with CL)/undecided, or the test ends in a result pass (with CL)/fail (with CL) but this requires a second limit.

For CL>1/2, a (measurement-result = specified-DUT-quality), generates undecided in test “supplier risk against pass limit” (a, from above) and also in the test “customer risk against the fail limit “ (aa)

For CL>1/2, a DUT, known to be on the limit, will be decided pass for the test “customer risk against pass limit” (b) and also “supplier risk against fail limit” (bb).

This overlap or undecided area is not a fault or a contradiction, however it can be avoided by introducing a Bad or a Good DUT quality according to:

- Bad DUT quality: specified DUT-quality * M (M>1)
- Good DUT quality: specified DUT-quality * m (m<1)

Using e.g. M>1 and CL=95% the test for different DUT qualities yield different pass probabilities:

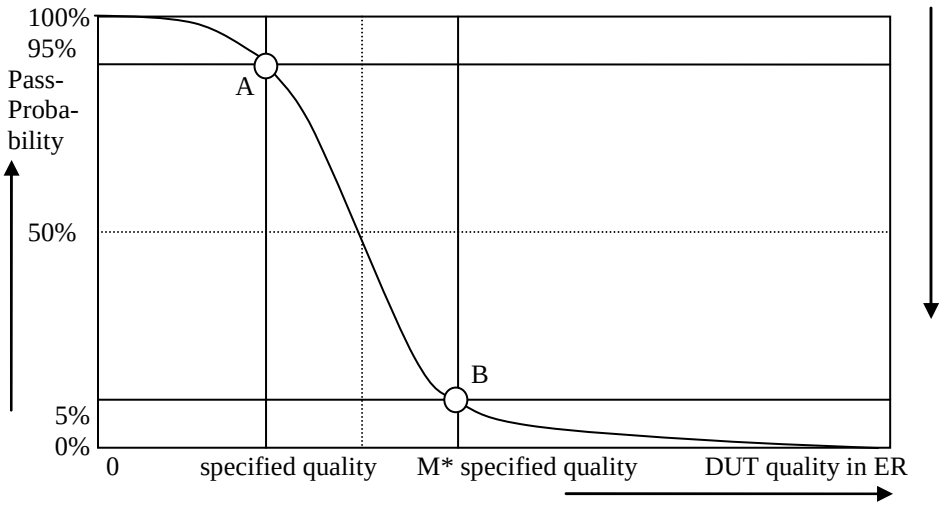



**Figure G.X.8-1: Pass probability versus DUT quality**

## G.7.9 Design of the test

The receiver characteristic test are defined by the following design principles:

1. The early decision concept is applied.
2. A second limit is introduced: Bad DUT factor M>1
3. To decide the test pass:

   Supplier risk is applied based on the Bad DUT quality

   To decide the test fail

   Customer Risk is applied based on the specified DUT quality

The receiver characteristic test are defined by the following parameters:

1. Limit ER = 0.05
2. Bad DUT factor M=1.5 (selectivity)

3. Confidence level CL = 95% (for specified DUT and Bad DUT-quality)

This has the following consequences:

1. A measurement on the fail limit is connected with 2 equivalent statements:

| | |
|---|---|
| A measurement on the fail-limit shows, that the DUT is worse than the specified DUT-quality | A DUT, known have the specified quality, shall be measured and decided pass |

2. A measurement on the pass limit is connected with the complementary statements:

| | |
|---|---|
| A measurement on the pass limit shows, that the DUT is better than the Bad DUT-quality. | A DUT, known to have the Bad DUT quality, shall be measured and decided fail |

   The left column is used to decide the measurement.

   The right column is used to verify the design of the test by simulation.

   The simulation is based on the two fulcrums A and B only in Figure G.x.8-1

3. Test time

   The minimum and maximum test time is fixed.

   The average test time is a function of the DUT's quality.

   The individual test time is not predictable.

4. The number of decision co-ordinates (ne,ns) in the early decision concept is responsible for the selectivity of the test and the maximum test time. Having fixed the number of decision co-ordinates there is still freedom to select the individual decision co-ordinates in many combinations, all leading to the same confidence level.

## G.7.10 Simulation to derive the pass fail limits in Table G.2.4-1

There is freedom to design the decision co-ordinates (ne,ns).

The binomial distribution and its inverse is used to design the pass and fail limits. Note that this method is not unique and that other methods exist.

$$fail(ne, d_f) := \frac{ne}{(ne + qnbinom(d_f, ne, ER))}$$

$$pass(ne, cl_p, M) := \frac{ne}{(ne + qnbinom(cl_p, ne, ER \cdot M))}$$

Where

- fail(..) is the error ratio for the fail limit
- pass(..) is the error ratio for the pass limit
- ER is the specified error ratio 0.05
- ne is the number of bad results. This is the variable in both equations
- M is the Bad DUT factor M=1.5
- $d_f$ is the wrong decision probability of a single (ne,ns) co-ordinate for the fail limit.
  It is found by simulation to be $d_f = 0.004$

- $cl_p$ is the confidence level of a single (ne,ns) co-ordinate for the pass limit.
  It is found by simulation to be $cl_p = 0.9975$

- qnbinom(..): The inverse cumulative function of the negative binomial distribution

The simulation works as follows:

- A large population of limit DUTs with true ER = 0.05 is decided against the pass and fail limits.

- $cl_p$ and $d_f$ are tuned such that CL (95%) of the population passes and D (5%) of the population fails.

- A population of Bad DUTs with true ER = M*0.05 is decided against the same pass and fail limits.

- $cl_p$ and $d_f$ are tuned such that CL (95%) of the population fails and D (5%) of the population passes.

- This procedure and the relationship to the measurement is justified in clause G.x.9. The number of DUTs decrease during the simulation, as the decided DUTs leave the population. That number decreases with an approximately exponential characteristics. After 169 bad results all DUTs of the population are decided.

NOTE: The exponential decrease of the population is an optimal design goal for the decision co-ordinates (ne,ns), which can be achieved with other formulas or methods as well.

# G.8 Statistical Testing of V2V and V2X Performance Requirements – Non concurrent with E-UTRA

## G.8.1 General

The system simulator (SS) sends sidelink packets to the UE under test. The number of packets sent by the SS is predefined by the test time in G.8.3 and G.8.4 for requirements with throughput and probability of miss-detection, respectively.

The UE is required to keep an updated counter of the received PSCCH and PSSCH transport blocks and to report either PSCCH, PSSCH and/or STCH PDCP SDU metrics to the SS upon demand via AT command +CUSPCREQ [7]. The SS can use the reported metrics to determine a Pass or Fail decision.

Three state variables have been defined for this purpose:

1) PSCCH_PACKET_COUNTER: to count the number of received PSCCH transport blocks

2) PSSCH_PACKET_COUNTER: to count the number of received PSSCH transport blocks

3) STCH_PACKET_COUNTER: to count the number of received STCH PDCP SDUs

The UE shall increase the respective counters upon successful reception of the corresponding transport block. To manage these counters, it is required to close the UE test loop back mode E. Such operation is performed following an AT-command based procedure to set the UE in State 5A-V2X [7]. The counters are initialized to zero upon closure of the UE test loop back mode E.

## G.8.2 Test Method for Performance Test Cases

Figure G.8.2-1 descriptively represents the course of a test based in two metrics: the noise-normalized test SNR and the performance session, represented in terms of fractional throughput. The SS shall read the sidelink packet counters twice and calculate the performance metrics based on the sample difference between both read operations. This effectively results on the discard of early sidelink counter values that might take place between their initialization at State 5A-V2X and the stabilized performance session. The test method is as follows:

1) The UE is set on State 5A-V2X, according to the procedure defined in [7]. In this process both PSCCH, PSSCH and STCH PDCP SDU counters are initialized to zero. This takes place during the initial conditions stage.

2) Once the UE is operating on State 5A-V2X, the SNR is set to the test SNR level and the scheduling of sidelink packets (PSCCH, PSSCH and/or STCH PDCP SDU) starts. This takes place during the test procedure stage.

3) Once the scheduling of sidelink packets starts, the SS shall wait for a stability window of T=10 seconds before the first PSCCH/PSSCH/STCH PDCP SDU sample counter read.

4) Upon expiration of the stability window, the SS shall perform the first PSCCH/PSSCH/STCH PDCP SDU sample counter read (Time Point A in Figure G.8.2-1) and record the retrieved values. Then the performance session starts.

5) During the performance session the SS shall record the number of transmitted sidelink packets (PSCCH, PSSCH and/or STCH PDCP SDU) starting in Time Point A and ending in Time Point B. The performance session lasts for the Test Time defined in sections G.8.3 and G.8.4 for throughput and probability of miss-detection, respectively.

6) Once the Test Time is completed the SS shall perform a second PSCCH/PSSCH/STCH PDCP SDU sample counter read (Time Point B in Figure G.8.2-1) and record the retrieved values. The SS shall use the retrieved counter values at Time Point A and Time Point B, as well as the recorded number of transmitted sidelink packets (PSCCH, PSSCH and/or STCH PDCP SDU) between Time Point A and Time Point B, to calculate the PSCCH probability of miss-detection, the PSSCH BLER and the STCH PDCP SDU loss, respectively.

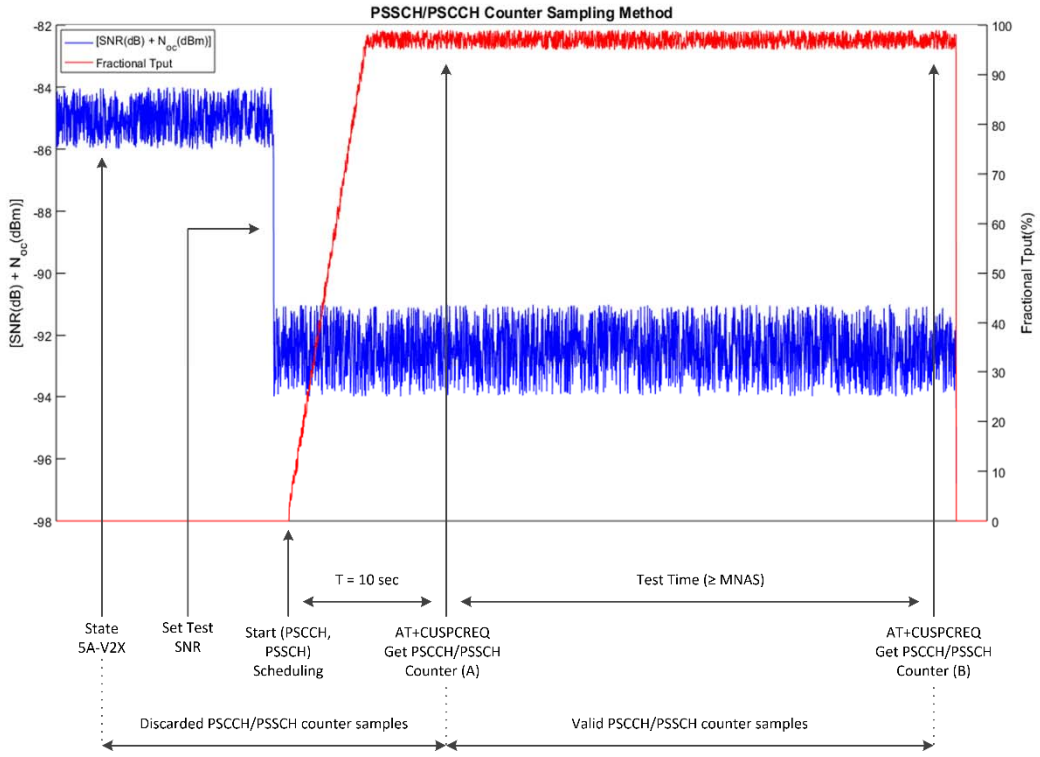



**Figure G.8.2-1: Proposed Test Method for V2V/V2X Performance Test Cases**

According to both the test method described in this section and Figure G.8.2-1 the PSCCH probability of miss-detection can be defined as follows:

$$P_{PSCCH}^{MD} = 1 - \left[\frac{PSCCH_{Counter}(B) - PSCCH_{Counter}(A)}{PSCCH_{Transmitted}}\right]$$

Similarly, we can define the PSSCH BLER as follows:

$$BLER_{PSSCH} = 1 - \left[\frac{PSSCH_{Counter}(B) - PSSCH_{Counter}(A)}{PSSCH_{Transmitted}}\right]$$

Finally, we can define the STCH PDCP SDU loss as follows:

$$Loss_{STCH_SDU} = 1 - \left[\frac{STCH_SDU_{Counter}(B) - STCH_SDU_{Counter}(A)}{STCH_SDU_{Transmitted}}\right]$$

Where:

$P^{MD}$ = Probability of Miss-Detection

BLER = Block Error Rate

$Loss_{STCH_SDU}$ = STCH PDCP SDU Loss rate

$PSCCH_{Counter}$ = PSCCH_PACKET_COUNTER

$PSSCH_{Counter}$ = PSSCH_PACKET_COUNTER

$STCH_SDU_{Counter}$ = STCH_PACKET_COUNTER

T = 10 seconds stability window

$PSCCH_{Transmitted}$ = Transmitted number of PSCCH transport blocks counted by the SS

$PSSCH_{Transmitted}$ = Transmitted number of PSSCH transport blocks counted by the SS

$STCH_SDU_{Transmitted}$ = Transmitted number of STCH PDCP SDUs counted by the SS

MNAS = Minimum Number of Active Subframes, as per Table G.8.3-1 and Table G.8.4-1 for performance tests with throughput and probability of miss-detection, respectively

## G.8.3 Test Time for V2V and V2X Performance Requirements with Throughput

The throughput requirements are tested in terms of PSSCH BLER. The maximum BLER requirement for all V2V and V2X tests is 10%. The tests are performed in a variety of AWGN and fading propagation models. For each test in Table G.8.3-1 the Test Time in Subframes is to be applied to the test method described in section G.8.2.

**Table G.8.3-1: Minimum Test Time for V2V and V2X Performance Requirements with Throughput**

| Test No | Performance Scenario | Minimum Number of Active Subframes (MNAS) | Minimum Number of Subframes (MNS)(Note 1) | Test Time in Subframes (Note 2) |
|---|---|---|---|---|
| 14.2 Test 1 | CD.8<br>(20 MHz, 8 PRB, 16QAM 1/2)<br>(1x2 Low)<br>EVA 180<br>1 PSSCH Transmission | 20 000<br>(MNAS not simulated, but conservatively estimated based on existing EVA fading scenarios with close but smaller Doppler spread) | 20 000 | 20 000 |
| 14.2 Test 2 | CD.9<br>(10 MHz, 3 PRB, QPSK 1/3)<br>(1x2 Low)<br>EVA 2700<br>2 PSSCH Transmissions | 15 000<br>(MNAS not simulated, but conservatively estimated based on existing EVA fading scenarios with close but smaller Doppler spread) | 15 000 | 30 000 |
| 14.4 Test 1 | CD.10<br>(20 MHz, 3 PRB, QPSK 3/4)<br>(1x2)<br>AWGN<br>1 PSSCH Transmission | 30 000<br>(MNAS not simulated, but conservatively estimated based on existing scenarios) | 30 000 | 30 000 |
| Note 1: The Minimum Number of Subframes is the total minimum number of subframes (active and inactive) required for this demodulation scenario and is derived from the MNAS, according to the resource pool configuration defined for each test case, [5] section 6.3.8 and to [10] section 14.1.5.<br>Note 2: The Test Time is based on the Minimum Number of Subframes (MNS) according to the formula: Test Time in Subframes = 1000*CEIL(MNS/1000). For tests with more than 1 PSSCH Transmission, the formula is: Test Time in Subframes = 1000*CEIL(MNS/1000)*Number of Transmissions. | | | | |

## G.8.4 Test Time for V2V and V2X Performance Requirements with Probability of Miss-Detection

The probability of miss-detection requirements are tested in terms of Probability of PSCCH miss-detection. The maximum Probability of PSCCH miss-detection for all V2V and V2X tests is 1%. The tests are performed in a variety of Static, AWGN and fading propagation models. For each test in Table G.8.4-1 the Test Time in Subframes is to be applied to the test method described in section G.8.2.

**Table G.8.4-1: Minimum Test Time for V2V and V2X Performance Requirements with Probability of Miss-Detection**

| Test No | Performance Scenario | Minimum Number of Active Subframes (MNAS) | Minimum Number of Subframes (MNS)(Note 1) | Test Time in Subframes (Note 2) |
|---|---|---|---|---|
| 14.3 Test 1 | CC.8<br>(10 MHz, 2 PRB, QPSK 1/3)<br>(1x2 Low)<br>EVA 1500<br>1 PSCCH Transmission | 15 000<br>(MNAS not simulated, but conservatively estimated based on existing fading scenarios with close but smaller Doppler spread) | 15 000 | 15 000 |
| 14.8 Test 1 Test 2 | CC.8<br>(20 MHz, 2 PRB, QPSK 1/3)<br>(1x2)<br>Static Channel<br>1 PSCCH Transmission | 30 000<br>(MNAS not simulated, but conservatively estimated based on existing fading scenarios) | 30 000 | 30 000 |
| Note 1: The Minimum Number of Subframes is the total minimum number of subframes (active and inactive) required for this demodulation scenario and is derived from the MNAS, according to the resource pool configuration defined for each test case, [5] section 6.3.8 and to [10] section 14.1.5.<br>Note 2: The Test Time is based on the Minimum Number of Subframes (MNS) according to the formula: Test Time in Subframes = 1000*CEIL(MNS/1000). | | | | |

# Annex H (normative): Uplink Physical Channels

## H.0 Uplink Signal Levels

Uplink signal power is a UE figure, which is configured by the Test System by means of:

RRC messages (IE-s), such as:

- UplinkPowerControlCommon (-v1020, SCell-r10),
- UplinkPowerControlDedicated (-v1020, SCell-r10),
- Other IE-s affecting directly or indirectly the uplink power,

and L1/2 Power control commands (TPC).

The uplink power settings are specified in the test case.

Otherwise, the uplink power settings result from the default RRC messages described in 3GPP TS 36.508 [7], and appropriate TPC-s, which are sent to the UE to transmit with an UL power level necessary for maintaining the call during the test.

### H.0.1 Uplink Signal Levels for NB1

Uplink signal power is a UE figure, which is configured by the Test System by means of:

RRC messages (IE-s), such as:

- NPUSCH-ConfigCommon-NB
- NPUSCH-ConfigDedicated-NB
- UplinkPowerControl-NB
- Other IE-s affecting directly or indirectly the uplink power,

The uplink power settings are specified in the test case.

Otherwise, the uplink power settings result from the default RRC messages described in 3GPP TS 36.508 [7], which are sent to the UE to transmit with an UL power level necessary for maintaining the call during the test.

## H.1 General

This annex specifies the uplink physical channels that are needed for setting a connection and channels that are needed during a connection. Table H.1-1 describes the mapping of uplink physical channels and signals to physical resources for FDD. Table H.1-2 describes the mapping of uplink physical channels and signals to physical resources for TDD.

**Table H.1-1: Mapping of uplink physical channels and signals to physical resources for FDD**

| Physical channel | Time Domain Location | Frequency Domain Location | Note |
|---|---|---|---|
| PRACH | Allowed for the parameter *prach-Configuration Index* provided by higher layers | Allowed for the parameter *prach-FrequencyOffset* provided by higher layers | Mapping rule is specified in TS 36.211 [8] Section 5.7.1 |
| DMRS | For PUCCH:<br>Symbols 2 to 4 of each slot (PUCCH format: 1, 1a, 1b)<br><br>Symbol 1 and 5 of each slot (PUCCH format: 2, 2a, 2b)<br><br>For PUSCH:<br>Symbol 3 of each slot | Uplink system bandwidth dependent. | Mapping rule of DMRS for PUCCH is specified in TS 36.211 [8] 5.5.2.2.2<br><br>Mapping rule of DMRS for PUSCH is specified in TS 36.211 [8] 5.5.2.1.2 |
| PUCCH | Slot 0 and 1 of each subframe | Each 12 subcarriers of both ends of the bandwidth | Mapping rule is specified in TS 36.211 [8] Section 5.4.3 |
| PUSCH | All remaining SC-FDMA symbols of each subframe not allocated to DMRS | RBs allocated according to Reference Measurement channel in Annex A.2 | Mapping rule is specified in TS 36.211 [8] Section 5.4.2 |
| SRS | Allowed for the cell-specific parameter *srs-BandwidthConfig* and the UE-specific parameter *srs-Bandwidth* provided by higher layers | Allowed for the cell-specific parameter *srsMaxUpPt* and the UE-specific parameter *transmissionComb* or *transmissionComb-ap* provided by higher layers | Mapping rule is specified in TS 36.211 [8] Section 5.5.3.2 |

**Table H.1-2: Mapping of uplink physical channels and signals to physical resources for TDD**

| Physical channel | Time Domain Location | Frequency Domain Location | Note |
|---|---|---|---|
| PRACH | Allowed for the parameters $(t_{RA}^0, t_{RA}^1, t_{RA}^2)$ in *prach-Configuration Index* provided by higher layers | For format 0-3, the frequency location allowed is by *prach-FrequencyOffset* and $(f_{RA})$ in *prach-Configuration Index* provided by higher layers. Preamble format 4 is mapped only on UpPTS, where the frequency location allowed is only by $(f_{RA})$ in *prach-Configuration Index* provided by higher layers. | Mapping rule is specified in TS 36.211 [8] Section 5.7.1 |
| DMRS | For PUCCH:<br>Symbols 2 to 4 of each slot (PUCCH format: 1, 1a, 1b)<br><br>Symbol 1 and 5 of each slot (PUCCH format: 2, 2a, 2b)<br><br>For PUSCH:<br>Symbol 3 of each slot | Uplink system bandwidth dependent. | Mapping rule of DMRS for PUCCH is specified in TS 36.211 [8] 5.5.2.2.2<br><br>Mapping rule of DMRS for PUSCH is specified in TS 36.211 [8] 5.5.2.1.2 |
| PUCCH | Slot 0 and 1 of each subframe | Each 12 subcarriers of both ends of the bandwidth | Mapping rule is specified in TS 36.211 [8] Section 5.4.3 |
| PUSCH | All remaining SC-FDMA symbols of each subframe not allocated to DMRS | RBs allocated according to Reference Measurement channel in Annex A.2 | Mapping rule is specified in TS 36.211 [8] Section 5.4.2 |
| SRS | Allowed for the cell-specific parameter *srs-BandwidthConfig* and the UE-specific parameter *srs-Bandwidth* provided by higher layers | Allowed for the cell-specific parameter *srsMaxUpPt* and the UE-specific parameter *transmissionComb* or *transmissionComb-ap* provided by higher layers | Mapping rule is specified in TS 36.211 [8] Section 5.5.3.2 |

NOTE: PUSCH, PUCCH, DMRS are not present in UpPTS for TDD.

### H.1.1 General for NB1

This annex specifies the uplink physical channels that are needed for setting a connection and channels that are needed during a connection. Table H.1.1-1 describes the mapping of uplink physical channels and signals to physical resources for NB1 UE.

**Table H.1.1-1: Mapping of uplink physical channels and signals to physical resources for NB1**

| Physical channel | Time Domain Location | Frequency Domain Location | Note |
|---|---|---|---|
| NPRACH | Allowed for the parameter n*prach-Configuration Index* provided by higher layers | Allowed for the parameter *nprach-SubcarrierOffset* provided by higher layers | Mapping rule is specified in TS 36.211 [8] Section 10.1.6 |
| NPUSCH | All the SC-FDMA symbols of each subframe. | RUs allocated according to Reference Measurement channel in Annex A.2 | Mapping rule is specified in TS 36.211 [8] Section 10.1.3 |

## H.2 Set-up

Table H.2-1 describes the uplink physical channels that are required for connection set up.

**Table H.2-1: Uplink Physical Channels required for connection set-up**

| Physical Channel |
|---|
| PRACH |
| DMRS |
| PUCCH |
| PUSCH |

### H.2.1 Set-up for NB1

Table H.2.1-1 describes the uplink physical channels that are required for connection set up.

**Table H.2.1-1: Uplink Physical Channels required for connection set-up**

| Physical Channel |
|---|
| NPRACH |
| NPUSCH |

## H.3 Connection

The following clauses describes the uplink physical channels that are transmitted during a connection i.e., when measurements are done.

### H.3.0 Measurement of Transmitter Characteristics

As specified in the test case. Otherwise:

- PUSCH + DMRS for PUSCH (and DMRS) measurements.
- PUCCH + DMRS for PUCCH (and DMRS) measurements.
- PRACH for PRACH measurements.

SRS for SRS measurements.

### H.3.1 Measurement of Receiver Characteristics

As specified in the test case. Otherwise:

- PUSCH + DMRS for measurements with uplink interference configured.
- PUCCH + DMRS for measurements without uplink interference configured.

### H.3.2 Measurement of Performance Requirements

As specified in the test case. Otherwise:

- PUCCH + DMRS for measurements without CSI feedback, or with CSI feedback in PUCCH mode.
- PUSCH + DMRS for measurements with CSI feedback in PUSCH mode.

## H.4 Connection for NB1

The following clauses describes the uplink physical channels that are transmitted during a connection i.e., when measurements are done.

### H.4.0 Measurement of Transmitter Characteristics

As specified in the test case. Otherwise:

- NPUSCH for measurements.
- NPRACH for PRACH measurements.

### H.4.1 Measurement of Receiver Characteristics

As specified in the test case. Otherwise:

- NPUSCH (format 2) for measurements.

### H.4.2 Measurement of Performance Requirements

As specified in the test case. Otherwise:

- NPUSCH (format 2) for measurements.

# Annex I (informative): Handling requirements and tests for different releases and UE capabilities

This annex gives guidance on how minimum requirements in different releases of 3GPP TS 36.101 [2] and different UE capabilities are handled in the specification 3GPP TS 36.521-1.

## I.1 General Considerations

Conformance tests in TS 36.521-1 are derived and specified by RAN WG5 based on minimum requirements in TS 36.101 [2] defined by RAN WG4. The actual practice of RAN WG5 is to specify conformance tests only in a single release of TS 36.521-1, capturing requirements defined by RAN WG4 in all releases of TS 36.101 [2].

1) In general the structure of TS 36.521-1 follows the structure of TS 36.101 [2].

2) In general for minimum requirements specified in a single clause in TS 36.101 [2], a corresponding conformance test is specified in a single clause in TS 36.521-1.

3) Exceptions to rule 2) occur in the following cases:

   a) Coverage of minimum requirements is too wide, in term of different test environments required for verifying all of them.

   b) Coverage of minimum requirements is too wide, in term of different features which need to be tested for verifying all of them.

   c) Coverage of minimum requirements is too wide, in term of different UE capabilities required for verifying all of them.

A set of conformance tests is generated in TS 36.521-1 based on the same clause with minimum requirements in TS 36.101 [2]. This "test group" consists in several "individual tests".

4) Exceptions to rule 2) occur also in the case when minimum requirements (including test conditions, test points etc.) are not the same in different releases of TS 36.101 [2]. More in details the differences may consist in:

   a) Different requirement values / test conditions for the same test points.

   b) Exclusion / Replacement / Addition of test points without introduction of new features

   c) Addition of test points introducing new features.

A set of conformance tests is generated in TS 36.521-1 based on the same clause with minimum requirements in TS 36.101 [2]. This set consists in one "original test" and one or several "additional tests".

5) The clause-number and the title of the "test group" / "original test" is derived based on the number and title of the corresponding minimum requirements in TS 36.101 [2], while the clause-numbers and titles of the "individual tests" / "additional tests" are derived based on those of the "test group" / "original test". In any case it should be avoided to have in TS 36.521-1 specification tests with the same title, even though they have different clause-numbers.

6) In case of high similarity between "individual tests", or between "additional tests" and "original test", in order to reduce the standardization and maintenance work the content of clauses for "individual tests" / "additional tests" may be reduced to a minimum by referencing to the analogue clauses of other "individual tests" / the "original test" and specifying the exceptions (requirement-tables, test parameter tables etc). This method should be applied very carefully considering differences in core functionalities of different E-UTRAN releases.

Details how to apply the above principles to concrete scenarios are defined in Annex I.2.

# I.2 Concrete scenarios

## I.2.1 Tests for minimum requirements varying between releases, without introduction of new features

Different minimum requirement between different releases of 3GPP TS 36.101 [2] without introduction of new features represent scenarios according to Annex I.1 bullets 4) a) and b).

In TS 36.521-1 are specified one "original test" and several "additional tests" respectively applicable to the appropriate releases. This is shown graphically in Figure I.2.1-1.

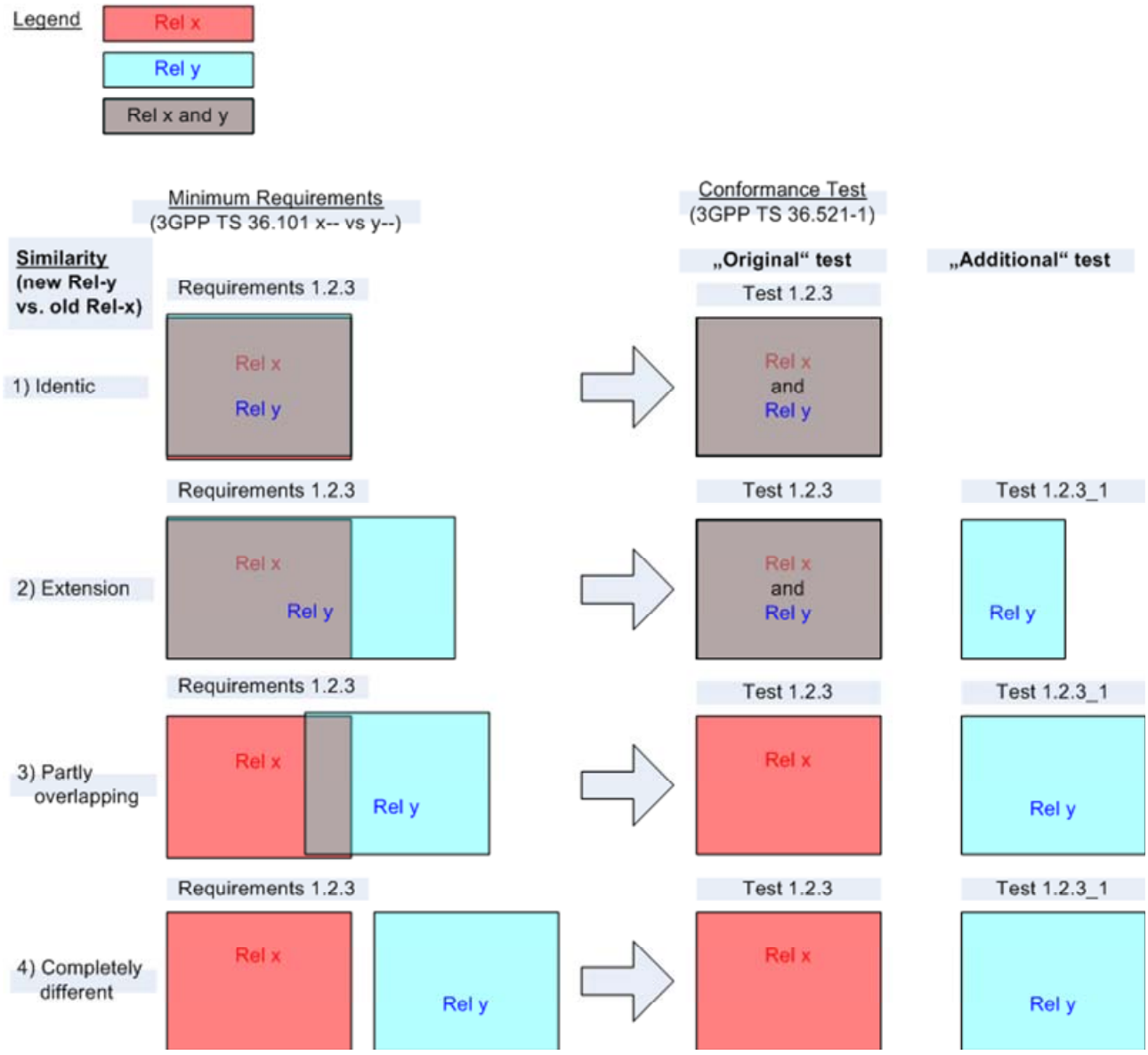



**Figure I.2.1-1: Mapping of minimum requirements to conformance tests, when minimum requirements are specified in multiple releases**

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

*Original tests:*

<x.x.x> <Test>

*Additional tests:*

<x.x.x>_<y> <Test> (<Release> <UE capability>)

**where:**

<x.x.x> = number of the original test

<y> = incrementing clause number (Arabic numeral)

<Test> = title of the original test

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

<UE capability> = optional identifier showing the UE capability, which leads to additional test. To be included only when there is already a test with the same title for the same release.

**Examples:**

1.2.3 Virtual test

1.2.3_1 Virtual test (Rel-9 and forward)

1.2.3_2 Virtual test (Rel-10 and forward)

## I.2.2 Tests for CA (Carrier aggregation)

### I.2.2.1 CA Tx tests (Chapter 6)

CA Transmitter minimum requirements in 3GPP TS 36.101 [2] are already specified in separate clauses from the legacy requirements, bearing the suffix "A" in the number and "for CA" in the title. However minimum requirements have a wide coverage in terms of Annex I.1 bullet 3).

In TS 36.521-1 are specified several separate "individual tests" for different CA scenarios and UE capabilities.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

*Test group clause:*

<x.x.x>A <Test> for CA

*Individual tests:*

<x.x.x>A.<y> <Test> for CA (<CA type> <DL/UL support> <BW Class> <Release>)

where:

<x.x.x> = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix "A" (if no legacy test available)

<y> = incrementing clause number (Arabic numeral)

<Test> = title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential suffix "for CA" (if no legacy test available)

<CA type> = mandatory identifier {intra-band contiguous; intra-band non-contiguous; inter-band}

<DL/UL support>= mandatory identifier {DL CA without UL CA; DL CA and UL CA}

<BW Class> = optional identifier showing UE CA Bandwidth class {Class B; Class C; Class D; Class E; Class F}. To be included only for intra-band contiguous scenarios, if there is already a test with the same title.

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

**Examples:**

1.2.3 Virtual test

1.2.3A Virtual test for CA

1.2.3A.1 Virtual test for CA (intra-band contiguous DL CA and UL CA)

1.2.3A.2 Virtual test for CA (inter-band DL CA and UL CA)

1.2.3A.3 Virtual test for CA (intra-band non-contiguous DL CA and UL CA)

1.2.3A.4 Virtual test for CA (3UL CA)

### I.2.2.2 CA Rx tests (Chapter 7)

Same as for Transmitter tests (Chapter 6) in Annex I.2.2.1 with following exception:

**Examples:**

1.2.3 Virtual test

1.2.3A Virtual test for CA

1.2.3A.1 Virtual test for CA (intra-band contiguous DL CA and UL CA)

1.2.3A.2 Virtual test for CA (intra-band contiguous DL CA without UL CA)

1.2.3A.3 Virtual test for CA (inter-band DL CA without UL CA)

1.2.3A.4 Virtual test for CA (intra band non-contiguous DL CA without UL CA)

1.2.3A.5 Virtual test for CA (3DL CA)

1.2.3A.6 Virtual test for CA (inter-band DL CA and UL CA)

1.2.3A.7 Virtual test for CA (4DL CA)

1.2.3A.8 Virtual test for CA (5DL CA)

### I.2.2.3 CA Performance tests (Chapter 8)

CA Performance minimum requirements in 3GPP TS 36.101 [2] are specified mostly in the same clause with the legacy requirements, as additional test points marked with CA capability identifiers. CA introduces a new feature in terms of Annex I.1 bullet 4) c). Furthermore the set of CA test points has a wide coverage in terms of Annex I.1 bullet 3).

In TS 36.521-1 are specified several separate "individual tests" for different CA scenarios and UE capabilities.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

*Test group clause:*

<x.x.x>_A <Test> for CA

*Individual tests:*

<x.x.x>_A.<y> <Test> for CA (<CA type > <DL/UL support> <Release>)

where:

<x.x.x> = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix "A" (if no legacy test available)

<y> = incrementing clause number (Arabic numeral)

<Test> = title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential "for CA" (if no legacy test available)

<CA type> = mandatory identifier {intra-band contiguous; intra-band non-contiguous; inter-band}

<DL/UL support> = mandatory identifier {DL CA}

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

**Examples:**

1.2.3 Virtual test

1.2.3_A Virtual test for CA

1.2.3_A.1 Virtual test for CA (2DL CA)

1.2.3_A.2 Virtual test for CA (3DL CA)

1.2.3_A.3 Virtual test for CA (4DL CA)

1.2.3_A.4 Virtual test for CA (5DL CA)

# I.2.3 Tests for UL-MIMO (Uplink Multiple Antenna Transmission)

## I.2.3.1 UL-MIMO Tx tests (Chapter 6)

UL-MIMO Transmitter minimum requirements in 3GPP TS 36.101 [2] are already specified in separate clauses from the legacy requirements, bearing the suffix "B" in the number and "for UL-MIMO" in the title.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

*Test group clause:*

<x.x.x>B <Test> for UL-MIMO

*Individual tests:*

<x.x.x>B.<y> <Test> for UL-MIMO (<Release>)

where:

<x.x.x> = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix "B" (if no legacy test available)

<y> = incrementing clause number (Arabic numeral)

<Test> = title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential suffix "for UL-MIMO" (if no legacy test available)

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

**Examples:**

| | |
|---|---|
| 1.2.3 | Virtual test |
| 1.2.3B | Virtual test for UL-MIMO |

### I.2.3.2 UL-MIMO Rx tests (Chapter 7)

Same as for Transmitter tests (Chapter 6) in Annex I.2.3.1.

## I.2.4 Tests for eDL-MIMO (Enhanced Downlink Multiple Antenna Transmission)

### I.2.4.1 eDL MIMO Performance tests (Chapter 8)

eDL MIMO Performance minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from the legacy requirements. In some cases the minimum requirements have a wide coverage in terms of Annex I.1 bullet 3) a) with respect of the presence of a simultaneous interfering transmission a) with respect of the presence of a simultaneous interfering transmission.

In TS 36.521-1 are specified several separate "individual tests" for eDL-MIMO.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

*Test group clause:*

| | |
|---|---|
| <x.x.x>_D | <Test> for eDL-MIMO |

*Individual tests:*

| | |
|---|---|
| <x.x.x>_D.<y> | <Test> for eDL-MIMO (<Release>) |

where:

| | |
|---|---|
| <x.x.x> | = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix (if no legacy test available). |
| <y> | =optional incrementing clause number (Arabic numeral) (if many individual tests). |
| <Test> | = title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential suffix potential suffix (if no legacy test available). |
| <Release> | = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases. |

**Examples:**

| | |
|---|---|
| 1.2.4 | Virtual test |
| 1.2.4_D | Virtual test for eDL-MIMO |

### I.2.4.2 eDL MIMO CSI tests (Chapter 9)

eDL MIMO CSI minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from legacy requirements.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

*Test group clause:*

<x.x.x>_D <Test> for eDL-MIMO

*Individual tests:*

<x.x.x>_D.<y> <Test> for eDL-MIMO (<Release>)

where:

<x.x.x> = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix (if no legacy test available).

<y> =optional incrementing clause number (Arabic numeral) (if many individual tests).

<Test> = title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential suffix (if no legacy test available).

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

**Examples:**

1.2.4 Virtual test

1.2.4_D Virtual test for eDL-MIMO

## I.2.5 Tests for eICIC (Enhanced Intercarrier Interference Cancellation / Coordination)

### I.2.5.1 eICIC Performance tests (Chapter 8)

eICIC Performance minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from the legacy requirements. The set of eICIC test points have a wide coverage in terms of Annex I.1 bullet 3)a) with respect of the ABS type (Non-MBSFN / MBSFN). In TS 36.521-1 are specified several separate "individual tests" for eICIC.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

*Test group clause:*

<x.x.x>_C <Test> for eICIC

*Individual tests:*

<x.x.x>_C.<y> <Test> for eICIC (<ABS-type> <Release>)

where:

<x.x.x> = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix (if no legacy test available).

<y> =optional incrementing clause number (Arabic numeral) (if many individual tests).

<Test> = title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential suffix (if no legacy test available).

<ABS-Type> = mandatory identifier {non-MBSFN ABS, MBSFN ABS}

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

**Examples:**

1.2.4 Virtual test

1.2.4_C Virtual test for eICIC

1.2.4_C.1 Virtual test for eICIC (non-MBSFN ABS)

1.2.4_C.2 Virtual test for eICIC (MBSFN ABS)

### I.2.5.2 eICIC CSI tests (Chapter 9)

Same as for Performance tests (Chapter 8) in Annex I.2.5.1.

## I.2.6 Tests for feICIC (Further Enhanced Non CA-based ICIC for LTE)

### I.2.6.1 feICIC Performance tests (Chapter 8)

feICIC Performance minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from the legacy requirements. The set of feICIC test points have a wide coverage in terms of Annex I.1 bullet 3)a) with respect of the ABS type (Non-MBSFN / MBSFN). In TS 36.521-1 are specified several separate "individual tests" for feICIC.

Rule:

Following tests and clauses are specified in TS 36.521-1:

*Test group clause:*

<x.x.x>_E<Test> for feICIC

*Individual tests:*

<x.x.x>_E.<y> <Test> for feICIC (<ABS-type> <Release>)

where:

<x.x.x> = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix (if no legacy test available).

<y> =optional incrementing clause number (Arabic numeral) (if many individual tests).

<Test> = title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential suffix (if no legacy test available).

<ABS-Type> = mandatory identifier {non-MBSFN ABS, MBSFN ABS}

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

Examples:

1.2.6 Virtual test

1.2.6_E Virtual test for feICIC

1.2.6_E.1 Virtual test for feICIC (non-MBSFN ABS)

1.2.6_E.2 Virtual test for eICIC (MBSFN ABS)

### I.2.6.2 feICIC CSI tests (Chapter 9)

Same as for Performance tests (Chapter 8) in Annex I.2.6.1.

# I.2.7 Tests for DL ComP (Downlink Coordinated Multipoint Transmission)

## I.2.7.1 CoMP Performance tests (Chapter 8)

CoMP Performance minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from the legacy requirements. The set of CoMP test points may have a wide coverage in terms of Annex I.1 bullet 3)a) with respect of the number of CSI processes (Single / Multiple CSI process) etc. In such cases in TS 36.521-1 are specified several separate "individual tests" for CoMP.

Rule:

Following tests and clauses are specified in TS 36.521-1:

*Test (group) clause:*

<x.x.x>_F <Test> for CoMP

*Individual tests:*

<x.x.x>_F.<y> <Test> < CSI Process number > for CoMP (<Release>)

where:

| | |
|---|---|
| <x.x.x> | = number derived from TS 36.101. |
| <y> | = optional incrementing clause number (Arabic numeral) (if many individual tests). |
| <Test> | = title derived from TS 36.101. |
| <CSI Process number> | = optional identifier {with Single CSI process, with Multiple CSI processes} (if many individual tests) |
| <Release> | = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases. |

Examples:

| | |
|---|---|
| 1.2.3 | Virtual test |
| 1.2.3_F | Virtual test for CoMP |
| 1.2.3_F.1 | Virtual test with Single CSI process for CoMP |
| 1.2.3_F.2 | Virtual test with Multiple CSI processes for CoMP |

## I.2.7.2 CoMP CSI tests (Chapter 9)

Same as for Performance tests (Chapter 8) in Annex I.2.7.1.

# I.2.8 Tests for Further eDL-MIMO (Enhanced Downlink Multiple Antenna Transmission) Enhancement for LTE-A

## I.2.8.1 eDL MIMO Enhancement CSI tests (Chapter 9)

Further eDL MIMO Enhancement for LTE-A CSI minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from the legacy requirements.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

<x.x.x> <Test> for eDL-MIMO Enhancement

*Individual tests:*

<x.x.x>< _y> <Test> for eDL-MIMO Enhancement (<Release>)

where:

<x.x.x> = number derived from the corresponding requirement clause in TS 36.101.

<_y> = optional incrementing clause number (Arabic numeral) with preceding underscore. To be applied only when there is already a test with the same title for earlier releases.

<Test> = title derived from the corresponding requirement clause in TS 36.101.

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

**Examples:**

1.2.3 Virtual test for eDL-MIMO Enhancement

1.2.3_1 Virtual test for eDL-MIMO Enhancement (Rel-13 and forward)

# I.2.9 Tests for UE category 0

## I.2.9.1 UE category 0 Tx tests (Chapter 6)

UE category 0 specific Transmitter minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from the legacy requirements, bearing the suffix "E" in the number and "for UE category 0" in the title. In other cases where no category 0 specific requirements exist, the legacy requirements apply. To maintain consistency all test cases for UE category 0 to be specified in TS 36.521-1 are handled similarly.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

<x.x.x>E <Test> for UE category 0

<x.x.x>E<_y> <Test> for UE category 0 (<Release>)

where:

<x.x.x> = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix "E" (if no legacy test available)

<_y> = optional incrementing clause number (Arabic numeral) with preceding underscore. To be applied only when there is already a test with the same title for earlier releases.

<Test> = title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential "for UE category 0" (if no legacy test available)

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

**Examples:**

| | |
|---|---|
| 1.2.3 | Virtual test |
| 1.2.3E | Virtual test for UE category 0 |
| 1.2.3E_1 | Virtual test for UE category 0 (Rel-13 and forward) |

### I.2.9.2 UE category 0 Rx tests (Chapter 7)

Same as for Transmitter tests (Chapter 6) in Annex I.2.9.1.

### I.2.9.3 UE category 0 Performance tests (Chapter 8)

UE category 0 Performance minimum requirements in 3GPP TS 36.101 [2] are already specified in separate clauses from the legacy requirements.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

| | |
|---|---|
| <x.x.x> | <Test> for UE category 0 |
| <x.x.x><_y> | <Test> for UE category 0 (<Release>) |

where:

| | |
|---|---|
| <x.x.x> | = number derived from the corresponding requirement clause in TS 36.101 |
| <_y> | = optional incrementing clause number (Arabic numeral) with preceding underscore. To be applied only when there is already a test with the same title for earlier releases. |
| <Test> | = title derived from the corresponding requirement clause in TS 36.101 |
| <Release> | = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases. |

**Examples:**

| | |
|---|---|
| 1.2.3 | Virtual test for UE category 0 |
| 1.2.3_1 | Virtual test for UE category 0 (Rel-13 and forward) |

### I.2.9.4 UE category 0 CSI tests (Chapter 9)

Same as for Performance tests (Chapter 8) in Annex I.2.9.3.

## I.2.9A Tests for UE category M1

### I.2.9A.1 UE category M1 Tx tests (Chapter 6)

UE category M1 specific Transmitter minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from the legacy requirements, bearing the suffix "E" in the number and "for UE category M1" in the title. Suffix “E” is also used for UE category 0. In other cases, where no category M1 specific requirements exist, the legacy requirements apply. To maintain consistency all test cases for UE category M1 to be specified in TS 36.521-1 are handled similarly, but suffix "EA" is used to distinguish from UE category 0 test cases using suffix "E".

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

| | |
|---|---|
| <x.x.x>EA | <Test> for UE category M1 |

<x.x.x>EA<_y> <Test> for UE category M1 (<CEMode><Release>)

where:

<x.x.x> = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix "E" (if no legacy test available)

<_y> = optional incrementing clause number (Arabic numeral) with preceding underscore. To be applied only when there is already a test for CEModeA or a test with the same title for earlier releases.

<Test> = title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential "for UE category M1" (if no legacy test available)

<CEMode> = optional identifier showing the CEMode applicability of the test. Can only take value CEModeB and is applied only if a corresponding CEModeA test exists.

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

**Examples:**

1.2.3 Virtual test

1.2.3EA Virtual test for UE category M1

1.2.3EA_1 Virtual test for UE category M1 (Rel-13 and forward)

## I.2.9A.2 UE category M1 Rx tests (Chapter 7)

Same as for Transmitter tests (Chapter 6) in Annex I.2.9A.1.

## I.2.9A.3 UE category M1 Performance tests (Chapter 8)

UE category M1 Performance minimum requirements in 3GPP TS 36.101 [2] are already specified in separate clauses from the legacy requirements.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

<x.x.x> <Test> for UE category M1

<x.x.x><_y> <Test> for UE category M1 (<CEMode><Release>)

where:

<x.x.x> = number derived from the corresponding requirement clause in TS 36.101

<_y> = optional incrementing clause number (Arabic numeral) with preceding underscore. To be applied only when there is already a test for CEModeA or a test with the same title for earlier releases.

<Test> = title derived from the corresponding requirement clause in TS 36.101

<CEMode> = optional identifier showing the CEMode applicability of the test. Can only take value CEModeB and is applied only if a corresponding CEModeA test exists.

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

**Examples:**

1.2.3 Virtual test for UE category M1

1.2.3_1 Virtual test for UE category M1 (Rel-13 and forward)

### I.2.9A.4 UE category M1 CSI tests (Chapter 9)

Same as for Performance tests (Chapter 8) in Annex I.2.9A.3.

## I.2.9B Tests for UE category M2

### I.2.9B.1 UE category M2 Tx tests (Chapter 6)

UE category M2 specific Transmitter minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from the legacy requirements and category M1 requirements, bearing the suffix "E" in the number and "for UE category M2" in the title. Suffix “E” is also used for UE category 0. In other cases, where no category M2 specific requirements exist, the legacy requirements apply. To maintain consistency all test cases for UE category M2 to be specified in TS 36.521-1 are handled similarly, but suffix "EC" is used to distinguish from UE category 0 test cases using suffix "E", category M1 test cases using suffix "EA" and category 1bis test cases using suffix “EB”.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

<x.x.x>EC <Test> for UE category M2

<x.x.x>EC<_y> <Test> for UE category M2 (<CEMode><Release>)

where:

<x.x.x> = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix "E" (if no legacy test available)

<_y> = optional incrementing clause number (Arabic numeral) with preceding underscore. To be applied only when there is already a test for CEModeA or a test with the same title for earlier releases.

<Test> = title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential "for UE category M2" (if no legacy test available)

<CEMode> = optional identifier showing the CEMode applicability of the test. Can only take value CEModeB and is applied only if a corresponding CEModeA test exists.

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

**Examples:**

1.2.3 Virtual test

1.2.3EC Virtual test for UE category M2

1.2.3EC_1 Virtual test for UE category M2 (Rel-14 and forward)

### I.2.9B.2 UE category M2 Rx tests (Chapter 7)

Same as for Transmitter tests (Chapter 6) in Annex I.2.9B.1.

### I.2.9B.3 UE category M2 Performance tests (Chapter 8)

UE category M2 Performance minimum requirements in 3GPP TS 36.101 [2] are already specified in separate clauses from the legacy requirements.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

<x.x.x> <Test> for UE category M2

<x.x.x><_y> <Test> for UE category M2 (<CEMode><Release>)

where:

<x.x.x> = number derived from the corresponding requirement clause in TS 36.101

<_y> = optional incrementing clause number (Arabic numeral) with preceding underscore. To be applied only when there is already a test for CEModeA or a test with the same title for earlier releases.

<Test> = title derived from the corresponding requirement clause in TS 36.101

<CEMode> = optional identifier showing the CEMode applicability of the test. Can only take value CEModeB and is applied only if a corresponding CEModeA test exists.

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

**Examples:**

1.2.3 Virtual test for UE category M2

1.2.3_1 Virtual test for UE category M2 (Rel-14 and forward)

### I.2.9B.4 UE category M2 CSI tests (Chapter 9)

Same as for Performance tests (Chapter 8) in Annex I.2.9B.3.

## I.2.10 Tests for SCE-L1 (Small Cell Enhancements-Physical layer)

### I.2.10.1 SCE-L1 Receiver tests (Chapter 7)

The set of 256QAM test points may have a wide coverage in terms of Annex I.1 bullet 3)c) with respect of the different UE capabilities (UE category 11-16), modulation mode and coding rate required and Annex I.1 bullet 4)a)etc with the addition of new requirements and new defined RMC for SCE-L1. In such cases in TS 36.521-1 are specified several separate "individual tests" for SCE-L1.

Rule:

Following tests and clauses are specified in TS 36.521-1:

*Test (group) clause:*

<x.x.x>_H <Test> for SCE-L1

*Individual tests:*

<x.x.x>_H.<y> <Test> for SCE-L1 (<Release>)

where:

<x.x.x> = number derived from TS 36.101.

<y> = optional incrementing clause number (Arabic numeral) (if many individual tests).

<Test> = title derived from TS 36.101.

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

Examples:

| | |
|---|---|
| 1.2.3 | Virtual test |
| 1.2.3_H | Virtual test for SCE-L1 |

## I.2.10.2 SCE-L1 Performance tests (Chapter 8)

The set of 256QAM test points may have a wide coverage in terms of Annex I.1 bullet 3)c) with respect of the different UE capabilities (UE category 11-16) and demodulation mode required and Annex I.1 bullet 4)c)etc with the addition of new test points introducing new features of 256QAM for SCE-L1. In such cases in TS 36.521-1 are specified several separate "individual tests" for SCE-L1.

Rule:

Following tests and clauses are specified in TS 36.521-1:

*Test (group) clause:*

<x.x.x>_H <Test> for SCE-L1

*Individual tests:*

<x.x.x>_H.<y> <Test> for SCE-L1 (<Release>)

where:

| | |
|---|---|
| <x.x.x> | = number derived from TS 36.101. |
| <y> | = optional incrementing clause number (Arabic numeral) (if many individual tests). |
| <Test> | = title derived from TS 36.101. |
| <Release> | = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases. |

Examples:

| | |
|---|---|
| 1.2.3 | Virtual test |
| 1.2.3_H | Virtual test for SCE-L1 |
| 1.2.3_H.1 | Virtual test for SCE-L1(Single Carrier) |
| 1.2.3_H.2 | Virtual test for SCE-L1(2DL CA) |
| 1.2.3_H.3 | Virtual test for SCE-L1(3DL CA) |

## I.2.10.3 SCE-L1 CSI tests (Chapter 9)

SCE-L1 Performance minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from the legacy requirements. The set of SCE-L1 test points may have a wide coverage in terms of Annex I.1 bullet 3)b) and c) etc. In such cases in TS 36.521-1 are specified several separate "individual tests" for SCE-L1.

Rule:

Following tests and clauses are specified in TS 36.521-1:

*Test (group) clause:*

<x.x.x>_H <Test> for SCE-L1

*Individual tests:*

<x.x.x>_H.<y> <Test> for SCE-L1 (<Release>)

where:

| | |
|---|---|
| <x.x.x> | = number derived from TS 36.101. |
| <y> | = optional incrementing clause number (Arabic numeral) (if many individual tests). |
| <Test> | = title derived from TS 36.101. |
| <Release> | = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases. |

Examples:

| | |
|---|---|
| 1.2.3 | Virtual test |
| 1.2.3_H | Virtual test for SCE-L1 |

# I.2.11 Tests for ProSe

## I.2.11.1 ProSe Tx tests (Chapter 6)

ProSe specific Transmitter minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from the legacy requirements, bearing the suffix "D" in the number and "for ProSe" in the title. The set of ProSe test points may have a wide coverage in terms of Annex I.1 bullet 3)b) and c) with respect of type of ProSe operation and UE capability (Discovery / Communication) etc. In such cases in TS 36.521-1 are specified several separate "individual tests" for ProSe.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

<x.x.x>D <Test> for ProSe

<x.x.x>D<.y><_z> <Test> for ProSe <Mode> (<Release>)

where:

<x.x.x> = number derived from TS 36.101 without suffix "D"

<.y> = incrementing clause number (Arabic numeral).

<_z> = optional incrementing clause number (Arabic numeral) with preceding underscore. To be applied only when there is already a test with the same title for earlier releases.

<Test> = title derived from TS 36.101 without "for ProSe"

<Mode> = mandatory identifier {Direct Discovery; Direct Communication}

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

**Examples:**

1.2.3D Virtual test for ProSe

1.2.3D.1 Virtual test for ProSe Direct Discovery

1.2.3D.2 Virtual test for ProSe Direct Communication

1.2.3D.2_1 Virtual test for ProSe Direct Communication (Release 13 and forward)

## I.2.11.2 ProSe Rx tests (Chapter 7)

Same as for Transmitter tests (Chapter 6) in Annex I.2.11.1.

## I.2.11.3 ProSe Performance tests (Chapter 8)

ProSe Performance minimum requirements in 3GPP TS 36.101 [2] are already specified in separate clauses from the legacy requirements.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

FFS

## I.2.11.4 ProSe CSI tests (Chapter 9)

Same as for Performance tests (Chapter 8) in Annex I.2.11.3.

# I.2.12 Tests for 4 Rx antenna ports

## I.2.12.1 4 Rx antenna ports Rx tests (Chapter 7)

4 Rx antenna ports minimum requirements in 3GPP TS 36.101 [2] are specified in the same clauses as the legacy requirements. The reference sensitivity requirements in section 7.3 are separate from the old test, but the rest of the Receiver tests have the same requirements as the old tests (tested at a level based on REFSENS). But since the test points are different, new variant test cases are still needed.

In TS 36.521-1 separate 2Rx and 4Rx tests are specified for Rel8 and Rel9 tests, but 4Rx is added to the existing tests starting from Rel10 test cases.

**Rule:**

Following tests and clauses are specified in TS 36.521-1:

*Test group before introducing 4Rx:*

<x.x.x> <Test> (Rel8 or Rel9)

<y.y.y> <Test> (Rel10 or later)

*Test group after introducing 4Rx:*

<x.x.x> <Test> for 2Rx

<x.x.x>_1 <Test> for 4Rx

<y.y.y> <Test> for 2Rx and 4Rx

where:

<x.x.x> = number of the corresponding legacy test.

<y> = incrementing clause number (Arabic numeral)

<Test> = title of the corresponding legacy test

(Release) = Release applicability (applicable from), which is not part of the title

**Examples:**

1.2.3 Virtual test (Rel8)

1.2.3_1 Virtual test with 4 Rx antenna ports (Rel10)

1,2,4 Virtual test (Rel10)

## I.2.12.2 4 Rx antenna ports Performance tests (Chapter 8)

4 Rx antenna ports Performance minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from the legacy requirements. Separate test cases for 4Rx antenna ports are needed in TS 36.521-1 with test case numbering following TS 36.101[2] numbering,

## I.2.12.3 4 Rx antenna ports CSI tests (Chapter 9)

TBD

# Annex J (normative): Modified MPR behaviour

Editor's note: The *modifiedMPRbehavior* is given in the Annex H.1 of TS 36.101.

## J.1 Indication of modified MPR behaviour

This annex contains the definitions of the bits in the field *modifiedMPRbehavior* indicated in the IE UE Radio Access Capability [5] by a UE supporting an MPR or A-MPR modified in a later release of this specification.

**Table J.1-1: Definitions of the bits in the field *modifiedMPRbehavior* (Rel-10 and Rel-11)**

| Index of field (bit number) | Definition (description of the supported functionality if indicator set to one) | Notes |
|---|---|---|
| 0 (leftmost bit) | The MPR for intra-band contiguous carrier aggregation bandwidth class C with non-contiguous resource allocation specified in Clause 6.2.3A in version 12.5.0 of TS36.101[2] | This bit can be set to 1 by a UE supporting intra-band contiguous CA bandwidth class C |
| 1 | The A-MPR associated with NS_05 for Band 1 in Clause 6.2.4 in version 12.10.0 of TS36.101[2] | This bit can be set to 1 by a UE supporting A-MPR associated to NS_05 for Band 1 |

**Table J.1-2: Definitions of the bits in the field *modifiedMPRbehavior* (Rel-12 and Rel-13)**

| Index of field (bit number) | Definition (description of the supported functionality if indicator set to one) | Notes |
|---|---|---|
| 0 (leftmost bit) | The MPR for intra-band contiguous carrier aggregation bandwidth class C with non-contiguous resource allocation specified in Clause 6.2.3A in version 12.5.0 of TS36.101 [2] | This bit shall be set to 1 by a UE supporting intra-band contiguous CA bandwidth class C |
| 1 | The A-MPR associated with NS_05 for Band 1 in Clause 6.2.4 in version 12.10.0 of TS36.101[2] | This bit shall be set to 1 by a UE supporting A-MPR associated to NS_05 for Band 1 |
| 2 | The A-MPR associated with NS_04 for Band 41 in Table 6.2.4-4 in version 14.2.0 of this specification. | This bit can be set to 1 by a power class 3 UE supporting A-MPR associated to NS_04 for Band 41. |

**Table J.1-3: Definitions of the bits in the field *modifiedMPRbehavior* (Rel-14 and later)**

| Index of field (bit number) | Definition (description of the supported functionality if indicator set to one) | Notes |
|---|---|---|

| | | |
|---|---|---|
| 0 (leftmost bit) | The MPR for intra-band contiguous carrier aggregation bandwidth class C with non-contiguous resource allocation specified in Clause 6.2.3A in version 12.5.0 of TS36.101 [2] | This bit shall be set to 1 by a UE supporting intra-band contiguous CA bandwidth class C |
| 1 | The A-MPR associated with NS_05 for Band 1 in Clause 6.2.4 in version 12.10.0 of TS36.101[2] | This bit shall be set to 1 by a UE supporting A-MPR associated to NS_05 for Band 1 |
| 2 | The A-MPR associated with NS_04 for Band 41 in Table 6.2.4-4 in version 14.2.0 of this specification. | This bit shall be set to 1 by a power class 3 UE supporting A-MPR associated to NS_04 for Band 41. |

# Annex K (normative): NB-IoT Test Frequencies

## K.1 NB-IoT Test frequencies for TRx Tests

Testing frequencies for all NB-IoT TRx test cases (sections 6 and 7 in TS 36.521-1) should be selected across the bands UE supports from any of the following subclauses indicated by each test case.

For transmitter test cases (section 6 in TS 36.521-1), UL frequencies should be considered on the test frequency selection algorithm described above, while DL frequencies should be used for receiver test cases (section 7 in TS 36.521-1).

Refer to TS 36.508 [7] section 8.1.3.1 for testing frequencies associated to each frequency band and each operation mode.

### K.1.1 Test frequencies selection criteria 1

Among all frequency bands ranges below 1GHz supported by the UE, testing points are defined as:

- @ low range of the lowest supported band
- @ high range of the highest supported band

If the UE does not support any frequency band below 1GHz, these test points are not applicable.

Among all frequency bands ranges above 1GHz supported by the UE, testing points are defined as:

- @ low range of the lowest supported band
- @ high range of the highest supported band

If the UE does not support any frequency band above 1GHz, these test points are not applicable.

### K.1.2 Test frequencies selection criteria 2

Among all frequency bands ranges below 1GHz supported by the UE, testing points are defined as:

- @ low range of the lowest supported band
- @ high range of the highest supported band
- All mid range of all supported mid bands (supported bands between lowest supported band and highest supported band below 1GHz)

If the UE does not support any frequency band below 1GHz, these test points are not applicable.

Among all frequency bands ranges above 1GHz supported by the UE, testing points are defined as:

- @ low range of the lowest supported band
- @ high range of the highest supported band
- All mid range of all supported mid bands (supported bands between lowest supported band and highest supported band above 1GHz)

If the UE does not support any frequency band above 1GHz, these test points are not applicable.

### K.1.3 Test frequencies selection criteria 3

Among all frequency bands ranges supported by the UE, testing points are defined as:

- @ low range of each supported band
- @ high range of each supported band

## K.2 NB-IoT Test frequencies for Demodulation Tests

Testing frequencies for all NB-IOT demodulation (Section 8 and 9 in TS 36.521-1) should be selected across the bands UE supports from any of the following subclauses indicated by each test case.

For NB-IOT demodulation (section 8 and 9 in TS 36.521-1) DL frequencies should be used from the frequency selection algorithm described below.

Refer to section 8.1.3.1 in TS 36.508 [7] for testing frequencies associated to each frequency band and each operation mode.

### K.2.1 Test frequencies selection criteria 1

Among all frequency bands ranges supported by the UE, testing points are defined as:

- @ mid range of any one of the NB1 and NB2 UE supported band

# Annex L (informative): Change history

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Date** | **TSG #** | **TSG Doc.** | **CR** | **Rev** | **Subject/Comment** | **Old** | **New** |
| 2007-08 | RAN5 #36 | R5-072185 | | | Skeleton proposed for RAN5#36Athens | | 0.0.1 |
| 2007-08 | RAN5 #36 | R5-072419 | | | Update the skeleton base on R4-071234_TR36.803.0.4.0.doc | 0.0.1 | 0.0.2 |
| 2007-08 | RAN5 #36 | R5-072424 | | | Update with editorial changes | 0.0.2 | 0.0.3 |
| 2007-11 | RAN5 #37 | R5-073043 | | | Update document with some info as following:<br>Section 5: Frequency band information<br>Section 6.2: Maximum output power<br>Section 6.5: Output RF spectrum emissions<br>Section 6.5.1: Occupied bandwidth<br>Section 6.5.2: Out of band emission<br>Section 6.5.3: Spurious emissions | 0.0.3 | 0.0.4 |
| 2007-11 | RAN5 #37 | R5-073360 | | | Editorial change to split MOP and UE Power classes | 0.0.4 | 0.0.5 |
| 2008-03 | RAN5 #38 | R5-080069 | | | Editorial changes to sync up with 36.101 v1.0.0 as much as feasible for the moment:<br>Update definitions, symbols and abbreviations<br>Update frequency bands, channel bandwidth, channel numbers information.<br>Restructure document to move “frequency error” sub-section inside Transmit signal quality.<br>Add “additional spectrum Emission Mask” sub-test (mask A,B,C) section to address the regulatory requirements that are not met with the general mask (OOB and spurious emission).<br>Add “Additional ACLR requirements” to address additional requirements that the network might indicate to the UE via signalling for a specific deployment scenario (in terms of additional requirements for UTRA/ACLR2<br>Restructure “Spurious Emission” to indicate we need to have 3 test cases to address: “E-UTRA Spurious Emission” requirements , “Spurious Emission band UE co-existence” requirements, and “Additional spurious emissions” requirements<br>Separate wide band and narrow band intermodulation in the intermodulation characteristics | 0.0.5 | 0.0.6 |
| 2008-03 | RAN5 #38 | R5-080408 | | | LTE Reference Sensitivity test Text proposal | | 0.0.7 |
| 2008-03 | RAN5 #38 | R5-080409 | | | LTE Maximum Rx input level test Text proposal | | 0.0.7 |
| 2008-03 | RAN5 #38 | R5-080410 | | | LTE Adjacent Channel Selectivity test Text proposal | | 0.0.7 |
| 2008-03 | RAN5 #38 | R5-080064 | | | LTE RF Receiver tests, General section Text proposal | | 0.0.7 |
| 2008-03 | RAN5 #38 | R5-080412 | | | LTE RF: transmission modulation initial EVM test proposal | | 0.0.7 |
| 2008-03 | RAN5 Workshop-UE LTE Test (9-11 April) | R5w0800027 | | | Modify styles and formats of tables and others according to drafting rules.<br>Add some definitions and abbreviations<br>Modified section 6.2 structure to be aligned with 36.101 v8.1.0<br>Modify tables of requirements to remove 1.6 MHz and 3.2MHz channel bandwidth according to new requirements 36.101 v8.1.0 | | 0.0.9 |
| 2008-03 | RAN5 Workshop-UE LTE Test (9-11 April) | R5w0800028 | | | Following TPs have been included:<br>R5w080013r1<br>R5w080014r1<br>R5w080008r2<br>R5w080009r2<br>R5w080040r1<br>R5w080015r1<br>R5w080016r1<br>R5w080017r1<br>R5w080018r2 | 0.0.9 | 0.1.0 |
| 2008-05 | RAN5#39 | R5-081046 | | | 36-521-1 alignment of measurement state for test cases | 0.1.0 | 0.1.1 |

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|---|---|---|---|---|---|---|---|
| 2008-05 | RAN5#39 | R5-081042 | | | Following approved TPs have been included:<br>R5-081040 36.521-1 after April LTE-RF workshop<br>R5-081415 36-521-1 alignment of measurement state for test cases – also the measurement state for each test cases has been updated according to R5-081404<br>R5-081416 Cover for LTE E-UTRAN RRC_IDLE State Mobility text proposal<br>R5-081417 Cover for LTE E-UTRAN RRC_CONNECTED State Mobility text proposal<br>R5-081404 LTE Rx Intermodulation test case text proposal<br>R5-081409 Annex structure for Measurement uncertainty & Test Tools<br>R5-081405 Text Proposal for TS 36.521-1 TC7.6 Blocking Characteristics<br>R5-081406 Text Proposal for TS 36.521-1 TC7.7 Spurious Response<br>R5-081403 Text Proposal for TS 36.521-1 TC7.9 Spurious Emissions<br>R5-081410 Uncertainties and Test Tools for subset of UE tests<br>R5-081331 Clarification of diversity characteristics section for multiple UE antennas<br>R5-081335 36-521-1 update of nominal and additional channel bandwidths | 0.1.1 | 0.2.0 |
| 2008-06 | RAN5 #39bis | R5-082029 | | | Following approved TPs have been included:<br>R5-082129: Restructure of TS 36.521-1 and RRM proposal (Split of RRM from 36.521-1 v0.2.0 in its own specification 36.521-3.)<br>R5-082166: Text Proposal for Annex C Downlink Physical Channels<br>R5-082130: Text Proposal for Chan bandwidths in TS 36.521-1<br>R5-082155: Text Proposal for LTE Tx Minimum Output Power<br>R5-082027: Text Proposal for Occupied bandwidth in TS 36.521-1<br>R5-082171: Text Proposal for LTE Adjacent Channel Leakage power Ratio<br>R5-082134: Text Proposal for LTE Tx Spurious Emissions<br>R5-082135: Text Proposal for LTE UE Maximum Output Power<br>R5-082136: Text Proposal for LTE Spectrum Emission Mask<br>R5-082138: UE Spurious Emissions Measurement uncertainty & Test Tolerances<br>R5-082169: LTE Spectrum Emission Mask test uncertainties and TTs<br>R5-082151: LTE UE Max Power and ACLR tests uncertainties and TTs<br>R5-082152: Text proposal for LTE Transmit OFF Power<br>R5-082153: LTE UE Max Rx Input and ACS test cases update<br>R5-082082: LTE Rx Intermodulation test case uncertainties and TTs<br>R5-082093: Text Proposal for TS 36.521-1 TC7.6 Blocking Characteristics<br>R5-082154: Text Proposal for TS 36.521-1 TC7.7 Spurious Response<br>R5-082167: OBW Measurement uncertainty & Test Tolerances<br>R5-082158: Cover for LTE Performance Requirement text proposal<br>R5-082159: Text Proposal for LTE Demodulation of PCFICH/PDCCH and PHICH<br>R5-082156: Text proposal for LTE Tx Minimum Output Power Uncertainty<br>R5-082157: Text proposal for LTE Tx Minimum Output Power Tolerance<br>R5-082164: Statistical testing of receiver characteristics<br>R5-082170: Cover for LTE Propagation Conditions Text Proposal<br>Editorial changes to align tables and figures numbering with R5-082025 | 0.2.0 | 0.3.0 |

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|---|---|---|---|---|---|---|---|
| 2008-08 | RAN5 #40 | R5-083163 | | | Following approved TPs have been included:<br>R5-083804: LTE Demodulation Performance text proposal<br>R5-083159: LTE-RF Occupied bandwidth test case / measurement uncertainty and TT text proposal<br>R5-083160: Transmission OFF power: TP, measurement uncertainty and test tolerances proposal<br>R5-083805: Frequency Error test case / measurement uncertainty and TT test proposal<br>R5-083162: Propagation conditions correction text proposal<br>R5-083220:Text Proposal for LTE Tx Minimum Output Power<br>R5-083806: TP of section 8 for E-UTRAN TDD in 36.521-1<br>R5-083344: Test Tolerance and System uncertainty for OBW test<br>R5-083848:Test Tolerance and System uncertainty for Reference sensitivity test<br>R5-083840: Test Tolerances for Spectrum Emission Mask<br>R5-083808: Reference Measurement Channel for LTE UE Receiver tests<br>R5-083350: Test Tolerance and System uncertainty for Blocking and Spurious response<br>R5-083366: Text Proposal for LTE Reporting of CQI/PMI<br>R5-083810: LTE PBCH Demodulation Performance Requirements<br>R5-083482: LTE-RF TP for Test Case 7.6 Blocking Characteristics<br>R5-083809: LTE-RF TP for Test Case 7.7 Spurious Response<br>R5-083484: LTE-RF TP for Test Case 7.9 Spurious Emissions<br>R5-083811: Annex E Global In-Channel TX-Test<br>R5-083163: TS 36.521-1 after RAN5#40 | 0.3.0 | 1.0.0 |
| 2008-10 | RAN5 #40Bis | R5-084072 | | | Following approved TPs have been included:<br>R5-084072 TS 36.521-1 after RAN5#40Bis<br>R5-084300 LTE-RF TP for Definitions Symbols and Abbreviations<br>R5-084304 LTE-RF-TP for general section<br>R5-084036 Test Tolerances for additional SEM<br>R5-084303 LTE-RF TP for Channel bandwidths and frequency range<br>R5-084305 LTE-RF TP for new Absolute Power Tolerance test case<br>R5-084067 LTE-RF TP for Transmission OFF test case<br>R5-084318 LTE-RF TP for Transmission Modulation test cases<br>R5-084069 LTE-RF Investigation of E-UTRA-TDD Frequency Error test case applicability<br>R5-084319 LTE-RF TP for Frequency Error test case<br>R5-084309 Text Proposal for LTE Tx Spurious Emissions<br>R5-084111 Text Proposal for LTE Adjacent Channel Leakage power Ratio<br>R5-084320 Text Proposal for LTE Additional Spectrum Emission Mask<br>R5-084310 Test Tolerances for additional spurious emission<br>R5-084311 Text Proposal for Occupied bandwidth<br>R5-084321 Text Proposal for LTE Spectrum Emission Mask<br>R5-084060 Modification to section 7.2 Diversity characteristics<br>R5-084312 References in 36.521-1 tests initial conditions<br>R5-084148 Update of Reference Measurement Channel for LTE UE Rx tests<br>R5-084167 LTE-RF TP for TC7.9 Spurious Emissions<br>R5-084075 LTE DL Reference Measurement Channel for PDSCH (FDD) text proposal<br>R5-084077 LTE Measurement of Performance Requirements text proposal<br>R5-084313 LTE Demodulation of PDSCH Test Requirements text proposal<br>R5-084147 Specification of DL propagation conditions for LTE UE tests<br>R5-084315 Text Proposal for LTE Demodulation of PCFICH/PDCCH<br>R5-084323 Text Proposal for Annex E Global In-Channel | 1.0.0 | 1.1.0 |
| 2008-12 | RAN#42 | RP-080863 | | | Approval of version 2.0.0 at RAN#42, then put to version 8.0.0. | 2.0.0 | 8.0.0 |
| 2008-01 | | | | | Editorial corrections. | 8.0.0 | 8.0.1 |
| 2009-03 | RAN#43 | R5-086011 | 0001 | - | TP for In-band emissions | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086012 | 0002 | - | TP for Spectrum flatness | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086013 | 0003 | - | TP for IQ-component | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086064 | 0004 | - | LTE-RF: UE max output power | 8.0.1 | 8.1.0 |

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|---|---|---|---|---|---|---|---|
| 2009-03 | RAN#43 | R5-086093 | 0005 | - | Clarification of measurement period in minimum output power test procedure | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086094 | 0006 | - | Clarification of measurement period in transmit OFF power test procedure | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086120 | 0007 | - | Update of Max.input level test | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086125 | 0008 | - | Addition of UL Reference Measurement Channels in Annex A2 | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086160 | 0009 | - | correction for Maximum Power Reduction (MPR) | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086167 | 0010 | - | LTE-RF: TDD applicability and CR for Blocking Characteristics and Spurious Response | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086168 | 0011 | - | LTE-RF: TDD applicability and CR for Spurious Emissions | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086239 | 0012 | - | Update of Symbols | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086401 | 0013 | - | LTE-RF: TX-RX channel freq separation | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086405 | 0014 | - | Update of 6.7 Transmit intermodulation test | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086406 | 0015 | - | Update of initial conditions for Tx and Rx test cases | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086408 | 0016 | - | Update of Adjacent Channel Leakage power Ratio | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086409 | 0017 | - | Removal of [ ] from Clause 7 Receiver Characteristics | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086413 | 0018 | - | Updates to Demodulation of PCFICH/PDCCH test case | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086414 | 0019 | - | Text proposal for Reporting of Channel State Information | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086415 | 0020 | - | Correction of RS_EPRE powers for default DL signal levels | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086416 | 0021 | - | Update of DL Reference Measurement Channels in Annex A3 | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086417 | 0022 | - | Update to Annex E | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086425 | 0023 | - | Update of General text in clause 6 | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086426 | 0024 | - | Clarification of measurement bandwidth in spectrum emission mask test | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086428 | 0025 | - | Demodulation of TDD PHICH test requirements text proposal | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-086429 | 0026 | - | Demodulation of TDD PCFICH/PDCCH test requirements text proposal | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-090306 | 0027 | - | New Annex H for Uplink Physical Channels | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-090308 | 0028 | - | Text proposal for Reporting of Channel State Information | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-090403 | 0029 | - | CR to 36.521-1: Update of Spurious Emissions test cases | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-090404 | 0030 | - | CR to 36.521-1: Update of ACLR test case | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-090443 | 0031 | - | LTE-RF: Correction to 36.521-1 Frequency error test case | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-090488 | 0032 | - | LTE TDD applicability for Transmit intermodulation test case | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091002 | 0033 | - | LTE Demodulation of PDSCH Test Requirements text proposal | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091004 | 0034 | - | LTE-RF: CR for UE max power test case | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091007 | 0035 | - | LTE-RF: TDD Applicability and CR for Spectrum Emission Mask and Additional Spectrum Emission Mask | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091008 | 0036 | - | LTE-RF Investigation of E-UTRA-TDD for Occupied bandwidth test case applicability | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091009 | 0037 | - | LTE-RF: Investigation of E-UTRA-TDD for Adjacent Channel Leakage power Ratio test case applicability | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091011 | 0038 | - | LTE-RF: TDD applicability and CR for Maximum Input Level | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091012 | 0039 | - | LTE-RF: TDD applicability and CR for Adjacent Channel Selectivity (ACS) | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091017 | 0040 | - | Removal of Rx Narrowband Intermod 7.8.2 | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091019 | 0041 | - | Relocation of 36.521-1 Annex C DL mapping | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091020 | 0042 | - | Removal of "Out-of-synchronization handling of output power" heading | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091023 | 0043 | - | Test requirements of TDD PDSCH demodulation performance with user-specific reference symbols | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091024 | 0044 | - | CR to 36.521-1: Update of Annex F.3.2 Measurement of transmitter | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091025 | 0045 | - | CR to 36.521-1: Update of SEM and Additional SEM test cases | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091077 | 0046 | - | CR to 36.521-1: Addition of test combinations for test cases with MPR application | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091082 | 0047 | - | Spurious emission requirements on PHS band including the future plan in Japan | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091101 | 0048 | - | LTE-RF: CR for MPR test case | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091106 | 0049 | - | Update of Reference sensitivity test in 7.3 | 8.0.1 | 8.1.0 |
| 2009-03 | RAN#43 | R5-091111 | 0050 | 1 | Update of initial conditions for Rx tests | 8.0.1 | 8.1.0 |
| 2009-05 | RAN#44 | R5-092144 | 0051 | - | LTE-RF: Resubmission of R5-086424 UE output power dynamics 36.521-1 v8.1.0 (re-submit no changes) | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092146 | 0052 | - | LTE-RF: CR for UE configured UE transmitted output power test case (re-submit no changes) | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092147 | 0053 | - | LTE-RF: CR for UE minimum output power test case (re-submit no change) | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092149 | 0054 | - | LTE-RF: CR for Power Control Absolute power tolerance test case (re-submit no changes) | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092150 | 0055 | - | LTE-RF: CR for Power Control Relative power tolerance test case (re-submit no changes) | 8.1.0 | 8.2.0 |

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|---|---|---|---|---|---|---|---|
| 2009-05 | RAN#44 | R5-092151 | 0056 | - | LTE-RF: New test case for Aggregate power control tolerance (re-submit no changes) | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092263 | 0057 | - | Text proposal for Reporting of Channel State Information | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092264 | 0058 | - | Propagation conditions for CQI tests | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092265 | 0059 | - | Correction to Demodulation of PDCCH/PCFICH test cases | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092273 | 0060 | - | Mapping of downlink physical channels for TDD | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092277 | 0061 | - | Annex A RMC updates | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092369 | 0062 | - | Update of A.3.4.3 for RMC with UE-specific RS | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092372 | 0063 | - | Maintenance on Initial configurations for Perf TCs | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092436 | 0064 | - | CR to 36.521-1: Update of ACLR test case | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092442 | 0065 | - | CR to 36.521-1: Update of Spurious Emissions test case | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092467 | 0066 | - | LTE-RF: Transmit OFF Power update | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092473 | 0067 | - | LTE_RF - Update on TC 7.7 Spurious Response (re-submit with no changes) | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092474 | 0068 | - | LTE_RF - Update on TC 7.9 Spurious Emissions (re-submit with no changes) | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092527 | 0069 | - | Update of TDD PDSCH test cases | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092602 | 0070 | - | LTE-RF: CR for Maximum Power Reduction test case (re-submit no changes) | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092603 | 0071 | - | TP for Demodulation of TDD PDCCH/PCFICH | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092605 | 0072 | - | Mapping of uplink physical channels for FDD | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092606 | 0073 | - | Update of Annex C | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092607 | 0074 | - | CR to 36.521-1: Update of test parameters for Demodulation of PDSCH (FDD) tests | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092614 | 0075 | - | Update of SEM test case | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092642 | 0076 | - | Update of transmit quality test cases | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092643 | 0077 | - | Text proposal for TDD part of CQI Reporting under Fading conditions | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092644 | 0078 | - | Text proposal for TDD part of CQI Reporting under AWGN conditions | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092645 | 0079 | - | LTE-RF: Update of Additional Spectrum Emission mask Test case with TDD Uplink Test configuration | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092649 | 0080 | - | LTE-RF: CR for TDD DL RMC to be used in TX test cases | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092653 | 0081 | - | LTE-RF: CR for Additional Maximum Power Reduction test case | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092661 | 0082 | - | RMC update for PDCCH/PCFICH performance requirement | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | RP-090444 | 1161 | - | Test frequencies for Additional Spurious Emission test case | 8.6.0 | 8.7.0 |
| 2009-05 | RAN#44 | R5-092366 | 0084 | - | Update of 7.3.1 | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092440 | 0085 | - | LTE-RF: CR for UE max output power test case | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092472 | 0086 | - | LTE_RF - Update on TC 7.6 Blocking Characteristics (re-submit with changes) | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092636 | 0087 | - | CR to 36.521-1 Addition of frequencies for band 18 and band 19 | 8.1.0 | 8.2.0 |
| 2009-05 | RAN#44 | R5-092652 | 0088 | 2 | Improved stability of TC 7.8.5 Power Control in the DL from F-DPCH to HSUPA TC 5.2D and 5.13.2B | 8.1.0 | 8.2.0 |
| - | - | - | - | - | Editorial corrections | 8.2.0 | 8.2.1 |
| 2009-09 | RAN#45 | R5-094032 | 0089 | - | Correction CR to 36.521-1: Update of Requirements for Demodulation of PDSCH (FDD) tests | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094034 | 0090 | - | Correction CR to 36.521-1: Update of General Requirements for Demodulation tests | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094214 | 0091 | - | Update of In-band emissions | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094215 | 0092 | - | TDD Initial downlink channel setting | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094216 | 0093 | - | Correction to Annex B | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094248 | 0094 | - | CR to 36.521-1: Update to ACLR test case | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094250 | 0095 | - | CR to 36.521-1: Update to UE max output power test case | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094281 | 0096 | - | Mapping of uplink physical channels for TDD | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094282 | 0097 | - | LTE-RF: CR for notes in TDD DL RMC to be used in TX test cases | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094283 | 0098 | - | LTE-RF: message update to keep Tx power constant for some Rx test cases | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094313 | 0099 | - | LTE-RF: CR to test case for Aggregate power control tolerance | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094317 | 0100 | - | LTE-RF: CR for UE minimum output power test case for TDD | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094318 | 0101 | - | LTE-RF: CR for Power Control Relative power tolerance test case | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094319 | 0102 | - | In band emission for non-allocated RB | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094320 | 0103 | - | LTE RF: correction for subclause 6.6.2.2.5 (A-SEM) supported band list | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094362 | 0104 | - | Correction of RMCs (36.521 Annex A) | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094363 | 0105 | - | Usage of the Global In-Channels TX-Test across different Signal Quality tests. | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094365 | 0106 | - | LTE TX: 1to2 RX antenna | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094367 | 0107 | - | Correction to 6.6.2.2 Additional Spectrum Emission Mask | 8.2.1 | 8.3.0 |

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| 2009-09 | RAN#45 | R5-094370 | 0108 | - | Correction to 6.6.2.3 ACLR | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094371 | 0109 | - | Correction to 6.7 TX Intermodulation | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094374 | 0110 | - | Correction to 7.6.1 In-Band Blocking | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094375 | 0111 | - | UE category (36.521 clause 8) | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094378 | 0112 | - | Completion of Global in-Channel TX-Test (36.521 Annex E) | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094379 | 0113 | - | Completion of Global in-Channel TX-Test with PRACH (36.521 Annex E) | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094380 | 0114 | - | Completion of Statistical testing (36.521 Annex G) | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094385 | 0115 | - | Correction to Annex D.2 Interference signals | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094439 | 0116 | - | Update for ACS | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094661 | 0117 | - | LTE RF - Core update on TC7.6.2 Out-of-band Blocking | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094663 | 0118 | - | LTE RF - Symbols Update on UL transmission configurations | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094665 | 0119 | - | LTE RF - Clarification for Test Configurations in General Section | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094668 | 0120 | - | LTE RF - Applicability of 6.2.3 MPR | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094671 | 0121 | - | LTE RF - Verification of UE Output Power in Out of Band Emission tests | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094684 | 0122 | - | CR to 36.521-1: Update to UE max output power test case | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094686 | 0123 | - | LTE-RF CR to 36.521-1: Update the E-UTRA channel numbers | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094687 | 0124 | - | LTE-RF: CR for UE maximum power reduction(MPR) test case | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094699 | 0125 | - | Update to SEM and spurious emissions TC | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094706 | 0126 | - | Resubmission-Update to the Requirements for frequency-selective fading test | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094717 | 0127 | - | Update of SEM | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094718 | 0128 | - | Update of initial conditions with Annex references | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094721 | 0129 | - | Update of 6.7 Tx Inter Mod | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094725 | 0130 | - | Correction to E-UTRA channel numbers for Band 2 | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094726 | 0131 | - | Correction to Tx spurious emissions | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094757 | 0132 | - | Update of TDD PHICH test cases | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094874 | 0133 | - | Correction to Demodulation of PDCCH/PCFICH test cases | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094902 | 0134 | - | Addition of 15 MHz and 20 MHz bandwidths and corresponding sensitivity requirements into band 38 | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094903 | 0135 | - | Correction CR to 36.521-1: Update of Transmitter tests network signalled parameter value | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094905 | 0136 | - | Update of TDD PDSCH test cases | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094908 | 0137 | - | LTE-RF: CR for Power Control Absolute power tolerance test case | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094909 | 0138 | - | Update to Output Power dynamics test cases | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094913 | 0139 | - | Clarification for downlink signal setting in RX tests | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094914 | 0140 | - | UL RB allocation for receiver tests | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094915 | 0141 | - | Update of TDD PCFICH/PDCCH test cases | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094921 | 0142 | - | Correction to CQI performance test case | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094922 | 0143 | - | Test description for CQI test cases under AWGN conditions | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094923 | 0144 | - | Resubmission - Requirements for PMI reporting ( Single and Multiple PMI) | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094966 | 0145 | - | CR to 36.521-1: Addition of A-MPR for band 19 | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094976 | 0146 | - | Without loop back: 6.2.2 UE maximum output power | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094977 | 0147 | - | Without loop back: 6.3.2 Minimum output power | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094979 | 0148 | - | LTE-RF: CR for UE configured UE transmitted output power test case | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094980 | 0149 | - | CR to 36.521-1: Definition of Maximum Power state in TX/RX test cases | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094982 | 0150 | 1 | Correction of Tx general description | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094986 | 0151 | - | Update of 6.6.1OBW | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094989 | 0152 | - | Correction to 1PRB tests in Demodulation of PDSCH | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094995 | 0153 | - | Correction CR to 36.521-1: Update of Requirements for Additional Maximum Power Reduction (A-MPR) test | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094996 | 0154 | - | Correction to Demodulation of PHICH test cases | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-094997 | 0155 | - | EVM TC update | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-095300 | 0156 | - | LTE-RF: test description update | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-095301 | 0157 | - | Correction CR to 36.521-1: Addition of measurement uncertainty and test tolerances for A-MPR | 8.2.1 | 8.3.0 |
| 2009-09 | RAN#45 | R5-095304 | 0158 | - | Sorting out Demodulation of PDSCH for FDD | 8.2.1 | 8.3.0 |
| 2009-09 | - | - | - | - | TOC update and Annexes' titles formattings | 8.3.0 | 8.3.1 |
| 2009-12 | RAN#46 | R5-095515 | 0159 | - | Correction CR to 36.521-1: Additional Spectrum Emission Mask test need to be updated to include the network signalled value "NS_07ó message contents exceptions | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-095589 | 0160 | - | Update for test period description in the general section | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-095657 | 0161 | - | LTE-RF: CR for Power Control Absolute power tolerance test case | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-095661 | 0162 | - | LTE-RF: CR for UE minimum output power test case | 8.3.1 | 8.4.0 |

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| 2009-12 | RAN#46 | R5-095735 | 0163 | - | Corrections to Annex A.4 | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-095766 | 0164 | - | LTE-RF: CR for In band emission for non-allocated RB | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-095790 | 0165 | - | Completion of Statistical testing (36.521 Annex G) | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-095791 | 0166 | - | Corrections to Annex E | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096058 | 0167 | - | Removal of [ ] from 7.6.1, 7.8.1, and 7.5 of Annex F3.3 | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096096 | 0168 | - | Update on 8.2.1 | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096105 | 0169 | - | LTE RF: Symbols Update on Configured UE Transmitted Power | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096204 | 0170 | - | LTE-RF: CR to Transmission signal quality | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096208 | 0171 | - | LTE-RF: CR for Power Control Relative power tolerance test case | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096210 | 0172 | - | LTE-RF: CR to ON/OFF Time mask test cases | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096211 | 0173 | - | Measurement period for TX-Tests | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096213 | 0174 | - | CR to 36.521-1: Update to Spurious Emissions test cases | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096214 | 0175 | - | CR to 36.521-1: Update to ACLR test case | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096219 | 0176 | - | LTE-RF: CR for UE configured UE transmitted output power test case | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096222 | 0177 | - | Test description for CQI test cases under AWGN conditions | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096223 | 0178 | - | LTE RF: Blocking Characteristics update | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096224 | 0179 | - | LTE RF: Spurious Response Update | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096228 | 0180 | - | LTE-RF: CR for MPR test case | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096229 | 0204 | 2 | CR to 36.521-1: Update to A-MPR test case | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096230 | 0181 | - | LTE RF: Applicability of 6.2.4 A-MPR | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096231 | 0182 | - | Correction to Demodulation of PHICH test cases | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096235 | 0183 | - | Introduction of CQI reporting test with frequency-selective interference | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096239 | 0184 | - | Update to the test procedure and message contents of TDD PMI reporting test cases | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096240 | 0205 | - | CR to 36.521-1: Update to Derivation of Test Requirements for A-MPR | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096241 | 0185 | - | Measurement uncertainties and Test Tolerances for transmit quality test cases | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096242 | 0186 | - | Update for 36.521-1 Annex A | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096289 | 0187 | - | CR on 36.521-1, 'Introduction of clause 8.2.1.1 test case uncertainties and Test Tolerances' | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096306 | 0188 | - | Update to the test procedure of SEM test cases of 36.521-1 | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096311 | 0189 | - | Update of 6.6.1 OBW | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096312 | 0190 | - | Correction to SEM | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096313 | 0191 | - | Update of 6.7 Transmit intermodulation | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096315 | 0192 | - | CR to 36.521-1: Update to UE max output power test case | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096316 | 0193 | - | CR to 36.521-1: Update to Additional Spurious Emissions test case | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096317 | 0194 | - | CR to TDD PHICH demodulation test cases | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096318 | 0195 | - | Correction to FDD PMI reporting test cases | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096320 | 0196 | - | Tx power range and core update for Receiver tests | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096322 | 0197 | - | Update on 7.4, 7.5, and 7.8.1 | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096323 | 0198 | - | Introduction of RI reporting test | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096333 | 0199 | - | Update to 6.5 Transmit signal quality test cases | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096334 | 0200 | - | LTE-RF: CR for Aggregate power control tolerance test case | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096335 | 0201 | - | Correction CR to 36.521-1: Update for Demodulation of PDSCH (FDD) tests to correct CR merges results from RAN5#44 | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096336 | 0206 | 1 | Update TDD PDSCH test cases | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096338 | 0202 | - | Number of used HARQ processes in DL Performance tests | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096342 | 0207 | 2 | Minimum test time for performance tests | 8.3.1 | 8.4.0 |
| 2009-12 | RAN#46 | R5-096718 | 0203 | - | LTE RF: A-SEM update and A-MPR verification | 8.3.1 | 8.4.0 |
| 2010-03 | RAN#47 | R5-100353 | 0208 | - | LTE-RF CR to 36.521-1:TIME MASK test case updated | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100354 | 0209 | - | LTE-RF: CR for A-MPR notation in NS_07 | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100403 | 0210 | - | LTE-RF: CR for Tx Intermodulation test case | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100404 | 0211 | - | LTE-RF: CR for OBW measurement period alignment | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100408 | 0212 | - | Reporting mode, Reporting Interval and Editorial corrections for demodulation | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100456 | 0213 | - | Misc update on MAC padding in Rx and performance sections | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100566 | 0214 | - | Missing Test limits in 36.521-1 Annex G | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100567 | 0215 | - | Wrong references from 36.521-1 clauses 8.4 and 8.5 into Annex G | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100569 | 0216 | - | Typos in 36.521-1, Annex E | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100571 | 0217 | - | Minimum test time for performance tests | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100572 | 0218 | - | Correction to 6.6.3.3 Additional spurious emissions | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100790 | 0219 | - | DL-RMC-s for transmitter tests: Corrections | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100800 | 0220 | - | Update of Test environment for RF test | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100803 | 0221 | - | Spectrum emission mask: Correction to uplink configuration | 8.4.0 | 8.5.0 |

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| 2010-03 | RAN#47 | R5-100807 | 0222 | - | Performance tests: Scheduling of retransmissions | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100810 | 0223 | - | UL-RMC-s: Corrections and completion | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100814 | 0224 | - | Corrections to Cl 5.4.2.1 of TS 36.521-1 | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100815 | 0225 | - | LTE-RF: CR for UE configured UE transmitted output power test case | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100816 | 0226 | - | LTE-RF: CR for Power Control Relative power tolerance test case | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100822 | 0227 | - | CR to 36.521-1: Update to Maximum output power | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100823 | 0228 | - | CR to 36.521-1: Update to ACLR test case | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100825 | 0229 | - | CR to 36.521-1: Update to Additional Tx spurious emissions test case | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100826 | 0230 | - | RMC-s and OCNG patterns: Update according 36.101 8.8.0 | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100827 | 0231 | - | Receiver and performance tests: Update use of OCNG according 36.101 8.8.0 | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100828 | 0232 | - | Update of PDSCH Demodulation Tests | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100831 | 0233 | - | Introduction of clause 8.2.1.2, 8.2.1.3, 8.2.1.4 test case uncertainties and Test Tolerances | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100832 | 0234 | - | Clarifications on DRS performance test case | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100833 | 0235 | - | Misc update on MAC padding in PDCCH, CSI test | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100834 | 0236 | - | Updates to the TDD portion of CQI reporting test cases under AWGN | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100838 | 0237 | - | Editorial Correction to 8.2.1.3 | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100839 | 0238 | - | Update on Annex C for 36.521-1 | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100840 | 0239 | - | Update on MAC padding in TDD PMI test case 9.4 of 36.521-1. | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100841 | 0240 | - | Correction to CQI test cases under AWGN conditions | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100842 | 0241 | - | Correction to CQI test cases under fading conditions | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100843 | 0242 | - | Correction to PMI reporting test cases | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100845 | 0243 | - | CSI: Corrections to tests titles and RI clause structure | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100848 | 0244 | - | CR to 36.521-1: Update LTE RF test cases with test requirements for extended LTE1500MHz | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100886 | 0245 | - | Transmitter characteristics: UE Categories and other corrections | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100887 | 0246 | - | CR to 36.521-1: Update to Tx spurious emissions and Spurious emission band UE co-existence | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100888 | 0247 | - | Clarification on notes in Max Power | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100889 | 0248 | - | Maximum input level: Corrections w.r.t. UE categories | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100891 | 0249 | - | Correction to PDCCH demodulation test cases | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100892 | 0250 | - | Correction to PHICH demodulation test cases | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100907 | 0251 | - | Update of RI reporting test case | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | R5-100909 | 0252 | - | Correction to set UL power in Rx TCs | 8.4.0 | 8.5.0 |
| 2010-03 | RAN#47 | - | - | - | Moved to v9.0.0 with no change | 8.5.0 | 9.0.0 |
| 2010-06 | RAN#48 | R5-103102 | 0253 | - | CR to 36.521-1: Update of EARFCN for band 21 | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103103 | 0254 | - | CR to 36.521-1: Update of A-MPR test case with band 21 | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103104 | 0255 | - | CR to 36.521-1: Update of Additional Spurious test case with band 21 | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103106 | 0256 | - | CR to 36.521-1: Update to ACLR test case | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103108 | 0257 | - | CR to 36.521-1: Update of Reference sensitivity level test case | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103226 | 0258 | - | CR to 36.521-1: Update of UE RF requirements for LTE, Band 20 | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103263 | 0259 | - | LTE-RF: Updates of PDCCH demodulation test cases (FDD and TDD) | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103265 | 0260 | - | LTE-RF:CR for TDD ACK/NACK feedback mode in CQI BLER test cases | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103288 | 0261 | - | PDCCH Aggregation level for RF tests | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103291 | 0262 | - | Update and correction to UE maximum output power requirements | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103293 | 0263 | - | Editorial correction in In-band blocking test | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103296 | 0264 | - | Correction to additional spectrum emission mask test configuration | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103300 | 0265 | - | Corrections to Uplink RMC-s | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103450 | 0266 | - | LTE-RF: editorial CR for TC 7.6.2 and 7.7 | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103471 | 0267 | - | Minimum test time for performance tests | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103476 | 0268 | - | EVM with exclusion period (annex) | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103521 | 0269 | - | CR on 36.521-1 for updating the "Reporting of Channel State Information" | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103525 | 0270 | - | CR on 36.521-1 for corrections in UE RF requirements | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103598 | 0271 | - | Correction to notes in Max Power | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103602 | 0272 | - | Clarification of measurement conditions for Rx spurious emission | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103726 | 0273 | - | CR to 36.521-1: Update of Spurious emission band UE co-existence test case | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103727 | 0274 | - | LTE-RF: CR for Prach time mask test case | 9.0.0 | 9.1.0 |

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| 2010-06 | RAN#48 | R5-103728 | 0275 | - | LTE-RF: CR for General ON/OFF time mask test case | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103729 | 0276 | - | LTE-RF: Update to spectrum flatness test case and relevant annexes | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103730 | 0277 | - | LTE-RF:CR for test case of In-band emissions | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103731 | 0278 | - | EVM with exclusion period (test) | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103732 | 0279 | - | CR to 36.521-1 on Correction to Demodulation Requirements for PDSCH | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103733 | 0280 | - | CR to 36.521-1: Update PDCCH DCI Formats for Open Loop and Closed Loop Spatial Multiplexing Test Cases | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103751 | 0281 | - | Misc update in CSI tests | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103752 | 0282 | - | Correction of the statistical part in PMI and RI tests | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103753 | 0283 | - | LTE-RF:CR to downlink RMCs for TX characteristics | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103754 | 0284 | - | LTE-RF: Update of annex C | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103756 | 0285 | - | Measuring throughput ratios (Annex G) | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103763 | 0286 | - | LTE-RF: CR for Minimum output power test case | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103764 | 0287 | - | Performance, CSI reporting and uncertainties for UEs with multiple Rx antennas | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103771 | 0288 | - | Introduction of clause 8.4.1 and 8.5.1 test case uncertainties and Test Tolerances | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103778 | 0291 | - | Uplink power for receiver tests | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103780 | 0292 | 1 | Addition of the exceptional message for In-band emissions | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103781 | 0289 | - | Correction to 6.5.2.1 EVM | 9.0.0 | 9.1.0 |
| 2010-06 | RAN#48 | R5-103782 | 0290 | - | Correction to CQI reporting | 9.0.0 | 9.1.0 |
| 2010-09 | RAN#49 | R5-104090 | 0294 | - | Corrections to Spectrum emission mask test regarding UE category | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104091 | 0295 | - | Missing note in Additional spurious emission test with NS_07 | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104095 | 0296 | - | PDCCH Aggregation level for CSI tests | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104096 | 0297 | - | Default initial and connection Uplink power for RF tests | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104212 | 0298 | - | Limits on Uplink power for Receiver tests | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104244 | 0299 | - | Correction to Demodulation Requirements | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104461 | 0300 | - | CR to 36.521-1: Editorial Corrections for Closed Loop Spatial Multiplexing Test Cases | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104478 | 0301 | - | Correction to Test requirements in 6.5.2.2 | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104482 | 0302 | - | Correction to 8.2.1.1 | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104520 | 0303 | - | 36521-1 General update of sections 00 to 08: missing Introduction references formatting | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104583 | 0304 | - | No necessity to apply - consecutive time slots for EVM | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104584 | 0305 | - | Correction to E.4.4 EVM equalizer spectrum flatness | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104630 | 0306 | - | Correction of table reference in In-band emissions test | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104808 | 0307 | - | CR to 36.521-1: Update to Additional Spectrum Emission Mask test case | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104809 | 0308 | - | CR to 36.521-1: Update to Spurious emission band UE co-existence test case | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104810 | 0309 | - | LTE-RF: CR for Max Output Power | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104811 | 0310 | - | LTE-RF: CR for Freq Error | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104812 | 0311 | - | Introduction of exclusion period for PUCCH-EVM test in clause 6.5.3 | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104813 | 0312 | - | Correction to Demodulation UE-Specific Reference Symbols | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104814 | 0313 | - | Uncertainties and Test Tolerances for CSI Test cases 9.2.1.1 and 9.2.1.2 | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104815 | 0314 | - | Uncertainties and Test Tolerances for CSI Test cases 9.2.2.1 and 9.2.2.2 | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104816 | 0315 | - | UE applicability for CSI test cases | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104817 | 0316 | - | Update of CQI reporting TCs under fading conditions | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104818 | 0317 | - | Update of Reporting of Precoding Matrix Indicator TCs | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104819 | 0318 | - | Correction of the statistical part 9.3.1.1.1 (CQI Reporting under fading conditions) | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104820 | 0319 | - | Correction of the statistical part 9.3.3.1.1 (CQI Reporting under fading conditions) | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104821 | 0320 | - | Correction of the statistical part 9.3.2.1.1 (CQI Reporting under fading conditions) | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104822 | 0321 | - | Update and new RMC-s for CQI tests | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104823 | 0322 | - | Correction of EVM calculation in annex | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104824 | 0323 | - | Introduction of exclusion period for PUCCH-EVM test in Annex E | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104844 | 0324 | - | Pcmax changes to Configured UE Transmitted Output Power | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104845 | 0325 | - | Clarification on the frequency range with net work signal in 6.6.3.2 | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104846 | 0326 | - | Update of editor's notes | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104847 | 0327 | - | Removal of Extreme Conditions in 6.2.3 | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104850 | 0328 | - | Corrections to Test procedure loop in CSI tests | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104851 | 0329 | - | Introduction of TDD CQI Reporting under fading conditions and frequency-selective interference test case | 9.1.0 | 9.2.0 |

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|---|---|---|---|---|---|---|---|
| 2010-09 | RAN#49 | R5-104852 | 0330 | - | Introduction of TDD RI Reporting test case | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104853 | 0331 | - | Update of CQI reporting TCs under AWGN conditions | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104854 | 0332 | - | Update of FDD RI Reporting TC | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104857 | 0333 | - | CR to 36.521-1 LTE UE Tx_RX test cases band 20 | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104861 | 0334 | - | Corrections to Test requirements for MPR test | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104863 | 0335 | - | Clarification on notes in Max Power | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104872 | 0336 | - | Correction to 6.3.5.2 | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104873 | 0337 | - | Numbering and alignment of TDD PHICH demod test cases | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104874 | 0338 | - | Correction to test numbering for exceptional messages in 8.2.x.x | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104875 | 0339 | - | Correction to 9.2.2 | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104876 | 0340 | - | Correction to the test procedures of 9.3.x | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104877 | 0341 | - | Correction to 9.4.x | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104878 | 0342 | - | The new reference of connection diagram for 9.3.3 | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104879 | 0343 | - | Correction to 6.3.4.1 and 6.3.5.1 | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-104888 | 0344 | - | Update of Annex C.2 for AG level | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-105055 | 0345 | - | Introduction of a new RF test case (8.7) to verify downlink sustained data rate performance | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-105061 | 0347 | - | CR to 36.521-1: Modification to Additional Maximum Power Reduction Test Case | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-105062 | 0348 | - | Modification to Additional Spectrum Emission Mask | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-105063 | 0349 | - | Modification to Additional Spurious Emissions | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-105064 | 0350 | - | Modification to Maximum Power Reduction | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | R5-105065 | 0351 | - | Modification to Adjacent Channel Leakage Power Ratio | 9.1.0 | 9.2.0 |
| 2010-09 | RAN#49 | RP-100987 | 0352 | - | Correction of status for RF performance test case | 9.1.0 | 9.2.0 |
| 2010-12 | RAN#50 | R5-106073 | 0353 | - | Corrections to receiver spurious emissions test | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106074 | 0354 | - | Update of downlink power for receiver tests | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106076 | 0355 | - | CQI: Side condition when CQI median equals min or max CQI-values | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106077 | 0356 | - | Update of the throughput-definition for multi-data stream transmission | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106078 | 0357 | - | Update of RF OCNG patterns | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106092 | 0358 | - | Correction of DCI format used in PDSCH performance test 8.2.1.4.2 | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106249 | 0359 | - | CR to 36.521-1: Correction to Spurious emission band UE co-existence test case | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106250 | 0360 | - | CR to 36.521-1: Correction to Additional Tx spurious emissions test case | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106374 | 0361 | - | Correction of FDD CQI reporting test under AWGN - PUCCH 1-1 | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106394 | 0362 | - | Correction of clause 9.3.1 and 9.3.3 | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106399 | 0363 | - | "Correction of G.2.5 Pass fail decision rules" | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106420 | 0364 | - | Introduction of test uncertainties and tolerances for TDD PDSCH DRS test cases | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106440 | 0365 | - | Correction to unsigned numbers in Annex F.1.2 | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106443 | 0366 | - | Correction to the exceptional messages in 9.4 Reporting of PMI TCs | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106491 | 0367 | - | CR to 36.521-1: Correction to Table Numbering Error in TDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 2x2 | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106512 | 0368 | - | Transport format table clarification in CSI test cases | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106801 | 0369 | - | HARQ scheduling in TDD performance tests using special subframes | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106803 | 0370 | - | Correction to Fading Profiles in TCs 8.4 and 8.5 | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106816 | 0372 | - | CR to 36.521-1: Modification to Spectrum Emissions Mask | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106817 | 0373 | - | Introduction of test uncertainties and tolerances for TDD PCFICH/PDCCH and PHICH test cases | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106818 | 0374 | - | Update of TDD PDSCH CRS Demodulation test cases | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106821 | 0375 | - | PUSCH-EVM with exclusion period | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106822 | 0376 | - | Maintenance of Band 20 for receiver tests | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106823 | 0377 | - | Completion of clause 9.3.1 and 9.3.2 | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106824 | 0378 | - | Update of FDD RI Reporting TC | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106825 | 0379 | - | Correction to 9.2.2 CQI TCs | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106826 | 0380 | - | G.3.5 on PDCCH&PHICH Minimum Test Times | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106827 | 0381 | - | Completion of test time and  -TT for clauses 9.3 to 9.5 | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106828 | 0382 | - | EVM window length for PRACH | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106842 | 0383 | - | Modification of TC 8.3.2.1 - TDD PDSCH Single-layer SM Performance (UE-Specific Reference Symbols) | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106843 | 0384 | - | Power control relative power tolerance: Missing band edge relaxation | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106844 | 0385 | - | SRS time mask test procedure update | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106845 | 0386 | - | Correction of TC General ON/OFF time mask | 9.2.0 | 9.3.0 |

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| 2010-12 | RAN#50 | R5-106846 | 0387 | - | Update of TDD CQI reporting test under frequency selective interference conditions | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106847 | 0388 | - | Update of TDD RI reporting test | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106848 | 0389 | - | Iot setting in CQI test clarification | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106850 | 0390 | - | Correction of Test Uncertainties and Test Tolerances for Reference Sensitivity-Band 4 | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106855 | 0391 | - | Correction to DL and UL RMC configurations in 6.5.1 Frequency Error | 9.2.0 | 9.3.0 |
| 2010-12 | RAN#50 | R5-106858 | 0392 | - | CR to 36.521-1: Update LTE RF test cases with test requirements for EUTRA TDD LTE band 41. | 9.2.0 | 9.3.0 |
| 2011-03 | RAN#51 | R5-110138 | 0393 | - | Spurious emission band co-existence test: Remaining old test requirement table | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110139 | 0394 | - | Transmit intermodulation test: Interferer offset for Band 20, Bandwidth 20 MHz | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110141 | 0395 | - | PMI Performance tests: Corrections to test settings | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110143 | 0396 | - | PDCCH Performance test: Correction to TDD DL RMC-s | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110144 | 0397 | - | OCNG for RF tests: Updates | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110158 | 0398 | - | CQI Performance tests: Clarification on subbands used in the test | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110302 | 0399 | - | LTE RF: PCFICH/PDCCH Transmit Diversity Performance | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110349 | 0401 | - | Correction of OFF power measurements in 6.3.4 ON/OFF time mask | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110354 | 0402 | - | Correction of Annex E (Global In-Channel TX-Test) | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110506 | 0403 | - | Addition of 3500 MHz TDD bands into chapter 5 of 36.521-1 | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110747 | 0404 | - | Updates to section 8.7 DL sustained data rate test case | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110850 | 0405 | - | Sustained data rate: Definition of UL RMC-s | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110860 | 0400 | - | Update measurement period from test procedure of 6.2.2 | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110861 | 0428 | - | A-MPR Test requirement update | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110862 | 0437 | - | Measuring throughput with different payload size. | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110900 | 0406 | - | Correction to SNR reference in FDD PCFICH/PDCCH Single Antenna Port Performance Test | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110901 | 0407 | - | CR to 36.521-1: Correction of Additional Maximum Power Reduction (A-MPR) test case | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110915 | 0408 | - | Uncertainties and Test Tolerances for CSI Test cases 9.3.1.1.x and 9.3.2.1.x | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110916 | 0409 | - | Uncertainties and Test Tolerances for CSI Test cases 9.3.3.1.x | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110917 | 0410 | - | Uncertainties and Test Tolerances for CSI Test cases 9.4.1.1.x and 9.4.2.1.x | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110918 | 0411 | - | Uncertainties and Test Tolerances for CSI Test cases 9.5.1.x | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110919 | 0412 | - | Editorial errors in CSI test cases 9.2.1.x Test procedure | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110933 | 0413 | - | Handling of different releases in RAN5 LTE RF specification | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110938 | 0414 | - | PRACH Time mask and EVM tests: TDD Special subframe configuration | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110939 | 0415 | - | Update on PRACH time mask for TDD | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110940 | 0416 | - | Correction of the connection diagram reference in the initial conditions for Transmitter Characteristics | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110941 | 0417 | - | Update of the reference sensitivity requirement for the 1.4MHz and 3MHz bandwidths and note correction for Band 3 and Band 9 | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110942 | 0418 | - | CR Removing brackets of band 41 reference sensitivity in 36.521-1 | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110949 | 0419 | - | PDCCH and PHICH performance tests: Updates and corrections | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110950 | 0420 | - | Addition of CodeBookSubsetRestriction bitmap for Multi-Layer Spatial Multiplexing | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110951 | 0421 | - | Addition of exceptional message in 8.4.1.2.2 | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110952 | 0422 | - | CQI test 9.2.2.2: Update acc TS 36.101 | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110953 | 0423 | - | Maximum input level test: Correction to DL-RMC | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110954 | 0424 | - | Correction of E.7, EVM with exclusion period | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110967 | 0425 | - | Updates to Additional Spurious emissions and Spurious emission band UE co-existence test | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110970 | 0426 | - | LTE RF: references to state 3A in 36.521-1 | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110973 | 0429 | - | RI Performance tests: Corrections | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110975 | 0430 | - | Completion of annex G.3.5 (Minimum test time, performance tests) | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110978 | 0431 | - | Correction to Band 12 frequency range | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110979 | 0432 | - | Additional in-band blocking requirement for Band 12 | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110989 | 0433 | - | Completion of annex G.3.6 (test conditions, performance tests) | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110990 | 0434 | - | Addition of test cases of TDD PDSCH Single-layer and Dual-layer Spatial Multiplexing Performance | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110991 | 0435 | - | Correction to Times Mask and Power Control tests | 9.3.0 | 9.4.0 |
| 2011-03 | RAN#51 | R5-110992 | 0436 | - | Add requirement of QPSK with partial RB allocation into test requirement of 6.2.3 | 9.3.0 | 9.4.0 |

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|---|---|---|---|---|---|---|---|
| 2011-04 | - | - | - | - | Added approved R5-110967 which was missing. | 9.4.0 | 9.4.1 |
| 2011-06 | RAN#52 | R5-112148 | 0438 | - | ON/OFF time mask for PRACH: PRACH configuration index | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112149 | 0439 | - | CQI tests with frequency selective scheduling mode: Random selection of Sub-Bands | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112150 | 0440 | - | DL-RMC for receiver tests: Obsolete editors note | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112211 | 0441 | - | Adding Band 24 to TS 36.521-1 | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112311 | 0442 | - | Correction to the sustained data rate tests | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112312 | 0443 | - | Correction to the multi-antenna transmission tests | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112349 | 0444 | - | Update Annex G.3.6 for spatial multiplexing test cases | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112412 | 0445 | - | Correction to DL RMC for Max input for UE category 2 | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112459 | 0446 | - | EVM window length for PRACH | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112460 | 0447 | - | Removal of square brackets in Annex G.5.4 | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112462 | 0448 | - | Test tolerances for EVM with exclusion period | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112808 | 0449 | - | LTE RF - UEs Demodulation and CSI Band applicability | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112810 | 0450 | - | Correction on test requirement of test case 6.5.2.3 | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112811 | 0451 | - | LTE RF - TC6.3.5.2 Change in Minimum Requirements | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112812 | 0452 | - | Removable of NS values for TDD | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112813 | 0453 | - | Correction on initial condition for test cases of 9.3.3 | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112814 | 0454 | - | Correction to 9.4 PMI test cases | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112816 | 0455 | - | Test procedure change on Tx spurious emissions test cases | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112850 | 0456 | - | Update of Initial conditions according to table 7.3.3-2 for the 5MHz and 10MHz bandwidths | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112851 | 0457 | - | Iot modelling in frequency-selective interference CQI tests | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112852 | 0458 | - | Correction to test procedure in 9.5.1 | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112859 | 0459 | - | Introduction of additional PDCCH test cases for Rel-9 | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112860 | 0460 | - | Introduction of additional PHICH test cases for Rel-9 | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112861 | 0461 | - | Introducing UE-selected subband CQI tests for Rel-9 | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112862 | 0462 | - | Introduction of new PMI test cases for UE-selected sub-band reporting for Rel-9 | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112863 | 0463 | - | Addition of a new TC for FDD MBMS performance | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112864 | 0464 | - | Addition of a new TC for TDD MBMS performance | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112866 | 0465 | - | Addition of UE category 1 coverage for single-layer spatial multiplexing transmission on antenna port 7 or 8 | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112870 | 0466 | - | Removal of square brackets in annex G.3.5 (Minimum test time, performance tests) | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112871 | 0467 | - | Update minimum requirements and test requirements for spatial multiplexing test cases | 9.4.1 | 9.5.0 |
| 2011-06 | RAN#52 | R5-112873 | 0468 | - | Test procedure change on few Rx test cases | 9.4.1 | 9.5.0 |
| 2011-09 | RAN#53 | R5-113178 | 0506 | - | RF TC 8.7.2: Correction of the ACK/NACK feedback mode | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113179 | 0469 | - | RF TC-s 9.3.4: Updates to minimum requirements and corrections to test procedures | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113180 | 0470 | - | RF: New UL RMC for 10 MHz 15RB-s | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113181 | 0471 | - | RF: Use of State 3A-RF | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113233 | 0472 | - | LTE RF: EVM Annex E correction | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113238 | 0473 | - | RF TC 6.3.4.2.2: Correction to SRS configuration | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113368 | 0474 | - | Correction in test cases of 8.2.2.1.2 and 8.5.1 | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113369 | 0475 | - | Correction in test cases of 9.5 | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113380 | 0476 | - | Update of minimum test time for PCFICH/PDCCH and PHICH tests | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113383 | 0477 | - | Correction of Table G.3.5-1 (minimum test time) | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113419 | 0478 | - | Correction for spurious emission band UE co-existence limits of Band 3 | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113454 | 0479 | - | Correction to test procedure in 6.5.1 | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113455 | 0480 | - | Correction to Minimum requirement in 6.6.2.2 | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113456 | 0481 | - | Correction to RMC for PDCCH/PCFICH performance requirements | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113458 | 0482 | - | Correction to CSI TCs | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113541 | 0483 | - | Introduction of Expanded 1900MHz Band (Band 25) into section 5 of 36.521-1 | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-113596 | 0506 | - | Abbreviation update and Editorial corrections in TS 36.521-1 | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114000 | 0484 | - | Correction in 6.3.5.2 Power Control Relative power tolerance | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114001 | 0485 | - | Correction in 6.3.4.2.2 SRS time mask | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114002 | 0486 | - | Addition of PDSCH TDD performance tests for Low UE categories | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114003 | 0487 | - | Additional FDD scenarios | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114004 | 0488 | - | Addition of RMC-s for PDSCH performance tests for low UE categories | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114032 | 0489 | - | Introduction of Expanded 1900MHz Band (Band 25) into section 6 of 36.521-1 | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114033 | 0490 | - | Correction on TDD MBMS performance requirements for 64QAM mode | 9.5.0 | 9.6.0 |

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|---|---|---|---|---|---|---|---|
| 2011-09 | RAN#53 | R5-114034 | 0491 | - | Correction on FDD MDMS performance requirements for 64QAM mode | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114038 | 0492 | - | RF TC 6.3.5.2: Consideration of band edge relaxation in test requirements | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114039 | 0493 | - | Band 19 A-MPR refinement | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114040 | 0494 | - | Test system uncertainty and TT for 6.6.3.3 additional spurious emissions NS_07 | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114041 | 0495 | - | Correction to Additional Maximum Power Reduction | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114042 | 0496 | - | Correction to 6.3.4.2.1 PRACH time mask | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114043 | 0497 | - | Correction to Receiver Characteristics Minimum Requirements | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114044 | 0498 | - | Addition of PDSCH FDD performance tests for Low UE categories | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114045 | 0499 | - | Additional Rel-9 TDD scenarios | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114046 | 0500 | - | Update of CQI/PMI test cases | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114047 | 0501 | - | Update of RI test cases | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114048 | 0502 | - | Release dependent RMCs in PCFICH/PDCCH and PHICH tests | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114049 | 0503 | - | Addition of tests scenarios in Annex | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114073 | 0504 | - | Introduction of Expanded 1900MHz Band (Band 25) into section 7 of 36.521-1 | 9.5.0 | 9.6.0 |
| 2011-09 | RAN#53 | R5-114091 | 0505 | - | Correction to test cases 10.1 and 10.2 | 9.5.0 | 9.6.0 |
| 2011-12 | RAN#54 | R5-115112 | 0507 | - | RF: Coverage of MPR and A-MPR requirements in emissions tests | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115113 | 0508 | - | RF: Update to names of some RMC-s used in different releases | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115114 | 0509 | - | RF TC 6.2.4, 6.6.2.2, 6.6.3.3: Corrections to A-MPR related tests | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115115 | 0510 | - | RF TC-s 9: Corrections to UL allocation for some CQI tests | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115116 | 0511 | - | RF TC 6.3.5.2: Missing extreme conditions in test requirements | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115117 | 0512 | - | RF TC 6.2.3: Missing test requirements for band 25 | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115118 | 0513 | - | RF TC 6.5.2.1: Redundant conflicting IE-s in message contents | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115119 | 0514 | - | RF TC 6.6.3.1: Correction of reference to the connection diagram | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115324 | 0517 | - | LTE RF: CSI test case update | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115472 | 0518 | - | Corrections to the dual-layer beamforming demodulation requirements | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115475 | 0519 | - | Correction to Code Block Numbers | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115800 | 0522 | - | Delete note in PUSCH-EVM | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115812 | 0526 | - | RF: Corrections to tests with release dependent requirements | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115815 | 0527 | - | Test Frequency for Relative Power Tolerance | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115821 | 0531 | - | RF: General review of the reference measurement channels | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115822 | 0532 | - | Correction for codebook subset restriction in single-layer closed loop spatial multiplexing test | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115830 | 0533 | - | Uncertainties and Test Tolerances for 3000MHz to 4200MHz, Tx Test cases | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115831 | 0534 | - | Uncertainties and Test Tolerances for 3000MHz to 4200MHz, Rx Test cases | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115832 | 0535 | - | Support for band 22, 42 and 43 | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115837 | 0536 | - | Update LTE RF test cases with test requirements for FDD LTE Band 23 in 36.521-1 | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115875 | 0537 | - | Correction on FDD and TDD MBMS conformance requirements | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115877 | 0538 | - | Introduction of test system uncertainties and TT to new TCs in clauses 9.3.4 to 9.4.2.2.2 | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115879 | 0539 | - | Uncertainties and Test Tolerances for Sustained data rate test cases | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115891 | 0540 | - | Requirement change in UE spurious emissions for Band 7 and 38 co-existence (Rel-8 only) | 9.6.0 | 9.7.0 |
| 2011-12 | RAN#54 | R5-115162 | 0515 | - | Definitions, symbols and abbreviations for CA RF | 9.7.0 | 10.0.0 |
| 2011-12 | RAN#54 | R5-115565 | 0520 | - | In-band blocking for CA (New) | 9.7.0 | 10.0.0 |
| 2011-12 | RAN#54 | R5-115568 | 0521 | - | Spurious Response for CA (New) | 9.7.0 | 10.0.0 |
| 2011-12 | RAN#54 | R5-115801 | 0523 | - | Out-of-Band blocking for CA (new) | 9.7.0 | 10.0.0 |
| 2011-12 | RAN#54 | R5-115802 | 0524 | - | Narrow band blocking for CA (new) | 9.7.0 | 10.0.0 |
| 2011-12 | RAN#54 | R5-115803 | 0525 | - | Addition of new RMCs for CA feature related Chapter8 test cases | 9.7.0 | 10.0.0 |
| 2011-12 | RAN#54 | R5-115816 | 0528 | - | General Section for CA RF | 9.7.0 | 10.0.0 |
| 2011-12 | RAN#54 | R5-115817 | 0529 | - | Frequency Band and Channel Assignments for CA RF | 9.7.0 | 10.0.0 |
| 2011-12 | RAN#54 | R5-115818 | 0530 | - | UE Maximum Output Power for intra-band contiguous CA (new) | 9.7.0 | 10.0.0 |
| 2012-03 | RAN#55 | R5-120080 | 0587 | - | Removal of technical content in 36.521-1 v9.7.0 and substitution with pointer to the next Release | 10.0.0 | 10.1.0 |

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| 2012-03 | RAN#55 | R5-120134 | 0541 | - | RF: General clarification on the count of ACK / NACKs in throughput calculation in CQI tests | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120137 | 0542 | - | RF: Corrections to message contents in some MIMO demodulation performance tests | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120138 | 0543 | - | RF: Updates to handling requirements and tests for different releases | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120140 | 0544 | - | RF: Coverage of MPR and A-MPR requirements in Tx emissions tests | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120243 | 0545 | - | Tx Test cases Uplink power limit window for 3000MHz to 4200MHz | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120244 | 0546 | - | Rx Test cases Uplink power limit window for 3000MHz to 4200MHz | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120252 | 0547 | - | Global in-channel TX-test, delete note | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120288 | 0548 | - | LTE RF - Update of abbreviations and addition of RBstart | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120314 | 0549 | - | Clarification for the starting point of RB in 6.3.5.2 Relative Power test | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120338 | 0550 | - | Correction to MCS value in Table A.4-3 | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120343 | 0551 | - | Introduction of new maximum input level test case for CA | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120351 | 0552 | - | CA RF - Changes in aggregated CC configurations | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120355 | 0553 | - | CA RF - updates to 7.7A Spurious response for CA | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120370 | 0554 | - | Test Tolerance for 6.6.3.3 additional spurious emissions NS_07 | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120426 | 0555 | - | Correction to Frequency Range for Spurious Emission Requirements | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120521 | 0556 | - | Introduction to Maximum Power Reduction for CA | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120524 | 0557 | - | Introduction to Maximum Power Reduction for CA in Annex | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120526 | 0558 | - | Introduction to Adjacent Channel Leakage power Ratio (ACLR) for CA in Annex | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120801 | 0559 | - | Correction of TC 6.5.2.1 Error Vector Magnitude (EVM) for Test requirement | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120802 | 0560 | - | Correction of TC 8.2.1.3.1 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for 8.2.1.3.1.4.1 Initial conditions | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120803 | 0561 | - | Correction of TC8.2.1.3.2 FDD PDSCH Open Loop Spatial Multiplexing 4x2 for 8.2.1.3.2.4.1 Initial conditions | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120804 | 0562 | - | Correction of TC 8.2.2.3.1 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for 8.2.2.3.1.4.1 Initial conditions | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120805 | 0563 | - | Correction of TC 8.2.2.3.2 TDD PDSCH Open Loop Spatial Multiplexing 4x2 for 8.2.2.3.2.4.1 Initial conditions | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120816 | 0564 | - | Addition of frequency band and channel assignments for UL MIMO | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120825 | 0565 | - | Introduction of Chapter8 Single antenna port and Open loop spatial Multiplexing test cases for CA capable UE's. | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120828 | 0566 | - | LTE RF - UE Co-ex test point clarification for bands 7 and 38 | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120833 | 0567 | - | Addition of receiver image section 7.10 | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120835 | 0568 | - | Correction to Reporting of Rank Indicator (RI) FDD Test | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120837 | 0569 | - | Introduction to Adjacent Channel Leakage power Ratio (ACLR) for CA | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120839 | 0570 | - | Addition of a new TC 6.2.2B for UE Maximum Output Power for UL-MIMO | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120842 | 0571 | - | Harmonic exceptions in LTE UE to UE co-existence tests | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120843 | 0572 | - | Clarification for upper and lower interferers in 7.6.3 Narrow Band Blocking | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120844 | 0573 | - | RF: Correction of frequency range for out of band blocking test | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120845 | 0574 | - | Correction and completion to clause 10 MBMS performance | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120874 | 0575 | - | RF: New RMC-s and updates to the RMC-s overview tables | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120875 | 0576 | - | RF: Test frequencies for UE co-existence emissions under Note 13 | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120877 | 0577 | - | UE Transmit OFF power for CA | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120878 | 0578 | - | Frequency error for Intraband CA | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120879 | 0579 | - | Occupied bandwidth for intra-band contiguous CA | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120880 | 0580 | - | Transmitter Spurious emissions for CA | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120881 | 0581 | - | Reference sensitivity level for CA | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120882 | 0582 | - | CA RF - Addition of test description to 6.2.2A MOP for intra-band CA | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120884 | 0583 | - | CA RF - updates to 7.6.2A OOB blocking for CA | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120885 | 0584 | - | CA RF - updates to 7.6.3A Narrow-band blocking for CA | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120899 | 0585 | - | CA RF - updates to 7.6.1A In-band Blocking for CA | 10.0.0 | 10.1.0 |
| 2012-03 | RAN#55 | R5-120900 | 0586 | - | Correction to UE Spurious Emissions | 10.0.0 | 10.1.0 |
| 2012-06 | RAN#56 | R5-121138 | 0588 | - | Correction of TC 6.3.5.2 Power Control Relative power tolerance | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121155 | 0589 | - | Correction in test configuration table of sections 7.4 and 7.5 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121206 | 0590 | - | Correction of test procedure for intermodulation | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121208 | 0591 | - | Correction of test procedure for out-of-band blocking | 10.1.0 | 10.2.0 |

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| 2012-06 | RAN#56 | R5-121221 | 0592 | - | Relative frequency error for CA performance tests | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121241 | 0593 | - | RF: Corrections to derivation of test requirements for some test points of TC 6.2.4 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121242 | 0594 | - | RF: Updates to Annex I (Handling of different releases) | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121253 | 0595 | - | RF: Clarification of test frequencies for UE co-existence emissions under Note 13 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121254 | 0596 | - | RF: Minor correction to RMC reference in minimum test time annex for TC 8.3.2.1.3 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121305 | 0597 | - | Removal of test description from Transmit off power for CA and introducing ON/OFF time mask for CA | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121322 | 0598 | - | Update of 6.3.4.2.2 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121337 | 0599 | - | Clarifications to Maximum Power Reduction for CA | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121438 | 0600 | - | Modification to Configured UE transmitted Output Power | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121451 | 0601 | - | Correction of the Band 23 for UE coexistence requirements | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121459 | 0602 | - | Correction of RF Test case: 8.7.2.1 TDD sustained data rate performance | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121463 | 0603 | - | Introduction of Adjacent Channel Selectivity (ACS) for CA | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121475 | 0604 | - | LTE CA general updates to sections 3 - 5 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121479 | 0605 | - | CA RF - TC 6.2.2A MOP updates | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121482 | 0606 | - | CA RF - 7.6.1A In-band blocking updates | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121483 | 0607 | - | CA RF - 7.6.2A Out-of-band blocking updates | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121484 | 0608 | - | CA RF - 7.6.3A Narrow-band blocking updates | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121485 | 0609 | - | CA RF - 7.7A Spurious response updates | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121488 | 0610 | - | LTE RF - TC 6.6.3.2 UE co-existence requirements correction | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121523 | 0611 | - | Correction to downlink RB allocation in 7.5.4 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121525 | 0612 | - | Correction to test requirement in 9.2.2.2 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121678 | 0613 | - | TS 36.521-1: Spurious emission band UE co-existence alignment | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121680 | 0614 | - | TS 36.521-1: Applicability correction for 9.3.2.1.1 and 9.3.2.1.2 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121700 | 0615 | - | Suffix definition of Clause 5 for CA, UL-MIMO, and DL-MIMO for 36.521-1 R-10 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121903 | 0616 | - | Update of Band 41 RF requirements to align with recent core specification changes | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121906 | 0617 | - | TS 36.521-1: Introduction of Band 26/XXVI in section 5 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121907 | 0618 | - | TS 36.521-1: Band 26 Test points for A-MPR test | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121909 | 0619 | - | CA RF - Adding contents to TC 6.2.4A A-MPR for CA | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121918 | 0620 | - | TS 36.521-1: Introduction of Band 26/XXVI in section 6 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121920 | 0621 | - | Corrections of test parameters and test procedure for ACS | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121921 | 0622 | - | TS 36.521-1: Introduction of Band 26/XXVI in section 7 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121925 | 0623 | - | CA RF - addition of test case 8.7.2.1A TDD sustained data rate performance for CA | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121937 | 0624 | - | A-MPR: Band 20, NS_10 not tested | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121938 | 0625 | - | RF: Several corrections to sustained data rate TC-s 8.7.1 and 8.7.2 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121939 | 0626 | - | RF: Corrections to CSI tests | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121944 | 0627 | - | Addition of a new TC 6.3.3B | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121945 | 0628 | - | Addition of a new TC 6.3.2B for Minimum Output Power for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121946 | 0629 | - | Addition of a new TC 6.3.4B | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121947 | 0630 | - | Addition of a new TC 6.5.1B for Frequency Error for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121948 | 0631 | - | Addition of a new TC 6.6.1B | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121949 | 0632 | - | Addition of a new TC 6.7B | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121950 | 0633 | - | Addition of a new TC for Configured transmitted power for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121951 | 0634 | - | Addition of a new TC for Power Control Absolute Power Tolerance for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121955 | 0635 | - | SEM for CA | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121956 | 0636 | - | Addition of a new TC for Carrier leakage for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121957 | 0637 | - | Addition of a new TC for In-band emissions for non allocated RB for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121958 | 0638 | - | Addition of a new TC for EVM equalizer spectrum flatness for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121959 | 0639 | - | Addition of a new TC for Reference sensitivity level for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121960 | 0640 | - | Addition of a new TC for Maximum input level for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121961 | 0641 | - | Addition of a new TC for Adjacent Channel Selectivity (ACS) for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121962 | 0642 | - | Addition of a new TC for In-band blocking for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121963 | 0643 | - | Addition of a new TC for Narrow band blocking for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121964 | 0644 | - | Addition of a new TC for Wide band Intermodulation for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121983 | 0645 | - | Introduction of Chapter8 Single antenna port and Open loop spatial Multiplexing TDD test cases for CA capable UEs | 10.1.0 | 10.2.0 |

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|---|---|---|---|---|---|---|---|
| 2012-06 | RAN#56 | R5-121984 | 0646 | - | EVM and Global In-Channel TX-Test for intra band CA | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121985 | 0647 | - | RF: Corrections to applicability of some CA tests | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121986 | 0648 | - | Addition of test description to Occupied bandwidth for CA | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121987 | 0649 | - | Addition of test description to ACLR for CA | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121988 | 0650 | - | Addition of test description to Transmitter Spurious emissions for CA | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121989 | 0651 | - | Addition of test description to Reference sensitivity level for CA | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121994 | 0652 | - | Addition of Codebook Subset Restriction in 8.3.2.x | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121995 | 0653 | - | Update of 6.3.5.2 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121996 | 0654 | - | TS 36.521-1: 9.4.1.2.1 and 9.4.1.2.2.1 test procedure correction | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-121997 | 0655 | - | TS 36.521-1: Minimum conformance requirements alignments for section 9 | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-122003 | 0656 | - | Addition of a new TC for Out-of-band blocking for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-122004 | 0657 | - | Addition of a new TC for Spurious response for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-06 | RAN#56 | R5-122006 | 0658 | - | Addition of a new TC for Error Vector Magnitude for UL-MIMO | 10.1.0 | 10.2.0 |
| 2012-09 | RAN#57 | R5-123136 | 0659 | - | Correction of TC 6.3.5.2 | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123146 | 0660 | - | Corrections to Transmitter Characteristics Requirements | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123148 | 0661 | - | Correction to SNR definition | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123150 | 0662 | - | RF: Several editorial corrections | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123161 | 0663 | - | RF: PDCCH Padding in Rx spurious emissions test | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123179 | 0664 | - | Introduction of eDL-MIMO to Propagation Conditions | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123209 | 0665 | - | RF: Alignment of RMC references in test procedure of CSI tests | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123234 | 0666 | - | LTE RF - Correction to 7.4 and 7.5 UL allocations | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123239 | 0667 | - | Addition of test description to CA Maximum input level test case | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123267 | 0668 | - | Correction to Occupied bandwidth for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123268 | 0669 | - | Correction to Reference sensitivity level for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123324 | 0670 | - | New Annex for: Statistical testing of receiver performance with throughput for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123330 | 0671 | - | Correction to test parameters in 6.6.3.2 | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123332 | 0672 | - | Update of section 8 uncertainties and Test Tolerances for Rel-9 Tests | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123333 | 0673 | - | Clarification of RB allocation for DRS demodulation tests | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123334 | 0674 | - | Correction to uplink reference measurement channel | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123386 | 0675 | - | Addition of a new TC for power control relative power tolerance for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123387 | 0676 | - | Addition of a new TC for aggregate power control tolerance for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123392 | 0677 | - | Update carrier frequency and EARFCN | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123394 | 0678 | - | Update test case of UE maximum output power for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123395 | 0679 | - | Update test case of configured UE transmitted output power for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123397 | 0680 | - | Update test case of power control absolute power tolerance for UL- MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123507 | 0681 | - | Editorial corrections to blocking characteristics for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123510 | 0682 | - | ACLR for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123521 | 0683 | - | TS 36.521-1: A-MPR and additional spurious corrections | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123522 | 0684 | - | TS 36.521-1: UL allocation clarification in PUSCH-EVM with exclusion period test | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123523 | 0685 | - | TS 36.521-1: Section 9 applicability revision (UE categories) | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123534 | 0687 | - | TS 36.521-1:A-MPR Test tolerances update for NS_12, NS_13, NS_14, NS_15 | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123547 | 0688 | - | Correction to the content of reference table number for TC 7.8.1 | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123783 | 0689 | - | Corrections to EVM and global in channel test for Intra-Band CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123850 | 0690 | - | Correction to ONOFF time mask for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123851 | 0691 | - | Correction to Transmitter Spurious emissions for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123852 | 0692 | - | New Annex for: Statistical testing of receiver characteristics with CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123853 | 0693 | - | Introduction of eDL-MIMO to measurement of performance requirements | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123854 | 0694 | - | Addition of a new TC for additional maximum power reduction (A-MPR) for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123855 | 0695 | - | Additional texts for Note2 in Spurious emission test | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123857 | 0696 | - | Additions to test requirements for Maximum Power Reduction for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123859 | 0697 | - | Addition of a new TC for time alignment between transmitter branches for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123900 | 0698 | - | Changes associated with PHS band operation change for LTE | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123901 | 0699 | - | TS 36.521-1: PDSCH RMC for Rel-9 PCFICH test cases | 10.2.0 | 10.3.0 |

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| 2012-09 | RAN#57 | R5-123902 | 0700 | - | TS 36.521-1:Adding missing UL RMCs for test 9.4.1.2.2 | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123910 | 0701 | - | MPR for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123911 | 0702 | - | SEM for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123912 | 0703 | - | ADDITIONAL SEM for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123915 | 0704 | - | RF: Update of Annex I | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123917 | 0705 | - | Correction of test procedure for 36.521-1 chapter 8 CA test cases | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123919 | 0706 | - | TS 36.521-1: New test cases for CQI reporting under fading conditions - PUCCH 1-0 | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123932 | 0707 | - | RF: Updates to transmission mode 8 test cases | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123933 | 0708 | - | RF: Several corrections to MBMS performance tests | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123934 | 0709 | - | Addition of RF Test case: 8.7.2.1_1 TDD sustained data rate performance (Rel-10 and forward) | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123943 | 0710 | - | Introduction of FDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123944 | 0711 | - | Introduction of TDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123945 | 0712 | - | FDD RI Reporting for eDL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123946 | 0713 | - | TDD RI Reporting for eDL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123947 | 0714 | - | Introduction of eDL-MIMO to CSI Reference Measurement Channels | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123948 | 0715 | - | Introduction of eDL-MIMO to structure of subclauses | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123950 | 0716 | - | RF-CA: Introduction of new specification structure for Tx tests for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123951 | 0717 | - | CA RF - TC 6.2.2A update | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123952 | 0718 | - | CA RF - Updates to Blocking Test Cases | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123953 | 0719 | - | CA RF - TC 7.7A Spurious Response update | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123954 | 0720 | - | New RF TC for 36.521-1 _ 6.3.5A.1 Power Control Absolute power tolerance for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123955 | 0721 | - | New RF TC for 36.521-1 _ 6.3.5A.2 Power Control Relative power tolerance for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123956 | 0722 | - | Correction to Transmit OFF power for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123957 | 0723 | - | Adjusting test procedure and test requirements to new Annex G.3A | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123958 | 0724 | - | Update of Test case 8.7.2.1A TDD sustained data rate performance for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123961 | 0725 | - | Corrections to A-MPR for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123962 | 0726 | - | Additions to test description for Adjacent Channel Selectivity (ACS) for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123963 | 0727 | - | Introduction to UE configured transmitted output power for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123964 | 0728 | - | Introduction of ACS and UE configured Tx output power for CA in Annex | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123969 | 0729 | - | Introduction Single-Layer Spatial Multiplexing for eDL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123970 | 0730 | - | updates to 6.6.2.1A SEM for CA | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123977 | 0731 | - | Addition of a new TC6.6.3B.1 for Transmitter Spurious emissions for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123978 | 0732 | - | Addition of a new TC6.6.3B.2 for Spurious emission band UE co-existence for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123979 | 0733 | - | Addition of a new TC6.6.3B.3 for Additional spurious emissions for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123980 | 0734 | - | Addition of a new TC for narrow band blocking for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123981 | 0735 | - | Update test case of general ON OFF time mask for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123982 | 0736 | - | Update test case of frequency error for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123983 | 0737 | - | Update test case of Error Vector Magnitude (EVM) for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123984 | 0738 | - | Update test case of carrier leakage for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123985 | 0739 | - | Update test case of in-band emissions for non allocated RB for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123986 | 0740 | - | Update test case of EVM equalizer spectrum flatness for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123987 | 0741 | - | Update test case of reference sensitivity level for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123988 | 0742 | - | Update test case of maximum input level for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123989 | 0743 | - | Update test case of in-band blocking for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123990 | 0744 | - | Update test case of out-of-band blocking for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123991 | 0745 | - | Update test case of spurious response for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123992 | 0746 | - | Update test case of wide band Intermodulation for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-09 | RAN#57 | R5-123994 | 0747 | - | Update test case of Adjacent Channel Selectivity (ACS) for UL-MIMO | 10.2.0 | 10.3.0 |
| 2012-12 | RAN#58 | R5-125109 | 0749 | - | Update of TC6.6.3B.2 for Spurious emissions band UE co-existence for UL-MIMO | 10.3.0 | 10.4.0 |

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| 2012-12 | RAN#58 | R5-125110 | 0750 | - | Update of TC6.6.3B.3 for Additional spurious emissions for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125146 | 0751 | - | Corrections to Test Procedure of TC 6.6.2.3 ACLR | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125147 | 0752 | - | Updates for TC 6.2.3B MPR for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125148 | 0753 | - | Updates for TC 6.6.2.1B SEM for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125149 | 0754 | - | Updates for TC 6.6.2.2B A-SEM for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125150 | 0755 | - | Updates for TC 6.6.2.3B ACLR for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125215 | 0756 | - | Correction of TC 6.6.2.1 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125252 | 0757 | - | Adding normative reference for core requirements in TC 6.2.4 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125253 | 0758 | - | Adding normative reference for core requirements for many section 9 tests | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125254 | 0759 | - | Correction of table references in sub clause G.X | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125260 | 0760 | - | CR to TC 7.4A: Splitting the CA Maximum input level test case | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125263 | 0761 | - | RF Cl G.3A: General corrections and completion of Annex G.3A with TDD tests | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125304 | 0762 | - | Updates for Minimum requirements of 6.2.5 Configured UE transmitted Output Power | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125309 | 0763 | - | Addition of Band 28 definition to Chap.5 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125311 | 0764 | - | Addition of Band 28 to 6.2.2 MOP | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125314 | 0765 | - | Addition of Band 28 to 7.3 Refsens | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125321 | 0766 | - | Updates for TC6.6.1A: Occupied bandwidth for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125322 | 0767 | - | Updates for TC6.6.2.3A: ACLR for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125323 | 0768 | - | Updates for TC6.6.3.1A: Transmitter Spurious emissions for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125346 | 0769 | - | TC 6.2.4A.1 A-MPR for CA updates | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125351 | 0770 | - | Correction to LTE Rx TCs UL allocation location | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125365 | 0771 | - | Uncertainties and Test Tolerances for Rel-9 CQI Reporting under fading conditions, PUCCH 1-0 Tests | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125374 | 0772 | - | Clean up of Tx tests | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125405 | 0773 | - | Addition of 15MHz and 20MHz Bandwidths for Band 23 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125407 | 0774 | - | RF TC 6.6.3.2: Clarification and corrections | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125417 | 0775 | - | Additions to test description for TC 7.5A.1 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA and UL CA) | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125422 | 0776 | - | Introduction to CA_1 & CA_40 TC 7.5A.2 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA without UL CA) | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125443 | 0777 | - | Corrections of RMC for receiver characteristics | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125445 | 0778 | - | Corrections of FRC subframe allocations for performance requirements | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125450 | 0779 | - | Introduction of TC 9.2.2.1_D FDD CQI Reporting under AWGN conditions - PUCCH 1-1 for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125451 | 0780 | - | Introduction of TC 9.2.2.2_D TDD CQI Reporting under AWGN conditions - PUCCH 1-1 for eDL-MIMO | 10.3.0 | 10.4.0 |

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| 2012-12 | RAN#58 | R5-125452 | 0781 | - | Introduction of TC 9.3.2.2.1_D FDD CQI Reporting under fading conditions - PUCCH 1-1 for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125453 | 0782 | - | Introduction of TC 9.3.2.2.2_D TDD CQI Reporting under fading conditions - PUCCH 1-1 for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125454 | 0783 | - | Additions of eDL-MIMO to Annex A | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125455 | 0784 | - | Additions of eDL-MIMO to Annex B Propagation Conditions for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125456 | 0785 | - | Additions of eDL-MIMO to Annex F | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125463 | 0786 | - | Additions to TC 9.4.2.1.1_D FDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125464 | 0787 | - | Additions to TC 9.4.2.1.2_D TDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125465 | 0788 | - | Additions to TC 9.5.1.1_D FDD RI Reporting for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125466 | 0789 | - | Additions to TC 9.5.1.2_D TDD RI Reporting for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125593 | 0790 | - | RF TC 6.2.4: Minor correction to test points for NS_15 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125594 | 0791 | - | RF TC 6.2.4B: Minor correction to test points for NS_15 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125610 | 0792 | - | TS 36-521-1: MPR correction for band 26 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125801 | 0793 | - | Updates of 6.3.3A UE Transmit OFF power for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125802 | 0794 | - | Update of Annex F in 36.521-1 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125803 | 0795 | - | Updates for 6.3.4A ON/OFF time mask for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125804 | 0796 | - | Addition of Transmitter test case - Transmit intermodulation for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125835 | 0797 | - | Update of TC6.6.3B.1 for Transmitter Spurious emissions for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125851 | 0798 | - | Introduction of TC 8.3.1.2.1_D FDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125852 | 0799 | - | Introduction of TC 8.3.2.2.1_D TDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125853 | 0800 | - | Additions to Annex G for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125854 | 0801 | - | Corrections to Annex H for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125855 | 0802 | - | Additions to TC 8.3.2.1.2_D TDD Single-Layer Spatial Multiplexing on antenna ports without a simultaneous transmission for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125856 | 0803 | - | Additions to TC 8.3.2.1.3_D TDD Single-Layer Spatial Multiplexing on antenna ports with a simultaneous transmission for eDL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125857 | 0804 | - | Introduction of Band 27 to TS 36.521-1 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125858 | 0805 | - | Updates to TC 8.2.2.3.1_A.1 for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125859 | 0806 | - | Addition of new test case 8.2.1.4.2_A.1 for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125860 | 0807 | - | Addition of new test case 8.2.2.4.2_A.1 for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125861 | 0808 | - | Addition of sustained downlink data rate TC 8.7.1.1_A.1 for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125862 | 0809 | - | Addition of sustained downlink data rate TC 8.7.1.1_A.2 for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125866 | 0810 | - | Update of RF TC for 36.521-1 _ 6.3.5A.2.1 Power Control Relative power tolerance for CA | 10.3.0 | 10.4.0 |

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| 2012-12 | RAN#58 | R5-125867 | 0811 | - | Update TC 6.6.3.2_1 Spurious emission band UE co-existence(Release 9 and forward) | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125868 | 0812 | - | Correction to test applicability in 6.2.4 A-MPR test case | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125869 | 0813 | - | Correction to test parameter in Perf 8.2.1 of 36.521-1 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125870 | 0814 | - | Clarification of AG level for 8.7 sustained data rate test of 36.521-1 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125871 | 0815 | - | Correction to SNR test points in test procedure | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125872 | 0816 | - | Clarification of random precoding granularity | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125873 | 0817 | - | Update of General sections for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125874 | 0818 | - | Introduction to CA_1-5 TC 7.5A.3 Adjacent Channel Selectivity (ACS) for CA (inter-band DL CA without UL CA) | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125875 | 0819 | - | Addition of a new TC 6.3.5A.3.1 Aggregate power control tolerance for CA(intra-band contiguous DL CA and UL CA) | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125876 | 0820 | - | Addition of a new TC 6.6.3.2A.1 Spurious emission band UE co-existence for CA(intra-band contiguous DL CA and UL CA) | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125890 | 0821 | - | Addition of Band 28 to 6.6.3.2 Spurious emission band UE co-existence | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125891 | 0822 | - | Addition of Band 28 to 6.6.3.3 Additional spurious emissions | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125892 | 0823 | - | UE output power definition for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125893 | 0824 | - | Update TC 6.2.4B Additional maximum power reduction (A-MPR) for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125894 | 0825 | - | Update TC 6.5.2B.1 Error vector magnitude (EVM) for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125895 | 0826 | - | Update TC 6.2.5B Configured transmitted output power for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125896 | 0827 | - | Update TC 7.3B Reference sensitivity level for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125897 | 0828 | - | Update TC 7.4B Maximum input level for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125898 | 0829 | - | Update TC 7.5B Adjacent Channel Selectivity (ACS) for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125899 | 0830 | - | Update TC 7.6.1B In-band blocking for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125900 | 0831 | - | Update TC 7.6.2B Out-of-band blocking for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125901 | 0832 | - | Update TC 7.6.3B Narrow band blocking for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125902 | 0833 | - | Update TC 7.7B Spurious response for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125903 | 0834 | - | Update TC 7.8.1B Wide band intermodulation for UL-MIMO | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125906 | 0835 | - | New RF TC for 36.521-1_8.2.1.2.3_Enhanced ICIC for LTE | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125907 | 0836 | - | New RF TC for 36.521-1_8.4.1.2.3_Enhanced ICIC for LTE | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125908 | 0837 | - | TDD CQI Reporting under AWGN conditions-PUCCH 1-0-Demod subframe overlaps with aggressor cell ABS (eICIC) | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125909 | 0838 | - | TDD PHICH Transmit Diversity 2x2-Demod subframe overlaps with aggressor cell ABS (eICIC) | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125910 | 0839 | - | TDD PDSCH Open Loop Spatial Multiplexing 2x2 Demod subframe overlaps with aggressor cell ABS (eICIC) | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125924 | 0841 | - | CR to 8.2.1.1.1_A: Correction to an average throughput measurement | 10.3.0 | 10.4.0 |

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| 2012-12 | RAN#58 | R5-125925 | 0842 | - | CR to 8.2.1.3.1_A: Correction to an average throughput measurement | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125931 | 0844 | - | Additions to test description TC 6.2.5A.1 and 6.2.5A.2 including CA_1A-19A and CA_1A-21A updates | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125932 | 0845 | - | Updates for TC7.3A: Reference sensitivity level for CA including CA_41C, CA_1-19 and CA_1-21 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125934 | 0846 | - | Update of RF TC for 36.521-1 _ 6.3.5A.1.1 Power Control Absolute power tolerance for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-125935 | 0847 | - | Updates for TC6.5.1A: Frequency error for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-126043 | 0849 | - | Updates for 5.2A operating bands for CA_7, CA_38, CA_41, CA_1-18, CA_1-19, CA_1-21, CA_2-17, CA_3-5, CA_3-7, CA_3-8, CA_3-20, CA_4-12, CA_4-13, CA_4-17, CA_4-20 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-126044 | 0850 | - | Updates for 5.4.2A channel bandwidth for CA_7, CA_38, CA_41, CA_1-18, CA_1-19, CA_1-21, CA_2-17, CA_3-5, CA_3-7, CA_3-8, CA_3-20, CA_4-12, CA_4-13, CA_4-17, CA_4-20 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-126063 | 0840 | - | Update of Perf 8.7.1.1 and 8.7.2.1 of 36.521-1 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-126065 | 0843 | - | Clarification of RB position in 9.4.1 and 9.4.2 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-126066 | 0848 | - | Update of minimum test time in Annex G.3.5 | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124010 | 0851 | - | RF Cl 8.1.1: Update of the CA capability table | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124013 | 0852 | - | RF Cl 8.7.2.1A: Update of test structure according to the work plan | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124082 | 0853 | - | Correction to TC 7.5.1 Adjacent Channel Selectivity (ACS) | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124116 | 0854 | - | Addition to test description for SEM for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124123 | 0855 | - | Addition to minimum requirement for TC 6.5.2A.3.1 in-band emissions for non allocated RB for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124125 | 0856 | - | TC 6.2.2A.1 UE MOP for CA updates | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124126 | 0857 | - | CR to Annex G.3A.5: Minimum number of samples for CA performance tests | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124131 | 0858 | - | Additions to test case for TC 6.2.3A.1 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA) | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124133 | 0859 | - | Introduction to TC 6.6.3.3A.1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124139 | 0860 | - | TC 6.3.2A.1 Minimum Output Power for CA introduction | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124149 | 0861 | - | RF TC 8.2.2.1.1_A: Adjusting test procedure and requirements to completed Annex G.3A | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124160 | 0862 | - | TC 7.6.1A.x In-band blocking for CA introduction | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124163 | 0863 | - | TC 7.6.2A.x Out-of-band blocking for CA introduction | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124164 | 0864 | - | TC 7.6.3A.x Narrow-band blocking for CA introduction | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124165 | 0865 | - | TC 7.7A.x Spurious response for CA introduction | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124166 | 0866 | - | Addition of Receiver test case - Wideband intermodulation for CA | 10.3.0 | 10.4.0 |
| 2012-12 | RAN#58 | R5-124186 | 0867 | - | RF: Addition of references to connection diagrams in CA tests | 10.3.0 | 10.4.0 |
| 2013-03 | RAN#59 | R5-130092 | 0851 | - | Updates of 6.6.3.3 - Addition of Low-channel Band 1 coexistence with PHS condition | 10.4.0 | 10.5.0 |

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| 2013-03 | RAN#59 | R5-130105 | 0854 | - | Update of TC6.6.3B.2 for Spurious emissions band UE co-existence for UL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130125 | 0856 | - | Update of TC6.6.3B.3 for Additional spurious emissions for UL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130128 | 0857 | - | Update TC 6.2.4B Additional Maximum Power Reduction (A-MPR) for UL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130129 | 0858 | - | Update TC 6.3.5B.1 Power control absolute power tolerance for UL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130130 | 0859 | - | Update TC 6.3.5B.2 Power Control Relative power tolerance for UL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130131 | 0860 | - | Update TC 6.3.5B.3 Aggregate power control tolerance for UL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130132 | 0861 | - | Update TC 6.5.2B.2 Carrier leakage for UL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130133 | 0862 | - | Update TC 6.3.2B Minimum Output Power for UL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130134 | 0863 | - | Update TC 6.6.1B Occupied bandwidth for UL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130135 | 0864 | - | Update TC 6.7B Transmit intermodulation for UL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130176 | 0869 | - | Introduction of new rel-10 Reporting of RI test cases into annexes | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130182 | 0870 | - | CA RF: Correction to Annex I | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130183 | 0871 | - | UL-MIMO RF: Correction to Annex I | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130184 | 0872 | - | eICIC RF: Correction to Annex I | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130185 | 0873 | - | eDL-MIMO RF: Correction to Annex I | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130188 | 0874 | - | RF: Correction to TC 8.2.1.1.1 - Frequency range for partial allocation | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130245 | 0877 | - | Additions to TC 6.6.2.3A.1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA) | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130273 | 0880 | - | Corrections to Annex A DL Reference Measurement and PMI Accuracy Measurements | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130285 | 0881 | - | Correction to TC 8.3.2.1.3 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130288 | 0882 | - | Addition to TC 9.2.2.2_D TDD CQI Reporting under AWGN conditions - PUCCH 1-1 for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130291 | 0883 | - | Addition to TC 9.3.2.2.2_D TDD CQI Reporting under fading conditions " PUCCH 1-1 for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130292 | 0884 | - | Additions to TC 9.4.2.1.1_D FDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130293 | 0885 | - | Additions to TC 9.4.2.1.2_D TDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130298 | 0886 | - | CA RF: Correction to TC 7.6.1A | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130299 | 0887 | - | Uncertainties and Test Tolerances for Test case 7.4A | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130308 | 0888 | - | Corrections to test procedure of TC 6.2.2 UE Maximum Output Power | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130309 | 0889 | - | Corrections to test purpose of TC 6.2.3 Maximum Power Reduction (MPR) | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130310 | 0890 | - | Correction to test procedure of TC 6.7A.1 Transmit Intermodulation for CA | 10.4.0 | 10.5.0 |

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| 2013-03 | RAN#59 | R5-130407 | 0894 | - | Correction to test requirement of 6.2.4A | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130408 | 0895 | - | Correction to test procedure in 6.3.5A.1 | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130411 | 0896 | - | Correction to test procedure in 6.6.2.3A | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130413 | 0897 | - | Correction to 7.6.3A.3 test procedure | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130415 | 0898 | - | Correction to 6.6.3.2A and 6.6.3.3A | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130416 | 0899 | - | Correction to 6.6.3B.2 and 6.6.3B.3 | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130419 | 0900 | - | Correction to 9.3.4 UE-selected subband CQI | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130421 | 0901 | - | Correction to wideband CQI-samples | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130427 | 0902 | - | Update of minimum test time in Annex G.5.4 | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130471 | 0905 | - | Update of spurious emission test cases for introduction of Japanese Regulatory Requirements for LTE Band 8 | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130779 | 0875 | 1 | CA RF: Clarification on Cell ID | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130780 | 0903 | 1 | Correction to 941 and 942 | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130801 | 0908 | - | Additions of CA RF test cases to Annex F | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130804 | 0909 | - | Correction to 6.6.3.2 and 6.6.3.3 | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130806 | 0911 | - | Update TC 6.6.3.2 Spurious emission band UE co-existence | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130808 | 0912 | - | CA RF - SCC configuration references | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130809 | 0913 | - | CA RF Rx - Update of blocking characteristics | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130811 | 0915 | - | LTE RF - Correction to LTE Rx TCs UL allocation location | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130901 | 0916 | - | Update of TC 8.7.2.1_A.1 TDD sustained data rate performance for CA (intra-band contiguous DL CA) | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130902 | 0917 | - | Editorial correction for ON/OFF time mask for CA | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130903 | 0918 | - | Correction to Band 12 frequency for CA_4-12 | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130908 | 0920 | - | Additions of eDL-MIMO to Annex A.4 CQI Reference Measurement Channels | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130909 | 0921 | - | Introduction of TC 8.3.1.1.1_D FDD Single-Layer Spatial Multiplexing on antenna ports without a simultaneous transmission for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130910 | 0922 | - | Introduction of FDD TC 8.3.1.1.2_D FDD Single-Layer Spatial Multiplexing on antenna ports with a simultaneous transmission for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130911 | 0923 | - | Additions to TC 8.3.1.2.1_D FDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130912 | 0924 | - | Additions to TC 8.3.2.2.1_D TDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130913 | 0925 | - | Additions to TC 8.3.2.1.2_D TDD Single-Layer Spatial Multiplexing on antenna ports without a simultaneous transmission for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130914 | 0926 | - | Additions to TC 8.3.2.1.3_D TDD Single-Layer Spatial Multiplexing on antenna ports with a simultaneous transmission for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130924 | 0934 | - | Update RF TC for 36.521-1_8.2.1.2.3_C FDD PDSCH Transmit div 2x2 Enhanced ICIC for LTE | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130925 | 0935 | - | Update RF TC for 36.521-1_8.4.1.2.3_C FDD PCFICH PDCCH Transmit div 2x2 Enhanced ICIC for LTE | 10.4.0 | 10.5.0 |

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| 2013-03 | RAN#59 | R5-130935 | 0937 | - | SNR uncertainty | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130936 | 0938 | - | Introduction of new rel-10 Reporting of RI test cases | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130937 | 0939 | - | RF: Corrections to Annex H - Default uplink settings | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130938 | 0940 | - | Update of TC 8.7.2.1_1 TDD sustained data rate performance (Rel-10 and forward) | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130939 | 0941 | - | Clarification to Soft Channel Bit size used by SS and UE | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130940 | 0942 | - | Correction to sustained data rate performance test | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130941 | 0943 | - | Clean up on performance tests | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130944 | 0944 | - | Update TC 6.3.5A.3.1 Aggregate power control tolerance for CA (intra-band contiguous DL CA and UL CA) | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130945 | 0945 | - | Update TC 6.6.3.2A.1 Spurious emission band UE co-existence for CA (intra-band contiguous DL CA and UL CA) | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130946 | 0946 | - | Additions to TC 6.2.5A.1 Configured UE transmitted Power for CA (intra-band contiguous DL CA and UL CA) | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130947 | 0947 | - | Additions to TC 6.6.3.3A.1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130948 | 0948 | - | Additions to TC 7.5A.1 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA and UL CA) | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130949 | 0949 | - | Additions to TC 7.5A.2 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA without UL CA) | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130950 | 0950 | - | Additions to TC 7.5A.3 Adjacent Channel Selectivity (ACS) for CA (inter-band contiguous DL CA without UL CA) | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130951 | 0951 | - | Correction to test point of Frequency Error for CA and addition of TC for intra-band contiguous DL CA without UL CA | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130961 | 0955 | - | Channel matrix impairments for eDL-MIMO CSI tests | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130965 | 0957 | - | TC 9.4.1.1.1_D FDD Reporting of PMI - PUSCH 3-1 (Single PMI) for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130966 | 0958 | - | TC 9.4.1.1.2_D TDD Reporting of PMI -PUSCH 3-1 (Single PMI) for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130967 | 0959 | - | Additions of eDL-MIMO to Annex C Measurement of Performance Requirements | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130968 | 0960 | - | Additions of eDL-MIMO test cases to Annex F | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130969 | 0961 | - | Additions to Annex G for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130970 | 0962 | - | Addition to TC 9.2.2.1_D FDD CQI Reporting under AWGN conditions - PUCCH 1-1 for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130971 | 0963 | - | Addition to TC 9.3.2.2.1_D FDD CQI Reporting under fading conditions - PUCCH 1-1 for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130972 | 0964 | - | Additions to TC 9.5.1.1_D FDD RI Reporting for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130973 | 0965 | - | Additions to TC 9.5.1.2_D TDD RI Reporting for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130978 | 0966 | - | Correcting TS 36.521-1 to reflect changes in 36.101 | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130979 | 0967 | - | Correction of RF conformance Test case: 8.2.1.3.3 | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130980 | 0968 | - | Addition new TC 8.2.2.3.3 TDD PDSCH Open Loop Spatial Multiplexing 2x2-Demod subframe overlaps with aggressor cell ABS (eICIC) | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130994 | 0969 | - | Corrections to 7.8.1A Wideband intermodulation for CA | 10.4.0 | 10.5.0 |

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| 2013-03 | RAN#59 | R5-130998 | 0970 | - | TC 9.3.1.2.1_D FDD CQI Reporting under fading conditions - PUSCH 3-1 for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130999 | 0971 | - | TC 9.3.1.2.2_D TDD CQI Reporting under fading conditions - PUSCH 3-1 for eDL-MIMO | 10.4.0 | 10.5.0 |
| 2013-03 | RAN#59 | R5-130093 | 0852 | - | Updates of 5.2A Operating bands for CA_11-18 | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130094 | 0853 | - | Updates of 5.4.2A Channel bandwidth combination for CA_11-18 | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130124 | 0855 | - | Additions to the inter-band relaxation term for CA 3A-8A in Table 6.2.5A.1.3-3 | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130140 | 0865 | - | Update TC 7.3A.3 Reference sensitivity level for CA_3-7 and CA_7-20 (inter-band DL CA without UL CA) | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130141 | 0866 | - | Update TC 7.6.2A.1 Out-of-band blocking for CA_38 (intra-band contiguous DL CA and UL CA) | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130142 | 0867 | - | Update TC 6.2.2A.1 UE Maximum Output Power for CA_38 (intra-band contiguous DL CA and UL CA) | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130144 | 0868 | - | Update TC 6.2.4A.1 Additional Maximum Power Reduction (A-MPR) for CA_38 (intra-band contiguous DL CA and UL CA) | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130239 | 0876 | - | Updates of 6.2.5A - inter-band relaxation term for CA_1A-18A and CA_11A-18A | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130257 | 0878 | - | Addition of TDD operating band 44 in receiver characteristic test cases | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130258 | 0879 | - | Addition of TDD operating band 44 in transmitter characteristic test cases | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130329 | 0891 | - | Updates for 7.6.1A.1 in-band blocking for CA_7 and CA_41 | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130330 | 0892 | - | Updates for 7.6.2A.1 Out-of-band blocking for CA_7 and CA_41 | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130348 | 0972 | - | Correction to Spurious emission band UE co-existence and Additional spurious emissions for Band 28 | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130349 | 0893 | - | Addition of Band 28 to MPR and A-MPR | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130769 | 0907 | - | Updates of Refsens for inter-band CA test points for CA_1A-19A and CA_1A-21A | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130783 | 0906 | - | Update TC 6.2.3A.1 Maximum Power Reduction (MPR) for CA_38 (intra-band contiguous DL CA and UL CA) | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130805 | 0910 | - | Update TC 7.3A.1 Reference sensitivity level for CA_38, CA_3-7 and CA_7-20 (intra-band contiguous DL CA and UL CA) | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130810 | 0914 | - | CA_2-17 and CA_4-17 addition to 36.521-1 Rx characteristics | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130905 | 0919 | - | Addition of TDD operating band 44 in chapter 5 | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130915 | 0927 | - | Addition of band 38 and band 41 in intra-band contiguous CA transmitter test cases | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130916 | 0928 | - | Update TC 7.6.1A.1 In-band blocking for CA_38 (intra-band contiguous DL CA and UL CA) | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130917 | 0929 | - | Addition of Inter Band CA combo CA_2A-29A | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130918 | 0930 | - | Update of 6.2.5A Configured transmitted power for CA | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130919 | 0931 | - | CA_2-17 and CA_4-17 addition to 36.521-1 Tx characteristics | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130920 | 0932 | - | Adding transmit power relaxation value for inter-band CA configurations CA_4A-5A and CA_4A-13A | 10.5.0 | 11.0.0 |

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| 2013-03 | RAN#59 | R5-130921 | 0933 | - | Adding refsens relaxation value for inter-band CA configurations CA_4A-5A and CA_4A-13A | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130926 | 0936 | - | Updates for 6.6.2.1A Spectrum emission mask for CA for CA_7 and CA_41 | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130956 | 0952 | - | Updates for 7.3A.1 Reference sensitivity level for CA_7C | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130957 | 0953 | - | Updates for 6.2.2A UE Maximum Output Power for CA_7 and CA_41 | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130958 | 0954 | - | Updates of 7.3A - Reference sensitivity level for CA_11A-18A | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | R5-130964 | 0956 | - | Adding Band 27 to TS 36.521-1 | 10.5.0 | 11.0.0 |
| 2013-03 | RAN#59 | - | - | - | Correction of missing small changes of R5-130806 in Table 6.6.3.2.3-1, 6.6.3.2.5-1, 6.6.3.2_1.3-1 and 6.6.3.2_1.5-1. | 11.0.0 | 11.0.1 |
| 2013-06 | RAN#60 | R5-131085 | 0973 | - | Removal of technical content in 36.521-1 v10.5.0 and substitution with pointer to the next Release | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131147 | 0974 | - | Updates to Chapter7 for Inter Band CA combo CA_2A-29A | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131149 | 0975 | - | New chap8 TDD TC 8.2.2.2.3_C for eICIC | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131150 | 0976 | - | New chap 8 TDD TC 8.4.2.2.3_C for eICIC | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131153 | 0977 | - | Introduction of new rel-11 Reporting of RI test cases | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131154 | 0978 | - | Introduction of new rel-11 Reporting of RI test cases into annexes | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131156 | 0979 | - | Correction to TC 8.4.1.1 test procedure | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131158 | 0980 | - | Introduction of Maximum Input Level test case for CA (inter-band DL CA without UL CA) into annexes | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131210 | 0981 | - | Correction of test applicability for TC 8.2.1.1.1_1: TC 8.2.1.2.1_1 and TC 8.3.2.1.1_1 in 36.521-1 | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131222 | 0982 | - | Update of TC6.6.3B.1 for Transmitter Spurious emissions for UL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131226 | 0983 | - | Clarification to test procedure on applying timing offset between CCs for Chap8 inter-band CA test cases | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131238 | 0984 | - | Update TC 6.2.4A.1 Additional Maximum Power Reduction (A-MPR) for CA_38C (intra-band contiguous DL CA and UL CA) | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131241 | 0985 | - | Update TC 7.3A.1 Reference sensitivity level for CA_4A-12A (intra-band contiguous DL CA and UL CA) | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131242 | 0986 | - | Update TC 7.3A.3 Reference sensitivity level for CA_4A-12A (inter-band DL CA without UL CA) | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131245 | 0987 | - | Update TT of 6.3.5A.3.1 Aggregate power control tolerance for CA (intra-band contiguous DL CA and UL CA) | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131289 | 0988 | - | Uncertainties and Test Tolerances for CA spectrum emission mask | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131358 | 0989 | - | RF: Corrections to RMC-s for sustained data rate test | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131379 | 0990 | - | CA RF - Corrections to 6.2.4A.1 requirements | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131381 | 0991 | - | LTE RF - Editorial correction to 8.2.2.4.2_1 | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131415 | 0992 | - | Updates for 6.6.1A Occupied bandwidth for CA_41C | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131450 | 0993 | - | Addition of band44 in MPR for UL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131473 | 0994 | - | References to wrong section in TS 36.508 | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131518 | 0995 | - | Corrections to Common Test Parameters User-Specific | 11.0.1 | 11.1.0 |

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| 2013-06 | RAN#60 | R5-131519 | 0996 | - | Corrections to Beamforming Model Parameters | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131521 | 0997 | - | Corrections to Reporting of Channel State Requirements | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131522 | 0998 | - | Corrections to Reporting of Precoding Matrix Indicator Requirements | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131527 | 0999 | - | Additions to Annex G for eDL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131528 | 1000 | - | Additions of eDL-MIMO test cases to Annex F | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131539 | 1001 | - | LTE RF: Minor changes to test case 7.5A.3 | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131540 | 1002 | - | LTE-RF: Clarification to 7.6.1A.3 test procedure | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131541 | 1003 | - | Corrections to TC 6.6.2.3A.1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA) | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131545 | 1004 | - | Additions to TC 9.2.3.1_D for FDD CQI reporting under AWGN conditions - PUCCH 1-1 for eDL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131546 | 1005 | - | LTE-RF: Corrections to CA Open Loop Spatial Multiplexing Performance test cases | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131553 | 1006 | - | Additions to TC 9.2.3.2_D for TDD CQI reporting under AWGN conditions - PUCCH 1-1 for eDL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131555 | 1007 | - | Additions to TC 9.3.1.2.2_D for TDD CQI reporting under fading conditions - PUSCH 3-1 for eDL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131559 | 1008 | - | Additions to TC 9.3.2.2.2_D for TDD CQI reporting under fading conditions - PUCCH 1-1 for eDL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131561 | 1009 | - | Update of 6.2.5A - Delta TIB for CA_11A-18A | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131562 | 1010 | - | Additions to TC 9.4.1.3.2_D for TDD reporting of PMI-PUSCH 3-1 (Single PMI) for eDL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131563 | 1011 | - | Update of 7.3A - Delta RIB for CA_11A-18A | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131567 | 1012 | - | Additions to TC 9.4.2.3.2_D for TDD PMI reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131569 | 1013 | - | Additions to TC 9.5.2.2_D for TDD RI reporting - PUCCH 1-1 for eDL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131634 | 1014 | - | Removal of Spurious emission UE co-existence test case 6.6.3.2_1 from annex F | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131649 | 1015 | - | Adding Band28 in some Receiver test cases in section 7 | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131677 | 1016 | - | Correction to the contents of the chapter 5. | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131711 | 1017 | - | Corrections to test procedure of TC 7.5B Adjacent Channel Selectivity (ACS) for UL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131900 | 1018 | - | RF: Correction of Imcs for CQI index 10 (15 RBs) | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131901 | 1019 | - | Corrections to Frequency non-selective scheduling mode | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131902 | 1020 | - | Correction to the missing title of Rel-9 close loop tests | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131903 | 1021 | - | Correction to the references of connection diagrams | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131904 | 1022 | - | Maintenance of Band 23 additional regulatory requirements | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131905 | 1023 | - | Realignment of A-MPR Configuration Tables for Band 27 in TS 36.521-1 | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131906 | 1024 | - | Update on General section of Tx and Rx for Cell IDs | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131907 | 1025 | - | LTE RF: Initial conditions update for test 6.2.5A.2 | 11.0.1 | 11.1.0 |

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| 2013-06 | RAN#60 | R5-131908 | 1026 | - | CA RF: Alignment for inter-band Rx tests with DL tested only as S-Cell | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131909 | 1027 | - | 36.521-1: Inter-band CA operating bands update | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131911 | 1028 | - | Updates for 7.7A.1 Spurious response for CA | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131915 | 1029 | - | Additions to TC 9.3.1.2.1_D for FDD CQI reporting under fading conditions - PUSCH 3-1 for eDL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131916 | 1030 | - | Additions to TC 9.3.2.2.1_D for FDD CQI reporting under fading conditions - PUCCH 1-1 for eDL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131917 | 1031 | - | Additions to TC 9.4.1.3.1_D for FDD reporting of PMI - PUSCH 3-1 (Single PMI) for eDL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131918 | 1032 | - | Additions to TC 9.4.2.3.1_D for FDD PMI reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131919 | 1033 | - | Additions to TC 9.5.2.1_D for FDD RI reporting - PUCCH 1-1 for eDL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131920 | 1034 | - | Adding Band28 in some Transmitter test cases in section 6 | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131921 | 1035 | - | New RF TC for 36.521-1_8.5.1.2.3_C.1_Enhanced ICIC for LTE | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131929 | 1036 | - | Update TT of 6.2.2B_6.2.3B_6.2.4B and 6.2.5B for UL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131930 | 1037 | - | Update TT of 6.3.2B_6.3.3B and 6.3.4B for UL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131931 | 1038 | - | Update TT of 6.3.5B.1_6.3.5B.2 and 6.3.5B.3 for UL- MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131932 | 1039 | - | Update TT of 6.5.1B_6.5.2B.1_6.5.2B.2_6.5.2B.3_6.5.2B.4 for UL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131933 | 1040 | - | Update TT of 6.6.1B Occupied bandwidth for UL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131934 | 1041 | - | Update TT of 6.6.2.1B_6.6.2.2B and 6.6.2.3B for UL- MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131935 | 1042 | - | Update TT of 6.7B Transmit intermodulation for UL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131936 | 1043 | - | Update TT of 6.8B Time alignment error for UL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131937 | 1044 | - | Update TT of 7.3B Reference sensitivity level for UL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131952 | 1045 | - | Corrections to TC 6.2.5A.1 Configured UE transmitted Power for CA (intra-band contiguous DL CA and UL CA) | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131954 | 1046 | - | Maintenance of Band 23 Spurious Emissions Requirements | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131955 | 1047 | - | Corrections to Demodulation Requirements | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131956 | 1048 | - | Updates to sustained data rate test case | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131957 | 1049 | - | New RF TC for 36.521-1_9.2.1.3_C.1_Enhanced ICIC for LTE | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131958 | 1050 | - | RF: Structure clean-up for chapter 9 (including eICIC and eDL-MIMO tests) | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131959 | 1051 | - | Update TT of 7.4B_7.5B_7.6.1B_7.6.2B_7.6.3B_7.7B and 7.8.1B for UL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131960 | 1052 | - | Update of TC6.6.3B.3 for Additional spurious emissions for UL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131961 | 1053 | - | Update of TC6.6.3B.2 for Spurious emissions band UE co-existence for UL-MIMO | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131962 | 1054 | - | Updates of 6.2.2.3 - maximum output power for UE that supports both Band 18 and 26 | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131963 | 1055 | - | Update of 6.2.4 Test points for A-MPR when NS_05 is signalled | 11.0.1 | 11.1.0 |

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| 2013-06 | RAN#60 | R5-131964 | 1056 | - | Updates of 7.3.3 - Refsens for UE that supports both Band 18 and Band 26 | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131969 | 1057 | - | CA RF: Alignment for tests with PCC and SCC switching | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131971 | 1059 | - | Introduction of Maximum Input Level test case for CA (inter-band DL CA without UL CA) | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131972 | 1060 | - | Addition of Maximum input level for inter-band CA and updates to test configuration for some Rx TCs | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131973 | 1061 | - | Updates to FDD sustained data rate test case for CA | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131974 | 1062 | - | Clarification on Time offset between cells | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131975 | 1063 | - | Update TC 6.2.3A.1 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA) | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131976 | 1064 | - | Update of UE co-existence requirement for CA | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131977 | 1065 | - | Update TC 6.2.5A.1 Configured UE transmitted Output Power for CA_3A-7A, CA_4A-12A and CA_7A-20A (intra-band contiguous DL CA and UL CA) | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131978 | 1066 | - | Updates for 6.2.4A A-MPR for CA_41C | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131979 | 1067 | - | Updates for 7.5A.1 Adjacent Channel Selectivity (ACS) for CA_41C | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131980 | 1068 | - | Updates for 7.6.1A.1 in-band blocking for CA_41C | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131981 | 1069 | - | Updates for 7.6.2A.1 Out-of-band blocking for CA_41C | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131982 | 1070 | - | Updates for 7.6.3A.1 Narrow band blocking for CA_41C | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131983 | 1071 | - | Updates for 7.8.1A.1 Wideband intermodulation for CA_41C | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131985 | 1072 | - | Update of CA refsens test 7.3A for inter-band CA configurations CA_4A-5A and CA_4A-13A | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131987 | 1073 | - | Addition of band 44 in MPR | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-131990 | 1074 | - | CA_1A-18A, CA_2A-17A, CA_3A-8A, CA_4A-5A, CA_4A-13A, CA_4A-17A, CA_11A-18A addition and corrections to Reference Sensitivity TC 7.3A | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-132079 | 1058 | - | Corrections to TC 6.6.3.3A.1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-132080 | 1075 | - | CA RF - Corrections to Blocking Characteristics in 7.6 | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-132103 | 1076 | - | Change Spurious emission UE co-existence test cases to align with release independence rule | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-132105 | 1077 | - | CA RF: Corrections to message contents with regard to transmission mode | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-132110 | 1078 | - | Updated test points test case 6.2.3 A-MPR for NS_15 band26 | 11.0.1 | 11.1.0 |
| 2013-06 | RAN#60 | R5-132113 | 1079 | - | New test cases for LTE B14 public safety high power UE | 11.0.1 | 11.1.0 |
| 2013-09 | RAN#61 | R5-133070 | 1080 | - | Correction to test points in Additional Spurious Emissions Coexistence test case | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133073 | 1081 | - | LTE Type A performance requirements - Changes to clause 3 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133074 | 1082 | - | LTE Type A performance requirements - Changes to clause 8.1.1 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133075 | 1083 | - | LTE Type A performance requirements - Changes to Annex A | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133076 | 1084 | - | LTE Type A performance requirements - Introduction of Annex B.5 | 11.1.0 | 11.2.0 |

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| 2013-09 | RAN#61 | R5-133077 | 1085 | - | LTE Type A performance requirements - Introduction of the new test case 9.3.5.1.1. | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133232 | 1086 | - | Corrections to CA TC 6.5.2A.3 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133247 | 1087 | - | Addition of Band 31 to 36.521-1 General s05 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133248 | 1088 | - | Addition of Band 31 to 36.521-1 RX s07 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133249 | 1089 | - | Addition of Band 31 to 36.521-1 TX s06 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133252 | 1090 | - | RF: Minor correction to test points for spurious emissions UE co-existence | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133258 | 1091 | - | Update TC 7.3A.3 Reference sensitivity level for CA_5A-12A (inter-band DL CA without UL CA) | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133261 | 1092 | - | Update the minimum requirements of TCs 7.6.3A.1, 7.7A.1 and 7.8.1A.1 for CA | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133262 | 1093 | - | Update TC 6.6.3B.2 of Spurious emission band UE co-existence for UL-MIMO | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133263 | 1094 | - | Update TCs 6.2.2B and 6.2.5B for UL-MIMO | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133265 | 1095 | - | RF: Addition of missing UL-RMC-s for Tx testing | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133266 | 1096 | - | Correction of TCs 7.3 and 7.3B Reference sensitivity level for Band 27 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133268 | 1097 | - | CA RF: Addition of new CQI tests for CA | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133298 | 1098 | - | Correction to Spurious emission band UE co-existence | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133415 | 1099 | - | Correction to the repeat steps in 7.6.1A, 7.6.3A and 7.8.1A | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133418 | 1100 | - | Correction to CA sustained data rate performance test | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133423 | 1101 | - | Correction to eICIC Performance test cases | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133425 | 1102 | - | Correction to UE category in Tx test cases | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133426 | 1103 | - | Correction to Spurious emission band UE co-existence | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133431 | 1104 | - | Correction to MBMS Performance test cases | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133474 | 1105 | - | Update TC of 8.7.2.1_A.1 TDD sustained data rate performance for CA (intra-band contiguous DL CA) | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133517 | 1106 | - | Adding the minimum channel spacing for intra-band non-contiguous CA | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133522 | 1107 | - | Corrections to Annex F for Maintenance of Band 23 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133523 | 1108 | - | Corrections to description for definition of MIMO Correlation Matrices using cross polarized antennas | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133524 | 1109 | - | Corrections to UE maximum output power for CA | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133525 | 1110 | - | Corrections to General Maintenance of Operating Bands and Channel Arrangements | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133532 | 1111 | - | Introduction of eICIC_enh_LTE to Annex C | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133534 | 1112 | - | Corrections to TC 6.6.2.3A.1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA) | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133535 | 1113 | - | Corrections to TC 7.5A.1 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA and UL CA) | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133800 | 1114 | - | Correction to test frequency in Additional Spurious Emissions test cases for NS_15 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133801 | 1115 | - | Update applicability of test cases 9.4.2.2.1 and 9.4.2.2.2 | 11.1.0 | 11.2.0 |

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| 2013-09 | RAN#61 | R5-133802 | 1116 | - | Correction to applicability for TDD-TM8 test cases | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133803 | 1117 | - | Editorial correction to 6.6.3.3 Additional spurious emissions | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133804 | 1118 | - | Correction the Minimum conformance requirements for test case 6.2.2B | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133805 | 1119 | - | CA RF: Adding missing DL-RMC-s | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133806 | 1120 | - | Update TC of 8.2.1.1 FDD PDSCH Single Antenna Port Performance (Cell-Specific Reference Symbols) for CA | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133807 | 1121 | - | Update TC of 8.2.1.4 FDD PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols) for CA | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133808 | 1122 | - | Addition of new TC 8.2.1.4.2_A.2 for FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (inter band DL CA) | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133811 | 1123 | - | Update of CA TC 7.3A.1 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133812 | 1124 | - | Update of CA TC 7.4A.1 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133819 | 1125 | - | Correction of applicability for FDD RF TCs 9.3.4.1.1, 9.3.4.2.1 & 9.4.1.2.1and TDD RF TCs 9.3.4.1.2, 9.3.4.2.2 & 9.4.1.2.2 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133823 | 1126 | - | Introduction of eICIC_enh_LTE to Annex A to reference measurement channels for PDCCH/PCFICH | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133824 | 1127 | - | Introduction of eICIC_enh_LTE to Annex A DL reference measurement channels | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133828 | 1128 | - | Corrections to 6.2.4 A-MPR for Maintenance of Band 23 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133829 | 1129 | - | Corrections to Transmitter Characteristics Maintenance | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133830 | 1130 | - | Alignment of test configuration tables (test frequencies) in Additional Spurious Emissions tests cases | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133831 | 1131 | - | Corrections to Receiver Characteristics Maintenance | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133832 | 1132 | - | Corrections to 6.6.2.2 Additional Spectrum Emission Mask for Maintenance of Band 23 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133833 | 1133 | - | Updates to Chapter7 for Inter Band CA combo CA_4A-29A | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133838 | 1134 | - | Update Minimum Requirements of TCs 6.2.4 and 6.2.5 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133845 | 1135 | - | Correction to Configured UE transmitted output power for CA | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133846 | 1136 | - | Corrections to TC 6.2.5A.2 Configured UE transmitted Power for CA (inter-band DL CA without UL CA) | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133847 | 1137 | - | Updates to Wideband intermodulation for CA test cases | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133850 | 1138 | - | Correction to measurement target of CA Rx test cases | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133851 | 1139 | - | Corrections to TC 7.5A.2 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA without UL CA) | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133852 | 1140 | - | Update TC of 8.7.1.1_A.1 FDD Sustained data rate performance for CA (intra band contiguous DL CA) | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133853 | 1141 | - | Update TC of 8.7.1.1_A.2 FDD Sustained data rate performance for CA (inter band DL CA) | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133854 | 1142 | - | Updates of Annex for CA test cases | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133863 | 1143 | - | Clarification on Bandwidth Combination Set for Carrier Aggregation Transmitter tests | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133865 | 1144 | - | Update TC 6.2.5A.1 Configured UE transmitted Output Power for CA_5A-12A (intra-band contiguous DL CA and UL CA) | 11.1.0 | 11.2.0 |

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| 2013-09 | RAN#61 | R5-133866 | 1145 | - | Update the minimum requirements of TCs 7.5A.1, 7.6.1A.1 and 7.6.2A.1 for CA | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133867 | 1146 | - | Update TC 7.3A.1 Reference sensitivity level for CA (intra-band contiguous DL CA and UL CA) | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133869 | 1147 | - | Addition of Refsens for intra-band non-contiguous CA | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133870 | 1148 | - | Update TC 7.3A.3 reference sensitivity level for CA_3-8 (inter-band DL CA without UL CA) | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133871 | 1149 | - | Test cases and test system uncertainty for LTE B14 public safety highpower UE | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133873 | 1150 | - | Addition of new TC 8.3.1.1.3 for FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133874 | 1151 | - | Addition of new TC 8.3.2.1.4 for TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133886 | 1152 | - | eICIC RF: Addition of new RI tests and OCNG patterns for eICIC | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133887 | 1153 | - | Update of CA TC 6.2.3A and TC 6.2.4A | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133888 | 1154 | - | CA RF: Corrections to reference sensitivity requirements for CA | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133889 | 1155 | - | Correction to Test Requirement in 7.3A.3 | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133890 | 1156 | - | Update TC of 8.2.1.3 FDD PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)for CA | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133898 | 1157 | - | Clarification on Bandwidth Combination Set for Carrier Aggregation Receiver tests | 11.1.0 | 11.2.0 |
| 2013-09 | RAN#61 | R5-133899 | 1158 | - | Addition of CA TC 6.6.2.2A | 11.1.0 | 11.2.0 |
| 2013-12 | RAN#62 | R5-134130 | 1159 | - | RF: Corrections to the notes in the band UE co-existence requirements table | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134131 | 1160 | - | RF: Corrections to sustained data rate test case | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134132 | 1161 | - | RF: Clean-up of uplink reference measurement channels | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134139 | 1162 | - | eICIC RF: Corrections to PHICH demodulation test | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134161 | 1163 | - | Corrections to Transmitter Requirements for Intra-band Non-contiguous CA | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134169 | 1164 | - | Introduction of I.2.6 Tests for feICIC (Further Enhanced Non CA- based ICIC for LTE) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134170 | 1165 | - | Introduction of TC 8.2.1.2.3_E.1 FDD PDSCH Transmit diversity 2x2 for feICIC (non-MBFSN ABS) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134171 | 1166 | - | Introduction of TC 8.2.2.2.3_E.1 TDD PDSCH Transmit diversity 2x2 for feICIC (non-MBSFN ABS) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134172 | 1167 | - | Introduction of TC 8.2.1.4.1_E.1 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134173 | 1168 | - | Introduction of TC 8.2.2.4.1_E.1 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134174 | 1169 | - | Introduction of TC 8.4.1.2.3_E.1 FDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134175 | 1170 | - | Introduction of TC 8.4.1.2.3_E.2 FDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (MBSFN ABS) | 11.2.0 | 11.3.0 |

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| 2013-12 | RAN#62 | R5-134176 | 1171 | - | Introduction of TC 8.4.2.2.3_E.1 TDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134177 | 1172 | - | Introduction of TC 8.4.2.2.3_E.2 TDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (MBSFN ABS) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134178 | 1173 | - | Introduction of Demodulation feICIC Test Cases to Annex F | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134179 | 1174 | - | Introduction of TC 9.2.1.5_E.1 FDD CQI Reporting under AWGN conditions - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134180 | 1175 | - | Introduction of TC 9.2.1.6_E.1 TDD CQI Reporting under AWGN conditions - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134181 | 1176 | - | Introduction of TC 9.3.1.3.1_E.1 FDD CQI Reporting under fading conditions - PUSCH 3-0 for feICIC (non-MBSFN ABS) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134182 | 1177 | - | Introduction of TC 9.3.1.3.2_E.1 TDD CQI Reporting under fading conditions - PUSCH 3-0 for feICIC (non-MBSFN ABS) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134183 | 1178 | - | Introduction of TC 9.5.4.1_E FDD RI Reporting - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134184 | 1179 | - | Introduction of TC 9.5.4.2_E TDD RI Reporting - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134185 | 1180 | - | Introduction of Reporting of Channel State Information feICIC Test Cases to Annex F | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134196 | 1181 | - | Corrections to 7.5A.3 Adjacent Channel Selectivity (ACS) for CA (inter-band DL CA without UL CA) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134199 | 1182 | - | Corrections to MPR for intra-band non-contiguous CA | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134234 | 1183 | - | CA RF: Corrections to requirements for In-Band blocking for Inter-Band without UL-CA | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134247 | 1184 | - | RF: Corrections to requirements for NS_11 (Band 23) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134250 | 1185 | - | RF: Band edge relaxation for UE-s supporting Band 18 and Band 26 | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134289 | 1187 | - | Correction to Maximum Power Reduction (MPR) for CA Test Procedure | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134413 | 1189 | - | Update TT of TC 8.2.1.4.2_A.2 FDD PDSCH Closed Loop Multi Layer 4x2 for CA | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134414 | 1190 | - | Correction of TC 6.2.4A Test Requirements for CA_38C | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134421 | 1191 | - | The addition of Beamforming model for EPDCCH localized transmission | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134423 | 1192 | - | The addition of Beamforming model for EPDCCH distributed transmission | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134424 | 1193 | - | The addition of Downlink physical setup for EPDCCH | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134431 | 1194 | - | LTE Type A performance requirements - Introduction of the new test case 8.2.1.2.4 | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134432 | 1195 | - | LTE Type A performance requirements - adding TC 8.2.1.2.4 and 9.3.5.1.1 to Annex E and G | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134445 | 1196 | - | TU and TT for 36.521-1 eICIC FDD PCFICH/PDCCH and PHICH demodulation tests | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134477 | 1197 | - | Correction to CA Sustained data rate tests | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134478 | 1198 | - | Correction to CQI-ReportConfig-DEFAULT for CA performance tests | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134485 | 1199 | - | Clarification of UL resource blocks for CA_4A-17A in 7.3A.3 | 11.2.0 | 11.3.0 |

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| 2013-12 | RAN#62 | R5-134488 | 1200 | - | Correction to test requirement in 6.2.4 | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134489 | 1201 | - | Correction to test requirement in 6.6.3.2 | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134490 | 1202 | - | Additional exception message for SIB3 in MBMS performance test | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134800 | 1204 | - | Introduction of UE TM3 Demodulation Performance under High Speed to Annex F | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134801 | 1205 | - | Introduction of UE TM3 Demodulation Performance under High Speed | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134802 | 1206 | - | Corrections to eDL-MIMO Channel State Information Test | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134805 | 1207 | - | Update Minimum Requirements of TCs 6.6.3.2 and 6.6.3.2A Spurious emission band UE co-existence | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134806 | 1208 | - | Change Spurious emission UE co-existence test case for LTE CA to align with release independence rule | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134807 | 1209 | - | Clarification of applicability of additional relaxation RIB,c on Reference Sensitivity Test Cases | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134816 | 1215 | - | Addition of new Test Case PUCCH 1-1 for Interference rejection | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134817 | 1216 | - | Addition of interference rejection test cases TC 8.2.2.2.4 and TC 8.2.2.4.3 | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134828 | 1217 | - | Clarification of multi-cluster transmission terminology | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134829 | 1218 | - | Corrections to Pcmax | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134830 | 1219 | - | Corrections to test descriptions reference tables for Transmitter Characteristics test cases | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134832 | 1220 | - | Corrections to definition of 5+20 MHz for spectrum emission mask for CA in Annex F | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134857 | 1223 | - | Update TC 6.2.4 A-MPR for NS_19 | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134858 | 1224 | - | Update TC 6.6.3.3 Additional Spurious Emissions for NS_19 | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134859 | 1225 | - | Simplification of test points in Additional Spurious Emissions Coexistence test case | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134861 | 1227 | - | Addition of Sustained data rate test(FDD) for category 6 and 7 UEs | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134865 | 1228 | - | CA RF: Power alignment between uplink component carriers | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134866 | 1229 | - | Completion of test case 6.7A Transmit intermodulation for CA | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134867 | 1230 | - | Update Minimum Requirements of TCs 7.3 and 7.3.1A Reference sensitivity power level | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134868 | 1231 | - | Clean-up of CA Rx test cases | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134871 | 1232 | - | Update Minimum Requirements and TT of TC 8.2.1.3.1_A | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134875 | 1233 | - | Addition of Inter Band CA combo CA_3A-5A, CA_3A-20A | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134876 | 1234 | - | Addition of Inter Band CA combo CA_4A-7A | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134878 | 1235 | - | Correction and applicability clarification to multi-cluster allocations for UL CA TCs 6.2.3A, 6.2.4A, 6.6.2.1A, 6.6.2.2A, 6.6.2.3A and 6.6.3.3A | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134879 | 1236 | - | Clarification of CA Reference sensitivity level | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134880 | 1237 | - | Correction to blocking requirements and use of delta RIB | 11.2.0 | 11.3.0 |

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| 2013-12 | RAN#62 | R5-134881 | 1238 | - | Addition of new TC 7.4A.4 Maximum input level for CA (intra band non-contiguous DL CA without UL CA) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134882 | 1239 | - | Addition of new TC 7.5A.4 Adjacent Channel Selectivity (ACS) for CA(intra band non-contiguous DL CA without UL CA) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134889 | 1244 | - | Uncertainties and Test Tolerances for eICIC PDSCH demodulation tests | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134893 | 1247 | - | Addition of applicabilities of LTE Type A performance requirements | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134894 | 1248 | - | Test Procedure, uncerts and TT for Rx Test cases with intra-band contiguous UL CA | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134976 | 1251 | - | Update TT of TC 8.2.1.4.2_A.1 FDD PDSCH Closed Loop Multi Layer 4x2 for CA | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134977 | 1252 | - | Update of CA CSI tests | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134978 | 1253 | - | Update of eICIC Performance test cases | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134985 | 1254 | - | LTE Type A performance requirements - Changes to TC 9.3.5.1.1 | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134987 | 1255 | - | RF: Corrections to requirements for NS_15 (Band 26) | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134988 | 1256 | - | Corrections to Band 23 NS_11 and NS_20 Test Points | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134995 | 1259 | - | Update on MPR and A-MPR test requirements | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-135012 | 1261 | - | Clarification in regard to 36.521-1 tests not included in 36.521-2 Applicability table | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-135031 | 1222 | - | RF TC Update for 36.521-1_9.2.1.3_C1 eICIC | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-135046 | 1226 | - | RF: Updates to the downlink reference measurement channels | 11.2.0 | 11.3.0 |
| 2013-12 | RAN#62 | R5-134277 | 1186 | - | Addition of Rel-12 CA band combinations(CA_3-19 and CA_19-21) to Chap. 5 | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134339 | 1188 | - | Updates to TC 6.2.2A.1 for CA_3C | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134540 | 1203 | - | Applicability statement of new 5MHz BB tests for Band 31 in TS 36.521-1 | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134808 | 1210 | - | Updates of 5.4.2A Channel bandwidth for CA_1A-18A | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134809 | 1211 | - | Updates of 5.2A Operating bands for CA_1A-26A | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134810 | 1212 | - | Updates of 5.4.2A Channel bandwidth for CA_1A-26A | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134811 | 1213 | - | Updates of 6.2.5A Delta TIB for CA_1A-26A | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134812 | 1214 | - | Updates of 7.3A Delta RIB for CA_1A-26A | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134833 | 1221 | - | Correction to Tx TCs for lower tolerance relaxation, removal of 6.2.5A.2 and addition of Rel-12 CA band combinations(CA_3-19 and CA_19-21) to 6.2.5 | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134884 | 1240 | - | Addition of Rel-12 CA band combination(CA_3-19 and CA_19-21) to Refsens | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134886 | 1241 | - | Updates for 5.2A operating bands and 5.4.2A channel bandwidth for CA_3C | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134887 | 1242 | - | Updates to TC 6.2.3A.1 for CA_3C | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134888 | 1243 | - | Updates to TC 6.6.2.1A.1 for CA_3C | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134891 | 1245 | - | Updates to FDD PDSCH Single Antenna and Transmit Diversity 2x2 performance test cases for 5MHz BW | 11.3.0 | 12.0.0 |

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| 2013-12 | RAN#62 | R5-134892 | 1246 | - | Updates to 8.2.1.3.1 for FDD PDSCH Open Loop Spatial Multiplexing 2x2 for 5MHz BW | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134896 | 1249 | - | Updates to TC 9.2.1.1 FDD CQI reporting under AWGN conditions - PUCCH 1-0 test case for 5MHz BW | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134897 | 1250 | - | Updates to TC 9.3.2.1.1 and 9.3.2.1.1_1 FDD CQI Reporting under fading conditions - PUCCH 1-0 test case for 5MHz BW | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134989 | 1257 | - | Corrections to definition of 5+20 MHz for spectrum emission mask for CA | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-134992 | 1258 | - | Updates to 8.5.1.2 FDD PHICH Transmit Diversity Performance tests | 11.3.0 | 12.0.0 |
| 2013-12 | RAN#62 | R5-135068 | 1262 | - | Updates to 8.2.1.4 FDD PDSCH Closed Loop Single/Multiple layer Spatial Multiplexing 2x2 for 5MHz BW | 11.3.0 | 12.0.0 |
| 2014-03 | RAN#63 | R5-140228 | 1264 | - | Uncertainties for eICIC 9.x CSI Test Cases | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140245 | 1265 | - | eDL-MIMO RF: Corrections to 8x2 MIMO tests | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140247 | 1266 | - | CA RF: Corrections to sustained data rate tests | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140248 | 1267 | - | RF: Corrections to OCNG pattern for PMI tests | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140249 | 1268 | - | RF: Corrections to cross references between tests | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140250 | 1269 | - | feICIC RF: Corrections to some subclause-titles | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140261 | 1270 | - | CoMP RF: Introduction of CoMP section in Annex I | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140388 | 1272 | - | LTE Type A performance requirements - Introduction of the new test case 9.3.5.1.2 | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140444 | 1273 | - | Updates of 6.2.5 Delta TIB for CA_1A-26A | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140446 | 1274 | - | Updates of 7.3 Delta RIB for CA_1A-26A | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140448 | 1275 | - | Updates of 6.6.3.2 Spurious emission band UE co-existence for B41 | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140499 | 1276 | - | Update of eICIC Performance tests | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140505 | 1277 | - | Correction to test configuration parameter in Tx | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140508 | 1278 | - | Update of CA FDD and TDD performance tests | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140509 | 1279 | - | Addition of CQI configuration in CA closed loop performance tests | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140511 | 1280 | - | Addition of SCC activation and CQI configuration in CA CQI Reporting tests | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140561 | 1281 | - | Removal of [ ]s in Annex G.6 | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140800 | 1282 | - | Corrections to NS signalling for CA refsens | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140801 | 1283 | - | Correction to statistical testing for Inter-band CA Rx tests | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140802 | 1284 | - | Additions to combinations of channel model parameters | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140803 | 1285 | - | Addition of a Fixed Reference Channel two antenna ports | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140804 | 1286 | - | Corrections to TDD eDL-MIMO test cases | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140805 | 1287 | - | Correction the category information of Table 8.2.1.1.2.3-2 and Table 8.2.1.1.2.5-1 in test case 8.2.1.1.2 | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140806 | 1288 | - | Correction the category information in Table 8.2.1.2.1.3-2 and Table 8.2.1.2.1.3-2 for Test case 8.2.1.2.1 | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140807 | 1289 | - | Correction the test case applicability of test case 8.2.1.3.2 | 12.0.0 | 12.1.0 |

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| 2014-03 | RAN#63 | R5-140811 | 1290 | - | Addition of A.3.9.4 TDD SDR Reference Channel for EPDCCH | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140812 | 1291 | - | Addition of A.3.9.3 FDD SDR Reference Channel for EPDCCH | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140813 | 1292 | - | Addition of OCNG Pattern for EPDCCH TDD performance requirements | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140814 | 1293 | - | Addition of OCNG Pattern for EPDCCH FDD performance requirements | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140815 | 1294 | - | Addition of Reference Measurement Channels for EPDCCH performance requirements | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140816 | 1295 | - | Introduction of RMCs and power levels for CoMP in annex | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140818 | 1296 | - | Addition of CA_1A-8A to 36.521-1 Chapter 5 | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140819 | 1297 | - | Addition of CA_1A-8A to 36.521-1 Chapter 6 | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140820 | 1298 | - | Addition of CA_1A-8A to 36.521-1 Chapter 7 | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140823 | 1300 | - | Corrections to definition of 20 MHz and 5MHz for transmit intermodulation for CA in 6.7A | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140824 | 1301 | - | Updates to TC 7.4A.1 for CA_3C | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140825 | 1302 | - | Updates to TC 6.6.3.2A for CA_3C | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140826 | 1303 | - | Corrections to definition of 20 MHz and 5MHz for occupied bandwidth for CA in 6.6.1A | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140827 | 1304 | - | Updates to TC 7.3A.1 for CA_3C | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140828 | 1305 | - | Updates to TC 7.3A.2 for CA_3C | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140831 | 1306 | - | Additions to TC 8.2.2.2.3_E.1 TDD PDSCH Transmit diversity 2x2 for feICIC (non-MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140832 | 1307 | - | Additions to TC 8.2.1.4.1_E.1 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140833 | 1308 | - | Additions to TC 8.2.2.4.1_E.1 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140834 | 1309 | - | Additions to TC 8.4.1.2.3_E.1 FDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140835 | 1310 | - | Additions to TC 8.4.2.2.3_E.1 TDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140836 | 1311 | - | Additions to TC 8.4.1.2.3_E.2 FDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140837 | 1312 | - | Additions to TC 8.4.2.2.3_E.2 TDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140838 | 1313 | - | Additions to TC 9.2.1.5_E.1 FDD CQI Reporting under AWGN conditions - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140839 | 1314 | - | Additions to TC 9.2.1.6_E.1 TDD CQI Reporting under AWGN conditions - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140840 | 1315 | - | Additions to TC 9.3.1.3.1_E.1 FDD CQI Reporting under fading conditions - PUSCH 3-0 for feICIC (non-MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140841 | 1316 | - | Additions to TC 9.3.1.3.2_E.1 TDD CQI Reporting under fading conditions - PUSCH 3-0 for feICIC (non-MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140842 | 1317 | - | Additions to TC 9.5.4.1_E FDD RI Reporting - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 12.0.0 | 12.1.0 |

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| 2014-03 | RAN#63 | R5-140843 | 1318 | - | Additions to TC 9.5.4.2_E TDD RI Reporting - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140844 | 1319 | - | Introduction of feICIC to Annex G | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140845 | 1361 | - | Addition of PHICH demod requirements for fEICIC | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140846 | 1320 | - | Addition to TC 8.2.2.3.3_E.1 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140847 | 1321 | - | Corrections to test configuration notes of CA soft buffer | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140856 | 1322 | - | Additions to TC 8.2.1.2.3_E.1 FDD PDSCH Transmit diversity 2x2 for feICIC (non-MBFSN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140868 | 1323 | - | Uncertainties and Test Tolerances for Interf_Rej Test case 8.2.1.2.4 | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140877 | 1324 | - | Introduction of TC 9.5.5.1_F.1 FDD RI Reporting with Single CSI process | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140878 | 1325 | - | Introduction of TC 9.5.5.2_F.1 TDD RI Reporting with Single CSI process | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140881 | 1326 | - | Addition to TC 8.2.1.3.3_E.1 FDD FDD PDSCH Open Loop Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140887 | 1327 | - | Correction to eICIC CQI Reporting tests | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140888 | 1328 | - | eICIC RF: Corrections to requirements, procedure and UL-RMCs for CQI tests | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140889 | 1329 | - | Addition of TC 8.7.3.1 FDD sustained data rate performance for EPDCCH scheduling | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140890 | 1330 | - | Addition of TC 8.8.1.1.1 FDD distributed EPDCCH performance | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140891 | 1331 | - | Addition of TC 8.7.4.1 TDD sustained data rate performance for EPDCCH scheduling | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140892 | 1332 | - | Addition of TC 8.8.1.2.1 TDD distributed EPDCCH performance | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140893 | 1333 | - | Addition of TC 8.8.2.1.1 FDD localized EPDCCH performance | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140894 | 1334 | - | Addition of TC 8.8.2.1.2 FDD EPDCCH localized transmission with TM10 quasi co-location Type-B | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140895 | 1335 | - | Addition of TC 8.8.2.2.1 TDD localized EPDCCH performance | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140896 | 1336 | - | Addition of TC 8.8.2.2.2 TDD EPDCCH localized transmission with TM10 quasi co-location Type-B | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-140922 | 1337 | - | Modify Applicability for LTE B14 public safety high power UE test cases | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141003 | 1338 | - | Addition of FDD CQI Reporting under AWGN conditions - Single CSI Process TC 9.2.4.1 | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141004 | 1339 | - | Addition of TDD CQI Reporting under AWGN conditions - Single CSI Process TC 9.2.4.2 | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141006 | 1340 | - | Addition of TC 8.2.1.7 FDD Carrier Aggregation with power imbalance | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141007 | 1341 | - | Updates to TC 7.4A.2 for CA_3C | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141008 | 1342 | - | Addition of TC 9.3.6.1_F FDD CQI Reporting under fading conditions multiple CSI processes for CoMP | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141009 | 1343 | - | Addition of TC 9.3.6.2_F TDD CQI Reporting under fading conditions multiple CSI processes for CoMP | 12.0.0 | 12.1.0 |

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| 2014-03 | RAN#63 | R5-141011 | 1345 | - | Corrections to definition of 20 MHz and 5MHz for minimum output power for CA in 6.3.2A | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141012 | 1346 | - | Addition of Intra NC CA to chap. 5 and related symbol to chap. 3 | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141016 | 1347 | - | Correction and proposed resolution to TBDs UL CA TCs 6.2.4A and 6.6.3.3A | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141017 | 1348 | - | Update for CA Rx TCs | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141018 | 1349 | - | PCC/SCC switching in inter-band CA Rx test cases | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141026 | 1350 | - | Introduction of new TC 8.3.1.3.2_F FDD PDSCH Performance with DCI format 2D, non Quasi Co-located Antenna Ports, Same Cell ID and multiple NZP CSI-RS resources for CoMP | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141027 | 1351 | - | Introduction of TC 8.3.1.3.3_F FDD PDSCH Performance with DCI format 2D, non Quasi Co-located Antenna Ports, Different Cell ID, Colliding CRS and single NZP CSI-RS for CoMP | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141028 | 1352 | - | Addition of new demod scenario for DL COMP - Same Cell ID and single NZP CSI-RS resource | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141029 | 1353 | - | Corrections to TM9 test to verify correct SNR estimation | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141038 | 1354 | - | Correction to sustained downlink data rate tests | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141040 | 1355 | - | Changes to test frequencies in Tx test cases for Band 28 | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141041 | 1356 | - | Updates of Reference sensitivity for Intra-band non-contiguous CA | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141042 | 1357 | - | Update TC of 7.4A.4 Maximum input level for CA (intra band non-contiguous DL CA without UL CA) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141043 | 1358 | - | Update TC of 7.5A.4 Adjacent Channel Selectivity (ACS) for CA (intra band non-contiguous DL CA without UL CA) | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141044 | 1359 | - | Corrections to maximum output power for multiple transmissions in a subframe | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141045 | 1360 | - | Correction to test configuration of Maximum input for CA | 12.0.0 | 12.1.0 |
| 2014-03 | RAN#63 | R5-141047 | 1271 | - | eICIC RF: Corrections to TDD PHICH test | 12.0.0 | 12.1.0 |
| 2014-06 | RAN#64 | R5-142069 | 1362 | - | LTE Type A performance requirements - adding TC 8.2.1.4.3 into annex F and G | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142071 | 1363 | - | Addition of connection diagram references to LTE Type A performance tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142072 | 1364 | - | Addition of connection diagram references to LTE Type A CSI tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142111 | 1365 | - | Addition of CA 3A-28A to 36.521-1 Chapter 6 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142112 | 1366 | - | Addition of CA 3A-28A to 36.521-1 Chapter 7 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142172 | 1367 | - | Addition of TC 6.2.2A.1 for CA_39C | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142176 | 1368 | - | Corrections to configured transmitted power for CA | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142177 | 1369 | - | Corrections to OCNG pattern | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142295 | 1370 | - | Updates of 6.2.5 Delta TIB for CA_3A-26A and CA_3A-27A | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142296 | 1371 | - | Updates of 7.3.3 Delta RIB for CA_3A-26A and CA_3A-27A | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142307 | 1372 | - | RF: Corrections to spurious emission requirements with NS different than NS_01 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142309 | 1373 | - | RF: Editorial corrections to the annexes | 12.1.0 | 12.2.0 |

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| 2014-06 | RAN#64 | R5-142312 | 1374 | - | CA RF: Several corrections to some Tx tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142317 | 1375 | - | eICIC RF: Corrections to RI performance tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142343 | 1376 | - | Addition of LTE CA_39A-41A into Table 6.2.5.3-2 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142366 | 1377 | - | Update of TC 8.7.4.1 TDD sustained data rate performance for EPDCCH scheduling | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142372 | 1378 | - | Update of TC 8.8.2.1.2 FDD EPDCCH localized transmission with TM10 quasi co-location Type-B | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142376 | 1379 | - | Update of TC 8.8.2.2.2 TDD EPDCCH localized transmission with TM10 quasi co-location Type-B | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142384 | 1380 | - | Update of TC 9.3.6.1_F FDD CQI Reporting under fading conditions multiple CSI processes for CoMP | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142387 | 1381 | - | Update overview of DL reference measurement channels for EPDCCH | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142391 | 1382 | - | Uncertainties and Test Tolerances for Enhanced Performance Requirement Type A 9.3.5.1.1 and 9.3.5.1.2 CQI Test cases | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142393 | 1383 | - | Test Tolerances for eICIC 9.2.x CQI Test cases | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142394 | 1384 | - | Correction of the test cases 8.2.1.2.2 and 8.2.1.2.2_1 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142420 | 1386 | - | Corrections to Annex G.5.4 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142444 | 1387 | - | Introduction of transmission mode 10 in precoder update granularity in FDD and TDD common test parameters | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142446 | 1388 | - | Introduction of new TC 8.3.2.4.2_F TDD PDSCH Performance with DCI format 2D, non Quasi Co-located Antenna Ports, Same Cell ID and multiple NZP CSI-RS resources for CoMP | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142449 | 1389 | - | Introduction of TC 8.3.2.4.3_F TDD PDSCH Performance with DCI format 2D, non Quasi Co-located Antenna Ports, Different Cell ID, Colliding CRS and single NZP CSI-RS for CoMP | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142515 | 1390 | - | Corrections to MBMS performance test cases | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142576 | 1391 | - | Update UE Transmit OFF power for CA _39C (intra-band contiguous DL CA and UL CA) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142588 | 1392 | - | Remove the square bracket in TC 8.3.1.3.2_F and TC 8.3.1.3.3_F | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142590 | 1393 | - | Uncertainties and Test Tolerances for eICIC PDCCH/PCFICH and PHICH demodulation tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142596 | 1394 | - | Addition of message exception for PHICH duration | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142597 | 1515 | - | Correction to eICIC CSI tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142601 | 1395 | - | Correction to title in feICIC PDSCH demodulation tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142605 | 1396 | - | Correction to measurement bandwidth in 6.6.2.1A.1 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142616 | 1399 | - | Correction to MBMS performance | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142672 | 1400 | - | Correction to in-band blocking requirements | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142676 | 1401 | - | Correction to 6.6.2.1A test environment | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142692 | 1402 | - | Correction to 8.2.2.1.1_1 and 8.2.2.2.1_1 applicability | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142697 | 1403 | - | 36.521-1: Corrections to section 7.3A | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142701 | 1404 | - | Introduction of NC CA TC 7.7A.4 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142703 | 1405 | - | Uncertainties and Derivation of Test Requirements for TCs 7.6.xA.4 and 7.7A.4 | 12.1.0 | 12.2.0 |

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| 2014-06 | RAN#64 | R5-142710 | 1406 | - | 36-521-1: Clarification on Averaged EVM for PRACH | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142749 | 1407 | - | Correction to CA band combo CA_3A-5A | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142750 | 1408 | - | Verification of exceptions of REFSENS requirements for carrier aggregation | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-142771 | 1409 | - | Addition of CA_2A-4A and CA_5A-7A to 36.521-1 Chapter 7 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143003 | 1410 | - | 36.521-1: Editorial correction on 6.6.3.3 Initial conditions for NS_19 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143004 | 1411 | - | 36.521-1: Editorial correction on 6.6.2.2B test requirements for NS_06 or NS_07 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143005 | 1412 | - | Correction for CA_4A-12A uplink configuration in inter-band CA reference sensitivity | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143006 | 1413 | - | CA RF: Clarification of test parameters and requirements for Inter-band CA Rx tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143007 | 1414 | - | Corrections to SNR test for TM9 minimum requirements | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143008 | 1415 | - | Correction to ACK NAK Reporting mode for TDD CA test cases | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143009 | 1416 | - | Addition of TC 8.2.1.1.1_2 and 8.2.2.1.1_2 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143010 | 1417 | - | Correction of FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA test cases of TCs 8.2.1.3.1_A.2 and 8.2.1.3.1_A.2_1 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143011 | 1418 | - | Updates to 8.2.1.3 FDD PDSCH Open Loop Spatial Multiplexing 2x2 related test cases | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143012 | 1419 | - | Updates to 8.2.2.3 TDD PDSCH Open Loop Spatial Multiplexing 2x2 related test cases | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143013 | 1420 | - | 36.521-1: Editorial correction on 8.2.1.4.2_A.2 message contents | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143014 | 1421 | - | Clarification the minimum conformance requirement and test parameter for 8.2.1.3.3_C1 and 8.2.1.3.3_C2 test cases | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143015 | 1422 | - | Correction to minimum test time for eICIC tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143025 | 1423 | - | LTE Type A performance requirements - Introduction of the new test case 8.2.1.4.3 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143026 | 1424 | - | Test Tolerances for eICIC 9.5.x RI Test cases | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143027 | 1425 | - | Uncertainties and Test Tolerances for EPDCCH 8.8.1.x demodulation Test cases | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143031 | 1426 | - | Update to operating bands for CA | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143032 | 1427 | - | Update to channel bandwidths for CA | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143033 | 1428 | - | Update to TC 6.3.2A.1 for CA_39C | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143034 | 1429 | - | Updates of 7.3A.3 Refsens for CA_3A-26A and CA_3A-27A | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143035 | 1430 | - | Addition of CA band Combo CA_2A-13A | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143036 | 1431 | - | Addition of CA_39A-41A to Refsens in chap.7 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143037 | 1432 | - | Updates to Chap.5 for CA_27B | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143038 | 1433 | - | Addition of CA_2A-4A and CA_5A-7A to 36.521-1 Clause 6 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143039 | 1434 | - | TC 8.2.1.3.3_E.1 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143040 | 1435 | - | TC 8.2.2.3.3_E.1 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS) | 12.1.0 | 12.2.0 |

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| 2014-06 | RAN#64 | R5-143041 | 1436 | - | Corrections applicability statement including UE category for feICIC | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143042 | 1437 | - | Additions to TC 8.2.1.2.3_E.1 FDD PDSCH Transmit diversity 2x2 for feICIC (non-MBFSN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143043 | 1438 | - | Additions to TC 8.2.2.2.3_E.1 TDD PDSCH Transmit diversity 2x2 for feICIC (non-MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143044 | 1439 | - | Additions to TC 8.2.1.4.1_E.1 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143045 | 1440 | - | Additions to TC 8.2.2.4.1_E.1 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143046 | 1441 | - | Additions to TC 9.2.1.5_E.1 FDD CQI Reporting under AWGN conditions - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143047 | 1442 | - | Additions to TC 9.2.1.6_E.1 TDD CQI Reporting under AWGN conditions - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143048 | 1443 | - | Additions to TC 9.3.1.3.1_E.1 FDD CQI Reporting under fading conditions - PUSCH 3-0 for feICIC (non-MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143049 | 1444 | - | Additions to TC 9.3.1.3.2_E.1 TDD CQI Reporting under fading conditions - PUSCH 3-0 for feICIC (non-MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143050 | 1445 | - | Additions to TC 9.5.4.1_E.1 FDD RI Reporting - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143051 | 1446 | - | Additions to TC 9.5.4.2_E.1 TDD RI Reporting - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143052 | 1447 | - | Additions to Reporting of Channel State Information feICIC Test Cases to Annex F | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143076 | 1448 | - | Update of TC 9.3.6.2_F TDD CQI Reporting under fading conditions multiple CSI processes for CoMP | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143077 | 1449 | - | Correction parameter and reference table number in test case 8.3.2.4.1_F | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143079 | 1450 | - | Update of TC 8.7.3.1 FDD sustained data rate performance for EPDCCH scheduling | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143080 | 1451 | - | Addition of TC 8.8.3.1 FDD Localized transmission with TM10 Type B quasi co-location type | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143081 | 1452 | - | Addition of TC 8.8.3.2 TDD Localized transmission with TM10 Type B quasi co-location type | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143082 | 1453 | - | Update initial condition and test requirement in test case 8.7.1.1_A.2_1 for two 15MHz CCs | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143097 | 1454 | - | Addition of message content exception in eICIC performance tests with MBSFN ABS | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143098 | 1455 | - | Additions to TC 8.4.1.2.3_E.1 FDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143099 | 1456 | - | Additions to TC 8.4.2.2.3_E.1 TDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143100 | 1457 | - | Additions to TC 8.4.2.2.3_E.2 TDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143101 | 1458 | - | Additions to Demodulation feICIC Test Cases to Annex F | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143104 | 1459 | - | Introduction of TC 8.2.2.4.2_A.3 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4 x 2 for CA | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143105 | 1460 | - | Updates to Refsens for Intra-band non-contiguous CA | 12.1.0 | 12.2.0 |

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| 2014-06 | RAN#64 | R5-143106 | 1461 | - | Correction of interference rejection test cases TC 8.2.2.4.3 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143107 | 1462 | - | Correction to eICIC PDSCH demodulation tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143113 | 1463 | - | Introduction of TC 8.2.2.1.1_A.3 TDD PDSCH Single Antenna Port Performance for CA | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143114 | 1464 | - | Additions to TC 8.4.1.2.3_E.2 FDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (MBSFN ABS) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143115 | 1465 | - | Update of TC 8.8.1.1 FDD distributed EPDCCH performance | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143116 | 1466 | - | Update of TC 8.8.2.1 FDD localized transmission with TM9 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143117 | 1467 | - | Update of TC 8.8.2.2 TDD localized transmission with TM9 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143118 | 1468 | - | Update sections of A.3.9 and A.3.10 reference channel for EPDCCH test | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143129 | 1469 | - | Addition of FDD CQI Reporting under AWGN conditions - PUCCH 1-0 for CA (intra band non-contiguous DL CA) TC 9.6.1.1_A.3 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143130 | 1470 | - | Addition of TDD CQI Reporting under AWGN conditions - PUCCH 1-0 for CA (intra band non-contiguous DL CA) TC 9.6.1.2_A.3 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143131 | 1471 | - | Addition of TC 6.2.4A.1 for CA_39C | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143133 | 1472 | - | Update additional spurious emissions for CA_38C (intra-band contiguous DL CA and UL CA) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143134 | 1473 | - | Update In-band blocking for CA_39C (intra-band contiguous DL CA and UL CA) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143135 | 1474 | - | Update Out-of-band blocking for CA_39C (intra-band contiguous DL CA and UL CA) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143136 | 1475 | - | Update Reference sensitivity level for CA_39C (intra-band contiguous DL CA and UL CA) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143137 | 1476 | - | RF: Corrections to CSI RMCs | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143138 | 1477 | - | CA RF: Corrections to CQI performance tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143140 | 1478 | - | CA RF: Corrections to performance test with power imbalance (Class C) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143141 | 1479 | - | Correction of test case 8.2.1.1.1_1 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143142 | 1480 | - | Correction of the test applicability for test cases 8.2.1.1.1_A.2, 8.2.1.3.1_A.1, 8.2.1.3.1_A.2 and 8.2.1.4.2_A.2 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143143 | 1481 | - | Correction of the test applicability of the test cases 8.2.1.1.1_A.1, 8.2.1.4.2_A.1, 8.2.2.1.1_A.1 and 8.2.2.4.2_A.1 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143144 | 1482 | - | Correction of the applicability for the test case 8.7.1.1 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143146 | 1483 | - | Addition of TC 9.5.5.1_F.2 FDD RI Reporting with Multiple CSI processes for CoMP | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143147 | 1484 | - | Addition of TC 9.5.5.2_F.2 TDD RI Reporting with Multiple CSI processes for CoMP | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143148 | 1485 | - | Clarification of test parameters for eICIC PDCCH performance tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143149 | 1486 | - | Correction to Intra-band CA uplink configuration for reference sensitivity | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143151 | 1487 | - | Correction to CQI reference measurement channels | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143154 | 1488 | - | Introduction of NC CA TC 7.6.1A.4 | 12.1.0 | 12.2.0 |

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| 2014-06 | RAN#64 | R5-143155 | 1489 | - | Introduction of NC CA TC 7.6.2A.4 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143156 | 1490 | - | Introduction of NC CA TC 7.6.3A.4 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143161 | 1491 | - | Update Spurious emission band UE co-existence for CA_39C (intra-band contiguous DL CA and UL CA) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143162 | 1492 | - | Update additional spurious emissions for CA_39C (intra-band contiguous DL CA and UL CA) | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143163 | 1493 | - | Updates to TC 7.3A.2 Reference sensitivity level for CA_27B | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143164 | 1494 | - | Updates to TC 7.4A.2 maximum input level for intra-band contiguous CA for CA_27B | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143165 | 1495 | - | Updates to TC 7.5A.2 ACS for CA_27B | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143166 | 1496 | - | Updates to 7.6.1A.2 IBB for CA of CA_27B | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143167 | 1497 | - | Updates to TC 7.6.2A.2 OOB for CA of CA_27B | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143168 | 1498 | - | Updates to TC 7.6.3A.2 Narrow band blocking for CA_27B | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143169 | 1499 | - | Updates to TC 7.7A.2 Spurious response for CA_27B | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143170 | 1500 | - | Updates to TC 7.8.1A.2 Wideband intermodulation for CA_27B | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143175 | 1502 | - | Updates to 8.7.2.1 TDD sustained data rate performance related test cases | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143178 | 1504 | - | Additions to TC 9.5.5.1_F.1 FDD RI Reporting with Single CSI process | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143179 | 1505 | - | Additions to TC 9.5.5.2_F.1 TDD RI Reporting with Single CSI process | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143181 | 1506 | - | Splitting of FDD CA TM3 and soft buffer management tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143182 | 1507 | - | Removal of soft buffer test points from FDD TM3 test cases in 8.2.1.3.1 and move to new soft buffer test cases in section 8.2.1.3.1A | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143183 | 1508 | - | Splitting of TDD CA TM3 and soft buffer management tests | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143184 | 1509 | - | Removal of soft buffer test points from TDD TM3 test cases in 8.2.2.3.1 and move to new soft buffer test case in section 8.2.2.3.1A | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143188 | 1512 | - | Addition of TC 8.2.2.7 TDD Carrier Aggregation with power imbalance | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143189 | 1513 | - | Corrections to test case 8.2.1.4.2_1, 8.2.2.4.1_1, and 8.2.2.4.2_1 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143190 | 1514 | - | Uncertainties and Test Tolerances for CoMP Test case 8.3.1.3.2_F | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143203 | 1385 | - | Throughput calculation for eICIC demodulation requirements | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143204 | 1503 | - | Correction to eICIC TDD RI requirements | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143205 | 1510 | - | Updates to 8.7.1.1_A FDD sustained data rate performance for CA related test cases | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143206 | 1511 | - | Updates to 8.7.2.1_A TDD sustained data rate performance for CA related test cases | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143207 | 1397 | - | Correction to CA Rx test cases | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143208 | 1398 | - | Correction to call setup in 8.7.1 and 8.7.2 | 12.1.0 | 12.2.0 |
| 2014-06 | RAN#64 | R5-143216 | 1501 | - | Updates to 8.7.1.1 FDD sustained data rate performance related test cases | 12.1.0 | 12.2.0 |

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| 2014-09 | RAN#65 | R5-144068 | 1516 | - | Uncertainties and test tolerances for test case 8.2.2.2.4 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144072 | 1517 | - | Uncertainties and test tolerances for test case 8.3.1.1.3 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144074 | 1518 | - | Uncertainties and test tolerances for test case 8.3.2.1.4 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144086 | 1519 | - | Corrections to TC 8.2.2.1.1_A.3 TDD PDSCH Single Antenna Port Performance for CA | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144087 | 1520 | - | Corrections to TC 8.2.2.4.2_A.3 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4 x 2 for CA | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144088 | 1521 | - | Test Tolerances to Annex F for TC 8.2.2.1.1_A.3 and TC 8.2.2.4.2_A.3 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144093 | 1522 | - | Test Tolerances for TC 9.5.5.1_F.1 FDD RI Reporting with Single CSI process | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144094 | 1523 | - | Test Tolerances for TC 9.5.5.2_F.1 TDD RI Reporting with Single CSI process | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144095 | 1524 | - | Addition of OCNG pattern for TM10 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144096 | 1525 | - | Uncertainties and Test Tolerances for TC 9.5.5.1_F.1+9.5.5.2_F.1 in Annex F | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144098 | 1526 | - | Test Tolerances for TC 8.2.1.4.1_E.1 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144099 | 1527 | - | Test Tolerances for TC 8.2.2.4.1_E.1 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 for feICIC (non-MBSFN ABS) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144101 | 1528 | - | Test Tolerances for TC 8.4.1.2.3_E.1 FDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144102 | 1529 | - | Test Tolerances for TC 8.4.2.2.3_E.1 TDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144104 | 1530 | - | Test Tolerances for TC 8.4.1.2.3_E.2 FDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (MBSFN ABS) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144105 | 1531 | - | Test Tolerances for TC 8.4.2.2.3_E.2 TDD PCFICH/PDCCH Transmit Diversity 2x2 for feICIC (MBSFN ABS) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144107 | 1532 | - | Uncertainties and Test Tolerances to Annex F for Demodulation feICIC | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144111 | 1533 | - | Test Tolerances for TC 9.2.1.5_E.1 FDD CQI Reporting under AWGN conditions - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144112 | 1534 | - | Test Tolerances for TC 9.2.1.6_E.1 TDD CQI Reporting under AWGN conditions - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144114 | 1535 | - | Test Tolerances for TC 9.3.1.3.1_E.1 FDD CQI Reporting under fading conditions - PUSCH 3-0 for feICIC (non-MBSFN ABS) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144115 | 1536 | - | Test Tolerances for TC 9.3.1.3.2_E.1 TDD CQI Reporting under fading conditions - PUSCH 3-0 for feICIC (non-MBSFN ABS) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144117 | 1537 | - | Test Tolerances for TC 9.5.4.1_E.1 FDD RI Reporting - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144118 | 1538 | - | Test Tolerances for TC 9.5.4.2_E.1 TDD RI Reporting - PUCCH 1-0 for feICIC (non-MBSFN ABS) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144120 | 1539 | - | Uncertainties and Test Tolerances to Annex F for Reporting of Channel State Information feICIC | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144122 | 1540 | - | Message contents updates for CSI feICIC test cases | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144123 | 1541 | - | Corrections to Annex G for feICIC | 12.2.0 | 12.3.0 |

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| 2014-09 | RAN#65 | R5-144173 | 1542 | - | RF: Corrections to spurious emission band co-existence test | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144174 | 1543 | - | RF: Missing test coverage for Band 31 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144176 | 1544 | - | IR RF: Correction to TCs 8.3.1.1.3 and 8.3.2.1.4 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144244 | 1545 | - | Correction of clause 6.2.4.5 in 36.521-1 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144248 | 1546 | - | Addition of operating band 30 to TS 36.521-1, clause 5 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144283 | 1547 | - | Add static propagation condition matrix for 1 x 2 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144299 | 1548 | - | Update of TC 8.3.1.3.2_F CoMP | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144300 | 1549 | - | Update of TC 8.3.1.3.3_F CoMP | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144301 | 1550 | - | Update of TC 8.3.2.4.2_F CoMP | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144302 | 1551 | - | Update of TC 8.3.2.4.3_F CoMP | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144310 | 1552 | - | Update minimum requirements and test tolerance for TC 8.7.3.1 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144311 | 1553 | - | Update minimum requirements and test tolerance for TC 8.7.4.1 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144312 | 1554 | - | Update minimum requirements and test tolerance for TC 8.8.2.1 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144313 | 1555 | - | Update minimum requirements and test tolerance for TC 8.8.2.2 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144347 | 1556 | - | Correction to Inter-band CA operating bands | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144352 | 1557 | - | Correction to eICIC performance test cases | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144353 | 1558 | - | Correction to UL/DL configuration in CQI requirements | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144393 | 1559 | - | RF: Corrections to A-MPR test requirements | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144416 | 1560 | - | Update configurations of CA_39C in A-MPR for CA | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144420 | 1561 | - | Update configurations of CA_39C in Additional spurious emissions for CA | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144436 | 1562 | - | Update of test applicabilities for TDD PDSCH Transmit Diversity | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144439 | 1563 | - | Update of test applicability for TDD PDSCH Transmit Diversity 4x2 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144441 | 1564 | - | Update test applicabilities for TDD interference rejection test cases | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144474 | 1565 | - | Updates to TC 8.7.2.1 and 8.7.2.1_1 for TDD SDR | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144766 | 1567 | - | Correction to CA Rx Blocking TCs | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144775 | 1568 | - | Correction of the ePDCCH TCs for applying default parameter | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144787 | 1566 | - | Addition of new TC 8.2.1.3.1_A.3 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for intra-band NC DL CA | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144801 | 1569 | - | Removal of TBDs in Clause 6.2.4A.1 (A-MPR for UL intra-band cont. CA), CA_NS_02 and 03, correction of Test Requirements | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144802 | 1570 | - | Correction to in-band blocking for CA requirements | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144803 | 1571 | - | Corrections to TM9 SNR requirements for eDL-MIMO | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144804 | 1572 | - | Addition of exception message for TDD MBMS | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144805 | 1573 | - | RF: Corrections to sustained data rate tests | 12.2.0 | 12.3.0 |

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| 2014-09 | RAN#65 | R5-144806 | 1574 | - | Correction of TDD CQI Reporting under AWGN conditions - PUCCH 1-0 for CA (intra band contiguous DL CA) TC 9.6.1.2_A.1 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144807 | 1575 | - | Correction of TDD CQI Reporting under AWGN conditions - PUCCH 1-0 for CA (intra band non-contiguous DL CA) TC 9.6.1.2_A.3 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144808 | 1576 | - | Correction to the test cases 8.3.2.1.1, 8.3.2.1.2, 8.3.2.1.3 and 8.3.2.2.1 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144809 | 1577 | - | Correction to RF General section on CA configurations | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144814 | 1578 | - | Update TC 9.3.6.1_F FDD CQI Reporting under fading conditions multiple CSI processes for CoMP | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144815 | 1579 | - | Update TC 9.3.6.2_F TDD CQI Reporting under fading conditions multiple CSI processes for CoMP | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144817 | 1580 | - | Addition of CoMP AWGN CQI Tests to Test Requirements Derivation in Annex F | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144818 | 1581 | - | Update minimum requirements and test tolerance for TC 8.8.3.1 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144819 | 1582 | - | Update minimum requirements and test tolerance for TC 8.8.3.2 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144820 | 1583 | - | Uncertainties and test tolerances for test cases 8.2.1.3.3_E.1 and 8.2.2.3.3_E.1 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144821 | 1584 | - | Uncertainties and Test Tolerances for feICIC Test cases 8.2.1.2.3_E.1 and 8.2.2.2.3_E.1. | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144822 | 1585 | - | Uncertainties and test tolerances for test case 8.2.2.4.3 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144824 | 1586 | - | Uncertainties and test tolerances for test cases 9.3.5.2.1 and 9.3.5.2.2 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144826 | 1587 | - | eICIC Test Tolerance references to TS 36.904 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144827 | 1588 | - | Addition of CA aQI Tests to Test Requirements Derivation in Annex F | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144828 | 1589 | - | ePDCCH RF: Corrections to sustained data rate tests | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144836 | 1590 | - | Update to CoMP test case 9.5.5.1_F.2 and 9.5.5.2_F.2 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144839 | 1591 | - | New CA band combination CA_NC_42 and CA_4-27-Update to 36.521-1 Chapter 6 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144840 | 1592 | - | New CA band combination CA_NC_42 and CA_4-27-Update to 36.521-1 Chapter 7 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144841 | 1593 | - | Addition of CA band Combo CA_7A-28A | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144842 | 1594 | - | Addition of CA_2A-2A to 36.521-1 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144844 | 1595 | - | Existing CA band combination CA_3A-28A update to 36.521-1 7.3 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144845 | 1596 | - | Addition of new CA band combo CA_2A-5A to 36.521-1 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144859 | 1597 | - | New TC: TDD CQI Reporting under AWGN conditions - PUCCH 1-0 for CA (inter band DL CA) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144873 | 1599 | - | Correction of clause 6.3.4.1.4 in 36.521-1 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144874 | 1600 | - | Removal of transition period for Band 28 test frequency definition | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144875 | 1601 | - | Clarification of tables used in TDD Intra band non-contiguous DL CA TCs | 12.2.0 | 12.3.0 |

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| 2014-09 | RAN#65 | R5-144876 | 1602 | - | Introduction of new Wideband Intermodulation test for Intra-band NC CA | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144879 | 1603 | - | New CA band combination CA_NC_42 and CA_4-27-Update to 36.521-1 Chapter 5 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144880 | 1604 | - | Update reference sensitivity level for CA (intra-band contiguous DL CA without UL CA) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144881 | 1605 | - | Update In-band blocking for CA (intra-band contiguous DL CA without UL CA) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144891 | 1606 | - | CA RF: Adopting test frequencies selection to the new structure proposed for TS 36.508 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144894 | 1607 | - | Corrections to 8.3.1.2.1_D_1 FDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO (Release 11 and forward) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144895 | 1608 | - | Corrections to 8.3.2.2.1_D_1 TDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO (Release 11 and forward) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144896 | 1609 | - | Correct errors in TDD PDSCH Single Antenna Port Performance test case | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144897 | 1610 | - | Separation of minimum requirements for CA UE PDSCH demodulation from single carrier | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144898 | 1611 | - | Introduction of FDD CQI Reporting under AWGN conditions - PUCCH 1-0 for CA (intra band contiguous DL CA) TC 9.6.1.1_A.1 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144899 | 1612 | - | Correction of FDD CQI Reporting under AWGN conditions - PUCCH 1-0 for CA (inter band DL CA) TC 9.6.1.1_A.2 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144900 | 1613 | - | Correction of FDD CQI Reporting under AWGN conditions - PUCCH 1-0 for CA (intra band non-contiguous DL CA) TC 9.6.1.1_A.3 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144901 | 1614 | - | Updates to 8.2.1.4.2_A.1/A.2 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA related test cases | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144902 | 1615 | - | Updates to 8.2.2.3.1_A TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144903 | 1616 | - | Updates to 8.2.2.4.2_A TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144904 | 1617 | - | Updates to 8.2.2.3.1 TDD PDSCH Open Loop Spatial Multiplexing 2x2 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144905 | 1618 | - | Updates to 8.2.2.3.2 TDD PDSCH Open Loop Spatial Multiplexing 4x2 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144906 | 1619 | - | Updates to 8.2.2.4 TDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 2x2 and 4x2 | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144907 | 1620 | - | Updates to 9.2.x CQI Reporting under AWGN conditions | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144916 | 1621 | - | Message contents updates for TC 9.5.5.1_F.1+9.5.5.2_F.1 CoMP | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144917 | 1622 | - | FDD CQI Reporting under AWGN conditions - Single CSI Process TC 9.2.4.1_F - Editor Notes Resolution | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144918 | 1623 | - | TDD CQI Reporting under AWGN conditions - Single CSI Process TC 9.2.4.2_F - Editor Notes Resolution | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144920 | 1624 | - | Addition of SDR test case 8.7.1.1_A.3 for intra-band NC DL CA | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144922 | 1625 | - | New TC: TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (inter band DL CA) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144923 | 1626 | - | New TC: TDD PDSCH Single Antenna Port Performance for CA (inter-band DL CA) | 12.2.0 | 12.3.0 |

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| 2014-09 | RAN#65 | R5-144924 | 1627 | - | New TC: TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (inter-band DL CA) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144925 | 1628 | - | New TC: TDD sustained data rate performance for CA (inter-band DL CA) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144926 | 1629 | - | Update Out-of-band blocking for CA (intra-band contiguous DL CA without UL CA) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144928 | 1630 | - | Message contents updates for Demod feICIC test cases | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144930 | 1631 | - | Addition of new TC 8.2.2.3.1A_A.3 TDD Soft buffer management test for intra-band NC DL CA | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144931 | 1632 | - | Addition of new TC 8.2.1.4.2_A.3 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (intra band NC DL CA) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144932 | 1633 | - | Updates to TCs 8.2.1.3.1_A.1/A.2 for FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144933 | 1634 | - | Updates to 8.7.1.1_A FDD SDR for CA related test cases | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144934 | 1635 | - | Addition of new TC 8.2.2.3.1A_A.2 TDD Soft buffer management test for inter-band DL CA | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144936 | 1636 | - | Updates of Annex F.1.4 and F.3.4 for newly added performance test cases | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144938 | 1637 | - | Updates to TC 8.2.2.1 TDD PDSCH Single Antenna Port Performance (Cell-Specific Reference Symbols) related test cases | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144939 | 1638 | - | Updates to 8.2.2.2 TDD PDSCH Transmit Diversity Performance (Cell-Specific Reference Symbols) | 12.2.0 | 12.3.0 |
| 2014-09 | RAN#65 | R5-144942 | 1640 | - | Updates to TC 9.6.1.1_A.2 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (inter band DL CA) | 12.2.0 | 12.3.0 |
| 2014-12 | RAN#66 | R5-145014 | 1641 | - | Corrections to CA Blocking TCs minimum requirements | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145015 | 1642 | - | Correction to CA Spurious Response TC minimum requirements | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145125 | 1645 | - | RF: Review of definition of CSI measurement channels with dynamic coding rate | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145128 | 1646 | - | RF: Review of references to CSI measurement channels with dynamic coding rate | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145175 | 1647 | - | New CA band combination CA_1A-3A - Updates of 5.2A Operating bands | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145176 | 1648 | - | New CA band combination CA_1A-3A - Updates of 5.4.2A Channel Bandwidth | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145177 | 1649 | - | New CA band combination CA_1A-3A - Updates of 6.2.5 Delta TIB | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145178 | 1650 | - | New CA band combination CA_1A-3A - Updates of 7.3.3 Delta RIB | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145189 | 1651 | - | eICIC-RF: Corrections to PDCCH performance tests | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145196 | 1652 | - | RF: Corrections to RMC-s tables | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145210 | 1653 | - | CA-RF: Correction to OBW requirement | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145222 | 1654 | - | Introduction of UE maximum output power for CA_42C | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145223 | 1655 | - | Introduction of Spurious emission band UE co-existence for CA_42C | 12.3.0 | 12.4.0 |

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| 2014-12 | RAN#66 | R5-145229 | 1656 | - | Update the minimum requirement and test requirements of TC 8.8.3 localized transmission with TM10 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145232 | 1657 | - | Existing CA band combination CA_4A-27A and new CA band combination CA_41A-42A update to 36.521-1 section 5.4.2A.1 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145234 | 1658 | - | New CA band combination CA_41A-42A update to 36.521-1 section 5.2A | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145235 | 1659 | - | New CA band combination CA_41A-42A update to 36.521-1 section 6.2.5 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145236 | 1660 | - | New CA band combination CA_41A-42A update to 36.521-1 section 7.3.3 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145291 | 1661 | - | CQI reporting in AWGN and in fading: CQI indices in set | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145311 | 1662 | - | Clarification for CA ACS and Wideband Intermodulation testcases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145374 | 1663 | - | New CA band combination CA_18A-28A - Updates of 5.2A Operating bands | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145375 | 1664 | - | New CA band combination CA_18A-28A - Updates of 5.4.2A Channel bandwidth | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145376 | 1665 | - | New CA band combination CA_18A-28A - Updates of 6.2.5.3 Delta TIB | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145377 | 1666 | - | New CA band combination CA_18A-28A - Updates of 7.3A Delta RIB | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145407 | 1667 | - | Alignment with 36.521-2 on UE categories for COMP | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145425 | 1668 | - | Removal of Non-contiguous Allocation within a Component Carrier Testpoints from UL CA MPR, Spectrum Emissions and ACLR Tests | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145431 | 1669 | - | Correction on parameters for high speed train scenario | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145436 | 1670 | - | Update TC 9.3.6 CQI Reporting under fading conditions Multiple CSI processes for CoMP | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145437 | 1671 | - | New CA band combination 1+11 and 8+11 û Introduction of 1+11 and 8+11 to 36.521-1 chapter 5 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145438 | 1672 | - | New CA band combination 1+11 and 8+11 û Introduction of 1+11 and 8+11 to 36.521-1 chapter 6 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145439 | 1673 | - | New CA band combination 1+11 and 8+11 û Introduction of 1+11 and 8+11 to 36.521-1 chapter 7 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145465 | 1674 | - | Correction to TC 8.2.1.1.1_A.1 FDD PDSCH Single Antenna Port Performance for CA | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145479 | 1675 | - | Corrections to throughput calculation for feICIC demodulation minimum requirements | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145480 | 1676 | - | Test Tolerances for TC 8.5.1.2.3_E.1 FDD PHICH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS) | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145481 | 1677 | - | Test Tolerances for TC 8.5.2.2.3_E.1 TDD PHICH Transmit Diversity 2x2 for feICIC (non-MBSFN ABS) | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145486 | 1678 | - | Uncertainties and Test Tolerances to Annex F for PHICH feICIC | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145487 | 1679 | - | Corrections to Annex G for minimum test time for demodulation for feICIC | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145505 | 1680 | - | Updates to TDD SDR CA test cases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145532 | 1681 | - | Addition of missing bandwidth combination sets for inter-band CA | 12.3.0 | 12.4.0 |

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| 2014-12 | RAN#66 | R5-145536 | 1682 | - | Additions to CoMP Demod test cases 8.3.1.3.1_F and 8.3.2.4.1_F | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145539 | 1683 | - | Addition of Band 30 in Max output power test cases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145540 | 1684 | - | Addition of Band 30 in Max power reduction test cases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145543 | 1685 | - | Addition of Band 30 in Spurious emission UE co-existence test cases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145559 | 1686 | - | Correction to 6.3.5A.1.1 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145638 | 1687 | - | Correction to HPUE Applicability statements in TS 36.521-1 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145800 | 1688 | - | RF: Modification of test description to refer to State 2A-RF | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145803 | 1689 | - | Removal of Non-contiguous Allocation within a Component Carrier Testpoints from UL CA A-MPR and Additional Spectrum/Spurious Emissions Tests | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145804 | 1690 | - | Addition of RF requirements in later releases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145805 | 1691 | - | eDL-MIMO RF: Correction to TC 8.3.1.1.1_D | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145808 | 1692 | - | Correction on support of a bandwidth combination set | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145809 | 1693 | - | Correction to TC 8.7.1.1_A FDD sustained data rate performance for CA | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145810 | 1694 | - | Correction to TC 8.2.2.1.1_A.1 TDD PDSCH Single Antenna Port Performance for CA | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145811 | 1695 | - | Corrections to TC 8.2.2.1.1_A.3 TDD PDSCH Single Antenna Port Performance for CA | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145812 | 1696 | - | Corrections to TC 8.2.2.4.2_A.3 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4 x 2 for CA | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145813 | 1697 | - | Corrections to Annex G for CA Enhancements | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145825 | 1698 | - | Uncertainties and TT for CoMP test case 9.5.5.1_F.2 and 9.5.5.2_F.2 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145835 | 1699 | - | Update Uncertainties for RI Test cases 9.5.x | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145839 | 1700 | - | Update of Demodulation of PDSCH CoMP TCs | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145840 | 1701 | - | Uncertainties and Test Tolerances for CoMP Test cases 8.3.1.3.3_F, 8.3.2.4.2_F, 8.3.2.4.3_F | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145841 | 1702 | - | Correction to CoMP TDD RI test case | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145846 | 1703 | - | Introduction of CA_42C in section 5 of TS 36.521-1 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145847 | 1704 | - | New CA band combination CA_4A-27A and CA_41A-42A update to 36.521-1 section 7.3A.3 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145848 | 1705 | - | Introduction of receiver requirements for CA_42C into TS 36.521-1 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145851 | 1706 | - | Addition of operating band 30 to TS 36.521-1 Clause 7 for receiver tests | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145853 | 1707 | - | Sections 3 and 4 update on 3DL CA WI | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145854 | 1708 | - | Addition of new 2DL(CA_1A-42A and CA_19A-42A) and 3DL CA band combinations(CA_1A-3A-19A, CA_1A-19A-21A, CA_1A-42C and CA_19A-42C) | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145855 | 1709 | - | New CA band combination CA_18A-28A - Updates of 7.3A Refsens | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145856 | 1710 | - | Update of CA Maximum input level Test cases | 12.3.0 | 12.4.0 |

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| 2014-12 | RAN#66 | R5-145857 | 1711 | - | Update of CA ACS Test cases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145858 | 1712 | - | Update of CA Blocking and Spurious Response Test cases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145859 | 1713 | - | Update of CA Rx Intermodulation Test cases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145872 | 1714 | - | Update to applicability for TM9 test cases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145874 | 1715 | - | RF: Correction to A-MPR requirements with NS_20 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145876 | 1716 | - | Applicability of CSI requirements for CA capability | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145880 | 1717 | - | Addition of Band 30 in Additional Max power reduction test cases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145881 | 1718 | - | Addition of Band 30 in Additional SEM test cases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145882 | 1719 | - | Addition of Band 30 in Additional Spurious emission test cases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145883 | 1720 | - | Update the minimum requirement and test requirements of TC 8.8.2 localized transmission with TM9 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145884 | 1721 | - | New CA band combination CA_1A-3A - Updates of 7.3A Refsens | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145885 | 1722 | - | New CA band combination CA_NC_41A and CA_NC_42A update to 36.521-1 section 7.4A.4 and 7.5A.4 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145886 | 1723 | - | New CA band combination CA_NC_41A and CA_NC_42A update to 36.521-1 section 7.6.1A.4, 7.6.2A.4 and 7.6.3A.4 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145887 | 1724 | - | New CA band combination CA_NC_41A and CA_NC_42A update to 36.521-1 section 7.8.1A.4 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145888 | 1725 | - | Existing CA band combination CA_39C: update bandwidth combination to CQI test | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145889 | 1726 | - | Existing CA band combination CA_39C: update bandwidth combination to PDSCH TM1 test | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145890 | 1727 | - | Existing CA band combination CA_39C: update bandwidth combination to PDSCH TM3 test | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145891 | 1728 | - | Existing CA band combination CA_39C: update bandwidth combination to PDSCH TM4 test | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145893 | 1729 | - | 7A-7A NC CA RX RF Tests Testpoint Correction | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145896 | 1730 | - | CA-RF: Correction to ACLR test points | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145898 | 1731 | - | Intraband Contiguous CA RF Tests Testpoint Choice Clarification | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145899 | 1732 | - | Updates to Spurious emission band UE co-existence test cases 6.6.3.2 and 6.6.3.2A.1 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145900 | 1733 | - | Chapter 7 RX RF Tests Intra-band contiguous Test Configuration Tables Cleanup | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145901 | 1734 | - | Updates to FDD and TDD PDSCH Soft buffer management test (inter-band DL CA) | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145902 | 1735 | - | Updates to TM3 CA demodulation tests for release independence | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145917 | 1736 | - | Addition of CRS assistance data in message contents for feICIC demodulation test cases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145922 | 1737 | - | Introduction of TC 8.2.1.1.1_A.3 FDD PDSCH Single Antenna Port Performance for CA | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145926 | 1739 | - | New CA band combination CA_NC_41A and CA_NC_42A update to 36.521-1 section 7.3A.4 | 12.3.0 | 12.4.0 |

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| 2014-12 | RAN#66 | R5-145933 | 1740 | - | Existing CA band combination CA_39C: update annex tables for 20+15MHz | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145934 | 1741 | - | Reconstruction of FDD SDR test cases based on Release independent rule | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145935 | 1742 | - | RF: Cleanup of sustained data rate test cases | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145936 | 1743 | - | Applicability of Demodulation requirements for CA capability | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145975 | 1643 | - | CA-RF: Review of test frequencies clause 8 | 12.3.0 | 12.4.0 |
| 2014-12 | RAN#66 | R5-145976 | 1644 | - | CA-RF: Review of test frequencies clause 9 | 12.3.0 | 12.4.0 |
| 2015-03 | RAN#67 | R5-150112 | 1744 | - | Addition of CA_2-30 to Clause 5.2A of TS 36.521-1. | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150135 | 1745 | - | Addition of CA_5-30 to Clause 5.2A of TS 36.521-1. | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150136 | 1746 | - | Addition of CA_5A-30A to Clause 5.4.2A of TS 36.521-1. | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150169 | 1747 | - | Addition of CA_4A-5A-30A to Clause 5.4.2A of TS 36.521-1. | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150181 | 1748 | - | Addition of new TC 9.3.6.1_F.2 FDD CQI Reporting under fading conditions with Three CSI processes for CoMP | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150184 | 1749 | - | Addition of new TC 9.3.6.2_F.2 TDD CQI Reporting under fading conditions with Three CSI processes for CoMP | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150186 | 1840 | - | Addition of TT for new TCs 9.3.6.1_F.1, 9.3.6.1_F.2, 9.3.6.1_F.3, 9.3.6.2_F.1, 9.3.6.2_F.2 and 9.3.6.2_F.3 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150209 | 1750 | - | Corrections to 1 PRB allocation performance in presence of MBSF | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150210 | 1751 | - | Corrections to the Common Test Parameters for User-specific Reference Symbols | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150214 | 1752 | - | Test Tolerances for 8.3.1.2.1_D_1 FDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO Rel-11 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150215 | 1753 | - | Test Tolerances for 8.3.2.2.1_D_1 TDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO Rel-11 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150216 | 1754 | - | Uncertainties and Test Tolerances to Annex F for PDSCH for eDL-MIMO Rel-11 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150234 | 1755 | - | CA RF: Corrections to power imbalance test | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150252 | 1756 | - | Update of non-contiguous CA Rx Test Cases | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150364 | 1757 | - | ePDCCH RF: Corrections to sustained data rate test | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150373 | 1758 | - | Introduction of new CA band combinations 5+25 and 12+25 for Transmitter Characteristics | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150409 | 1759 | - | Correction in cl.3 of 36.521-1 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150415 | 1760 | - | Correction to message exceptions for eICIC performance test cases | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150416 | 1761 | - | Clean up on Performance and CSI test cases for eICIC and feICIC | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150417 | 1762 | - | Correction to test procedure in CQI Reporting under AWGN for feICIC | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150420 | 1763 | - | Correction to minimum test time for feICIC performance tests in G.3A.5 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150437 | 1764 | - | New CA band combination CA_1A-28A - Updates of 5.2A Operating bands | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150438 | 1765 | - | New CA band combination CA_1A-28A - Updates of 5.4.2A Channel bandwidth | 12.4.0 | 12.5.0 |

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| 2015-03 | RAN#67 | R5-150440 | 1766 | - | New CA band combination CA_1A-28A - Updates of 6.2.5.3 Delta TIB | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150441 | 1767 | - | New CA band combination CA_1A-28A - Updates of 7.3.3 Delta RIB | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150452 | 1768 | - | New CA band combination CA_1A-18A-28A - Updates of 5.4.2A Channel bandwidth | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150453 | 1769 | - | New CA band combinations (CA_1A-41A, CA_1A-41C) - Updates of 5.2A Operating bands | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150455 | 1770 | - | New CA band combinations (CA_26A-41A, CA_26A-41C) - Updates of 5.2A Operating bands | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150456 | 1771 | - | New CA band combination CA_1A-18A-28A - Updates of 5.2A Operating bands | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150460 | 1772 | - | Correction to the description of duplex mode related to CA_18A-28A | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150461 | 1773 | - | Correction to the test frequencies and test CC combinations for CA_18A-28A | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150472 | 1774 | - | Correction to requirements for test case 7.6.2A.1 and 7.6.2A.2 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150476 | 1775 | - | Removal of Note 1 in requirements of TC 6.2.2A | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150478 | 1776 | - | Addition of &#916:RIB,c to requirements of blocking and spurious response test cases | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150479 | 1777 | - | Correction to PUSCH configuration details for 36.521-1 4x2 CA test cases | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150505 | 1778 | - | Added TT in annex for TDD inter band CA performance tests | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150506 | 1779 | - | Updated TT in TDD inter band CA performance tests | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150522 | 1780 | - | Addition of CA_1A-20A to TS 36.521-1 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150543 | 1781 | - | Addition of 2A-12A and 5A-13A 2DL Interband CA to 36.521-1 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150606 | 1782 | - | Clarification on bandwidth to be tested | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150800 | 1783 | - | Correction to 6.6.3.2 of Tx Spurious | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150801 | 1784 | - | Correction in 6.2.5A and 6.5.1A of 36.521-1 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150802 | 1785 | - | Fixing numbering in Table 6.6.2.3A.1.4.1-1 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150803 | 1786 | - | Change of test points for A-MPR in band 26 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150809 | 1787 | - | Addition of BCS1 to 25A-25A CA | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150810 | 1788 | - | Introduction of CA_1A-7A to TS 36.521-1 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150811 | 1789 | - | Correction to test points for intra-band contiguous receiver test cases | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150816 | 1790 | - | Addition of CA_2A-30A to Clause 7.3.3 of TS 36.521-1. | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150817 | 1791 | - | Addition of CA_2A-30A to Clause 6.2.5 of TS 36.521-1. | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150818 | 1792 | - | Addition of CA_2A-30A to Clause 5.4.2A of TS 36.521-1. | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150819 | 1793 | - | Addition of CA_4A-30A to Clause 7.3.3 of TS 36.521-1. | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150820 | 1794 | - | Addition of CA_4A-30A to Clause 6.2.5 of TS 36.521-1. | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150821 | 1795 | - | Addition of CA_4-30 to Clause 5.2A of TS 36.521-1. | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150822 | 1796 | - | Addition of CA_4A-30A to Clause 5.4.2A of TS 36.521-1. | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150823 | 1797 | - | Addition of CA_5A-30A to Clause 7.3.3 of TS 36.521-1. | 12.4.0 | 12.5.0 |

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| 2015-03 | RAN#67 | R5-150824 | 1798 | - | Addition of CA_5A-30A to Clause 6.2.5 of TS 36.521-1. | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150825 | 1799 | - | Addition of CA_4-5-30 to Clause 5.2A of TS 36.521-1. | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150826 | 1800 | - | Addition of new TC FDD PDSCH Single Antenna Port Performance for CA (3DL CA) | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150827 | 1801 | - | Addition of CA_2A-2A-13A to TS 36.521-1 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150828 | 1802 | - | Addition of 40D,41D,41C-41A and 25A-25A BCS1 to Channel BW for CA tables | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150829 | 1803 | - | Addition of multiple interband 3DL CA Combinations to Channel BW for CA tables | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150848 | 1804 | - | Addition of new TC 9.3.6.1_F.1 FDD CQI Reporting under fading conditions with Single CSI process for CoMP | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150849 | 1805 | - | Addition of new TC 9.3.6.1_F.3 FDD CQI Reporting under fading conditions with Four CSI processes for CoMP | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150850 | 1806 | - | Addition of new TC 9.3.6.2_F.1 TDD CQI Reporting under fading conditions with Single CSI process for CoMP | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150851 | 1807 | - | Addition of new TC 9.3.6.2_F.3 TDD CQI Reporting under fading conditions with Four CSI processes for CoMP | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150860 | 1808 | - | Introduction of new CA band combinations 5+25 and 12+25 for Receiver Characteristics | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150861 | 1809 | - | Addition of CA_1A-7A-20A to TS 36.521-1 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150862 | 1810 | - | Update of minimum requirements for TC 6.2.5 Configured UE transmitted Output Power | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150863 | 1811 | - | Updates of minimum requirement to reference sensitivity for CA | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150865 | 1812 | - | Addition of new TC TDD PDSCH Single Antenna Port Performance for CA (3DL CA) | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150866 | 1813 | - | Addition of new TC FDD Sustained data rate performance for CA (3DL CA) | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150867 | 1814 | - | Addition of new TC TDD Sustained data rate performance for CA (3DL CA) | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150869 | 1839 | - | Addition of Cell IDs for 3DL CA Rx tests | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150870 | 1815 | - | New CA band combinations (CA_1A-41A, CA_1A-41C) - Updates of 5.4.2A Channel bandwidth | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150871 | 1816 | - | New CA band combinations (CA_26A-41A, CA_26A-41C) - Updates of 5.4.2A Channel bandwidth | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150935 | 1817 | - | Change in UE co-existence 6.6.3.2 harmonic emissions exceptions | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150874 | 1818 | - | CA RF: Updates to in-band emissions requirements | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150875 | 1819 | - | Correction to test procedure of TC 7.6.1A.4 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150880 | 1820 | - | Update of CA sustained data rate tests | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150881 | 1821 | - | Aligning Bandwidth Combination Sets with latest core specification | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150892 | 1822 | - | Update to TC 7.5A.4 Adjacent Channel Selectivity (ACS) for CA (intra-band non-contiguous DL CA without UL CA) | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150897 | 1823 | - | New CA band combination CA_1A-28A - Updates of 7.3A Refsens | 12.4.0 | 12.5.0 |

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| 2015-03 | RAN#67 | R5-150928 | 1824 | - | Updates to Spurious emission band UE co-existence test case 6.6.3.2 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150906 | 1825 | - | Updates to FDD and TDD RI Reporting test cases for CoMP | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150929 | 1827 | - | Addition of CA capability in Rx tests | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150913 | 1828 | - | Addition of Multi-Cluster PUSCH with One Uplink Carrier test cases to 36.521-1 | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150915 | 1829 | - | Addition of CA capability and applicability changes to Section 8 36.521-1 FDD TM3 CA test cases | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150916 | 1830 | - | Changes to Annex F of 36.521-1 related to CA capability and applicability changes to FDD CA test cases | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150917 | 1831 | - | Correction to CA applicability and test rules | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150918 | 1832 | - | Addition of CA capability and applicability changes to 36.521-1 FDD TM1 CA test cases | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150919 | 1833 | - | Update to LTE CA Sustained Data rate test cases | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150920 | 1834 | - | CA demod Soft Buffer test case variants merge | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150921 | 1835 | - | Addition of CA capability and applicability changes to Section 8 36.521-1 FDD TM4 CA test cases | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150922 | 1836 | - | Addition of CA capability and applicability changes to FDD chap9 CA test cases | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150925 | 1837 | - | Introduction of Test Case for Maximum input level for 3DL CA | 12.4.0 | 12.5.0 |
| 2015-03 | RAN#67 | R5-150926 | 1838 | - | Addition of new TC of reference sensitivity for 3DL CA | 12.4.0 | 12.5.0 |
| 2015-06 | RAN#68 | R5-151067 | 1841 | - | Removal of Extreme Conditions from TC 6.6.2.1A test environment | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151114 | 1843 | - | RF: Missing power class information | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151116 | 1845 | - | CA RF: Clarification of PHICH configuration | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151117 | 1846 | - | RF: Corrections to CSI RMCs references | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151121 | 1850 | - | ePDCCH RF: Corrections to sustained data rate test | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151122 | 1851 | - | feICIC RF: Updates to TC 9.2.1.6_E.1 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151123 | 1852 | - | feICIC RF: Corrections to CSI TCs | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151151 | 1853 | - | Correction to the requirements of test case 6.6.2.1A | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151152 | 1854 | - | Addition of Rx parameter for test case 7.6.2A.1 and 7.6.2A.2 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151181 | 1855 | - | CA RF: Corrections to the applicability clause | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151195 | 1857 | - | Corrections to CSI Reference Measurement Channel | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151213 | 1871 | - | Updating Annex A relevant for the introduced of eDL MIMO enhancement Tests | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151214 | 1872 | - | Updating Annex B Beam steering approach for eDL MIMO enhancement Tests | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151215 | 1873 | - | Updating Annex I relevant for the introduced of eDL MIMO enhancement Tests | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151231 | 1874 | - | CoMP TCs applicability update section 8 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151237 | 1876 | - | Update of CoMP TCs 9.2.4.1_F and 9.2.4.2_F | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151238 | 1877 | - | Update of CoMP TCs in sections 9.3.6.1_F and 9.3.6.2_F | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151256 | 1884 | - | Update of CoMP TCs in section 8 | 12.5.0 | 12.6.0 |

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| 2015-06 | RAN#68 | R5-151257 | 1885 | - | Update of CoMP TCs 9.5.5.1_F.1 and 9.5.5.2_F.1 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151329 | 1902 | - | Addition of band 32 to clause 6 in 36.521-1 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151366 | 1912 | - | Removal of double table 7.6.1B.5-2 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151367 | 1913 | - | Corrections to UL CA Test Cases | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151369 | 1915 | - | Editorial corrections to TC 6.6.1 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151425 | 1940 | - | Addition of Band 32 in Receiver test cases | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151487 | 1955 | - | Introduction of new test case 8.9.1.1.1 MTC | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151515 | 1962 | - | Correction to test case 6.3.3A.1: UE Transmit OFF power for CA (intra-band contiguous DL CA and UL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151561 | 1963 | - | Update to TX test case 6.6.3.3 Additional spurious emissions | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151591 | 1976 | - | 36.521-1: CA Soft buffering corrections | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151616 | 1978 | - | Introduction of new test case 9.7.1.1 MTC | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151639 | 1980 | - | Test points correction in test case 7.3A.2 for CA_23B in 36.521-1 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151802 | 1875 | 1 | CoMP TCs applicability update section 9 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151805 | 1904 | 1 | Clarification to spurious emission requirement for the edge of spurious domain | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151806 | 1842 | 1 | Missing NS Value for Band 30 Reference Sensitivity Testing and Missing Message Content Exceptions | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151807 | 1891 | 1 | Correction of UL RB Allocation in Interband DL CA Testcases | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151808 | 1898 | 1 | Correction of CA_25A-25A wrong allocation in Chapter 7 Table 7.3A.4.4.1-1 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151809 | 1914 | 1 | Updates for interferer placement in non-contiguous CA | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151811 | 1903 | 1 | Correction of UEs category for TDD sustained data rate performance | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151812 | 1952 | 1 | Updates to 36.521-1 Annex F and G | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151813 | 1916 | 1 | Clean up of PDSCH performance test cases | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151814 | 1924 | 1 | Clean up of eDL-MIMO test cases | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151815 | 1925 | 1 | Clean up of TM9 interference model test cases | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151816 | 1926 | 1 | Correction to eICIC performance test cases | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151817 | 1927 | 1 | Correction to CQI and RI reporting test in feICIC | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151818 | 1928 | 1 | Correction to PDSCH demodulation test in feICIC | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151819 | 1929 | 1 | Clean up on PCFICH/PDCCH demodulation test in feICIC | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151820 | 1930 | 1 | Clean up on PHICH demodulation test in feICIC | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151821 | 1932 | 1 | Correction of PMI test cases in the section 9.4.1 and 9.4.2 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151822 | 1966 | 1 | Removal of the correlation matrix of HST propagation conditions | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151825 | 1979 | 1 | Updates to CoMP test cases 9.5.5.x | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151854 | 1909 | 1 | Addition of new TC FDD PDSCH 2x2 Open Loop Performance for 3DL CA | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151855 | 1910 | 1 | Addition of new TC FDD PDSCH 4x2 Closed Loop Performance for 3DL CA | 12.5.0 | 12.6.0 |

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| 2015-06 | RAN#68 | R5-151856 | 1967 | 1 | Introduction of TC TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4X2 for CA (3DL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151857 | 1968 | 1 | Introduction of TC TDD PDSCH Open Loop Spatial Multiplexing 2X2 for CA (3DL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151858 | 1969 | 1 | New CA band combination CA_1A-41A and CA_26A-41A - Updates of 6.2.5.3 Delta TIB | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151859 | 1970 | 1 | New CA band combination CA_1A-41A and CA_26A-41A - Updates of 7.3.3 Delta RIB | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151884 | 1878 | 1 | New TCs: FDD PMI Reporting with 4Tx enhanced codebook - PUSCH 1-2 (Multiple PMI) for eDL-MIMO Enhancement | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151885 | 1879 | 1 | New TCs: TDD PMI Reporting with 4Tx enhanced codebook - PUSCH 1-2 (Multiple PMI) for eDL-MIMO Enhancement | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151891 | 1901 | 1 | Addition of band 32 to clause 5 in 36.521-1 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151894 | 1941 | 1 | Addition of test case 6.2.2E - UE Maximum Output Power for UE category 0 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151895 | 1943 | 1 | Introduction of UE category 0 in section 4 of 36.521-1 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151896 | 1954 | 1 | Update of SNR definition in clause 8.1.1 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151897 | 1859 | 1 | Introduction of TC 6.3.5A.1.2 Power Control Absolute Power Tolerance for CA | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151899 | 1860 | 1 | Introduction of TC 6.3.5A.1.3 Power Control Absolute Power Tolerance for CA | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151900 | 1883 | 1 | New CA 2UL Tx test case 6.2.2A.3 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151901 | 1861 | 1 | Introduction of TC 6.3.5A.2.3 Power Control Relative Power Tolerance for CA | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151902 | 1862 | 1 | Introduction of TC 6.3.5A.2.2 Power Control Relative Power Tolerance for CA | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151903 | 1863 | 1 | Introduction of TC 6.7A.2 Transmit intermodulation for CA | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151921 | 1886 | 1 | Updates of minimum requirement for reference sensitivity for CA | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151922 | 1887 | 1 | Addition of test points and test requirements for 3DL inter-band CA | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151926 | 1977 | 1 | Update of 7.6.1A.1 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151928 | 1918 | 1 | Correction to CQI reference measurement channels | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151929 | 1849 | 1 | CA RF: Corrections to sustained data rate test | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151930 | 1946 | 1 | Update two band and three band information in test case 7.3 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151931 | 1888 | 1 | Update of Maximum input level for CA (3DL CA without UL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151932 | 1950 | 1 | Introduction of TDD FDD CA with TDD as Pcell for PDSCH Single Antenna Port Performance | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151933 | 1951 | 1 | Introduction of TDD FDD CA with FDD as Pcell for PDSCH Single Antenna Port Performance | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151934 | 1956 | 1 | Introduction to test case 9.6.1.1_A.2: FDD CQI Reporting under AWGN conditions – PUCCH 1-0 (3DL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151935 | 1957 | 1 | Introduction to test case 9.6.1.2_A.2: TDD CQI Reporting under AWGN conditions – PUCCH 1-0 (3DL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151936 | 1965 | 1 | Addition of CA capability and applicability for 3 DL CCs in Chapter 8 | 12.5.0 | 12.6.0 |

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| 2015-06 | RAN#68 | R5-151937 | 1971 | 1 | New CA band combination CA_1A-41A and CA_26A-41A - Updates of 7.3A Refsens | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151938 | 1972 | 1 | New CA band combination CA_1A-18A-28A - Updates of 7.3.3 Delta RIB and 7.3A Refsens | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151940 | 1958 | 1 | Introduction to test case 6.3.3A.3: UE Transmit OFF power for CA (intra-band non-contiguous DL CA and UL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151941 | 1959 | 1 | Introduction to test case 6.3.4A.1.3: General ON/OFF time mask for CA (intra-band non-contiguous DL CA and UL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151942 | 1960 | 1 | Introduction to test case 6.6.1A.3: UE Occupied bandwidth for CA (intra-band non-contiguous DL CA and UL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151943 | 1961 | 1 | Introduction to test case 6.6.2.1A.3: Spectrum Emission Mask for CA (intra-band non-contiguous DL CA and UL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151944 | 1893 | 1 | Merge of TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA cases | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151945 | 1936 | 1 | Introduction of TC 7.6.2A.5 Out-of-band blocking for CA (3DL CA without UL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151946 | 1983 | 1 | Introduction of TC 7.6.3A.5 Narrow-band blocking for CA (3DL CA without UL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151947 | 1937 | 1 | Introduction of TC 7.7A.5 Spurious response for CA (3DL CA without UL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151948 | 1935 | 1 | Introduction of TC 7.6.1A.5 In-band blocking for CA (3DL CA without UL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-151950 | 1844 | 1 | CA RF: PCC/SCC mapping onto physical CC-s definition cleanup | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152000 | 1848 | 1 | CA RF: Corrections to power imbalance test | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152001 | 1953 | 1 | Correction to 9.3.1.3.1_E.1 FDD CQI Reporting test | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152002 | 1858 | 1 | Corrections to Reference Measurement Channel | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152003 | 1911 | 1 | Update of DL RMCs for PDSCH performance requirements | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152004 | 1947 | 1 | Addition of CA capability, applicability changes and core spec updates to Section 8 36.521-1 TDD TM1 CA test cases | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152005 | 1948 | 1 | Addition of CA capability, applicability changes and core spec updates to Section 8 36.521-1 TDD TM3 CA test cases | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152006 | 1949 | 1 | Addition of CA capability, applicability changes and core spec updates to Section 8 36.521-1 TDD TM4 CA test cases | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152007 | 1974 | 1 | Editorial correction to 8.2.1.1.1_A.1 and 8.2.1.3.1_A.1 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152013 | 1856 | 1 | Addition of Chapter 7 3DL CA Test Configuration Tables | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152017 | 1938 | 1 | Introduction of test case 7.8.1A.5 Wideband intermodulation for CA (3DL CA without UL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152018 | 1942 | 1 | Addition of test case 7.3E - Reference sensitivity level for UE category 0 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152020 | 1882 | 1 | New CA 2UL Tx test case 6.2.2A.2 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152021 | 1944 | 1 | Introduction of test case Maximum Power Reduction (MPR) for CA (inter-band DL CA and UL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152022 | 1945 | 1 | Introduction of test case Maximum Power Reduction (MPR) for CA (intra-band non-contiguous DL CA and UL CA) | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152025 | 1922 | 1 | Corrections to spurious emission band co-existence limit tables in clause 6 | 12.5.0 | 12.6.0 |

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| 2015-06 | RAN#68 | R5-152027 | 1896 | 1 | Update Reference Channel and Minimum test time for TDD CA power imbalance demodulation test | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152028 | 1897 | 1 | Update TDD CA BW combination to power imbalance test | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152031 | 1908 | 1 | Update of TC8.2.1.1.1_A.2:FDD PDSCH Single Antenna Performance for 3DL CA | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152032 | 1900 | 1 | Addition of Multiple 3DL CA Combinations to Chapter 7 Delta RIB and REFSENS Exceptions Tables | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152033 | 1906 | 1 | Clarification of the power of interferer with deltaRIBc | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152038 | 1889 | 1 | Introduction of ACS Test Case for 3DL CA without UL CA | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152043 | 1923 | 2 | Addition and alignment of all Rel-12 CA configurations in Section 5 | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152133 | 1939 | 2 | NS value for intra-band contiguous CA configurations not allowed A-MPR | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | R5-152136 | 1981 | 2 | 36.521-1: DL Sustained Data Rate clarifications | 12.5.0 | 12.6.0 |
| 2015-06 | RAN#68 | - | - | - | section 8.2.1.4.3 which was deleted by mistake due to a wrong implementation of R5-150921 was restored | 12.5.0 | 12.6.0 |
| 2015-09 | RAN#69 | R5-153100 | 1991 | - | Corrections to EVM and Carrier leakage CA test cases | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153101 | 1992 | - | Update of EVM minimum requirements | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153243 | 2017 | - | CA RF: Minor corrections | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153244 | 2018 | - | eDL-MIMO RF: Minor corrections | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153245 | 2019 | - | CA RF: Correction to applicability of SDR test | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153247 | 2021 | - | eICIC and feICIC RF: Corrections to PDSCH RMCs used for PDCCH performance | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153300 | 2029 | - | Addition of new TC of Frequency error for inter-band CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153305 | 2033 | - | Addition of new TC of Reference sensitivity level for 2UL inter-band CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153317 | 2037 | - | CA RF: Addition of missing requirements for CA_4A-12A | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153318 | 2038 | - | RF: Clarifications for TC 6.6.3.2 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153322 | 2042 | - | RF: Correction to TC 6.6.3.3A | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153362 | 2053 | - | Clean up for Tx test cases | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153364 | 2055 | - | Correction to DL parameters in CA Rx tests | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153365 | 2056 | - | Correction to 7.6.1A.4 In-band blocking for non-contiguous CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153367 | 2058 | - | Removable of PCFICH_RA in 8.4 and 8.5 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153371 | 2062 | - | Correction to CQI reporting under AWGN for eDL-MIMO | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153372 | 2063 | - | Correction to CQI reporting under fading(PUSCH3-1) for eDL-MIMO | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153373 | 2064 | - | Correction to CQI reporting under fading(PUCCH1-1) for eDL-MIMO | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153375 | 2066 | - | Correction to RI reporting test for eDL-MIMO | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153377 | 2068 | - | Correction to CQI reporting test for TM9 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153378 | 2069 | - | Correction to feICIC CQI reporting test procedure in 9.2.1.5_E.1 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153423 | 2075 | - | Updates of ?TIB,c values to TC 6.2.5 | 12.6.0 | 12.7.0 |

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| 2015-09 | RAN#69 | R5-153460 | 2091 | - | Correction of 1A-3A-5A CA REFSENS DL Allocation | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153462 | 2092 | - | Addition of several definitions to chapter 3 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153474 | 2095 | - | Applicability Update of Intra-Band DL-only CA testcases in Chapter 7 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153613 | 2122 | - | Introduction of Receiver Spurious emissions test case for Carrier Aggregation in DL-only bands | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153624 | 2126 | - | New CA 2UL Tx test case 6.6.2.3A.2 Adjacent Channel Leakage power Ratio for CA (inter-band DL CA and UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153629 | 2127 | - | Test Tolerances for test case 6.3.4A.1.3 General ON/OFF time mask for CA (intra-band contiguous DL CA and UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153630 | 2128 | - | Test Tolerances for test case 6.3.4A.1.1 General ON/OFF time mask for CA (intra-band contiguous DL CA and UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153633 | 2130 | - | Test Tolerances for test case 6.6.1A.3 Occupied bandwidth for CA (intra-band non-contiguous DL CA and UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153634 | 2131 | - | Test Tolerances for test case 6.6.2.1A.3 Spectrum emission mask for CA (intra-band non-contiguous DL CA and UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153646 | 2135 | - | 36.521-1_Reference corrections in test 6.6.3.2 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153671 | 2145 | - | Resubmission: CA RF: Clarification of PHICH configuration | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153800 | 2070 | 1 | Correction to applicability of feICIC demod test cases | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153801 | 2057 | 1 | Correction to test procedure in 7.8.1A.4 Wideband intermodulation for non-contiguous CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153802 | 2090 | 1 | Correction to Testpoint Selection in Chapter 7 NC CA Testcases | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153803 | 2048 | 1 | Correction to title of table A 3.2-3 and A 3.2-4 in annex A.3.2 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153804 | 2061 | 1 | Correction to message exceptions in performance test(User-Specific RS) for eDL-MIMO | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153805 | 2065 | 1 | Correction to PMI reporting test for eDL-MIMO | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153806 | 2067 | 1 | Correction to TM9 interference model test cases | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153807 | 2078 | 1 | Updates to 8.7.2.1.A_1 TDD Sustained data rate performance for CA (2DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153810 | 2087 | 1 | Correction to test point selection table for all chap8/9 FDD and TDD 2DLCA cases | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153821 | 2012 | 1 | Update to FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153822 | 2024 | 1 | Addition of annex F for Reference sensitivity for 3DL CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153823 | 2039 | 1 | CA RF: Update of test points for CA_12B | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153827 | 2094 | 1 | Addition of 3DL CA default XB-YA configuration to REFSENS test configuration table | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153836 | 1999 | 1 | Introduction of SUMIMO for LTE Type C performance TC 8.2.2.3.1B | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153837 | 2111 | 1 | Addition of Reference measurement channel and overview reference for multi-cell test in Annex | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153838 | 2112 | 1 | Introduction of FDD TM3 test case for LTE Type C performance requirements (8.2.1.3.1B) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153839 | 2113 | 1 | Introduction of FDD TM3 multi-cell test case with TM1 interference for LTE Type C performance requirements (8.2.1.3.1C) | 12.6.0 | 12.7.0 |

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|---|---|---|---|---|---|---|---|
| 2015-09 | RAN#69 | R5-153840 | 2114 | 1 | Introduction of TDD TM3 multi-cell test case with TM1 interference for LTE Type C performance requirements (8.2.2.3.1C) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153841 | 2115 | 1 | Introduction of FDD TM4 test case for LTE Type C performance requirements (8.2.1.4.2A) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153842 | 2116 | 1 | Introduction of TDD TM4 test case for LTE Type C performance requirements (8.2.2.4.2A) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153843 | 2117 | 1 | Introduction of TDD TM8 test case for LTE Type C performance requirements (8.3.2.2.2) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153844 | 2118 | 1 | Introduction of FDD TM9 test case for LTE Type C performance requirements (8.3.1.2.2) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153845 | 2119 | 1 | Addition of Enhanced performance requirements Type C definition | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153848 | 1997 | 1 | Update of eDL MIMO enhancement TC 9.4.2.3.3_G | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153849 | 1998 | 1 | Update of eDL MIMO enhancement TC 9.4.2.3.4_G | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153851 | 2000 | 1 | New TC: 9.7.1.2 TDD CQI reporting definition under AWGN conditions for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153852 | 2125 | 1 | RMC definitions for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153853 | 2123 | 1 | Additions to test case 6.2.2E - UE Maximum Output Power for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153854 | 2124 | 1 | Changes to test case 7.3E - Reference sensitivity level for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153855 | 2026 | 1 | Addition of new TC of Transmit off power for inter-band CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153856 | 2034 | 1 | Addition of annex F for 2UL CA test cases | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153858 | 2045 | 1 | Introduction to test case 6.2.4A.3: Additional Maximum Power Reduction (A-MPR) for CA (intra-band non-contiguous DL CA and UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153859 | 2088 | 1 | EVM for Intra-band contiguous UL CA for non-equal Channel BWs | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153867 | 2150 | - | Adding missing subclauses in Annex A.2 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153868 | 2008 | 1 | Align Test Procedure and Test requirements for 7.5A.5 ACS 3DL CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153869 | 2010 | 1 | Align Test requirements for 7.4A.5 Max Input 3DL CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153870 | 2132 | 1 | Completion to Test cases 9.6.1.1_A.2 and 9.6.1.2_A.2: FDD/TDD CQI Reporting under AWGN conditions – PUCCH 1-0 (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153873 | 2035 | 1 | Updates of minimum requirements of Spurious emission band UE co-existence | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153874 | 2001 | 1 | New CA band combination CA_1A-5A-7A - Updates of 7.3.3 Delta RIB and 7.3A Refsens Test Configuration | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153879 | 2036 | 1 | CA RF: Update of intraband contiguous blocking requirements | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153880 | 2096 | 1 | Update of Reference sensitivity for CA_39A-41C and CA_39C-41A | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153881 | 2121 | 1 | Updates to test case 7.8.1A.5 Wideband intermodulation for CA (3DL CA without UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153882 | 2148 | - | New CA band combinations (CA_1A-41C, CA_26A_41C) - Updates of 7.3.3 Delta RIB | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153884 | 2147 | - | Addition of Multiple Inter-band CA Configurations to 7.3A.4 | 12.6.0 | 12.7.0 |

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| 2015-09 | RAN#69 | R5-153885 | 2011 | 1 | Update to FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153886 | 2013 | 1 | Update to TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153887 | 2014 | 1 | Update to TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153888 | 2076 | 1 | Updates to 8.2.2.1.1_A.2 TDD PDSCH Single Antenna Port Performance for CA (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153889 | 2077 | 1 | Updates to 8.7.1.1.A_2 FDD Sustained data rate performance for CA (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153890 | 2079 | 1 | Updates to 8.7.2.1.A_2 TDD Sustained data rate performance for CA (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153891 | 2086 | 1 | Updates to TDD FDD CA test cases for PDSCH Single Antenna Port Performance | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153892 | 2105 | 1 | Update of FDD PDSCH Single Antenna Port Performance for CA (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153893 | 2106 | 1 | TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (2DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153894 | 2107 | 1 | TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153895 | 2149 | 1 | New CA band combinations (CA_1A-41C, CA_26A-41C) - Updates of 7.3A Refsens | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153902 | 1993 | 1 | Introduction of eDL MIMO enhancement TC 9.3.7.1_G | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153903 | 1994 | 1 | Introduction of eDL MIMO enhancement TC 9.3.7.2_G | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153904 | 1995 | 1 | Introduction of eDL MIMO enhancement TC 9.4.1.4.1_G | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153905 | 1996 | 1 | Introduction of eDL MIMO enhancement TC 9.4.1.4.2_G | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153906 | 2016 | 1 | UE Cat 0 RF: Addition to Annex I | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153907 | 2097 | 1 | Addition of test case 7.4E - Maximum input level for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153908 | 2120 | 1 | Additions to test case 6.2.3E - Maximum Power Reduction (MPR) for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153909 | 2144 | 1 | Additions to test case 6.2.4E – Additional Maximum Power Reduction (A-MPR) for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153912 | 2027 | 1 | Addition of new TC of ON/OFF time mask for inter-band CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153913 | 2028 | 1 | Addition of new TC of Occupied bandwidth for inter-band CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153914 | 2030 | 1 | Addition of new TC of Spectrum emission mask for inter-band CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153915 | 2031 | 1 | Addition of new TC of Transmitter Spurious emissions for inter-band CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153916 | 2032 | 1 | Addition of new TC of Spurious emission band UE co-existence for inter-band CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153917 | 2046 | 1 | Introduction to test case 6.2.5A.2: Configured UE transmitted Output Power for CA (inter-band DL CA and UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153918 | 2047 | 1 | Introduction to test case 6.2.5A.3: Configured UE transmitted Output Power for CA (intra-band non-contiguous DL CA and UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153920 | 2007 | 1 | Update of 6.2.3_2 MPR for Multi-Cluster PUSCH | 12.6.0 | 12.7.0 |

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| 2015-09 | RAN#69 | R5-153921 | 2054 | 1 | Correction to lower tolerances for CA_NS_05 in A-MPR | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153922 | 2129 | 1 | Corrections to test case 6.6.1A.1 Occupied bandwidth for CA (intra-band contiguous DL CA and UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153923 | 2043 | 1 | CA RF: Clean Up of UL resource allocation for interband 2DL CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153924 | 2002 | 1 | Correction of minimum requirements and test procedures for 8.2.2.1.1_A.1 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153925 | 2003 | 1 | Corrections to 8.2.2.3.1_A.1 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153926 | 2059 | 1 | Correction to the title in 2DL CA performance test cases | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153927 | 2060 | 1 | Correction to FDD soft buffer test for CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153928 | 2134 | 1 | 36.521-1_CA power imbalance test updates | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153944 | 2022 | 2 | Updates of minimum requirements of reference sensitivity for 3DL CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153945 | 2023 | 2 | Updates of Reference sensitivity for 3DL CA | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153947 | 2146 | 1 | UE Category Corrections to test case 8.2.1.4.2_A.1 from 36.521-1 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-153949 | 1985 | 1 | Correction to RC.2 TDD Nr. HARQ Proc. | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154002 | 1986 | 1 | Introduction of TC 9.6.1.3.1 TDD FDD CA CQI Reporting – PUCCH 1-0 for FDD PCell (2DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154003 | 1987 | 1 | Introduction of TC 9.6.1.3.2 TDD FDD CA CQI Reporting – PUCCH 1-0 for FDD PCell (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154004 | 1988 | 1 | Introduction of TC 9.6.1.4.1 TDD FDD CA CQI Reporting – PUCCH 1-0 for TDD PCell (2DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154005 | 1989 | 1 | Introduction of TC 9.6.1.4.2 TDD FDD CA CQI Reporting – PUCCH 1-0 for TDD PCell (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154006 | 2098 | 1 | Addition of test case 7.5E - Adjacent Channel Selectivity (ACS) for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154007 | 2099 | 1 | Addition of test case 7.6.1E - In-band blocking for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154008 | 2100 | 1 | Addition of test case 7.6.2E - Out-of-band blocking for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154009 | 2101 | 1 | Addition of test case 7.6.3E - Narrow band blocking for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154010 | 2102 | 1 | Addition of test case 7.7E - Spurious response for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154011 | 2103 | 1 | Addition of test case 7.8.1E - Wide band Intermodulation for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154012 | 2104 | 1 | Addition of test case 7.9E - Spurious emissions for UE category 0 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154014 | 2136 | 1 | 36.521-1_Test requirements correction in test 6.3.5.2 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154015 | 2080 | 1 | Addition of 8.7.5.1.1 TDD FDD CA Sustained data rate performance for FDD PCell (2DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154016 | 2081 | 1 | Addition of 8.7.5.1.2 TDD FDD CA Sustained data rate performance for FDD PCell (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154017 | 2082 | 1 | Addition of 8.7.5.2.1 TDD FDD CA Sustained data rate performance for TDD PCell (2DL CA) | 12.6.0 | 12.7.0 |

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|---|---|---|---|---|---|---|---|
| 2015-09 | RAN#69 | R5-154018 | 2083 | 1 | Addition of 8.7.5.2.2 TDD FDD CA Sustained data rate performance for TDD PCell (3DL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154019 | 2049 | 1 | Update to TC 7.6.1A.5 In-band blocking for CA (3DL CA without UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154022 | 2050 | 1 | Update to TC 7.6.2A.5 Out-of-band blocking for CA (3DL CA without UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154023 | 2051 | 1 | Update to TC 7.6.3A.5 Narrow band blocking for CA (3DL CA without UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154024 | 2052 | 1 | Update to TC 7.7A.5 Spurious response for CA (3DL CA without UL CA) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154026 | 2084 | 2 | Addition of SCE-L1 clause numbering principle in Annex I | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154030 | 2009 | 1 | Revise Power Control Relative power tolerance for 2 UL CA test case 6.3.5A.2.1 | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | R5-154031 | 2020 | 1 | RF: Applicability of CSI requirements to UE Category 1 (for 36.521-1) | 12.6.0 | 12.7.0 |
| 2015-09 | RAN#69 | - | - | - | update of the "non-specific references" in section 2 according to the approved R5-153582 and an action point on ETSI MCC | 12.6.0 | 12.7.0 |
| 2015-12 | RAN#70 | R5-155112 | 2156 | - | Addition of simplified CA testing method (Annex C.3.5) into 36.521-1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155113 | 2157 | - | Uncertainty and Test Tolerance for FDD TM3 test case for LTE Type C performance requirements (8.2.1.3.1B) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155116 | 2160 | - | Uncertainty and Test Tolerance for TDD TM8 test case for LTE Type C performance requirements (8.3.2.2.2) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155117 | 2161 | - | Uncertainty and Test Tolerance for FDD TM9 test case for LTE Type C performance requirements (8.3.1.2.2) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155118 | 2162 | - | Uncertainty and Test Tolerance for FDD TM3 multi-cell test case with TM1 interference for LTE Type C performance requirements (8.2.1.3.1C) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155119 | 2163 | - | Uncertainty and Test Tolerance for TDD TM3 multi-cell test case with TM1 interference for LTE Type C performance requirements (8.2.2.3.1C) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155205 | 2169 | - | Addition of test time for testing throughput ratios for eDL MIMO Enhancement | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155300 | 2206 | - | Update of editor's note for TC 6.6.2.2A.1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155309 | 2208 | - | ProSe: Update of general chapters in 36.521-1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155312 | 2211 | - | ProSe: Update of annexes in 36.521-1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155313 | 2212 | - | Update of UE categories for R8 in 36.521-1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155316 | 2214 | - | Update of UE categories for R11 in 36.521-1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155360 | 2215 | - | Test description for test case 6.3.3A.3: UE Transmit OFF power for CA (intra-band non-contiguous DL CA and UL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155361 | 2216 | - | Correction to Test cases 9.6.1.1_A.1 and 9.6.1.2_A.1: FDD/TDD CQI Reporting under AWGN conditions – PUCCH 1-0 (2DL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155394 | 2226 | - | Updates of the test configuration about occupied bandwidth for CA (inter-band DL CA and UL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155401 | 2228 | - | Updates of message contents for ON/OFF time mask for 2UL inter-band CA | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155405 | 2232 | - | Updates of Refsens for 2UL inter-band CA | 12.7.0 | 12.8.0 |

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|---|---|---|---|---|---|---|---|
| 2015-12 | RAN#70 | R5-155406 | 2233 | - | Addition of CA_3A-42A to 7.3A.3 and applicability updates for all inter-band 2DL CA receiver test cases | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155409 | 2235 | - | Updatest of CA demodulation applicabilities in general section | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155420 | 2241 | - | Changes to general clauses for Dual Connectivity | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155425 | 2246 | - | Introduction of the reference and abbreviations for Dual Connectivity | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155426 | 2247 | - | Removal of the duplicate clause 8.2.1.4.2_A.2.5 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155444 | 2253 | - | Clean up of Tx test cases | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155446 | 2255 | - | Correction to Rx UL CA test cases | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155447 | 2256 | - | Correction to reference channel for CQI requirements | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155448 | 2257 | - | Correction to UL RMC for single carrier SDR | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155450 | 2259 | - | Correction to CoMP demodulation requirements | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155452 | 2261 | - | Correction to Enhanced Performance Type A CQI reporting test | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155453 | 2262 | - | Correction to CQI and RI Reporting test cases for feICIC | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155460 | 2265 | - | CA RF: Update 3DL Refsense test requirements | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155462 | 2267 | - | Corrections to Refsense minimum requirements | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155464 | 2269 | - | CA RF: Update of test points for Rx inter-band test cases | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155471 | 2274 | - | Corrections to message contents for CSI 3DL CA TCs 9.6.1.3.2+9.6.1.4.2 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155474 | 2275 | - | Corrections to CA demodulation tests | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155476 | 2276 | - | Corrections to message exceptions for CSI-RS setting | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155478 | 2278 | - | Updates to Annexes A.2 and A.3 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155530 | 2282 | - | Addition of measurement uncertainty and test tolerances for TC 9.7.1.2 TDD CQI reporting definition under AWGN conditions for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155543 | 2283 | - | Correction to Test Parameters for the test cases 10.1 and 10.2 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155554 | 2289 | - | Correction to 6.6.3.3A.1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155668 | 2325 | - | Addition of CA configuration CA_2A-4A-5A in Reference sensitivity level for 3DL CA | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155670 | 2326 | - | Correction to DL RMCs for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155709 | 2331 | - | Editorial corrections to TC 8.2.2.1.1_A.1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155745 | 2346 | - | Correction to CQI test cases for LTE CA | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155801 | 2288 | 1 | Correction to 6.2.4A.1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155802 | 2254 | 1 | Correction to 2DL CA Rx test cases | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155803 | 2266 | 1 | CA RF: Correction to message contents for 2DL Max Input Power TCs | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155804 | 2213 | 1 | Update of UE categories for R10 in 36.521-1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155807 | 2176 | 1 | Add new LC MTC test case 9.7.2.1 FDD CQI Reporting under fading conditions for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155808 | 2177 | 1 | Add new LC MTC test case 9.7.2.2 TDD CQI Reporting under fading conditions for UE category 0 | 12.7.0 | 12.8.0 |

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|---|---|---|---|---|---|---|---|
| 2015-12 | RAN#70 | R5-155809 | 2318 | 1 | Test case 6.2.4E – Additional Maximum Power Reduction (A-MPR) for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155810 | 2321 | 1 | Additions to test case 6.3.3E – UE Transmit OFF Power for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155811 | 2322 | 1 | Additions to test case 6.3.4E.1 – General ON/OFF time mask for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155812 | 2329 | 1 | Additions to test case 6.3.5E.1 – Power Control Absolute power tolerance for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155813 | 2330 | 1 | Additions to test case 6.3.5E.2 – Power Control Relative power tolerance for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155814 | 2333 | 1 | Additions to test case 6.5.1E – Frequency Error for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155815 | 2334 | 1 | Additions to test case 6.5.2.1E.1 – Error Vector Magnitude for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155816 | 2336 | 1 | Additions to test case 6.5.2.2E – Carrier Leakage for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155817 | 2338 | 1 | Additions to test case 6.5.2.3E – In-band emissions for non allocated RB for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155818 | 2339 | 1 | Additions to test case 6.5.2.4E – EVM equalizer spectrum flatness for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155819 | 2342 | 1 | Additions to test case 6.2.5E – Configured Transmitted Power for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155840 | 2158 | 1 | Uncertainty and Test Tolerance for FDD TM4 test case for LTE Type C performance requirements (8.2.1.4.2A) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155841 | 2159 | 1 | Uncertainty and Test Tolerance for TDD TM4 test case for LTE Type C performance requirements (8.2.2.4.2A) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155842 | 2165 | 1 | Update of SUMIMO for LTE Type C performance TC 8.2.2.3.1B | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155844 | 2151 | 1 | New CA band combination CA_1A-3A-8A - Updates of 7.3A.5 RefSens | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155845 | 2152 | 1 | New CA band combination CA_1A-3A-8A - Updates of 7.3.3 Delta RIB | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155846 | 2183 | 1 | LTE Type B performance requirements - Addition of fixed reference channels into Annex A | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155847 | 2184 | 1 | LTE Type B performance requirements - Introduction of new interference models into Annex B.6 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155848 | 2182 | 1 | LTE Type B performance requirements - Changes to clause 3 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155850 | 2236 | 1 | Addition of new test cases for TDD FDD CA PDSCH Open Loop for FDD PCell(2DL and 3DL) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155851 | 2224 | 1 | Update of 2DL TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (8.2.3.3.2.1) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155852 | 2225 | 1 | Update of 3DL TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (8.2.3.3.2.2) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155853 | 2248 | 1 | Update for Annex for TDD/FDD Perf test cases | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155855 | 2250 | 1 | Clean up of 3DL CA Rx test cases | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155857 | 2280 | 1 | Completion of Testcase 7.3A.5 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155859 | 2272 | 1 | CA RF: Correction to message contents for 3DL Max Input Power | 12.7.0 | 12.8.0 |

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|---|---|---|---|---|---|---|---|
| 2015-12 | RAN#70 | R5-155860 | 2327 | 1 | Correction of BW to be tested and CA Capability to be tested for TM3 Test Cases | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155861 | 2328 | 1 | 36.521-1 – CA_2A-12B updates | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155892 | 2168 | 1 | Correction of test cases title for eDL MIMO Enhancement test cases | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155893 | 2263 | 1 | Corrections to eDL MIMO enhancement TC 9.3.7.1_G+9.3.7.2_G | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-155894 | 2264 | 1 | Corrections to eDL MIMO enhancement TC 9.4.1.4.1_G+9.4.1.4.2_G | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156006 | 2229 | 1 | Addition of initial conditions for frequency error for 2UL inter-band CA | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156007 | 2230 | 1 | Updates of SEM for 2UL inter-band CA | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156008 | 2231 | 1 | Updates of test requirements for general spurious for 2UL inter-band CA | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156013 | 2210 | 1 | ProSe: Additions to Annexes for RF testing | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156014 | 2209 | 1 | ProSe: Reference sensitivity test | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156016 | 2242 | 1 | Introduction of FDD PDSCH Closed Loop Multi-Layer Spatial Multiplexing 4x2 for Dual Connectivity | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156017 | 2243 | 1 | Introduction of TDD PDSCH Closed Loop Multi-Layer Spatial Multiplexing 4x2 for Dual Connectivity | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156018 | 2244 | 1 | Introduction of FDD sustained data rate performance for Dual Connectivity | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156019 | 2245 | 1 | Introduction of TDD sustained data rate performance for Dual Connectivity | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156020 | 2207 | 1 | Update of RB configurations for TC 7.3A.5 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156021 | 2222 | 1 | Addition of soft-buffer test cases for FDD-TDD 2DL CA (8.2.3.2.1A, 8.2.3.2.2A) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156022 | 2234 | 1 | Delta RIB,c updates for 3DL CA supporting UE | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156023 | 2237 | 1 | Addition of new test cases for TDD FDD CA PDSCH Closed Loop 4x2 for FDD PCell (2DL and 3DL) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156024 | 2239 | 1 | Correction to test point selection table for TDD-FDD CA cases | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156025 | 2251 | 1 | Correction to 7.3A.5 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156026 | 2252 | 1 | Update CA perf test cases in clause 8 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156027 | 2271 | 1 | CA RF: Update to 3DL Refsense test configurations | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156028 | 2281 | 1 | Improvements to 3DL OOB Testcase (7.6.2A.5) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156029 | 2295 | 1 | Updates to 8.7.5 about TDD-FDD CA SDR performance test | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156030 | 2337 | 1 | 36.521-1: CA_1A-3A-20A & CA_1A-7A-20A updates | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156031 | 2346 | 1 | Addition of 2x2 FDD-TDD CA test cases with TDD PCELL | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156035 | 2170 | 1 | New TC: 8.9.1.1.2 FDD Closed-loop spatial multiplexing performance (Cell-Specific Reference Symbols) for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156036 | 2171 | 1 | New TC: 8.9.1.2.2 TDD Closed-loop spatial multiplexing performance (Cell-Specific Reference Symbols) for UE category 0 | 12.7.0 | 12.8.0 |

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|---|---|---|---|---|---|---|---|
| 2015-12 | RAN#70 | R5-156037 | 2173 | 1 | Add new LC MTC test case 8.9.1.1.3 FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156038 | 2174 | 1 | Add new LC MTC test case 8.9.1.2.1 TDD PDSCH Transmit Diversity for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156039 | 2175 | 1 | Add new LC MTC test case 8.9.1.2.3 TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156040 | 2189 | 1 | Addition of Minimum test time for Demodulation performance for UE category 0 in Annex G | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156041 | 2191 | 1 | Introduction of new test case 8.9.2.2.1 MTC | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156042 | 2240 | 1 | Update of TC 9.7.1.2 TDD CQI reporting definition under AWGN conditions for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156043 | 2315 | 1 | Update test requirement for MTC test cases: 7.6.1E, 7.6.2E and 7.6.3E | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156044 | 2316 | 1 | Addition of Maximum Test System Uncertainty and Derivation of Test Requirements in Annex F for MTC test cases | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156045 | 2317 | 1 | Additions to test case 6.2.3E - Maximum Power Reduction (MPR) for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156046 | 2320 | 1 | Additions to test case 6.3.2E – Minimum Output Power for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156047 | 2332 | 1 | Additions to test case 6.3.5E.3 – Aggregate power control tolerance for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156048 | 2340 | 1 | Additions to test case 6.6.1E – Occupied bandwidth for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156049 | 2341 | 1 | Additions to test case 6.6.2.1E – Spectrum Emission Mask for UE category 0 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156057 | 2193 | 1 | New CA 2UL Tx test case 6.5.1A.3 Frequency Error for CA (intra-band non-contiguous DL CA and UL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156058 | 2291 | 1 | New TC of A-MPR for 2UL inter-band CA (6.2.4A.2) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156059 | 2293 | 1 | New TC of Additional spurious emissions for intra-band non-contiguous CA 6.6.3.3A.3 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156062 | 2166 | 1 | Addition of Minimum test time for LTE Type C performance in Annex G | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156063 | 2297 | 1 | Addition of new TC 7.4_H Maximum input level for SCE-L1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156064 | 2298 | 1 | Addition of new TC 7.4A.1_H Maximum input level for SCE-L1 for CA (intra-band contiguous DL CA and UL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156065 | 2299 | 1 | Addition of new TC 7.4A.2_H Maximum input level for SCE-L1for CA (intra-band contiguous DL CA without UL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156066 | 2300 | 1 | Addition of new TC 7.4A.5_H Maximum input level for SCE-L1 for CA (3DL CA without UL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156089 | 2185 | 1 | LTE Type B performance requirements - Introduction of new test cases 8.2.1.2.5 and 8.2.1.2.6 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156090 | 2186 | 1 | LTE Type B performance requirements - Introduction of new test cases 8.2.2.2.6 and 8.2.2.2.7 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156091 | 2187 | 1 | LTE Type B performance requirements - Introduction of new test cases 9.3.8.1.1 and 9.3.8.1.2 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156092 | 2188 | 1 | LTE Type B performance requirements - Adding six NAICS test cases into Annex F and G | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156095 | 2155 | 1 | Update Minimum requirements for test case 6.2.3A.1 | 12.7.0 | 12.8.0 |

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| 2015-12 | RAN#70 | R5-156096 | 2227 | 1 | Updates of test configuration for OBW for intra-band contiguous UL CA | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156097 | 2268 | 1 | CA RF: Minor corrections to section 6.6.3.3A | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156098 | 2292 | 1 | Revise Configured UE transmitted Output Power for 2UL intra-band contiguous CA test case 6.2.5A.1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156100 | 2167 | 1 | Deleting redundant and outdated Demod scenario in Minimum test time | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156101 | 2258 | 1 | Clarification of DL configuration for wideband | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156102 | 2260 | 1 | Correction to Enhanced Performance Type A performance test cases | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156103 | 2277 | 1 | Correction and addition of minimum test time for several tests | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156104 | 2284 | 1 | Correction to test cases of the section of 9.5.1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156110 | 2190 | 1 | Introduction of new test case 8.9.2.1.1 MTC | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156113 | 2301 | 1 | Addition of new TC 8.2.1.4.1_H FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 2x2 for SCE-L1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156114 | 2302 | 1 | Addition of new TC 8.2.2.4.1_H TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 2x2 for SCE-L1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156115 | 2303 | 1 | Addition of new TC 8.3.1.1.1_H FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 without a simultaneous transmission for SCE-L1 for eDL-MIMO | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156116 | 2304 | 1 | Addition of new TC 8.3.2.1.2_H TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 without a simultaneous transmission for eDL-MIMO for SCE-L1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156117 | 2305 | 1 | Addition of new TC 8.7.1.1_H FDD sustained data rate performance for SCE-L1 | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156118 | 2306 | 1 | Addition of new TC 8.7.1.1_H.2 FDD Sustained data rate performance for CA for SCE-L1 (2DL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156119 | 2307 | 1 | Addition of new TC 8.7.1.1_H.3 FDD Sustained data rate performance for CA for SCE-L1 (3DL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156120 | 2308 | 1 | Addition of new TC 8.7.2.1_H.1 TDD sustained data rate performance for SCE-L1 (Single Carrier) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156121 | 2309 | 1 | Addition of new TC 8.7.2.1_H.2 TDD sustained data rate performance for CA for SCE-L1 (2DL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156122 | 2310 | 1 | Addition of new TC 8.7.2.1_H.3 TDD Sustained data rate performance for CA for SCE-L1 (3DL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156124 | 2312 | 1 | Addition of new TC 8.7.5.1_H.2 TDD FDD CA Sustained data rate performance for FDD PCell for SCE-L1 (3DL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156125 | 2313 | 1 | Addition of new TC 8.7.5.2_H.1 TDD FDD CA Sustained data rate performance for TDD PCell for SCE-L1 (2DL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156126 | 2314 | 1 | Addition of new TC 8.7.5.2_H.2 TDD FDD CA Sustained data rate performance for TDD PCell for SCE-L1 (3DL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156130 | 2192 | 2 | New CA 2UL Tx test case 6.3.5A.3.3 of Aggregate Power Control Tolerance for CA (intra-band non-contiguous DL CA and UL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156131 | 2290 | 2 | New TC of Aggregate Power Control Tolerance for 2UL inter-band CA(6.3.5A.3.2) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156133 | 2294 | 1 | Correction to the applicable test release of 1.4MHz Bandwidth MBMS test | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156134 | 2164 | 1 | Update to in-band Emissions Limits for less than 1GHz Carrier Frequencies | 12.7.0 | 12.8.0 |

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| 2015-12 | RAN#70 | R5-156183 | 2311 | 1 | Addition of new TC 8.7.5.1_H.1 TDD FDD CA Sustained data rate performance for FDD PCell for SCE-L1 (2DL CA) | 12.7.0 | 12.8.0 |
| 2015-12 | RAN#70 | R5-156071 | 2153 | 1 | New TC: Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156073 | 2194 | 1 | New TC: 6.2.3_3 MPR for UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156074 | 2195 | 1 | New TC: 6.2.3_4 MPR for Multi-Cluster PUSCH with UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156075 | 2196 | 1 | New TC: 6.2.4_2 AMPR for UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156076 | 2197 | 1 | New TC: 6.5.2.1_1 EVM for UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156077 | 2198 | 1 | New TC: 6.5.2A.1.1_1 EVM for CA with UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156078 | 2199 | 1 | New TC: 6.6.2.2_1 Additional Spectrum Emission Mask for UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156079 | 2200 | 1 | New TC: 6.6.2.3_3 ACLR for UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156080 | 2201 | 1 | New TC: 6.6.2.3_4 ACLR for Multi-Cluster PUSCH with UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156081 | 2202 | 1 | New TC: 6.6.3.3_1 Additional spurious emissions for UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156082 | 2203 | 1 | Addition of RMCs for UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156083 | 2204 | 1 | Introduction of uncertainties and TTs in Annex F for UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156084 | 2285 | 1 | New TC: A-MPR for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156085 | 2286 | 1 | New TC: A-SEM for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156086 | 2287 | 1 | New TC: Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | 12.8.0 | 13.0.0 |
| 2015-12 | RAN#70 | R5-156188 | 2154 | 2 | New TC: Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA) for UL 64QAM | 12.8.0 | 13.0.0 |
| 2016-01 | RAN#70 | R5-156099 | 2324 | 1 | introduction of R5-156099 "Introduction of new A-MPR test with PUSCH frequency hopping" with the test case renumbered to 6.2.4_3 after working group agreement to avoid duplication | 13.0.0 | 13.0.1 |
| 2016-03 | RAN#71 | R5-160025 | 2347 | - | Update to NAICS test cases to release NAICS configuration | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160026 | 2348 | - | Test Tolerances for FDD PDSCH Transmit Diversity 2x2 with TM2 Interference Model– Enhanced Performance Requirement Type B (8.2.1.2.5) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160027 | 2349 | - | Test Tolerances for FDD PDSCH Transmit Diversity 2x2 with TM9 Interference Model– Enhanced Performance Requirement Type B (8.2.1.2.6) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160028 | 2350 | - | Test Tolerances for TDD PDSCH Transmit Diversity 2x2 with TM2 Interference Model– Enhanced Performance Requirement Type B (8.2.2.2.6) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160029 | 2351 | - | Test Tolerances for TDD PDSCH Transmit Diversity 2x2 with TM9 Interference Model– Enhanced Performance Requirement Type B (8.2.2.2.7) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160030 | 2352 | - | Test Tolerances FDD and TDD CQI reporting under fading conditions (PUCCH) TM4 - Enhanced Receiver Type B (9.3.8.1.1 and 9.3.8.1.2) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160067 | 2362 | - | Correction to UE output power of Tx test cases 6.5.2.3 | 13.0.1 | 13.1.0 |

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| 2016-03 | RAN#71 | R5-160068 | 2363 | - | Correction to some incorrect sentences of Tx test case 6.5.2A.3.1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160106 | 2368 | - | Update of Test Tolerance for eDL MIMO enhancement test cases | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160107 | 2369 | - | Removal of technical content in 36.521-1 v12.8.0 and substitution with pointer to the next Release | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160124 | 2371 | - | Correction to test case 8.7.1.1_A.1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160125 | 2372 | - | Correction to test case 9.3.2.1.1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160139 | 2375 | - | Test Tolerances for 9.6.1.3.1+9.6.1.3.2+9.6.1.4.1+9.6.1.4.2 2DL-3DL CA | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160141 | 2376 | - | TTs to Annex F for 2DL and 3DL CA | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160155 | 2382 | - | Test Tolerances for 9.3.7.1+9.3.7.2 eDL MIMO enhancement | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160159 | 2383 | - | Test Tolerances for 9.4.1.4.1+9.4.1.4.2+9.4.2.3.3+9.4.2.3.4 eDL MIMO enhancement | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160162 | 2385 | - | Corrections to eDL MIMO enhancements Annex B to include High XP 4x2 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160164 | 2386 | - | Corrections to EVM test case 6.5.2A.1.1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160165 | 2387 | - | Update of uncertainty and TT references for TC 6.2.4E and 6.2.5E | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160169 | 2390 | - | Addition of 4 Rx part to Diversity characteristics | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160203 | 2391 | - | Revise Power Control Relative power tolerance for CA (intra-band contiguous DL CA and UL CA) test case 6.3.5A.2.1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160281 | 2419 | - | Addition of delta TIB for the new CA configuration CA_3A-41A in sub-clause 6.2.5 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160334 | 2423 | - | Updates of Spurious emission band UE co-existence for CA (inter-band DL CA and UL CA) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160337 | 2425 | - | Annex F update for frequency error for inter-band 2UL CA | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160338 | 2426 | - | Correction and updates to test requirements of Reference sensitivity for inter-band 2DL CA | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160344 | 2428 | - | Updates of some Rel-13 defined CA combinations to minimum requirements of Reference sensitivity for CA | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160345 | 2429 | - | Updates of delta TIB,c values and table references for delta TIB,c | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160377 | 2437 | - | R10 Remove editor's note for CA_39C spurious emission test | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160441 | 2439 | - | Update to MTC test case 8.9.2.1.1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160442 | 2440 | - | Update to MTC RF test applicability for Editor’s Note | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160459 | 2443 | - | Rel-13 Test point reduction for UL 64QAM multi-cluster MPR and ACLR tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160461 | 2445 | - | Rel-13 Test point reduction for UL 64QAM AMPR and ASEM tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160462 | 2446 | - | Rel-13 Test point reduction for UL 64QAM CA MPR and ACLR tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160464 | 2448 | - | Rel-13 Test point reduction for UL 64QAM CA AMPR, ASEM and ASE tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160482 | 2451 | - | Correction to the minimum test time reference in TDD/FDD CA performance | 13.0.1 | 13.1.0 |

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| 2016-03 | RAN#71 | R5-160483 | 2452 | - | Correction to UL CA Tx tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160484 | 2453 | - | Clean up on performance test cases | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160485 | 2454 | - | Correction to 9.5.5.1_F.1 and 9.5.5.1_F.2 for RI Reporting test with CoMP | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160486 | 2455 | - | Correction to 8.2.2.2.4 and 8.2.2.4.3 for Enhanced Performance Type A | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160487 | 2456 | - | Correction to CQI reporting tests for Enhanced Performance Type A | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160488 | 2457 | - | Correction to CQI and RI reporting tests for feICIC | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160490 | 2459 | - | Correction to PCFICH/PDCCH and PHICH Tx Diversity for feICIC | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160491 | 2460 | - | Correction to G.5.4 for minimum test time | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160504 | 2462 | - | New CA band combination CA_41A_42C - Updates of 6.2.5.3 Delta TIB | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160506 | 2463 | - | New CA band combination CA_41A_42C - Updates of 7.3.3 Delta RIB | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160527 | 2468 | - | Addition of operating band and channel assignments for the new Intel assigned CA configuration | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160569 | 2477 | - | Correction to PMI Reporting for eDL-MIMO | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160578 | 2480 | - | Minor corrections to applicabilities of TCs 8.2.2.2.3_E.1 & 8.2.2.3.3_E.1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160580 | 2482 | - | Correction to PDCP SDU size in TC 8.7.2.1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160582 | 2484 | - | CA RF: Corrections to Notes in TC 7.3A.3 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160583 | 2485 | - | CA RF: Corrections to Notes in TC 7.3A.5 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160584 | 2486 | - | CA RF: Minor correction to Note in TC 7.3A.6 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160586 | 2488 | - | Corrections to DL 256QAM SDR Test Cases | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160587 | 2489 | - | Corrections to TDD FDD CA SDR Test Cases | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160588 | 2490 | - | Addition of Maximum Wgap definition | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160590 | 2492 | - | Corrections to TDD FDD CA Closed Loop Spatial Multiplexing TCs | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160592 | 2494 | - | Corrections to TDD FDD CA Test Applicability tables in section 8.1.2.3B | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160622 | 2497 | - | Addition of delta RIB for CA_3A-41A in TC 7.3.3 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160681 | 2516 | - | Introduction of test case 6.6.2.3A.3 - Adjacent Channel Leakage power Ratio for CA (intra-band non-contiguous DL CA and UL CA) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160686 | 2519 | - | Add reference to TR 36.905 in 36.521-1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160801 | 2479 | 1 | Annex F: Corrections for intra-band contiguous UL CA Test Cases | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160802 | 2483 | 1 | Minor correction to TC 6.6.3.2 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160803 | 2487 | 1 | Removal of editor's notes in TC 6.5.2A.2.1 & 6.5.2A.3.1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160804 | 2466 | 1 | Correction to UE category information in test case 8.2.1.1.1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160805 | 2467 | 1 | Correction to test case applicability for test case 9.2.1.3_C.1 and 9.2.1.4_C.1 | 13.0.1 | 13.1.0 |

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| 2016-03 | RAN#71 | R5-160811 | 2430 | 1 | Updates of delta RIB,c values and table references for delta RIB,c | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160812 | 2431 | 1 | Addition of CA_19A-28A and CA_21A-42A to refsens for inter-band 2DL CA | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160813 | 2432 | 1 | Updates of test points and test requirements of some Rel-13 defined CA combinations for Reference sensitivity for 3DL CA | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160814 | 2469 | 1 | Addition of CA configurations and bandwidth combination sets for the new CA configuration | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160815 | 2496 | 1 | Add delta TIB for the new CA_20A-67A configuration in sub-clause 6.2.5. | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160819 | 2400 | 1 | Addition of new TC 7.4A.3_H Maximum input level for CA (inter-band DL CA without UL CA) for 256QAM in DL | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160820 | 2401 | 1 | Addition of new TC 7.4A.4_H Maximum input level for CA (intra band non-contiguous DL CA without UL CA) for 256QAM in DL | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160825 | 2436 | 1 | Rel-10 Test point reduction for UL 64QAM multi-cluster MPR and ACLR tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160828 | 2422 | 1 | Updates to TM3 TDD-FDD Soft buffer 2DLCA test cases | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160829 | 2493 | 1 | Corrections to TDD FDD CA TCs 9.6.1.3.1 and 9.6.1.4.1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160831 | 2520 | 1 | Test points for CA_4A-4A-13A in Reference sensitivity test case | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160835 | 2379 | 1 | Addition of UL CA capability for CA_4A-4A in Table 5.4.2A.1-3 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160836 | 2380 | 1 | Correction for table references in TC 6.6.3.2A.1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160837 | 2381 | 1 | Renaming of Table 6.6.3.2A-3a | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160838 | 2409 | 1 | Update to Annex F for TC 6.3.5A.1.2, 6.3.5A.1.3 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160839 | 2411 | 1 | Update to TC 6.3.5A.1.2 Power Control Absolute Power Tolerance for CA (inter-band DL CA and UL CA). | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160840 | 2412 | 1 | Update to TC 6.3.5A.1.3 Power Control Absolute power tolerance for CA (intra-band non-contiguous DL CA and UL CA). | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160841 | 2416 | 1 | Correction to test case 6.2.5A.3 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160845 | 2424 | 1 | Addition of new test case for additional spurious for inter-band 2UL CA and updates for A-MPR for inter-band 2UL CA | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160846 | 2518 | 1 | Introduction of test case 7.3A.7 - Reference sensitivity level for CA (intra-band non-contiguous DL CA and UL CA) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160849 | 2470 | 1 | New TC: FDD CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) TM9 - Enhanced Receiver Type B | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160850 | 2471 | 1 | New TC: TDD CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) TM9 - Enhanced Receiver Type B | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160852 | 2393 | 1 | Update to TC 8.9.1.1.3 FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160853 | 2394 | 1 | Update to TC 8.9.1.2.1 TDD PDSCH Transmit Diversity for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160854 | 2395 | 1 | Update to TC 8.9.1.2.3 TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160855 | 2408 | 1 | Update to TC 9.7.2.2 TDD CQI reporting definition under fading conditions for UE category 0 | 13.0.1 | 13.1.0 |

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| 2016-03 | RAN#71 | R5-160856 | 2420 | 1 | Update to TC 9.7.2.1 FDD and Half duplex FDD CQI reporting definition under fading conditions for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160858 | 2498 | 1 | Additions to test case 6.6.2.2E – Additional Spectrum Emission Mask for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160859 | 2500 | 1 | Additions to test case 6.6.3E.3 – Additional spurious emissions for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160860 | 2501 | 1 | Additions to test case 6.6.2.3E – Adjacent Channel Leakage power Ratio for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160861 | 2504 | 1 | Additions to test case 6.3.4E.2 – PRACH and SRS ON/OFF time mask for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160862 | 2506 | 1 | Additions to test case 6.7E – Transmit intermodulation for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160863 | 2508 | 1 | Additions to test case 6.5.2.1E.2 – PUSCH-EVM with exclusion period for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160864 | 2510 | 1 | Additions of overlying section 6.6.3E-Spurious emission for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160865 | 2511 | 1 | Additions of overlying sections 6.3.5C, 6.3.5D and 6.3.5E Power Control for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160866 | 2513 | 1 | Additions to test case 6.2.3E - Maximum Power Reduction (MPR) for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160867 | 2515 | 1 | Additions of overlying section 6.3.4E-ON/OFF time mask for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160868 | 2507 | 1 | Additions to test case 6.6.3E.2 –Spurious emission band UE co-existence for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160869 | 2505 | 1 | Additions to test case 6.6.3E.1 – Transmitter Spurious emissions for UE category 0 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160870 | 2370 | 1 | Updates and test tolerance to single antenna FDD-TDD CA test cases | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160877 | 2384 | 1 | TTs to Annex F for eDL MIMO enhancement | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-160878 | 2392 | 1 | Update to Annex F for TC 8.9.1.1.3, 8.9.1.2.1, 8.9.1.2.3, 9.7.2.1, 9.7.2.2 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161001 | 2495 | 1 | Addition of B66 in Frequency bands and channel arrangement. | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161004 | 2427 | 1 | Updates of some Rel-13 defined CA combinations to chapter 5 of TS 36.521-1 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161005 | 2449 | 1 | New ProSe test case: Demodulation of PSDCH for ProSe direct discovery | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161006 | 2450 | 1 | New ProSe test case: Maximum input level test | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161008 | 2398 | 1 | Updates to TC 8.7.1.1_A.2 FDD Sustained data rate performance for CA (3DL CA) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161009 | 2421 | 1 | Updates to TM3 TDD-FDD with TDD Pcell 2DLCA and 3DLCA test cases | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161010 | 2491 | 1 | Corrections to TDD FDD CA Open Loop Spatial Multiplexing TCs | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161012 | 2502 | 1 | 36.521-1 Sensitivity test points revision for 3DL 1A-3A-7A | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161014 | 2503 | 1 | 36.521-1 Sensitivity test points revision for 3DL 1A-3A-20A | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161017 | 2417 | 1 | Update to TC 6.2.4A.2 A-MPR for 2UL inter-band CA | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161019 | 2356 | 1 | New CA 2UL Tx test case 6.5.2A.1.3 Error Vector Magnitude (EVM) for CA (intra-band non-contiguous DL CA and UL CA) | 13.0.1 | 13.1.0 |

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| 2016-03 | RAN#71 | R5-161022 | 2359 | 1 | New CA 2UL Tx test case 6.5.2A.3.2 In-band emissions for non allocated RB for CA (inter-band DL CA and UL CA) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161023 | 2360 | 1 | New CA 2UL Tx test case 6.5.2A.3.3 In-band emissions for non allocated RB for CA (intra-band non-contiguous DL CA and UL CA) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161024 | 2361 | 1 | New CA 2UL Tx test case 6.6.3.1A.3 Transmitter Spurious emissions for CA (intra-band non-contiguous DL CA and UL CA) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161025 | 2377 | 1 | Addition of new LTE_CA_Rel12_2UL test case 6.6.3.2A.3 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161026 | 2378 | 1 | Completion of new LTE_CA_Rel12_2UL Test Case 6.7A.2 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161028 | 2517 | 1 | Introduction of test case 6.6.2.2A.2 - Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161029 | 2407 | 1 | Updates to Annex A for 256QAM test | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161030 | 2403 | 1 | Addition of new TC 9.2.1.7 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for 256QAM in DL | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161031 | 2404 | 1 | Addition of new TC 9.2.1.8 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for 256QAM in DL | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161032 | 2405 | 1 | Addition of new TC 9.3.1.2.3 FDD CQI Reporting under fading conditions – PUSCH 3-1 for 256QAM in DL | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161033 | 2406 | 1 | Addition of new TC 9.3.1.2.4 TDD CQI Reporting under fading conditions – PUSCH 3-1 for 256QAM in DL | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161034 | 2399 | 1 | Updates to 7.4A.1_H and 7.4A.2_H Maximum input level for intra-band contiguous CA for 256QAM in DL | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161035 | 2402 | 1 | Updates to TC 7.4A.5_H Maximum input level for CA (3DL CA without UL CA) for 256QAM in DL | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161039 | 2353 | 1 | LTE Type B performance requirements - Introduction of new test cases 8.2.1.4.4 and 8.2.2.4.5 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161040 | 2354 | 1 | LTE Type B performance requirements - Adding test cases 8.2.1.4.4 and 8.2.2.4.5 into Annex F and G | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161041 | 2433 | 1 | Test configuration correction for AMPR tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161042 | 2434 | 1 | Test configuration correction for ASE tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161043 | 2435 | 1 | Test configuration correction for ASEM tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161044 | 2438 | 1 | Test configuration correction for UL 64QAM AMPR tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161045 | 2441 | 1 | Test configuration correction for UL 64QAM ASE tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161046 | 2442 | 1 | Test configuration correction for UL 64QAM ASEM tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161047 | 2444 | 1 | Rel-8 Test point reduction for UL 64QAM AMPR, ASEM and ASE tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161056 | 2410 | 1 | Adding new clause 6.3.5A.1.0 and 6.3.5A.2.0 to define the minimum conformance requirements. | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161059 | 2465 | 1 | New CA band combination CA_41A-42C - Updates of 7.3A Refsens | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161061 | 2447 | 1 | Rel-10 Test point reduction for UL 64QAM CA AMPR, ASEM and ASE tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161062 | 2472 | 1 | Correction to the UL CA Frequency Error Testcase | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161064 | 2522 | 1 | Correction to A-MPR test with frequency hopping | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161065 | 2415 | 1 | Correction of Table number of DeltaRib reference in CA receiver RF tests | 13.0.1 | 13.1.0 |

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| 2016-03 | RAN#71 | R5-161073 | 2367 | 1 | Update of test applicability for eDL MIMO enhancement TCs | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161085 | 2514 | 1 | 36.521-1 Editorial corrections | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161086 | 2524 | 1 | Addition frequency bands and channel arrangement for B67 and CA_20-67 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161103 | 2355 | 2 | New CA 2UL Tx test case 6.5.2A.1.2 Error Vector Magnitude (EVM) for CA (inter-band DL CA and UL CA) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161104 | 2357 | 2 | New CA 2UL Tx test case 6.5.2A.2.2 Carrier leakage for CA (inter-band DL CA and UL CA) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161105 | 2358 | 2 | New CA 2UL Tx test case 6.5.2A.2.3 Carrier leakage for CA (intra-band non-contiguous DL CA and UL CA) | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161107 | 2389 | 2 | Reference sensitivity level with 4 Rx antenna ports | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161109 | 2509 | 2 | 36.521-1 Transmitter tests for Band 66 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161110 | 2512 | 1 | 36.521-1 Receiver tests for Band 66 | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161111 | 2373 | 1 | Correction to power level for dual layer TM9 demodulation tests | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161112 | 2458 | 2 | Correction to TDD CQI Reporting for feICIC | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161113 | 2461 | 2 | Correction to UL 64 QAM RMC | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161114 | 2475 | 2 | Correction to CQI reports in CoMP fading test | 13.0.1 | 13.1.0 |
| 2016-03 | RAN#71 | R5-161115 | 2476 | 2 | Correction to test system uncertainties for Rx 7.6.3 | 13.0.1 | 13.1.0 |
| 2016-06 | RAN#72 | R5-162088 | 2527 | - | Test Tolerances for FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 with TM4 Interference Model– Enhanced Performance | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162090 | 2528 | - | Test Tolerances for TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x2 with TM4 Interference Model– Enhanced Performance | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162169 | 2533 | - | Corrections to Annex F.1.2 and F.3.2 for Pcmax test case | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162189 | 2536 | - | Additions to test case 6.3.5E.3 – Aggregate power control tolerance for UE category 0 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162191 | 2537 | - | Additions to test case 6.3.5E.2 – Power Control Relative power tolerance for UE category 0 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162192 | 2538 | - | Editorial correction in Reference sensitivity QPSK PREFSENS four antenna ports Table number | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162195 | 2539 | - | Addition In-band blocking with 4 Rx antenna ports test case | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162210 | 2542 | - | Addition of UL CA capability for CA_4A-5A in Table 5.4.2A.1-2 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162211 | 2543 | - | New test points for CA_4A-5A (2DL-2UL) in sec. 6.2 and sec. 6.3 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162212 | 2544 | - | New test points for CA_4A-5A (2DL-2UL) in sec. 6.5 and sec. 6.6 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162215 | 2545 | - | Update of requirements in TC 6.2.2A.2 for CA_4A-5A (2DL-2UL) | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162235 | 2557 | - | Introduction of ACLR for intra-band non-contiguous UL CA for UL 64QAM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162241 | 2563 | - | New test case: Maximum sidelink processes for ProSe Direct discovery | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162247 | 2569 | - | Update of TC 7.3A.6 for CA_4A-5A (2DL-2UL) | 13.1.0 | 13.2.0 |

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| 2016-06 | RAN#72 | R5-162248 | 2570 | - | New D2D Tx test case 6.5.1D.2 Frequency error for ProSe Direct Communication | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162249 | 2571 | - | Update of Inter-band E-UTRA ProSe / E-UTRA operating bands to chapter 5 of TS 36.521-1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162251 | 2572 | - | Update to CA 2UL Tx test case 6.5.1A.3 Frequency Error for CA (intra-band non-contiguous DL CA and UL CA) | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162296 | 2590 | - | New TC: FDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model - Enhanced Performance Requirement Type B | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162303 | 2593 | - | RF: Wrong Number of PDCCH symbols in TC 8.2.1.4.1_H | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162304 | 2594 | - | RF: Corrections to RMCs in Annex A | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162306 | 2595 | - | RF: Correction to RMC for UE Category 1 in CSI tests | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162308 | 2597 | - | RF: Pb setting in power imbalance TCs | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162309 | 2598 | - | RF: UE Categories in FDD-TDD 2DL joint operation CSI test cases | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162324 | 2605 | - | Introduction of TDD PCFICH/PDCCH Single-antenna Port Performance 1x4 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162340 | 2608 | - | Added Channel BW clause for Dual Connectivity | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162343 | 2609 | - | Introduction of Spurious Response for ProSe | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162344 | 2610 | - | Introduction of In-band blocking for ProSe | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162345 | 2611 | - | Introduction of Out-of-band blocking for ProSe | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162346 | 2612 | - | Annex F: Addition of chapter 7 ProSe TCs | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162350 | 2615 | - | UL CA: Corrections to 6.5.2A.x inter-band and non-contiguous TCs | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162354 | 2618 | - | Correction to UL64QAM A-MPR and ASE tests | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162355 | 2619 | - | Correction to TC 8.2.1.3.1A_A.1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162358 | 2622 | - | Annex G: Corrections to test times for joint operation TCs | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162393 | 2625 | - | Addition CA_66A-66A in test case 7.4A.4_H | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162420 | 2628 | - | Addition of CA_1A-3A-7A in 36.521-1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162421 | 2629 | - | Addition of CA_3A-7A-8A in 36.521-1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162463 | 2633 | - | Addition of Band 45 to Section 5 of 36.521-1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162464 | 2634 | - | Addition of Band 45 in maximum output power test cases | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162465 | 2635 | - | Addition of Band 45 in MPR test cases | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162467 | 2637 | - | Addition of Band 45 in Refsens test cases | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162468 | 2638 | - | Addition of Band 45 in in-band blocking test cases | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162469 | 2639 | - | Addition of Band 45 in out-of-band blocking test cases | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162475 | 2640 | - | Addition of output power configuration for CA_3C-5A to Section 6.2.5 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162486 | 2644 | - | Updates of test configuration for Additional spurious emissions for 2UL inter-band CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162490 | 2645 | - | New CA band combinations CA_28A-41A and CA_28A-41C - Updates of 5.4.2A Channel bandwidth | 13.1.0 | 13.2.0 |

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| 2016-06 | RAN#72 | R5-162491 | 2646 | - | New CA band combinations CA_28A-41A and CA_28A-41C - Updates of 6.2.5.3 Delta TIB | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162492 | 2647 | - | New CA band combinations CA_28A-41A and CA_28A-41C - Updates of 7.3.3 Delta RIB | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162495 | 2649 | - | New CA band combinations CA_28A-42A and CA_28A-42C - Updates of 5.4.2A Channel bandwidth | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162496 | 2650 | - | New CA band combinations CA_28A-42A and CA_28A-42C - Updates of 6.2.5.3 Delta TIB | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162497 | 2651 | - | New CA band combinations CA_28A-42A and CA_28A-42C - Updates of 7.3.3 Delta RIB | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162499 | 2653 | - | New CA band combinations CA_41C-42A and CA_41C-42C - Updates of 5.4.2A Channel bandwidth | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162500 | 2654 | - | New CA band combinations CA_41C-42A and CA_41C-42C - Updates of 6.2.5.3 Delta TIB | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162501 | 2655 | - | New CA band combinations CA_41C-42A and CA_41C-42C - Updates of 7.3.3 Delta RIB | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162502 | 2656 | - | New CA band combinations CA_41C-42A - Updates of 7.3A Refsens | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162527 | 2661 | - | Correction of editor's note for CA_41A-42C | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162528 | 2662 | - | Minor correction to TC 8.2.1.4.2_A.1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162542 | 2666 | - | Updates of delta TIB,c values for some CA configurations | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162549 | 2668 | - | Correction to test case 9.3.2.2.2_D | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162550 | 2669 | - | Correction to test applicability in test case 8.7.5.1.1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162553 | 2671 | - | Correction to test case 9.3.3.1.1. | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162563 | 2676 | - | Introduction of new Rx test case Maximum input level with 4 Rx antenna ports | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162567 | 2678 | - | Addition of 2x1 antenna correlation matrices for UE category 0 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162568 | 2679 | - | Updates to test case 8.9.1.1.1 - FDD PDSCH Transmit Diversity 2x1 for UE category 0 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162569 | 2680 | - | Updates to test case 9.7.1.1 - FDD and Half duplex FDD CQI reporting definition under AWGN conditions for UE category 0 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162593 | 2688 | - | Correction to CQI tests for Enhanced Performance Type A | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162594 | 2689 | - | Correction to TDD FDD CA CQI Reporting tests | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162596 | 2691 | - | Correction to demodulation test cases for CoMP in 8.3.1.3.2_F and 8.3.2.4.2_F | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162597 | 2692 | - | Correction to PDCCH Aggregation Level for SDR test | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162605 | 2695 | - | Update of refsens test case 7.3A.3 for CA_20A-67A | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162647 | 2700 | - | Re-Addition of new LTE_CA_Rel12_2UL test case 6.6.3.2A.3 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162661 | 2704 | - | Band 65 introduction to Chapter 7 in 36.521-1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162802 | 2546 | 1 | Introduction of MPR for inter-band DL CA and UL CA for UL 64QAM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162803 | 2547 | 1 | Introduction of MPR for intra-band non-contiguous CA and UL CA for UL 64QAM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162804 | 2553 | 1 | Rel-11 Test point reduction for intra-band non-contiguous UL CA MPR and ACLR tests | 13.1.0 | 13.2.0 |

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| 2016-06 | RAN#72 | R5-162805 | 2554 | 1 | Rel-11 Test point reduction for inter-band UL CA AMPR, ASEM and ASE tests | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162806 | 2555 | 1 | R8 - Modification of test bandwidths in AMPR, ASEM and ASE test | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162807 | 2556 | 1 | R13 - Modification of test bandwidths in AMPR and ASE for UL 64QAM test | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162808 | 2616 | 1 | UL CA: Corrections to TC 6.5.2A.1.1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162810 | 2685 | 1 | Correction to 6.2.4 A-MPR test for Band 12 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162811 | 2535 | 1 | Corrections to CA_41A-41C and CA_41C-41A tables in clauses 7.3A.5, 7.4A.5, 7.5A.5, 7.6.1A.5, 7.6.2A.5, 7.6.3A.5 and 7.8.1A.5 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162812 | 2665 | 1 | Correction of refsens test case 7.3A.3 for CA_20A-32A | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162813 | 2674 | 1 | New CA band combination CA_8A-40A – Updates of 7.3.3 Delta RIB | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162814 | 2684 | 1 | New CA band combination CA_8A-40A – Updates of 7.3A Refsens | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162815 | 2686 | 1 | Correction to reference sensitivity test cases | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162816 | 2687 | 1 | Clarification of interferer frequencies in ACS | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162817 | 2621 | 1 | Corrections to chapter 8 joint operation TCs | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162818 | 2670 | 1 | Correction to test case 8.2.3.2.2A | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162819 | 2690 | 1 | Additional test point for 3DL CA Performance and CQI test cases | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162820 | 2693 | 1 | Correction to TDD FDD CA performance test cases for FDD PCell(2DL and 3DL) | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162821 | 2694 | 1 | Correction to TDD FDD CA performance test cases for TDD PCell TCs(2DL) | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162832 | 2623 | 1 | Corrections to 256QAM SDR joint operation TCs | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162837 | 2559 | 1 | New test case: 2x4 PDSCH TM9 single layer TypeA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162838 | 2530 | 1 | Addition of CA_4A-12A Bandwidth combination set5 information | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162839 | 2567 | 1 | Update of TC 6.6.3.1A.2 for CA_4A-5A (2DL-2UL) | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162840 | 2584 | 1 | Updates TC7.3 for new Rel-13 defined CA combinations to minimum requirements of Reference sensitivity | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162841 | 2585 | 1 | Updates TC7.3A for new Rel-13 defined CA combinations to minimum requirements of Reference sensitivity for CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162842 | 2586 | 1 | Updates of some Rel-13 defined CA combinations to operating bands of TS 36.521-1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162843 | 2587 | 1 | Updates TC6.2.5 for delta TIB,c values with new Rel-13 CA band combination | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162844 | 2627 | 1 | Addition of CA_4A-4A BW set 1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162846 | 2531 | 1 | Addition of Rel-13 CA combination CA_3A-41A to refsens for inter-band 2DL CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162847 | 2710 | 1 | Introduction of new TC8.2.1.4.2_A.3 4DL CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162848 | 2719 | 1 | Addition of definition of CA capability with 4DL & 5DL CCs | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162849 | 2720 | 1 | Addition of Operating bands for CA in clause 5.2A | 13.1.0 | 13.2.0 |

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| 2016-06 | RAN#72 | R5-162851 | 2560 | 1 | New test case: 4layer PDSCH CLSM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162852 | 2561 | 1 | New test case: 4layer PDSCH TM9 SM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162853 | 2562 | 1 | New test case: 3layer PDSCH OLSM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162854 | 2573 | 1 | New Performance test case 8.10.4.1.1 FDD distributed EPDCCH performance 2x4 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162855 | 2574 | 1 | New Performance test case 8.10.4.1.2 TDD distributed EPDCCH performance 2x4 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162856 | 2575 | 1 | New Performance test case 8.10.4.2.1 FDD localized EPDCCH performance with TM9 2x4 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162857 | 2576 | 1 | New Performance test case 8.10.4.2.2 TDD localized EPDCCH performance with TM9 2x4 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162858 | 2602 | 1 | Introduction of FDD PCFICH/PDCCH Single-antenna Port Performance 1x4 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162859 | 2603 | 1 | Introduction of FDD PCFICH/PDCCH Transmit Diversity 2x4 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162860 | 2606 | 1 | Introduction of TDD PCFICH/PDCCH Transmit Diversity 2x4 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162861 | 2607 | 1 | Introduction of TDD PCFICH/PDCCH Transmit Diversity 4x4 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162862 | 2675 | 1 | Addition of 4Rx antenna port feature into Annex I | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162863 | 2677 | 1 | Introduction of new Rx test case Adjacent Channel Selectivity (ACS) with 4 Rx antenna ports | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162865 | 2577 | 1 | Rearrangement of TC 6.6.2.3A.1_1 and TC 6.6.2.3A.2 and corrections to TC 6.6.2.3A.2 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162866 | 2614 | 1 | UL CA: Corrections to intra-band non-contiguous test configuration tables | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162867 | 2725 | 1 | Updates of test configuration for EVM and Carrier leakage test cases of 2UL CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162868 | 2643 | 1 | Addition of minimum requirement tables to clause 6.3.5A.1.0 and 6.3.5A.2.0 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162869 | 2681 | 1 | Updates to test case 6.6.2.2A.2 - Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA) | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162870 | 2699 | 1 | Re-submission of New CA 2UL Tx test case 6.5.2A.1.3 Error Vector Magnitude (EVM) for CA (intra-band non-contiguous DL CA and UL CA) | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162872 | 2724 | 1 | Additions to test case 6.6.3.1A.2 – Transmitter Spurious emissions for CA (inter-band DL CA and UL CA) | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162875 | 2696 | 1 | Adding operating band definitions for MTC and eMTC | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162877 | 2564 | 1 | New test case: PSSCH performance for ProSe Direct communication | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162878 | 2565 | 1 | New test case: Maximum sidelink processes for ProSe Direct communication | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162879 | 2722 | 1 | New test Case: ProSe-UE Maximum Output Power | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162880 | 2723 | 1 | New test Case: ProSe-UE Maximum Power Reduction test case | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162884 | 2599 | 1 | Update to FDD PDSCH Closed Loop Multi-Layer Spatial Multiplexing 4x2 for Dual Connectivity | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162885 | 2600 | 1 | Update to TDD PDSCH Closed Loop Multi-Layer Spatial Multiplexing 4x2 for Dual Connectivity | 13.1.0 | 13.2.0 |

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| 2016-06 | RAN#72 | R5-162886 | 2601 | 1 | Update to sustained data rate performance for Dual Connectivity 64QAM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162887 | 2641 | 1 | Addition of test case for FDD sustained data rate performance for Dual Connectivity 256QAM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162888 | 2642 | 1 | Addition of test case for TDD sustained data rate performance for Dual Connectivity 256QAM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162890 | 2728 | - | Adding Low Wgap definition to section 3 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162952 | 2632 | 1 | Update to TC 6.3.5A.2.3 Power Control Relative power tolerance for CA (intra-band non-contiguous DL CA and UL CA) | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162953 | 2525 | 1 | CR for Clause 9.3.8.2 in 36.521-1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162954 | 2591 | 1 | New TC: TDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model - Enhanced Performance Requirement Type B | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162967 | 2624 | 2 | Addition CA combinations in intra-band contiguous DL CA and UL CA transmitter test cases | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162969 | 2660 | 1 | Update BW definition for band 66 in clause 5 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162973 | 2701 | 1 | Band 65 introduction to Chapter 5 in 36.521-1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162974 | 2703 | 1 | Band 65 introduction to Chapter 6.6.3 in 36.521-1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162975 | 2636 | 1 | Addition of Band 45 in Spurious emission test cases | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162976 | 2540 | 2 | 6.3.4E.1 – General ON/OFF time mask for UE category 0 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162977 | 2548 | 1 | Introduction of AMPR for inter-band DL CA and UL CA for UL 64QAM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162978 | 2541 | 1 | 6.3.4.1 – General ON/OFF time mask. | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162979 | 2549 | 1 | Introduction of EVM for inter-band UL CA for UL 64QAM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162980 | 2550 | 1 | Introduction of ASEM for inter-band DL CA and UL CA for UL 64QAM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162981 | 2551 | 1 | Introduction of ACLR for inter-band DL CA and UL CA for UL 64QAM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162982 | 2552 | 1 | Introduction of ASE for inter-band DL CA and UL CA for UL 64QAM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162983 | 2657 | 1 | Updates of test point for A-Spur for UL 64QAM | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162985 | 2673 | 1 | New CA band combination CA_8A-40A – Updates of 5.4.2A Channel Bandwidth | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162987 | 2664 | 1 | Change of test case applicability for A-MPR for NS_05 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162989 | 2566 | 1 | Update of TC 6.6.2.2A.2 for CA_4A-5A (2DL-2UL) | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162990 | 2648 | 1 | New CA band combinations CA_28A-41A and CA_28A-41C - Updates of 7.3A Refsens | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162991 | 2716 | 1 | Introduction of new TC7.7A.7 4DL CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162992 | 2604 | 1 | Introduction of FDD PCFICH/PDCCH Transmit Diversity 4x4 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162993 | 2532 | 1 | Update test case 6.2.4A.2:AMPR for 2UL inter-band CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162995 | 2658 | 1 | Addition of a new TC for Minimum Output Power for CA (inter-band DL CA and UL CA) | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-162996 | 2659 | 1 | Addition of a new TC for Minimum Output Power for CA (intra-band non-contiguous DL CA and UL CA) | 13.1.0 | 13.2.0 |

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| 2016-06 | RAN#72 | R5-162997 | 2682 | 1 | Introduction of test case 6.6.2.2A.3 - Additional Spectrum Emission Mask for CA (intra-band non-contiguous DL CA and UL CA) | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163100 | 2588 | 1 | Introduction of new eMTC RF test case 6.3.5EA.1 for category M1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163101 | 2589 | 1 | Introduction of new eMTC RF test case 6.3.5EA.2 for category M1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163102 | 2705 | 1 | Addition of new test case for aggregate power control tolerance for UE category M1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163103 | 2706 | 1 | Addition of New test case for Maximum input level for UE category M1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163104 | 2707 | 1 | Addition of New test case for Adjacent Channel Selectivity (ACS) for category M1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163107 | 2568 | 1 | New D2D Tx test case 6.5.1D.1 Frequency error for ProSe Direct Discovery | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163110 | 2558 | 1 | New 2x4 test case: PDSCH CLSM TypeA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163119 | 2708 | 1 | Introduction of new TC7.3A.9 4DL CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163120 | 2709 | 1 | Introduction of new TC7.4A.7 4DL CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163121 | 2711 | 1 | Introduction of new TC7.5A.7 4DL CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163122 | 2712 | 1 | Introduction of new TC7.6.1A.7 4DL CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163123 | 2713 | 1 | Introduction of new TC7.6.2A.7 4DL CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163124 | 2715 | 1 | Introduction of new TC7.6.3A.7 4DL CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163125 | 2717 | 1 | Introduction of new TC7.8.1A.7 4DL CA | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163126 | 2718 | 1 | Updates of delta TIB,c values and table references for delta TIB,c for TC 6.2.5 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163127 | 2727 | 1 | Introduction of CA 1A-8A-11A in chapters 5, 6 and 7 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163129 | 2529 | 1 | Addition of new test case 7.9_1 Spurious emissions with 4 Rx antenna ports | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163130 | 2534 | 1 | Revise Power Control Relative power tolerance for CA (intra-band contiguous DL CA and UL CA) test case 6.3.5A.2.1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163132 | 2652 | 1 | New CA band combinations CA_28A-42A and CA_28A-42C - Updates of 7.3A Refsens | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163192 | 2631 | 2 | Update to TC 6.3.5A.2.2 Power Control Relative power tolerance for CA (inter-band DL CA and UL CA) | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163194 | 2702 | 2 | Band 65 introduction to Chapter 6.2 in 36.521-1 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163195 | 2663 | 2 | Change of test points and requirements for A-MPR for NS_05 | 13.1.0 | 13.2.0 |
| 2016-06 | RAN#72 | R5-163196 | 2726 | 1 | Correction to the UL CA Frequency Error Testcase | 13.1.0 | 13.2.0 |
| 2016-09 | RAN#73 | R5-165046 | 2742 | 2 | Introduction of new definitions for NB-IoT in Chapter 3 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165047 | 2744 | 2 | Introduction of general information for NB-IoT in Chapter 4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165048 | 2745 | 2 | Introduction of operating bands for NB-IoT in Chapter 5 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165049 | 2730 | 2 | Introduce Downlink Fixed Reference Channels for UE category NB1 Receiver tests | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165050 | 2731 | 2 | Introduce GSM Interferer for UE category NB1 Adjacent channel selectivity tests | 13.2.0 | 13.3.0 |

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| 2016-09 | RAN#73 | R5-165051 | 2736 | 2 | New test case: 6.2.2EA UE Maximum Output Power for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165057 | 2759 | 2 | Addition of FDD MPDCCH demod test case for eMTC | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165058 | 2760 | 2 | Addition of TDD MPDCCH demod test case for eMTC | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165062 | 2757 | 2 | UE Maximum Output Power for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165063 | 2741 | 2 | Addition of test case 6.6.2.3F for ACLR for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165067 | 2749 | 2 | Addition of test case 6.7F for Transmit Intermodulation for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165068 | 2750 | 2 | Addition of Occupied Bandwidth test case 6.6.1F for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165069 | 2751 | 2 | Addition of Spectrum Emission Mask test case 6.6.2.1F for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165070 | 2756 | 2 | Introduction of 6.5.1F Frequency Error for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165071 | 2763 | 2 | Introduction of new NB-IoT RF test case 6.3.4F.1 for category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165072 | 2765 | 2 | Introduction of test case 6.2.3F - Maximum Power Reduction (MPR) for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165073 | 2766 | 2 | Introduction of test case 6.6.3F.1 - Transmitter Spurious emission for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165074 | 2758 | 2 | Maximum input level for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165075 | 2729 | 2 | Introduce Adjacent Channel Selectivity (ACS) for UE category NB1 test case 7.5F | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165076 | 2733 | 2 | Introduce Downlink Physical Channels for UE category NB1 Receiver tests | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165077 | 2764 | 2 | Addition of the TC 6.6.2.3EA ACLR for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165094 | 2776 | - | New test case: 6.5.1EA Frequency Error for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165095 | 2777 | - | New test case: 6.5.2.1EA.1 Error Vector Magnitude for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165096 | 2778 | - | New test case: 6.5.2.1EA.2 PUSCH-EVM with exclusion period for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165097 | 2779 | - | New test case: 6.5.2.2EA Carrier leakage for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165098 | 2780 | - | New test case: 6.5.2.3EA In-band emissions for non allocated RB for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165099 | 2781 | - | New test case: 6.5.2.4EA EVM equalizer spectrum flatness for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165100 | 2782 | - | New test case: 6.6.2.1EA Spectrum Emission Mask for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165101 | 2783 | - | New test case: 6.6.2.2EA Additional Spectrum Emission Mask for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165117 | 2797 | - | Changes to general clauses for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165158 | 2800 | - | Introduction of ProSe RF TC 7.5D | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165159 | 2801 | - | Introduction of ProSe RF TC 7.6.3D | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165160 | 2802 | - | Introduction of ProSe RF TC 7.8.1D | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165210 | 2808 | - | New CA band combination CA_1A-40A and CA_3A-40A - Updates of 7.3A Refsens | 13.2.0 | 13.3.0 |

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| 2016-09 | RAN#73 | R5-165225 | 2809 | - | Update minimum test time into Annex G for TC 8.9.1.1.3,8.9.1.2.3 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165228 | 2810 | - | Update to TC 9.7.2.1,9.7.2.2 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165243 | 2812 | - | Addition of new 4Rx Test Cases - CQI reporting / AWGN / rank 1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165244 | 2813 | - | Addition of new 4Rx Test Cases - CQI reporting / AWGN / rank 2 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165245 | 2814 | - | Addition of new 4Rx Test Cases - CQI reporting / AWGN / rank 4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165247 | 2815 | - | Addition of new 4Rx Test Cases - CQI reporting / AWGN / rank 3 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165248 | 2816 | - | Uncertainties and Test Tolerances for new 4Rx Test Cases - CQI reporting / AWGN | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165250 | 2817 | - | Addition of channel matrices for 4Rx in Annex B.1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165310 | 2822 | - | Update to FDD PCFICH/PDCCH transmit diversity 2x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165311 | 2823 | - | Update to FDD PCFICH/PDCCH transmit diversity 4x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165322 | 2833 | - | Update minimum requirement of Reference sensitivity level for all Rel-13 CA configurations | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165334 | 2834 | - | Correction of test requirements of In-band emissions for non allocated RB | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165366 | 2837 | - | Update to test case 8.10.4.1.1 FDD distributed EPDCCH performance 2x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165368 | 2839 | - | Update to test case 8.10.4.1.2 TDD distributed EPDCCH performance 2x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165369 | 2840 | - | Update to test case 8.10.4.2.1 FDD localized EPDCCH performance 2x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165370 | 2841 | - | Introduction of a clause for Demodulation of PBCH (enhanced coverage) | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165371 | 2842 | - | Update to test case 8.10.4.2.2 TDD localized EPDCCH performance 2x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165395 | 2851 | - | Correction to the test requirement for General ON/OFF time mask for UE category 0 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165413 | 2854 | - | Correction for UL 64QAM test cases to TS36.521-1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165415 | 2856 | - | Update to eMTC RF test case 6.3.5EA.2 for category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165424 | 2861 | - | Update Reference sensitivity for Band 66 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165441 | 2868 | - | Introduction of EVM test for UL 64QAM + 2UL CA (intra-band non-contiguous DL CA and UL CA) | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165443 | 2870 | - | Introduction of test requirements for AMPR inter-band UL CA + UL 64QAM | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165444 | 2871 | - | Introduction of TT in Annex F for UL 64QAM + 2UL CA | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165454 | 2872 | - | Correction to test case 7.3E Reference sensitivity level for UE category 0 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165485 | 2876 | - | Removal of SCC allocation in TCs 6.5.2A.x | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165487 | 2878 | - | Annex F: Addition of Uncertainties for chapter 7 ProSe TCs | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165489 | 2880 | - | Minor correction to TC 6.6.3.3A.2 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165496 | 2885 | - | Update to Annex C for CAT M1 testing | 13.2.0 | 13.3.0 |

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| 2016-09 | RAN#73 | R5-165510 | 2887 | - | UE Power Class test requirements in Multi-Cluster PUSCH TCs | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165512 | 2889 | - | Correction of Reference sensitivity test settings for CA_26A-41C | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165541 | 2890 | - | Introduction of additional 3DL tolerances in TC 6.2.2A.2 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165592 | 2894 | - | Adding the Diversity characteristics requirements in chapter 7.2 for category NB1 UE. | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165624 | 2909 | - | New TC: FDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM3 interference model - Enhanced Performance Requirement Type B | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165625 | 2910 | - | New TC: TDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM3 interference model - Enhanced Performance Requirement Type B | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165673 | 2924 | - | Correction to CA sustained data rate tests for 256QAM | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165674 | 2925 | - | Clean up on UE DL category for 256QAM DL RMC | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165675 | 2926 | - | Correction to TDD eDL-MIMO performance test case with 256QAM | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165676 | 2927 | - | Addition of test points in 6.5.1A.1 Frequency error for CA | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165680 | 2931 | - | Correction to Annex F.3 for UL64QAM test cases | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165681 | 2932 | - | Clean up on TM4 CA and TDD FDD CA performance test cases | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165682 | 2933 | - | Correction to TDD FDD CA sustained data rate performance test cases | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165683 | 2934 | - | Correction to the minimum test time for TDD FDD CA performance test cases | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165684 | 2935 | - | Correction to TDD FDD soft buffer for 2DL CA | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165690 | 2938 | - | Correction of the test requirement for TC 6.6.2.1A.1 SEM for CA (intra-band contiguous DL CA and UL CA) | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165695 | 2942 | - | Addition of the FDD-FDD-TDD 3DL case into TC 9.6.1.3.2 TDD FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (3DL CA) | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165701 | 2948 | - | Change of test points and requirements for NS_05 A-MPR for UL64QAM | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165702 | 2949 | - | Change of test points and requirements for NS_05 Additional spurious emissions for UL64QAM | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165732 | 2951 | - | Correction to spurious emission band UE co-existence limits references for Rel-13 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165734 | 2952 | - | NS_24 and NS_25 A-MPR test configuration and requirements | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165735 | 2953 | - | NS_24 and NS_25 A-Spurious emission test configuration and requirements | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165785 | 2955 | - | Addition of CQI report config IE for 4Rx TM9 test cases | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165787 | 2956 | - | Addition TC 6.3.2F Minimum Output power for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165790 | 2957 | - | Addition TC 7.3F.1 Reference sensitivity test for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165820 | 2966 | - | 36.521-1 UL CA frequency error clarification | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165837 | 2970 | - | Addition Out of-band blocking with 4 Rx antenna ports TC 7.6.2_1 | 13.2.0 | 13.3.0 |

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| 2016-09 | RAN#73 | R5-165838 | 2971 | - | Addition Narrow band blocking with 4 Rx antenna ports TC 7.6.3_1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165857 | 2975 | - | New test case: FDD Multiple timing reference test for ProSe direct discovery | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-165858 | 2976 | - | New test case: FDD power imbalance performance with two links for ProSe Direct communication | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166001 | 2869 | 1 | Introduction of test configurations for ASEM inter-band UL CA + UL 64QAM | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166002 | 2930 | 1 | Correction to interferer frequencies in In-band blocking for CA | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166003 | 2884 | 1 | Addition of test points to UL 64 QAM TC | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166004 | 2905 | 1 | Correction to TC 6.2.4A.1 A-MPR for CA (intra-band contiguous DL CA and UL CA) | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166005 | 2929 | 1 | Correction to Max Power for CA | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166006 | 2928 | 1 | Clean up on chapter 3, 6 and 7 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166007 | 2941 | 1 | Change of test points and requirements for NS_05 A-MPR | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166008 | 2943 | 1 | Change of test points and requirements for NS_05 Additional spurious emissions | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166009 | 2945 | 1 | Change of test points and requirements for NS_05 A-MPR for UL-MIMO | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166010 | 2947 | 1 | Change of test points and requirements for NS_05 Additional spurious emissions for UL-MIMO | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166011 | 2818 | 1 | Change of names of 3DL TCs | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166012 | 2860 | 1 | Update Reference sensitivity for additional requirement | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166013 | 2883 | 1 | Correction to applicability of Power Class 3 only UL TCs | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166022 | 2799 | 1 | Correction to Max Input power for 256QAM | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166023 | 2939 | 1 | Update of the test points of the TC 8.7.1.1_H.3 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166027 | 2771 | 1 | Update of Delta Tib tables in clause 6.2.5.3 for all Rel-13 CA configurations | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166028 | 2772 | 1 | Update of Delta Rib tables in clause 7.3.3 for all Rel-13 CA configurations | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166029 | 2773 | 1 | Update of CA operating bands and bandwidth for all Rel-13 CA configurations | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166030 | 2768 | 1 | Addition of CA_3A-5A BW set 3 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166031 | 2819 | 1 | Introduction of CA_8A-42A (2DL) to test case 7.3A.3 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166033 | 2820 | 1 | Introduction of CA_8A-42C (3DL) to test case 7.3A.5 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166034 | 2853 | 1 | Addition of CA_2A-28A in TS 36.521-1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166035 | 2858 | 1 | Update power control and in-band emission requirement for CA_8B | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166036 | 2862 | 1 | Update TC 6.6.2.1A.1 requirement for CA_8B | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166037 | 2902 | 1 | Rel 13 CA_5B RF Test Cases Section 7 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166038 | 2903 | 1 | Rel 13 CA_3C-5A RF Test Cases Section 7 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166039 | 2916 | 1 | Introduction of New TC8.7.1.1_A.4 4DL CA | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166040 | 2917 | 1 | Introduction of New TC9.6.1.1_A.3 4DL CA | 13.2.0 | 13.3.0 |

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| 2016-09 | RAN#73 | R5-166041 | 2944 | 1 | Updates of Rx test cases for 4DL CA | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166042 | 2958 | 1 | Addition CA_2A-4A-5A-30A in TS 36.521-1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166043 | 2960 | 1 | Addition CA_2A-2A-4A-4A in TS 36.521-1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166044 | 2920 | 1 | Update TC 6.6.2.3A.1 and 6.6.2.3A.1_1 requirement for CA_8B | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166045 | 2921 | 1 | Update TC 6.6.3.1A.1 requirement for CA_8B | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166046 | 2922 | 1 | Update TC 6.6.3.2A.1 requirement for CA_8B | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166047 | 2923 | 1 | Update TC 6.7A.1 requirement for CA_8B | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166048 | 2940 | 1 | Addition of the FDD-FDD-TDD 3DL case into TC 8.7.5.1.2 TDD FDD CA Sustained data rate performance for FDD PCell (3DL CA) | 13.2.0 | 13.3.0 |
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| 2016-09 | RAN#73 | R5-166060 | 2844 | 1 | New test case: 6.3.5F.1 Power Control Absolute power tolerance for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166061 | 2845 | 1 | New test case: 6.3.5F.2 Power Control Relative power tolerance for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166062 | 2846 | 1 | New test case: 7.7F Spurious response for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166063 | 2847 | 1 | New test case: 7.8.1F Wide band Intermodulation for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166064 | 2864 | 1 | Introduction of TT for Configured UE transmitted output power in Annex F | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166065 | 2865 | 1 | Resubmission of 6.2.5F Configured UE transmitted Output Power for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166066 | 2866 | 1 | Resubmission of 6.5.2.1F.1 Error Vector Magnitude (EVM) for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166067 | 2867 | 1 | Resubmission of 6.5.2.2F Carrier leakage for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166068 | 2895 | 1 | Addition of In-band emissions for non allocated RB test case 6.5.2.3F for UE category NB1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166069 | 2775 | 1 | New test case: 6.2.4EA Additional Maximum Power Reduction (A-MPR) for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166070 | 2791 | 1 | New test case: 6.2.3EA Maximum Power Reduction (MPR) for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166071 | 2792 | 1 | New test case: 6.6.3EA.1 Transmitter Spurious emissions for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166072 | 2793 | 1 | New test case: 6.6.3EA.2 Spurious emission band UE co-existence for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166073 | 2794 | 1 | New test case: 6.6.3EA.3 Additional spurious emissions for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166074 | 2795 | 1 | New test case: 7.3EA Reference sensitivity level for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166075 | 2835 | 1 | Introduction of General ON/OFF time mask for UE category M1 | 13.2.0 | 13.3.0 |

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| 2016-09 | RAN#73 | R5-166076 | 2836 | 1 | Introduction of PRACH and SRS ON/OFF time mask for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166077 | 2838 | 1 | Introduction of Occupied bandwidth for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166078 | 2848 | 1 | New test case: 7.7EA Spurious response for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166080 | 2850 | 1 | New test case: 7.9EA Spurious emissions UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166084 | 2913 | 1 | Update of TC6.3.5EA.3 Aggregate power control tolerance for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166085 | 2914 | 1 | Update of TC7.4EA Maximum input level for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166086 | 2915 | 1 | Update of TC7.5EA Adjacent Channel Selectivity (ACS) for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166087 | 2972 | 1 | Adding narrowband and narrowband index definitions to 36.521-1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166103 | 2805 | 1 | Corrections to LC MTC test case 7.4E and 7.5E | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166104 | 2912 | 1 | Update of TC 9.7.1.2 TDD CQI reporting definition under AWGN conditions for UE category 0 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166105 | 2803 | 1 | Introduction of NAICS RF TC 8.3.1.1.7 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166106 | 2804 | 1 | Introduction of NAICS RF TC 8.3.2.1.8 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166108 | 2875 | 1 | Removal of DL allocation from UL CA TCs | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166109 | 2964 | 1 | 36.521-1: UL CA spurious updates | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166111 | 2965 | 1 | 36.521-1: A-MPR and A-SEM corrections for inter-band UL CA | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166112 | 2859 | 1 | Additional Operation Band 46 for LAA | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166113 | 2897 | 1 | Update test case 7.6.3A.3 to add LAA band combinations | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166114 | 2824 | 1 | Update to TDD PCFICH/PDCCH single-antenna performance 1x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166115 | 2825 | 1 | Update to TDD PCFICH/PDCCH transmit diversity 2x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166116 | 2826 | 1 | Update to TDD PCFICH/PDCCH transmit diversity 4x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166117 | 2827 | 1 | Introduction of FDD PHICH Single-antenna Port Performance 1x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166118 | 2828 | 1 | Introduction of FDD PHICH Transmit Diversity 2x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166119 | 2829 | 1 | Introduction of FDD PHICH Transmit Diversity 4x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166120 | 2830 | 1 | Introduction of TDD PHICH Single-antenna Port Performance 1x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166121 | 2831 | 1 | Introduction of TDD PHICH Transmit Diversity 2x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166122 | 2832 | 1 | Introduction of TDD PHICH Transmit Diversity 4x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166123 | 2978 | 1 | Addition of the 4Rx test case into the chapter 7 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166133 | 2980 | - | Change of test points and requirements for NS_05 A-MPR for Band 65 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166134 | 2981 | - | Change of test points and requirements for NS_05 Additional spurious emissions for Band 65 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166135 | 2982 | - | Change of test points and requirements for NS_05 A-MPR for UL-MIMO for Band 65 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166136 | 2983 | - | Change of test points and requirements for NS_05 Additional spurious emissions for UL-MIMO for Band 65 | 13.2.0 | 13.3.0 |

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| 2016-09 | RAN#73 | R5-166137 | 2950 | 1 | Correction to TC 6.6.3.2 Band 66 UE E-UTRA release requirements | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166138 | 2967 | 1 | 36.521-1 Band 66 Receiver test cases updates | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166139 | 2977 | 1 | Updates to 4Rx Demod test cases | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166141 | 2959 | 1 | D2D New test cases: Power imbalance performance with two Sidelinks | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166143 | 2901 | 1 | Rel 13 CA_5A-5A RF Test Cases Section 7 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166145 | 2937 | 1 | Addition of some 4DL CA combinations into TC 7.3A.9.5 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166147 | 2852 | 1 | Updates of 7.3A.5 Channel bandwidth for CA_1A-3C | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166148 | 2898 | 1 | Introduction to new test case 6.2.5EA Configured transmitted power for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166152 | 2879 | 1 | Corrections to TC 7.9A | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166154 | 2896 | 1 | Update test case 7.6.1A.3 to add LAA band combinations | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166155 | 2877 | 1 | Correction to 256QAM CQI TCs | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166156 | 2806 | 1 | Addition of CA_4A-12A Bandwidth combination set5 information | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166157 | 2857 | 1 | Update Maximum Output Power and MPR requirement for CA_8B | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166158 | 2918 | 1 | Update of Test Cases for 4DL CA | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166160 | 2821 | 1 | Update to FDD PCFICH/PDCCH single-antenna performance 1x4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166165 | 2855 | 1 | Update to eMTC RF test case 6.3.5EA.1 for category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166166 | 2900 | 1 | Introduction to new test case 6.3.3EA UE Transmit OFF power for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166169 | 2873 | 1 | Corrections to TC 7.3A.4 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166171 | 2899 | 2 | Introduction to new test case 6.3.2EA Minimum Output Power for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166303 | 2874 | 2 | Corrections to TC 7.3A.5 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166309 | 2789 | 2 | New test case: 9.8.1.1 FDD and half-duplex FDD CQI reporting definition under AWGN conditions in enhanced coverage | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166310 | 2796 | 2 | New test case: 8.11.1.1.1 FDD and half-duplex FDD (Fixed Reference Channel) demodulation of PDCCH in enhanced coverage | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166311 | 2811 | 1 | Adding RMCs for CAT M1 testing to Annex A | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166312 | 2849 | 2 | New test case: 7.8.1EA Wide band intermodulation for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166313 | 2891 | 2 | Introduction of new test case In-band blocking for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166314 | 2892 | 2 | Introduction of new test case Out-of-band blocking for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166315 | 2893 | 2 | Introduction of new test case Narrow band blocking for UE category M1 | 13.2.0 | 13.3.0 |
| 2016-09 | RAN#73 | R5-166319 | 2973 | 2 | 36.521-1 Correction of intra-band cont CA spurious co-existence test case for Rel-10 and Rel-11 UEs | 13.2.0 | 13.3.0 |

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|---|---|---|---|---|---|---|---|
| 2016-09 | RAN#73 | R5-166053 | 2904 | 1 | New CA band combination CA_1A-41A-42A - Updates of 5.4.2A Channel bandwidth | 13.3.0 | 14.0.0 |
| 2016-09 | RAN#73 | R5-166054 | 2906 | 1 | New CA band combination CA_1A-41A-42A - Updates of 6.2.5.3 Delta TIB | 13.3.0 | 14.0.0 |
| 2016-09 | RAN#73 | R5-166055 | 2907 | 1 | New CA band combination CA_1A-41A-42A - Updates of 7.3.3 Delta RIB | 13.3.0 | 14.0.0 |
| 2016-09 | RAN#73 | R5-166056 | 2908 | 1 | New CA band combination CA_1A-41A-42A - Updates of 7.3A Refsens | 13.3.0 | 14.0.0 |
| 2016-12 | RAN#74 | R5-168019 | 2984 | - | Adding MPDCCH aggregation level to Annex C for CAT M1 testing | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168042 | 2995 | - | Introduction of numbering rules guideline for category M1 in Annex I | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168123 | 3007 | - | Completion of 4Rx Test Cases for CQI reporting under AWGN | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168125 | 3009 | - | Correction to Initial conditions of TC 6.2.4A.2_1 for NS_03/NS_01 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168126 | 3010 | - | Correction to Initial conditions of TC 6.6.2.2A.2_1 for NS_03/NS_01 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168189 | 3014 | - | Chapter 3 introduction of symbols for NB-IoT | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168190 | 3015 | - | Chapter 5 change of frequency bands and channel arrangement for NB-IoT | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168191 | 3016 | - | 6.2.5F Configured UE transmitted Output Power for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168194 | 3019 | - | Annex A Introduction of UL RMC for NB-IoT | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168195 | 3020 | - | Introduction of TT for EVM and Carrier leakage test cases | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168209 | 3021 | - | Derivation of Test Requirements for 7.5A.4 ACS for intra-band non-contiguous DL CA | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168294 | 3042 | - | Update to eMTC RF test case 6.3.5EA.1 and 6.3.5EA.2 for category M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168310 | 3047 | - | Updated chapter 2, 3, 4 and 5 for ProSe | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168311 | 3048 | - | Updated of Delta Tib tables in clause 6.2.5.3 for all Rel-14 CA configurations | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168314 | 3051 | - | Correction to RF TC 6.6.3.1A.1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168368 | 3053 | - | Updates to section 7 4Rx single carrier TCs | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168400 | 3063 | - | Band 70 introduction to 36.521-1 Chapter 5 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168401 | 3064 | - | Band 70 introduction to 36.521-1 output power requirements | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168405 | 3066 | - | Correction to TX-RX frequency separation for Band 65 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168420 | 3069 | - | Update of TC 6.6.3.1A.2 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168478 | 3070 | - | Introduction of Power Class 2 in power control for HPUE | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168484 | 3071 | - | Update to 4 test cases 8.10.4.1.1, 8.10.4.1.2, 8.10.4.2.1 and 8.10.4.2.2 by adding connection diagram | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168555 | 3093 | - | Updates of the test number in TC 8.7.5.1_H.2 TDD FDD CA SDR for FDD PCell (3DL CA) for 256QAM in DL | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168557 | 3094 | - | Correction of the test point for TC 7.3A.9 REFSENS 4DL CA | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168595 | 3103 | - | Update to In-band blocking requirements 7.6.1A.0 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168604 | 3105 | - | Clean-up of 7.3A.3 test configuration tables | 14.0.0 | 14.1.0 |

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|---|---|---|---|---|---|---|---|
| 2016-12 | RAN#74 | R5-168647 | 3115 | - | Correction of RB allocation in Additional Maximum Power Reduction (A-MPR) for CA and Additional Spectrum Emission Mask for CA | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168654 | 3120 | - | Corrections of Spurious Emissions TC for CA | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168668 | 3126 | - | Correction to tolerance value for CA_NS_01 for CA A-MPR test 6.2.4A.1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168669 | 3127 | - | Correction to UL RB allocation in 6.5.1A Frequency error for CA | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168670 | 3128 | - | Clarification of test requirement for CA MPR test cases 6.2.3A.1 and 6.2.3A.1_1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168671 | 3129 | - | Correction of Highest NRB_agg and REFSENS in 7.3A.5 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168672 | 3130 | - | Correction to DL modulation parameter for CA 5A-5A in Max Input Level test | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168675 | 3133 | - | Correction to reference channel of Multi-Layer Spatial Multiplexing test case for CA | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168676 | 3134 | - | Corrections regarding power allocation for TM9 performance and CQI tests | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168749 | 3151 | - | Update minimum conformance requirements for receiver 4 Rx antenna ports test cases and legacy test cases | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168785 | 3167 | - | RF: Correction to RMC R.31-6 FDD | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168792 | 3171 | - | Updates to test case 6.2.3EA - MPR for category M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168794 | 3172 | - | Updates to test case 6.2.4EA - A-MPR for category M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168795 | 3173 | - | Updates to test case 6.6.2.1EA - SEM for category M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168796 | 3174 | - | Updates to test case 6.6.2.2EA – Additional SEM for category M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168797 | 3175 | - | Updates to test case 6.6.3EA.3 – Additional Spurious emissions for category M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168803 | 3179 | - | Introduction of new test case 7.6.1F In-band blocking for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168805 | 3181 | - | Introduction of new test case 7.6.2F Out-of-band blocking for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168807 | 3182 | - | CSI-RS-Config-r10 message content aligned to minimum conformance requirements for TC 8.3.1.1.2_D | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168816 | 3184 | - | NB-IoT test frequencies algorithm for TRx test cases | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168827 | 3188 | - | Addition Reference sensitivity with repetitions test for UE category NB1 7.3F.2 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168829 | 3189 | - | Default operation mode definition for TRx TCs | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168845 | 3191 | - | CA_70C introduction to 36.521-1 receiver requirements | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168847 | 3192 | - | Update UL RMC for CA_1A-3A-7A in 7.3A.5 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168849 | 3193 | - | Update test repetitions tables for receiver 4CC test cases | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168851 | 3194 | - | Update test case 6.5.2A.2.1 to remove editor's notes | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168852 | 3195 | - | Update reference sensitivity level for some CA Configurations in test 7.3A.6 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168857 | 3197 | - | Editorial correction in TC 6.2.4A.1_1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168858 | 3198 | - | Update reference tables in ASEM, ACLR, ASE for intra-band contiguous UL CA for UL 64QAM | 14.0.0 | 14.1.0 |

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|---|---|---|---|---|---|---|---|
| 2016-12 | RAN#74 | R5-168859 | 3199 | - | Update test cases 6.2.4A.1 and 6.6.2.2A.1 to remove editor's notes | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168974 | 3210 | - | Addition of TM10 CQI reporting test cases with NAICS | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168975 | 3211 | - | Test tolerance update to MPDCCH performance test cases | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168979 | 3213 | - | Update of test tolerance of 4-Rx Type A demod test cases | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168981 | 3215 | - | Test Tolerances for FDD PDSCH Closed Loop Single Layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model – Enhanced Performance Requirement Type B (8.3.1.1.4) | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168982 | 3216 | - | Test Tolerances for FDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM3 interference model - Enhanced Performance Requirement Type B (8.3.1.1.6) | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168983 | 3217 | - | Test Tolerances for TDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model - Enhanced Performance Requirement Type B (8.3.2.1.5) | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168984 | 3218 | - | Test Tolerances for TDD PDSCH Closed Loop Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM3 Interference Model - Enhanced Performance Requirement Type B (8.3.2.1.7) | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-168985 | 3219 | - | Test Tolerances for FDD and TDD CQI Reporting under fading conditions - PUCCH 1-1 (CSI Reference Symbol) TM9 - Enhanced Receiver Type B (9.3.8.2.1 and 9.3.8.2.2) | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169045 | 3229 | - | Addition Transmit intermodulation for UE category M1 test case 6.7EA | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169502 | 3080 | 1 | Update to test case 8.7.5.1.2 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169506 | 3006 | 1 | Update of B3/39 UE co-existence requirements | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169507 | 3058 | 1 | Updates to SEM Test Cases for HPUE | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169508 | 3067 | 1 | Correction to Band 66 UL-MIMO test requirements 6.2.3B, 6.2.4B | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169509 | 3068 | 1 | Correction to NS_24 and NS_25 TC 6.6.3.3 test requirements | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169510 | 3108 | 1 | Correction of test description for NS_05 A-MPR | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169511 | 3109 | 1 | Correction of test description for NS_05 Additional spurious emissions | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169512 | 3138 | 1 | Correction of power tolerance in A-MPR TC | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169513 | 3196 | 1 | Update TC 6.6.3.3A.1 to remove editor's notes and modify additional requirements for CA_NS_07 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169514 | 3097 | 1 | Addition of missing CA_7A-8A for Refsens test | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169519 | 3043 | 1 | Introduction of new NB-IoT RF test case 6.3.3F for category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169520 | 3212 | 1 | Addition of demod test case for NPDSCH with In-band mode | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169521 | 3074 | 1 | Update to test case 6.3.5F.2 Power Control Relative power tolerance for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169522 | 3076 | 1 | Update to test case 7.8.1F Wide band Intermodulation UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169523 | 3214 | 1 | Update to Annex H | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169524 | 3099 | 1 | Supplementation of test case 6.7F for Transmit Intermodulation for UE category NB1 | 14.0.0 | 14.1.0 |

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| 2016-12 | RAN#74 | R5-169525 | 3177 | 1 | Updates in test case 6.6.3F.1, Transmitter Spurious emissions for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169526 | 3185 | 1 | Corrections for NB-IoT Rx test cases in TS 36.521-1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169527 | 3186 | 1 | Corrections for NB-IoT Tx test cases in TS 36.521-1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169528 | 3227 | 1 | Addition of demod test case for NPDCCH with In-band mode | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169531 | 3056 | 1 | Corrections to TC 7.3A.9 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169532 | 3078 | 1 | Add New TC of 9.6.1.3.3 for TDD FDD CQI Reporting under AWGN conditions - PUCCH 1-0 for FDD PCell (4DL CA) | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169533 | 3079 | 1 | Add New TC of 9.6.1.4.3 for TDD FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD Pcell | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169535 | 3089 | 1 | Addition of the new TC 8.7.5.1.3 TDD FDD CA Sustained data rate performance for FDD PCell (4DL CA) | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169536 | 3091 | 1 | Addition of the new TC 8.2.3.1.1.3 TDD FDD CA PDSCH Single Antenna Port Performance for FDD PCell (4DL CA) | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169537 | 3092 | 1 | Addition of the new TC 8.7.5.1_H.3 TDD FDD CA Sustained data rate performance for FDD PCell (4DL CA) for 256QAM in DL | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169539 | 3111 | 1 | New CA band combination CA_1A-11A-18A - Updates of 7.3A Refsens | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169541 | 3112 | 1 | New CA band combination CA_41C-42C - Updates of 7.3A Refsens | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169543 | 3113 | 1 | New CA band combinations CA_1A-18A, 1A-26A, 1A-28A, 1A-42A and 18A-28A - Updates of 6.2.2A UE maximum output power | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169544 | 3117 | 1 | New CA band combinations CA_1A-18A, 1A-26A, 1A-28A, 1A-42A and 18A-28A - Updates of 6.6.3.1A Transmitter Spurious emissions | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169545 | 3118 | 1 | New CA band combinations CA_1A-18A, 1A-26A, 1A-28A, 1A-42A and 18A-28A - Updates of 6.6.3.2A Spurious emission band UE co-existence | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169546 | 3137 | 1 | Introduction of exception for CA_4A-12A-30A in Refsense TC | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169550 | 3164 | 1 | Correction of CA_42-42 sub-block CA configuration | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169567 | 2994 | 1 | Updates of 7.3A Refsens for CA_1A-3A-41A | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169568 | 3049 | 1 | Updated of Delta Rib tables in clause 7.3.3 for all Rel-14 CA configurations | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169569 | 3050 | 1 | Updated of Reference sensitivity level in clause 7.3A.0 for all Rel-14 CA configurations | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169570 | 3086 | 1 | Updates of the test point of the TC 6.6.2.3EA ACLR for UE category M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169571 | 3125 | 1 | Correction to Rx test cases for Cat M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169572 | 3228 | 1 | Update of CA operating bands and bandwidth for all CA configurations as per TS 36.101 v14.1.0 | 14.0.0 | 14.1.0 |
| ~~2016-12~~ | ~~RAN#74~~ | ~~R5-169573~~ | ~~3180~~ | ~~1~~ | ~~Introduction of FDD and Half-Duplex FDD Demodulation of MPDCCH in CE Mode B Test Case~~ (not implementable) | ~~14.0.0~~ | ~~14.1.0~~ |
| ~~2016-12~~ | ~~RAN#74~~ | ~~R5-169574~~ | ~~3183~~ | ~~1~~ | ~~Introduction of TDD Demodulation of MPDCCH in CE Mode B Test Case~~ (not implementable) | ~~14.0.0~~ | ~~14.1.0~~ |
| 2016-12 | RAN#74 | R5-169610 | 3170 | 1 | Introduction of NAICS demod test cases 8.3.1.1.5 (FDD) and 8.3.2.1.6 (TDD) | 14.0.0 | 14.1.0 |

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| 2016-12 | RAN#74 | R5-169612 | 3022 | 1 | Introduction of ProSe Transmit Off power Test case 6.3.3D.1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169613 | 3060 | 1 | Updates to ProSe Receiver TCs | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169615 | 3013 | 1 | Update of TC 6.6.3.2A.2 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169616 | 3055 | 1 | Corrections to TC 7.3A.6 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169620 | 3008 | 1 | update Annex A with 4Rx RMCs | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169621 | 3011 | 1 | Addition of new 4Rx Test Case – TDD PMI reporting | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169622 | 3012 | 1 | Addition of new 4Rx Test Case - TDD FDD CA SDR (2DL CA) | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169623 | 3023 | 1 | Introduction of 4Rx new test case “FDD sustained data rate performance 4X4” | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169624 | 3024 | 1 | Introduction of 4Rx new test case “TDD sustained data rate performance 4X4” | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169625 | 3025 | 1 | Introduction of new 4Rx test case 9.9.2.1.1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169626 | 3026 | 1 | Introduction of new 4Rx test case 9.9.2.1.2 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169627 | 3027 | 1 | Introduction of new 4Rx test case 9.9.2.2.1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169628 | 3028 | 1 | Introduction of new 4Rx test case 9.9.2.2.2 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169629 | 3030 | 1 | Update connection diagram for PCFICH/PDCCH performance with 4Rx antenna ports | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169630 | 3031 | 1 | Update to FDD PHICH Single-antenna Port Performance 1x4 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169631 | 3032 | 1 | Update to FDD PHICH Transmit Diversity 2x4 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169632 | 3033 | 1 | Update to FDD PHICH Transmit Diversity 4x4 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169633 | 3034 | 1 | Update to TDD PHICH Single-antenna Port Performance 1x4 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169634 | 3035 | 1 | Update to TDD PHICH Transmit Diversity 2x4 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169635 | 3036 | 1 | Update to TDD PHICH Transmit Diversity 4x4 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169636 | 3046 | 1 | Update Reference sensitivity for additional requirement and TC7.3_1 test requirement | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169637 | 3054 | 1 | Updates to 4 Layer Spatial Multiplexing TCs | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169638 | 3110 | 1 | Correction of FDD and TDD Open-loop spatial multiplexing TCs with 3 Layer Multiplexing with 4 Tx Antenna Ports | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169639 | 3123 | 1 | Correction to 4Rx demodulation tests | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169640 | 3178 | 1 | Introduction of FDD 4Rx PDSCH demodulation test cases | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169650 | 3065 | 1 | Band 70 introduction to 36.521-1 receiver requirements | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169652 | 3156 | 1 | Introduction of Band 41 HPUE Maximum Output Power | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169653 | 3157 | 1 | Introduction of Band 41 HPUE Maximum Output Power for CA | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169654 | 3158 | 1 | Introduction of Band 41 HPUE Maximum Output Power for UL-MIMO | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169655 | 3159 | 1 | Introduction of Band 41 HPUE Maximum Power Reduction | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169656 | 3168 | 1 | Introduction of Power Class 2 in test case 6.2.5_1 Configured UE transmitted Output Power for HPUE | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169657 | 3169 | 1 | Addition of TDD RMC for UL-DL configuration 0 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169659 | 3136 | 1 | Correction of CQI Reporting under AWGN conditions - PUCCH 1-1 (Cell-Specific Reference Symbols) TC | 14.0.0 | 14.1.0 |

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| 2016-12 | RAN#74 | R5-169660 | 3059 | 1 | Updates to SEM Test Case for category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169662 | 3106 | 1 | Correction to EPDCCH SDR tests | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169665 | 3122 | 1 | Corrections to 256QAM sustained data rate performance test cases | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169666 | 3082 | 1 | Introduction of Rel-13 CA new test case “TDD Sustained data rate performance for CA (4DL CA)” | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169667 | 3114 | 1 | New CA band combinations CA_1A-18A, 1A-26A, 1A-28A, 1A-42A and 18A-28A - Updates of 6.2.4A Additional Maximum Power Reduction (A-MPR) | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169668 | 3116 | 1 | New CA band combinations CA_1A-18A, 1A-26A, 1A-28A, 1A-42A and 18A-28A - Updates of 6.6.2.2A Additional Spectrum Emission Mask | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169669 | 3119 | 1 | New CA band combinations CA_1A-18A, 1A-26A, 1A-28A, 1A-42A and 18A-28A - Updates of 6.6.3.3A Additional spurious emissions | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169671 | 3220 | 1 | Addition of CA band combinations into TC 7.3A.9 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169672 | 3221 | 1 | Update of 4DL CA RX Test Cases | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169675 | 3203 | 1 | Addition of new case FDD RI Reporting- PUCCH 1-1 4x4 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169676 | 3204 | 1 | Addition of new case TDD RI Reporting- PUSCH 3-1 4x4 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169677 | 3206 | 1 | Addition of new case FDD RI Reporting- PUCCH 1-1 for eDL-MIMO 1x4 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169678 | 3207 | 1 | Addition of new case TDD RI Reporting- PUCCH 1-1 for eDL-MIMO 1x4 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169681 | 3160 | 1 | Update some receiver test cases to add LAA band combinations | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169682 | 3202 | 1 | Update test case 7.8.1A.3 to add LAA band combinations | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169683 | 3044 | 1 | Updated to RF test case 6.3.4F.1 for Category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169684 | 3045 | 1 | Introduction of new NB-IoT RF test case 6.3.4F.2 for category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169686 | 3075 | 1 | Update to test case 7.7F Spurious response for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169687 | 3088 | 1 | Updates of the TC 6.6.3F.2 Spurious emission band UE co-existence for category NB1 UE | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169688 | 3098 | 1 | Supplementation of test case 6.6.2.3F for ACLR for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169689 | 3100 | 1 | Update of test case 6.6.1F Occupied bandwidth for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169690 | 3101 | 1 | Update of test case 6.6.2.1F Spectrum Emission Mask for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169691 | 3102 | 1 | Update of test case 6.5.2.3F In-band emissions for non allocated RB for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169692 | 3124 | 1 | Update Adjacent Channel Selectivity (ACS) for UE category NB1 test case 7.5F | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169693 | 3176 | 1 | Updates in test case 6.2.3F, Maximum Power Reduction (MPR) for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169694 | 3225 | 1 | Update of Test Case 6.5.1F Frequency Error for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169696 | 3017 | 1 | 6.5.2.1F.1 Error Vector Magnitude (EVM) for NB-IoT | 14.0.0 | 14.1.0 |

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| 2016-12 | RAN#74 | R5-169697 | 3018 | 1 | 6.5.2.2F Carrier leakage for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169699 | 2996 | 1 | Updates to HD-FDD scheduling pattern for cat M1 RMCs in annex A | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169700 | 2998 | 1 | Update test case: 8.11.1.1.1, FDD Closed-loop spatial multiplexing performance for UE category M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169701 | 2999 | 1 | New test case: 8.11.1.1.2, FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169702 | 3000 | 1 | New test cases: 8.11.1.1.3, FDD PDSCH Transmit Diversity 2x1 for UE category M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169703 | 3001 | 1 | New test case: 8.11.1.2.1, TDD Closed-loop spatial multiplexing performance for UE category M1 (Cell-Specific Reference Symbols) | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169704 | 3002 | 1 | New test case: 8.11.1.2.2, TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169705 | 3003 | 1 | New test case: 8.11.1.2.3, TDD PDSCH Transmit Diversity for UE category M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169706 | 3005 | 1 | Updating eMTC test case 9.8.1.1, FDD and Half duplex FDD CQI reporting definition under AWGN conditions for UE category M1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169707 | 3004 | 1 | New test case: 8.11.1.2.3_1, TDD PDSCH Transmit Diversity for UE category M1 (CEModeB) | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169713 | 3131 | 1 | Correction to PCC SCC frequency mapping for CA_66A-66A | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169715 | 3132 | 1 | Correction of UL RMC for sustained data rate CA test cases | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169716 | 3162 | 1 | Update test procedure 9.2.1.5_E.1 and 9.2.1.6_E.1 test cases to align it with minimum conformance requirements | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169719 | 3081 | 1 | Introduction of Rel-13 CA new test case “FDD Sustained data rate performance for CA (5DL CA)” | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169720 | 3083 | 1 | Introduction of Rel-13 CA new test case “FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (5DL CA)” | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169721 | 3104 | 1 | Introduction of new TC 8.2.2.1.1_A.3 4DL CA | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169722 | 3222 | 1 | New TC: FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for 5DL CA | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169723 | 3223 | 1 | New TCs: TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for 4DL CA | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169730 | 3121 | 2 | Correction to test points for test cases refer to 6.2.3A | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169732 | 3073 | 2 | Update to test case 6.3.5F.1 Power Control Absolute power tolerance for UE category NB1 | 14.0.0 | 14.1.0 |
| 2016-12 | RAN#74 | R5-169735 | 3166 | 2 | Update test requirements for test case 6.6.3.2A.1 | 14.0.0 | 14.1.0 |
| 2017-03 | RAN#75 | R5-170604 | 3238 | - | Update 4Rx test cases 9.9.4.1.1/9.9.4.1.2/9.9.4.2.1/9.9.4.2.2 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170606 | 3239 | - | Update 4Rx test cases 9.9.4.1.1/9.9.4.1.2/9.9.4.2.1/9.9.4.2.2 information in Annex F and G. | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170627 | 3249 | - | Resubmission of R5-170017 Update of editor's note in NB-IoT receiver RF tests related to scheduling pattern issue | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170630 | 3250 | - | Resubmission of R5-170073 Update of editor's note in NB-IoT transmitter RF tests related to scheduling pattern issue | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170631 | 3251 | - | Resubmission of R5-170074 Update of test parameters for NPDCCH tests | 14.1.0 | 14.2.0 |

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| 2017-03 | RAN#75 | R5-170632 | 3252 | - | Resubmission of R5-170328 New TC 6.3.5F.3 Aggregate power control tolerance for category NB1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170633 | 3253 | - | Resubmission of R5-170333 Introduction of RMCs for NB-IoT demodulation tests | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170641 | 3258 | - | Update of TC 6.6.2.3_1 Adjacent Channel Leakage power Ratio for HPUE | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170694 | 3269 | - | Updates of the CQI reporting TC 9.6.1.4.2 for TDD FDD CA | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170750 | 3273 | - | Correction of typos in test cases 6.3.5.1, 6.3.5A.1.1, 6.3.5A.1.2, 6.3.5A.1.3, 6.3.5B.1, 6.3.5E.1 and 6.3.5EA.1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170751 | 3274 | - | Update to test cases 6.5.1D.1 and 6.5.1D.2 Frequency error for ProSe | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170757 | 3276 | - | Uncertainties and Test Tolerances update to FDD and TDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A 1x4 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170758 | 3277 | - | Uncertainties and test tolerances update to FDD and TDD CQI Reporting under fading conditions - PUCCH 1-1 - Enhanced Performance Requirement Type A 2x4 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170760 | 3278 | - | Update of test cases 8.7.9 and 8.7.10 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170762 | 3279 | - | Update of test cases 8.7.1.1_A.5, 8.7.2.1_A.3 and 9.6.1.1_A.4 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170774 | 3280 | - | Beamforming model missing in chapter 9 TM9 receiver type A tests | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170806 | 3287 | - | Correction of number of EREGs per ECCE for special subframe mentioned in TC 8.7.4 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170811 | 3291 | - | Correction of description of TC 8.2.2.4.2_1 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 (Release 9 and Forward) | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170813 | 3292 | - | Introduction of Minimum Test time for R.73 TDD | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170814 | 3293 | - | Update of Mapping of CQI Index to Modulation Coding Scheme | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170816 | 3295 | - | Correction of release of TC Error Vector Magnitude (EVM) for CA (inter-band DL CA and UL CA) for UL 64QAM | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170823 | 3296 | - | Removal of the power class restriction in the test applicability for Test Cases 6.2.2A.1 and 6.2.2A.2 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170894 | 3304 | - | Correction to feICIC CQI TCs | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170895 | 3305 | - | Annex E: Updates for NB-IoT | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170896 | 3306 | - | Annex E: Update to averaged EVM for D2D | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170897 | 3307 | - | Update of requirements in TC 6.2.2A.2 for CA_2A-5A and CA_2A-12A | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170905 | 3310 | - | Re-addition of Band 41 HPUE Maximum Output Power | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170908 | 3312 | - | Update of TC 6.6.3.3A.2 for CA_2A-5A and CA_2A-12A | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170909 | 3313 | - | Update of TC 6.6.2.2A.2 for CA_2A-5A and CA_2A-12A | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170910 | 3314 | - | Update of TC 6.6.2.2A.2_1 for CA_2A-5A and CA_2A-12A | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170911 | 3315 | - | Correction of RB allocation in TC 6.2.5A.3 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170912 | 3316 | - | Correction of RB allocation in TC 6.6.2.1A.2 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170914 | 3317 | - | Corrected test requirements for TC 6.2.3A.2_1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170915 | 3318 | - | Correction to configuration table in TC 6.7A.2 | 14.1.0 | 14.2.0 |

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| 2017-03 | RAN#75 | R5-170919 | 3321 | - | Update of applicability for 4Rx CQI reporting under AWGN tests | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170949 | 3324 | - | Addition of CA_2A-66A and CA_5A-66A in TS 36.521-1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170957 | 3326 | - | Update to test case 7.6.1F In-band blocking for category NB1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170958 | 3327 | - | Update to test case 7.6.2F Out-of-band blocking for category NB1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-170996 | 3332 | - | New CA band combinations CA_1A-18A, 1A-26A, 1A-28A, 1A-42A and 18A-28A - Updates of 7.3A.6 REFSENS | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171006 | 3334 | - | Update test configuration and requirement for CA_8B in clause 6 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171010 | 3336 | - | Update RF general section for V2X information | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171040 | 3347 | - | Update of test tolerance of 4-Rx TDD Type A demod test cases | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171085 | 3353 | - | Addition of applicability and test rules for CA UE demodulation tests with 4DL and 5DL CCs | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171092 | 3360 | - | Addition of CA configuration CA_4A-5A-29A for Refsens test | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171094 | 3362 | - | Addition of CA configuration CA_20A-31A for Refsens test | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171095 | 3363 | - | Addition of CA configuration CA_7A-42A and CA_28A-40A for Refsens test | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171097 | 3365 | - | Addition of for CA_20A-42A and CA_20A-42A-42A Refsens test | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171098 | 3366 | - | Addition of for CA_40C Set 1 Refsens test | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171153 | 3368 | - | Update receiver test cases to remove DCI format 1C | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171161 | 3369 | - | Editorial correction in reference clause numbering for TC 6.3.4A.1.1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171162 | 3370 | - | Update test configuration table and requirement for CA_8B in clause 7 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171165 | 3371 | - | Addition of 7.4A.3_H and 7.4A.4_H to Annex F | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171167 | 3373 | - | Clean up on clause 7 256QAM test cases | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171178 | 3382 | - | Addition of Downlink Reference measurement channel for Cat-M1 TX characteristics | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171182 | 3383 | - | Clean up on Tx test cases for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171183 | 3384 | - | Correction to general and additional Tx spurious for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171184 | 3385 | - | Correction to HD-FDD PDSCH scheduling pattern for UE category M1 RMC | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171185 | 3386 | - | Correction to PUSCH-EVM with exclusion period for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171186 | 3387 | - | Correction to Power control test cases for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171187 | 3388 | - | Correction to ON/OFF time mask for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171188 | 3389 | - | Clarification of test requirement for test cases 6.2.2A.1, 6.2.4A.1 and 6.2.4A.1_1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171190 | 3391 | - | Correction to additional spurious emissions test | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171191 | 3392 | - | Correction to test procedure for test case 7.9A | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171201 | 3396 | - | Editorial correction in test case 6.3.5A.2.2 | 14.1.0 | 14.2.0 |

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| 2017-03 | RAN#75 | R5-171202 | 3397 | - | Alignment frequency ranges in TC 6.6.3.1A.2 for CA_3A-26A and CA_5A-17A to TR 36.905 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171203 | 3398 | - | Correction in configuration IDs for NS_24 in test cases 6.2.4_2 and 6.6.3.3_1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171226 | 3401 | - | Update of Annex C to include 4 antenna ports in UE | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171227 | 3402 | - | Adding support for 4 Rx antenna port UEs in Receiver test cases | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171234 | 3406 | - | Update of Reference Sensitivity test case for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171237 | 3409 | - | Correction to test case 7.3F.2, Reference sensitivity level with repetitions for category NB1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171238 | 3410 | - | Correction to test case header in 8.11.1.1.1, 8.11.1.1.2, 8.11.1.1.3 and 8.11.1.1.3_1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171247 | 3419 | - | Update of Frequency error test case for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171315 | 3435 | - | Clean up in test case 6.6.2.1A.2 to remove additional spectrum emission requirements | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171349 | 3437 | - | Correction to NS_24 and NS_25 test configurations to align use of Ful | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171514 | 3439 | - | Update TT of the TC 8.2.3.1.1.3 TDD FDD CA PDSCH Single Antenna Performance for FDD PCell(4DL CA) | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171700 | 3248 | 1 | Clean up editor's note for UL 64QAM | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171701 | 3390 | 1 | Correction to UL CA Tx tests | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171707 | 3230 | 1 | Updates of 7.3A Refsens for CA_1C-3A | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171708 | 3297 | 1 | Introduction of CA_3A-11A to section 7 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171709 | 3298 | 1 | Introduction of CA_8A-28A to section 7 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171711 | 3300 | 1 | Introduction of 3DL/1UL of CA_1A-8A-28A to section 7 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171714 | 3301 | 1 | Introduction of 3DL/1UL of CA_3A-8A-28A to section 7 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171717 | 3302 | 1 | Introduction of 3DL/1UL of CA_3A-28A-41A to section 7 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171719 | 3438 | 1 | CA_29A-66A, CA_29A-66A-66A, CA_29A-66C, CA_46A-66A Reference Sensitivity requirements | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171725 | 3330 | 1 | Updates of 6.6.3.2 Spurious emission band UE co-existence for Band 5 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171733 | 3322 | 1 | LAA: Applicability and test selection update to Section 8 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171734 | 3270 | 1 | Annexure update for LAA RF | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171735 | 3328 | 1 | Update of test case 7.6.1A.3 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171736 | 3367 | 1 | Update test case 7.5A.3 to add LAA band combinations | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171748 | 3404 | 1 | Test tolerance for NAICS demod test cases with CRS interference | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171752 | 3329 | 1 | Updates to test tolerances and test uncertainty for 4Rx TCs | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171753 | 3271 | 1 | LAA Uncertainties and Test Tolerances for Test Case 7.8.1A.3 Intermodulation for CA, inter band DL CA | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171754 | 3320 | 1 | LAA: Test case and test tolerance addition for Dual Layer DM-RS demod | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171787 | 3265 | 1 | Update to MPDCCH demod test cases in CE Mode A | 14.1.0 | 14.2.0 |

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| 2017-03 | RAN#75 | R5-171788 | 3289 | 1 | Correction of DCI format in MTCe2 TCs and PDSCH and MPDCCH configuration | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171790 | 3378 | 1 | Clean up on TRx TCs for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171791 | 3379 | 1 | Correction to Carrier leakage and In-band emissions for Cat-M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171792 | 3380 | 1 | Correction to Carrier leakage and In-band emissions | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171793 | 3412 | 1 | New eMTC test case 9.8.2.1, FDD and half-duplex FDD UE-selected subband CQI for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171794 | 3414 | 1 | New eMTC test case 9.8.2.2, TDD UE-selected subband CQI for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171795 | 3416 | 1 | New eMTC test case 9.8.1.2, TDD CQI reporting definition under AWGN conditions for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171796 | 3408 | 1 | Correction to test case 9.8.1.1, FDD and Half duplex FDD CQI reporting definition under AWGN conditions for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171813 | 3266 | 1 | Introduction of FDD and Half-Duplex FDD Demodulation of MPDCCH in CE Mode B Test Case | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171814 | 3267 | 1 | Introduction of TDD Demodulation of MPDCCH in CE Mode B Test Case | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171817 | 3235 | 1 | Addition of bandwidth combinations 10+5+10MHz and 20+10+5+10MHz in Chapter 8 FDD 3CA and 4CA test cases | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171818 | 3237 | 1 | Addition of bandwidth combinations 10+10+ 5MHz and 20+10+10+5MHz in TC 9.6.1.1_A.2 and 9.6.1.1_A.3 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171819 | 3240 | 1 | Addition of CA_2A-5A-12B test configuration and reference sensitivity in TC 7.3A.9. | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171821 | 3233 | 1 | Addition of CA_1A-3A-28A in 36.521-1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171823 | 3241 | 1 | Addition of CA_2A-4A-30A test configuration and reference sensitivity in TC 7.3A.5. | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171825 | 3243 | 1 | Addition of CA_2A-4A-12A-30A test configuration and reference sensitivity in TC 7.3A.9. | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171829 | 3242 | 1 | Addition of CA_5A-12B test configuration and reference sensitivity in TC 7.3A.5. | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171832 | 3260 | 1 | Addition of CA_2A-4A-5A-12A test configuration and reference sensitivity in TC 7.3A.9 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171834 | 3261 | 1 | Addition of CA_2C-12A-30A test configuration and reference sensitivity in TC 7.3A.9 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171837 | 3263 | 1 | Addition of CA_2C-30A test configuration and reference sensitivity in TC 7.3A.5 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171838 | 3255 | 1 | Addition of CA_2A-2A-4A-5A in subclause 7.3A.9 of 36.521-1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171839 | 3256 | 1 | Addition of CA_2A-2A-5A-12A in subclause 7.3A.9 of 36.521-1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171840 | 3257 | 1 | Addition of CA_2A-2A-12B in subclause 7.3A.9 of 36.521-1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171842 | 3308 | 1 | Update of TC 6.2.4A.2 for CA_2A-5A and CA_2A-12A | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171844 | 3331 | 1 | CA band combinations 1A-18A, 1A-26A, 1A-28A, 1A-42A and 18A-28A - Updates of 6.6.3.2A Spurious emission band UE co-existence | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171846 | 3309 | 1 | Update of TC 6.2.4A.2_1 for CA_2A-5A and CA_2A-12A | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171847 | 3311 | 1 | New test points in transmit modulation tests for CA_2A-5A and CA_2A-12A | 14.1.0 | 14.2.0 |

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|---|---|---|---|---|---|---|---|
| 2017-03 | RAN#75 | R5-171848 | 3426 | 1 | Update of 4DL CA Test Cases | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171851 | 3341 | 1 | Addition of the new TC 8.2.3.1.1.4 TDD FDD CA PDSCH Single Antenna Performance for FDD PCell(5DL CA) | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171852 | 3351 | 1 | Addition of the new TC 8.7.5.1_H.4 TDD FDD CA Sustained data rate performance for FDD PCell (5DL CA) for 256QAM in DL | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171853 | 3375 | 1 | Clean up on clause 7 CA test cases | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171860 | 3433 | 1 | Correction to Rel 13 CA_5A-5A RF Test Cases Section 7 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171861 | 3358 | 1 | Addition of CA configuration CA_3A-40C, CA_3A-41C, CA_28A-40C for Refsens test | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171862 | 3359 | 1 | Addition of CA configuration CA_4A-28A for Refsens test | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171863 | 3361 | 1 | Addition of CA configuration CA_7A-42A-42A for Refsens test | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171864 | 3342 | 1 | Addition of the new TC 8.2.3.1.2.3 TDD FDD CA PDSCH Single Antenna Performance for TDD PCell(4DL CA) | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171865 | 3343 | 1 | Addition of the new TC 8.2.3.1.2.4 TDD FDD CA PDSCH Single Antenna Performance for TDD PCell(5DL CA) | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171866 | 3344 | 1 | Addition of the new TC 8.2.2.3.1_A.3 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (4DL CA) | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171867 | 3354 | 1 | Addition of for FDD PDSCH Single Antenna Port Performance for CA (4DL CA) (8.2.1.1.1_A.4) | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171868 | 3355 | 1 | Addition of for FDD PDSCH Single Antenna Port Performance for CA (5DL CA) (8.2.1.1.1_A.5) | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171869 | 3356 | 1 | Addition of for FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (4DL CA) (8.2.1.3.1_A.3) | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171870 | 3357 | 1 | Addition of for FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (5DL CA) (8.2.1.3.1_A.4) | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171871 | 3372 | 1 | Clarification of test points for sustained data rate test | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171872 | 3400 | 1 | Introduction of new Dual Connectivity test cases - Power Control Relative power tolerance | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171875 | 3282 | 1 | Addition of Band 47 for UE maximum output power for V2X Communication | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171876 | 3284 | 1 | Introduction of UE maximum output power with additional requirements for V2X Communication | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171877 | 3285 | 1 | Introduction of 6.2.5G Configured transmitted power for V2X Communication | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171878 | 3286 | 1 | Introduction of 6.3.4G.1 General ON/OFF time mask for V2X Communication | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171879 | 3337 | 1 | Add Operating bands, channel bandwidth and RMC for V2X | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171880 | 3427 | 1 | Introduction of Reference sensitivity level for V2X | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171881 | 3428 | 1 | Introduction of Maximum input level for V2X | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171882 | 3429 | 1 | Introduction of Adjacent Channel Selectivity (ACS) for V2X | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171883 | 3430 | 1 | Introduction of In-band blocking for V2X | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171884 | 3431 | 1 | Introduction of Out-of-band blocking for V2X | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171885 | 3432 | 1 | Introduction of Spurious response for V2X | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171887 | 3288 | 1 | Correction of payload in fixed reference channel for CDM-multiplexed DM RS with four CSI-RS antenna ports | 14.1.0 | 14.2.0 |

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| 2017-03 | RAN#75 | R5-171888 | 3350 | 1 | Updates to legacy CSI test cases to include 4Rx UE | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171889 | 3376 | 1 | Correction to 3 or 4 layers 4Rx demodulation tests | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171890 | 3403 | 1 | Introduction of TDD 4Rx PDSCH demodulation test cases | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171896 | 3303 | 1 | Power Class 2: Update to A-MPR for NS_04 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171897 | 3268 | 1 | Updates of the SDR TC 8.7.5.2.2 and 8.7.5.2_H.2 for TDD FDD CA | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171898 | 3425 | 1 | Update of test configuration table of 4DL CA | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171916 | 3236 | 1 | TDD FDD CA Sustained data rate performance for TDD PCell (4DL CA) | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171917 | 3424 | 1 | Update of test configuration table of 3DL CA | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171918 | 3281 | 1 | Introduction to Performance test case 8.7.5.1.4 TDD FDD CA Sustained data rate performance for FDD PCell (5DL CA) | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171919 | 3345 | 1 | Introduction of LAA Closed-Loop spatial multiplexing performance test cases for 4Tx antenna ports | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171921 | 3348 | 1 | Test Tolerance updates to CQI reporting with enhanced receiver typeB test case | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171922 | 3246 | 1 | Update of NPDCCH single-antenna demodulation test | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171923 | 3247 | 1 | Update of NPDSCH demodulation test in standalone and Guard-band | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171924 | 3339 | 1 | Updates to In-band mode NPDSCH and NPDCCH Demodulation Performance tests for category NB1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171932 | 3381 | 1 | Correction to PDSCH demodulation test cases for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171934 | 3299 | 1 | Introduction of CA_11A-28A to section 7 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171936 | 3283 | 1 | Introduction of UE maximum output power for modulation / channel bandwidth for V2X Communication | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171937 | 3231 | 1 | Update TS 36.521-1 with Addition of LTE Band 48 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171938 | 3399 | 1 | Addition configuration IDs to test case 6.2.3A.1_1 for CA configuration 10+20 MHz | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171940 | 3393 | 1 | Correction to TDD FDD 2CA Soft buffer test cases | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171941 | 3352 | 1 | Add minimum testing time in Annex G for SCE performance requirements | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171942 | 3349 | 1 | Updates to legacy demod test cases to include 4Rx UE | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171945 | 3440 | - | Band 41 HPUE Maximum Output Power | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171946 | 3441 | - | Adjacent Channel Leakage power Ratio for HPUE | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171949 | 3442 | 1 | Update of RMCs for NB-IoT RF tests | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171963 | 3275 | 2 | Update to test case 6.3.5F.2 Power Control Relative power tolerance for UE category NB1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171967 | 3377 | 2 | Correction to Aggregate power control tolerance for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171968 | 3417 | 2 | Update of RMCs for UE category M1 in Annex A | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171969 | 3420 | 2 | Minimum requirements updates in section 8.11 test case for UE category M1 | 14.1.0 | 14.2.0 |
| 2017-03 | RAN#75 | R5-171997 | 3405 | 2 | Introduction of LAA PDCCH/PCFICH demodulation test case with FDD Pcell | 14.1.0 | 14.2.0 |

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| 2017-06 | RAN#76 | R5-172116 | 3447 | | NB-IoT bands 11, 25, 31, and 70 introduction to receiver requirements | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172142 | 3450 | | Uncertainties and Test Tolerances for new LAA Test Cases - CQI reporting / PUSCH 3-1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172196 | 3457 | | Correction to typos in UL-MIMO test cases 6.3.2B | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172198 | 3458 | | Clarification to measurement of SEM in test procedure of TC 6.6.2.1A.2 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172199 | 3459 | | Introduction of switched case for inter-band CA transmit modulation test cases | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172200 | 3460 | | Introduction of switched case for TC 6.5.2A.1.2_1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172201 | 3461 | | Update of test requirements in TC 7.3A.3 for missing CA configurations | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172203 | 3463 | | Update of TC 7.3_1 to align with minimum conformance requirements | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172206 | 3464 | | Update of TC 6.6.2.2A.2 for CA_2A-5A and CA_2A-12A | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172207 | 3465 | | Update of TC 6.6.3.3A.2 for CA_2A-5A and CA_2A-12A | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172214 | 3467 | | Remove content of SDR test cases for 4Rx | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172216 | 3468 | | Update of requirements in TC 6.2.2A.2 for new Rel-14 CA configurations | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172219 | 3471 | | Update of test requirements in TC 6.6.3.1A.2 for new Rel-14 CA configurations | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172221 | 3473 | | Update of initial conditions in TC 6.6.3.3A.2 for new Rel-14 CA configurations | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172224 | 3476 | | Update of test requirements in TC 7.3A.6 for new Rel-14 CA configurations | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172255 | 3477 | | Update of the TC about TDD FDD CA Sustained data rate performance | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172260 | 3478 | | Update of the TC 7.3A.5 REFSENS for 3DL CA (CA_1A-19A-42A, 1A-21A-42A, 19A-21A-42A) | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172307 | 3488 | | Update to the Dual Connectivity performance test cases | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172345 | 3494 | | Alignment of Fixed Reference Channel two antenna ports for UE category M1 to TS 36.101 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172347 | 3495 | | Invalid csi-ReportMode-r10 in message exceptions of CSI reporting for 4Rx UE TC | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172350 | 3498 | | Correction of UL RMC for 5+10+10 MHz test step in TC 8.7.1.1_A.2 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172351 | 3499 | | Editorial correction of references to tables in clause UE category M1 TCs | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172352 | 3500 | | Editorial correction of test case heading | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172353 | 3501 | | Removal of duplicate Test step in TC 8.2.3.1.2.3 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172359 | 3504 | | Update to chapter 8 & 9 PCC/SCC frequency mapping | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172360 | 3505 | | Editorial update to Annex G for DL 256QAM | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172362 | 3506 | | New eMTC test case 6.5.1EA_1, Frequency Error for UE category M1 (CE Mode B) | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172374 | 3516 | | Align CA capability definitions for demodulation test cases in sub-clause 8.1.2.2 with TS 36.101 v14.3.0 | 14.2.0 | 14.3.0 |

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|---|---|---|---|---|---|---|---|
| 2017-06 | RAN#76 | R5-172375 | 3517 | | Align CA delta RIB in sub-clause 7.3.3 with TS 36.101 v14.3.0 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172376 | 3518 | | Align CA delta TIB in sub-clause 6.2.5.3 with TS 36.101 v14.3.0 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172377 | 3519 | | Align CA minimum requirements for reference sensitivity in sub-clause 7.3A.0 with TS 36.101 v14.3.0 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172392 | 3521 | | Updated to NB-IoT RF tests cases | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172397 | 3524 | | Updated to Table of E-UTRA channel numbers for SDL Band 69 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172422 | 3526 | | Resubmission to update Annex F for test case 7.5A.3 to add LAA band combinations | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172431 | 3528 | | Correction of codebookSubsetRestriction in test case 9.9.1.3.2 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172433 | 3529 | | Updates to FDD and half-duplex FDD demodulation of MPDCCH in CE Mode A and TDD demodulation of MPDCCH in CE Mode A | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172463 | 3540 | | Addition of Annex F for TDD FDD CA PDSCH Open Loop Multiplexing 2x2 Performance Test cases (4 & 5DL CA) | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172487 | 3544 | | Change of UE target power configuration for Carrier leakage and In-band emissions tests | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172527 | 3551 | | Introduction of CA_8A-11A-28A to section 7 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172602 | 3578 | | Addition of Annex G.3A.5 and G.3A.6 for 4DL CA test cases. | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172603 | 3579 | | Removing of redundant editor's note for 4DL CA test cases | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172626 | 3585 | | Correction to message contents for 4DL CA Rx tests | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172628 | 3587 | | Correction to message contents of 4DL CA 8.2.1.4.2_A.3 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172634 | 3589 | | Introducing uncertainty of receiver spurious emission for band 46 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172641 | 3594 | | Correction to Annex A.2 and A.3 for Cat-M1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172644 | 3597 | | Correction to Annex A.4 for Cat-M1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172650 | 3601 | | Correction to spurious emission band UE co-existence test | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172651 | 3602 | | Editorial correction to 6.2.5 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172652 | 3603 | | Correction to message contents of 3DL CA Rx tests | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172656 | 3607 | | Correction to message contents for 2DL CA Rx tests | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172658 | 3609 | | Correction to PMI test for TM9 with 8 TX and with 4TX enhanced codebook | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172710 | 3610 | | Test tolerance and statistical test time addition to 4Rx demodulation test cases | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172715 | 3611 | | Addition of NS_27 for Band 48 in A-MPR test cases | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172718 | 3614 | | Introduction of test case LAA PCFICH/PDCCH Transmit Diversity 2x2 with TDD as Pcell | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172720 | 3616 | | Applicability correction for eDL-MIMO test cases in part 1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172724 | 3617 | | Correction to test case references in tables for applicability and test rules in clause 8.1.2.3 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172814 | 3625 | | Update of minimum conformance requirement in 7.4A.0 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-172824 | 3628 | | Introduction of 8.2.3.2.1.3 TDD FDD CA PDSCH Open Loop Multi Layer Spatial Multiplexing 2x2 for FDD Pcell (4DL CA) | 14.2.0 | 14.3.0 |

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| 2017-06 | RAN#76 | R5-172825 | 3629 | | Introduction of 8.2.3.2.1.4 TDD FDD CA PDSCH Open Loop Multi Layer Spatial Multiplexing 2x2 for FDD Pcell (5DL CA) | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173052 | 3621 | 1 | Updates to legacy CA CQI reporting test cases to include 4Rx UE | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173053 | 3622 | 1 | Updates to legacy single carrier CQI reporting test cases to include 4Rx UE | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173054 | 3623 | 1 | Updates to legacy PMI and RI test cases to include 4Rx UE | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173063 | 3595 | 1 | Correction to CSI tests for Cat-M1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173064 | 3596 | 1 | Correction to MPDCCH aggregation level for Cat-M1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173065 | 3598 | 2 | Correction to Cat-M1 demodulation test cases | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173070 | 3550 | 2 | Introduction of CA_1A-11A-28A to section 7 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173071 | 3557 | 2 | Update of 2DL/1UL of CA_3A-3A and CA_7A-7A to section 7.3A.3 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173072 | 3558 | 2 | Introduction of 3DL/1UL of CA_3A-3A-7A and CA_3A-7A-7A to section 7.3A.5 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173073 | 3559 | 2 | Introduction of 4DL/1UL of CA_3A-3A-7A-7A to section 7.3A.9 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173200 | 3523 | 1 | Updated Test Applicability for TC 6.2.3E | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173201 | 3456 | 1 | Correction to typos in Rx test cases for CA | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173202 | 3522 | 1 | Updated table references related to reference sensitivity in test description and test requirements | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173203 | 3604 | 1 | Correction to UL configuration for REFSENS test for CA_41C and CA_7C | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173204 | 3605 | 1 | Clean up on test configuration tables for intra-contiguous 2CA Rx tests | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173205 | 3493 | 1 | Update of NAICS demodulation TCs | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173206 | 3608 | 1 | Correction to Annex B.2.2 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173209 | 3443 | 1 | Update of test points and test requirements in TC 7.3A.5 for CA_4A-12A-30A | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173210 | 3451 | 1 | New CA band combinations CA_1A-41A-42C and 1A-41C-42A - Updates of 7.3A.9 REFSENS | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173212 | 3452 | 1 | New CA band combinations CA_3C-8A - Updates of 7.3A.5 REFSENS | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173215 | 3472 | 1 | Update of TC 6.6.3.2A.2 for Rel-14 CA configuration CA_2A-7A | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173216 | 3520 | 1 | Align operating bands and Channel bandwidths in sub-clause 5.2, 5.2A, 5.4.2.1 and 5.4.2A with TS36.101 v14.3.0 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173217 | 3527 | 1 | Addition of CA_13A-66A in TS 36.521-1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173220 | 3552 | 1 | Corrections on 3A-28A-41A in Test Configuration Table of section 7.3A.5.4.1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173221 | 3554 | 1 | Introduction of 2UL/2DL CA_41A-42A to section 7 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173223 | 3600 | 1 | Addition of CA configuration CA_66A-66C, CA_xA-66A-66A and CA_66A-66A-xA for Refsens test | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173228 | 3624 | 1 | Test Tolerances and general updates to NB-IoT performance test cases | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173276 | 3448 | 1 | Addition of new LAA Test Case - CQI reporting / PUSCH 3-1 / FDD Pcell | 14.2.0 | 14.3.0 |

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| 2017-06 | RAN#76 | R5-173277 | 3449 | 1 | Addition of new LAA Test Case - CQI reporting / PUSCH 3-1 / TDD Pcell | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173278 | 3525 | 1 | Introduction of LAA Dual-Layer Spatial Multiplexing with DM-RS with TDD as Pcell Test Case | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173279 | 3542 | 1 | Update test case 7.6.2A.3 to add LAA band combinations | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173280 | 3543 | 1 | Update test case 7.7A.3 to add LAA band combinations | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173281 | 3626 | 1 | LAA: Addition of CQI Reporting with FDD as PCELL | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173288 | 3453 | 1 | Introduction to New Rx test case 7.6.3A.8 Narrow band blocking for 5DL CA | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173289 | 3454 | 1 | Introduction to New Rx test case 7.7A.8 Spurious response for 5DL CA | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173290 | 3455 | 1 | Introduction to New Rx test case 7.8.1A.8 Wideband intermodulation for 5DL CA | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173291 | 3466 | 1 | Update of test requirements in TC 7.3A.6 for new Rel-13 CA configurations | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173295 | 3535 | 1 | Introduction of 8.2.3.2.2.3 TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for TDD PCell (4DL CA) | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173296 | 3536 | 1 | Introduction of 8.2.3.2.2.4 TDD FDD CA PDSCH Open Loop Spatial Multiplexing 2x2 for TDD PCell (5DL CA) | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173298 | 3560 | 1 | Correction of 3DL CA & 4DL CA RX TC | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173299 | 3561 | 1 | Introduction of New TC7.3A.10 Reference sensitivity level for 5DL CA | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173301 | 3562 | 1 | Addition of CA_8A-41C in test configuration in TC 7.3A.5 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173302 | 3539 | 1 | Addition of G.3A for TDD FDD CA PDSCH Single Antenna and Open Loop Spatial Multiplexing 2x2 Performance Test cases (4 & 5DL CA) | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173303 | 3555 | 1 | Update of 2DL/1UL of CA_3A-42A, CA_28A-42A, CA_41A-42A and CA_42A-46A to section 7.3A.3 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173305 | 3556 | 1 | Introduction of 3DL/1UL of CA_2A-4A-7A and CA_3A-41A-42A to section 7.3A.5 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173306 | 3618 | 1 | Addition of test case TDD FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for FDD PCell (5DL CA) (9.6.1.3.4) | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173307 | 3619 | 1 | Addition of test case TDD FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for TDD PCell (5DL CA) (9.6.1.4.4) | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173316 | 3510 | 1 | Updates to eMTC test case 8.11.1.1.3, FDD and half-duplex FDD PDSCH Transmit Diversity 2x1 for UE category M1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173317 | 3514 | 1 | Updates to eMTC test case 8.11.1.2.3, TDD PDSCH Transmit Diversity for UE category M1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173318 | 3515 | 1 | Updates to eMTC test case 9.8.1.1, FDD and Half duplex FDD CQI reporting definition under AWGN conditions for UE category M1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173329 | 3496 | 1 | Sending of MaxLayersMimo-r10 IE for 4Rx TCs with more than 2 Layers | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173330 | 3530 | 1 | Updates to legacy FDD PDSCH demod test cases to include 4Rx UE | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173331 | 3531 | 1 | Updates to legacy TDD PDSCH demod test cases to include 4Rx UE | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173332 | 3532 | 1 | Updates to legacy TDD FDD CA PDSCH demod test cases to include 4Rx UE | 14.2.0 | 14.3.0 |

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| 2017-06 | RAN#76 | R5-173333 | 3533 | 1 | Updates to legacy sustained data rate test cases to include 4Rx UE | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173339 | 3612 | 1 | Addition of NS_27 for Band 48 in A-SEM test cases | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173340 | 3613 | 1 | Addition of NS_27 for Band 48 in A-Spurious test cases | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173341 | 3444 | 1 | Correction to Band 70 test frequencies to clarify the use of two duplex spacings | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173342 | 3508 | 1 | Updates to eMTC test case 8.11.1.1.1, FDD and half-duplex FDD Closed-loop spatial multiplexing performance for UE category M1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173343 | 3509 | 1 | Updates to eMTC test case 8.11.1.1.2, FDD and half-duplex FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category M1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173344 | 3512 | 1 | Updates to eMTC test case 8.11.1.2.1, TDD Closed-loop spatial multiplexing performance for UE category M1 (Cell-Specific Reference Symbols) | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173345 | 3513 | 1 | Updates to eMTC test case 8.11.1.2.2, TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 for UE category M1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173346 | 3497 | 1 | eHST RF: Practical and consistent model definition for HST-SFN scenario | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173347 | 3549 | 1 | Introduction of reference channels for enhanced high speed train test | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173348 | 3481 | 1 | Update of the TC 6.6.3F.2 Spurious emission band UE co-existence for category NB1 for Release 14 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173349 | 3581 | 1 | NB-IoT band 70 introduction to transmitter requirements | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173351 | 3446 | 1 | CA_46A-46A-66A, CA_46C-66A Receiver requirements | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173354 | 3482 | 1 | Update to operating bands for V2X Communication | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173355 | 3483 | 1 | Introduction of 6.2.2G UE Maximum Output Power for V2X Communication | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173356 | 3484 | 1 | Update to 6.2.3G.1 Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Contiguous allocation of PSCCH and PSSCH | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173357 | 3485 | 1 | Update to 6.2.4G.1 Additional Maximum Power Reduction (A-MPR) for V2X Communication / Non-concurrent with E-UTRA uplink transmission | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173358 | 3486 | 1 | Update to TC 6.2.5G.1 Configured UE transmitted Output Power for V2X Communication / Non-concurrent with E-UTRA uplink transmission | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173359 | 3489 | 1 | Introduction of 6.2.2G.2 UE Maximum Output Power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173360 | 3490 | 1 | Introduction of 6.2.5G.2 Configured UE transmitted Output Power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173361 | 3492 | 1 | Introduction of 6.2.3G.1.3 Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173370 | 3566 | 1 | Update of 7.3G.1 Reference sensitivity level for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173372 | 3568 | 1 | Introduction of 7.3G.3 Reference sensitivity level for V2X Communication / Intra-band contiguous MCC operation | 14.2.0 | 14.3.0 |

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| 2017-06 | RAN#76 | R5-173373 | 3569 | 1 | Update of 7.4G.1 Maximum input level for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173374 | 3570 | 1 | Introduction of 7.4G.2 Maximum input level for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173375 | 3571 | 1 | Introduction of 7.4G.3 Maximum input level for V2X Communication / Intra-band contiguous MCC operation | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173376 | 3572 | 1 | Update of 7.5G.1 Adjacent channel selectivity (ACS) for V2X Communication / Non-concurrent | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173377 | 3573 | 1 | Introduction of 7.5G.2 Adjacent channel selectivity (ACS) for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173378 | 3574 | 1 | Introduction of 7.5G.3 Adjacent channel selectivity (ACS) for V2X Communication / Intra-band contiguous MCC operation | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173379 | 3575 | 1 | Update of 7.6.1G.1 In-band blocking for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173380 | 3576 | 1 | Introduction of 7.6.1G.2 In-band blocking for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173381 | 3577 | 1 | Introduction of 7.6.1G.3 In-band blocking for V2X Communication / Intra-band contiguous MCC operation | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173382 | 3582 | 1 | Introduction of TC 7.8.1G Wide band Intermodulation for V2X | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173383 | 3583 | 1 | Introduction of TC7.9G Spurious emissions for V2X | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173384 | 3487 | 1 | Correction to the A-SE requirement for Band 41 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173385 | 3469 | 1 | Update of TC 6.2.4A.2 for new Rel-14 CA configurations | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173386 | 3470 | 1 | Update of TC 6.2.4A.2_1 for new Rel-14 CA configurations | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173387 | 3474 | 1 | Update of TC 6.6.2.2A.2 for new Rel-14 CA configurations | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173388 | 3475 | 1 | Update of TC 6.6.2.2A.2_1 for new Rel-14 CA configurations | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173390 | 3553 | 1 | Introduction of 2UL/2DL CA_41A-42A to section 6 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173395 | 3564 | 1 | Addition of CA bands in test configuration in TC 7.3A.5 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173396 | 3565 | 1 | Addition of CA bands in test configuration in TC 7.3A.9 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173397 | 3580 | 1 | Introduction of 3DL/1UL of CA_3A-20A-32A to section 7 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173399 | 3563 | 1 | Addition of CA_12A-66A in test configuration in 7.3A.3 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173400 | 3545 | 1 | Change of UE target power configuration for EVM test | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173401 | 3479 | 1 | Update of the TC 7.3A.9 REFSENS for 4DL CA (CA_1A-3A-19A-42A, 1A-19A-21A-42A, 1A-19A-42C, 1A-21A-42C, 19A-21A-42C) | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173402 | 3534 | 1 | Correction to Test configuration Tables in subclause 7.3A for 3DL CA and 4DL CA | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173403 | 3584 | 1 | Correction to 4DL CA out of band blocking interferer | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173404 | 3620 | 1 | Correction of CA configuration CA_28A-40C Refsens test | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173409 | 3591 | 1 | Clean up on Cat-M1 Rx test cases | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173410 | 3592 | 1 | Clean up on Cat-M1 Tx test cases | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173411 | 3593 | 1 | Correction to spurious emission band UE co-existence for UE category M1 | 14.2.0 | 14.3.0 |

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| 2017-06 | RAN#76 | R5-173417 | 3462 | 1 | Update of legacy Reference Sensitivity CA tests for 4Rx | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173421 | 3507 | 1 | Updates to Annex A and Annex G for eMTC test cases | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173422 | 3511 | 1 | Updates to eMTC test case 8.11.1.1.3_1, FDD PDS and half-duplex FDD CH Transmit Diversity 2x1 for UE category M1 (CEmodeB) | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173423 | 3546 | 1 | Clean up NPDCCH single-antenna performance test | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173424 | 3547 | 1 | Clean up NPDSCH demodulation test in standalone and Guard-band mode | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173427 | 3606 | 1 | Correction to 3DL CA out of band blocking interferer | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173428 | 3590 | 1 | Correction to transmit signal quality tests for category M1 | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173431 | 3502 | 1 | Updates to A-MPR, A-SEM and A-Spur TCs | 14.2.0 | 14.3.0 |
| 2017-06 | RAN#76 | R5-173436 | 3567 | 2 | Introduction of 7.3G.2 Reference sensitivity level for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 14.2.0 | 14.3.0 |
| 2017-09 | RAN#77 | R5-173529 | 3630 | - | Correction of Test Settings for CA_4A-12A-30A in TC 7.3A.5 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173617 | 3637 | - | Addition of CA_2A-5A-66A in TS 36.521-1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173619 | 3639 | - | Addition of CA_2A-13A-66A in TS 36.521-1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173694 | 3645 | - | Addition of CA_XA-YC-ZA to 7.4A.7 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173695 | 3646 | - | Addition of CA_XA-YC-ZA to 7.5A.7 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173696 | 3647 | - | Addition of CA_XA-YC-ZA to 7.6.1A.7 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173697 | 3648 | - | Addition of CA_XA-YC-ZA to 7.6.2A.7 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173698 | 3649 | - | Addition of CA_XA-YC-ZA to 7.6.3A.7 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173699 | 3650 | - | Addition of CA_XA-YC-ZA to 7.8.1A.7 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173784 | 3652 | - | Editorial correction to 4Rx Applicability for CSI | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173785 | 3653 | - | Addition of FS3 OCNG pattern to Rx tests | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173787 | 3655 | - | Clarification on UL RMC for category NB1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173797 | 3658 | - | Addition of measurement period for 9.8.2.1 in Annex G.5.4 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173798 | 3659 | - | Removing editor's note regarding UE's declaration on carrier center frequency for Cat M1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173912 | 3667 | - | Editorial: Addition of band 40 for eMTC | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173942 | 3674 | - | Editorial: Addition of V2V reference resource pooll configurations | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173949 | 3676 | - | Addition of new Rel-13 CA RF test case 7.4A.8 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173962 | 3678 | - | Update to test requirements in TC 6.7 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173963 | 3679 | - | Updates to test requirements for CA tests with interferers | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173984 | 3683 | - | Correction of test procedure and test requirement in TC 6.6.3.2A.2 (editorial change) | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173993 | 3686 | - | eMTC correction of missing references for UL RMCs | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173994 | 3687 | - | Correction of test requirement in TC 7.3_1 (editorial change) | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-173999 | 3690 | - | New eMTC test case, 6.3.5EA.3_1 Aggregate power control tolerance for UE category M1 (CE Mode B) | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174006 | 3694 | - | Addition of new 4Rx SDR test cases - Annex F | 14.3.0 | 14.4.0 |

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| 2017-09 | RAN#77 | R5-174007 | 3695 | - | Update Annex A with RMCs for 4Rx and 5MHz (editorial change) | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174024 | 3700 | - | Addition of new CA Configuration CA_3A-38A to TS 36.521-1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174026 | 3701 | - | Editorial Change of TC 8.10.1.1.3 – Alignment to TS 36.101 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174027 | 3702 | - | Correction of RB allocation in TC 6.5.2.3EA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174029 | 3704 | - | Editorial Change of RBstart expression in category M1 TC | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174031 | 3706 | - | Editorial Change of heading format for TC 6.3.3F | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174090 | 3713 | - | Editorial change of CA configuration for CA_41C-42A and CA_41C-42C | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174092 | 3714 | - | New CA band combination CA_41A-42C(2UL) and CA_41C_42A(2UL) - Updates of 7.3A.5 REFSENS | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174096 | 3716 | - | Correction of test frequency in 6.2.4EA for NS_17 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174097 | 3717 | - | Correction of test frequency in 6.6.3EA.3 for NS_17 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174135 | 3724 | - | Editorial Change to align LAA capability definitions for demodulation test cases in sub-clause 8.1.2 with TS 36.101 v14.4.0 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174136 | 3725 | - | Added CA band combination to test requirement | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174152 | 3729 | - | Addition of 1.4 and 3 MHz to Ch 5 in 36.521-1 for Band 65 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174153 | 3730 | - | Addition of 1.4 and 3 MHz to Ch 7 in 36.521-1 for Band 65 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174155 | 3731 | - | Receiver requirements for CA_29A-70A, CA_29A-46A-66A, CA_46A-66A-66A, CA_46A-66C, CA_46A-70A | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174178 | 3732 | - | Editorial Change of tables for channel bandwidths per operating band for CA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174244 | 3738 | - | Introduction of the new TC7.5A.8 ACS for 5DL CA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174245 | 3739 | - | Introduction of the new TC7.6.1A.8 In-band blocking for 5DL CA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174246 | 3740 | - | Introduction of the new TC7.6.2A.8 Out-of-band blocking for 5DL CA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174256 | 3743 | - | FDD Enhanced Downlink Control Channel Performance Type A for PCFICH/PDCCH, 2 Tx Antenna Port under Asynchronous Network | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174257 | 3744 | - | FDD Enhanced Downlink Control Channel Performance Type A for PCFICH/PDCCH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174258 | 3745 | - | Test procedure correction for CQI-RI test cases | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174261 | 3748 | - | TDD Enhanced Downlink Control Channel Performance Type A for PCFICH/PDCCH, 2 Tx Antenna Port with Colliding CRS Dominant Interferer | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174262 | 3749 | - | TDD Enhanced Downlink Control Channel Performance Type A for PCFICH/PDCCH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174264 | 3751 | - | Addition of test points in test configuration table for RX sensitivity TCs | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174270 | 3755 | - | TDD Enhanced Downlink Control Channel Performance Type B for PCFICH/PDCCH, 2 Tx Antenna Port with Colliding CRS Dominant Interferer | 14.3.0 | 14.4.0 |

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| 2017-09 | RAN#77 | R5-174271 | 3756 | - | TDD Enhanced Downlink Control Channel Performance Type B for PCFICH/PDCCH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174342 | 3769 | - | Introduction of new Dual Connectivity test cases - General ON/OFF time mask for Dual Connectivity | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174346 | 3772 | - | Updates to FDD and TDD Dual-Layer Spatial Multiplexing 2x4 (User-Specific Reference Symbols) | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174356 | 3774 | - | Editorial correction to Cat M1 MPDCCH test case | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174357 | 3775 | - | Editorial change to include note 2 reference for Band 22 tolerance in 6.2.2 UE Maximum Output Power | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174429 | 3785 | - | Editorial change to modify wrong references in category NB1 test cases | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174440 | 3789 | - | Addtion of test tolerance statement for TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 (4&5 DL CA) in Annex F | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-174680 | 3697 | 1 | Editorial Change - Correction of band sets for CA_7A-46C and CA_7A-46D | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175001 | 3681 | 1 | Addition of test requirement in TC 7.3A.5 for CA_2A-7A-12A | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175002 | 3720 | 1 | Update to Rx test case 7.6.3A.8 Narrow band blocking for 5DL CA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175003 | 3721 | 1 | Update to Rx test case 7.7A.8 Spurious response for 5DL CA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175004 | 3722 | 1 | Update to Rx test case 7.8.1A.8 Wideband intermodulation for 5DL CA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175005 | 3726 | 1 | Editorial Change to align CA capability definitions for demodulation test cases in sub-clause 8.1.2.3 with TS 36.101 v14.4.0 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175006 | 3741 | 1 | Addition of the CA_1A-3A, 1A-19A, 1A-21A, 3A-19A, 19A-21A for 2UL 64QAM TCs | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175007 | 3765 | 1 | Updated RF general section 4.1 to align with core specification | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175008 | 3777 | 1 | Add New TC of 6.2.2A.4.1 of UE Maximum Output Power for intra-band contiguous 3 UL CA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175009 | 3778 | 1 | Add New TC of 6.2.2A.4.2 for UE Maximum Output Power for inter-band 3 UL CA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175010 | 3779 | 1 | Add New TC of 6.5.1A.4.1 for Frequency error for intra-band contiguous 3 UL CA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175011 | 3780 | 1 | Add New TC of 6.5.1A.4.2 of Frequency error for inter- band 3 UL CA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175012 | 3790 | 1 | Addtion of minimum test time statement for TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 (4&5 DL CA) in Annex G | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175025 | 3715 | 1 | New CA band combination CA_1A-41C-42C - Updates of 7.3A.10 REFSENS | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175026 | 3698 | 1 | Addition of a few Band 46 CA Configurations to TS 36.521-1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175027 | 3712 | 1 | Addition of Rel-14 CA minimun and test requirements for Spurious emission band UE co-existence for CA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175052 | 3666 | 1 | Editorial Change to TC7.3 minimum conformance requirements of 4Rx to same text in core spec | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175055 | 3767 | 1 | Introduction of A-SEM test case with PUSCH frequency hopping | 14.3.0 | 14.4.0 |

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| 2017-09 | RAN#77 | R5-175056 | 3781 | 1 | Correction to test applicability of test cases 8.2.1.3.1 and 8.2.1.3.1_1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175057 | 3685 | 1 | Correction of initial conditions in TC 6.6.2.2A.2_1 (editorial change) | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175058 | 3782 | 1 | Editorial Change - Reordering of Tables according to NS value | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175059 | 3708 | 1 | Editorial Change – Cleanup of Test Configuration Tables of TC 7.3A.5 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175060 | 3661 | 1 | Correction to TDD PMI Reporting Multiple PMI for eDL-MIMO test case 9.4.2.3.2_D | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175065 | 3657 | 1 | Correction to UE-selected subband CQI test for Cat M1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175066 | 3696 | 1 | Correction of minimum test time for ETU1 in annex G | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175067 | 3705 | 1 | Editorial Change – Correction of minimum test time for TC 8.11.1.1.3 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175068 | 3773 | 1 | Completion of eMTC A-MPR test cases for NS_07 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175075 | 3692 | 1 | Addition of new 4Rx SDR test case - FDD 2DL | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175076 | 3693 | 1 | Addition of new 4Rx SDR test case - FDD 3DL | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175077 | 3746 | 1 | FDD Enhanced Downlink Control Channel Performance Type B for PCFICH/PDCCH, 2 Tx Antenna Port with Colliding CRS Dominant Interferer | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175078 | 3747 | 1 | FDD Enhanced Downlink Control Channel Performance Type B for PCFICH/PDCCH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175079 | 3768 | 1 | Introduction of new Dual Connectivity test cases - Power Control Relative power tolerance | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175085 | 3631 | 1 | Introduction of In-band emissions for non-allocated RB for V2X Communication / Non-concurrent with E-UTRA uplink transmissions in 6.5.2.3G.1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175086 | 3633 | 1 | Update of TC7.6.2G Out-of-band blocking for V2X Communication | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175087 | 3634 | 1 | Update of TC 7.8.1G.1 Wide band Intermodulation for V2X | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175088 | 3635 | 1 | Update of TC7.9G Spurious emissions for V2X | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175089 | 3642 | 1 | Introduction of Spurious emission for V2X Communication / Non-concurrent with E-UTRA uplink transmissions in 6.6.3G.1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175090 | 3675 | 1 | Addition of V2V new test case 6.5.1G.1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175091 | 3718 | 1 | Adding new TC 6.6.1G.1 Occupied bandwidth for V2X Communication/ Non-concurrent with E-UTRA uplink transmissions | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175092 | 3723 | 1 | GNSS Reference signal for V2V | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175093 | 3733 | 1 | Introduction of Spurious emission band UE co-existence for V2X Communication / Non-concurrent with E-UTRA uplink transmissions in 6.6.3G.1_1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175094 | 3764 | 1 | Introduction of Additional Spectrum Emission Mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions in 6.6.2.2G.1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175095 | 3784 | 1 | Editorial: Addition of V2V RMC for performance requirements | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175096 | 3787 | 1 | New test cases: Demodulation performance Requirements for V2X Sidelink communications | 14.3.0 | 14.4.0 |

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| 2017-09 | RAN#77 | R5-175102 | 3643 | 1 | Introduction of Spurious emission for V2X Communication / Intra-band contiguous MCC operation in 6.6.3G.3 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175103 | 3752 | 1 | Editorial change for V2X reference sensitivity TC | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175104 | 3753 | 1 | Update & editorial change for V2V RX Test Cases | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175105 | 3757 | 1 | Introduction ofSpurious emission band UE co-existence for V2X Communication / Intra-band contiguous MCC operation in 6.6.3G.3_1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175106 | 3766 | 1 | Update RF general section 3 for V2X information | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175107 | 3791 | 1 | Introduction of Spectrum Emission Mask for V2X Communication / Intra-band contiguous MCC operation in 6.6.2.1G.3 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175111 | 3786 | 1 | Editorial change to align 7.8.1F minimun and test requirements with core spec | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175113 | 3750 | 1 | Addition of test requirement & test points in test configuration table for 3A-69A | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175114 | 3776 | 1 | Addition of Band 69 in Receiver test cases | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175115 | 3788 | 1 | Addition of Cat1bis demod test cases | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175122 | 3669 | 1 | New TC: FDD PDSCH performance in HST-SFN scenario | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175123 | 3670 | 1 | New TC: TDD PDSCH performance in HST-SFN scenario | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175125 | 3770 | 1 | Addition of Rel14 bands for NB-IoT in Clause 5 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175126 | 3771 | 1 | Addition of Rel14 bands in NB-IoT Transmitter test cases | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175127 | 3699 | 1 | Editorial Change – Cleanup of Test Configuration Tables of TC 7.3A.9 and TC 7.3A.10 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175128 | 3727 | 1 | Updated to test requirement to clause 8 test cases | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175129 | 3737 | 1 | Introduction of TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (4DL CA) | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175130 | 3742 | 1 | Update of the test requirement about TC 7.3A.10 REFSENS for 5DL CA | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175137 | 3662 | 1 | Introduction ofTDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for FDD PCell (4DL CA) in 8.2.3.3.1.3 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175138 | 3663 | 1 | Introduction of TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for FDD PCell (5DL CA) in 8.2.3.3.1.4 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175139 | 3664 | 1 | Introduction of TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (4DL CA) in 8.2.3.3.2.3 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175140 | 3665 | 1 | Introduction of TDD FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for TDD PCell (5DL CA) in 8.2.3.3.2.4 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175145 | 3673 | 1 | Addition of LAA test case 9.2.6.2 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175146 | 3758 | 1 | NBIoT correction of bandwidth | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175160 | 3689 | 1 | Correction to eMTC test case (CEModeB) to support repetition factor >1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175161 | 3710 | 1 | Updates for FDD and HD-FDD and TDD Demodulation of MPDCCH in CE Mode B Test Cases | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175168 | 3644 | 1 | New CA band combinations CA_1A-3C-8A - Updates of 7.3A.9 REFSENS | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175169 | 3680 | 1 | Introduction of CA_1A-3A-11A to section 7 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175170 | 3682 | 1 | Introduction of CA_3A-8A-11A to section 7 | 14.3.0 | 14.4.0 |

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| 2017-09 | RAN#77 | R5-175171 | 3684 | 1 | Introduction of CA_3A-11A-28A to section 7 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175176 | 3783 | 1 | Update test case 7.6.2A.3 for LAA band combinations | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175177 | 3638 | 1 | Introduction of EVM equalizer spectrum flatness for V2X Communication / Non-concurrent with E-UTRA uplink transmissions in 6.5.2.4G.1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175178 | 3640 | 1 | Introduction of Spectrum Emission Mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions in 6.6.2.1G.1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175179 | 3636 | 1 | Introduction of In-band emissions for non-allocated RB for V2X Communication / Intra-band contiguous MCC operation in 6.5.2.3G.3 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175180 | 3719 | 1 | Adding new TC 6.6.1G.2 Occupied bandwidth for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175181 | 3754 | 1 | Update & editorial change for V2X RX Test Cases | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175185 | 3761 | 1 | Update to Configured UE transmitted Output Power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175190 | 3691 | 1 | Addition of new 4Rx SDR test case - FDD single carrier | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175191 | 3711 | 1 | Introduction of TDD-FDD CA PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model-Enhanced Performance Requirement Type A for TDD Pcell (2DL CA) | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175192 | 3734 | 1 | Introduction of TDD-FDD CA PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model-Enhanced Performance Requirement Type A for FDD Pcell (2DL CA) | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175197 | 3632 | 1 | Editorial correction to In-band emissions for non allocated RB in 6.5.2.3.4.2 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175199 | 3672 | 1 | Addition of eIMTA performance test case 8.2.2.2.5 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175203 | 3654 | 1 | Correction to NB-IoT test cases 6.5.1F and 6.6.2.1F | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175206 | 3735 | 2 | Introduction of TDD-FDD CA PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 Interference Model-Enhanced Performance Requirement Type A for TDD Pcell (2DL CA) | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175207 | 3736 | 2 | Introduction of TDD-FDD CA PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 Interference Model-Enhanced Performance Requirement Type A for FDD Pcell (2DL CA) | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175208 | 3688 | 1 | Editorial change, correction of RMC for Cat-M1 TDD PDSCH demodulation requirements | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175210 | 3707 | 1 | Update of TC 6.3.4F ON/OFF time mask for category NB1 | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175217 | 3656 | 1 | Correction to Test Parameters for Cat M1 CQI tests | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175220 | 3759 | 2 | Update to 6.2.2G.2 UE Maximum Output Power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | 14.3.0 | 14.4.0 |
| 2017-09 | RAN#77 | R5-175221 | 3760 | 2 | Update to Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | 14.3.0 | 14.4.0 |
| 2017-12 | RAN#78 | R5-176118 | 3793 | - | Correction of eMTC minimum test time | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176196 | 3806 | - | Update of Annexes F.1.4 and F.3.4 | 14.4.0 | 14.5.0 |

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| 2017-12 | RAN#78 | R5-176229 | 3809 | - | Introduction of New TC 6.5.2A.1.4 Error Vector Magnitude (EVM) for CA (3UL CA) | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176230 | 3810 | - | Introduction of New TC 6.5.2A.2.4 Carrier leakage for CA (3UL CA) | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176231 | 3811 | - | Introduction of New TC 6.5.2A.3.4 In-band emissions for non allocated RB for CA (3UL CA) | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176245 | 3818 | - | Correction of eMTC test case 7.3EA | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176246 | 3819 | - | Aligning CA delta TIB in sub-clause 6.2.5.3 with TS 36.101 v14.5.0 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176247 | 3820 | - | Aligning CA delta RIB in sub-clause 7.3.3 with TS 36.101 v14.5.0 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176252 | 3822 | - | Adding missing ULCA bandwidth class B MPR | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176299 | 3827 | - | Updated Annex I.2.2 Tests for CA | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176300 | 3828 | - | Updated Annex G for new 4DL CA test cases | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176301 | 3829 | - | Added TC7.3A.9 test requirement for CA_2A-2A-5A-30A | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176308 | 3832 | - | Updated to Annex A for RMC and reference resource pool configuration | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176336 | 3846 | - | Addition of new 4Rx SDR test cases - Annex F | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176386 | 3850 | - | New CA band combinations CA_1A-3A-8A-40A - Updates of 7.3A.9 REFSENS | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176388 | 3851 | - | Updates of the SDR TC 8.7.5.1_H.3 for TDD FDD CA | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176418 | 3860 | - | Introduction of Spurious response for V2X in 7.7G.2 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176423 | 3862 | - | Update of 4DL CA Test Cases | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176425 | 3863 | - | Correction to applicability statement of 4Rx CQI test cases | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176430 | 3864 | - | Update the applicability of test points for CA configurations 3A-3A and 7A-7A | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176431 | 3865 | - | Update REFSENS of 3DL CA for multiple CA configurations in 7.3A.5 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176432 | 3866 | - | Addition of REFSENS of 2A-4A-7A-7A in 7.3A.9 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176453 | 3869 | - | Update of UE co-existence requirements for Band 39 in 6.6.3.2 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176477 | 3870 | - | Missed Addition of Cat1bis demod test case | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176493 | 3875 | - | Correction to test procedure for 6.3.5F.2 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176496 | 3878 | - | Correction to 6.5.2.1F.1 and 6.5.2.3F | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176503 | 3881 | - | Correction to requirement of 9.4.1.3.2_D | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176504 | 3882 | - | Editorial correction to 8.2.1.4.2_A.3 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176505 | 3883 | - | Clean up on LAA demodulation test cases | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176507 | 3885 | - | Correction to the test applicability for 2Rx SDR tests (36.521-1) | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176541 | 3889 | - | Introduction of TDD FDD CA Sustained data rate performance for TDD PCell (5DL CA) in 8.7.5.2.4 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176553 | 3892 | - | Correction of test points for intra band non-contiguous 2DL CA Max input level | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176555 | 3894 | - | Editorial correction of title for 4Rx chapter 9 TCs in 36.521-1 | 14.4.0 | 14.5.0 |

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| 2017-12 | RAN#78 | R5-176559 | 3896 | - | Alignment of TC 9.9.2.2.1 & 9.9.2.2.2 with 36.101 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176614 | 3902 | - | Introduction of UE Transmit OFF power for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176616 | 3904 | - | Update of test configuration for Maximum input level for 4DL CA | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176618 | 3905 | - | Update of test configuration for ACS for 4DL CA | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176619 | 3906 | - | Update of test configuration for In-band blocking for 4DL CA | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176620 | 3907 | - | Update of test configuration for Out-band blocking for 4DL CA | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176621 | 3908 | - | Update of test configuration for Narrow band blocking for 4DL CA | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176622 | 3909 | - | Update of test configuration for Wideband intermodulation for 4DL CA | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176631 | 3912 | - | FDD Enhanced Downlink Control Channel Performance Type A for PHICH, 2 Tx Antenna Port under Asynchronous Network | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176632 | 3913 | - | FDD Enhanced Downlink Control Channel Performance Type A for PHICH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176634 | 3914 | - | FDD Enhanced Downlink Control Channel Performance Type B for PHICH, 2 Tx Antenna Port with Colliding CRS Dominant Interferer | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176635 | 3915 | - | FDD Enhanced Downlink Control Channel Performance Type B for PHICH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176636 | 3916 | - | TDD Enhanced Downlink Control Channel Performance Type A for PHICH, 2 Tx Antenna Port with Colliding CRS Dominant Interferer | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176638 | 3918 | - | TDD Enhanced Downlink Control Channel Performance Type B for PHICH, 2 Tx Antenna Port with Colliding CRS Dominant Interferer | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176639 | 3919 | - | TDD Enhanced Downlink Control Channel Performance Type B for PHICH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176640 | 3920 | - | FDD Enhanced Downlink Control Channel Performance Type A for EPDCCH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176642 | 3922 | - | TDD Enhanced Downlink Control Channel Performance Type A for EPDCCH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176643 | 3923 | - | FDD Enhanced Downlink Control Channel Performance Type A for EPDCCH, 2 Tx Antenna Port under Asynchronous Network | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176654 | 3925 | - | Correction to e-MTC TM9 PDSCH. | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176721 | 3937 | - | Missed additions and corrections in TS 36.521-1 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176722 | 3938 | - | Correction to test requirements for B42 in TC 6.2.2A.2 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176773 | 3940 | - | Alignment of 7.9A measurement frequency ranges with TS 36.101 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176776 | 3941 | - | Correction of MPDCCH test cases | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176780 | 3942 | - | Corrections for NPDSCH-ConfigCommon-NB-DEFAULT in 6.3.4F.1 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176792 | 3943 | - | Update of UL CA relative power control | 14.4.0 | 14.5.0 |

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| 2017-12 | RAN#78 | R5-176796 | 3944 | - | Introduction of 4Rx CA TM9 demodulation test cases | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176827 | 3947 | - | Updates to Performance Test Cases for V2X Sidelink communications | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176839 | 3951 | - | Change of V2V TC names in TS 36.521-1 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176840 | 3952 | - | Correction of eMTC chapter 8 TC | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176841 | 3953 | - | Editorial Change – Alignment of HST-SFN scenario and requirements to TS 36.101 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176843 | 3955 | - | Editorial Change - Alignment of UE category M1 demodulation TCs to TS 36.101 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176847 | 3957 | - | New feMTC test case, 7.3EC Reference sensitivity level for UE category M2 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176848 | 3958 | - | New feMTC test case 6.2.2EB UE Maximum Output Power for UE category M2 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176849 | 3959 | - | Correction 6.6.2.3F NB-IoT ACLR test conditions | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177092 | 3888 | 1 | Change of eMTC demodulation test cases numbering | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177094 | 3956 | 1 | Editorial Change - Alignment of Channel spacing for CA to 36.101 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177112 | 3876 | 1 | Correction to test procedure for 6.3.5F.3 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177113 | 3877 | 1 | Correction to test condition for 6.5.1F | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177114 | 3879 | 2 | Clean up on NB-IoT demodulation tests | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177117 | 3932 | 1 | eLAA: Updates to Maximum output power | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177300 | 3934 | 1 | Updates of the Receiver Test cases for 5DL CA | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177301 | 3936 | 1 | Updates of the Receiver Test cases for 4DL CA | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177303 | 3849 | 1 | New CA band combinations CA_1A-3A-40A, CA_1A-8A-40A, and CA_3A-8A-40A - Updates of 7.3A.5 REFSENS | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177304 | 3903 | 1 | Update of A-MPR and Additional spurious emissions for inter-band DL and UL CA for UL 64QAM | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177305 | 3911 | 1 | Update of test case 9.6.1.1_A.4 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177306 | 3927 | 1 | Add a new test case 6.2.2A.4 to merge test cases 6.2.2A.4.1 and 6.2.2A.4.2 of UE Maximum Output Power for 3 UL CA | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177317 | 3917 | 1 | TDD Enhanced Downlink Control Channel Performance Type A for PHICH, 2 Tx Antenna Port with Non-Colliding CRS Dominant Interferer | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177318 | 3921 | 1 | TDD Enhanced Downlink Control Channel Performance Type A for EPDCCH, 2 Tx Antenna Port with Colliding CRS Dominant Interferer | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177320 | 3926 | 1 | Correction to test case 6.2.2A.1 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177321 | 3880 | 1 | Update 3DL CA Rx tests to support LAA band | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177323 | 3831 | 1 | Updated to RF section 8 & 9 test cases for missing TM9 in Test applicability | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177324 | 3884 | 1 | Correction to Test Parameters for Cat M1 PUCCH 1-0 static tests | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177325 | 3901 | 1 | Editorial correction to the operating bands for the vehicle mounted Band 30 UE | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177327 | 3930 | 1 | Correction to test case 9.3.2.1 | 14.4.0 | 14.5.0 |

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| 2017-12 | RAN#78 | R5-177333 | 3834 | 1 | Update to existing FDD 4Rx SDR test cases | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177335 | 3837 | 1 | Addition of new 4Rx SDR test case - TDD single carrier | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177336 | 3835 | 1 | Addition of new 4Rx SDR test case - FDD 4DL | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177337 | 3836 | 1 | Addition of new 4Rx SDR test case - FDD 5DL | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177338 | 3838 | 1 | Addition of new 4Rx SDR test case - TDD 2DL | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177339 | 3839 | 1 | Addition of new 4Rx SDR test case - TDD 3DL | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177340 | 3840 | 1 | Addition of new 4Rx SDR test case - TDD 4DL | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177341 | 3841 | 1 | Addition of new 4Rx SDR test case - TDD 5DL | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177342 | 3842 | 1 | Addition of new 4Rx SDR test case - TDD FDD 2DL | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177343 | 3843 | 1 | Addition of new 4Rx SDR test case - TDD FDD 3DL | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177344 | 3845 | 1 | Addition of new 4Rx SDR test case - TDD FDD 5DL | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177349 | 3960 | - | Add a new test case 6.5.1A.4 to merge test cases 6.5.1A.4.1 and 6.5.1A.4.2 of Frequency error for CA (3UL CA) | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177352 | 3857 | 1 | Update of V2V RX Test cases | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177353 | 3794 | 1 | Update of TC7.6.2G.1 Out-of-band blocking for V2X Communication | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177354 | 3797 | 1 | Update of TC 7.8.1G.1 Wide band Intermodulation for V2X | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177355 | 3802 | 1 | Update of TC7.9G Spurious emissions for V2X | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177356 | 3808 | 1 | Introduction of new test case 6.3.5G.1 Power Control Absolute power tolerance for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177357 | 3858 | 1 | Introduction of Spurious response for V2V in 7.7G.1 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177362 | 3859 | 1 | Update of V2X RX Test cases | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177363 | 3792 | 1 | Update to 5.2, 5.2G and 5.4.2G | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177364 | 3795 | 1 | Introduction of TC7.6.2G.2 Out-of-band blocking for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177365 | 3796 | 1 | Introduction of TC7.6.2G.3 Out-of-band blocking for V2X Communication / Intra-band contiguous multi-carrier operation | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177366 | 3798 | 1 | Introduction of TC 7.8.1G.2 Wide band Intermodulation for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177367 | 3799 | 1 | Introduction of TC 7.8.1G.3 Wide band Intermodulation for V2X Communication / Intra-band contiguous multi-carrier operation | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177368 | 3814 | 1 | Introduction of New TC 6.3.2G.3 Minimum output power for V2X Communication / Intra-band contiguous multi-carrier operation | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177369 | 3815 | 1 | Introduction of new test case 6.3.5G.2 Power Control Absolute power tolerance for V2X Communication / Intra-band contiguous multi-carrier operation | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177370 | 3861 | 1 | Introduction of Spurious response for V2X in 7.7G.3 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177371 | 3946 | 1 | Addition of new TC for V2X_Demod | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177373 | 3816 | 1 | Introduction of numbering rules guideline for category M2 in Annex I | 14.4.0 | 14.5.0 |

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| 2017-12 | RAN#78 | R5-177379 | 3847 | 1 | Correction to NB-IOT NPDSCH demod parameters | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177381 | 3939 | 1 | Correction in 8.12.2.1.2 to accommodate number of antennas | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177390 | 3825 | 1 | Updated clause 5.2E to include operating bands for UE category 1bis | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177391 | 3948 | 1 | Addition of new CAT1-bis TM9 Demod TCs | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177392 | 3949 | 1 | Cat1bis: Addition of new CAT1-bis TxDiv Demod TC | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177393 | 3950 | 1 | Cat1bis: Addition of new CAT1-bis SDR TCs | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177394 | 3954 | 1 | Addition of TC 7.3EB Reference Sensitivity for UE Category 1bis | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177395 | 3804 | 1 | Introduction of TC 8.9.1.1.2_1 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x1 for UE Category 1bis. | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177396 | 3805 | 1 | Introduction of TC 8.9.1.2.2_1 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x1 for UE Category 1bis | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177407 | 3833 | 1 | Introduction of new test case 6.3.5A.1.x Power Control Absolute power tolerance for CA (SRS carrier based switching) | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177408 | 3962 | 1 | Introduction of new test case TC 6.7A.4 "Transmit intermodulation for CA (3DL CA and 3UL CA) | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177418 | 3817 | 1 | Update to Rx test case 7.6.3A.8 and 7.8.1A.8 for 5DL CA | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177419 | 3854 | 1 | Update test parameters for TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (4DL CA) | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177420 | 3961 | 1 | Introduction of new test case TC 6.6.1A.4 “Occupied bandwidth for CA (3DL CA and 3UL CA) | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177421 | 3935 | 1 | Introduction of the new Test case 8.7.5.2_H.3 TDD-FDD 4DL CA SDR for 256QAM | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177423 | 3803 | 1 | Introduction of TC7.9F Spurious emissions for category NB1 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177424 | 3868 | 1 | Update of 6.7F the transmit intermodulation for category NB1 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177427 | 3855 | 1 | Introduction of TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (5DL CA) | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177428 | 3812 | 1 | Introduction of New TC 6.3.2G.1 Minimum output power for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177430 | 3899 | 1 | Adding new TC 6.7G.1 Transmit intermodulation for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177433 | 3844 | 1 | Addition of new 4Rx SDR test case - TDD FDD 4DL | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177434 | 3852 | 1 | Introduction of TDD-FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 with 256QAM for FDD PCell (2DL CA) | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177435 | 3853 | 1 | Introduction of TDD-FDD CA PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 with 256QAM for TDD PCell (2DL CA) | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177436 | 3824 | 1 | Introduction of RF TC 8.9.2.1.1_1 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177437 | 3813 | 1 | Introduction of New TC 6.3.2G.2 Minimum output power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177438 | 3856 | 1 | Introduction of Additional Maximum Power Reduction (A-MPR) for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 14.4.0 | 14.5.0 |

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| 2017-12 | RAN#78 | R5-177439 | 3890 | 1 | Introduction of In-band emissions for non-allocated RB for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions in 6.5.2.3G.2 | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177440 | 3900 | 1 | Adding new TC 6.7G.2 Transmit intermodulation for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177443 | 3821 | 1 | Optimisation for test cases 7.6.2A.x, statistical significance change. | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-177452 | 3924 | 1 | Clarification on the Order of SCCs | 14.4.0 | 14.5.0 |
| 2017-12 | RAN#78 | R5-176378 | 3848 | - | Band 72 introduction to 36.521-1 Chapter 5 | 14.5.0 | 15.0.0 |
| 2017-12 | RAN#78 | R5-176568 | 3898 | - | Band 72 introduction to 36.521-1 output power requirements | 14.5.0 | 15.0.0 |
| 2017-12 | RAN#78 | R5-177309 | 3830 | 1 | Align CA information in clause 5 with TS36.101 v15.0.0 | 14.5.0 | 15.0.0 |
| 2017-12 | RAN#78 | R5-177376 | 3826 | 1 | Added operating band and bandwidth for FDD Band 71 | 14.5.0 | 15.0.0 |
| 2017-12 | RAN#78 | R5-177441 | 3897 | 1 | Addition of LTE Band 71 into TS 36.521-1 | 14.5.0 | 15.0.0 |
| 2017-12 | RAN#78 | R5-177442 | 3931 | 1 | Addition of Band 71 in Receiver test cases | 14.5.0 | 15.0.0 |
| 2018-03 | RAN#79 | R5-180351 | 3965 | - | Band 68 introduction to 36.521-1 Chapter 5 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180356 | 3969 | - | Introduction of new V2X test case 6.3.5G.2 Power Control Absolute power tolerance for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180358 | 3971 | - | Update Annexes F.1.2 and F.3.2 for V2X test cases 6.3.5G.2 and 6.3.5G.3 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180385 | 3976 | - | Introduction of TC 9.7_1.1.2 TDD CQI reporting under AWGN conditions - PUCCH 1-0 for UE category 1bis | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180386 | 3977 | - | Introduction of TC 9.7_1.1.1 FDD CQI reporting under AWGN conditions - PUCCH 1-0 for UE category 1bis | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180387 | 3978 | - | Introduction of TC 9.7_1.1.3 FDD CQI reporting under fading conditions - PUSCH 3-0 for UE category 1bis | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180388 | 3979 | - | Introduction of TC 9.7_1.1.4 TDD CQI reporting under fading conditions - PUSCH 3-0 for UE category 1bis | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180389 | 3980 | - | Update of Annexes F.1.5 and F.3.5 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180414 | 3985 | - | Update of eIMTA performance test case 8.2.2.2.5 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180415 | 3986 | - | Addition of eIMTA CQI reporting test case 9.2.5 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180416 | 3987 | - | Addition of eIMTA CQI reporting test case 9.3.1.1.5 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180417 | 3988 | - | Addition of eIMTA CQI reporting test case 9.3.1.2.6 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180418 | 3989 | - | Add the test tolerance information into Annex F for multiple eIMTA test cases. | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180464 | 3991 | - | Update of TC8.13.3.6.1 and 8.13.3.6.2 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180466 | 3992 | - | Introduction of new test case 8.12.1.1.3 “Demodulation of NPDSCH (Cell-Specific Reference Symbols) in standalone for NB2” | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180500 | 4008 | - | Band 72 introduction to 36.521-1 spurious requirements | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180509 | 4009 | - | Introduce definitions and symbols of NB2 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180513 | 4012 | - | Addition of Band 72 in 36.521-1 Receiver test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180516 | 4013 | - | Addition of Band 72 in 36.521-1 Sections 9 and 12 | 15.0.0 | 15.1.0 |

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| 2018-03 | RAN#79 | R5-180575 | 4023 | - | Introduction of UE maximum output power for V2X Communication / Intra-band contiguous multi-carrier operation | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180576 | 4024 | - | Introduction of UE maximum output power for V2X Communication / Power class 2 / Non-concurrent with E-UTRA uplink transmissions | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180578 | 4025 | - | Introduction of UE Transmit OFF power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180739 | 4041 | - | Completion of FDD 4Rx SDR test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180740 | 4042 | - | Completion of TDD 4Rx SDR test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180741 | 4043 | - | Completion of TDD FDD 4Rx SDR test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180742 | 4044 | - | Minimum conformance requirements update for spurious emission band UE co-existence for CA (editorial) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180743 | 4045 | - | Introduction of Rel-15 test requirement for spurious emission band UE co-existence for CA | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180755 | 4049 | - | Added operation band and bandwidth information for Rel-15 CA | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180762 | 4051 | - | Resolve RMC name conflict in PHICH demodulation test | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180769 | 4052 | - | New feMTC test case 8.11.1.1.3.2, FDD and half-duplex FDD PDSCH 2 Tx Antenna Port supporting wideband transmission for UE category M2 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180770 | 4053 | - | New UL 256-QAM test case, 6.2.3_5, Maximum Power Reduction (MPR) for UL 256QAM | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180771 | 4054 | - | New UL 256-QAM test case, 6.6.2.3_5, Adjacent Channel Leakage power Ratio for UL 256QAM | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180772 | 4055 | - | Updates to legacy Tx test cases for UL 256-QAM | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180774 | 4056 | - | Update Annex A with reference measurement channels for UL 256-QAM | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180794 | 4059 | - | Editorial Correction – Alignment of Rel-14 CA configurations to TS 36.101 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180795 | 4060 | - | Editorial Correction – Alignment of RMC to 36.101 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180797 | 4062 | - | Correction of TC 7.3EB | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180798 | 4063 | - | Editorial Correction – Alignment of Rel-15 CA configuration to TS 36.101 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180799 | 4064 | - | Correction of A-MPR for Band 48 (NS_27) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180812 | 4065 | - | Applicability of LTE DL Control Channel Interference Mitigation test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180815 | 4066 | - | IM DLLCH Definitions, symbols and abbreviations | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180840 | 4067 | - | Update of Category M1 UL CEModeB TCs | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180843 | 4070 | - | Correction to LAA performance TCs | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180844 | 4071 | - | Correction to TC 6.7F | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180855 | 4078 | - | Introduction of General ON/OFF time mask for CA (3UL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180926 | 4089 | - | Editorial change of Additional spurious emissions for CA (inter-band DL CA and UL CA) for UL 64QAM | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180927 | 4090 | - | Update of TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (4DL CA) | 15.0.0 | 15.1.0 |

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| 2018-03 | RAN#79 | R5-180928 | 4091 | - | Update of TDD Sustained data rate performance for CA (4DL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180929 | 4092 | - | Update of TDD FDD CA PDSCH Single Antenna Port Performance for TDD PCell (5DL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180935 | 4095 | - | Correction to Rx Test Environment for 4 and 5 DL CA with Wgap | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180938 | 4097 | - | Correction to NB-IoT Configured UE transmitted power test 6.2.5F | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180941 | 4098 | - | Correction to operating band for NB-IoT | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180942 | 4099 | - | Correction to test configuration tables for intra-contiguous 2CA Tx tests | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180943 | 4100 | - | Update to test requirements in CatM1 TC 6.7EA | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180947 | 4104 | - | Editorial correction to 4x4MIMIO demodulation test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180949 | 4106 | - | Editorial correction in Annex F for CatM1 TC 8.11.1.1.1 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-180992 | 4109 | - | Introduction of CA_3A-7A-20A (3DL-2UL) to section 7 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181055 | 4127 | - | Addition of the Band 74 information into TS 36.521-1 chapter 5 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181057 | 4129 | - | Addition of the Band 74 information into TS 36.521-1 chapter 7 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181080 | 4134 | - | Editorial Correction of DCI format in 4Rx demodulation test case | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181096 | 4140 | - | Introduction of 4Rx CA TDD TM9 demodulation test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181097 | 4141 | - | Introduction of 4Rx CA FDD TM4 demodulation test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181098 | 4142 | - | Introduction of 4Rx CA TDD TM4 demodulation test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181099 | 4143 | - | Update of Annex F and G for new 4Rx CA demodulation test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181102 | 4144 | - | Beamforming model for FD-MIMO | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181341 | 4068 | 1 | Updates of Annex A for LAA | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181342 | 4069 | 1 | Correction to LAA CQI TCs | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181361 | 4086 | 2 | Updates to PDSCH scheduling for CQI reporting test cases for CA | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181362 | 4103 | 1 | Correction to 4x4MIMO CSI test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181511 | 4028 | 1 | Insert TT statement for V2V SEM and SE test cases in Annex F | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181516 | 4034 | 1 | Add TT statement for V2X SEM and SE test cases in Annex F | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181520 | 3972 | 1 | Updates of the CQI reporting TC 9.6.1.3.3 and 9.6.1.4.3 for TDD FDD CA | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181521 | 4076 | 1 | Introduction of Minimum Output Power for CA (3UL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181522 | 4077 | 1 | Introduction of UE Transmit OFF power for CA (3UL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181527 | 4096 | 1 | Editorial correction to Table 6.2.5.3-3 Delta TIB (three bands) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181529 | 3974 | 1 | Band 68 introduction to 36.521-1 output power requirements | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181530 | 3975 | 1 | Band 68 introduction to 36.521-1 spurious requirements | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181531 | 4029 | 1 | Addition of Band 68 in 36.521-1 Receiver test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181533 | 4083 | 1 | Update of CA Performance Test Cases | 15.0.0 | 15.1.0 |

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| 2018-03 | RAN#79 | R5-181534 | 4115 | 1 | Correction to typo of the test case numbering of 8.2.2.1.1_A.3 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181537 | 4125 | 1 | Missing requirements for CA_29A-66A-66A, CA_29A-66C | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181538 | 4126 | 1 | Receiver requirements for CA_29A-66A-70A, CA_29A-66A-66A-70A, CA_29A-66A-66A-70C, CA_29A-66A-70C, CA_29A-66C-70A, CA_29A-66C-70C, CA_29A-70C, CA_66A-66A-70A, CA_66A-66A-70C, CA_66A-70A, CA_66A-70C, CA_66C-70A, CA_66C-70C | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181539 | 4040 | 1 | eLAA_Update to 6.3.5A.1.2 and 6.3.5A.2.2 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181540 | 4113 | 1 | Updates to test case 6.6.1A.2 Occupied bandwidth | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181543 | 4085 | 1 | Correction of test points and test requirement for TC 6.6.3.2A.2 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181544 | 4135 | 1 | Intra-band non-contiguous sensitivity test case corrections | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181545 | 4072 | 1 | Update of section 8.1.2 for DL 256QAM | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181546 | 4132 | 1 | CSI 4RX: Correction to RI tests and used reference channels and MCS schemes | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181547 | 4105 | 1 | Correction to LAA performance tests | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181549 | 4131 | 1 | Reference sensitivity adjustment due to support for 4 antenna ports | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181550 | 4133 | 1 | Correction of message exceptions with zeroTxPowerResourceConfigList-r10 and zeroTxPowerSubframeConfig-r10 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181558 | 4001 | 1 | Introduction of New TC 8.13.1.1.3 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 with 256QAM (2DL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181559 | 4002 | 1 | Introduction of New TC 8.13.1.1.4 FDD PDSCH Closed Loop Four-Layer Spatial Multiplexing for CA (2DL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181561 | 4093 | 1 | Update of test applicability and minimum requirement in 9.6.1.3.4 and 9.6.1.4.4 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181563 | 3973 | 1 | Resubmission of Updates to Performance Test Cases for V2X Sidelink communications | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181564 | 3982 | 1 | Addition of new test case 6.5.2.1G.1, EVM for V2X non-concurrent with E-UTRA | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181565 | 3981 | 1 | Update of test case 6.5.1G.1, Frequency Error for V2X non-concurrent with E-UTRA | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181566 | 3983 | 1 | Addition of new test case 6.5.2.2G.1, Carrier leakage for V2X non-concurrent with E-UTRA | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181567 | 4014 | 1 | Introduction of Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Non-contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181568 | 4019 | 1 | Update to General ON/OFF time mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181569 | 4021 | 1 | Introduction of PSSS/SSSS time mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181572 | 3990 | 1 | Editorial, Cleaning up the style of titles of V2X test cases in TS 36.521-1 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181573 | 4016 | 1 | Introduction of Configured UE transmitted Output Power for V2X Communication / Intra-band contiguous multi-carrier operation | 15.0.0 | 15.1.0 |

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| 2018-03 | RAN#79 | R5-181574 | 4018 | 1 | Introduction of UE Transmit OFF power for V2X Communication / Intra-band contiguous multi-carrier operation | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181575 | 4020 | 1 | Introduction of General ON/OFF time mask for V2X Communication / Intra-band contiguous multi-carrier operation | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181577 | 4030 | 1 | Introduction of Spurious emission for V2X Communication / Sidelink simultaneous with E-UTRA uplink transmissions | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181578 | 4031 | 1 | Introduction of Spurious emission band UE co-existence for V2X Communication / Sidelink simultaneous with E-UTRA uplink transmissions | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181579 | 4032 | 1 | Introduction of Spectrum Emission Mask for V2X Communication /Sidelink simultaneous with E-UTRA uplink transmissions | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181580 | 4033 | 1 | Introduction of Additional Spectrum Emission Mask for V2X Communication / Sidelink simultaneous with E-UTRA uplink transmissions | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181581 | 4037 | 1 | Completion of Performance Test Case 14.8 for V2X Sidelink communications | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181582 | 4039 | 1 | Addition of new TC 6.6.1G.3 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181583 | 4094 | 1 | Addition of new TC 6.7G.3 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181602 | 4010 | 1 | Add the term NB2 into the applicability of minimum requirements | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181603 | 4011 | 1 | Add the term NB2 into Operating bands, Channel bandwidth and Carrier frequency | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181610 | 4128 | 1 | Addition of the Band 74 information into TS 36.521-1 chapter 6 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181615 | 4130 | 1 | Update of the operation bands about Category M2 and NB2 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181619 | 4138 | 1 | Introduction of CA_3A-7A-20A-32A 4DL/1UL to section 7 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181621 | 4082 | 1 | Update of 5DL CA Receiver Test Cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181622 | 4117 | 1 | Addition of the information about timing difference for TDD CA (2Rx) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181624 | 4022 | 1 | Introduction of TDD sustained data rate performance for CA (5DL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181625 | 4047 | 1 | Updated to RF section 7 test cases for Rel-14 CA combination | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181626 | 4079 | 1 | Introduction of TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (5DL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181627 | 4080 | 1 | Introduction of TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (5DL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181628 | 4081 | 1 | Introduction of TDD PDSCH Single Antenna Port Performance for CA (5DL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181629 | 4116 | 1 | Update test cases 6.2.2A.2 and 6.2.3A.2 for 12A-66A 2ULCA | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181631 | 4026 | 1 | Supplement the TC In-band emissions for non-allocated RB for V2X Communication/Non-concurrent with E-UTRA uplink transmissions with PSBCH testing | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181632 | 4027 | 1 | Update of the V2V SEM and SE test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181633 | 4036 | 1 | Completion of Performance Test Cases 14.2 and 14.3 for V2V Sidelink communications | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181634 | 4107 | 1 | Update of Spectrum Emission Mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions in 6.5.2.4G.1 | 15.0.0 | 15.1.0 |

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| 2018-03 | RAN#79 | R5-181636 | 4035 | 1 | Addition of IBE and EVM test requirement for Elaa | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181639 | 4108 | 1 | eLAA: Updates to Maximum output power | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181641 | 4003 | 1 | Introduction of New TC 8.13.1.3.1 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model – Enhanced Performance Requirement Type A (2DL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181642 | 4004 | 1 | Introduction of New TC 8.13.1.4.1 FDD PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 Interference Model - Enhanced Performance Requirement Type A (2DL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181643 | 4005 | 1 | Introduction of New TC 8.13.2.3.1 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model – Enhanced Performance Requirement Type A (2DL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181644 | 4006 | 1 | Introduction of New TC 8.13.2.4.1 TDD PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 Interference Model - Enhanced Performance Requirement Type A (2DL CA) | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181645 | 3970 | 1 | Update Annexes F.1.2 and F.3.2 for 4.2GHz < f <= 6GHz of 6.2.2/6.3.2/6.3.3/6.3.5.1 and V2V Sidelink test case 6.3.5G.1 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181646 | 3967 | 1 | Update the message contents and test requirement for V2V Sidelink test case 6.3.5G.1 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181647 | 3968 | 1 | Update the message contents and test requirement for V2X test case 6.3.5G.3 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181648 | 4015 | 1 | Introduction of Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Intra-band contiguous multi-carrier operation | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181649 | 4058 | 1 | Update to UE Maximum Output Power for V2X Communication / Non-concurrent with E-UTRA uplink transmission | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181650 | 4048 | 1 | Align CA capability definitions for demodulation test cases in sub-clause 8.1.2.x with TS 36.101 v15.1.0 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181651 | 4050 | 1 | Updated to RF section 7 test cases for Rel-15 CA combination | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181653 | 4114 | 1 | Correction to test case 6.6.3.1A.1 | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181654 | 4061 | 1 | Corrections for eMTC demodulation test cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181663 | 4007 | 1 | Update to Rx test cases for 5DL CA | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181664 | 4073 | 1 | Correction to 3DL/4DL CA Receiver Test Cases | 15.0.0 | 15.1.0 |
| 2018-03 | RAN#79 | R5-181361 | 4086 | 2 | Addition of missing CR "Updates to PDSCH scheduling for CQI reporting test cases for CA" | 15.1.0 | 15.1.1 |
| 2018-04 | RAN #79 | RP-180517 | 4145 | - | Resubmission of clause 8 part of CR: Cat1bis: Addition of new CAT1-bis SDR TCs<br>Note: This is a resubmission of CR3950r1 which was not implemented after RAN #78. | 15.1.1 | 15.1.2 |
| 2018-06 | RAN #80 | R5-182229 | 4146 | - | Editorial change – Alignment of RMCs in HST TCs | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182253 | 4149 | - | Addition of TT for test case 8.2.1.9 in TS 36.521-1 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182254 | 4150 | - | Addition of TT for test case 8.2.2.9 in TS 36.521-1 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182273 | 4155 | - | Update minimum conformance requirements for B43 in Spurious emission band UE co-existence test case (editorial) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182362 | 4163 | - | eLAA: RMC Update for eLAA | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182366 | 4164 | - | New test case: 7.4EC Maximum input level for UE category M2 | 15.1.2 | 15.2.0 |

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| 2018-06 | RAN #80 | R5-182414 | 4180 | - | Updating category M2 receiver test case 7.3EC with new bands (4, 14, 71) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182531 | 4186 | - | Update to Transmit OFF power for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182532 | 4187 | - | Update to General ON/OFF time mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182534 | 4189 | - | Update to PSSS/SSSS time mask for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182539 | 4193 | - | Update to Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182590 | 4204 | - | Update to UE Maximum Output Power for V2X Communication / Non-concurrent with E-UTRA uplink transmission | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182591 | 4205 | - | Update to UE Maximum Output Power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182592 | 4206 | - | Update to UE Maximum Output Power for V2X Communication / Intra-band contiguous multi-carrier operation | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182602 | 4212 | - | Addition of Annex G for V2V/X performance requirements for Sidelink communications | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182606 | 4215 | - | Addition of V2V performance test 14.4 for Sidelink communications | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182626 | 4224 | - | Update to 6.6.1G.1 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182631 | 4227 | - | New LTE 3UL CA TC 6.6.3.2A.4 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182633 | 4228 | - | eLAA update to 6.3.5A.2.2 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182647 | 4230 | - | Resubmit the CR of TC 9.7_1.1.2 for UE category 1bis | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182661 | 4231 | - | Update of test case 6.5.2.1G.1, EVM for V2X non-concurrent with E-UTRA | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182662 | 4232 | - | Update of test case 6.5.2.2G.1, Carrier leakage for V2X non-concurrent with E-UTRA | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182663 | 4233 | - | Update of Annex E to add EVM calculation method for V2X communication | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182667 | 4235 | - | Addition of REFSENS for CA_40E | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182669 | 4236 | - | Addition of REFSENS for CA_41F | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182672 | 4237 | - | Introduction of band 73 to TS36.521-1 clause 5 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182687 | 4242 | - | Introduction of TC 6.3.5A.1.4 Power Control Absolute power tolerance for CA (3UL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182688 | 4243 | - | Introduction of TC 6.3.5A.2.4.1 Power Control Relative power tolerance for CA (intra-band contiguous 3DL CA and 3UL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182691 | 4246 | - | Introduction of TC 6.3.5A.2.4.3 Power Control Relative power tolerance for CA (intra-band non-contiguous 3DL CA and 3UL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182694 | 4247 | - | Introduction of TC 6.3.5A.3.4 Aggregate Power Control Tolerance for CA (3UL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182696 | 4249 | - | CA band combination CA_1A-18A-28A - Updates of test points for some Rx tests | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182699 | 4251 | - | CA band combination CA_3A-42A - Updates of 7.3A.6 REFSENS | 15.1.2 | 15.2.0 |

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| 2018-06 | RAN #80 | R5-182702 | 4253 | - | CA band combination CA_41C-42C - Updates of 7.3A.9 REFSENS | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182704 | 4254 | - | Update of Editor's note in clause 9.6.1.3.4 and 9.6.1.4.4 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182705 | 4255 | - | Introduction of TC 6.6.2.3A.4.3 Adjacent Channel Leakage power Ratio for CA (intra-band non-contiguous 3DL CA and 3UL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182709 | 4257 | - | CA band combinations CA_1A-3A-28A, CA_1A-3A-42A, CA_1A-42C and CA_3A-42C - Updates of 7.3A.5 REFSENS | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182714 | 4259 | - | New CA band combination CA_3A-18A - Updates of 7.3A.3 and 7.3A.6 REFSENS | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182715 | 4260 | - | Introduction of TC 6.6.3.1A.4.3 Transmitter Spurious emissions for CA (intra-band non-contiguous 3DL CA and 3UL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182722 | 4262 | - | CA band combinations CA_41A-42C and CA_41C-42A - Updates of 6.2.2A.4 MOP | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182725 | 4264 | - | CA band combinations CA_41A-42C and CA_41C-42A - Updates of 7.3A.5 REFSENS | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182727 | 4265 | - | Editorial Correction of SNR value for TC 8.10.2.1.1 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182733 | 4268 | - | Correction of REFSENS for CA_2A-4A-29A-30A and CA_4A-29A-30A | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182735 | 4270 | - | Correction of REFSENS for CA_4A-4A-12A and CA_4A-4A-13A | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182742 | 4271 | - | Editorial correction to 6.2.5A.3 test requirement | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182743 | 4272 | - | Correction to SRS time mask for UE category M1 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182746 | 4275 | - | Correction to eDL-MIMO RI Reporting Test | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182747 | 4276 | - | Correction of RMC name in PHICH demodulation test | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182748 | 4277 | - | Correction to TM4 4Tx Perf tests | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182750 | 4279 | - | Editorial correction to eMTC CSI tests | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182760 | 4280 | - | Updated RF clause 7.3A.0 for Rel-15 CA combination | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182771 | 4284 | - | Correction of MPR for Multi Cluster PUSCH test case 6.2.3_4 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182772 | 4285 | - | Correction of MPR for Multi Cluster PUSCH test case 6.2.3_2 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182804 | 4289 | - | Corrections to RMC for LAA performance TCs | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182806 | 4291 | - | Update of general sections of chapter 8 and 9 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182877 | 4304 | - | Clarification on the Order of SCCs | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182898 | 4305 | - | Update the minimum conformance requirements, message contents and test requirement for V2V Sidelink test case 6.3.5G.1 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182899 | 4306 | - | Correction to e-MTC CQI test cases | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182904 | 4307 | - | Introduction of new V2X test case 6.3.5G.2 Power Control Absolute power tolerance for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182906 | 4308 | - | Update the minimum conformance requirements, message contents and test requirement for V2X test case 6.3.5G.3 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182919 | 4312 | - | Introduction of 4Rx TDD FDD CA TM4 demodulation test cases | 15.1.2 | 15.2.0 |

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| 2018-06 | RAN #80 | R5-182974 | 4316 | - | Addition of band 4, 14 and 71 for UE category M1 and NB1 to clause 6.6. | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-182975 | 4317 | - | Addition of band 4, 14 and 71 for UE category M1 and NB1 to clause 7.3 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183002 | 4320 | - | Corrections for LAA performance test cases | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183005 | 4323 | - | Editorial correction of applicability and test rules for TDD-FDD CA configurations | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183006 | 4324 | - | Editorial correction to RMC for UL 256QAM | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183010 | 4325 | - | Alignment of test configuration tables for CA receiver test cases | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183254 | 4288 | 1 | Corrections to LAA performance TCs | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183278 | 4278 | 1 | Correction to LAA CSI reporting tests | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183713 | 4329 | - | Addition and correction of GNSS information for V2X for receiver tests | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183718 | 4188 | 1 | Test Tolerance and other details for CAT1-bis TM9 Demod TCs | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183731 | 4222 | 1 | Addition of new TC 7.4A.7_H | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183732 | 4223 | 1 | Addition of new TC 7.4A.8_H | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183735 | 4295 | 1 | Update of Name_Release mapping table for DL CA | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183744 | 4181 | 1 | LTE_B48_Reference sensitivity level correction | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183746 | 4203 | 1 | Correction for test requirement in TC 6.2.4_2 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183747 | 4273 | 1 | Editorial correction to additional spurious emission test | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183748 | 4287 | 1 | Correction to test points for NS_12 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183749 | 4274 | 1 | Correction to test configuration tables in intra-band non-contiguous CA Rx test cases | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183750 | 4300 | 1 | Decreasing test frequency for NB-IoT test | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183752 | 4151 | 1 | Correction to eMTC TM6 PDSCH applicability | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183754 | 4154 | 1 | Editorial: Adding titles to empty sub-clauses | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183760 | 4216 | 1 | Updates to Ch9 CA CQI Reporting Accuracy tests | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183761 | 4217 | 1 | Introduction of New TC 8.13.2.1.3 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x4 with 256QAM (2DL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183762 | 4219 | 1 | Introduction of New TC 8.13.2.1.4 TDD PDSCH Closed Loop Four-Layer Spatial Multiplexing (2DL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183763 | 4221 | 1 | Introduction of New TC 8.13.3.7.1 TDD-FDD CA PDSCH Closed Loop Four-Layer Spatial Multiplexing for FDD PCell (2DL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183764 | 4225 | 1 | Introduction of New TC 8.13.3.7.2 TDD-FDD CA PDSCH Closed Loop Four-Layer Spatial Multiplexing for TDD PCell (2DL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183765 | 4267 | 1 | Editorial correction to 4 layer MIMO test | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183766 | 4290 | 1 | Update of RMCs for four antenna ports | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183770 | 4321 | 1 | Corrections of CA configurations | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183772 | 4147 | 1 | Align CA information in clause 5 with TS36.101 v15.2.0 | 15.1.2 | 15.2.0 |

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| 2018-06 | RAN #80 | R5-183773 | 4160 | 1 | Aligning CA delta TiB in sub-clause 6.2.5.3 with TS 36.101 v15.2.0 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183774 | 4161 | 1 | Aligning CA delta RiB in sub-clause 7.3.3 with TS 36.101 v15.2.0 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183776 | 4261 | 1 | CA band combinations CA_1A-3A-18A and CA_1A-3A-26A - Updates of 7.3A.5 REFSENS | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183779 | 4327 | 1 | Correction to Rx requirements in Band 70 CA configurations without Band 71 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183788 | 4332 | - | New CA band combinations CA_3A-7A-42A and CA_3A-20A-42A - Updates of 7.3A.5 REFSENS | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183789 | 4197 | 1 | Cleaning up TC 6.5.2.4G.1 and 6.6.3G.1 for V2V | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183790 | 4198 | 1 | Update of test requirement in TC 6.6.3G.1_1 for V2V | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183791 | 4199 | 1 | Introduction of TC 6.6.2.3G.1 for V2V | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183792 | 4208 | 1 | Correction to the V2V test applicability | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183793 | 4210 | 1 | Update to Additional Maximum Power Reduction (A-MPR) for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183794 | 4211 | 1 | Update to Configured UE transmitted Output Power for V2X Communication / Non-concurrent with E-UTRA uplink transmission | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183795 | 4213 | 1 | Completion of V2V performance tests for Sidelink communications | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183796 | 4226 | 1 | Update of test case 6.7G.1 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183797 | 4234 | 1 | Update of Annex F to add TT information for multiple V2V test cases | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183798 | 4310 | 1 | Update Annex F.3.2 for 4.2GHz < f <= 6GHz of 6.3.2/6.3.5.1 and V2V Sidelink test case 6.3.5G.1 according to R4-1805742 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183801 | 4330 | 1 | Addition and correction of GNSS information for V2X for transmitter tests – part 1 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183802 | 4331 | 1 | Addition and correction of GNSS information for V2X for transmitter tests – part 2 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183803 | 4168 | 1 | Addition and correction of GNSS information for V2X to clause 14 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183804 | 4169 | 1 | Deletion of GNSS information for V2X from annex C.2 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183805 | 4207 | 1 | Introduction of Maximum Power Reduction (MPR) for V2X Communication / Power class 2 / Contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183806 | 4214 | 1 | Completion of V2X Performance TC 14.8 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183808 | 4309 | 1 | Introduction of new V2X test case 6.5.1G.2 Frequency error for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183809 | 4311 | 1 | Update Annex F.3.2 for V2X test cases 6.3.5G.2 and 6.3.5G.3 according to R4-1805742 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183813 | 4148 | 1 | Introduce HST-SFN into the Abbreviations of TS 36.521-1 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183814 | 4318 | 1 | Update of SRS switching test case 6.3.5A.1.5 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183815 | 4170 | 1 | Addition of new test case for Maximum input level for UE category 1Bis | 15.1.2 | 15.2.0 |

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| 2018-06 | RAN #80 | R5-183816 | 4171 | 1 | LTE_New test case 7.5EB Adjacent Channel Selectivity (ACS) for UE category 1bis | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183817 | 4172 | 1 | LTE_New test case 7.6.1EB In-band blocking for UE category 1bis | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183818 | 4173 | 1 | LTE_New test case 7.6.2EB Out-of-band blocking for UE category 1bis | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183819 | 4174 | 1 | LTE_New test case 7.6.3EB Narrow band blocking for UE Category 1bis | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183820 | 4175 | 1 | LTE_New test case 7.7EB Spurious response for UE category 1bis | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183821 | 4176 | 1 | LTE_New test case 7.8.1EB Wide band Intermodulation for UE category 1bis | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183822 | 4177 | 1 | LTE_New test case 7.9EB Spurious emissions for UE category 1bis | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183823 | 4229 | 1 | Update of TC 8.9.1.1.2_1 FDD PDSCH Closed Loop Single Layer Spatial Multiplexing for UE category 1bis | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183824 | 4238 | 1 | Update of TC 8.9.1.2.2_1 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing for UE category 1bis | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183825 | 4314 | 1 | Addition of new CAT1Bis demod TC 8.9.2.2.1_1 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183826 | 4326 | 1 | Addition of UE category 1bis transmit quality test cases | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183831 | 4281 | 1 | Updated general clause to include Cat-M2 information | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183832 | 4282 | 1 | Updated RF TC 8.11.2.x to cover Cat-M2 requirement | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183833 | 4283 | 1 | Added RMC information for category M2 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183835 | 4301 | 1 | Message Exceptions for LTE IM DLCCH EDPCCH Test Cases | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183836 | 4302 | 1 | Message Exceptions for LTE IM DLCCH PCFICH/PDCCH Test Cases | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183837 | 4303 | 1 | Message Exceptions for LTE IM DLCCH PHICH Test Cases | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183839 | 4156 | 1 | Correction to NB-IoT Configured UE transmitted power test 6.2.5F | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183840 | 4157 | 1 | Addition of Clause 6.2.5FA Configured UE transmitted Output Power for UE category NB1 and NB2 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183841 | 4158 | 1 | Addition of Clause 6.2.3FA MPR for category NB1 and NB2 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183842 | 4159 | 1 | Correction to Subclause 6.2.2F.3 and addition of Clause 6.2.2FA MOP for category NB1 and NB2 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183843 | 4162 | 1 | Correction to Clause 6.2.3F MPR for category NB1 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183853 | 4286 | 1 | Update of TCs 6.5.2A.1.2 and 6.5.2A.1.2_1 for eLAA | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183861 | 4200 | 1 | Addition of new UL 256QAM test case - MPR for multi cluster | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183862 | 4201 | 1 | Addition of new UL 256QAM test case - A-MPR | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183863 | 4202 | 1 | Addition of new UL 256QAM test cases - Annex F | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183868 | 4315 | 1 | Addition of band 4, 14 and 71 for UE category M1 and NB1 to clause 6.2 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183870 | 4218 | 1 | Addition of new TC 8.7.1.1_H.4 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183871 | 4245 | 1 | Introduction of TC 6.3.5A.2.4.2 Power Control Relative power tolerance for CA (inter-band 3DL CA and 3UL CA) | 15.1.2 | 15.2.0 |

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| 2018-06 | RAN #80 | R5-183872 | 4250 | 1 | Introduction of TC 6.6.2.3A.4.1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous 3DL CA and 3UL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183873 | 4252 | 1 | Introduction of TC 6.6.2.3A.4.2 Adjacent Channel Leakage power Ratio for CA (inter-band 3DL CA and 3UL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183874 | 4256 | 1 | Introduction of TC 6.6.3.1A.4.1 Transmitter Spurious emissions for CA (intra-band contiguous 3DL CA and 3UL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183875 | 4258 | 1 | Introduction of TC 6.6.3.1A.4.2 Transmitter Spurious emissions for CA (inter-band 3DL CA and 3UL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183876 | 4292 | 1 | Introduction of Maximum Power Reduction (MPR) for CA (3UL CA) | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183877 | 4178 | 1 | LTE_In Band Blocking test for 4DLCA combo CA_40E and 5DLCA-2ULCA combo CA_41F | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183878 | 4179 | 1 | LTE_Out_of_Band_Blocking for 4DLCA combo CA_40E and 5DLCA-2ULCA combo CA_41F | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183879 | 4195 | 1 | Update of TT in TC 6.5.2.3G.1 for V2V | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183880 | 4196 | 1 | Update of TT in TC 6.6.2.2G.1 for V2V | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183881 | 4209 | 1 | Update to Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Non-contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183882 | 4220 | 1 | Addition of new TC 8.7.1.1_H.5 | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183884 | 4266 | 1 | Correction to test procedure for CQI reporting test cases for CA | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183885 | 4190 | 1 | Update to Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183886 | 4191 | 1 | Introduction of Maximum Power Reduction (MPR) for V2X Communication / Power class 2 / Non-contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183887 | 4192 | 1 | Update to Configured UE transmitted Output Power for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmission | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183888 | 4194 | 1 | Introduction of General ON/OFF time mask for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183889 | 4182 | 1 | Introduction of New TC 6.5.2.1_2 Error Vector Magnitude (EVM) for UL 256QAM | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183890 | 4183 | 1 | Introduction of New TC 6.5.2A.1.1_2 EVM for CA (intra-band contiguous DL CA and UL CA) with UL 256QAM | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183891 | 4184 | 1 | Introduction of New TC 6.5.2A.1.2_2 Error Vector Magnitude (EVM) for CA (inter-band DL CA and UL CA) for UL 256QAM | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183892 | 4185 | 1 | Introduction of New TC 6.5.2A.1.3_2 Error Vector Magnitude (EVM) for CA (intra-band non-contiguous DL CA and UL CA) for UL 256QAM | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183897 | 4322 | 1 | Corrections to eMTC performance test cases | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183934 | 4334 | - | Update of V2V RF test cases for proper test mode setting | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183942 | 4293 | 2 | update of V2V RF TC | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183943 | 4333 | 1 | eLAA updates to Max power | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183944 | 4263 | 2 | Annex G update for NB-IOT demod test cases | 15.1.2 | 15.2.0 |

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| 2018-06 | RAN #80 | R5-183945 | 4296 | 2 | Addition of new FDD SDR LAA test cases | 15.1.2 | 15.2.0 |
| 2018-06 | RAN #80 | R5-183946 | 4298 | 2 | Addition of new TDD SDR LAA test cases | 15.1.2 | 15.2.0 |
| 2018-09 | RAN #81 | R5-184066 | 4337 | - | Resubmission of the Annexes of TC 6.5.2.3G.1 for V2V | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184099 | 4339 | - | Introduction of band 73 to UE maximum output power in TS36.521-1 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184130 | 4341 | - | Introduction of band 73 to Spurious emission in TS36.521-1 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184177 | 4342 | - | Updation of V2X TC 6.6.2.1G.2 & 6.6.2.1G.3 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184238 | 4355 | - | Correction to LAA CQI reporting tests | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184240 | 4357 | - | Correction to cqi-pmi-ConfigurationIndex for 5DL CA CQI Reporting tests | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184242 | 4359 | - | Correction to p-Max in configured UE transmitted output power tests for CA | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184243 | 4360 | - | Removal of the editor's note regarding the faders in 4x4 CA demod tests | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184244 | 4361 | - | Editorial correction to inter-band UL CA tests | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184246 | 4363 | - | Editorial correction to test points for 8.7.5.1 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184247 | 4364 | - | Correction to 4CA and 5CA PDSCH demodulation tests | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184249 | 4366 | - | Editorial correction to Table 6.2.5.3-3 Delta TIB (three bands) | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184250 | 4367 | - | Correction to Test Tolerance for 4DL and 5DL Reference Sensitivity Test | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184252 | 4369 | - | Correction of connection diagram for 4Rx 3CC/4CC/5CC Rx tests | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184253 | 4370 | - | Clarify the definition of active time slot in out of band and spurious emission tests | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184254 | 4371 | - | Editorial correction to test points for CA_2A-12A-66A in 7.3A.5 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184285 | 4375 | - | Addition of REFSENS test configuration of CA_1A-3A-7A-8A | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184313 | 4376 | - | Demodulation test case 8.11.1.1.1 and 8.11.1.1.2 updated for category M2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184316 | 4377 | - | Update of TDD-FDD CA PDSCH Closed Loop Single Layer Spatial Multiplexing 2x4 with TM4 Interference Model-Enhanced Performance Requirement Type A (2DL CA) | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184317 | 4378 | - | Update of TDD-FDD CA PDSCH Single-layer Spatial Multiplexing 2x4 on antenna ports 7 or 8 with TM9 Interference Model-Enhanced Performance Requirement Type A (2DL CA) | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184374 | 4382 | - | Update of TC 8.9.1.2.2_1 TDD PDSCH Closed Loop Single Layer Spatial Multiplexing for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184380 | 4383 | - | New feMTC test case 7.5EC Adjacent Channel Selectivity (ACS) for UE category M2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184381 | 4384 | - | New feMTC test case 7.6.1EC In-band blocking for UE category M2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184382 | 4385 | - | New feMTC test case 7.6.3EC Narrow band blocking for UE category M2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184383 | 4386 | - | New feMTC test case 7.8.1EC Wide band intermodulation for UE category M2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184384 | 4387 | - | Update of Annexes F.1.3 and F.3.3 | 15.2.0 | 15.3.0 |

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| 2018-09 | RAN #81 | R5-184385 | 4388 | - | Update of TC 6.6.2.3A.4 Adjacent Channel Leakage power Ratio for CA (3UL CA) | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184388 | 4389 | - | Update of TC 6.6.3.1A.4 Transmitter Spurious emissions for CA ( 3UL CA) | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184396 | 4391 | - | New CA band combination CA_8A-27A - Updates of 7.3A Refsens | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184412 | 4395 | - | Update to test case 6.5.2A.1.4 for 3UL CA | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184413 | 4396 | - | Update to test case 6.5.2A.2.4 for 3UL CA | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184414 | 4397 | - | Update to test case 6.5.2A.3.4 for 3UL CA | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184415 | 4398 | - | Update to test case 7.6.3A.8 and 7.8.1A.8 for 5DL CA | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184416 | 4399 | - | Cleanning up SDR test cases for 4CC and 5CC using UL RMC | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184417 | 4400 | - | Update to Performance test cases for LTE DL CA 4 Rx antenna ports | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184539 | 4410 | - | Update of DL256QAM RF test cases 7.4A.7_H,7.4A.8_H,8.7.1.1_H.4 and 8.7.1.1_H.5 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184540 | 4411 | - | Update MU and TT of V2X test case 6.5.1G.2 Frequency error for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184541 | 4412 | - | Correction to eMTC tc 6.2.2EA, UE Maximum Output Power for UE category M1 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184557 | 4420 | - | Addition of new UL 256QAM test case - A-MPR for 2UL CA inter-band | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184558 | 4421 | - | Addition of new UL 256QAM test case - Annex F | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184559 | 4422 | - | Updates to feMTC tc 6.2.2EC UE Maximum Output Power for UE category M2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184585 | 4423 | - | Updated test requirement to RF clause 7 test cases for CA band | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184586 | 4424 | - | Align CA information in clause 5 with TS36.101 v15.3.0 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184604 | 4427 | - | Introduction of new test case TC 6.6.2.2A.4 Additional Spectrum Emission Mask for CA (3UL CA) | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184639 | 4430 | - | CA_1A-3A-26A(1UL) –Updates of 7.3A.5 REFSENS | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184644 | 4433 | - | Editorial: Cleaning up the style of Annex B.4.1A in TS 36.521-1 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184647 | 4435 | - | Correction of test requirements in 7.3.5A REFSENSE | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184650 | 4437 | - | Editorial correction of Table 7.6.3A.5.4.1-1 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184651 | 4438 | - | Update of TC8.12.1.1.3 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184660 | 4444 | - | Update to Maximum Power Reduction (MPR) for V2X Communication / Power class 3 / Contiguous allocation of PSCCH and PSSCH / Non-concurrent with E-UTRA uplink transmissions | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184695 | 4448 | - | Resubmission of update of TC8.13.3.6.1 and 8.13.3.6.2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184728 | 4451 | - | Update of TC7.6.2G.1 Out-of-band blocking for V2X Communication | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184729 | 4452 | - | Update of TC 7.8.1G.1 Wide band Intermodulation for V2X | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184733 | 4453 | - | Update of TC7.9G Spurious emissions for V2X | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184762 | 4455 | - | Aligning CA delta TiB in sub-clause 6.2.5.3 with TS 36.101 v15.3.0 | 15.2.0 | 15.3.0 |

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| 2018-09 | RAN #81 | R5-184764 | 4456 | - | Aligning CA delta RiB in sub-clause 7.3.3 with TS 36.101 v15.3.0 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184797 | 4459 | - | Clarification for chapter 8 & 9 general sections | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184811 | 4462 | - | Correction to Note 1 of Table 7.3A.0-0bB Reference sensitivity level for CA | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184812 | 4463 | - | Correction to Power Control for CA Test Procedure of TCs 6.3.5A.1.1, 6.3.5A.1.2 and 6.3.5A.1.4 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184818 | 4464 | - | Correction to Message Content for TC 6.2.4EA A-MPR for UE Category M1 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184832 | 4465 | - | Addition of Test point and test requirements for CA_3A-41A, 41A-42A,3A-42A spurious test cases | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184839 | 4467 | - | Update of TDD PDSCH Closed Loop Multi Layer Multiplexing 4x2 for CA (5DL CA) | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184840 | 4468 | - | Update of TX Minimum Ouput Power for CA (3UL CA) | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184842 | 4470 | - | Introduction of Maximum Power Reduction (MPR) for CA (3UL CA) | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184844 | 4472 | - | Addition of new 2CA band combination for CA REFSENS | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184886 | 4483 | - | LTE_New test case 6.2.2EB UE Maximum Output Power for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184935 | 4485 | - | Cat1bis new RF test case: Occupied bandwidth for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184936 | 4486 | - | Cat1bis new RF test case: Spectrum Emission Mask for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184937 | 4487 | - | Cat1bis new RF test case: Additional Spectrum Emission Mask for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184938 | 4488 | - | Cat1bis new RF test case: Adjacent Channel Leakage power Ratio for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184939 | 4489 | - | Cat1bis new RF test case: Spurious emission for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184941 | 4491 | - | Editorial correction of NS requirements | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-184991 | 4494 | - | Correction to Reference sensitivity level for CA UL Allocation in Table 7.3A.1.4.1-1 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185174 | 4457 | 1 | Reference sensitivity requirements for CA_66A-66A-70C-71A, CA_66A-66A-70A-71A, CA_66A-70C-71A, CA_66A-70A-71A, CA_66A-66A-71A, CA_70A-71A, CA_66A-71A, CA_66C-70C-71A, CA_66C-70A-71A, CA_70C-71A, CA_66C-71A | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185175 | 4492 | 1 | Update 3UL CA test cases 6.2.2A.4 and 6.5.1A.4 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185176 | 4493 | 1 | Update to test configuration tables and requirement tables for 12A-66A 2ULCA test cases. | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185185 | 4380 | 2 | Band 41 HPUE Maximum Output Power | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185186 | 4484 | 1 | 4Rx support in some 4DL CA and 5DL CA Demodulation test cases | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185330 | 4497 | - | Addition of test points for UL-CA_4A-12A in TC 6.3.2A.2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185331 | 4498 | - | Addition of test points for UL-CA_4A-12A in TC 6.3.5A.2.2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185343 | 4340 | 1 | New CA band combination CA_1A-3A-7A-20A - Update of table 7.3A.5, 7.3A.9 and refsens | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185354 | 4346 | 1 | Update of V2V TCs 6.5.2.3G.1 & 6.5.2.4G & 6.6.2.2G.1& 6.6.3G.1 | 15.2.0 | 15.3.0 |

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| 2018-09 | RAN #81 | R5-185355 | 4401 | 1 | Update to test case 6.3.2G.1 for V2V services based on LTE sidelink | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185356 | 4439 | 1 | Update of Additional Maximum Power Reduction (A-MPR) for V2X Communication / Non-concurrent with E-UTRA uplink transmissions | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185357 | 4445 | 1 | Update to Annex G for V2V/V2X Demod Perf tests | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185358 | 4454 | 1 | Update of multiple V2V RF test cases for proper test mode setting | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185360 | 4348 | 1 | Update of V2X TCs 6.6.3G.2_1 & 6.6.3G.3_1 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185361 | 4349 | 1 | Update of V2X TCs 6.6.3G.2 & 6.6.3G.3 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185362 | 4350 | 1 | Correction to 36521-1-chapter 6_V2V and V2X | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185363 | 4372 | 1 | Cleaning up V2X test cases in TS 36.521-1 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185364 | 4402 | 1 | Update to test case 6.3.2G.2 for LTE-based V2X Services | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185365 | 4403 | 1 | Update to test case 6.3.2G.3 for LTE-based V2X Services | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185366 | 4413 | 1 | Update of V2X test case 6.7G.2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185367 | 4414 | 1 | Addition of new TC 6.6.2.3G.2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185368 | 4415 | 1 | Introduction of new V2X test case 6.5.2.1G.2 Error Vector Magnitude (EVM) for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185369 | 4416 | 1 | Introduction of new V2X test case 6.5.2.1G.3 Error Vector Magnitude (EVM) for V2X Communication / Intra-band contiguous multi-carrier operation | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185370 | 4440 | 1 | Update to Additional Maximum Power Reduction (A-MPR) for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185371 | 4458 | 1 | Updates to Align Initial Conditions with Other V2X Test Cases | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185372 | 4474 | 1 | Update of V2X Receiver Test Cases | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185375 | 4356 | 1 | Correction to 4x4 CA demodulation tests | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185377 | 4475 | 1 | TS 36.521-1 Annex F update for UE cat 1bis test cases | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185378 | 4476 | 1 | LTE_New test case LTE_New test case 6.3.4EB ONOFF time mask for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185379 | 4477 | 1 | LTE_New test case 6.3.5EB Power Control for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185380 | 4479 | 1 | LTE_New test case 6.3.2EB Minimum Output Power for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185381 | 4481 | 1 | LTE_New test case 6.2.4EB Additional Maximum Power Reduction (A-MPR) for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185382 | 4478 | 1 | LTE_New test case 6.3.3EB UE Transmit OFF power for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185383 | 4480 | 1 | LTE_New test case 6.2.5EB Configured UE transmitted Power for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185384 | 4482 | 1 | LTE_New test case 6.2.3EB Maximum Power Reduction (MPR) for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185385 | 4490 | 1 | Cat1bis new RF test case: Transmit intermodulation for UE category 1bis | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185387 | 4434 | 1 | Introduction of FDD PDSCH Single-layer Spatial Multiplexing for FD-MIMO | 15.2.0 | 15.3.0 |

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| 2018-09 | RAN #81 | R5-185388 | 4436 | 1 | Introduction of TDD PDSCH Single-layer Spatial Multiplexing for FD-MIMO | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185406 | 4431 | 1 | Introduction of Additional spurious emissions for UL 256QAM | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185426 | 4379 | 1 | New test case: 6.2.3A.3_2, Maximum Power Reduction (MPR) for CA (intra-band non-contiguous DL CA and UL CA) for UL 256QAM | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185427 | 4449 | 1 | New UL 256QAM test case: 6.6.2.2_2 Additional Spectrum Emission Mask for UL 256QAM | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185431 | 4351 | 1 | eLAA_correction to 6.3.5A.1.2 and 6.3.5A.2.2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185432 | 4353 | 1 | eLAA_Update to 6.6.3.1A.2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185433 | 4447 | 1 | eLAA: Updates to Adjacent Channel Leakage power Ratio for CA | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185434 | 4419 | 1 | Addition of new UL 256QAM test case - A-MPR for 2UL CA intra-band contiguous | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185435 | 4418 | 1 | Correction of test points and test requirements for TC 6.2.4A.2_1 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185436 | 4417 | 1 | Correction of test points and test requirements for TC 6.2.4A.2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185438 | 4343 | 1 | Introduction of V2X TC 6.5.2.4G.3 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185439 | 4344 | 1 | Updation of V2X TC 6.6.2.2G.2 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185440 | 4345 | 1 | Updation of V2X TCs 6.5.2.3G.2 and 6.5.2.3G.3 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185441 | 4347 | 1 | TT statements for V2X TCs | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185448 | 4461 | 1 | Corrections to A-MPR values for NS_27 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185450 | 4358 | 1 | Correction to message exception for 8.2.1.4.2_A.4 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185451 | 4362 | 1 | Editorial correction to RMC name in PHICH demodulation test | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185452 | 4365 | 1 | Corrections to CA Test Configuration Table in section 7 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185493 | 4373 | 1 | Correction of test configuration of CA_20A-42A REFSENS | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185494 | 4374 | 1 | Update of 7.3A.5 REFSENS for Rel-13 CA configurations | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185497 | 4392 | 1 | New test case 6.3.5FA.1 Power Control Absolute power tolerance for category NB1 and NB2/Power Class 6 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185498 | 4393 | 1 | New test case 6.3.5FA.2 Power Control Relative power tolerance for category NB1 and NB2/Power Class 6 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185499 | 4394 | 1 | New test case 6.3.5FA.3 Aggregate power control tolerance for category NB1 and NB2/Power Class 6 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185506 | 4473 | 1 | Addition of new 3CA band combination for CA REFSENS | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185508 | 4469 | 1 | Introduction of Additional Maximum Power Reduction (A-MPR) for CA (3UL CA) | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185509 | 4471 | 1 | Introduction of General ON/OFF time mask for CA (3UL CA) | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185514 | 4408 | 1 | Updates of receiver test cases for CA_XA-YE | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185515 | 4409 | 1 | Updates of receiver test cases for CA_XA-YD | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185517 | 4390 | 1 | Updates of Band 74 information about Tx test cases in TS 36.521-1 | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185522 | 4338 | 1 | Update Clause in 6.2.5EA Configured UE transmitted Power for UE category M1 | 15.2.0 | 15.3.0 |

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| 2018-09 | RAN #81 | R5-185530 | 4446 | 1 | Clarification on frame structure in 4Rx performance and CSI test principles sections | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185535 | 4443 | 1 | Update to General ON/OFF time mask for V2X Communication / Simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185538 | 4425 | 1 | Introduction of new test case TC 6.2.5A.4 Configured UE transmitted Output Power for CA (3UL CA) | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185539 | 4426 | 1 | Introduction of new test case TC 6.6.2.1A.4 Spectrum emission mask for CA (3UL CA) | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185540 | 4429 | 1 | Update of test case TC 6.7A.4 "Transmit intermodulation for CA (3DL CA and 3UL CA)" | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185542 | 4432 | 1 | CA_3A-18A - Updates of some Tx test cases | 15.2.0 | 15.3.0 |
| 2018-09 | RAN #81 | R5-185185 | 4380 | 2 | fix wrong change of R5-185185 | 15.3.0 | 15.3.1 |
| 2018-12 | RAN #82 | R5-186580 | 4528 | - | Update NB-IOT Spurious Emission UE co-existence | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-186582 | 4530 | - | Update the 6.2.3FA to reduce test points | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-186583 | 4531 | - | Update Rel-14 NB-IOT Tx test cases to support category NB2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-186584 | 4532 | - | Update Rel-14 NB-IOT Rx test cases to support category NB2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-186588 | 4533 | - | Update 8.1.2.2 Definition of CA capability for 4DL and 5DL CA | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-186589 | 4534 | - | Update 4DL and 5DL performance test cases (Editorial) | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-186590 | 4535 | - | Addition of Statistic information for 4DL and 5DL test cases | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-186693 | 4538 | - | Update of V2X EVM TCs | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187004 | 4540 | - | Update 6.2.4G.1 the V2V AMPR test case to remove brackets and add Power Class 2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187049 | 4541 | - | Editorial correction to 4CA and 5CA ACS test cases | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187050 | 4542 | - | Editorial correction to 5DL CA blocking tests | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187054 | 4546 | - | Editorial correction to 6.6.3.1A.2 Transmitter Spurious emissions for CA | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187056 | 4548 | - | Correction to 6.2.5A.3 Configured UE transmitted Output Power for CA | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187060 | 4550 | - | Correction to 4x4 CA demodulation tests | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187062 | 4551 | - | Correction to Minimum Test time for 8.12.1.1.2 Demodulation of NPDSCH | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187065 | 4552 | - | Removal of TC 7.3F.2 Reference sensitivity level with repetition for Category NB1 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187066 | 4553 | - | Correction to LAA CQI tests | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187068 | 4554 | - | Correction to 6.6.3.3A.2 Additional spurious emissions for CA | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187069 | 4555 | - | Correction to 6.2.4A.2 Additional Maximum Power Reduction (A-MPR) for CA | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187072 | 4558 | - | Correction to 2x4 CA demodulation tests | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187092 | 4569 | - | Introduction of New test case 6.6.2.2A.1_2 Additional Spectrum Emission Mask for CA (intra-band contiguous DL CA and UL CA) for UL 256QAM | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187093 | 4570 | - | Introduction of New test case 6.6.2.2A.2_2 Additional Spectrum Emission Mask for CA (inter-band DL CA and UL CA) for UL 256QAM | 15.3.1 | 15.4.0 |

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| 2018-12 | RAN #82 | R5-187094 | 4571 | - | Update to Tx test cases for UL 256QAM | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187096 | 4572 | - | Update to 3 Tx test case for 3UL CA | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187143 | 4580 | - | Align CA information in clause 5 with TS36.101 v15.4.0 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187145 | 4582 | - | Updated test requirement to RF clause 7 test cases for CA band | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187147 | 4584 | - | Correction to test configuration table for CA band combination | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187154 | 4585 | - | Added applicability of requirements for UEs supporting coverage enhancement | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187182 | 4586 | - | Clarification for Cat-M1 Reference Sensitivity Test Requirement | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187192 | 4590 | - | Change of test point applicability in TC 6.2.4_2 due to 256QAM support | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187193 | 4591 | - | Change of test point applicability in TC 6.6.2.2_1 due to 256QAM support | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187195 | 4592 | - | Change of test point applicability in TC 6.6.2.3_4 due to 256QAM support | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187197 | 4594 | - | Change of test point applicability in TC 6.6.3.3_1 due to 256QAM support | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187202 | 4596 | - | Addition of new UL 256QAM test case - MPR for intra-band contiguous | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187205 | 4598 | - | Addition of new UL 256QAM test case - ACLR for multi cluster | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187210 | 4600 | - | Addition of new UL 256QAM test case - ALCR for intra-band contiguous | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187212 | 4602 | - | Addition of new UL 256QAM test case - ACLR for inter-band | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187291 | 4603 | - | CA_3A-28A - Updates of some Tx test cases | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187293 | 4604 | - | CA_11A-18A - Updates of some Tx test cases | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187295 | 4605 | - | CA_3A-41A-42C(1UL) - Updates of 7.3A.9 REFSENS | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187298 | 4606 | - | CA_3A-41C-42A(1UL) - Updates of 7.3A.9 REFSENS | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187300 | 4607 | - | CA_3A-41C-42C(1UL) - Updates of 7.3A.10 REFSENS | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187322 | 4609 | - | Correction to clause 9.1.1.4.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187329 | 4611 | - | Introduction of Additional spurious emissions for UL 256QAM | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187335 | 4614 | - | Test points and test requirements in TC 7.3A.9 for CA_2A-66C-71A and CA_2C-66A-66A | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187340 | 4615 | - | Introduction of CA_2A-66C-71A in Rx test cases | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187343 | 4616 | - | Correction of applicability statement in TC 6.2.4A.1 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187344 | 4617 | - | Addition of new Rel-14 CA configurations into REFSENS test | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187345 | 4618 | - | Addition of new Rel-15 CA configurations into REFSENS test | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187346 | 4619 | - | Correction of applicability in TC 6.6.2.2A.2 and TC.6.6.3.3A.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187347 | 4620 | - | Correction for test procedure step 4 in TC 6.6.3.3A.1 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187349 | 4622 | - | Correction for test procedure in TC 6.6.3.3A.1_1 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187350 | 4623 | - | Correction for test procedure in TC 6.6.3.3A.2_1 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187363 | 4626 | - | Corrections to TC 7.3A.5 | 15.3.1 | 15.4.0 |

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| 2018-12 | RAN #82 | R5-187364 | 4627 | - | Correction to general clause 7.1 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187365 | 4628 | - | Corrections to eMTC CQI Test Cases | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187389 | 4630 | - | Removing editor's note in FDD 5DL CA test cases | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187473 | 4631 | - | MU for UL 256QAM EVM test cases updated | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187476 | 4632 | - | Introduction of FD-MIMO test case: FDD PMI Reporting with 12Tx Class A codebook – PUSCH 3-1 (Single PMI) for FD-MIMO | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187535 | 4637 | - | Update the parameters to test cases 7.6.1A.1, 7.6.1A.2, 7.6.1A.3 and 7.6.1A.4 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187541 | 4640 | - | Update test case to cover band 46 for test cases 7.5A.7 and 7.5A.8 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187861 | 4629 | 1 | Update of V2X RF Receiver Test Cases for Intra-band contiguous | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187862 | 4560 | 1 | Editorial: 6.2.2EC, UE Maximum Output Power for UE category M2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187871 | 4638 | 1 | Update test case to cover band 46 for test cases 7.6.1A.7 and 7.6.1A.8 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187872 | 4639 | 1 | Update to test cases 7.6.1A.5 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187873 | 4561 | 1 | Introduction of tc 6.2.3EC, Maximum Power Reduction (MPR) for UE category M2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187874 | 4562 | 1 | Introduction of tc 6.2.5EC Configured UE transmitted Power for UE category M2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187875 | 4563 | 1 | Introduction of tc 6.3.2EC, Minimum Output Power for UE category M2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187876 | 4564 | 1 | Introduction of tc 6.3.3EC, UE Transmit OFF power for UE category M2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187877 | 4565 | 1 | Introduction of 6.3.4EC.1, General ON/OFF time mask for UE category M2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187878 | 4566 | 1 | Introduction of 6.3.5EC.1, Power Control Absolute power tolerance for UE category M2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187879 | 4567 | 1 | Introduction of 6.3.5EC.2, Power Control Relative power tolerance for UE category M2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187880 | 4568 | 1 | Introduction of 6.3.5EC.3, Aggregate power control tolerance for UE category M2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187916 | 4547 | 1 | Editorial correction to 6.5.1A.2 Frequency error for CA | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187917 | 4556 | 1 | Correction to 6.2.4A.2_1 and 6.6.2.2A.2_1 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187918 | 4543 | 1 | Correction to the test configuration table of 7.3A.6 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187940 | 4499 | 1 | Addition of new Test Configuration on TC 6.2.2A.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187941 | 4500 | 1 | Addition of new Test Configuration on TC 6.2.3A.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187942 | 4501 | 1 | Addition of new Test Configuration on TC 6.2.3A.2_1 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187943 | 4502 | 1 | Addition of new Test Configuration on TC 6.2.4A.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187944 | 4504 | 1 | Addition of new Test Configuration on TC 6.2.5A.3 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187945 | 4505 | 1 | Addition of new Test Configuration on TC 6.3.4A.1.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187946 | 4506 | 1 | Addition of new Test Configuration on TC 6.3.5A.1.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187947 | 4507 | 1 | Addition of new Test Configuration on TC 6.3.5A.3.2 | 15.3.1 | 15.4.0 |

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| 2018-12 | RAN #82 | R5-187948 | 4509 | 1 | Addition of new Test Configuration on TC 6.5.2A.1.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187949 | 4510 | 1 | Addition of new Test Configuration on TC 6.5.2A.1.2_1 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187950 | 4511 | 1 | Addition of new Test Configuration on TC 6.5.2A.2.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187951 | 4512 | 1 | Addition of new Test Configuration on TC 6.5.2A.3.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187952 | 4513 | 1 | Addition of new Test Configuration on TC 6.6.1A.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187953 | 4514 | 1 | Addition of new Test Configuration on TC 6.6.2.1A.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187954 | 4515 | 1 | Addition of new Test Configuration on TC 6.6.2.2A.2_1 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187955 | 4517 | 1 | Addition of new Test Configuration on TC 6.6.2.3A.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187956 | 4518 | 1 | Addition of new Test Configuration on TC 6.6.2.3A.2_1 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187957 | 4519 | 1 | Addition of new Test Configuration on TC 6.6.3.1A.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187958 | 4520 | 1 | Addition of new Test Configuration on TC 6.7A.2 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187963 | 4529 | 1 | Update the general sections for Rel-14 NB-IOT (Editorial) | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187965 | 4593 | 1 | Aligning CA delta TiB in sub-clause 6.2.5.3 with TS 36.101 v15.4.0 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187966 | 4595 | 1 | Aligning CA delta RiB in sub-clause 7.3.3 with TS 36.101 v15.4.0 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187967 | 4624 | 1 | Correction in TC 7.3A.3 for CA configuration CA_2A-71A | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187968 | 4625 | 1 | Correction in TC 7.3A.5 for CA configuration CA_2A-66A-71A | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187970 | 4587 | 1 | Change of applicability in UL 64QAM MPR and A-MPR tests due to UL 256QAM support | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187971 | 4588 | 1 | Change of applicability in UL 64QAM A-SEM and ACLR and Additional spurious tests due to UL 256QAM support | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187972 | 4597 | 1 | Addition of new UL 256QAM test case - MPR for inter-band | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187973 | 4612 | 1 | Addition of new UL 256QAM test case - Annex F | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187974 | 4537 | 1 | Introduction of Power Class 1 for B31 and B72 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187977 | 4536 | 1 | Introduction of the support of ProSe for B72 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187979 | 4521 | 1 | Correction to TC 7.7B Spurious response for UL-MIMO | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187980 | 4635 | 1 | Updating test case 6.2.4A.2 Additional Maximum Power Reduction (A-MPR) for CA (inter-band DL CA and UL CA) | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187984 | 4579 | 1 | Updated RF clause 9.8 to cover Cat-M2 requirement | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187988 | 4581 | 1 | Align CA information in clause 7.3A.0 with TS36.101 v15.4.0 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187990 | 4610 | 1 | Update of test case 9.6.1.1_A.4 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187991 | 4539 | 1 | Alignment of 256QAM EVM Test Tolerance between LTE and NR | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-187992 | 4634 | 1 | Updating test case 6.6.2.2 Additional spectrum emission mask and test case 6.6.3.3 Additional spurious emission | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-188040 | 4608 | 1 | Correction of RB allocation for 3DL_CA_1A-3A-41A | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-188051 | 4559 | 1 | Correction to the MU for UL CA | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-188066 | 4573 | 2 | Update TC 6.6.3G.2_1 | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-188233 | 4633 | 1 | Introduction of FD-MIMO test cases in Annexes | 15.3.1 | 15.4.0 |
| 2018-12 | RAN #82 | R5-188234 | 4574 | 1 | Maximum Output Power for CA | 15.3.1 | 15.4.0 |

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| 2018-12 | RAN #82 | R5-188235 | 4641 | 1 | MPR for CA (intra-band contiguous DL CA and UL CA) | 15.3.1 | 15.4.0 |

# History

| Document history | | |
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| V15.2.0 | October 2018 | Publication |
| V15.3.1 | March 2019 | Publication |
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